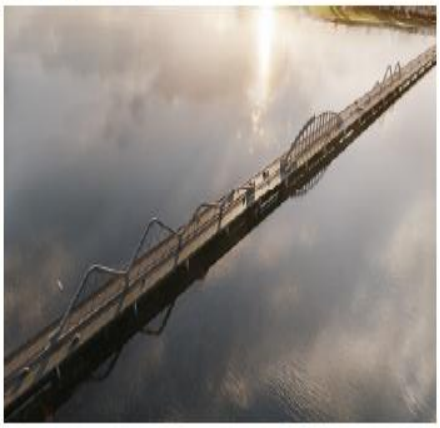
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE FOURTH MAINLAND BRIDGE



DRAFT FINAL REPORT

AUGUST, 2022

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AIDS	Acquired immunodeficiency syndrome
CESMP	Contractors Environmental and Social Implementation Plans
EHS	Environmental Health and Safety
ESHS	Environmental Social Health and Safety
ESIA	Environmental and Social Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FMEnv	Federal Ministry of Environment
GBV/ SEA	Gender Based Violence/ Sexual Exploitation and Abuse
IFC	International Finance Corporation
JHA	Job Hazard Analysis
LSSC	Lagos State Safety Commission
PPE	Personal Protective Equipment
PPP	Public-Private Partnership
RAP	Resettlement Action Plan
RAP	Resettlement Action Plan
ROW	Right of Way
SEP	Stakeholder Engagement Plan
SME	Small and Medium Scale Enterprises
STIs	Sexually Transmitted Infections
TMP	Traffic Management Plan (TMP)
WCS	Wildlife Conservation Society

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This ESIA report has been prepared by a multi-disciplinary team of experts from Sustainabiliti Limited and regulatory overview by the Federal Ministry of Environment (FMEnv), the Lagos State Ministry of Environment andWater Resources (LSMOEWR) and the Ogun State Ministry of Environment

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- The LSMOWI Project Coordinating Unit for their active participation in the ESIA study right from the inception, Field Visits and Stakeholder Consultations, supervision and review of the preliminary documents.
- The Engineering Design Consultants for the Project, Messrs Advanced Engineering Consultants (AEC) for the Project Design, Field accompaniment and other contributions.
- Efforts of our Environmental and Social Management Consultants, Sustainabiliti Limited with the support of dar al-handasah shair and partners for undertaking this ESIA study, conforming to the standards that we set at the commencement of the study and the timely completion of all aspects of this ESIA study, are highly commendable.

We greatly appreciate and acknowledge all contributions made by the afore-mentioned parties in the successful preparation of this Draft EIA Report.

EXECUTIVE SUMMARY

ES 1 Introduction/ Background

The Lagos State Government is implementing the 4th Mainland Bridge project (4MB) with financing support from a Consortium of International Finance Providers. Designed to cover a distance of 37 kilometres, the project will be constructed under a Design, Build, Finance, Operate, Maintain and Transfer (DBFOMT) concession and the state's Public-Private Partnership (PPP) programme for a period of 30 years. The Bridge, which is geared towards economic growth in the State, is expected to be financed and constructed in a Public Private Partnership (PPP) initiative and would be delivered in three years.

Policy, Legal, Institutional and Administrative Framework

The 4th Mainland Bridge project will be guided by various applicable policies, regulations and guidelines for ESIA studies stipulated by relevant authorities. These include Federal Ministry of Environment, State Ministry of Environment, Labour laws and social regulations, Caps, laws and edicts of international bodies as well as the World Bank Environmental and Social Framework (ESF). The project will comply with Lagos and Ogun States Environmental Laws.

The Federal Ministry of Environment (FMEnv), Ogun State Ministry of Environment and the Lagos State Ministry of Environment & Water Resources would provide procedures for conducting Environmental Assessments for this infrastructural project in line with the Environmental Impact Assessment Act No. 86, 1992 (as amended by EIA Act CAP E12 LFN 2004). Details in Chapter 2 of this ESIA report.

ES 2 Project Justification and Alternatives

Over 20 years many routes were looked at on maps for the 4th Mainland Bridge. All routes looked at only considered routes between the Lekki-Epe Expressway on Lekki to the Sagamu Road in Ikorodu. The road classification being used was for a "Distributor Road", which would not be to Expressway/Motorway standards. No historical route considered joining up the two major expressways, Lagos-Ibadan to the Lekki-Epe expressways?

In 2015 Advanced Engineering Consultants (AEC) undertook an extensive study, within its "Research & Development Unit" as regards the viability of the 4th Mainland Bridge Project. This study investigated all the "historical options considered" as well as investigating the possibility of alternative options. It was during this investigation that the viability of linking the 2 major expressways (Lagos -Ibadan & Lekki - Epe) came to the fore.

16 corridors were appraised for the route of the new alignment. One corridor came to the fore and it was approved "in principle" by the Lagos State Ministry of Works" in May 2016, after much internal discussions.

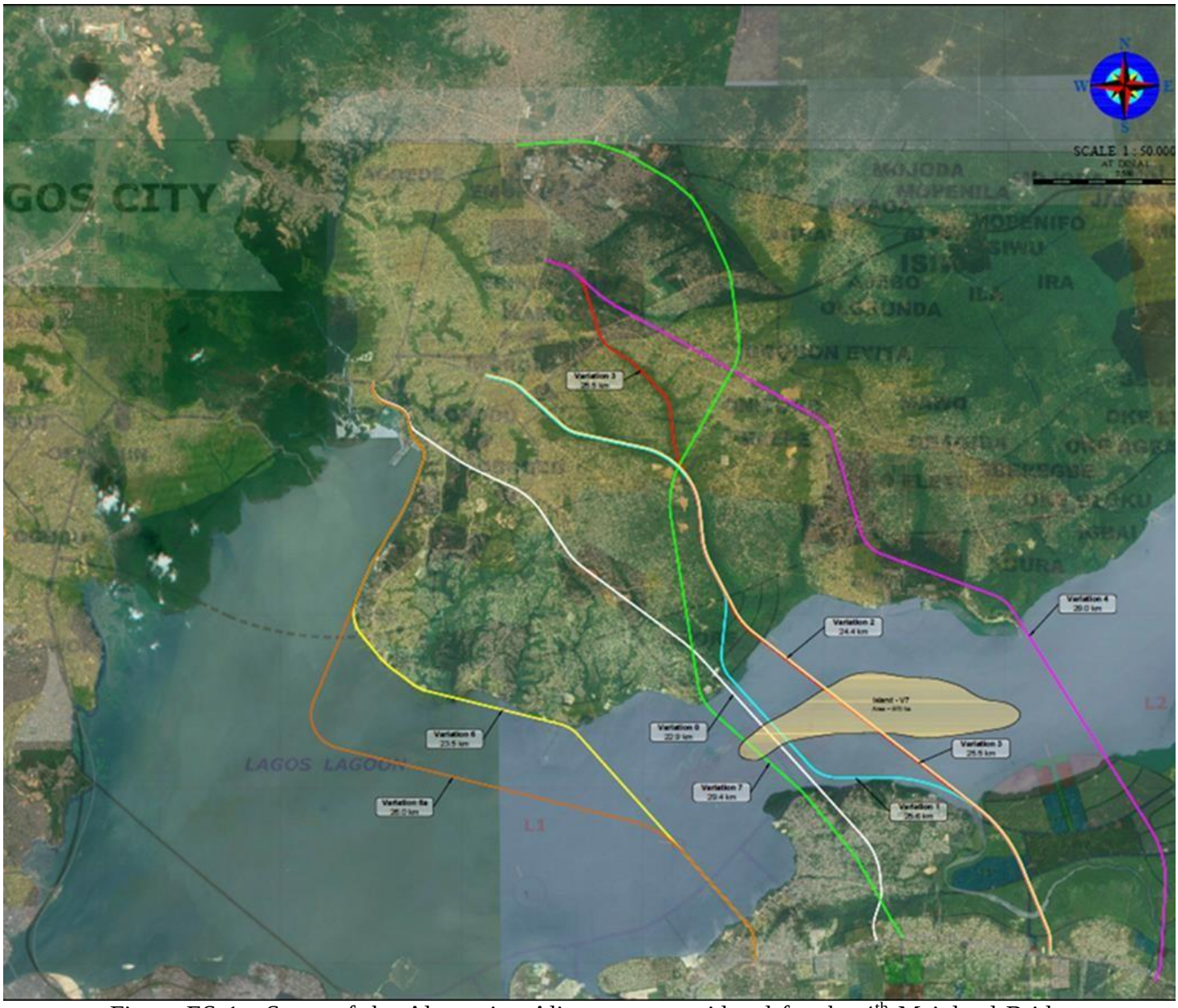


Figure ES 1: Some of the Alternative Alignments considered for the 4th Mainland Bridge Project

In July 2019, a review of the project was carried out by the Technical Transition Team of His Excellency, Mr. Babajide Sanwo-Olu. The "technical transition team" raised a number of observations which they felt should be considered in a revised design.

The alternatives considered were; Alternative alignments; Alternative technologies; and Alternative design. However, the preferred location/ proposed design chosen has been highlighted in Chapter 2 of this document.

Project options represent possible lines of actions to be taken against the problem the project is designed to solve. Considering the impacts and benefits associated with the project, the following options were considered in respect of the proposed project:

Option 1 - No - project Option

Option 2 - Do - project Option

Option 3 - Delayed - Project Option

This "Do-project option" proposes that the project be implemented: This option was considered as the best feasible option to the proposed 4th Mainland Bridge project. Details in chapter 2 of this EIA report.

Since the re-activation of the Project in late 2019, the Design of the Alignment has also taken into account a number of key observations by the technical Transition Team, so as to allow for both the present & future needs along its corridor, which include but not limited to;

- Adjusting the alignment to avoid as much as possible demolition.
- Allowing for future Highway Connections.
- Providing for many of Lagos States Main Drainage Issues along the corridor, in tandem with the Lagos Main Drainage Report.
- Providing for a BRT along the entire length (as per STMP Report).
- Minimizing Visual Intrusion through the Lagos Polytech Lands.
- Minimizing impacts on existing road construction works currently being undertaken by Lagos State Ministry of Works & Infrastructure at; - Igbe Road - Isawo Road
- Ensuring that the alignment stays above current water levels by applying a "Global Warming" threshold along the route.
- Securing an ESIA Certificate for the current Horizontal Alignment & Right of Way.

The benefits the proposed project now brings to Lagos State, are many. The east side of Lagos City will now have a relief highway which allows road users to navigate around the city center in accessing the Lekki area from the Lagos-Ibadan and Sagamu-Benin Expressways; which is one of the primary benefits.

a) Swift access to Lekki area.

b) Swift access to Lekki FTZ and Lekki Port.

c) Relieves pressure on 3rd Mainland Bridge

d) Opens up the Ikorodu area for growth.

e) Provides a "spine" for other proposed highway projects to connect to, such as; - Regional Road - Lagoon Highway - Lagos-Abuja Direct Route Transportation Corridor - Ikorodu Lagoon Highway

f) Catalyst for growth east of Lagos City.

g) Provides a strong socio-economic facility

h) Encourages the GDP growth within Lagos State.

ES 3 Project Description

Project Proponent

The Lagos State Government (LASG) as the Project Proponent, acting through its Ministry of Works and Infrastructure (LSMOWI) and the Lagos State Public Private Partnerships (PPP) Office intends to construct the Fourth Mainland Bridge (4MB) under a Design, Build, Finance, Operate, Maintain and Transfer (DBFOMT) arrangement.

The Project is a proposed PPP transport infrastructure development, which includes the construction of a 37km greenfield tolled road and bridge with a design speed of 120km/h. The road has a 4-lane dual carriageway with option of BRT lane on the outside and the Lagoon bridge which is approximately 5km in length is proposed to have 5 lanes in each direction.
Project Development Objective: The Project Development Objective (PDO) is to "improve he capacity of Lagos State in managing transportation in the state". The need for the bridge had become imperative following the phenomenal growth of Lagos State with a population of over 21 million people, which has in turn increased commercial activities and traffic gridlock, which has made it imperative to have a 4th Mainland Bridge that will serve as an alternative route to the Eastern axis and decongest traffic in the State. More importantly this bridge will provide the required transportation compliment to the rapidly growing industrial activities on the Eti-Osa – Lekki – Epe corridor of the State.

This proposed project will incorporate a new "Eastern Relief Road for Lagos City" which when completed will have the following:

• 32km of 4 lane Expressway – Land Based (operating at 100 or 120kph)

• 5km long Lagoon Bridge (5 lanes each way)

• 6 Interchanges installed initially

• 3 further Interchanges added at a "future date" to accommodate;

- Future Lagoon Highway

- Future Ikorodu Lagoon Highway

– Future Lagos-Abuja Direct Route Highway

• Designed to link to the "Coastal Road" at Lekki in the future

• 3 Mainline Toll Plazas

• Ramp "toll plazas" may be added depending on which Consortium is awarded the project

Potential for 2 "service areas" with adjacent "trailer park facilities"

• A number of "online" sites have been located for controlled & specific development

• Will accommodate "Cyclists & Pedestrians" locally

• Will have provision for "BRT Corridor" on its outsides, so that the route complies with the STMP Report of 2012, for Greater Lagos (which indicated then a 240,000 passenger/day carry)

• Will provide additional pedestrian crossings along the route after public consultation.

• Access to 3 major "land development" areas facilitated within the design

• River Bridges & Culverts to be installed at key locations

• Alignment can be increased to accommodate 6 lanes each way in the future The corridor for the project generates 397,000 ADT (2019) and it is expected that the project will eventually carry up to 75% of that volume, when initially open.

The Lekki section of the project starts at the existing Lekki-Epe expressway at the existing Abraham Adesanya Junction. It then moves northwards' towards the lagoon trying to use as much as possible of the "open spaces"

The proposed route alignment of the 4th Mainland Bridge (4MB) cuts across Lagos and Ogun States, Nigeria. These project areas have been grouped into zones as presented in the Table ES 1 below. Details on project description based on communities/ locations along the project corridor are presented in Chapter 3 of this ESIA report.

Table ES1: Communities within the Corridor of Influence on the Preferred Emerging Horizontal Route Alignment for the 4MB Project

ZONES	**COMMUNITIES**			
Zone 1	Ado (Okera Nla)	10 Families	HFP	-
Zone 2	Powerline	Addo Road	Abraham Adesanya	-
Zone 3	Ayetoro (Bayeku)	Agunfoye (Igbogbo)	Igbogbo/Egbe	Elepe
Zone 4	Erunwe	Ita Maga	Lagos Poly	-
Zone 5	Banuso (Sagamu Road)	Eyita / Ojokoro	Agric Ishawo	Tapa
Zone 6	Mawere	Isheri (Lagos State)	OPIC (Ogun State)	Sparklight Estate (Ogun State)

ES 4 Description of existing Environment

Environmental and Social Baseline

The description and analysis of the physical, biological and human conditions shall address relevant environmental and social issues along the Bridge corridor, including any changes anticipated before project implementation.

Meteorological Parameters obtained in the study area is characterized by the dry and wet seasons though it rains in every month of the year with mean monthly rainfall of 104.4 – 288.4 mm. Its monthly relative humidity is 77 - 87% with air temperatures of about 22.5 – 33.7 °C. The atmospheric pressure is 1015 – 1020 mbar while the cloud cover is 6.7 – 6.9 Oktas with 51.2 – 165.7 hrs monthly sunshine periods. Its surface wind speed is 0.5 – 7.7 m/s with occasional calmness and southwest prevailing direction. All the measured microclimatic parameters during the study agreed with these climatic data.

Air: Though nine (9) gaseous pollutants were monitored, CH_4 was not detected while VOCs were 0.01 – 0.26 ppm in the dry season and 0.02 – 0.12 ppm in the wet season. In the dry season, CO concentrations were 1.0 – 12.30 ppm but 0.60 – 10.20 in the wet season with SO_2 levels of 0.02 – 0.14 ppm and 0.02 – 0.04 ppm respectively in the dry and wet seasons. Both NO and NO_2 were 0.02 – 0.25 ppm and 0.01 – 0.06 ppm respectively in the dry season but 0.01 – 0.08 ppm and 0.02 – 0.15 ppm in the wet season. The dry season NH_3 was 0.03 – 1.40 ppm but 0.01 – 0.09 ppm in the wet season while H_2S was 0.20 ppm and 0.01 – 0.08 ppm respectively in the dry and wet seasons. Both the dry and wet seasons O_3 were 0.02 – 0.10 ppm

and 0.01 – 0.04 ppm respectively. The 1-hour averaging period $PM_{2.5}$ was 3.6 – 49.5 μg/m^3 in the dry season, it was 2.3 – 131.5 μg/m^3 in the wet season. Also, the dry season PM_{10} was 49.0 – 636.6 μg/m^3 but 17.0 – 2133.6 μg/m^3 in the wet season. In the dry season TSP was 55.8 – 874.7 μg/m^3 and 19.5 – 2725.9 μg/m^3 in the wet season.

Flora and Fauna species: A substantial part of the site is a marshy wetland having characteristic mangrove species such as *Dryopteris filix-mas, Raphia hookeri, Elaeis guineensis, Avicennia germinans, Rhizophora mangle, Alchornea cordifolia, Sporobolus pyramidalis,* and *Cyperus articulatus* forming the dominant species. Apart from the wetland, a smaller portion of dry arable land also exists along the proposed project route. Most herbaceous species found were green and nourished despite being in the dry season due to high level of water table in the area. Species such as *Chromolaena odorata, Sida corymbosa, Sida acuta, Commelina diffussa, Elusine indica,* and *Panicum maximum* were quite abundant. Table 4.26 shows the dominant plant species along proposed project area and Plates in Chapter 3 show vegetation found in various sites along the project area. The predominant vegetation observed are shrubs, grasslands, weeds and certain economic trees (such as plantain trees, banana etc) alongside other trees that serve as a source of shade.

Fauna: The wild life species prevailing in the area for the wet and dry season also varied from invertebrates to large reptiles, birds and small mammals. Generally, the invertebrate groups consist of several arthropod groups including butterflies, moths, dragon flies, water boatman, beetles, praying mantes, grass hoppers, spiders, ants and termites. The arthropods were varied and impacted variously on the ecosystem as well, the invertebrate phyla also included molluscs (the giant African land snail). The mammalian groups include giant rats, gazelles, grass cutters, porcupines, ant eaters, bats and deer.

Water Quality: Thirty-Eight (38) underground water samples and twelve (12) control samples were collected at fifty sampling points within the coverage area. Thirty-Eight (38) Surface water samples and (12) control samples from Lagos Lagoon.

The **metal content** of the surface water samples from project coverage area conform to the FMEnv limit for all locations during wet season while for the data obtained during dry season the metal content of the surface water samples from project coverage area conform to the FMEnv limit for most locations. However, Lead of one (1) surface water sample was **above FMEnv** limit of <1.00mg/L for Lead in water.

The results obtained for the **physical and chemical parameters** of 4th Mainland Bridge Project; Lagos Underground water samples showed some parameters were **not within permissible** limit of Standard Organization of Nigeria (SON) Limit for drinking water in some of the sampling locations including:

- **pH** Thirty-Eight (38) pH samples and twelve (12) control samples were collected at fifty sampling points within the coverage area. (Ayetoro near Jetty, Ayetoro Community Control, Bayeku Community, Fatgbems Filling station OPIC, Taiwo Street Mawere Community, Mawere Isheri Road, Mawere Community GW 2, Igbe Community control, Oluwafemi Avenue Igbe Road, Agunfoye Community, Ogunlawa/ Igbogbo control, Arepo community control, Elepe Laaga, Muyi Street Elepe, Erunwe/Radio, Erunwe Interchange, Erinwe

Itamaga Control, Sawmill Itamaga, NASFAT Itamaga, LASPOTECH Sch. of Environment, LASPOTECH Staff Quarters, LASPOTECH Odogunyan Control, Modupe/Ishawo, Mawere Road Tapa, Ifelodun Street Tapa, Malo Filling Station Agric Control, David Alaka Shagamu Road, Titus Street Apeka, Abraham Adesanya/Ten Families Estate, Total Filling Station Abraham Adesanya, NIPCO Gas Lagos Epe Exp way control, Abraham Adesanya Ogombo Road, TCN Ajah, Eyita Ojokoro Road, Sabo Banuso Control).

- **Chloride** (Ayetoro near Jetty, 3rd Gate Isheri and LASPOTECH Mini Mosque.
- **Total coliform** was detected in twenty-six (26) of fifty (50) locations which values ranged from 2.0cfu/ml to 9.0cfu/ml during dry season while for the wet season, the SON limit of 10.0 cfu/ml was exceeded at Ayetoro near jetty for coliform in ground water. Also, non-fecal coliform, Enterobacter spp and Bacillus spp were isolated from the samples.

Microbiological results for groundwater showed that thirty-three (33) of fifty (50) locations from the project site have a significant Bacteria growth with values that ranged from 1.0 x 10^1 cfu/ml to 8.0 x 10^1 cfu/ml while (17) locations had no significant Bacteria growth during dry season. For the wet season, the results showed that (42) of fifty (50) locations from the project site **have a significant Bacteria** growth with the values that ranges from 1.0 x 10^1 cfu/ml to 9.0 x 10^2 cfu/ml while (8) locations had **no significant Bacteria** growth.
Microbiological analysis of dry season surface water samples showed that Fifteen (15) locations have a significant Bacteria growth with a population that ranged from 1.0 x 101 cfu/ml to 2.0 x 102 cfu/ml. Thirty-five (35) sampled locations had no significant Bacteria growth.

Soil and Land Use: The aerial map or imageries of the proposed route for the bridge indicates that the selected route passes mostly through the existing freshwater swamp areas of the adjoining settlements/towns. Typically, freshwater swamp areas are intentionally reserved for nature conservation and are often left undeveloped except in some places where such areas are used for Peri-Urban agriculture (mainly aquaculture/fish and dry season crops' farming).

Soil: In general, soils along the route are mostly peaty, containing varying amounts of fine sand, silt and clay. Thus, the soils are soft, poorly drained with surface abundant organic materials thus physically aggressive with high potential for subsidence. The very low to low bulk density values recorded are typical of peaty soils while the fibrous nature of the surface organic materials accounted for the high porosity of the top 0 – 30 cm of the soils. Seasonal variations in the particle size distribution of the soils are not significantly different, and both the top and subsoils are highly homogeneous in regards to sand, silt and clay particles distribution with seasons.

A total 126 **phytoplankton** species in richness (S) order of Bacillariophyta (Diatoms). Distribution of phytoplankton across the sampling sites showed that the Lagoon had higher richness compared with the remaining sites. Seasonal distribution showed that the dry season generally had higher richness. The relative abundance of **zooplankton** was dominated alternately by protozoans and rotifers. **Blue-green algae** dominated both Seasons, distribution across the sampling sites showed that dry season had more species compared with rainy season.

Fishing activities observed at the 4MB catchment water bodies are presented in chapter 4 of this ESIA report. Activities involving the harvesting of fin- and shell-fish were observed at different parts of the study area, including the township water bodies. The present physical and chemical condition of the Lagoon is moderately conducive for a**quatic** life.

Socio economy and health conditions: Socio-economic baseline data was collected from respondents along the project corridor and the following findings were made from the survey.

- The respondents are in their productive age across the clusters and there is a preponderance of male to female in the communities
- The respondents are average income earners and are engaged in both informal and formal income generating activities.
- The traditional leadership structure and the Community Development associations (CDA) is prominent in the communities along the project corridor. It is also upheld that the leaders are responsive to the needs of their subjects.
- Flooding, erosion and air pollution are the main environmental challenges experiences by the sample subjects across the clusters studied.
- Inhabitants are adequately aware of the proposed fourth mainland bridge project and are prepared for its eventual commencement.
- There is no conflict in the communities at the moment. However, triggers to conflict which include improper handling of relocation and compensation and insecurity as a result of population increase are identified as triggers to conflict.

Stakeholder Engagement

Public consultation and participation are essential because they afford the stakeholders the opportunity to contribute to both the design and implementation of the project activities and reduce the likelihood for conflicts. It also provides an avenue to enlighten stakeholders of their choices and rights with regards to compensation and resettlement if need be (See Chapter 9 of this ESIA report for details).

Table ES2: Summary of concerns and how they were addressed during consultations

Language of Communication:	English & Yoruba
Introduction	The team members were introduced by professor Oyin Oladeji the team head for the socio-economic team. A proper introduction was done to further inform the people of the purpose of our coming. The stakeholders raised concerns about their fears which was answered by Professor Oyin Oladeji and the ESIA team
Key Stakeholders	Community leaders; executives of landlord associations; women and youth groups; NGO/CBOs, Vulnerable groups, religious groups (Christian and Muslim); opinion groups, Consultant's team: experts, research assistants and enumerators

Venue	**Igbogbo Ikorodu**
Date	**15/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Pa koko Jacob Yabena raised concerns about the fear of losing his farm land and asked if there'll be proper compensation if he were to lose his farm land.	All affected persons will be duly compensated
The stakeholders asked to know the exact position/location of where the bridge will pass through	He stated that we only know the communities where the bridge will pass through and that some people will still come for the mapping out of the bridge route.

The vulnerable group were present and they expressed that the government should put them into consideration in the creation/construction of the bridge. So as to make movement easier for them	Prof Oyin made it clear that it will be clearly noted in our report.
Venue	**Ayetoro**
Date	**15/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
One of the attendees raised his concern about the bridge going through the community	It was clearly stated to him that that the bridge was going to pass through the mash land
Issues of livelihood being cut off	The government will make sure everybody affected will be duly compensated
The residents of the community raised issues of not having good water and expressed that they had to go a long distance to go get water to drink and asked the government to intervene	It will be stated in the report

Grievance Redress Mechanism (GRM)

Grievance mechanisms provides a formal avenue for affected groups or stakeholders to engage with the project implementers or owners on issues of concern or unaddressed impacts. Grievances are any complaints or suggestions about the way a project is being implemented.

There is no ideal model or one-size-fits-all approach to grievance resolution. The best solutions to conflicts are generally achieved through localized mechanisms that take account of the specific issues, cultural context, local customs, and project conditions and scale.

Hence the 4MB GRM process would include the following primary components:

- Receiving and registering a complaint.
- Acknowledge grievance
- Screening and assessing the complaint.
- Formulating a response.
- Selecting a resolution approach.
- Implementing the approach.
- Announcing the result.
- Tracking and evaluating the results.
- Learning from the experience and communicate back to all parties involved.
- Preparing a timely report to management on the nature and resolution of grievances.

See details on GRM in chapter 10 of this ESIA report.

Stakeholder Engagement and Consultations: Public consultation and participation are essential because they afford the stakeholders the opportunity to contribute to both the design and implementation of the project activities and reduce the likelihood for conflicts. It also provides an avenue to enlighten stakeholders of their choices and rights with regards to compensation and resettlement if need be. Stakeholders can be categorized as Direct or Indirect beneficiaries/ affected persons

The Stakeholders made up of both genders were constantly engaged and consulted throughout the various phases of the EIA Study and their concerns were adequately addressed.

Recommendations for social baseline observations

- Stakeholder consultation should be ensured throughout the project lifecycle.
- As part of its social responsibility environmental and social issues and social amenities bedeviling the affected communities should be factored in the design of the project.

- Issues revolving around compensation and relocation of affected families should be promptly and adequately handled with transparency and fairness.

Details on Environmental and social baseline conditions are presented in Chapter 4 of this EIA report.

ES 5 Potential and Associated Environmental and Social Impacts

Impact Identification and Evaluation

The associated and potential impacts of project activities during the various phases are discussed in , the corresponding mitigation measures for adverse effects and a comprehensive management plan are presented in chapter 6 of this ESIA report, and a summary in Table ES 2 for ease of comprehension.'

ES 6 Mitigation Measures for Potential and Associated Environmental and Social Impacts

The proposed corresponding mitigation measures for the identified associated and potential impacts of project activities during the various phases and a comprehensive management plan are presented in chapter 6 of this ESIA report, and a summary in Table ES 2 for ease of comprehension.'

Potential benefits of the proposed project can be observed during construction and post-construction includes;

- Local employment and skills development: During construction, the project would provide job opportunities to women and youth.
- Support for local entrepreneurs, especially small and medium scale enterprises (SMEs) as labourers would patronize them for food, water, and basic necessities.
- Promotes local economic development and livelihoods especially in rural and low-income urban areas where economic activities are limited.
- Reduced traffic congestion in the area/ state.
- Improved access in remote and inaccessible areas.

Mitigation Measures

Table ES3: Summary of Impacts and mitigation

Activities	Potential Impact	Mitigation measures	Rating
Establishment of temporary construction camps	Reduction in Air quality	• Limited wetting of sites and or unloading and reloading points should be done to reduce dust raising • Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use. • Construction traffic speed control measures should be enforced on unpaved Roads.	MEDIUM
Site clearing	Impact on Flora/ Vegetation loss	• Replanting/ Landscaping after construction works to replace vegetation cover. • Limit clearing of acquired lands to the minimum required, giving due consideration to forest conservation zones along the project corridor. • Use existing path ways/Roads to the extent practicable. • Use native species to re-vegetate the cleared portions during reclamation	
Health and Safety	Occupational Health and Safety	• Develop and implement a comprehensive and project specific Occupational Health and Safety Plan (OHSP). • All Contractors shall be required to maintain OHS plans and safety audit to ensure that safety measures are adhere to at all times • Training of workforce on work-related accidents and prevention measures.	LOW

		• Provision and appropriate use of PPE (such as reflective jackets, safety boots, hand gloves etc.)	
Mobilization and construction works Influx of people (migrant workers, sub-contractors and suppliers) etc.	Risks associated with labour influx include; Labour and employment related impacts	• Development of site specific labour influx management plan • Ensure that the local communities are given priority in relation to employment and provided with training (skilled) to provide future labour in the project e.g. operation and maintenance. • Ensure that workers are provided satisfactory working conditions and work environment including pay in accordance with standard rates applicable. • Ensure that child labour is prohibited in the project;	
	GBV/ SEA, HIV/AIDS Spread and other related public health diseases.	• Design GBV/SEA and HIV/AIDS awareness, sensitisation and prevention program, Health campaigns etc. for each project that extends to the host communities as a whole. • A GBV action plan including a GBV Code of conduct should be developed and implemented.	
Stakeholder engagement, Interaction between labour force etc.	Risk of COVID 19	• Physical distancing: Ensure social distancing and provide face masks, sanitizers etc. during consultation, on site etc. • Split the site into separate working zones manned by specific teams that do not mix, so that each person works with only a few others. If teams need to enter other working zones, ensure that the previous teams have left. This may also mean altering resumption and closing periods for different workers/ shifts to avoid large concentrations of workers at site entrances/exits. • If workers have to work in close proximity, for example during lifting or maintenance activities, keep numbers to a minimum and ensure masks are worn. • Provide adequate hand-washing stations wherever possible throughout the site, including at entrances, exits and in eating or rest areas, equipped with soap, clean water and paper towels together with appropriately sealed disposal bins (preferably pedal operated to prevent hand contact with the lid). • See details on Covid-19 prevention in links below; • ILO: https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/instructionalmaterial/wcms_764847.pdf • CDC:https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/construction-workers.html • LAGOS:http://safetycommission.lagosstate.gov.ng/wp-content/uploads/sites/157/2020/05/Sectorial-Guidelines_LASG-compressed.pdf • See a sample plan in Annex 9	HIGH
Demolition	Physical displacement	• A standalone RAP would be prepared for all impacts related to ESS 5: Land acquisition, restrictions on land use and involuntary resettlement • All affected persons to be given relocation assistance (cash or kind) by the Project to enable them move their properties to new locations • If a site is acquired, the government may relocate persons and their families as well as community facilities to be affected. The affected families should not be made to incur any cost during the relocation period. A resettlement plan should be prepared for this area with the proposed RAP as a guide.	

ES 7 Environmental and Social Management Plan

The main impacts on the physical environment during construction and operation may include soil and surface water contamination, temporary air quality deterioration, and increased noise levels. Mitigation measures have been proposed to reduce impacts, including but not limited to the development and implementation of a soil and erosion management plan, using existing access Roads where possible, and maintaining equipment in good working order. The main impact on the biophysical environment will be the permanent loss of vegetation in the ROW.

The most significant social impact will be the relocation of houses and other assets located within the ROW/ project design. A standalone Resettlement Action Plan (RAP) would be

prepared. Other impacts include traffic, impacts on archaeological/ cultural resources, community and occupational health and safety, Covid-19 risks, GBV/SEA etc. Mitigation measures have also been proposed to reduce or compensate for these negative impacts. These measures include, providing compensation measures and resettlement assistance to affected households and landowners, stakeholder engagement throughout project life cycle, proposal of alternative routes, signages to reduce traffic etc. Other impacts on the human environment could arise. Table ES 3 below presents a summary of the ESIA budget.

Table ES4: ESIA Implementation Budget

S. No.	Items	Cost in US$	Cost in Naira
Pre-construction Stage			
1	Cost of compensatory afforestation and transplantation of trees (in case needed)	191,874.73	85,225,000.00
Construction Stage			
2.	Estimated Cost towards EMP (Contractor's cost): EMP mitigation costs which includes all items listed in 7.3	55,031.31	24,443,259.00
3.	**ESMP Implementation and Monitoring**		
	Environment monitoring for air, water, noise, soil testing (4 measurements per year during construction for 4MB)	147,770.99	65,635.440.00
	Public Consultations, Grievance Redress (4 times a year 4MB)	21,613.35	9,600,000,00
	Purchase of Health and Safety equipment yearly	40,525.02	18,000,000.00
	Training in Environmental monitoring/Medical camps for workmen and society including check-ups of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS and health awareness program on regular basis	62,476.08	27,750,000.00
	Mid-term audit of E&S performance	82,400.88	36,600,000.00
4.	**Operation / Maintenance Phase**		
	Environment monitoring for air, noise, soil testing (4 measurements per year during construction for 4MB)	85,552.83	38,000,000.00
		687,245.11	**305,253,659.00**

Environmental and Social Management/ Organization: Successful implementation of the ESIA requires the collaborative efforts of the project implementation team and relevant institutions/ stakeholders to apply or use the ESIA/ESMP effectively. The roles and responsibilities of those that will be involved in the implementation and monitoring of this ESMP are described in Table ES 4 below.

Table ES5: Summarized Roles and Responsibility of Institutions

S/N	Stakeholders	Responsibilities
1	Federal Ministry of Environment	Formulation and enforcement of policies/regulations on environment in Nigeria. Under this project the Federal Ministry of environment will perform supervisory functions at the government level during construction and even during operation of the facility. This will involve taking measurements and collecting relevant samples
		Lead roles in the provision of advice on screening, scoping, review of draft ESIA report (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, monitoring and evaluation process
2		Oversees Environmental monitoring and compliance at the State level

	State Ministry of Environment and Water Resources	Review of draft ESIA report (in liaison with Federal Ministry of Environment)
		Site assessment and monitoring of ESIA/ ESMP implementation.
3	The Supervising Engineer	Ensure compliance with all other aspects of the contract by the Contactor like environmental and social safeguards. Consequently, the supervising Engineer is expected to have a suitably qualified HSE personnel on site on a daily basis.
		Ensuring strict compliance with the engineering specifications
		HSE personnel will grant work permits, enforce use of PPEs, ensure that only suitably qualified and properly trained persons are used by the Contractor for any particular jobs, enforce 'stop work' orders in the event of safeguards breach by the Contractor and recommend appropriate punitive measures to prevent re-occurrence of same
4	Contractor	implement adequate precautions to protect the environment, avoid disturbance to residents, deterioration of the amenity of the area, and ensure the health and safety of construction workers.
		Contractors should check daily that all operations are being conducted correctly. In general, "good housekeeping" must be employed. Contractor must report on a monthly basis to the project implementation unit on implementation of the ESMP.
		Notwithstanding monthly reporting they must react promptly to any incidents occurring and respond quickly to any complaints received.
		Ensure the ESMP is properly implemented

Preparation of an Environmental & Social Monitoring Programme.

Monitoring will be carried out by Contractor/ Supervising Engineers and relevant MDAs pursuant to their contractual obligations/ roles in the ESMP to undertake inspections, monitoring and reporting.

The following types of inspections and monitoring will be employed.

- **Compliance monitoring**: This involves periodic sampling or continuous recording of specific environmental quality indicators or discharge levels to ensure compliance of discharges and emissions with project standards (e.g. produced water discharges and air emissions).
- **Inspections:** These are planned and conducted on a regular basis to ensure that mitigation measures and commitments are properly maintained and implemented, and that specific management procedures are being following (e.g. practices on waste storage and disposal).
- **Receptor monitoring**: These are undertaken to verify predictions made in the ESIA and to confirm that the activities at the site are not resulting in an unacceptable deterioration in the quality of habitats or infrastructure (e.g. monitoring disturbance to affected residents through a grievance redress mechanism).
- **Internal and external Audits**: This is done to assess compliance of the site activities with both regulatory and site management system requirements (e.g. waste management procedures and systems).

ES 8 Remediation Plans After Decommissioning

Projects are usually designed with an expected lifespan and so, no matter how long the design life, all projects eventually close out. The lifespan may sometimes be less than planned, while in some cases; it can be extended with proper planning and maintenance. The longevity of any development project is primarily dependent on a number of factors including:

- ❖ Availability of raw materials
- ❖ Durability of equipment and machinery
- ❖ Profitability of the project
- ❖ Usefulness and acceptability of project performance

This project is planned to last for at least 50 years. However, if and when the likely operator of the proposed 4MB project development is to be demolished, the project proponent would need to decommission the entire system.

While this is not expected to occur within the next twenty to thirty years, it is, all the same, necessary to start planning, at this stage, for the closure stage, when the use of the terminals and bus parks and infrastrucrual facilities have to be discontinued. For this reason, therefore, this chapter of the report discusses succinct plans for the closure/decommissioning of the proposed 4MB project.

ES 9 Recommendation/Conclusion

This ESIA aims at protecting and enhancing the environment in which the project is to be deployed to meet the needs of the communities without compromising the integrity of the environment and socioeconomic setup of project affected areas. This ESIA has therefore described in detail the processes the 4MB project will follow to maximize its compliance to statutory requirements as well as those of project sponsors and minimize the impacts of the project on the general environment.

A summary of recommendations for this ESIA includes;

- Ensure implementation and monitoring of the ESMP in this document
- Avoid environmentally sensitive habitat areas and exposed soils should be re-vegetated with native vegetation immediately after construction to prevent erosion.
- All affected persons to be given relocation assistance (cash or kind) by the Project to enable them move their properties to new locations, i.e. in accordance with the proposed RAP.
- Covid-19 preventive measures should be strictly observed.
- Undertake intermittent and unannounced monitoring on Occupation Health and Safety (OHS) on site.
- Develop a traffic management plan and ensure alternative routes are motorable and safe for motorists and pedestrians.
- Develop a detailed waste management plan and ensure proper waste management through project phases.
- Ensure stakeholder engagement throughout the project life cycle.

CHAPTER ONE: INTRODUCTION

1.1 Background

The Lagos State Government is the government of Lagos State, concerned with the administration of the state ministries. The government consists of the Executive, Legislative and Judiciary. The Government is headed by the Governor, Mr. Babajide Olusola Sanwo-Olu, who is the policy-maker and often assisted by the commissioners and other civil servants of the State.

The state vision is "Making Lagos Africa's Model Mega City and Global Economic and Financial Hub", and the state policy thrust is "Poverty Eradication and Sustainable Economic Growth through Infrastructure Renewal and Development."

1.1.1 Profile of Lagos State

Lagos State was created on May 27, 1967 by virtue of the States (Creation and Transitional Provisions) Act No. 14 of 1967 which restructured Nigeria's Federation into 12 States. Prior to this, Lagos Municipality was administered as a Federal Territory by the Federal Government through the Federal Ministry of Lagos Affairs as the regional authority, while the Lagos City Council governed the City of Lagos. Equally, the Metropolitan areas (Colony Province) of Ikeja, Agege, Mushin, Ojo, Ikorodu, Epe and Badagry were then administered by the Western Region Government. The State took off as an administrative entity on April 11, 1968 with Lagos Island serving the dual role of being the State and Federal Capital Territory respectively. However, with the creation of the Federal Capital Territory of Abuja in 1976, Lagos ceased to be the Capital of the State, as this was moved to Ikeja. Similarly, with the formal relocation of the seat of the Federal Government to Abuja on 12th December, 1991, Lagos ceased to be Nigeria's political capital. Nevertheless, Lagos remains the nation's economic and commercial capital. According to extant political records, "Lagos is to the people of Nigeria, what the head is to the body of an individual".

1.1.2 Location/Extent

The state is located on the South-Western part of Nigeria, on the narrow plain of the Bight of Benin. Lying approximately on the longitude 20 42'E and 32 2'E respectively, and between latitude 60 22'N and 60 2'N, Lagos State is bounded in the North and East by Ogun State of Nigeria, in the West by Republic of Benin and stretches over 180 kilometers along the Guinea Coast of the Bight of Benin on the Atlantic Ocean. Its territorial extent and political jurisdiction encompass the City of Lagos and the four administrative divisions of Ikeja, Ikorodu, Epe and Badagry collectively referred to as IBILE and covering an area of 358,862 hectares or 3,577 sq.km.

1.1.3 Relief

The dominant vegetation of the State is the fresh water and mangrove swamp forests, both of which are influenced by the double rainfall pattern of the State, which makes the environment a wetland region. Generally, the State has two climatic seasons: Dry (November - March) and wet (April - October). The drainage system of the State is characterized by a maze of lagoons and waterways, which constitutes about 22% or 787 sq.km. (75.755 hectares) of the State's territory. The major water bodies are the Lagos and Lekki lagoons, Yewa, Ogun, Oshun, and

Kweme Rivers. Others are Ologe Lagoon, Kuramo Waters, and Badagry, Five Cowries and Omu Creeks respectively.

1.1.4 Demography

Lagos state is the smallest state in Nigeria yet, it has the highest urban population, which is 27.4% of the national estimate (UN-Habitat). According to 2006 National Census, Lagos State has a population of 9,013,534 in relation to National count of 140,003,542.

However, based on the UN-Habitant and international development agencies' estimates, Lagos State is said to have about 24.6 million inhabitants in 2015. Of this population, Metropolitan Lagos accounts for over 85% on an area that is 37% of the land area of the State. Lagos population is growing 10 times faster than that of New York and Los Angeles, and more than the population of 32 African nations combined.

1.1.5 The Lagos Megacity

Lagos, Nigeria lagoon city, Africa's leading NEPAD City and World's sixth megacity is a bourgeoning global urban agglomeration which attained megacity status in 1995 when its population soared to over 10 million people, per UN-Habitat.

From its global city ranking of 31st in 1985, Lagos population exploded to 13.4 million in Y2000 to become world's sixth megacity and Africa's foremost Urban centre and hub of national, regional and global socio-economic and political activities.

The Megacity region, which approximates to 17 of the State's 20 Local Governments and 37 Local Council Development Areas and impinges imperceptibly on four local government areas of the adjoining Ogun State of Nigeria, is geographically disjointed (maze of islands/mainland), located on poor soil (wetlands) and overwhelmed by its growth (6%-8% urbanization rate).

1.1.6 People

Lagos State is essentially a Yoruba environment inhabited by its sub-nationality of Aworis and Ogus in Ikeja and Badagry Divisions respectively, with the Ogus being found mainly in Badagry and the Awori forming the indigenous population of Lagos where there are, nevertheless, other pioneer immigrant settlers – Edos, Saros, Brazilians, Kannike/Tapa, etc collectively called Lagosians but more appropriately referred to as the Ekos.

For Ikorodu and Epe Divisions, the local populations are mainly the Remos and Ijebus with pockets of Eko-Awori settlers along the entire State coastland and riverine areas. However, despite its Yoruba indigeneity, the State is global socio-cultural melting pot attracting Nigerians, Africans and foreigners alike. The situation is attributable to its sound economic base, strategic maritime location and socio-political importance which induced a high rate of migration to the State.

1.1.7 Administrative Division (IBILE)

With a territorial land area of 351,861 hectares, Lagos State is made of five administrative divisions, namely: Ikeja, Badagry, Ikorodu, Lagos (Eko) and Epe. The divisions were created in May 1968 by virtue of Administrative Division (Establishment) Edict No. 3 of April 1968. The Divisions are further divided into 20 Local Governments and 37 Local Council

Development Areas respectively, in accordance with Nigeria's federal structure and the need to bring governance, development and participatory democracy to the grassroots.

IKEJA

Ikeja Division, a predominantly Awori enclave and the cradle of its civilization, consists of eight local government authorities namely: Agege, Ifako-Ijaiye, Kosofe, Mushin, Alimosho, Oshodi-Isolo, Somolu and Ikeja which serves as both the seat of the State Government and the divisional headquarters. The LCDAs include Agbado/Oke-Odo, Agboyi-Ketu, Ayobo-Ipaja, Bariga, Egbe-Idimu, Ejigbo, Igando-Ikotun, Ikosi-Isheri, Isolo, Mosan-Okunola, Odi Olowo-Ojuwoye, Ojodu, Ojokoro, Onigbongbo and Orile Agege.

Ikeja is the State capital and administrative centre of Lagos State Government. The Division has a concentration of both medium and large-scale industries within the Mushin-Isholo-Oshodi and greater Ikeja industrial complex, while also having a large agricultural area in its rural Alimosho, Kosofe and Agege districts. A fledging Central Business District (Alausa/Agidingbi) and Nigeria's biggest and busiest international airport (Murtala Mohammed Airport) are situated in the divisional headquarters, Ikeja.

There are over fifty settlements in the division notable among which are: Isolo, Isheri-Oshun, Ikotum, Isheri-Olofin, Meiran, Ejigbo, Egan, Ketu, Ojota, Shangishe, Oworonshoki, Mushin,Abesan, Magodo, Egbe, Igando, Idimu, Ayobo, Iju, Ifako, Abule Egba, Agboyi, Ikosi, Okota, Somolu, Ipaja, Oregun, Isheri-Oke, Oshodi, Oke-Afa, Ojodu, Ogudu, Bariga, Ilupeju, Obanikoro, Akowoju, Agege, Ijegun, Alagbado, Aboru, Olota, Ojokoro, Ikola, Ajasa, Baruwa, Ewu, Abule-Onigbagdo,Odi-Olowo, Shasha, Mende, Ipodo and Alimosho.

BADAGRY

Badagry division is a zone cultural mix between the Ogu and Awori as well as an international border region. It consists of four Local Governments, including: Ojo, Amuwo-Odofin, Ajeromi-Ifelodun, and Badagry as well as six Local Council Development Areas namely: Iba, Ifelodun, Olorunda, Oriade, Badagry West and Oto-Awori. Badagry serves as the divisional headquarters. The Division enjoys a pride of place in Nigeria history, especially as regards early European contacts with West Africa.

Being a coastal town on the western littoral, Badagry was a major slave outpost and market during the pre-colonial era and also the entry point of Christianity in Nigeria being the place where Bible was first preached in 1842, under the Agia Tree. The original name of the time, Gbagi, a contraction of the word 'Ogbagleme' means a 'farmland near the swamp' in Ogu language. The word 'Ogbaleme' was later coined to Agbadarigi by Yoruba settlers and later corrupted to Badagry by the Europeans. Major settlements in the Division include: Badagry, Ajara (a collection of villages), Iworo, Ajido, Akarakunmo, Gbaji, Aseri, Egan, Agonrin, Ahanve, Epe, Pota, Mowo, Itoga, Shibiri, Ekunpa, Aradagun, Kankon, Mosafejo, Gayingbo-Topa, Apa, Moba, Ropoji, Oranyan, Tafi-Awori, Yeketome, Pota, Seme, Iyagbe, Ajegulne, Aiyetoro, Festac and Satellite Towns, Iba, Kirikiri, Agboju-Amuwo, Okokomaiko, Ojo, Amukoko, Alaba-Oro, Ijofin, Igbanko, Imore, Ijegun, Ibeshe, Oto, Ijanikin, Ilogbo Eremi, Ilado, Abule-Ado and Odan Group of Villages (Soba, Onireke, etc).

IKORODU

Ikorodu lies approximately 36 km north of Lagos and derives its name from 'Oko-Odu' meaning vegetable farm. This farmland was the first place where Oga, the crown prince of a Remo King and supposed founder of the town settled hence, the reference to the town as Ikorodu Oga. The Division consists of Ikorodu Local Government, and five Local Council Development Areas including: Igbogbo-Baiyeku, Ikorodu North, Ikorodu West, Imota and Ijede. By virtue of its location, the Division serves as the gateway to the country's hinter-land. It is also an active commercial/energy centre and national broadcasting gangway as the transmitters of the Federal Radio Corporation of Nigeria (FRCN), Voice of Nigeria (VON) both located in Ipakodo and those of the State Broadcasting Corporation, Radio Lagos/Eko F.M. and LTV), are located there.

The population of the Division consists of predominantly the Ijebu and Remo groups that inhabit Ikorodu, Egbin, Igbogbo, Imota, Ijede, Maya Adio, Odogunyan, Isiu, Igbokuta, Ewu-Elepe, Baiyeku, Oreta, Ofin, Gberigbe, Erikorodo and Igbalu. However, along the riverine fringes of Ipakodo, Ibese, Majidun, Itowolo, and other coastal communities, there is a strong presence of Eko-Awori population. The indigenes of Ikorodu Divisions are mostly traders and farmers with fishing thriving mostly along the Lagos Lagoon foreshore on the Cradoo (Ikorodu) Lake waterfront, Ipakodo, where a Nigerian Ports Authority's Lighter Port Terminal is situated. The hub of the Lagos Ferry Services in the division is also located there.

LAGOS (EKO)

This is the core of the Lagos State and highly urbanized Division. It consists of five Local Government Councils, vis: Lagos Island, Lagos Mainland, Surulere, Apapa and Eti-Osa, as well as eight Local Council Development Areas which includes: Lagos Island East, Yaba, Itire-Ikate, Coker-Aguda, Ikoyi-Obalende, Apapa-Iganmu, Eti-Osa East and Iru/Victoria Island with the city of Lagos being the pivot of ever-expanding Megacity and the divisional headquarters. The centre and most developed of this island chain, Lagos Island, is called 'Eko' by the indigenes. The name 'Lagos' is derivative of a Portuguese imposition of 'Lagos de Curamo' or 'Rio Lago' on account of its topography and network of lagoons. The Island is the Cultural watershed of the white Cap (Idejo) Chieftaincy and metropolitan Lagos with the Oba of Lagos as the paramount monarch and *primus inter pares* of the State traditional authorities.

Lagos is the chief commercial, financial and maritime nerve-centre of Nigeria with seaports at Apapa, Tin Can Island, Roro Terminal Ports and Ijora Container Terminal. It has an ever-expanding Central Business District in Tinubu and Victoria Island. As the Economic capital and major port of Africa's most populous nation, Lagos has attracted immigrants from all over Nigeria and beyond, as well as commercial entrepreneurs and industries from African, Europe, Asia and the Americas. Major settlements in the Divisions are: Tarkwa Bay, Victoria Island, Iru, Lagos Island, Ikoyi, Obalende, Oto, Ijora, Apapa, Ebute-Meta, Yaba, Ido, Sangotedo, Mayegun,Ogombo, Ogoyo, Okun-Ibeju, Moba, Alaguntan, Ado, Langbasa, Ilasan, Igbo-Efon, Ikota, Itire, Coker-Aguda, Ikate-Elegushi, Ajiran, Iiasan, Tomaro, Abagbo, Igbo-Ejo (Snake Island), etc

EPE

The Division is made up of two Local Government Councils, namely: Epe and Ibeju-Lekki while the three Local Council Development Areas are: Lekki, Ikosi-Ejirin and Eredo with Epe serving as the divisional headquarters. It lies about 89 kms north-east of the City of Lagos. Urakaloye's reputed to be the ancestral founder of Epe, a name derived from black ants, which invaded Urakaloye's hunting homestead. Hence, the town's name, Epe, means the forest of black ants.

Epe Division consists of Epe, Orugbo-Iddo, Agbowa-Ikosi, Ilara, Odo-Ayandelu, Odoragunsin, Igbooye, Naforija, Igbodu, Ejinrin, Poka, Itoikin, Idotun, Ita-Oko, Omi, Temu, Ise and Debojo. Others are Apawa, Aba-Titun, Abomiti, Afere, Apakin, Abalaye, Origanrigan, Kayetoro Eleko, Yeunda, Oriba, Iwerekun, Iberekodo, Idado, Okun Igando-Orudu, Tiye, Awoyaya, Ote-Omi, Bogije, Siriwon, Idaso, Orimedu, Olorunkoya, Ojota, Ode-Ifa, Ofin, Igbesibi and Igbolomi, among others.

A peculiar feature of Epe is the presence of a long range of hills, which demarcate the coastal town into equal parts. However, in Ibeju-Lekki, artisanal fishing, sandy beach and coconut fringed Atlantic coastlines are distinctive features of the environment which has enormous tourism potentials. Fishing and farming form the major occupations of the inhabitants of the Divisions, which also includes the Eko Aworis.

1.1.8 Lagos State Economy

Lagos State plays a pivotal role in the Nigerian Economy and as a nation's commercial nerve centre, remains the focal point of economic activities. The Lagos Gross Domestic Product (GDP) accounted for 26.9% of Nigeria's total GDP and more than 50% of non-oil GDP. Over 50% of Nigeria's non-oil industrial capacity is located in Lagos.

Lagos is Nigeria's financial hub with all major banks having their headquarters in the City. It also home to the Nigerian Stock Exchange (NSE). It accounts for over 80% of the country's foreign trade flows, and generates over 50% of Nigeria's port revenues. The estimated GDP of Lagos was put at N28.343 trillion in 2017 by the Lagos Bureau of Statistics and it expected to rise to N29.627 trillion by 2018 with projected average annual growth rate of 4.21% (2018) and 4.13% (2019). Lagos economy, with an estimated population of over 25million is larger than any other economy in the ECOWAS sub-region despite the rebasing of Ghana's GDP.

Fueled by public-private investment, as well as an estimated population of over 24million, Lagos diverse economy is the leading contributor to Nigeria GDP.A 10% growth is expected in the local economy as the State plans to widen the tax base and improve collection methods to boost Local Tax Receipts towards at least N521.0bn by 2021 (Lagos State Budget) up from N279bn in 2015, edging towards 80% of annual revenues from 70% of income in the late 2000.

Lagos State remain the economic, financial and commercial nerve centre of Nigeria and the ECOWAS. Regionally, the Gross National Product (GNP) is three times that of any West African Country, thus making Lagos State, ECOWAS economic hub and the springboard for Innovation and development in Nigeria and sub-Saharan Africa.

The Lagos State Government is implementing the 4th Mainland Bridge project (4MB) with financial support from a Consortium of International Finance Providers. Designed to cover a distance of 37 kilometres, the project will be constructed under a Design, Build, Finance, Operate, Maintain and Transfer (D.B.F.O.M.T) concession arrangement and the state's Public Private Partnership (PPP) programme for a period of 30 years. The Bridge, which is geared towards economic growth in the State, is expected to be financed and constructed in a Public Private Partnership (PPP) initiative and would be delivered in three and a half years.

The need for the bridge had become imperative following the phenomenal growth of Lagos State with a population of over 21 million people, which has in turn increased commercial activities and traffic gridlock. This has made it imperative to have a 4th Mainland Bridge that will serve as an alternative route to the Eastern axis and decongest traffic in the state. More importantly this bridge will provide the required transportation compliment to the rapidly growing industrial activities on the Eti-Osa – Lekki – Epe corridor of the State.

Given the afore-stated, the Environmental and Social Impact Assessment (ESIA) is necessitated to document and address the environmental and social impacts of the proposed 4MB Project as part of Nigeria's legislation and international best practices.

1.2 Purpose of the ESIA

The purpose of an ESIA is to identify and assess environmental, health, safety and social (EHSS) impacts, and provide guidance to minimize or avoid any adverse impacts that may emanate from project implementation from baseline to construction and during operation, in compliance with the Federal Ministry of Environment (FMENV) EIA Act 86 of 1992 and the World Bank (WB) Environmental & Social Standard Framework (ESS1-10).

1.3 The Proponent

The Lagos State Government (LASG) as the Project Proponent, acting through its Ministry of Works and Infrastructure (LSMOWI) and the Lagos State Public Private Partnerships (PPP) Office intends to construct the Fourth Mainland Bridge (4MB) under a Design, Build, Finance, Operate, Maintain and Transfer (DBFOMT) arrangement.

The Project is a proposed PPP transport infrastructure development, which includes the construction of a 37km greenfield tolled road and bridge with a design speed of 120km/h. The road has a 4-lane dual carriageway with option of BRT lane on the outside and the Lagoon bridge which is approximately 5km in length is proposed to have 5 lanes in each direction.

1.4 Objectives of the ESIA

The overarching objective of the ESIA is to establish baseline information for the 4th Mainland Bridge project on the present condition and ecological status of the project sites before the construction and operation of its various components commences.

The specific objectives of the ESIA are to:

- Identify and meet relevant national and international legal requirements and guidelines, including Word Bank environmental and social standards and international best practices to the satisfaction of all Stakeholders including Financial Intermediaries
- Present project alternatives and no project alternative and give all justification of the project

- Describe project components and activities of relevance to the environmental and social impacts assessments
- Document the biophysical and socio-economic baseline conditions of the study areas and the affected communities
- Identify all stakeholders and ensure proper consultation and engagement of all stakeholders, including the communities bordering the proposed project, and document and address environmental and social concerns raised by stakeholders and the Public in consultation events and activities
- Assess associated/potential environmental, social, health and safety impacts of the project
- Describe what preventive and mitigative environmental and social measures the project proponent commits to implement to address adverse impacts identified
- Develop the corresponding Environmental and Social Management Plan (ESMP) for the project

1.5 EIA Scope of Work

The EIA covers Environmental and Social Scoping study (E&SS), and Environmental and Socio-economic Impact Assessment (ESIA.

The EIA approach will include the following cut across pre-field, field, and post-field activities:

- Review of national and international regulations applicable to the project activities;
- Review of existing literature to adequately describe the environmental and social conditions of the study areas;
- Collection of information from project affected persons and stakeholders, and analysis of data gathered;
- Identification, prediction and evaluation of potential impact;
- Development of effective mitigation/ameliorative measures and monitoring programmes; and
- Preparation of EIA-ESMP reports in line with regulatory guidelines and.

1.6 Policy, Legal and Institutional Framework

This section presents an overview of the Lagos State, Ogun State, Federal and International Policies, Regulations and Guidelines including the World Bank E&S standards and also analyses the existing gaps between the Nigerian legal framework, World Bank requirements that are applicable to the project.

It should be noted that, in Nigeria, Federal Laws take precedence over State Laws, but in a situation that Project-funding is provided by International Agencies, the stricter of the Policies / Regulations between that of the National Government and that of the Funding Agency, is adopted.

1.6.1 Gap Analysis against World Bank (WB) guideline

Regarding legislative and institutional arrangement for EIA, in general there is no difference in categorization, details of EIA study and EIA report, public participation, and information disclosure between the WB Guidelines and Nigerian laws and regulations as shown in Table 1.1

Table 1.1: GAP Analysis Between Nigerian Laws and World Bank E & S Policies

Item	Outline of EIA Legislation in Nigeria	Differences/Measures
Category	According to the EIA Act and EIA Procedural Guidelines 1992, all the proposed projects are classified into three categories considering extent, nature and location of the projects. (a) Category I for which EIA is mandatory; the project is likely to significantly affect the environment (almost same as the category A of WB Guidelines) (b) Category II for which a partial EIA will be required; the project is likely to not significantly but somewhat affect the environment (almost same as the category B of the WB Guidelines).and, (c) Category III for which EIA is not required; the project is unlikely to affect the environment (almost same as the category C of the WB Guidelines) In addition, the proposed projects in Sensitive Areas as shown in 3.1.1.3 2) are also classified as category I.	No difference in general
Screening	Screening should be conducted by FME after site survey.	No difference in general
Scoping and preparation of TOR	Proponent should make environmental scoping and TOR for EIA study and submit to FME.	No difference in general
Environmental Items	Environmental items, on which impacts due to the project to be identified and evaluated are not described in the EIA Act. However, items of major negative impacts due to road project are indicated to such items as land acquisition/resettlement and ROW, landscape, ecological system, noise and vibration are indicated as major negative impacts due to road project according to EIA Sectoral Guidelines for Roads.	No difference in general
Contents of EIA report	Mentioned in Article 4 of the EIA Act An Environmental Impact Assessment shall include at least the following minimum matters (a) Proposed activities (b) Potential affected environment including specific information necessary to identify and assess the environmental effects of the proposed activities (c) Practical activities, as appropriate (d) An assessment of the likely or potential environmental impacts on the proposed activity and the alternatives, including the direct or indirect cumulative, short-term and long-term effects (e) An identification and description of measures available to mitigate adverse environmental impacts of proposed activity and assessment of those measures (f) An indication of gaps in knowledge and uncertainly which may be encountered in computing the required information (g) An indication of whether the environment of any other State, Local Government Area or areas outside Nigeria is likely to be affected by the proposed activity or its alternatives (h) A brief and non-technical summary of the information provided under paragraph (a) to (g).	No difference in general
Environmental Management Plan (EMP) and Environmental Monitoring Plan	Although the term of "environmental management plan" is not found in the EIA Act, it is used in the EIA Sectoral Guidelines. Although the term of "environmental monitoring" is not found in the EIA Act, the term of "follow-up program" is used as follows: (a) Article 16 - the design and implementation of a follow-up program, (b) Article 17 –mandatory study must include a discussion of the need for and the requirements of any follow-upprogram.	No difference in general

Information disclosure and public participation	Term of "stakeholder" or "public participation" is not found in the EIA Act. However, subjects relating to public involvement are described from screening process to reviewing draft final report of EIA study for EIA approval in the EIA Act. In general: Article 7 - FME shall give opportunity to government agencies, members of the public, experts in any relevant discipline and interested groups to make comment. (b) Screening process. (c) Public hearing. (d) Public comments. However, it is not mentioned about public involvement conducted by the proponent itself during scoping phase and EIA study phase.	In the road project by World Bank stakeholder meetings were held for communities and villages. In the proposed project stakeholder meetings will be held at the scoping phase and at the stage of preparing draft final report of EIA study.
Comparison of alternatives	Mentioned in the EIA Act. For example: (a) Article 4 - an EIA shall include an assessment of the likely or potential environmental impacts on the proposed activity and the alternatives, including the direct or indirect cumulative, short- term and tong-term effects. (b) Article 17 - every mandatory study of a project by review panel shall include a consideration of alternative means of carrying out the project.	No difference in general

1.6.2 Legal Framework at the National, State and International Levels

Environmental and Social Impact Assessment (ESIA) studies in Nigeria are guided by several rules and regulations. These regulations occur at three (3) tiers, namely: Local (State level), national and international. Responsibility for environmental management and protection at the national level lies primarily with the Federal Ministry of Environment (FMEnv), However, State Environmental Protection Agencies (SEPAs) and/or State Ministries of Environment also play significant roles in this regard, although, they are subject to the FMEnv. The FMEnv provides minimum standards, which must be complied with, but states are allowed to establish more stringent regulations, depending on the peculiarities of the state environment. In addition, the Project will follow the Environmental and Social Standards as prescribed by World Bank and comply with the provisions of the international regulations/treaties ratified by Nigeria. The following subsections describes the legislations relevant to the Project at the national, state and international levels.

1.6.2.1 National Legislation

in Nigeria, at the national level, supervision of environmental management is primarily under the jurisdiction of the Federal Ministry of Environment (FMEnv), with a number of subsidiary agencies such as the Nigerian Environmental Standards and Regulatory Enforcement Agency (NESREA), Nigerian Oil Spill Detection and Regulatory Agency (NOSDRA), amongst others., saddled with other specific responsibilities, under the FMEnv. The major relevant regulations are discussed below.

i. The Environmental Impact Assessment Act No. 86, 1992/Environmental Impact Assessment Act Cap E12 LFN 2004

Under the EIA Act, it is mandatory for any person, authority, corporate body private or public, to conduct an EIA prior to the commencement of any new major development or expansion that may likely have significant effect on the environment. The Act sets the EIA objectives and the procedures for consideration of EIA of certain public or private projects as it deems fit.

Theis 4MB Package 1 project is considered to be a major development, which is expected to have impacts on the environment. Thus, full compliance with the EIA Act is required. The EIA guidelines (procedural and sectoral) issued by the FMEnv derives from this Act and the Lagos

Metropolitan Area Transport Authority (LSMOWI) as the Project Implementation Unit on behalf of the Lagos State Government as Project Proponent, shall conduct their activities in conformance with these guidelines.

The Nigerian EIA Act also requires public participation in the ESIA process at the following stages:

Scoping: Meeting with communities and other stakeholders to document their concerns and obtain their views about the Project (with the FMEnv officials in attendance), for consideration for inclusion in the scope of the study.

Impact Assessment: Consultation with key stakeholders to inform them of responsibilities for mitigation.

Review/Approval: Report is displayed at designated public centers for general public to review and submit comments. The dates and venue for the 21-working days display is announced in newspapers and on local radio stations. Review panel also sits in public to present their comments and views about the project. Date and location for meeting is advertised in newspapers and on radio.

ii. Land use Act 1978 and Resettlement Procedures

The Land Use Act (Cap 202, 1990), now Cap L5 Laws of the Federation of Nigeria 2004, is the key legislation that has direct relevance to this project. Relevant sections of these laws that may relate to this project with respect to land ownership and property rights, resettlement and compensation are summarized in this section.

The Land Use Act is the applicable law regarding ownership, transfer, acquisition and all such dealings on Land. The provisions of the Act vest every parcel of Land, in every State of the Federation, in the Executive Governor of the State. He holds such parcels of land in trust for the people and government of the State.

The Act categorized the land in a State to urban and non-urban or local areas. The administration of the urban land is vested in the Governor, while the latter is vested in the Local Government Councils. At any rate, all land irrespective of the category belongs to the State while individuals only enjoy a right of occupancy as contained in the Certificate of Occupancy, or where the grants are "deemed".

The concept of ownership of land as known in the western context is varied by the Act. The Governor administers the land for the common good and benefits of all Nigerians. The law makes it lawful for the Governor to grant statutory rights of occupancy for all purposes; grant easements appurtenant to statutory rights of occupancy and to demand rent. The Statutory Rights of Occupancy are for a definite time (the limit is 99 years) and may be granted subject to the terms of any contract made between the state Governor and the Holder.

The Local Government Councils may grant customary rights of Occupancy for agricultural (including grazing and ancillary activities), residential and other purposes. But the limit of such grants is 500 hectares for agricultural purposes and 5,000 for grazing except with the consent of the Governor. The local Government, under the Act is allowed to enter, use and occupy for public purposes any land within its jurisdiction that does not fall within an area compulsorily

acquired by the Government of the Federation or of relevant State; or subject to any laws relating to minerals or mineral oils.

The State is required to establish an administrative system for the revocation of the rights of occupancy, and payment of compensation for the affected parties. So, the Land Use Act provides for the establishment of a Land Use and Allocation Committee in each State that determines disputes as to compensation payable for improvements on the land (**Section 2 (2) (c)**).

In addition, each Local Government is required to set up a Land Allocation Advisory Committee, to advise the Local Government on matters related to the management of land. The holder or occupier of such revoked land is to be entitled to the value of the unexhausted development as at the date of revocation. (**Section 6**) (5). Where land subject to customary rights of Occupancy and used for agricultural purposes is revoked under the Land Use Act, the local government can allocate alternative land for the same purposes (**section 6**) (6).

If Local Government refuses or neglects within a reasonable time to pay compensation to a holder or occupier, the Governor may proceed to effect assessment under section 29 and direct the Local Government to pay the amount of such compensation to the holder oroccupier. (Section 6) (7).

Where a right of occupancy is revoked on the ground either that the land is required by the Local, State or Federal Government for public purpose or for the extraction of building materials, the holder and the occupier shall be entitled to compensation for the value at the date of revocation of their unexhausted improvements. Unexhausted improvement has been defined by the Act as:

> *anything of any quality permanently attached to the land directly resulting from the expenditure of capital or labour by any occupier or any person acting on his behalf, and increasing the productive capacity the utility or the amenity thereof and includes buildings plantations of long-lived crops or trees, fencing walls, roads and irrigation or reclamation works, but does not include the result of ordinary cultivation other than growing produce.*

Developed Land is also defined in the generous manner under **Section 50(1)** as follows: land where there exists any physical improvement in the nature of road development services, water, electricity, drainage, building, structure or such improvements that may enhance the value of the land for industrial, agricultural or residential purposes.

It follows from the foregoing that compensation is not payable on vacant land on which there exist no physical improvements resulting from the expenditure of capital or labour. The compensation payable is the estimated value of the unexhausted improvements at the date of revocation.

Payment of such compensation to the holder and the occupier as suggested by the Act may appear confusing as it raises the following question: Does it refer to holder in physical occupation of the land or two different parties entitled to compensation perhaps in equal shares? The correct view appears to follow from the general tenor of the Act.

First, the presumption is more likely to be the owner of such unexhausted improvements. Secondly, the provision of **section 6(5)** of the Act, which makes compensation payable to the holder and the occupier according to their respective interests, gives a pre-emptory directive as to who shall be entitled to what.

Again, the Act provides in **section 30** that where there arises any dispute as to the amount of compensation calculated in accordance with the provisions of **section 29,** such disputes shall be referred to the appropriate Land Use and Allocation Committee. It is clear from **section 47 (2)** of the Act that no further appeal will lie from the decision of such a committee. If this is so, then the provision is not only retrospective but also conflicts with the fundamentalprinciple of natural justice, which requires that a person shall not be a judge in his own cause.

The Act must, in making this provision, have proceeded on the basis that the committee is a distinct body quite different from the Governor or the Local Government. It is submitted, however, that it will be difficult to persuade the public that this is so since the members of the committee are all appointees of the Governor.

Where a right of occupancy is revoked for public purposes within the state of the Federation; or on the ground of requirement of the land for the extraction of building materials, the quantum of compensation shall be as follows:

- In respect of the land, an amount equal to the rent, if any, paid by the occupier during the year in which the right of occupancy was revoked.
- In respect of the building, installation, or improvements therein, for the amount of the replacement cost of the building, installation or improvements to be assessed on the basis of prescribed method of assessment as determined by the appropriate officer less any depreciation, together with interest at the bank rate for delayed payment ofcompensation. With regards to reclamation works, the quantum of compensation is such cost as may be substantiated by documentary evidence and proof to the satisfaction of the appropriate officer.
- In respect of crops on land, the quantum of compensation is an amount equal to the value as prescribed and determined by the appropriate officer.

Where the right of occupancy revoked is in respect of a part of a larger portion of land, compensation shall be computed in respect of the whole land for an amount equal in rent, if any, paid by the occupier during the year in which the right of occupancy was revoked less a proportionate amount calculated in relation to the area not affected by the revocation; and any interest payable shall be assessed and computed in the like manner.

Where there is any building installation or improvement or crops on the portion revoked, the quantum of compensation shall follow that outlined in paragraph (ii) above and any interest payable shall be computed in like manner.

This project will require acquisitions of land for the Bus Terminal and Lay-byes sites and ROW for therehabilitation of corridors. Hence, will comply with the requirements of this law.

The present 4MB Package 1 Project will include land acquisition, loss of assets, properties, etc. hence the Project shall comply with the provisions of Land Use Act of 1978 and Resettlement Procedures.

iii. National Environmental Standards & Regulations Enforcement Agency (NESREA) Act, 2007

Administered by the Ministry of Environment, the National Environment Standards and Regulations Enforcement Agency (NESREA) Act of 2007, repealed the Federal Environmental Protection Agency (FEPA) Act. It is the embodiment of laws and regulations focused on the protection and sustainable development of the environment and its natural resources. The following sections are worth noting:

- Section 7 provides authority to ensure compliance with environmental laws, local and international, on environmental sanitation and pollution prevention and control through monitory and regulatory measures.
- Section 8 (1)(K) empowers the Agency to make and review regulations on air and water quality, effluent limitations, control of harmful substances and other forms of environmental pollution and sanitation.
- Section 27 prohibits, without lawful authority, the discharge of hazardous substances into the environment. This offence is punishable under this section, with a fine not exceeding, N1, 000,000 (One Million Naira) and an imprisonment term of 5 years. In the case of a company, there is an additional fine of N 50,000, for every day the offence persists.

This project will comply with NESREA regulations, including conducting ESIA, environmental audit every three years after commissioning, obtain permit before disposing hazardous wastes, etc.

iv. The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:

a. Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.
b. Section 39 (7) establishes that an application for land development would be rejectedif such development would harm the environment or constitute a nuisance to the community.
c. Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10, 000 (Ten thousand naira) and in the case of acompany, a fine not exceeding N50, 000.
d. Section 72 provides for the preservation and planting of trees for environmental conservation.

The project shall be implemented in line with requirements of this Act, including obtaining development permit from Ogun and Lagos State Governments.

v. Harmful Waste (Special Criminal Provisions) ACT CAP H1, LFN 2004

The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

a. Section 6 provides for a punishment of life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
b. Section 7 makes provision for the punishment accordingly, of any conniving,consenting or negligent officer where the offence is committed by a company.

c. Section 12 defines the civil liability of any offender. He would be liable to personswho have suffered injury as a result of his offending act.

The project will generate wastes including construction wastes and used oils at Bus Terminals and other harmful wastes. These wastes shall be handled, treated, and disposed of in accordance with the relevant requirements of this Act.

vi. The Endangered Species Act, CAP E9, LFN 2004

This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of over exploitation. These sections are noteworthy:

a. Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely, in danger of extinction.
b. Section 5 defines the liability of any offender under this Act.
c. Section 7 provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.

Certain sections of the line route of this project will pass through natural areas that serve as wildlife habitats which will be impacted by the project. Hence, the project activities shall be carried out to comply with relevant provisions of this Act.

vii. The Factories Act, 1987 (Factory Act cap 126, LFN, 1990)

The factories Act, as contained in the Laws of the Federation of Nigeria 1990, seeks to legislate, and regulate the conduct of health and safety in the Nigerian workplaces. It was enacted in June1987 with the desire to protect the workers and other professionals against exposure to occupational hazards. The director of factories at the Federal Ministry of Employment, labor and productivity is responsible for the administration of the provisions or requirements of this Act. Section 13 allows an inspector to take emergency measures or request that emergency measures be taken by a person qualified to do so, in cases of pollutionor nuisances.

This Act deals with working conditions at work sites, including construction sites, such as the type to be undertaken under the Project. Hence, the occupational health and safety requirements applicable to construction sites, as well as other work sites to be used by the project shall be subjected to the provisions of this Act.

viii. Labour Act - CAP. L1 L.F.N. 2004

This Act deals with labour issues, including payment of wages, recruitment, discipline, employee welfare, employment of women and child labour. Sections **54 to 58** which deal with employment of women, prescribed period of absence from work for nursing mothers andallows her half an hour twice a day during her working hours to attend to the baby for aperiod of up to six months after she resumes work. Section 55 also exempted women from night work, except when they are employed as nurses. Sections 59-64 deal with employment of young people.

ix. Wages Board and Industrial Council Act, 1974 (Minimum Wage Repel and Enactment of National Minimum Wage Act, 2019)

The Act provides for the establishment of a National Wages Board and Area MinimumWages Committee for States and for Joint Industrial Councils for particular industries. It empowers

the Minister to order or direct that an industrial wages board be established to perform, in relation to the workers described in the order and their employers, the functions specified in the provisions of this Act, including the Minimum Wage Repel and Enactment National Minimum Wage Act, 2019, which makes it compulsory for all employers of labour in Nigeria to pay to their workers the sum of N30, 000. The Act increased the minimum wage for Nigerian workers from N18,000 to N30,000. The minimum wage is currently NGN 30,000.00 per month, and all workers employed for this project shall not earn less than the minimum wage as per the above- mentioned Act.

x. Workers' Compensation Act, 1987

The Act to make provisions for the payment of compensation to workmen for injuriessuffered in the course of their employment. The compulsory insurance covers employees for injury or death resulting in the course of work or in work places. All types of workers are covered including working under a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work or otherwise, and whether the contract is expressed or implied, is oral or in writing. The project will employ both skilled and non- skilled labour and shall be subject to this law as applicable.

xi. Inland Fisheries Act, Cap 110, LFN 2004

Focused on the protection of the water habitat and its species, the following sections are instructive:

- **Section 1** prohibits unlicensed operations of motor fishing boats within the inland waters of Nigeria.
- **Section 6** prohibits the taking or destruction of fish by harmful means; and is punishable with a fine of ₦3, 000 or an imprisonment term of 2 years, or both

xii. National Inland Waterways Authority (NIWA), Cap 47, LFN 2004

The NIWA Act, which came into force on the 12th August, 1997, has the main objective of establishing the National Inland Waterways Authority (NIWA), formerly the Inland Waterways Department (IWD) of the Federal Ministry of Transport and requires it to, among other things: improve, develop and regulate Inland water ways for navigation and specify Navigable water. Highlights of the provisions of the Act, with environmental bearings are:

- Established NIWA, to inter alia, provide regulation for inland navigation, grant permit and licenses for sand dredging, pipeline construction, dredging of slots and crossing of waterways by utility lines, water intake, rock blasting and removal – (Ss. 8,9)
- The Authority may, subject to the approval of the Minister, make regulations generally for the regulation of users of navigable water ways and such other regulations as appear to him to be expedient for giving full effect to the provisions of the Act – (s.29(10(2)
- The Rivers and their tributaries, distributaries, creeks, lakes, lagoons, and intra-coastal waterways specified in the 2nd schedule are declared Federal Navigable waterways. – (s. 10)

  The Lagoon Bridge connecting the Island and Mainland Sections of the proposed 4MB Project, spans a surface waterbody, so the NIWA Act is applicable to this component**.**

xiii. National Commission for Museums and Monuments Act, Cap 242, LFN1990

The Act provides for the dissolution of both the Antiquities Commission and the Federal Department of Antiquities and to create a National Commission for Museums and Monuments, with the responsibilities to establish and administer national museums, antiquities and monuments; including, antiquities, science and technology, warfare, African, Black and other antiquities, arts and crafts, architecture, natural history and educational services among others. Sections 12 to 18 provide the process/steps for the declaration of antiquities as national monuments.

Section 19 of this Act deals with restriction of excavations or the purpose finding antiquities as well as issuance of permits and 20 deals with accidental discoveries.

If there are existing monuments including antiquities, art and crafts etc. in the Project Area, necessary permissions according to the provisions of the above said Act will be taken before any construction activities or any excavation activities.

In case there are any chance discovery of antiquities or any objects of cultural significance in the study are, the same will be notified to the Commission within seven days as per the Act.

1.6.3 National Regulations

The National Regulations are highlighted below.

1.6.3.1 National Environmental Regulations

In exercise of this power, the minster issued the national environmental regulations covering all sectors of development. The regulations relevant to the project are as follows:

a. National Environmental (Sanitation and Wastes Control) Regulations, S.I.28 of 2009,
b. National Environmental (Noise Standards and Control) Regulations, S.I.35 of 2009;
c. National Environmental (Surface and Groundwater Quality) Regulations, S.I.22 of 2011;
d. National Environmental (Electrical/Electronic Sector) Regulations, S.I.23 of 2011;
e. National Environmental (Control of Bush/Forest Fire and Open Burning) Regulations, S.I.15 of 2011; and
f. National Environmental (Soil Erosion and Flood Control) Regulations, S.I.12 of 2011

- The National Guidelines and Standards for Environment Pollution Control in Nigeria (March 1999), which is the basic instrument for monitoring and controlling industrial and urban pollution.
- National Environmental (Wetlands, River Banks and Lake Shores) Regulations, 2009. S. I. No. 26.
- The National Environmental Protection (Waste Management) Regulations S.I.15 of 1991, which regulates the collection, treatment and disposal of solid and hazardous waste from municipal and industrial source.
- National Environmental (Watershed, Mountainous, Hilly and Catchments Areas) Regulations,2009. S. I. No. 27.
- The National Environmental (Sanitation and Wastes Control) Regulation S.I 28 of 2009; this regulation applies to issues in environmental sanitation and all categories of wastes. It

regulates the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.

- National Environmental (Noise Standard and Control Emission) Regulations, S.I No. 35 of 2009: this Regulation is to ensure maintenance of a healthy environment for all people in Nigeria, the tranquility of their surroundings and their psychology well-being by regulating noise levels and generally, to elevate the standard of living of the people by prescribing maximum permissible noise levels for facilities and activities and providing for the control of noise and for mitigating measures for noise reduction.
- The National Environment (Soil Erosion and Flood Control) regulations S.I.12 of 2011 and its general objectives includes:
  1. Protect human life and the environment;
  2. Minimize losses due to flood and erosion and their effects on vulnerable areas by regulating land-disturbing activities; and
  3. Control accelerated soil erosion, flooding and sediment deposition in water bodies and water courses in order to prevent pollution of these water resources.
- National Environmental (Surface and Ground Water Quality) Regulation, S. I. No. 22 of 2011: this Regulation establish environmental objectives to be achieved in groundwater bodies, groundwater quality standards and threshold values for the classification of groundwater and the protection of groundwater against pollution and deterioration in groundwater quality.
- National Environmental (Control of Vehicular Emissions from Petrol and Diesel Engines)Regulations, 2010. S. I. No. 20.
- National Environmental (Permitting and Licensing system) Regulations, S. I. No. 23 of 2009 which among others, enables consistent application of Environmental Laws, Regulations, and Standards in all sectors of the economy and geographical regions.

1.6.4 Policy Framework

The Policy Frameworks are highlighted below.

1.6.4.1 Nigerian Constitution, 1999

The Constitution of the Federal Republic of Nigeria (1999) recognizes the importance of improving and protecting the environment and makes provision for it in the following relevant sections:

- **Section 20** makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria.
- **Section 12** establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as law in Nigeria.
- **Sections 33 and 34** which guarantee fundamental human rights to life and human dignity, respectively, have also been argued to be linked to the need for a healthy and safe environment to give these rights effect.

1.6.4.2 National Environmental Policy, 1989/2017

Launched by Government in November 1989, this document prescribed guidelines for achieving sustainable development in fourteen vital sectors of the nation's economy, namely: Human Population;Land Use and Soil Conservation; Water Resources Management; Forestry, Wildlife and Protected Natural Areas; Marine and Coastal Area Resources; Sanitation and Waste Management; Toxic and Hazardous Substances; Mining and Mineral Resources; Agricultural Chemicals; Energy Production;Air Pollution; Noise in the Working Environment; Settlements; Recreational Spaces, Green Belts, Monuments, and Cultural Property.

It also contains Nigeria's commitment to ensure that the country's natural and built environment is safeguarded for the use of present and future generations. This commitment demands that efficient resource management and minimization of environmental impacts be the core requirements of all development activities. Accordingly, this Policy seeks to promote good environmental practices through environmental awareness and education.

The project energizes this policy as it cuts across the Land use, Human Population, Soil conservation, water resources management through drain construction and desilting; and the reduction of carbon emissions through the introduction of Compressed Natural Gas (CNG) powered buses for passenger operations.

1.6.4.3 Social Protection Policies

Social protection policy has been on the agenda since 2004, when the National Planning Commission,supported by the international community, drafted a social protection strategy. More recently, the National Social Insurance Trust Fund drafted a social security strategy. The social protection policy approached social protection using a life-cycle and gender lens, recognizing both economic and socialrisks, including, for example, job discrimination and harmful traditional practices. The policy was organized around four main themes: social assistance, social insurance, child protection and the labour market.

However, only a few of the instruments of this approach were adopted in the national implementation plan, most notably the provision of specific and limited social assistance, social insurance (such as expanding national health insurance to the informal sector) and labour market programmes (such as developing labor-intensive programmes). Moreover, in practice, programmes to date have been focused largely on conditional cash transfers and two health financing mechanisms driven by the federal government with little inter-sectoral or state-federal coordination. A significant number of actorsare involved in funding and implementing social protection, including those from government, donors, international non-governmental organizations and civil society. Federal government-led social protection includes three main programmes:

- the conditional cash transfer In Care of the People (COPE) (funded initially through the DRG fund) targeted at households with specific social categories (those with children of school-going age that are female-headed or contain members who are elderly, physically challenged, or are fistula or HIV/ AIDS patients
- the health fee waiver for pregnant women and children under five (financed through the

DRG fund)

- the community-based health insurance scheme, which was redesigned in 2011 because theprevious scheme had design challenges

Other social assistance programmes are implemented in an ad hoc manner by various government ministries, departments and agencies at state level, and some are funded by international donors. These include conditional cash transfer programmes for girls' education (in three states), child savingsaccounts, disability grants, health waivers, education support (such as free uniforms) and nutrition support. HIV and AIDS programming at state level also include social protection sub-components (although not as the primary objective), including nutrition, health and education support. Labour market programmes include federal- and state-level youth skills and employment programmes, and Nigeria also has agricultural subsidies/inputs.

1.6.4.4 National Policy on Climate Change (NCCP), 2013 (Amended June 2021)

Given Nigeria's status as a fossil-fuel dependent economy with a large climate sensitive agricultural sector, the development of a climate change policy and response strategy is critical; as climate change portends a serious threat to poverty eradication and sustainable development in general. One of the key pillars of the Vision 20:2020 is investment in low carbon fuels and renewable energy. Achieving the goal of low carbon, high growth and resilient socio-economic system for equitable and sustainable socio-economic and environmental development faces some challenges which include stability and sustainability of enabling environment, adequate institutional and human resources capacity and availability of adequate resources to address mitigation and adaptation initiatives to address climate change. Thus, Government needs to ensure that economic growth, resource management and climate change mitigation and adaptation can all happen simultaneously if this willbe done effectively (Department of Climate Change, 2017).

As the proposed 4MB Project is a road infrastructure project which will result in carbon emissions due to construction activities, emissions due to vehicles, the National Policy on Climate Change will be relevant to the Project.

1.6.4.5 Gender Policy Framework

The 1999 Constitution, the Federal Republic of Nigeria, prohibits discrimination based on origin, sex, religion, status, ethnic or linguistic association. Successive governments have consistently demonstrated commitment to upholding and promoting gender equality and women's empowerment in varying degrees. To facilitate gender equality and women's empowerment, the FGN created favourable national legal and policy frameworks and placed institutional mechanisms in this regard.

Moreover, as a member of the United Nations, Nigeria signed and ratified the various relevant international instruments, treaties, and conventions without reservation. These instruments have always emphasised that member nations put the necessary mechanisms needed to eliminate gender discrimination and ensure equality and human dignity to all men and women.

The government of Nigeria in 2000 adopted a National Policy on Women; it was reviewed and upgraded in 2006 to become the National Gender Policy. Other key government policies with

gender equality and empowerment of women frameworks include the National Economic Empowerment and Development Strategies (NEEDS) in May 2004; and the Transformation Agenda.

1.6.4.6 National Gender Policy, 2006

The overall goal of the National Gender Policy of Nigeria is to promote the welfare and rights of Nigerian women and children in all aspects of life: political, social and economic. The policy seeks to plan, coordinate, implement, monitor and evaluate the development of women in the county. In concrete terms, the National Gender Policy in Nigeria focuses on:

- Contribution towards women's empowerment and the eradication of unequal gender power relations in the workplace and economy, in trade unions and broader society;
- Encouragement of the participation, support and co-operation of men in taking shared responsibility for the elimination of sexism and redefining of oppressive gender roles;
- Increase the involvement of women in leadership and decision-making;
- Ensure that through labour legislation and collective bargaining, the particular circumstances of women are considered and that measures are promoted to eliminate discrimination based on gender;
- Ensure that there is a gender perspective in all sectors of development.

1.6.5 Local (State Level) Regulations

This entire project falls within Lagos state and as such, the various Lagos state regulations that relate to this project, directly and/or indirectly, are presented below:

1.6.5.1 Lagos State Environmental Management and Protection Law 2017

This Law consolidates all the Laws and Regulations applicable to the management, protection and sustainable development of the environment in Lagos State. It deals with modern cosmopolitan environmental issues like waste management, litter, dumping of untreated toxic and or radioactive material into public drains; sanitation, street trading and hawking; obstruction to drainage systems, water generation, effluents, noise, signage, advertisement, gardens and parks, etc.

The Ministry of Environment shall be responsible under the Law for the overall management of the environment and environmental related matters in the State.

The objectives of this Law are to provide:

1. A clean, safe and healthy environment to all residents of the State, and
2. To enable citizens, access the various public amenities or segments of the environment for recreational, educational, health, cultural and economic purposes

Section 4 of the Law grants supervisory authority to the Ministry over all Agencies, Authorities, Boards, Departments, Offices and Units established under the Boards and Agencies.

The twelve (12) Agencies, Authorities, Boards, Departments, Offices and Units over which it has Supervisory Roles are:

a) Lagos State Waste Management Authority (LAWMA),
b) Lagos State Environmental Protection Agency (LASEPA),
c) Lagos State Water Corporation (LWC),
d) Lagos State Water Regulatory Commission (LSWRC),
e) Lagos State Wastewater Management Office (LSWMO),
f) Lagos State Signage and Advertising Agency (LASAA),
g) Lagos State Parks and Gardens Agency (LASPARK),
h) Office of Drainage Services (ODS),
i) Lagos State Environmental Sanitation Enforcement Agency (LSESEA),
j) Environmental Trust Fund,
k) Public Utilities Monitoring and Assurance Unit (PUMAU), and
l) Any other Agencies, Authorities, Boards, Departments, Offices and Units as may be established under the provisions of this Law

Key requirements related to this project are as follows:

- It is mandatory for all waste collection, transportation, recycling, sorting, treatment and disposal businesses to only operate in Lagos State under a Licence issued, by the Lagos Waste Management Authority ("LAWMA"). Therefore, the Contractor during construction shall engage a LAWMA licensed agent to manage its waste.
- All Residents are required to keep their premises and surrounding environment, forty-five (45) metres from all public sidewalks of a street, clean and devoid of litter and waste. As part of this requirement, all generated during construction and operation of the project shall be kept in securely tied and fastened plastic bags or leak proof dustbins, or covered litter bins.
- Prohibition of objectionable loud noises, except where a Licence is obtained prior to the commencement of a noise generating activity.
- Prohibition of street trading, for which both buyer and seller becomes liable. Hence, workers employed by the project (both temporary and permanent) shall not engage in street buyer or patronizing hawkers.
- Any person engaged in any form of commercial activity is required to pay, not later than the 1st day of January of every calendar year, an Environmental Development Levy to the Lagos State Environmental Protection Agency ("LASEPA").
- The dumping and burying of any untreated, injurious gases, toxic or radioactive waste or substances, without a government issued Permit is expressly prohibited.
- Waste Management Facilities, Abattoirs and Livestock establishments, Housing Estates, Hotels, Hospitals and other commercial facilities shall not discharge any trade or industrial waste or effluents into the public drains without first treating such waste and effluent and retaining possession of a prior issued Permit from LASEPA.
- Residents in residential premises are allowed, without a licence from the Lagos State Water Corporation ("LWC"), to construct, dig or extend in their premises, any well, borehole or other works for the supply of water for domestic use only. Such water supply systems must however be sited in hygienically conducive environment, protected from any kind or form of pollution. The quality of the water must also meet the World Health Organisation ("WHO") recommended standards for water consumed.
- Where a borehole or well is for commercial purposes, a Licence for groundwater abstraction must be obtained from LWC.

- No person shall erect any building or structure over, across or adjacent to any drainage, channel, sewer or sewerage system without first obtaining a ClearanceCertificate from the Lagos State Wastewater Management Office ("LSWMO"); for drains and channels, the permit is from the Lagos State Office of Drainage Services. Therefore, public drains or water channels shall not be blocked by the project, even if it is temporary without permit.
- It is an offence for any person to discharge, cause or permit to be discharge any kind of untreated trade effluent into any public sewer or drain-line without a Permit. Penalties include fines.
- Construction of any structure that will accommodate or serve 50 or more people must obtain a Wastewater Clearance License from the LSWMO.
- Erection of any structure or signage for advertisement purposes require Permit by the Lagos State Signage and Advertisement Agency ("LASAA").
- It is not permitted to fall or trim trees in Lagos State without a prior Permit obtained for such a purpose from the Lagos State Parks and Gardens Agency ("LASPARK'').

1.6.5.2 Lagos State Properties Protection Law, 2016

The law seeks to protect the proprietary rights of land and property owners in Lagos State and also criminalizes actions of forceful and unlawful entry or occupation of premises. The enactment of the law heralded profuse commendations and applause from commentators, Estate Surveyors and Legal practitioner. The law seeks to protect the proprietary rights of land and property owners in Lagos State and also criminalizes actions of forceful and unlawful entry or occupation of premises. The enactment of the law heralded profuse commendations and applause from commentators, Estate Surveyors and Legal practitioner.

1.6.5.3 Lagos State Environmental Sanitation Law 2000

The environmental sanitation law of Lagos State was enacted to establish the Environmental Sanitation Corps and for connected purposes.

The Lagos State House of Assembly enacts the law as follows:

1. As from the commencement of this Law, every owner, tenant and occupier of any building shall;
   - keep clean the sidewalks and gutter area (45cm from the side walk into the street) along the building frontage, sides and back at all time;
   - bind all old newspapers, loose papers, rubbish and rags before putting out for collection;
   - put refuse into securely tied plastic bags or leak proof dustbins with tightly fitting lids;
   - keep refuse dustbins within their premises until the time of collection;
   - ensure that refuse dustbins are covered at all times with tight fitting cover;
   - not dump yard sweepings, hedge cuttings, grass, leaves, cards, stones, bricks or business waste with household refuse;
   - not use dustbins which may be leaking or permitting litter to escape or which might injure people handling them; and
   - not litter, sweep out, or throw ashes, refuse, paper, nylon, and rubbish into any street, public place or vacant plot.

2. As from the commencement of this Law, every owner, tenant and occupier of any building shall ensure the cleanliness of his premises, particularly the backyard and the courtyard.
3. As from the commencement of this Law every owner or operator of a restaurant, hotel, nightclub or school shall ensure the cleanliness of all toilets and bathrooms within the premises.
4. As the construction activities will include generation of solid wastes, construction and demolition wastes, the provisions of the above-said Act will be relevant to the construction sites and construction camps.

1.6.5.4 Ogun State Laws

Ogun State Environmental Protection Agency (OGEPA) Law of 1995: This law established Ogun State Environmental Protection Agency as a parastatal under ministry of environment with the responsibility to protect the environment in the state.

Ogun State of Urban and Regional Planning Law No 20 of 2005: Established the Ogun State Urban and Regional Planning Board as the agency responsible for development control in the state. The substation sites as well as the ROW in Ogun State needs to be approved by the board as part of the process for granting right of occupancy by the Governor. The State Ministry of Urban and Physical Planning also derives its statutory functions from section 3 line 246 of this law as the policy arm of the government related to physical planning in the State.

1.6.6 Institutional and Administrative Framework

This section highlights the relevant institutions through which planning and implementation of the 4MBProject will be achieved. The following institutions and agencies have been identified and will be involved in the overall implementation of the project.

Responsibilities for the ESIA and its implementation are shared between multiple stakeholders, including concerned ministries, competent authorities, the LSMOWI and the contractors. These include the following;

- The Federal Government of Nigeria (FGN)
- Federal Ministry of Environment
- Lagos Metropolitan Area Transport Authority (LSMOWI)
- Lagos Waste Management Authority (“LAWMA”)
- Lagos State Environmental Protection Agency (“LASEPA”)
- Lagos State Bureau for Lands
- Surveyor General Lagos State
- Local Government Authority (LGA):
  - ✓ Kosofe, Lagos Mainland Local Government Area
  - ✓ Oshodi – Isolo Local Government Area
  - ✓ Mushin Local Government Area
  - ✓ Lagos Mainland Local Government Area and
  - ✓ Surulere Local Government Area
- The Customary District Councils headed by Obas of each Kingdom affected

- Village Chiefs (Baale) of Affected Communities

The responsibilities and roles of each of the institutions are discussed below.

1.6.6.1 The Federal Government of Nigeria

Section 20 of the Constitution of Nigeria makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria. Sections 33 and 34 which guarantee fundamental human rights to life and human dignity, respectively, can also be linked to the need for a healthy and safe environment to give these rights effect. The executive council of the federation approves all national policies including the National Policy on Environment.

1.6.6.2 Federal Ministry of Environment

The Federal Ministry of Environment is responsible for the overall environmental policy of the Country. It has the responsibility for ESIA implementation and approval. It has developed certain guidelines and regulations to protect the environment and promote sustainable development. It will monitor the implementation of mitigation measures, when the project commences. And they can issue directives to the project on specific actions related to the environment in the project area. The Ministry normally involves the states and sometimes local governments in this responsibility depending on the specific activity.

1.6.6.3 Lagos State Ministry of Environment and Water Resources

Lagos State Ministry of Environment and Water Resources is responsible for the overall environmental policy of Lagos State, enforcement of state environment laws, establishing regulations, sanitation and waste management. Since, environment is on the concurrent list in the Nigerian Constitution, the State Ministry of Environment has a role in the EIA process. The state undertakes joint site verifications with the Federal Ministry of Environment, receives a copy of the report, appoints a member on the review panel as well as participates in impact mitigation monitoring. The State can also impose additional requirements based on the nature of the local environment.

1.6.6.4 Lagos State Ministry of Physical Planning and Urban Development

Lagos State Ministry of Physical Planning and Urban Development has the responsibility for the formulation of policies and implementation pursuant to the provisions of the Land Use Act, 1978 as amended under the 1990 Laws of the Federation of Federal Republic of Nigeria. It also has the primary responsibility for land management in the state. Part of its agencies includes the Land Use Advisory and Allocation Committee. Its functions and powers include advising the Governor on how to grant right of way for the line route to be constructed. The Ministry is also the primary Government agency with respect to payment of compensation.

1.6.6.5 Lagos State Bureau for Lands and Survey

This bureau is responsible for the issuance of right of way (ROW) and certificate of occupancy (C of O) for portions of line route and substation sites that falls within Lagos State. Other functions of the Agency include

- Preparation and issuance of Certificates-of-Occupancy and other certificate-evidencing titles.
- Preparation and issuance of Right-of-Occupancy.

- Production and printing of Titled Deed Plan (TDP).
- Street naming and house numbering in Lagos State.
- Provision of Geospatial information infrastructure.
- Textual and graphic data on Lagos State, including land record, aerial photographs, satellite images, engineering drawing, and scanned pictures of building.
- Property search and verification of land record.
- Land application processing and administration.

1.6.6.6 Lagos State Ministry of Women Affairs and Social Development:

has the responsibility

- To promote Gender Equality and provide Empowerment facilities for Socio-economic Development for people displaced by the project in Lagos State
- To promote the survival, protection, participation and development of children
- To promote family harmony and reduce juvenile delinquency
- To provide care, support, rehabilitation and empowerment for the vulnerable groups (challenged persons, older persons, destitute and the likes)
- To collaborate and network with Non-Governmental Organisations, Professional Institutions and other MDAs on issues affecting women, children/vulnerable ones.

1.6.6.7 Ogun State Ministry of Environment

The Ministry of Environment was established in July 2003 with the aim of creating better living and conducive environment for the entire people of Ogun State. The Ministry has five (5) departments and two (2) sister Agencies namely, Ogun Environmental Protection Agency (OGEPA) and Ogun State Emergency Management Agency (SEMA).

- Department of Administration & Supplies: is involved in the management, co- ordination and facilitation of the activities of other Departments.
- Department of Environmental Conservation & Resources Management: is responsible for environmental Sanitation, landscaping and beautification, environmental and natural resources conservation, meteorological services, water shed management and water quality monitoring, climate change, etc.
- Department of Planning, Research & Statistics: plan, undertake research and gather data or information which will allow the Ministry to grow and develop.
- Department of Finance & Accounts: responsible for budgeting and other financial management responsibilities.
- Department of Flood & Erosion Control: Management of flood and erosion issues, including planning, designing, and construction and maintenance of control structures.

1.6.6.8 Ogun State Bureau for Lands and Survey

This bureau is responsible for the issuance of right of way (ROW) and certificate of occupancy (C of O) for portions of line route and substation sites that falls within Ogun State. Other functions of the Agency include

- Preparation and issuance of Certificates-of-Occupancy and other certificate evidencing titles.
- Preparation and issuance of Right-of-Occupancy.

- Production and printing of Titled Deed Plan (TDP).
- Street naming and house numbering in Ogun State.
- Provision of Geospatial information infrastructure.
- Textual and graphic data on Ogun State, including land record, aerial photographs, satellite images, engineering drawing, and scanned pictures of building.
- Property search and verification of land record.
- Land application processing and administration.

1.6.6.9 Ogun State Ministry for Physical Planning

The Ministry is the apex body of Physical Planning in Ogun State. It is responsible for the formulation of Physical Planning policies and the coordination of physical development within the State. It derives its statutory functions from section 3 line 246 of the State Urban and Regional Planning Law No.20 of 2005. Though the Ministry is the policy making body, it has the Urban and Regional Planning Board as its parastatal.

1.6.6.10 The Ogun State Urban and Regional Planning Board:

This Board is a parastatal of the Ministry of Urban and Physical Planning established the enactment of Ogun State Urban and Regional Planning law No.20 of 2005. The Board, which have 20 Zonal Town Planning Offices spread across the State is responsible for:

- Controlling all various physical developments be it Residential, Commercial, Industrial, Public, and Institutional uses.
- Monitoring all the development in order to control the growth of Urban Sprawl in Ogun State.

1.6.6.11 Ogun State Ministry of Women Affairs and Social Development: has the responsibility

- To promote Gender Equality and provide Empowerment facilities for Socio-economic Development
- To promote the survival, protection, participation and development of children
- To promote family harmony and reduce juvenile delinquency
- To provide care, support, rehabilitation and empowerment for the vulnerable groups (challenged persons, older persons, destitute and the likes)
- To collaborate and network with Non-Governmental Organisations, Professional Institutions and other MDAs on issues affecting women, children/vulnerable ones.

1.6.6.12 Ogun State Ministry of Agriculture

This Ministry is the organ of Government responsible for formulating policies on food and agriculture for the State. The ministry is to enhance self-sufficiency in food production, provide raw materials for agro-based industries, generate employment opportunities and obtain desirable levels of export in order to improve the country's foreign exchange earnings.

Ogun State has 1.2million hectares of arable land which is 74% of the State's total land area. Only 30% of this arable land or 35,000 hectares is under cultivation. The major crops grown or cultivated in the State include: Cassava, Rice, Maize, Oil-Palm, Cocoa, Rubber, Citrus,

Cotton, Soya-Bean, Vegetable, Pine apple, Sugar-Cane, among others. Livestock and fish farming are strong and viable in the State.

The mandate of the ministry includes;

- Formulating and implementing agricultural policies and programmes for Ogun State.
- Regulation of farm practice and certification of farm produce.
- Ensuring food safety and food security.
- Promotion of mechanized agriculture.
- Ensuring availability and provision of quality agricultural inputs
- Coordinating agricultural cooperative societies and commodity groups
- Promoting and managing Irrigation Schemes
- Delivery of agricultural research proven technologies to farmers for adoption through effective Extension Services
- Promoting the development of the Livestock and Fishery industries in the State

1.6.6.13 Local Government Authority

Three Local Government Areas (LGAs) are involved in this project, Eti Osa, Ikorodu, and Obafemi Owode. These LGAs are involved in the EIA approval process, because environment is on the concurrent list in the Nigerian Constitution, which means all three tiers of Government can legislate. Each LGA will have representatives of the panel that will review the report and advise the Minister to make decisions on the project. The LGAs also have roles in the administration of lands in rural areas and hence, will be involved in the resettlement process.

1.6.6.14 The Customary District Councils

The 4MB corridor will pass through the Chiefdoms as several villages under them. The Obas (traditional head of chiefdom) and Village Heads (Baales) have important role to play in the project with respect to mobilization of the community members to support the project, grievance redress, peace and security of personnel, equipment and facilities to be installed. Close contact and regular consultation shall be maintained with customary chiefs throughout the life of the project.

1.6.6.15 Witness NGO

To enhance transparency and trust from PAPs it is suggested that a witness NGO, recognized and credible in the project area, be retained, through a public proposal and selection process, by LSMOWI to provide independent advice and report on RAP implementation and management focusing on consultation activities, compensation and resettlement related activities and grievances management. This NGO could be a recognized and credible Human Right advocacy group or an NGO active in environmental management or rural development.

This outside look will ensure that proper procedures and stated compensation processes are followed, that PAP grievances are well taken care of, and that PAPs are treated with fairness. This mode of supervision was experienced in other projects and gave good results in terms of reduction of grievances in particular[1].

This NGO will revise reports of compensation payment process, meet with PAPs, check implementation of the measures, reconstruction, etc. in the field, and provide comments and

recommendations. All PAPs will be informed of the NGO role and function and need to have access to its representatives, in a confidential manner, if necessary, to explain and discuss their difficulties of grievances.

1.6.6.16 Contractors

Each contractor shall appoint a qualified Environmental Manager who, after approval by LSMOWI will be responsible for daily management on-site and for the respect of management measures from the ESMP and RAP. This manager will report regularly to the environment specialist of the PIU during the entire construction period.

Contractors must hold all necessary licenses and permits before the work begins. It will befall on them to provide the PIU with all the required legal documents, including the signed agreements with owners, authorizations for borrow pits and for temporary storage sites, etc.

1.6.6.17 LSMOWI PMU

The Safeguards department of LSMOWI PMU shall be responsible for ensuring implementation of management measures during operation phase (post-commissioning), including audits, compliance monitoring, preparation of periodic reports required by regulations.

1.6.7 ESIA Process to be Followed

The Federal Ministry of Environment (FMEnv) developed guidelines to be used by project proponents in conducting EIA, in compliance with the EIA Act. Accordingly, the ESIA process follows the following steps sequentially as outlined in the procedural guideline as Figure 1.1.

***Project* Proposal:** As soon as a proponent decides to embark on any development project (for which EIA is mandatory), a project proposal shall be submitted to FMEnv along with completed "EIA Notification Form" for registration.

Screening: FMEnv shall carry out Initial Environmental Examination and assign the project to a category and provide screening reports to the proponent.

A screening is a systematic approach to documenting the environmental effects of a proposed project and determining needs to eliminate or minimize (mitigate) the adverse effects, to modify the project plan or to recommend further assessment through mediation or an assessment by a review panel.

Based on the screening process, Projects are categorized into Category A, B and C projects and it is determined whether a full, partial or no EIA is required. The proposed 4MB project is categorized as Category A Project requiring a full EIA.

depending on the circumstances of the proposed project, the existing environment, and the likely environmental effects, Screenings will vary in time, length and depth of analysis. Some may require only a brief analysis of the available information and a brief report; while others may need new background studies and thus, will be more thorough and rigorous. This may involve site verification visits by the officers of the Ministry, and the expenses transferred to the proponent.

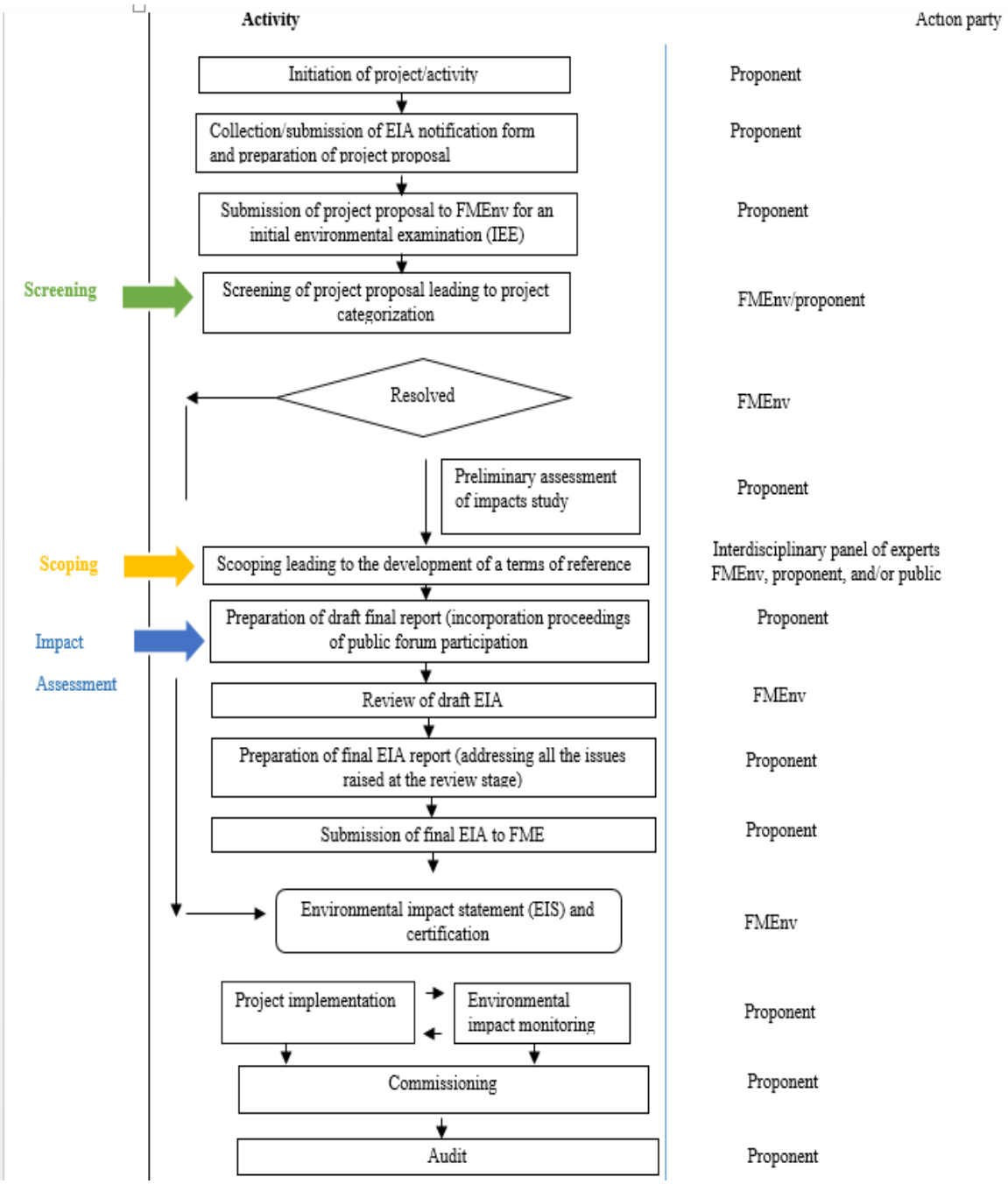


Figure 1.1: Federal Ministry of Environment Environmental Impact Assessment Process

The responsible authority must prepare or ensure the preparation of a Screening Report which summarizes the findings of the screening exercise.

A responsible authority must determine the significance of the environmental effects of the project.This in turn governs whether the responsible authority can take action that will enable the project to proceed (i.e., whether to proceed with the project itself when it is the proponent, or otherwise toprovide the funding, land, permit or other authorization).

If the screening has identified the need for further review, the responsible authority must ask the Minister of the Environment to refer the project to a mediator or a review panel.

Further review is necessary when:

- it is uncertain whether the project is likely to cause significant adverse environmental effects
- the project is likely to cause significant adverse environmental effects and it is uncertain whether these effects are justified in the circumstances
- public concerns warrant it

However, the responsible authority cannot take any **action that enables the project to proceed**, if the project is likely to cause significant adverse environmental effects (taking into account any appropriate mitigation measures) that cannot be justified in the circumstances.

Scoping: After receipt of screening report, the proponent shall carry out scoping exercises to ensure all significant impacts and reasonable alternatives are addressed in the ESIA. The scoping exercises normally involve stakeholders, particularly people affected by the project. The proponent shall submit Terms of Reference (ToR) to the Ministry indicating scope of the proposed EIA study as well as evidence of consultation.

Commencement of ESIA: The proponent shall undertake the ESIA study according to the TOR agreed with the Ministry. Field work may be conducted twice (during dry and rainy seasons) as will be statedin the approved ToR.

Submission of the Draft Reports: After their completion, 5 copies of the ESIA, ESMP and RAP are submitted to the Federal Ministry of Environment (FMEnv) for review.

Review Process: The ministry shall evaluate the form of review of the report, which may be in-house, panel sitting in public, public display or mediation. The method of review shall be communicated to the proponent and the review comments shall be furnished to the proponent to address issues raised in the final report. A provisional approval may be granted at this stage, if the Ministry is satisfied that the report presented is acceptable except for minor corrections, which shall be corrected and final report submitted within stipulated time frame.

Public Display: The reports will be displayed at various centers including Abuja, Lagos, Lagos State Ministry of Environment and LGA Offices for 21 working days for members of the general public to review and submit comments. The display centers and dates will be advertised by radio jingles and newspapers through 2 national dailies and one local. Associated costs will be paid by the proponent.

Panel Review: A review panel is a group of experts selected on the basis of their knowledge and expertise and appointed by the Minister of the Environment. The regulatory agencies at all three levels of Government (Federal, State and Local Government) are also represented on the panel, because environmental protection is on the concurrent list of the Nigerian Constitution. TheMinister also appoints one of the panel members as chairperson. The panel review reports and assesses the project including a visit to the project site. The proponent will be required to make presentations to the panel and the panel presents its findings during the public meeting, in the presence of all stakeholders. After completing the public hearings and its analysis, the panel prepares a report which summarizes its rationale, conclusions and recommendations, and includes a summary of comments received from the public display center as well as those

presented during the public meeting. This report is submitted to the Minister of the Environment, who will use it to guide decisions on the project. Associated costs are paid by the projectproponent and depend on the number of participants.

Final Report: The proponent incorporates Panel Review comments on ESIA, ESMP and RAP. Once the reports are modified accordingly, the 5 to 10 hard copies and a soft copy of the final reports are submitted to the FMEnv. The FMEnv issues a provisional ESIA approval and the proponent can start project implementation. The FMEnv will then undertake Impact Mitigation Monitoring (IMM) activities. If it is satisfactory, the proponent will pay a final access charge and the final ESIA report will be approved. The FMEnv will issue the EIS and the ESIA certificate.

1.6.7.1 EIA Process carried out till Date

Table 1.2 shows the EIA Process relevant to the project and the steps which have been carried out and the further actions to be taken:

Table 1.2: EIA Process Relevant to the Project

S/N	Activities under the EIA Process	Responsibility	Stage
1.	Initiation of Project/activity	Proponent	Completed
2.	Collection / submission of EIA Notification Form and preparation of Project Proposal	Proponent	Completed
3.	Submission of Project Proposal to FMEnv for an initial environmental examination (IEE)	Proponent	Completed
4.	Screening of Project Proposal leading to Project Categorization	Proponent / FMEnv	Completed. The Project is categorized as Category I
5.	Scoping leading to development of Terms of Reference	Interdisciplinary panel of experts, FMEnv, Proponent, public	Completed
6.	Preparation of draft final report (incorporation of proceedings of public forum participation	ESS Consultants and Proponent	Completed
7.	Review of draft final report	FMEnv	This stage will come once draft final report is submitted to the FMEnv
8.	Preparation of final report (addressing all the issues raised at the review stage and submission of final EIA Report to FMEnv	ESS Consultant and Proponent	This stage will come once draft final report is submitted to FMEnv and on receipt of their comments
9.	Environmental Impact Statement and Certification	FMEnv	Will be granted after the above processes of S.N. 6 to 8
10.	Project implementation, Environmental Impact Monitoring	Proponent	Will be carried out during the construction stage
11.	Commissioning and Audit	Proponent	Will be carried out during the commissioning phase

1.6.8 International Legislations

In her responsiveness and responsibility in regional and global efforts towards sustainable development particularly in the safeguard of the environment and natural resources, Nigeria has entered into a number of international treaties and conventions. Being signatory to the conventions, Nigeria pledges to uphold the principles of such conventions. Some of the conventions considered in this project are as follows:

African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968

This convention came into force in Nigeria 7th May, 1974. The objectives of the convention is to encourage individual and joint action for the conservation, utilization and development of soil, water flora and fauna for the present and future welfare of mankind, from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

Convention on Wetland of International Importance, Especially as Water Fowl Habitat, Ramsar, Iran 1971

This provision came into force in Nigeria on 2nd February, 2001 with the objective to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.

Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 (As Amended)

This came into force in Nigeria on 7th January, 1993 with the objective to protect the ozone layer by taking precautionary measure to control global emissions of substances that deplete it.

Convention on Biological Diversity, Rio de Janerio, 1992

This convention came into force in Nigeria on 27th November 1994. The objectives are to conserve biological diversity, promote the sustainable use of its components and encourage equitable sharing of the benefit arising out of the utilization of genetic resources. Such equitable sharing includes appropriate access to genetic resources as well as appropriate transfer of technology, taking into account existing rights over such resources

Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, 1979 (As Amended)

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) entered into force in 1975 and became the only treaty to ensure that international trade in plants and animals does not threaten their survival in the wild. Currently 180 countries (called Parties), including the United States, implement CITES.

Convention for Cooperation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region (1981)

The objective of the convention is: To protect the marine environment, coastal zones and related internal waters falling within the jurisdiction of the Sates of the West and Central African region.

Basel Convention on the Control of Hazardous Wastes and their Disposal, 1989

The Basel Convention was adopted on 22 March 1989 and its objective is to protect human health and the environment against the adverse effects of hazardous wastes.

Stockholm Convention on Persistent Organic Pollutants, 2001

This is a global environmental treaty, signed on 22 May 2001 in Stockholm and effective from 17th May 2004, that aims to eliminate or restrict the production and use of persistent organic pollutants.

The Convention Concerning the Protection of the World Cultural and Natural Heritage, The World Heritage Convention, 1972

The Convention aims to identify, protect and promote the world's natural and cultural heritage considered to be of outstanding universal value.

The Framework Convention on Climate Change, Kyoto Protocol, 1995:

The Kyoto Protocol is an agreement under the United Nations Framework Convention on Climate Change (UNFCCC). Its objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

Conventions of International Labour Organization (ILO) ratified by Nigeria

Nigeria is a member of ILO since 1960 and has ratified 40 conventions. Some of the fundamental ILO conventions ratified by Nigeria are as follows:

- **C 029 – Forced Labour Convention, 1930 (No. 29) , Ratified in 1960.** This aims to suppress the use of forced labour in all its forms irrespective of the nature of the work or the sector of activity in which it may be performed.
- **C087 – Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87), Ratified in 1960.** The Freedom of Association and Protection of the Right to Organise Convention No 87 is an International Labour Organization Convention, and one of eight conventions that form the core of international labour law, as interpreted by the Declaration on Fundamental Principles and Rights at Work.
- **C98 Right to Organize and Collective Bargaining Convention, 1949, Ratified in 1960:** An International Labour Organisation Convention that provides adequate protection for workers and employer's organisations against any acts of interference by each other or each other's agents or members in their establishment, functioning, or administration.
- **C100 Equal Remuneration Convention, 1951, Ratified in 1960**: The Convention provides equal remuneration for work of equal value for men and women workers, and prevention of discrimination, on the ground of sex, against women in the matter of employment and for matters connected therewith or incidental thereto.
- **C105 Abolition of Forced Labor Convention, 1957, Ratified in 1960:** This is one of the eight ILO conventions on the protection of labour rights. The Convention prohibits the use of forced labour or mobilising labour for economic development or as a measure of labour discipline.

- **C111 Discrimination (Employment and Occupation) Convention, 1958, Ratified in 2002:** The Discrimination Convention is an anti-discrimination convention that addresses discrimination based on race, sex, religion, political opinion, national or social origin in employment and repeal legislation that is not based on equal opportunities.
- **C138 Minimum Age Convention, 1973, Ratified in 2002:** The International Labour Organisation adopted the Convention in 1973 to regulate and abolish child labour, and set a minimum age for admission to employment or work.
- **C182 Worst Forms of Child Labor Convention, 1999, Ratified in 2002:** Convention concerning the prohibition and immediate action for the elimination of the worst forms of child labour.

In addition, Nigeria also has obligations to protect the environment through various commitments to the African Union (AU), the Economic Community of West African States (ECOWAS) and the Commonwealth. It is also committed through relations with the European Community under the Lome IV Convention.

1.6.9 Requirements of the Funding Agency

In addition to national requirements in terms of environmental and social protection, the Project implementation needs to comply with international best practices. The Financial Intermediaries (FI), safeguard systems will need to be integrated inside the project cycle as well as other requirements from the European Union. Main environmental and social requirements that the project needs to comply with are described in the following sub-sections.

1.6.9.1 Financial Intermediaries (FI) Environmental and social risk management policy for FI-funded operations

FI's financing is conditional upon the implementation by the client of continuous and systematic environmental and social assessment procedures to (i) assess the environmental and social impacts of operations, (ii) propose appropriate measures to avoid the negative impacts or, when they are unavoidable, reduce or offset them in an appropriate manner, (iii) monitor the application of such measures during the implementation phase of the operation, and (iv) conduct an ex post evaluation of the effectiveness of the proposed measures.

The systematic environmental and social assessment of operations1 aims to ensure that they are environmentally and socially sustainable, contribute to integrating environmental and social considerations into the decision-making process of all the stakeholders, and provide a strong framework to manage financial and reputational risks run by FI.

This process also makes clients commit to achieving progress and improving their environmental and social performance, while monitoring results and impacts.

FI's conducts due diligence on all the projects submitted to its financing that fall within the scope of application of the present policy. This due diligence analyzes the environmental and social risks and impacts during the *ex ante* assessment of the operation, in a manner adapted to the nature and scale of the operation and proportional to the levels of these risks and impacts.

Pursuant to the Paris Declaration on Aid Effectiveness promoting Donor alignment and coordination, **the World Bank's prevailing environmental and social operational standards**. Compliance with these environmental and social standards is the objective of the environmental and social performance applied to this project. The project must also be implemented in compliance with the World Bank Group's Environmental, Health and Safety Guidelines (EHSG). These are reference technical documents, with general and specific examples of international good practices in the industry.

These standards will:

- Support Borrowers in achieving good international practice relating to environmental and social sustainability;
- Assist Borrowers in fulfilling their national and international environmental and social obligations;
- Enhance non-discrimination, transparency, participation, accountability and governance; and
- Enhance the sustainable development outcomes of projects through ongoing stakeholder engagement.

The ten Environmental and Social Standards establish the standards that the Borrower and the project will meet through the project life cycle, as follows:

- Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Environmental and Social Standard 2: Labor and Working Conditions;
- Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management;
- Environmental and Social Standard 4: Community Health and Safety;
- Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Environmental and Social Standard 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities;
- Environmental and Social Standard 8: Cultural Heritage;
- Environmental and Social Standard 9: Financial Intermediaries; and
- Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure.

Table 1.3 gives the applicability of the Environmental and Social Standards to the present project.

Table 1.3: Applicability of ESS to the present project

World Bank ESS	Rationale for Applicability
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	The proposed Project has potential environmental and social impacts that need to be appropriately managed. These include air and noise emission; loss of terrestrial flora and fauna; occupational health and safety; community health and safety, etc. ESS 1 is applicable
ESS 2: Labour and Working Conditions	The proposed Project will engage direct and indirect workers especially during construction and operation. It is necessary to maintain appropriate labour and working conditions for these workers. Therefore, ESS 2 is applicable.
ESS 3: Resource Efficiency and Pollution Prevention and Management	The proposed Project will involve the use of diesel as fuel for power generation. The Project will also involve the use of chemicals, and the construction activities will cause air, water, noise pollution. Therefore ESS 3 is applicable.
ESS 4: Community Health and Safety	There are communities within and around the Project site. Potential activities such influx of workers during construction; traffic related issues; land use change, etc. may have potential impacts on the communities. Hence ESS 4 is applicable.
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	The proposed project sites are within built up areas and may require acquisition of sites and displacement (at least temporarily) of traders. Therefore, some involuntary resettlement is associated with the proposed Project. Thus, the requirements of ESS 5 on land acquisition and involuntary resettlement are applicable.
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Though most of the project sites are in the urban built up area, but some project activities may take place near to critical natural habitats or environmentally sensitive areas and some mitigation measures may be necessary to minimize any negative environmental and social impacts. Hence ESS 6 is applicable
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	There are no known Indigenous Peoples (as defined by the ESS 7 within the Project's area of influence. Hence ESS 7 is not applicable
ESS 8: Cultural Heritage	Cultural sites such as Oke-ira Nla Jetty, Agbede Olu – Nla with tangible and intangible cultural heritage and triggers ESS 8.
ESS 9: Financial intermediaries	ESS 9 will be triggered by the 4MB as it is to be financed through financial intermediaries

World Bank ESS	Rationale for Applicability
ESS 10: Stakeholder Engagement and Information Disclosure	ESS 10 is triggered by the entire 4MB Project. In line with the requirements of ESS 10, LSMOWI recognises, "*stakeholder*" as referring to individuals or groups who: • are affected or likely to be affected by the project (*project-affected parties*); and may have an interest in the project (*other interested parties*) and has in place appropriate means of engaging with them from the conception of the Project and its sub-components all through its entire life cycle • Hence ESS 10 is triggered for the entire Project

Environmental issues during the construction and operation of the new facilities to be incorporated in the ***4MB Project*** are similar to those of other large infrastructure projects involving significant earth moving and civil works and their prevention and control recommendations are presented in the IFC General EHS Guidelines and Industry-specific IFC Environmental, Health and Safety Guidelines as may be applicable.

All operations financed by Financial Intermediaries are required to comply with the national regulations of the country where the operation is implemented, including for environmental and social issues. However, as regulations in the countries where Financial Intermediaries operates are sometimes incomplete or under development, Financial Intermediaries uses as a reference a number of rules, good practices and directives produced by international standard-setting organizations and proven with more than 70 years of experience in the financing of development projects. This mainly concerns:

- The World Bank Environmental and Social Standards;
- The UN Principles for Responsible Investment (UNPRI);
- The World Bank group EHS guidelines.

The major international conventions ratified by the countries where FI's operate are also used as references, mainly:

- The United Nations Universal Declaration on Human Rights;
- The ILO fundamental conventions on labor law;
- The United Nations Convention on the Elimination of All Forms of Discrimination against Women;
- The OECD guidelines for multinational enterprises.

1.6.10 Categorization of the Present Project as per Nigerian Guidelines and Pre-assessment

As per the screening process of Nigerian Environmental Impact Assessment Notification, 1992/2004, the present project is categorized as Category I project. The project was screened by the FMEnv and categorized as High-Risk Category. This is in tandem with the Nigerian regulations. Hence, this EIA has been prepared complying to all the applicable national and international legislations, guidelines and standards.

1.6.11 Assessment and Adequacy of Legal Instruments for Environmental and Social Issues

The existing legal framework for environmental assessment in Nigeria is considered adequate. Detailed laws, regulations and guidelines have been developed and serve as the framework for environmental protection. Lagos State has a good governance framework and laws to back up and manage the environmental and social safeguard issues that shall be triggered. Though the implementation has been poor due to poor enforcement.

As per the EIA Act, 1992/2004, does not encourage the participation of people whose lives are likely to be affected by a project; rather, it encourages the collection and documentation of technical information which is confusing to most people. However, in line with WB's best practices for Stakeholder Engagement and ESS 10 guidelines, LSMOWI will encourage the active participation of PAPs.

The Lagos Ministry of Environment and LSMOWI are conversant with the Environmental Assessment (EA) legislation, procedures and framework applicable based on the Federal EIA Act 86 of 1992/ 2004.

1.7 EIA Approach and Methodology

This EIA report was prepared in accordance with the Nigerian Government -Environmental Impact Assessment (EIA) Act No. 86 of 1992 and World Bank Safeguard Policy-Environmental and Social Assessment (ESS1): Assessment and Management of Environmental and Social Risks and Impacts.

The approach adopted for this project included; obtaining environmental and social baseline data from desktop, field and laboratory studies, interviews and consultations with individuals/representatives of the communities of the project area. This approach provided adequate information for establishing the environmental and social baseline status of the study area.

1.7.1 Desktop Research

Desktop research was carried out to establish the environmental and social baseline. Consulted materials include books, articles, journals, reports, project design, maps and photographs, project specific documents etc. as specified in the references section to this report.

1.7.2 Field Visit

A reconnaissance survey was first undertaken to familiarize the Team with the proposed project corridor and to facilitate an effective plan for field work execution.

1.7.3 Stakeholders Consultation

Relevant stakeholders were consulted for effective communication and successful achievement of the project. Stakeholders' consultation was achieved by courtesy visits to traditional rulers (Oba / Baale) of affected communities, meetings with the indigenous / affected communities, relevant interested or affected parties, women and youth groups, phone calls, interviews etc. with Local Government Chairmen of affected communities, the General Managers, Permanent Secretaries and Directors of the listed MDAs.

The stakeholders consulted for this project include but not limited to:

- Federal Ministry of Environment (FMEnv);

- Lagos State Ministry of Environment and Water Resources;
- Lagos State Environmental Protection Authority (LASEPA);
- Lagos State Ministry of Physical Planning and Urban Development;
- Lagos State Ministries of Environment & Water Resources;
- Lagos State Ministry of Works & Infrastructure;
- Lagos Metropolitan Area Transport Authority (LSMOWI PIU);
- Lagos State Ministry of Women Affairs and Social Welfare;
- Local Government Area and indigenous communities.

1.7.4 Socio-economic Assessment

Socio-economic data were collected through key informant interviews, Focus Group Discussions (FGD), direct observation, administration of structured questionnaire and collection of secondary data.

1.7.5 Environmental Sampling Techniques

Baseline data gathering, and laboratory analysis were carried out to verify and complement information obtained from literature review/ desktop studies. The fieldwork covered all the relevant aspects of the ecological, community health and socio- economic environment. Samples taken includes water, soil, air, flora and fauna species etc., which was analyzed during the course of this project.

1.8 Report Structure

The EIA Report is structured keeping in view with the requirements of Nigerian Federal Ministry of Environment and the Environmental and Social Safeguards (ESS) 1 of the World Bank Guidelines. The report is structured into nine (9) chapters, as follows:

Chapter 1 – Introduction: The chapter provides background information of the project, the purpose of the study, an overview of the ESIA study, its objectives, scope for the project, structure of the report. The chapter also describes all the applicable legal and institutional framework for the project, the environmental and social guidelines and standards of the World Bank, and the national environmental and social legislation within which the impact assessment is being carried out.

Chapter 2 – Project Justification: The chapter gives a comparison of all the feasible alternatives to the project sites, design and operation including the "without project" situation in terms of their potential environmental and social impacts.

Chapter 3 – Project and Process Description: The chapter describes the proposed project, site location, technical aspects of the projects, project components, additional project requirements, resource requirements like land requirement, raw materials, water, power requirements, manpower requirements, Project phases and activities, Project benefits and Cost of the Project. It also includes a map showing the project site and the area affected by the project's direct, indirect and cumulative impacts.

This chapter is divided in two sub-sections: construction phase and operation phase.

Chapter 4 - Description of the Environmental and Social Baseline: This chapter describes the environmental and social baseline data in the project influence area, including the source and reliability of the sources of data collection. The chapter also provides a narrative on the methodology adopted for the baseline study. This chapter also contains the section on approach and methodology for the consultation, stakeholders' assessment, information disclosure, public consultations, focus group discussions with various groups including women, stakeholders' engagement, stakeholders' engagement program, monitoring and reporting are well articulated.

Chapter 5 – Associated and Potential Environmental and Social Impacts: The chapter discusses and analyses the potential environmental and social impacts specific to the project, including those identified in the World Bank's ESS 2-8. The impacts identified cut across the pre-construction, construction and operational phases of the Project.

Chapter 6 – Mitigation Measures: The chapter describes the environmental and social mitigation measures based on identified and assessed environmental and social impacts.

Chapter 7- Environmental and Social Management Plan (ESMP): The chapter presents an overview of the ESMP, including its objectives and implementation plan, grievance redress mechanism, monitoring and evaluation framework, environmental and social performance indicators, ESMP Budgeting, institutional setting (including needs of capacity enforcement) and implementation arrangement.

Chapter 8 - Remediation Plans after Decommissioning/ Closure: The Chapter provides remediation plans after Decommissioning/Closure of the Project

Chapter 9 - Conclusions and Recommendations: This chapter summarizes the conclusions drawn from key findings of the ESIA and provides key recommendations for future work.

CHAPTER TWO: PROJECT JUSTIFICATION

2.1 Background

This section highlights the project needs, benefits, alternatives and options, including the "without project scenario" as well as its sustainability for the 4MB Project

The proposed 4MB Project is designed to improve the capacity in managing transportation within Lagos State following the phenomenal growth within the State which now has a population of over 21 million people, which has in turn increased commercial and traffic activities, which has made it imperative to have a 4th Mainland Bridge Project that will serve as an alternative route for the Eastern axis and help decongest traffic within the State. More importantly this Project will provide the required transportation compliment to the rapidly growing industrial activities on the Eti-Osa – Lekki – Epe corridor of the State. The proposed 37km Highway and Bridge Project also involves the reclaiming of an area within the lagoon to create a large "construction platform" for the proposed main Lagoon Bridge which has a length of 5.0km.

It will support the establishment of a sustainable integrated multimodal public transport system benefitting the megacity status of Lagos. This is in line with the infrastructure development priority in Nigeria intended to improving access to basic infrastructures for the less privileged, contributing towards an integrated urban development, reducing spatial and social imbalances through the promotion of regional economic integration, and promoting economic diversification through support to the non-oil productive sector.

2.2 Need for the project

Lagos is the largest city of Africa and among the fastest growing cities in the world. Lagos Metropolitan Area (LMA) serves as economic and financial hub of Nigeria with concentration of more than 50% of the nation's commercial and economic activities. Yet Lagos suffers from relatively high level of poverty and unemployment compared with the national average. Although Lagos has the most extensive road network in Nigeria, existing public transport system and infrastructure cannot cope with ever growing rate of demand. The inadequacy of the infrastructure, equipment and the regulatory system has hampered the development of the road network. The poor condition of the road network and of the public transport system affects severely the development of the city and the working and living conditions of the population, particularly the most vulnerable. Rapid growth of the private vehicle fleet, combined with reliance on commercial vehicles and motorcycles including Danfo (yellow and black stripe commercial bus), Shared Taxis, Okada (motorcycle), Keke Marwa (tricycle) has resulted in extreme traffic congestion throughout the city, particularly in the Eastern part of the State.

Most sections of main roads are congested with the air pollution levels exceedingly much above the maximum permissible level.

2.3 Project Benefits

The proposed 4MB Project is an important urban road development and infrastructure project whose benefits include but not limited to:

- Development of safe, efficient, affordable, comfortable multimodal transport infrastructure which will reduce travel time and enhance seamless connectivity across the State.
- Improved road network system
- Optimisation of an integrated transport system
- Promote economic growth and provision of short term and long-term employment opportunities to the local population during the construction and operation phases
- Improved air quality through reduction of emissions
- Improved noise levels
- Reduced accidents due to improved road conditions

This proposed project will incorporate a new "Eastern Relief Road for Lagos City" which when completed will have the following:

- ❖ 32km of 4 lane Expressway – Land Based (operating at 100 or 120kph)
- ❖ 5km long Lagoon Bridge (5 lanes each way)
- ❖ 6 Interchanges installed initially
- ❖ 3 further Interchanges added at a "future date" to accommodate;
  - Future Lagoon Highway
  - Future Ikorodu Lagoon Highway
  - Future Lagos-Abuja Direct Route Highway
- ❖ Designed to link to the "Coastal Road" at Lekki in the future
- ❖ 3 Mainline Toll Plazas
- ❖ Ramp "toll plazas" may be added depending on which Consortium is awarded the project
- ❖ Potential for 2 "service areas" with adjacent "trailer park facilities"
- ❖ A number of "online" sites have been located for controlled & specific development
- ❖ Will accommodate "Cyclists & Pedestrians" locally
- ❖ Will have provision for "BRT Corridor" on its outsides, so that the route complies with the STMP Report of 2012, for Greater Lagos (which indicated then a 240,000 passenger/day carry) • Will provide additional pedestrian crossings along the route after public consultation.
- ❖ Access to 3 major "land development" areas facilitated within the design
- ❖ River Bridges & Culverts to be installed at key locations
- ❖ Alignment can be increased to accommodate 6 lanes each way in the future The corridor for the project generates 397,000 ADT (2019) and it is expected that the project will eventually carry up to 75% of that volume, when initially open.

Additional Benefits of the proposed 4th Mainland Bridge

Major Strategic Route

Within Greater Lagos Region, the proposed route connects the E1 Ibadan expressway to the Lekki expressway as well as passing through the large satellite suburb of Ikorodu. This is the first eastern route to be advanced and is proposed to be open within 4-5 years. The existing route is in various conditions of repair and because of the inconsistency traffic diverts to other longer routes to complete what should be a simple journey, as they try to avoid regular delays along the existing expressways
within Lagos.

Figure 2.1: Route of Proposed 4th Mainland Bridge Project

Major Primary Connector

All major routes lead to and from Lagos State as the State is perceived to be the Financial, Industrial & Commercial capital of Nigeria, all routes within Lagos must use the present bridge connections between mainland and Victoria Island.

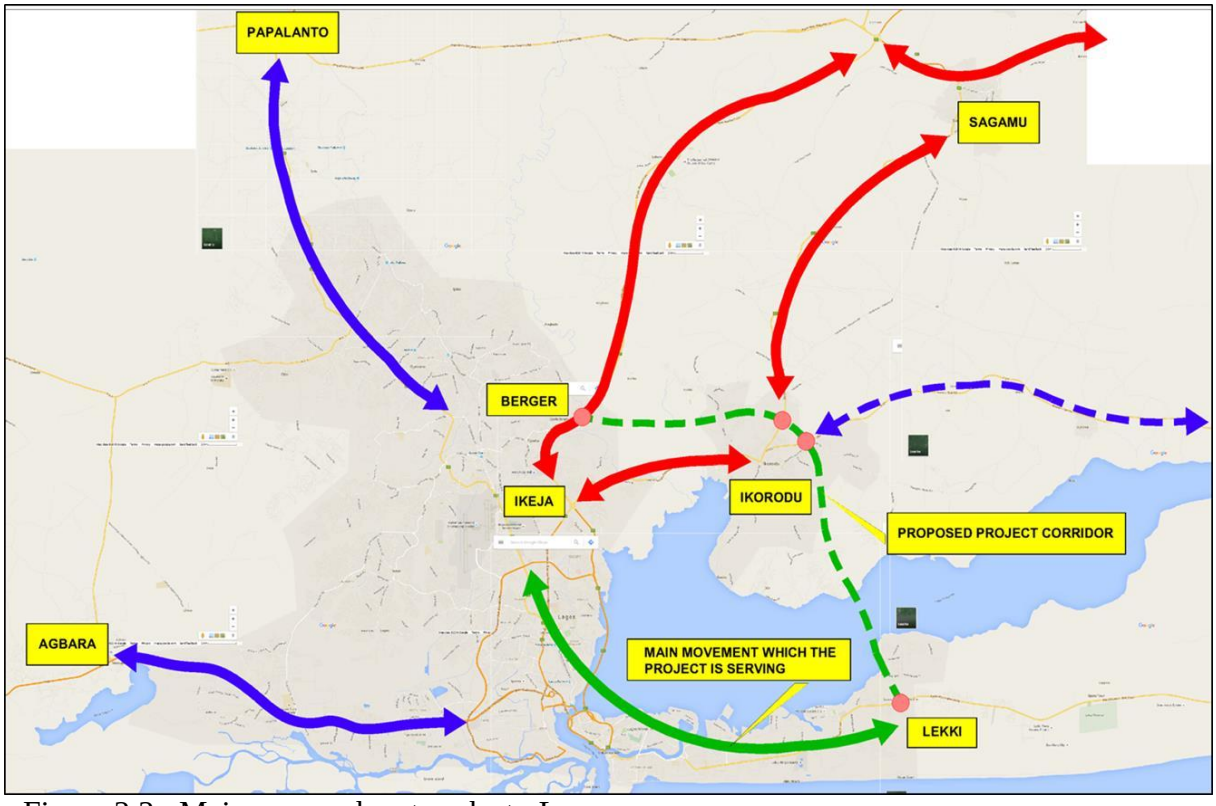


Figure 2.2: Main approach networks to Lagos

Demand for the Project

The "demand" for the project takes on a number of headings from a local to an international demand and the associated benefits it brings. The route locally has demand as to connectingthe various towns and villages on Mainland to the Lekki area as well as linking the E1 expressway to Ibadan and to the Lekki Free Trade Zone.

The demand for the project is further supported by the fact that there is no other route competing with it nearby and therefore it is critical to the economy of the region. Unfortunately, its present condition deters many from using the route for journeys and instead divert to much longer routes because of worsening traffic conditions.

Benefits to the Region

The Corridor for the 4th Mainland Project will both service and enhance large areas in the Greater Lagos area and will provide a vital strategic connection which will further enhance the commercial & industrial growth of the city.

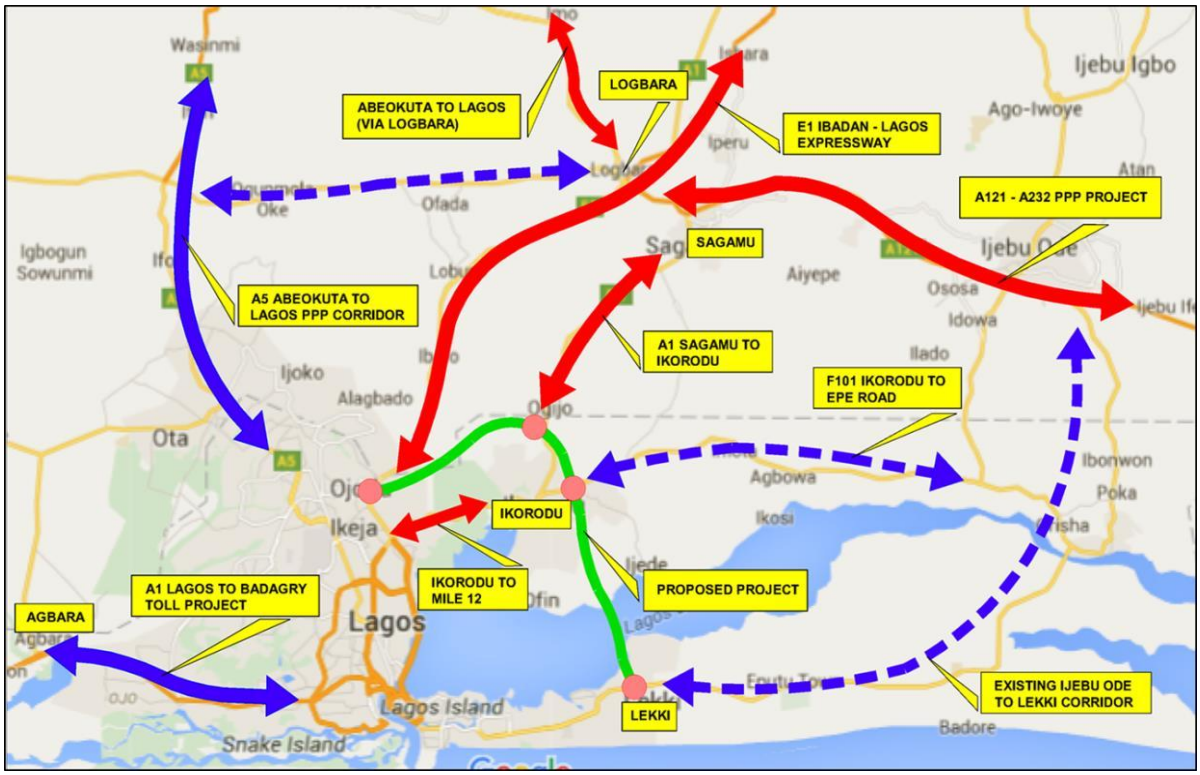


Figure 2.3: Areas which are served by the proposed 4th Mainland Bridge Project Corridor.

2.4 Envisaged Sustainability of the Project

The sustainability of this project stems from the fact that it will make economic contributions whilst also satisfying environmental and social requirements. The target is to meet the needs of the present populace without compromising the ability of future generations to meet their own need in the future, this can only be achieved by ensuring the proposed Projects longevity and is hinged on the key pillars of sustainability: Economic, Technical, Environmental and Social.

2.4.1 Economic Sustainability

The proposed project cost is about US$2,500,000,000 (NGN 1,110,425,000,000) (1.1 trillion) using 1 USD = 444.17 NGN exchange rate, as of July 2022). The funding is to be provided by

a consortium of Financial Intermediaries. The massive infrastructural development along the eastern axis of Lagos State around the Lekki – Epe corridor particularly around the Lekki Free Trade Zone and proposed Airport will add to the constraints of the current transport infrastructure in the area.

Lagos presently enjoys a very strong competitive position in transportation due to its location in Nigeria and a major trade route providing links between Ports and the other part of the country. The Lagos and Tin-Can Ports are the busiest ports in the country. In addition to its over 20 million population, Lagos hosts about 7000 medium and large-scale industrial setups (about 70% of the country's setups). On its road are cars, buses, Minibuses, Taxis, Tricycles and Motorcycles. In 2017 for example, there were over 5 million cars and 200,000 commercial vehicles on Lagos roads with about 227 vehicles/km of road against the national average of 11 vehicles/km. The daily required connection between Lagos and Ogun State along the axis shows that this proposed project is already needed. All these imply the presence of thousands of commuters and goods to be conveyed daily within the city and around the corridor thus throwing up more business interests and improved tax payments to the state. With these, its economic sustainability is fully guaranteed.

Public transport, such as buses, provides an economically sustainable means of transportation. Buses are affordable, enabling those who do not have access to private vehicles, to travel within the city. Development of the proposed 4MB Project and incorporating the same with the BRT lines, the rail lines and ferry routes will help promote the use of public transport. Also, during the construction and operational phase of the project, temporary jobs are expected to be created for both skilled and unskilled labour. The economic sustainability of the project is fully guaranteed as a result of the aforementioned.

2.4.2 Environmental Sustainability

The project activities will include greenfield road infrastructure development and improvement, rehabilitation of nearby road network and pedestrian walkways to improve walking conditions and accessibility to public transport services, rehabilitation of drainage, improvements of road junctions, provision of dedicated lanes for public transportation buses and construction of a new bus terminals.

The Environmental and Social Impact Assessment (ESIA) have been conducted to identify all potential impacts associated with the proposed project and appropriate mitigation measures have been suggested so that all the impacts avoided or minimized thereby ensuring the present development does not affect the natural resources. However, incorporating the findings and recommendation of this ESIA, and implementing an effective Environmental Management Plan (ESMP), at the planning, design, construction, operation and abandonment/decommissioning stages of the proposed 4MB project, will further ensure its environmental sustainability.

The project's activities shall be as per the National and International environmental regulatory guidelines and standards.

2.4.3 Technical Sustainability

Sustainable technology is an umbrella term that describes innovation that considers natural resources and fosters economic and social development. The goal of these technologies is to drastically reduce environmental and ecological risks and to create a sustainable product.

A project is sustainable when defects can be corrected, it is able to meet new requirements, future maintenance is made easier, and it can cope with the changing environment.

The technical sustainability of the proposed project shall involve the application of Best available cost-effective technology. Also, strict adherence to International and National engineering design, construction standards and codes of practices shall ensure the technical viability of the project.

The proposed 4MB project can boast of an assemblage of a team of professionals with impressive relevant experience that would be involved in the implementation of the project and would where necessarily source for necessary technical expertise to ensure the sustainability of the project.

LSMOWI as well as the contractors will in addition develop operating manuals and appropriate documentation regarding the operation and maintenance of the facilities. All the projects facility designs and construction shall be handled by properly trained and experienced personnel and competent contractors as this shall form part of technical sustainability for the proposed project.

2.4.4 Social Sustainability

The project has secured its first social license – the host communities' acceptance of the proposed project their eagerness to see it succeed.

The proposed project synchronizes with Phase 1 of the Lagos Strategic Transport Master Plan Project (LSTMPP-1) designed to establish a sustainable integrated multimodal public transport system for Lagos. The development of the proposed 4MB project is expected to impact positively on the social life of the people of Lagos by the reduction in travel times and traffic safety improvements leading to increased physical activities.

The project will be undertaken in a socially sustainable manner since it directly influences the local community all throughout the project corridor. The Project will establish and maintain a conducive environment in the project area and put in place Grievance Redress Mechanism while maintaining effective community relations during construction and throughout the life span of the project.

Lagos State Government and LSMOWI will ensure that adequate compensation is paid to all affected persons under the Resettlement Action Plan (RAP) as well as ensuring cordial relationship with stakeholders and communities by the contractor. The Construction and operation phases of the proposed 4MB project shall create opportunities for direct and indirect, temporary, contract and permanent employment.

2.5 Analysis of Alternatives

In accordance with the requirements of ESIA procedural guideline a number of alternatives have been considered during the conceptualization of the proposed Project design. This section also discusses the alternatives with respect to alignments, technical and environmental considerations. This process is an identification and analysis of feasible alternatives to ensure successful implementation of the project.

Project alternatives were evaluated as part of the conceptual design process and the alternatives that provide cost-effectiveness, environment friendliness and management. This process is an identification of and analysis of feasible alternatives to ensure successful implementation of the project. Analysis of viable alternatives was based on safety considerations, environmental and social impacts, design improvements/ alterations with current traffic and future projections, and also considered parameters such as cost-effectiveness, environment friendliness and management, financial, social and technical feasibility.

As far as the proposed 4MB project is concerned, the alternatives that could be considered may include: -

- Alternative Alignment Option
- Alternative Technology Option

The project options took cognizance of environmental, safety and operational considerations. These include the No project option, Delayed project option, and Go-Ahead project option.

2.5.1 Alternative Alignment options

The alignments for the 4th Mainland Bridge Project go back to around 2010-2012 where a number of potential Promoters presented proposals for the route options. These routes varied in profile as did the start and end points for the project, at that time. One of the mainproponents regarding possible routes was Julius Berger, whose proposals in 2012/13 showeda number of potential options for consideration. However, all these routes only went from Lekki-Epe Expressway to the existing Sagamu Road, out of Ikorodu.

While at the outset, when these historical routes were being considered as options, there wasno underpinning traffic study or assessment to promote any one particular option and the proposals seemed to have disappeared as there was no Promoter willing to take up the task of delivering the solution, at that time, unless the credible backup existed to support the proposal.

Figure 2.4: Historical routes looked at by Julius Berger for alignment.

2016 Alignment

In 2015, AEC embarked on research and development, in relation to at the time what was called an Eastern Relief Road for Lagos City, which over the following 12 months became known as the 4th Mainland Bridge Project (2016). This was undertaken by the "R&D" section of Advanced Engineering Consultants who looked at the overall "network strategy" for the Greater Lagos Area.

The "R&D" exercise looked at the viability options in providing a "Ring" around Lagos City that will not only help to alleviate congested areas within the City but also provide "long haul" users with an option to "go around" the city especially with heavy goods vehicles. Our studies show that the "heavy goods" vehicles using the approach Roads to & from Lagos City are of 27% composition depending on the day of the week, with the global averages in the region of 23%. This accounts for the problem with "pavement breakdown" in many areas as such Roads are not designed for these percentage figures, but merely at best 12%.

The original feasibility 2016 study carried out underscores many issues as well as highlights the benefits to upgrade and develop the "Orbital Infrastructure" around Lagos City. It also shows how this can be phased as well as developed by competitive PPP type packages so as to optimize the benefit to the State.

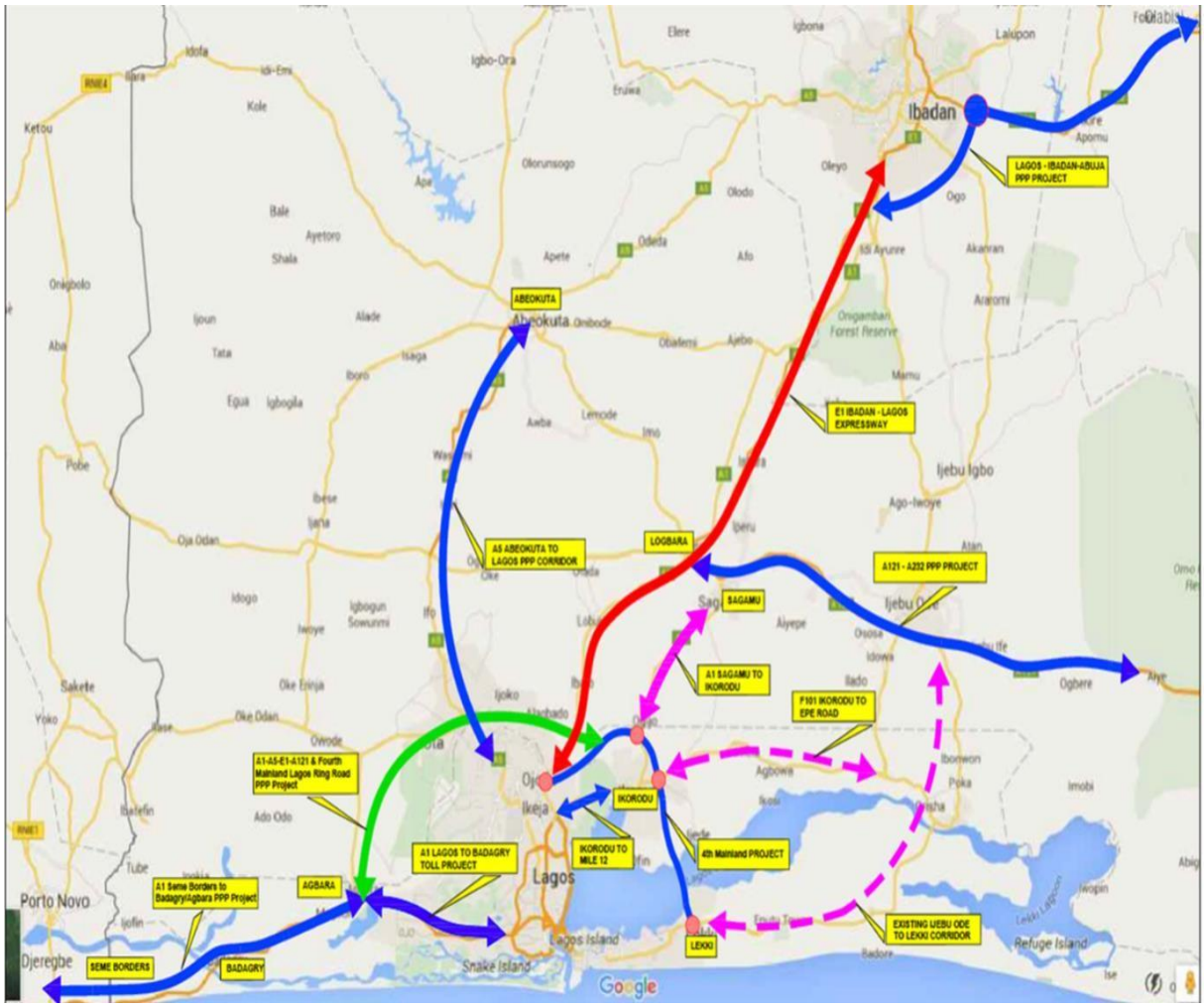


Figure 2.5: AEC "R&D" Infrastructural Network Analysis (Jan. 2015 – July 2016)

The main infrastructural highway network around and approaching Lagos City is in various conditions of operating efficiency. These operating efficiencies vary from "none to reasonable" which has been core to the traffic issues especially over the past 10 years. This isbased simply on the following:

a) Lagos-Badagry Expressway – Report 2008, never updated prior to construction.
b) Lagos-Ibadan Expressway - Upgrading carried out with no clear strategy
c) Lekki – Epe Upgrading – Not modeled to optimize solutions
d) Extension of the Strategic Transport Masterplan for Lagos Megacity & Model – Prepared in 2012 and needs to be overhauled in 2017.
e) Ikeja Traffic Management Plan.

The "overview" traffic appraisal & Modelling carried out as part of the R&D exercise raised many issues at key "conflict points" across the entire network. It was also noted that within each Local Government Area, there was no cohesive transportation plan that interacts with adjacent local Governments, which is why the "street scape within Lagos is so disjointed.

So once the Primary Transport Corridors were established it became clear of the critical needto interconnect all of these in order to make the network more efficient to the User. This willhelp to significantly reduce heavy traffic trying to navigate through the City streets.

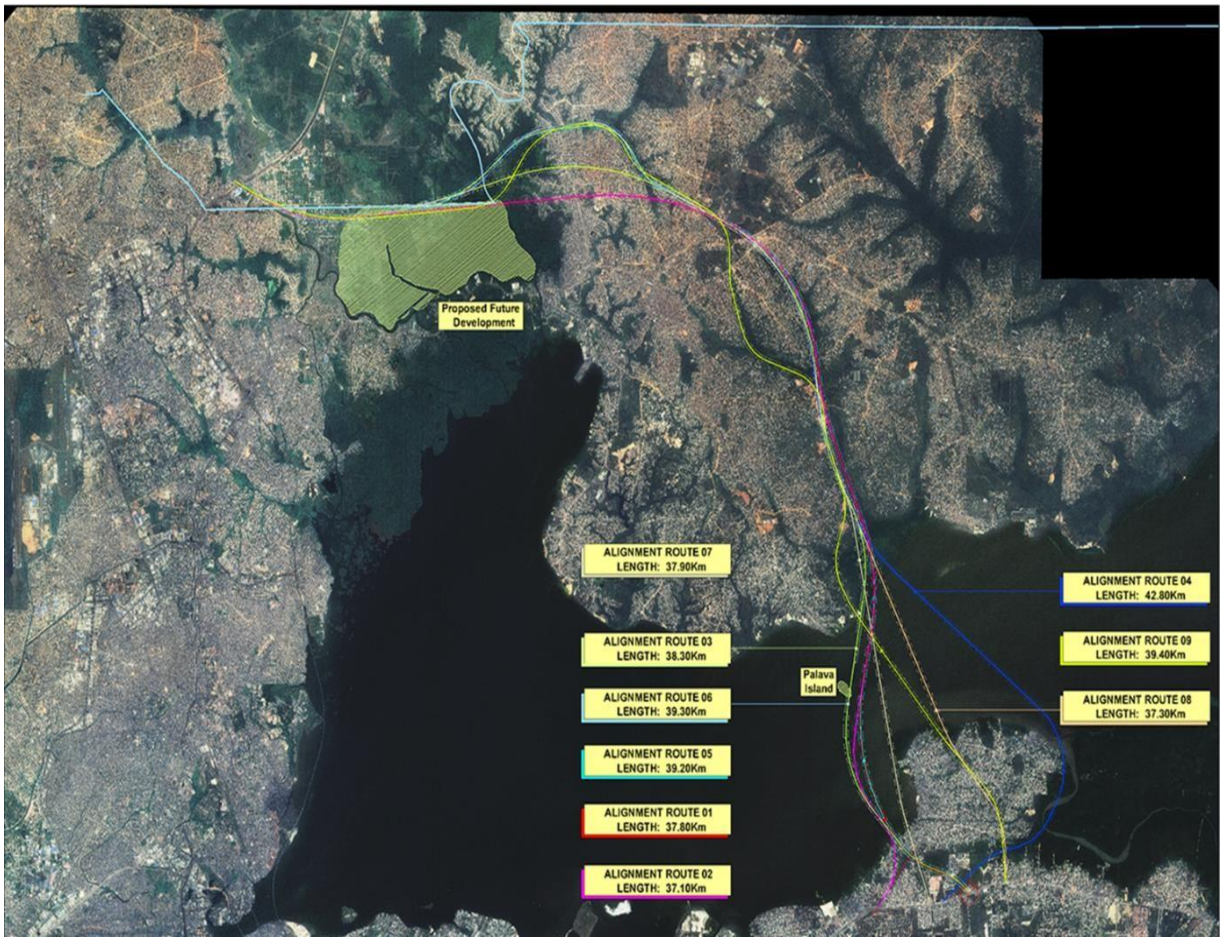


Figure 2.6: AEC new route options reviewed under "Route Selection" (Nov. 2015 to June 2016)

Once the corridor, in general, was established for the 4th Mainland Bridge which is now based on sound traffic assumptions, it was necessary to carry out a "route selection" process to optimize the attractiveness of the route. This process was carried out between November 2015 and June 2016 so as to get approval in principle from Lagos State Ministry of Works forthe proposed corridor. The route selection process involved the preparation of a detailed "constraint matrix" which helped to generate the "pros & cons" of each route and allowed for some early technical issues to be established during the process. On completing the route selection process, the Lagos State Ministry of Works was consulted on the 19th April 2016 and a route was approved in principle.

The other alignment options were discounted for various reasons, ranging from:

- Demolition requirements
- Length
- Cost
- Social Impact
- Interface
- Overall benefit

to mention but a few.

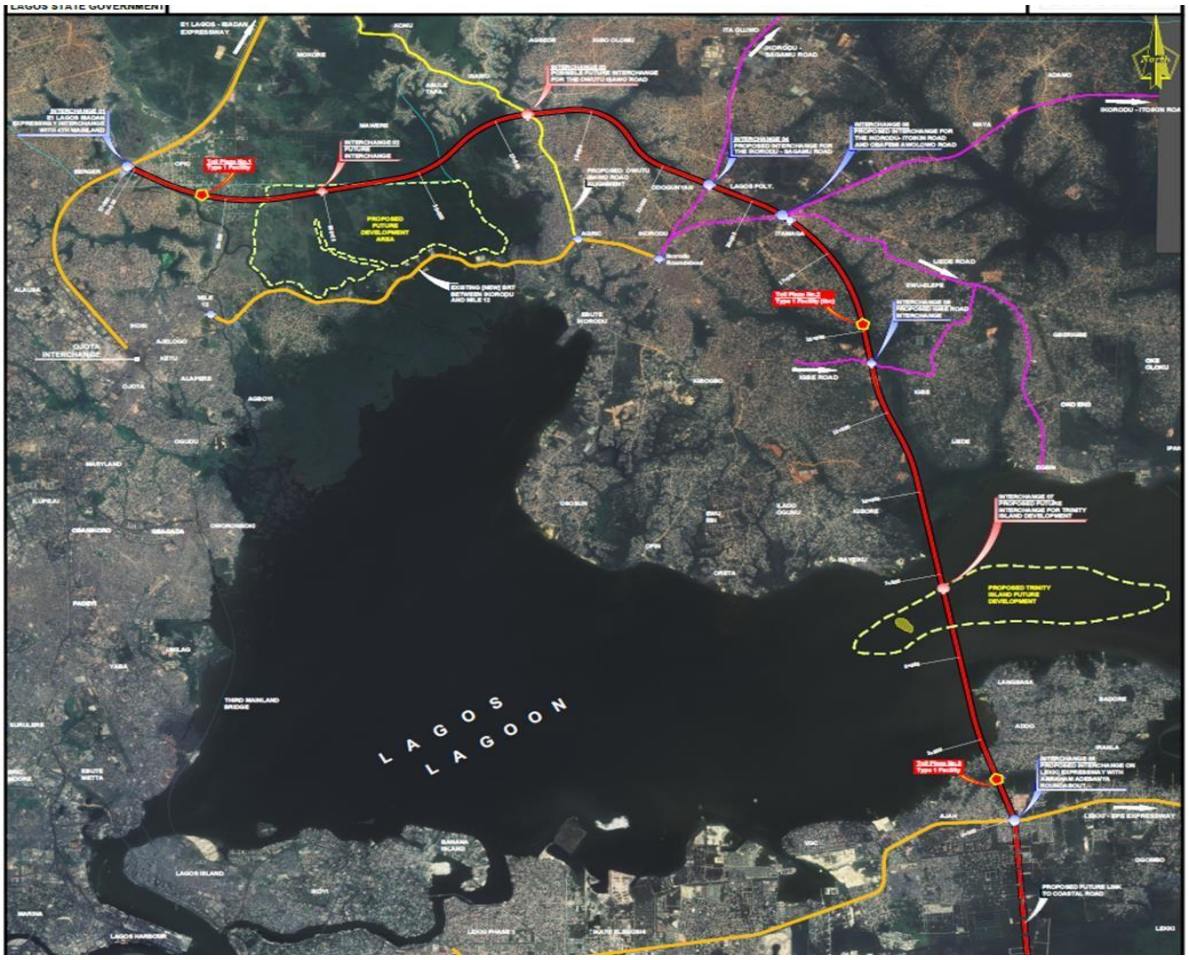


Figure 2.7: Preferred Route, as Approved by Lagos State Ministry of Works (July 2016).

In July 2019, a review of the project was carried out by the Technical Transition Team of His Excellency, Mr. Babajide Sanwo-Olu, the Executive Governor of Lagos State who assumed Office on 29th May 2019. The "technical transition team" raised a number of observations which they felt should be considered in a revised design.

The Project should also consider the viability of possibly connecting to 3rd Mainland Bridge as well as the port area in a larger strategic vision.

The Project should allow for integration into a bigger picture for the south west region of Nigeria and for future strategic highways in the Greater Lagos Area

All these were considered and factored into the Approved 2016 Preferred Route for a revised Potential Highway Infrastructure which will allow for the integration, into a bigger picture, for future strategic highways in the Greater Lagos Area

1. Connect to Lekki-Epe Expressway

2. Lekki Regional Road

3. Lagoon Highway "West" (Connects 3rd Mainland bridge to 4th Mainland Bridge)

4. Lagoon Highway "East" (Connects 4th Mainland Bridge to the New Epe Airport)

5. Possible Connection to Port Area

6. Ikorodu Lagoon Highway

7. Lagos-Abuja Direct Highway (Phases 1 & 2)

8. Connect to Mile 12-Ikorodu Highway

9. Connect to Lagos-Ibadan Expressway

10. Lagos Coastal Highway

whilst also providing a platform for the future Strategic Growth of Lagos State Development Plan 2052 which has the following features:

1. Ikorodu Master Plan (Population 6.35m).

2. Lekki Master Plan (Population 6.24m)

3. Ikoyi & Island Connection

4. Lekki FTZ & Major Petrochemical Refinery with up to 700,000 Jobs

5. Lekki Deep Sea Port

6. Lekki FTZ Expansion

7. Epe International Airport

8. Epe Master Plan (Population 2m)

9. A1 Sagamu Road Large Ribbon Development – Ogun State

10. E1 Lagos-Ibadan Expressway Ribbon Development – Ogun State

11. Sagamu Development Expansion – Ogun State

12. Ikeja Master Plan Population (16.5m)

2.5.2 Alternative Technologies and Design options

After the route was selected and approved, it was necessary to carry out a number of specific testing to ensure its viability and above all its benefits to the region. Therefore, the following aspects were assessed:

a) Interface options at each end of the alignment
b) Possible interchanges
c) Vertical profile
d) Horizontal Geometry
e) Existing Network Connectivity
f) Cross Section Capacity & Capability
g) Lagoon Bridge footprint
h) Preliminary Estimates

Once all these parameters were established then the Specimen Design commenced so as to add detail to the "route master string" which is required for all the disciplines to advance to Preliminary &/or Full Design.

Figure 2.8 shows the "Specimen Design" for the whole alignment which is supported by 35 Volumes of documentation in line with the traffic, tolling and technical requirements of the project. The alignment has been fully profiled and all interchanges tested for present and future capacities.

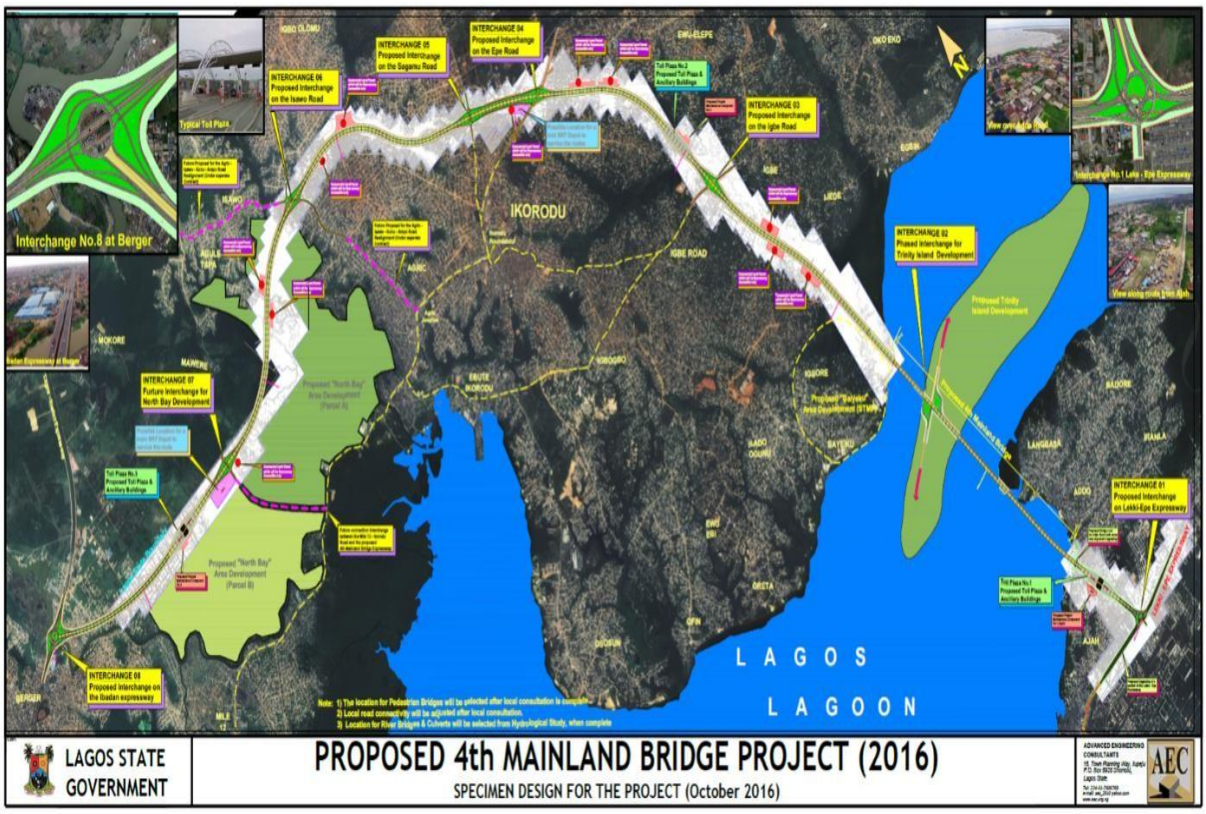


Figure 2.8: 4th Mainland bridge project (2016), Specimen Design (October 2016).

Diesel Technologies

Diesel engines are recognised and favoured worldwide for their fuel efficiency, excellent durability and low maintenance requirements. They offer the convenience of using a liquid fuel that is easily dispensed through an established fuelling infrastructure. The technology is mature, widely produced and competitively priced. Although diesel engines have historically produced high levels of pollutant emissions, especially oxides of nitrogen (NOx) and particulate matter (PM), recent improvements in engines, fuel and emissions control technology have resulted in new diesel systems for buses that are substantially cleaner than they were only a few years ago.

Strategies to Reduce Particulate Emissions

In situations where most articulated vehicles are poorly maintained, particulate and other emissions can be reduced substantially just by improving maintenance and tuning. Proper engine maintenance, repair and tuning are probably the most important and cost-effective steps developing countries can take to reduce diesel emissions, especially particulates. However, such steps may require strong government regulation and strict enforcement. For example, in

some instances buses may be tuned to maximize engine power, which may result in higher fuel consumption or emissions than necessary. Regular inspection can help minimise this practice. This is of strategic importance as the Dangote Industrial Complex at the Lekki Free Tade Xone is expected to have a minimum of 19,000 Trucks per day plying the Lekki - Victoria Island corridor when operational. It is strongly recommended that the Lagos State Government should proactively enter into discussions with the Management of Dangote Group to as a matter of necessity change its strategy by utilizing a pipeline model to transport the finished Petroleum Products from its Refinery to the Loading Platforms at the Sea Ports / Terminals and simultaneously use a Conveyor System for transporting its Fertilsers from Dangote Fertiliser Company to a dedicated Logistics Centre at Ijebu Ode on the Epe – Ijebu Ode Axist o reduce wear and tear on the adjoining road network thus prolonging its lifespan and reduce vehicular emissions on the adjoining road corridors

Intelligent transport systems.

The use of information technology through Intelligent Transport Systems (ITSs) is likely to be another major tool for future sustainable transport of the 4MB Project. ITSs already include equipment and in-vehicle technology and software for traveler information, transport systems management, driving assistance, and electronic transactions. They can benefit transport managers, users, and the environment by offering improved operational efficiency and reduced travel uncertainty, and can reduce avoidable trips and increase safety. The use of ITSs can improve real-time traffic management, reduce congestion, reduce the need for additional infrastructure, and provide more accurate information to support traffic monitoring, forecasting, and investment project design.

2.6 Analysis of Project Alternatives

This shows the comparison of all feasible alternatives to the project sites, design and operations including the "without project" situation of in terms of their potential environmental and social impacts.

Project options represent possible lines of actions to be taken against the problem the project is designed to solve. Considering the impacts and benefits associated with the project, the following options were considered in respect of the proposed project:

Option 1 - No - project Option
Option 2 - Delayed - project Option
Option 3 - Go Ahead - Project Option

2.6.1 No Project Option

Under the No Project Option, or no-development option is a scenario in which 4MB project would not be executed. With the "no-project" option, existing levels of service and safety deficiencies in the project area will worsen as automobile and traffic volumes would continue to increase and would make industrial and socio-economic development impossible. This will negatively impact the local economy and by extension, the state and the nation in general considering our dependence on road transportation.

Adopting this option renders all the resources used at the planning stage wasted. Also, the project benefits (road infrastructure improvement, rehabilitation of adjoining road network and pedestrian walkways to improve walking conditions and accessibility to public transport

services, rehabilitation of drainage, improvements of road junctions, employment opportunities) would not be achieved. Hence, this scenario is equally rejected as it would prevent meeting the city's growing transport infrastructure needs.

2.6.2 Delayed Project Option

Sometimes, either as a result of civil unrest or public outcry against a development or project, the implementation of a project may be delayed. Applying this option to this project would mean that the proposed project implementation would be stalled until conditions are favourable. However, none of the above stated conditions currently apply to this project. In fact, the people of Lagos are yearning for the facility in view of its envisaged immense social and economic benefits.

Considering the fact that the proposed 4MB Project has been on the drawing board for the past 20 years, and also, because of inflationary trends, such a delay may result in unanticipated increase in project costs, which may affect the final profit from the project. The consequence of these is that it would be a discouragement for private/local investors. In consideration of the above concerns and assessments, selecting the Delay Project Option would mean a larger part of those living in Lagos would have their dream of utilizing efficient world-class integrated transport infrastructure delayed.

These, and other related problems make impracticable to adopt the delayed option. It is therefore unattractive to adopt the "Delayed Project" option.

2.6.3 Go Ahead Project Option

This option addresses the effects of implementing the proposed 4MB project. This is an option which would have a cumulative short- and long-term positive impact on the locality, its environs and Lagos State. The need for this project in the proposed locations outweighs the other options of 'no project option' and 'delayed project option'. It is also clear that if the full potentials of the project location are to be exploited; thus, it is recommended that the project be carried ahead as planned. Adequate mitigation measures shall be put in place to minimize or eliminate potential negative environmental and social impacts of the proposed project.

Despite the dire need for the project to proceed, options that ensures minimal displacement of people and deforestation were prioritized. Thus, given the above- enumerated considerations, the preferred option - construction of the proposed Project with efficient technology, cost minimization and environmental friendliness – is considered the optimal one. The option to go ahead as planned does outweigh the other options of no project and delay as clearly highlighted above.

CHAPTER THREE: PROJECT DESCRIPTION

3.1 Introduction

This chapter describes the proposed project and its geographic location, ecological, social, economic and temporal context: project location, various project components, etc. It describes also the selected preferred emerging horizontal route alignment as a whole with emphasis on selected project route's alignment in Lagos and Ogun States in Nigeria, which has been the subject of Environmental and Social Impact Assessment and Resettlement Action Plan.

The Challenges of a Megacity

Lagos is internationally appraised as a Megacity with great influence on the African continent. Its rapid development, especially since the 1960s, is shown in the figure 3.1.

The transformation from a settlement in Lagos Island to a massive urban expansion beyond the traditional metropolitan boundaries is well-apparent. Lagos is expected to overtake Cairo as the biggest city in Africa by 2025, reaching a population of over 30 million people by 2030. It also represents the gateway to Western Africa, with a remarkable potential as a transportation and economic hub.

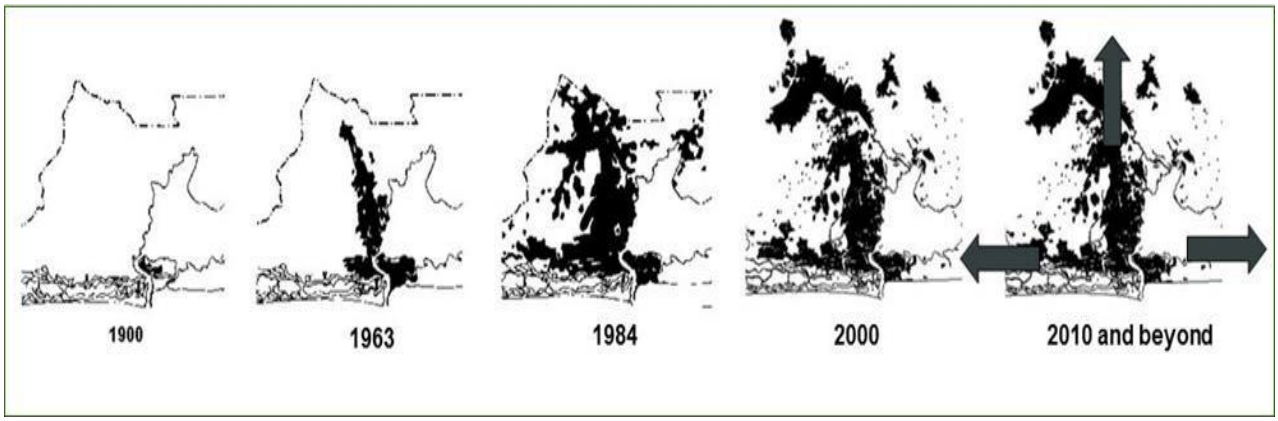


Figure 3.1: Lagos' Urban Expansion
Source: Ministry of Physical Planning/Environment; LSMOWI GIS Database

However, Lagos' accelerated demographic expansion cannot continue without appropriate planning. Up till now, the rapid dynamism of this city has not been accompanied by adequate urban and transport development policies. Lack of planning has led to the proliferation of slums, degradation of urban areas and facilities, and transportation problems affecting all modes including:

- Neglected infrastructure
- No real alternatives to Road transportation
- Insufficient capacity and inadequate Road hierarchy
- Inadequate and insufficient link Roads and bridges
- Unregulated street trading
- Inadequate traffic management
- Absence of a parking strategy
- Safety and security issues

This situation has led to a state of growing congestion, which represents a major challenge for the Megacity.

An inadequately regulated and structured public transportation system does not help in easing the current congestion problem. In Lagos State, the public transportation system is a highly fragmented sector, which comprises of many un-regulated routes (concentrated alongthe main corridors). Majority of the public transport providers use mini-buses (Danfos)leading to an inefficient public transport service which is largely responsible for the modal change from public into private transportation.

The use of the mini buses itself generates additional congestion resulting in the degradation of the public transportation system in Lagos. The outcome of all this is a chaotic transportation system where the use of private vehicles becomes the best option andcongestion becomes a recurrent problem.

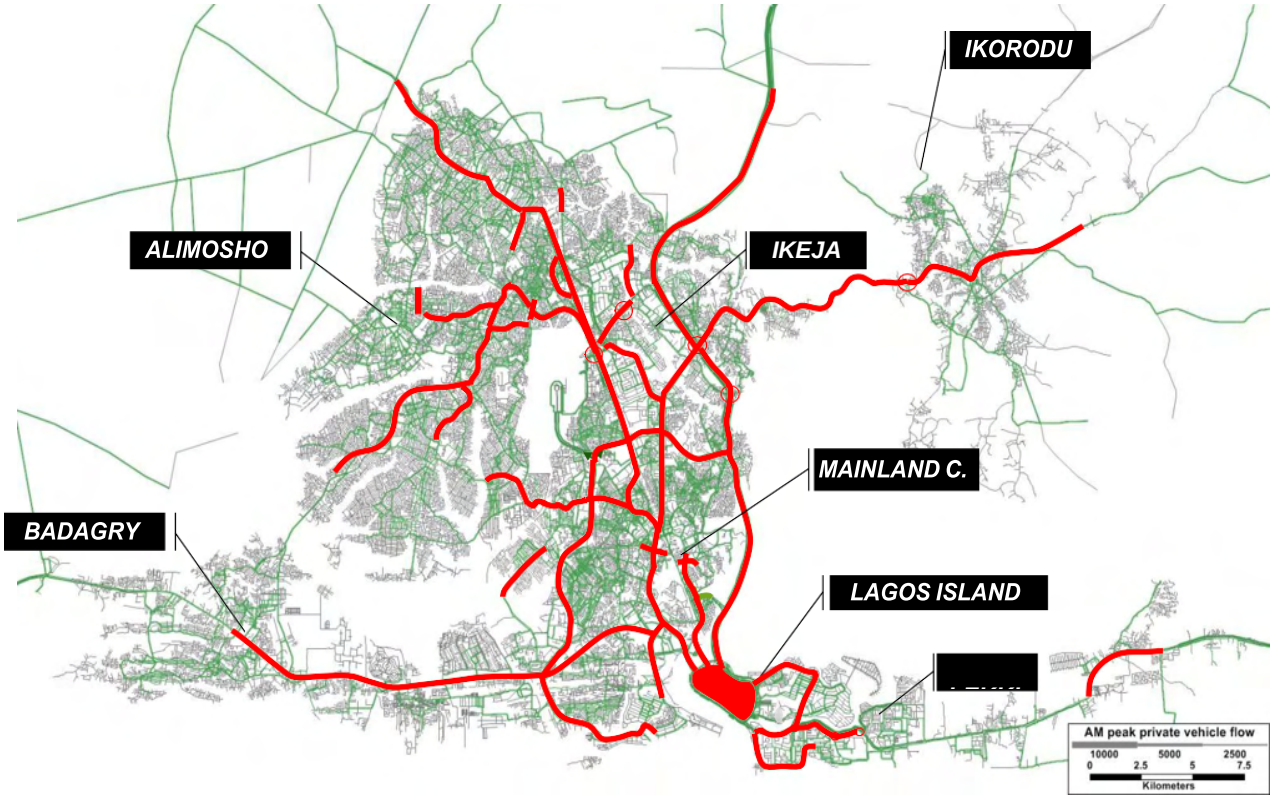


Figure 3.2: Current state of congestion in Lagos' Road network
Source: ALG

Besides, Lagos represents a key-industrial centre in Nigeria, as well as a gateway for the delivery of many of the consumer products in several states across the Federation (Lagos State inclusive). This is responsible for the growing number of freight vehicles along the main transport corridors in Lagos Megacity area. Most of these freight movements are strongly linked to Lagos' Ports and industrial areas in locations such as Apapa, Ikeja and Ikorodu.

These freight vehicles have to share the existing Road infrastructure (which is badly maintained and inadequate for freight traffic) with passengers. There are also insufficient distribution centres, warehouses, parking areas and other facilities. In brief, the Megacity does not have the basic infrastructure for a proper organization of freight movements.

In addition, the freight fleet is old and poorly maintained. Also, there is inadequate institutional framework in place (regulation, capacity building). All these conditions raise serious concerns on a number of issues such as:

- Safety and security
- Pollution
- Accidents
- Increased congestion, particularly around Lagos Ports and along the main Megacity corridors

3.2 Project Corridor Description

The proposed 4MB Project has been an aspiration of the LSG for over 20 years, with different proposals being presented as regards the alignment route. The 4MB project is aligned with the Lagos State Strategic Transport Master Plan (LSSTMP) and the National Integrated Infrastructure Master Plan which aims to raise Nigeria's stock of infrastructure from the current 20 – 25% of GDP to at least 70% of GDP by 2043.

It aims to reduce severe congestion on the existing 3rd Mainland Bridge and Lekki – Epe Expressway while opening new areas of the city for future development. The 4MB project is one of the priority solutions to relieve traffic and distribute social and economic growth across the State.

The approved and preferred route alignment of the proposed 4MB project is the only proposal which had indicated connecting the Lagos – Ibadan Expressway to the Lekki – Epe Expressway through Ikorodu, which has a much bigger attraction to traffic flow.

The 4MB Project Corridor can be divided into 3 Sections:

Mainland Section, Island Section (with 4 lane dual carriageway with option of BRT lane on the outside) and the Lagoon Bridge which is approximately 5km in length and is proposed to have up to 5 lanes in each direction.

The Lekki Island section of the project starts at the existing Lekki-Epe expressway at the existing Abraham Adesanya Junction. It then moves northwards towards the lagoon trying to use as much as possible of the "open spaces"

The Project Corridor will span approximately 37 kilometres, starting from Abraham Adesanya Junction on Eti-Osa – Lekki – Epe corridor where a "free flow" interchange will be constructed as well as some traffic flow alterations to the existing Lekki – Epe Expressway so as to maintain traffic movements during construction. The 2x4 lane carriageway then proceeds north towards the Lagoon passing through Ajah and Langbasa areas and crossing the existing Addo-Badore Road before arriving at the existing shoreline of the Lagoon. This route was chosen as it is the most practical shortest route from Abraham roundabout to the Lagoon. This section of the alignment will contain the first "Toll Plaza" for the project, with associated ancillary buildings and maintenance depot. It will also cross the Addo-Badore Road, at-grade, and the project proposes to divert a section of the existing Road to allow it cross over the proposed highway.

The proposed works to be carried out in the Lagoon area, include but not limited to;

a) Reclaiming an area within the lagoon to create a large "construction platform" for the proposed main Lagoon Bridge.
b) The proposed Lagoon bridge will launch from the reclaimed area of the Lagoon and travel

north towards the mainland and landing east of Baiyeku, which will have a total "bridge length" of 5km.

c) Also included on the reclaimed section of the Lagoon area will be the proposed diverted alignment of a portion of the Addo-Badore Road.
d) The lagoon reclaimed area will also facilitate the future interchange for the future proposed Lagoon Highway West and East from 4th Mainland Bridge.
e) The Lagoon area can then be reclaimed as indicated in phases as the potential development of the area grows. This area will form a new Commercial/Residential and Recreational area adjacent to the Lagoon in the Lekki area.

The proposed Lagoon bridge, which has a length of 5km, will comprise of a "twin 7 lane deck" (2 parallel decks) to provide for both the present traffic needs and the future traffic growth needs as well as the potential for a BRT network. However, this may be adjusted by final proposals from the successful Concessionaire when looking at both the cost and phasing of the capacity of the bridge deck. The criteria for the proposed bridge crossing the Lagoon have already been given by the "Inland Waterways Authority" in 2016 and are accommodated within the generic design parameters of the proposed structure.

The proposed alignment lands between the villages of Baiyeku and Ijede on the mainland after descending from crossing the Lagoon. The route continues northwards through the open area until it reaches the Epe Road on the outskirts of Ikorodu. Along this section of the proposed alignment contains;

a) Provides for a future interchange to service the "Baiyeku Area Action Plan", as defined in the Lagos STMP Report, which is designated for development.
b) It crosses over the local realigned Igbe Road and an interchange will also be provided here to accommodate for the future expansion in the area, as indicated in the new Ikorodu master Plan.
c) The second Toll Plaza, ancillary buildings and maintenance compound will be located south of the Igbe Road interchange.

At the proposed Epe Road crossing, where the proposed alignment will pass under the existing Road, an interchange will be installed to connect both the Epe and the Ijede Road to the proposed highway. This proposed interchange will require the upgrading of portions of the existing Road network adjacent to the proposed alignment to allow for a more efficient flow of traffic in the area. Due to the close proximity of the proposed Epe Road interchange crossing and the Sagamu Road to the north, the Epe Road interchange is designed to integrate with the adjacent Sagamu Road proposed interchange, within the lands of Lagos Polytech.

The proposed route continues northwards towards the existing Sagamu Road, through the lands of the Lagos Poly Tech, until it reaches the existing Sagamu Road where an interchange will be constructed. The proposed highway will go under the existing Sagamu Road and the proposed interchange at this location is designed so as to integrate with the Epe Road interchange to the south. This is done due to the potential close proximity of the merge and diverge ramps, as they would be too close to allow for safe movements.

After crossing the Sagamu Road, the proposed alignment continues north west around Ikorodu suburbs which tries to optimize the use of the open space. Along this section of the proposed

route provision is made for the possible future connection to the future "Lagos – Abuja Direct Route Highway" before continuing westwards towards the Isawo Road, again trying to utilize as much as possible the open space areas.

Due to the extensive upgrading works being carried out by Lagos State to the existing Isawo Road, it is now proposed that the 4th Mainland alignment will go over the isawo Road. It is therefore proposed that a very short length of the upgraded Isawo Road will be modified so as to accommodate the construction of a proposed underbridge at this location with the new proposed interchange for the area located west of the Isawo Road, thus limiting potential demolition.

After leaving the Isawo Road area, the alignment continues west where it briefly enters and exits Ogun State before arriving at the Proposed future interchange which will ultimately service the "North Bay" area land development as well as south Ogun State land development. This future interchange will be installed once the adjacent land banks begin to develop, however, provision will be included in the initial construction for the interchange. This future interchange will also connect to the recently upgraded "Mile 12 to Ikorodu" BRT alignment so as to allow for network connectivity.

The proposed alignment continues west/northwest towards the existing Lagos-Ibadan Expressway, where it will interface with the Federal highway. Along this section will be located Toll Plaza No.3 with ancillary buildings and maintenance depot before heading towards the existing expressway. As the proposed alignment travels towards the existing expressway, it will again enter Ogun State so as to allow for the free-flow interchange to be constructed at the existing Lagos-Ibadan expressway. The table 3.1 below presents a categorization of communities along the project corridor. The communities are further broken down into smaller communities/ areas/ settlements as described in this chapter.

Project Technical Features and Benefits

Project features are:

- Ramp Toll Plaza
- Two potential service areas with trailer park facilities
- Online sites that are located for controlled development
- Accommodation of local cyclists and pedestrians
- BRT Corridor along the route
- Additional pedestrian crossings along the route after Public Cow brings to Lagos State are nsultations
- Access to 3 major 'land developments' facilitated within the design
- River Bridges & Culverts at key locations
- Allowance for the project corridor to be increased to 6 lanes in the future

The corridor for the project generates 397,000 ADT (2019) and it is expected that the project will eventually carry up to 90% of that volume, when open.

Project benefits

The benefits the proposed 4MB project now brings to Lagos State are many. The east side of Lagos City will now have a relief highway which allows road users to navigate around the city

centre in accessing the Lekki area from the Lagos – Ibadan and Sagamu – Benin Expressways; which is one of the primary benefits. Other benefits include:

a) Swift access to Lekki, Lekki FTZ and Lekki Port,
b) Relieves pressure on 2nd and 3rd Mainland Bridges
c) Catalyst for growth east of Lagos City while opening up the Ikorodu area for growth,
d) Provides a 'spine'for other proposed highway projects to connect to, such as:
    - Regional Road Transportation Corridor
    - Lekki Lagoon Highway
    - Lagos – Abuja Direct Route Transportation Corridor
    - Ikorodu Lagoon Highway
e) Provides a strong socio-economic facility
f) Encourages the GDP growth within Lagos State
g) Contributes to the improvement of Liveability Index for the Mega City

In addition, the proposed 4MB project conveys economic benefits beyond the region in which it operates to the South West geo-political region and the wider Nigerian economy with direct economic benefits of the project through the generation of over 5,500 direct and indirect jobs. Provision of a safe and smooth travel ling for vehicles, alleviating traffic congestion and hence providing the benefits of reduced vehicle operating costs, reduced accidents, fuel saving and reduced carbon dioxide emissions.

This 4MB project is a catalyst for other major highway infrastructure project and will incorporate a new 'Eastern Relief Road for Lagos City' and an installation of 3 Interchanges at a future date which are:

- Future Lekki Lagoon Highway
- Future Ikorodu Lagoon Highway
- Future Lagos – Abuja Direct Route Transportation Corridor

It is equally designed to link the Coastal Road at Lekki thereby reducing travel time within the Lagos Island

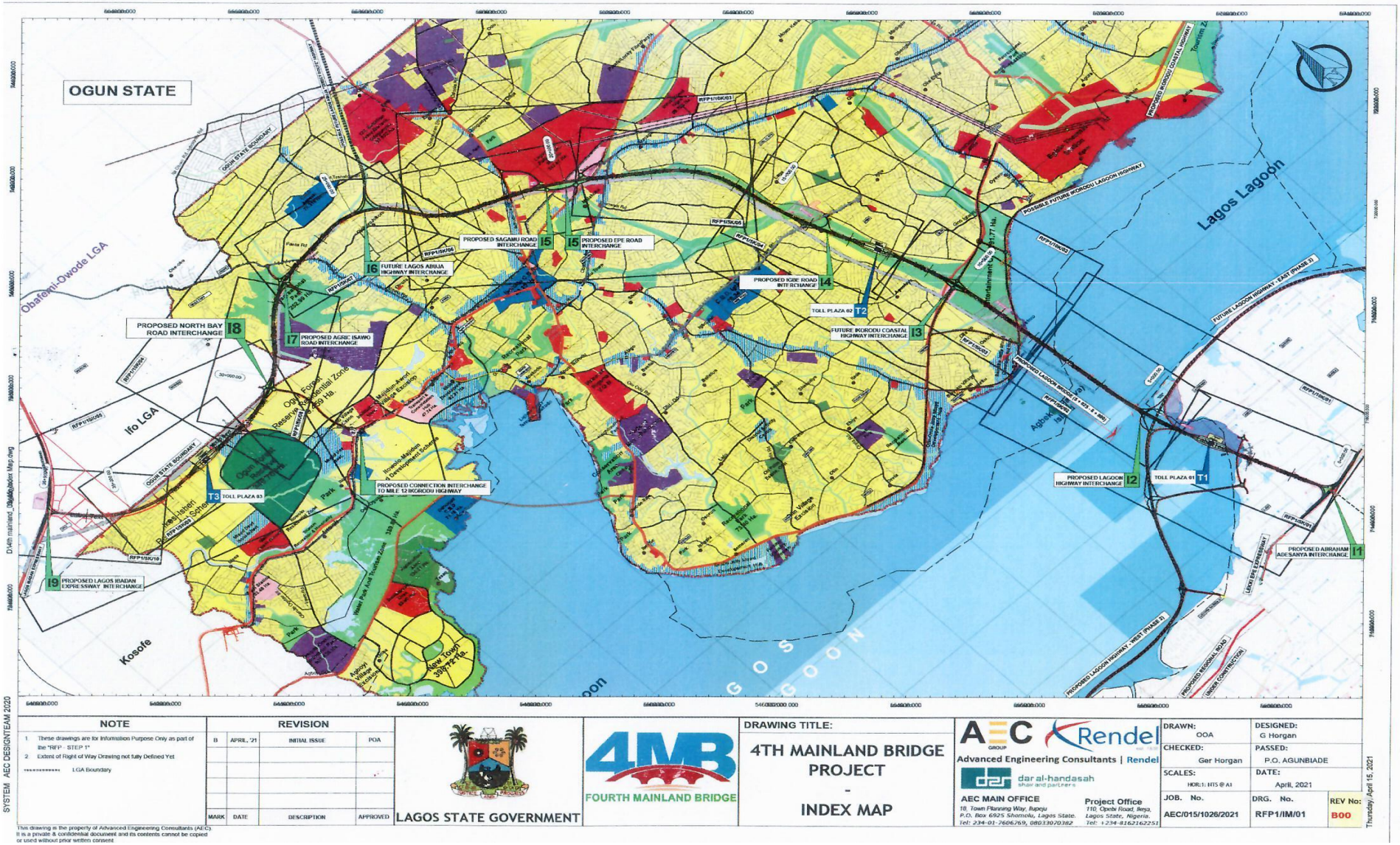


Figure 3.3: Location of the Proposed Development

Table 3.1: Grouping of Communities within the Corridor of Influence on the Preferred Emerging Horizontal Route Alignment for the 4MB Project

ZONES	COMMUNITIES			
Zone 1	Ado (Okera Nla)	10 Families	HFP	-
Zone 2	Powerline	Addo Road	Abraham Adesanya	-
Zone 3	Ayetoro (Bayeku)	Agunfoye (Igbogbo)	Igbogbo/Egbe	Elepe
Zone 4	Erunwe	Ita Maga	Lagos Poly	-
Zone 5	Banuso (Sagamu Road)	Eyita / Ojokoro	Agric Ishawo	Tapa
Zone 6	Mawere	Isheri (Lagos State)	OPIC (Ogun State)	Sparklight Estate (Ogun State)

3.3 Description of Project Area of Influence

OPIC MTR Boulevard: This is mainly a residential area with a tarred Road and good security. **Vegetation, Drainage and Waste Management:** This is a built-up area, therefore vegetation observed were on the other side of the MTR Boulevard estate fence (i.e an undeveloped fenced land beside the MTR estate). These include trees, shrubs and grasses. There are good drainage channels along the Road (however, the gutters were lined with vegetation) and waste was not observed along the streets. Hence, it can be deduced that proper waste management is in practice. See pictures below.

Plate 3.1: Vegetation and Drainage Channels in OPIC, MTR Boulevard

Redeemed Church, Isheri near OPIC MTR Boulevard: This area was accessed through MTR gardens, Isheri OPIC (after a straight drive, there was an untarred Road by the right). The church is located beside Sunoco Estate ILO and adjacent to Isheri River View Estate gate. **Vegetation** includes economic trees such as; Banana trees, coconut trees, grasses, etc. Land-use in this area is mainly residential.

Plate 3.2: Vegetation around Redeemed Church, Isheri

Waste management observed in the area was poor as waste heaps were seen around the area. **Drainage channel** observed were lined with vegetation and stagnant water was seen, which implies adverse health implications e.g. malaria from breeding of mosquitoes in such stagnant water.

Plate 3.3: Waste Disposal and Drainage Channel around Redeemed Church, Isheri

Isheri North GRA, Estate: It is a residential estate with developing sections as construction works were observed in the estate. **Olakunle Ismail** street with GPS coordinates; waypoint 427, 31N 0545374, UTM 0733871. Waste bins were observed in the area; however, waste was also littered on the grass. Drainage channel in the area was fair but terminates at a point (where there is undeveloped land).

Plate 3.4: Land-use, Drainage & Waste Management Observed in Isheri North GRA

Fatgbems Filling Station, Isheri: Fatgbems is a filling station located along Lagos- Ibadan expressway with supermarket and mechanic workshop. Vegetation observed was mainly grasses. Power generating plant was observed in the basement as an alternative source of energy in case of electrical failure.

Plate 3.5: Water Source, Waste Disposal & Vegetation in Fatgbems Filling Station

Plate 3.6: Power Generating Plant in Fatgbems Filling Station

Sparklight Estate: Sparklight Estate is opposite Fatgbems filling station (OPIC)**.** Land-use activities around the area includes car garage/ car wash, stalls, block moulding area, estate, sheds for fruit sellers, etc. Waste was observed in the drainage channels.

Plate 3.7: Land-use Activities around Sparklight Estate

Plate 3.8: Clogged Drainage Channels with Waste and Vegetation (Grasses) around Sparklight Estate

Mawere: Mawere is located close to Isawo, Ikorodu. It serves as a link between Isheri/ OPIC area and Ikorodu as it was accessed through Isheri but there is no accessible Road to Ikorodu at the time of this report.

Plate 3.9: Canal Lined with Vegetation and Waste Disposal Observed in Mawere Area.

Isheri Estate: It is a built-up area with mixed activities (residential and commercial). Waste management is organized as waste bins were observed.

Wawa: Poor waste management and drainage was observed in this area as seen in the pictures below. Land-use activities include; commercial stores, car wash, etc.

Plate 3.10: Picture Showing Activities in Wawa

Plate 3.11: Picture Showing Drainage and Waste Disposal in Wawa

Arepo: Activities include; provision shops, block moulding, school, etc.

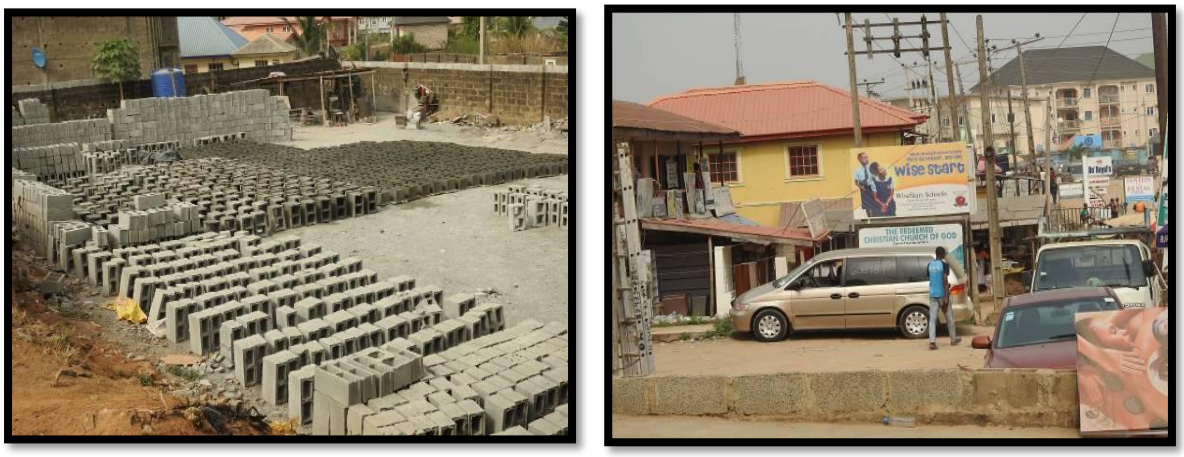


Plate 3.12: Activities around Wawa Community

Isawo Ikorodu: This project area is a busy area and Road construction activities are ongoing. It was observed that there is poor waste management and drainage system in this area as seen in pictures below.

Plate 3.13: Solid Wastes Burned/ Littered and Drainage In Isawo, Ikorodu

Agbede Road, off Isawo, Ikorodu: This is a busy area with mixed activities such as motorpark, shops, petrol station etc. A School was also observed with GPS: 468, 31N 0552704, UTM 0736016. Poor waste management was noticed.

Plate 3.14: Waste Disposal/ Drainage and Vegetation in Agbede, Ikorodu

Plate 3.15: Activities around Agbede Road, Ikorodu.

Kenneth Foma Street, Ikorodu: This area is located in Harmony community. It is a residential area with poor waste management practices and it is in a slopy terrain.

Plate 3.16: Waste Disposal / Vegetation and Drainage in Kenneth Foma Street

Ori-okuta: This is a residential area with good vegetation. The area has been adversely affected by erosion, which is visible in the topography. Livestock rearing was observed in this area as seen in the pictures below.

Plate 3.17: Vegetation and Livestock in Ori-Okuta

Plate 3.18: Waste Disposal and Drainage Facilities in Ori-Okuta

Tapa, Ikorodu: This area 'Tapa' consists on Tapa Island and Oke- Tapa. Activities within this area include; farming, poultry, welding shop, food shop etc. Vegetation includes Plantain trees, shrubs, grasses, etc.

Plate 3.19: Waste Disposal and Drainage Channel Affected by Erosion in Tapa, Island

Oke- Tapa, Ikorodu: This area is located at the other tapa, island. Waste disposal method observed is open dumping and this area is prone to erosion hence residents used sand bags as erosion control mechanisms as seen in pictures below.

Plate 3.20: Vegetation/ Waste Disposal Practice and Sandbags for Erosion Control in Oke-Tapa

Plate 3.21: Drainage Channels in Oke-tapa

Idowu Lafiaji: This is a residential area which is prone to erosion as observed by the topography and Sandbags were used by residents to curb the adverse effects of erosion.

Plate 3.22: Students Returning from School and Sandbags Used for Erosion Control in Idowu Lafiaji

Off Idowu Lafiaji: This area is along the express Road opposite Ayonnusi Estate. It is mainly a commercial area with some residential buildings. Activities include; Sawmill, houses, car wash, shops etc.

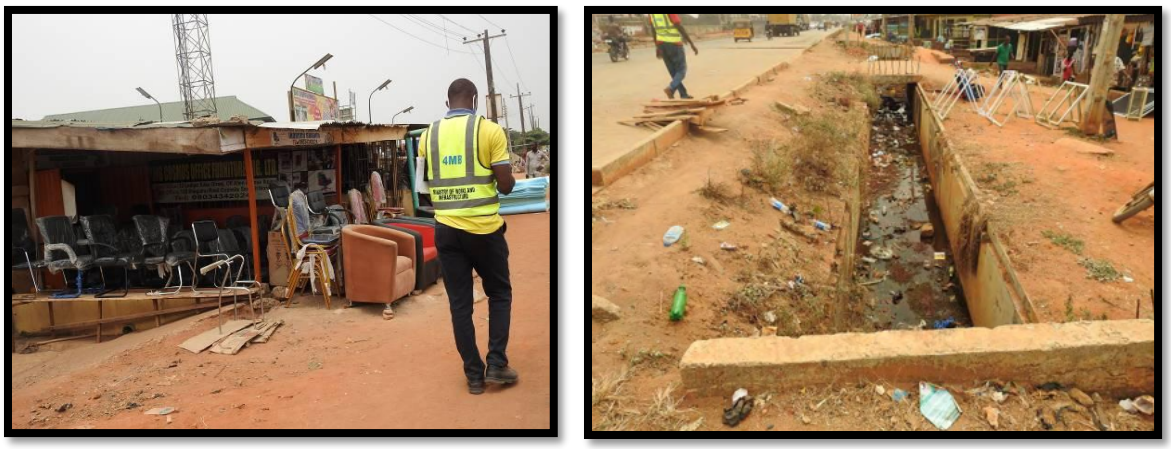


Plate 3.23: Activities and Drainage Channel in the Area

Oku Adebo: This is mainly a residential area. Organized waste collection bins were seen in the area. However, waste was still littered beside the Road, No drainage channels,

Plate 3.24: Waste Disposal and Drainage Facilities in Oku- Adebo

NNPC Itokin Road, Ikorodu: This area is opposite a sawmill. Around the project area activities such as petrol stations, sawmill, motor park, market etc. were observed. Wastes are littered in some areas and properly collected in other areas.

Plate 3.25: Waste Disposal Practices in Itokin

Plate 3.26: Activities in Itokin, Ikorodu

Ayetoro Community: This community is situated in Bayeku town along the banks of the lagoon. The major occupation of the people in this community is fishing. The houses are made of wood and the standard of living in this area is low, there isn't much development in this community. The Bayeku jetty is about 800m away from this community their major means of transportation is by cannon which they use for fishing. The proposed bridge alignment is about 300m away from the closest part of the community as the proposed alignment is to pass through the estuaries which is a marshy ground and cannot be accessed by foot.

Plate 3.27: Lagos Lagoon connecting Lekki to Ikorodu at Ayetoro community

Olumo Area (Gbogbo Community): This area is situated in the Gbogbo community where the proposed bridge alignment is said to pass through the marshy ground the level of impact in this area is low, this can be attributed to the proposed location in which the bridge is proposed to pass. This area is located not too far from the mashy ground causes of the soft ground and the presence of peat which was found in the soil during the time of sampling. The major land-use activities in this place are residential and farming. This area has a CDA, and many of the people in this area are traders and office workers.

Plate 3.28: Construction Site in Olumo Community

Plate 3.29: Sensitization of a Concerned Member of the Community

Ire (Gbogbo Community): This area is about 1Km from the Olumo area. The level of impact in this area will be low as there are few settlements along the project corridor. Few construction activities were sighted ongoing on the swampy ground which was sand filled, the area is covered with vegetation.

Plate 3.30: Vegetative cover in Ire Community

Elepe Laaga Community: This community has a few residential settlements; however, the major land-use activity is farming. The community has an extension which is occupied with residential houses and farmlands, but previously, this extension was used for farmland only. The community is ruled/ governed by the Baale.

Plate 3.31: Farm Land in Elepe Community

Plate 3.32: Residential House Sited within the Farmland in Elepe Community

Plate 3.33: House Construction site in Elepe Community

Plate 3.34: Integrated Farming in Elepe Community

Itamaga Community: The level of impact in this area is high as this is a completely built-up area with residential buildings, shops, eateries, sawmill etc. The area is known for its famous wood market, which has the proposed interchange. This place has a well-organized residential system with estates (Hilltop Estate), a mechanic workshop, stalls etc., which will be affected. In this case, the bridge alignment will be affecting lots of houses and business (Shops, Eateries, Sawmill and the wood market).

Plate 3.35: Wood Market at Itamaga

Lagos State Polytechnic: In line with the bridge alignment, it will be passing through certain areas in LASPOTECH but the proposed alignment has minimal impacts on some structures in the school.

Plate 3.36: Built Up Areas (Faculties/ lecture halls) in LASPOTECH

Along Shagamu Road: The proposed bridge alignment which will be passing through certain areas such as Apeke Estate, CAC Road and Davide Alaka Street, these areas are all built-up areas with buildings for both residential and commercial purpose and farmland (Banana farm, etc.). The level of impacts in this area will be high, cause lots of buildings will be affected. (David Alaka Street GPS: N 0556412 0734072, Titus Street GPS: N 0555733, 0734450). Titus street which is under the Apeke CDA.

Plate 3.37: Built Up Area and Plantain Plantation Farm at Titus Street

Plate 3.38: David Alaka Street

Eyita Ojokoro Area: The proposed bridge alignment is situated on an inhabited land which could be seen from Grace Avenue Street off Cele Agaye, Eyita Ojokoro. The land use activities in this area are mostly residential and farming.

Plate 3.39: Shops and Farmland at Grace Avenue, Eyita Ojokoro

3.4 Project Right-Of-Way

A width of 100m wide has been selected for the preferred emerging horizontal route alignment's Right of Way.

There are 4 main land parcels associated with the Right of Way for the project, as follows: a) Mainland - Area Required - 739.9 hectares b) Lekki - Area Required - 64.08 hectares c) Lagoon Reclamation - Area Required - 242.75 hectares (could possibly be reduced) d) Lagoon Bridge - Area Required in Lagoon – (5km long x 60m wide). In relation to main alignment footprint, the following is the status: a) Mainland length - 27.485km (74.31%) b) Lekki Length - 2.4km (6.50%) c) Lagoon Length - 7.1km (19.29%

3.5 Project Schedule and Cost

3.5.1 Project Schedule

The Project is expected to be completed in 3 years and six months from the time of commencement of Civil Works at an estimated cost of US$2.5 billion

CHAPTER FOUR: DESCRIPTION OF EXISTING ENVIRONMENT

4.1 Description of Project Environment and Social Baseline Studies

4.2 Introduction

This chapter defines the spatial boundaries and limits of the study area, usually referred to as Area of Potential Project Influence (APPI), including clearly defined buffer zones, in order to encompass all project direct and indirect impacts. The description and analysis of the physical, biological and human conditions shall address relevant environmental and social issues within this area, including any changes anticipated before project implementation.

Within the social environment, key issues that shall be considered include population characteristics and trends, revenue disparities, gender issues, health problems, prevalent economic activities, natural resource access and ownership, land use patterns and civil society organisation level. Community safety with respect to the infrastructural works and issues associated with Child labour, labour influx into communities. The EIA study will assess issues associated with Child labour, Gender Based Violence/ Sexual Exploitation.

4.2.1 Baseline Data Acquisition

Baseline Data Acquisition were conducted along the project corridor. Primary data were collected during field investigations and socio-economic survey.

The approach adopted includes the following:

- Review of existing literature on the proposed project corridor
- Reconnaissance survey
- Field samples collection
- Field analysis and sample preservation
- Laboratory / data analysis; and
- Result interpretation

4.2.2 Field Quality Assurance (QA) and Quality Control (QC)

During this field data gathering, quality assurance measures were applied and observed throughout the atmospheric condition assessment study. All the measuring instruments were maintained and calibrated in accordance with the QA/QC protocol for ambient air quality and noise monitoring of the Federal Ministry of Environment. Also, free flow of air was ascertained with the appropriate elevation to avoid obstruction during measurement. Similarly, vibration was avoided at every point of noise measurement. No measurement was taken without the field recommended calibration. Data from the analyzers were subjected to review and ratification process. The 24-hour averaging period concentrations of the measured parameters were carefully generated from the hourly averaging period concentrations measurements.

4.2.3 Laboratory Analysis

After the fieldwork exercise, study samples were collected and transported in ice chest coolers to Jawura Environmental Services Limited laboratory (accredited by NESREA and FMENV) located at 130 Obafemi Awolowo Way, Balogun Bus Stop Opp. Lagoon Hospital Ikeja, Lagos State, Nigeria for analyses in compliance with extant National Environmental Standards Regulations and Enforcement Agency (NESREA) regulatory requirements.

Field sampling and data collection were done in accordance with Federal Ministry of Environment, American Society of Testing of Materials (ASTM) and American Public Health Association (APHA). Sampling stations with their coordinates are presented in table 4.1 below.

4.2.4 Methods of Samples Preservation

Parameters that vary with time e.g. pH, DO and temperature were determined in-situ, while samples of more stable parameters were preserved (i.e. iced and acidified) to maintain their integrity prior to analysis in the laboratory. Preservatives were added as required in the specific test methods in order to avoid changes in chemical composition of the sample as a result of microbial degradation and inter-chemical reaction.

4.2.5 Quality Assurance/Quality Control (QA/QC)

Internationally accepted methodology such as those of APHA, ASTM, USEPA and others prescribed by the FMENV was used. QA/QC includes the regular calibration of field and laboratory instruments and equipment that were used for the ESIA. All apparatus, sample containers and glass wares were thoroughly cleaned using standard prescribed methods. Sample blanks and procedural blank were taken and analyzed for each set of samples.

Samples were well labeled and transported in ice cooled box so as to maintain their integrity prior to analysis. All data, both in-situ and ex-situ, were logged in appropriately. Also, the use of chain of custody for quality control.

4.3 Environmental Baseline

Environmental baseline conditions in the proposed project corridor were sampled. Ambient air quality, noise and microclimatic parameters monitoring was carried out in and around the proposed 4th Mainland Bridge corridor. Two season sampling was conducted to compare environmental conditions. Laboratory Analyses of the collected samples were conducted at Jawura Environmental Services Limited, a FMEnv and NEREA Accredited Environmental Laboratory at Obafemi Awolowo Way in Ikeja. This section presents the Wet and Dry season study, which investigates the atmospheric conditions of the area in support of Environmental and Social Impact Assessment (ESIA) of the project. Dry season sampling took place between Monday 22nd and Saturday 27th February, 2021 while the wet season sampling was between Monday 17th May and Saturday 22nd May 2021. Dry and wet season sampling Activities (Plate 4.1) took place at fifty (50) monitoring stations (Table 4.1) along the proposed project corridor.

The field data gathering exercise was executed using on-line monitors for all the investigated parameters as proposed for the study. Table 4.1 shows GPS coordinates of sampling points and Figure 4.1 presents sampling points on a map.

Table 4.1: Sampling Locations for Meteorology, Air Quality and Noise along the Proposed Project Site

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
1.	SP1	6.54048	3.5632	Ayetoro community	Monday 22-02-2021	13:36 – 14:36	Monday 17-05-2021	12:45 – 13:45
2.	SP2	6.54058	3.5641	Ayetoro extension		14:54 – 15:54		13:52 – 14:52

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
3.	SP3 (Control)	6.53972	3.5611	Ijede 2		16:01 – 17:01		15:11 – 16:11
4.	SP4 (Control)	6.54283	3.55646	Omolade street		17:21 – 18:21		16:20 – 17:20
5.	SP5 (Control)	6.55022	3.55389	Bayeku community		18:28 – 19:28		17:31 – 18:31
6.	SP6	6.5916	3.55388	Ijede Road		08:45 – 09:45		18:40 – 19:10
7.	SP7	6.58848	3.5553	Prosperity estate, Olumo igbogbo		09:53 – 10:53		19:18 – 19:48
8.	SP8	6.58562	3.55543	Igbogbo 2, Ikorodu		11:27 – 12:27		19:53 – 20:23
9.	SP9	6.58145	3.55472	Igbogbo 2, Ikorodu		12:43 – 13:43		20:31 – 21:01
10.	SP10 (Control)	6.58227	3.55257	Close to Lady Vet Poultry, Ikorodu	Tuesday 23-02-2021	13:59 – 14:59		06:58 – 07:58
11.	SP11	6.57953	3.55648	Iree 1		15:11 – 16:11		08:15 – 09:15
12.	SP12	6.5693	3.56028	Igbogbo/ Iree 2		16:33 – 17:33		09:26 – 10:26
13.	SP13 (Control)	6.55478	3.559	Bayeeku/Igbogbo		17:49 – 18:49		10:50 – 11:50
14.	SP14 (Control)	6.55699	3.54771	Igbogbo 2, Ikorodu		18:58 – 19:58		12:14 – 13:14
15.	SP15	6.58524	3.55999	Igbogbo 2, Ikorodu		07:41 – 08:41	Tuesday 18-05-2021	13:45 – 14:45
16.	SP16	6.57752	3.56106	Close to Lanre Akinade Avenue, Ire 1, Igbogbo, Ikorodu		08:54 – 09:54		15:04 – 16:04
17.	SP17 (Control)	6.59381	3.55905	Igbogbo 2, Ikorodu		10:17 – 11:17		16:22 – 17:22
18.	SP18	6.60245	3.55242	Close to Akintayo Eribake St, Ikorodu		11:49 – 12:49		17:38 – 18:38
19.	SP19	6.61128	3.55089	Erikorodu, Ikorodu	Wednesday 24-02-2021	13:17 – 14:17		18:56 – 19:56
20.	SP20	6.62388	3.54154	Igbogbo 2, Ikorodu		14:33 – 15:33		20:14 – 21:14
21.	SP21	6.62962	3.53251	Ita Maga		15:52 – 16:52		06:01 – 07:01
22.	SP22	6.63544	3.5242	LASPOTECH		17:13 – 18:13		07:24 – 08:24
23.	SP23	6.64005	3.51451	Opp sawmill okegbegun, Ikorodu		18:26 – 19:26	Wednesday 19-05-2021	08:36 – 09:36
24.	SP24	6.64297	3.50972	Olu Balogun Street, Ikorodu		19:35 – 20:35		09:50 – 10:50
25.	SP25	6.64989	3.49723	Olu Balogun Street, Ikorodu	Thursday 25-02-2021	07:22 – 08:22		11:01 – 12:01
26.	SP26	6.6568	3.49188	Socam church, Fomah St, Ikorodu		08:51 – 09:51		12:20 – 13:20

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
27.	SP27	6.65917	3.48452	Itokin Road, Nipco Station, Lagos		10:16 – 11:16		13:33 – 14:33
28.	SP28	6.66127	3.47142	Ipakodo, Ikorodu		11:35 – 12:35		14:42 – 15:42
29.	SP29	6.6591	3.46843	Ipakodo, Ikorodu		12:56 – 13:56		15:53 – 16:53
30.	SP30	6.65126	3.45779	Ipakodo, Ikorodu		14:13 – 15:13		17:13: 18:13
31.	SP31	6.64082	3.43156	Channels TV Ave, Lagos		15:24 – 16:24		18:25 – 19:25
32.	SP32	6.64057	3.42267	Channels TV Ave, Lagos		16:38 – 17:38		06:48 – 07:48
33.	SP33	6.64043	3.4148	Channels TV Ave, Lagos		17:47 – 18:47		08:01 – 09:01
34.	SP34	6.64026	3.40422	Isheri Olofin, Lagos		18:59 – 19:59		09:14 – 10:14
35.	SP35	6.64588	3.39958	Opposite Lonex Garden		20:04 – 21:04		10:36 – 11:36
36.	SP36	6.651542	3.393166	Isheri Oke		06:04 – 07:19		11:49 – 12:49
37.	SP37 (Control)	6.656883	3.401004	Isheri Oke		07:24 – 07:39	Thursday 20-05-2021	13:04 – 14:04
38.	SP38 (Control)	6.646938	3.380085	Ojodu Berger		07:42 – 07:57		14:16 – 15:16
39.	SP39	6.48971	3.57972	Ibeju, Eti-Osa, Lekki		08:15 – 08:30		15:47 – 16:47
40.	SP40 (Control)	6.491655	3.585961	2 Bello Olopo St, Lambasa, Lekki		08:34 – 09:34		16:02 – 17:02
41.	SP41	6.48932	3.57835	Lagos Lagoon		09:43 – 10:43		17:16 – 18:16
42.	SP42	6.47812	3.58157	12 Aguleri Dr, Aja, Lagos		10:52 – 11:52		18:34 – 19:34
43.	SP43	6.469844	3.585353	End of Abraham Adesanya bridge	Friday 26-02-2021	12:00 – 13:00		19:47 – 20:47
44.	SP44	6.46381	3.58533	OgonboRoad		13:10 – 14:10		06:34 – 07:34
45.	SP45 (Control)	6.47361	3.59933	Lekki - Epe Expy, Eti-Osa, Lagos		14:19 – 15:19		07:50 – 08:50
46.	SP46 (Control)	6.47609	3.58408	Eti-Osa, Lagos		15:40 – 16:40	Friday 21-05-2021	09:13 – 10:13
47.	SP47	6.5363	3.55132	Bayeiku Ferry Terminal		16:48 – 17:48		10:28 – 11:28
48.	SP48 (Control)	6.57057	3.57191	Igbe ogunro central mosque		18:00 – 19:00		11:40 – 12:40
49.	SP49	6.5319	3.55314	Lagos Lagoon		19:04 – 20:04		13:04 – 14:04
50.	SP50	6.49982	3.57014	Lagos Lagoon		20:10 – 21:10		14:20 – 15:20

Source: Sustainabiliti Limited Field Study, February and May 2021

Figure 4.1: Monitored Stations during the Fieldwork

(a) Air Quality Sampling for Dry Season – February 2021

(b) Air Quality Sampling for Wet Season – May 2021

Plate 4.1: Dry and wet season samling Activities during the Fieldwork

4.3.1 Climate and Meteorological Parameters

Lagos is located at Latitude 6.4°N and Longitude 3.4°E lying on an average elevation of 15m asl, a tropical climate with distinct dry and wet seasons classified according to Köppen climate classification. Lagos has a short dry season between November and February with a lengthy wet season which runs from March through October. The climate of Lagos is predominantly influenced by its situation adjacent to the Atlantic Ocean with susceptibility to prevailing maritime weather conditions.

The Lagos lagoon which also has huge hydrological effects on the regional climate is the largest of the three Lagoon systems occurring in the Lagos area, receiving over 80% of the land-derived run-offs laden with various types of wastes. It lies within longitudes 6°25" and 6°43" and latitudes 3°22" and 3°40". During the rainy season, the lagoon is fed by the numerous coastal rivers draining into it while during the dry season, the loss of water due to evaporation and the reduced amount of water from the rivers and creeks is compensated for by the underground seepage under the active sandy barrier formation and inflow of the tidal waters from the sea through the Lagos harbor and other lagoon outlets.

A summary climatic chart for Lagos is presented in Figure 4.2.

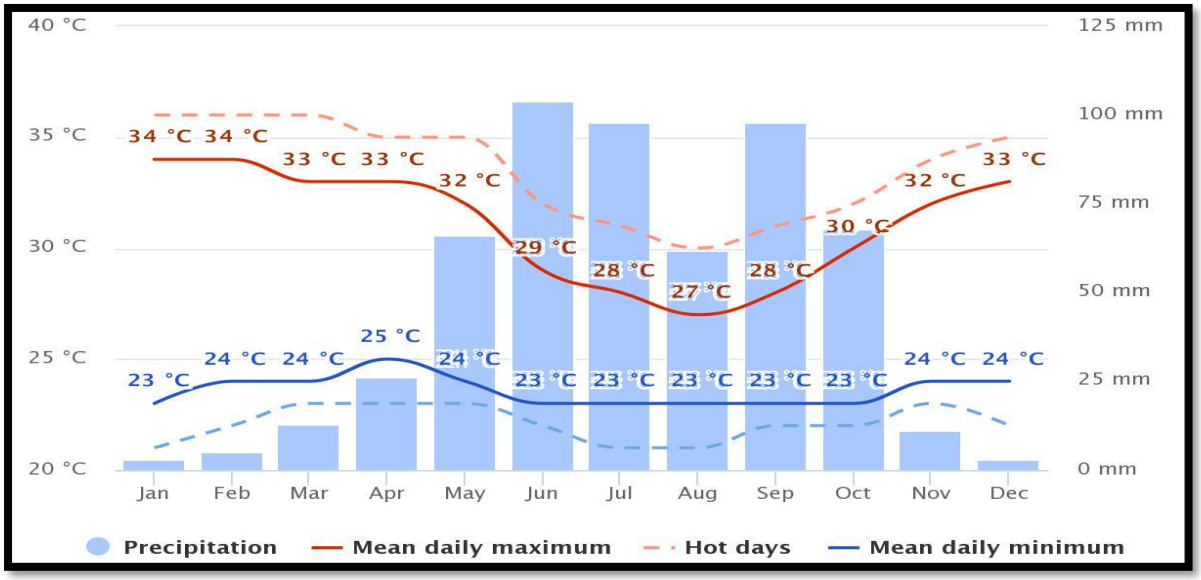


Figure 4.2: Summary of Rainfall and Temperature over Lagos (1987 – 2020)

The summary climatology of Lagos as presented in the figure above, shows the long term mean precipitation (rainfall) as well as the average monthly temperature including the mean daily maximum and minimum with indicated hot days and cold nights.

Rainfall: As presented in Table 4.2, the proposed project area experiences rain every month of the year. Its rainy season (April – October) mean monthly rainfall levels are 104.4 – 288.4 mm with the minimum in August and maximum in June. In the dry season, mean monthly rainfall levels are 12.7 – 81.5 mm with the minimum and maximum in January and March respectively. The mean monthly numbers of rainy days are 8 – 16 days during the raining season but 1 – 5 days per month in the dry season.

Relative Humidity: The mean monthly Relative Humidity in the area is 77 - 87% with the minimum in February and the maximum between June and September (Table 4.2). During the

dry season fieldwork, the measured relative humidity levels were 17.8 – 94.6% but 62.2 – 98.6% in the wet season which agree with the climatic data as presented in Table 4.3.

Air Temperature: Air temperature in Lagos hosting the proposed project is 22.5 – 33.7 °C (Table 4.2) with the minimum in August (the rainy season) and the maximum in February (peak of the dry season). These agree with the measured air temperature of 24.2 – 35.1 ºC obtained during the dry season fieldwork and 21.6 – 31.1 °C recorded during the wet season fieldwork (Table 4.3).

Atmospheric Pressure: The mean atmospheric pressure from the climatic data is 1015 – 1020 mbar with the minimum and maximum in January and June respectively (Table 4.2). During the fieldwork, atmospheric pressure was measured to be 1007.1 – 1019.4 mbar in the dry season but 1011.1 – 1013.6 mbar in the wet season (Table 4.3). These are also within the climatic data.

Table 4.2: Climatic Parameters on the Study Area (NIMET, 2021)

Month	Air Temp (° C)		Rainfall (mm)			Number of Rain Days			Relative Humidity (%)			Pressure (mbar)			Cloud Cover (Oktas)		
	T_{min}	T_{max}	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Jan	23.1	32.6	0.0	53.4	12.7	0	4	2	41	90	78	1009	1031	1015	5.4	7.1	6.7
Feb	24.2	33.7	0.0	188.5	38.7	0	6	2	58	86	77	1009	1032	1017	5.4	7.3	6.7
Mar	24.7	33.2	5.8	308.1	81.5	0	12	5	74	85	79	1005	1033	1016	3.8	7.0	6.7
Apr	24.4	32.5	26.4	336.3	135.8	1	17	9	76	84	80	1008	1033	1016	4.6	7.0	6.7
May	23.7	31.2	88.6	353.8	196.3	3	22	12	79	88	83	1010	1032	1018	6.1	7.0	6.8
Jun	23.1	29.7	69.5	619.5	288.4	2	23	16	84	90	87	1011	1031	1020	5.9	7.1	6.8
Jul	22.7	28.5	18.5	567	194.5	1	25	13	77	90	87	1012	1031	1018	6.4	7.3	6.9
Aug	22.5	28.4	3.9	419.1	104.4	2	16	8	81	89	86	1008	1031	1018	6.3	7.1	6.9
Sep	22.7	29.3	22.9	436.6	185.2	3	24	13	83	90	87	1011	1032	1018	6.2	7.3	6.9
Oct	23.0	30.5	37.3	342.7	155.4	1	22	11	81	88	85	1010	1033	1019	6.3	7.0	6.8
Nov	23.5	31.9	1.2	240.6	78.6	0	11	4	74	86	82	1010	1033	1018	6.1	7.0	6.7
Dec	23.1	32.5	0.0	87.7	25.4	0	6	1	65	88	81	1010	1032	1018	3.9	7.0	6.7

Table 4.3: Field Measured Meteorological Parameters in the Proposed Project Area during this Study

Season	**Level**	**Air Temperature (°C)**	**Relative Humidity (%)**	**Atmospheric Pressure (mbar)**	**Wind**	
					Speed	**Direction**
Dry	Minimum	24.2	17.8	1007.1	0.8	SW
	Maximum	35.1	94.6	1019.4	1.7	NE
	Mean	29.1	76.2	1011.5	1.2	NE
Wet	Minimum	21.6	62.2	1011.1	3.1	SW
	Maximum	31.1	98.6	1013.6	3.9	SSW
	Mean	27.3	88.8	1012.2	3.4	SSW

Cloud cover: In the project area, cloud cover is generally high throughout the year with very little variations. It is higher in May and October and lowest in June and July with average of 6.7 – 6.9 Oktas (Table 4.2), indicating overcast sky with blue patches.

Wind Speed and Direction: Surface wind speed is 0.5 – 7.7 m/s with an average of 3.6 m/s (Table 4.3) and prevailing southwest direction (Figure 4.2). The measured wind speed of 0.8 – 1.7 m/s during the dry season fieldwork with northeast prevailing direction and 3.1 – 3.9 m/s

with south-southwest prevailing direction in the wet season (Figure 4.4) also agree with the climatic data.

Sunshine Pattern: The annual sunshine period in the study area is about 1500 hours with monthly period of 51.2 – 165.7 hrs (Figure 4.4). It receives the minimum period in July - September but the maximum in December - January. The short period in July could be due to the greater cloudiness and rainfall characteristic of the period. Conversely, the higher December sunshine period is due to the prevalent clear skies accompanying the ITCZ movement in its northward migration.

Table 4.4: Monthly Wind Speed Variation in the Study Area (NIMET, 2021)

Month	Wind Speed (m/s)		
	Minimum	Maximum	Mean
January	0.1	5.7	3.0
February	0.1	6.2	4.0
March	1.5	7.2	4.5
April	0.5	7.2	4.0
May	0.1	6.7	3.9
June	0.1	6.7	3.4
July	0.1	7.7	3.8
August	0.1	7.7	4.2
September	0.1	7.7	3.8
October	0.1	5.7	3.0
November	0.1	5.7	2.7
December	0.1	6.7	2.9

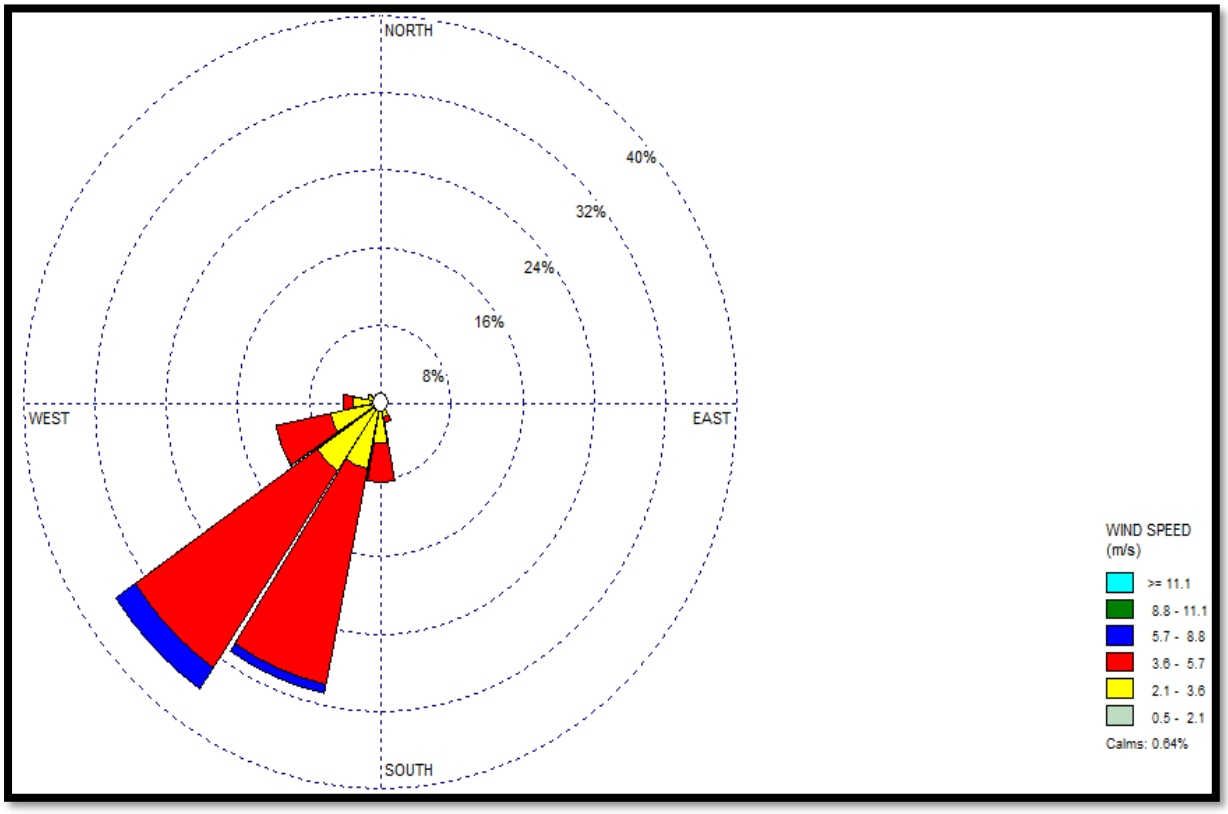
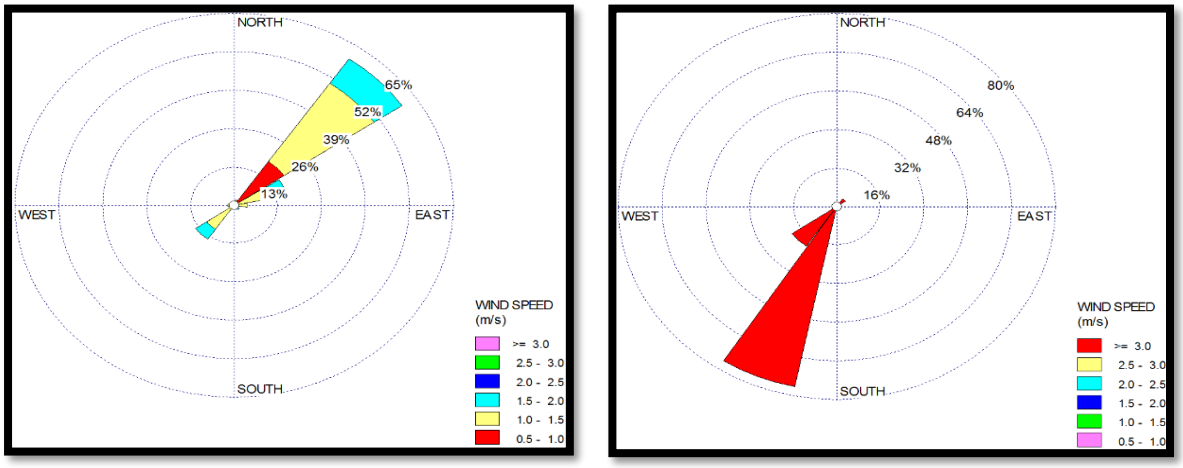


Figure 4.3: Windrose of the Proposed Project Area (NIMET, 2021)



(a) Dry Season *(b) Wet Season*

Figure 4.4: Observed Windrose in the Project Area during the Fieldwork

Potential Impact Assessment: There is no potential impact envisaged and as such the risk to climate is ranked negligible.

Mitigation: Since there is no identifiable impact the mitigation need is not significant. Albeit, since the site is in the fringe of an urban canopy, attenuating factors such as climate change adaptation and mitigation techniques may be relevant.

4.3.2 Air Quality

The mean measured gaseous pollutants obtained during the fieldwork in the ambient environment of the project including CO, NO, NO_2, SO_2, NH_3, H_2S, O_3, CH_4 and VOCs are as summarized in Table 4.5. Though nine (9) gaseous pollutants were monitored, CH_4 was not detected in any of the sampling locations while VOCs were 0.01 – 0.26 ppm in the dry season and 0.02 – 0.12 ppm in the wet season. In the dry season, CO concentrations were 1.0 – 12.30 ppm but 0.60 – 10.20 in the wet season with SO2 levels of 0.02 – 0.14 ppm and 0.02 – 0.04 ppm in the dry and wet seasons respectively. Both NO and NO2 were 0.02 – 0.25 ppm and 0.01 – 0.06 ppm respectively in the dry season but 0.01 – 0.08 ppm and 0.02 – 0.15 ppm in the wet season. The dry season measured NH_3 was 0.03 – 1.40 ppm but 0.01 – 0.09 ppm in the wet season while H_2S was 0.20 ppm and 0.01 – 0.08 ppm in the dry and wet seasons respectively. Both the dry and wet seasons measured O_3 concentrations were respectively 0.02 – 0.10 ppm and 0.01 – 0.04 ppm.

The 24-hour averaging period equivalents of the measured $PM_{2.5}$ is 1.8 – 25.4 $\mu g/m^3$ in the dry season but 25.4 $\mu g/m^3$ in the wet season (Table 4.5), while the 24-hour equivalent of the measured PM_{10} is 25.1 – 326.6 $\mu g/m^3$ in the dry season it is 8.7 – 1094.6 $\mu g/m^3$ in the wet season. In the dry and wet seasons, the TSP equivalents are 28.6 – 448.8 $\mu g/m^3$ and 10.0 – 1398.5 $\mu g/m^3$ respectively.

As presented in Figure 4.6, the monitored gaseous pollutants were detected in 2 - 58% of the sampling locations in the study area during the dry season but in 8 - 22% of the locations in the wet season. However, CH_4 was not detected in any of the locations in the two seasons while particulates were detected in all during the study. Detection of air pollutants in more of the sampling locations in the dry season than in the wet season could be attributed to "rain

washout" effect associated with the wet season. This effect reduces the concentrations of air pollutants in the atmosphere.

During the study, particulates concentrations were higher in the dry season than wet season in most sampling locations (Figure 4.6). Similarly, gaseous concentrations in the dry season were higher in more sampling locations than in the wet season except for NH_3 and H_2S as presented in Figure 4.6. Lower concentrations of some gases in the dry season than the wet season could also be attributed to "rain washout" effect associated with the wet season as earlier observed. Higher NH_3 and H_2S in the wet season than the dry season could be attributed to decomposition of nitrogen and sulphide-containing vegetation in the wet season than in the dry season. This induces emissions of NH_3 and H_2S into the atmosphere.

As reported in Table 4.5, the FMEnv's 1-hour 0.10 ppm limit of ambient SO_2 and the WBG 1-hour 0.11 ppm limit of ambient NO were breached once each in the dry season while all the other detected gaseous pollutants were within their respective limits in all the sampling locations. In the wet season, none of the 1-hour averaging period limits was breached by the monitored gaseous pollutants while the 0.01 ppm 24-hour FMEnv's limit for SO_2 was breached times in the dry season, the limit was breached in five times in the wet seasons (Figure 4.6). Also, 0.04 ppm 24-hour limit for NO was breached three times in the dry season but once during the wet season while the 0.28 ppm 24-hour limit of NH_3 and 0.01 ppm 24-hour limit for H_2S were breached once each in the dry season. H_2S limit was breached five times during the wet season.

The 1-hour TSP limit of 600 µg/m^3 FMEnv limit was breached twice in the dry season but six times during the wet season (Table 4.7) while the $PM_{2.5}$ limit of 25 µg/m^3 was breached once in the dry season and five times in the wet season (Figure 4.7). Also, PM_{10} limit of 80 µg/m^3 was breached fifteen times in the dry season but twelve times in the wet season. The TSP limit of 250 µg/m^3 was breached twice and seven times in the dry and wet seasons respectively.

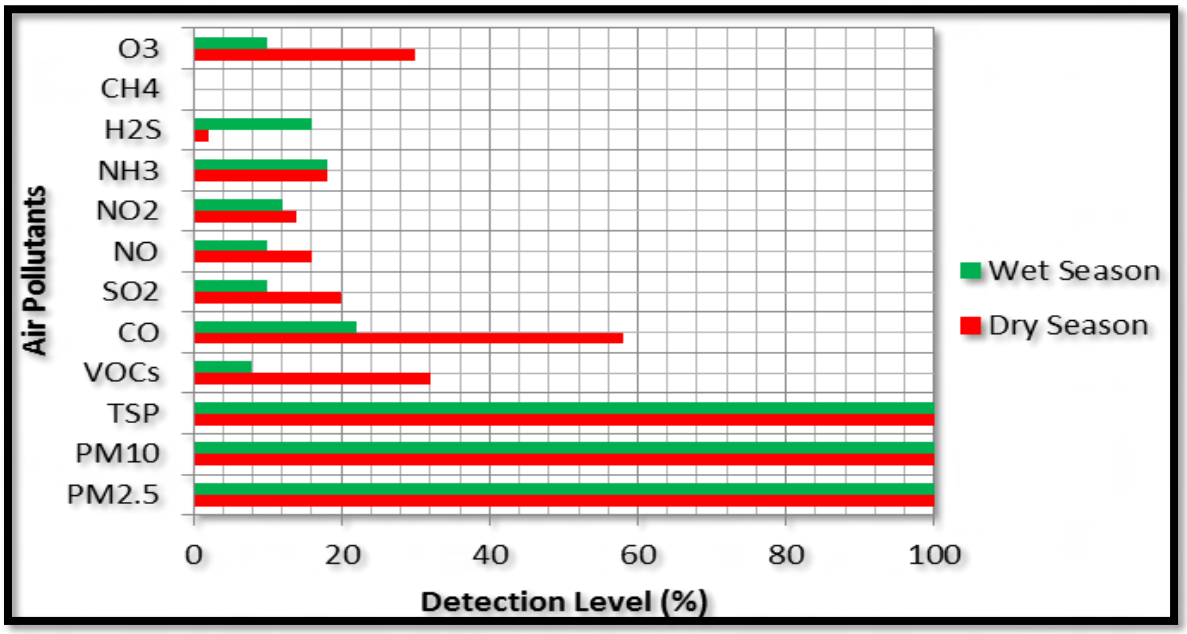


Figure 4.5: Air Pollutants Presence in the Proposed Project Area during the Study

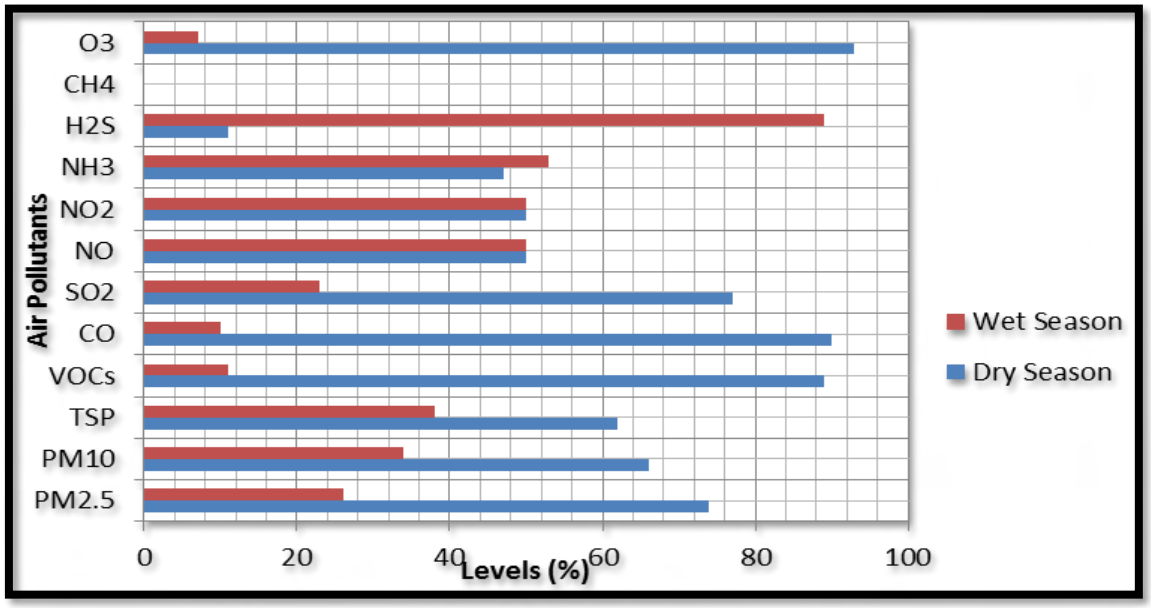


Figure 4.6: Air Pollutants Detection Levels in the Proposed Project Area during the Study

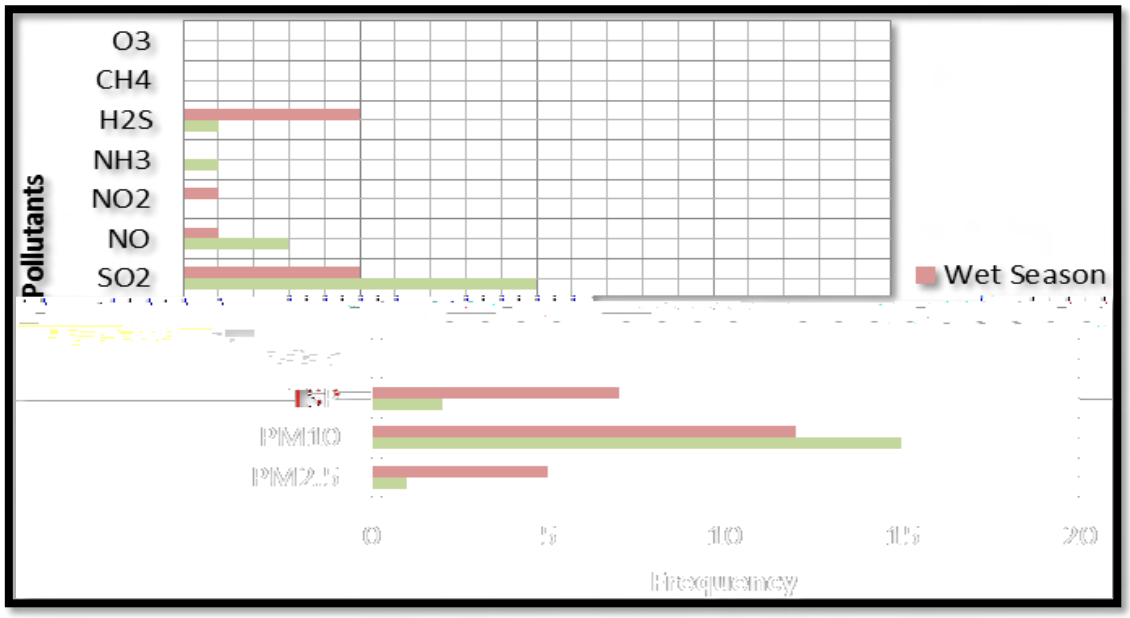


Figure 4.7: Frequency of 24-Hour Limit Exceedance by Air Pollutants during the Study

Being by-products of fuel combustion, CO, SO_2, NO and NO_2 sources along the corridor in the proposed project area include fossil fuel burning in electric power generators, cooking appliances (e.g. gas cooker and kerosene stove), biomass burning cooking appliances (e.g. firewood and charcoal stoves) and refuse handling via open burning in commercial places. However, their main source is vehicular emission as a result of the fuel combustion. These air pollutants have health implications and adverse effects on the environment. Their present levels indicate some levels of degradation in the airshed of the proposed project corridor due to some of the identified sources.

Though not conventional air pollutants, VOCs are toxics emitted as gases and may include a variety of chemicals, some of which may have short- and long-term adverse health effects. Their release depends on the products handled in the environment. If a by-product of

combustion of fuels, VOCs sources along proposed 4th Mainland Bridge corridor may include fuel evaporation in vehicles and filling stations. Others may include insecticides, air freshener, cooking gas, paints and lacquers, and furnishings. Their health effects are eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. If good vehicle maintenance habit is encouraged along the bridge in the life of the proposed project, the VOCs levels can be accommodated by the host airshed.

Ground level O_3 is formed in the atmosphere by chemical reactions between NOx and VOCs in the presence of sunlight. Fuel evaporation identified as source of VOCs and vehicular emissions identified as source of NO_X may be responsible for the detected O_3 during this study. Breathing O_3 in the ambient environment may trigger health challenges in some classes of people. The presence of H_2S and NH_3 in the area could be attributed to decomposition of sulphide and nitrogen vegetation aided by the presence of moisture in the atmosphere especially in the wet season. Atmospheric particles are dispersed materials that may include solid, oil, and water droplets, among others. In the study area, detected particulates could be from dust re-suspension, vehicular emissions and domestic/commercial activities involving combustion.

Table 4.5: Mean Measured 1-Hour Gaseous Pollutants during the Dry and Wet Season Study in and around the Proposed Project Site

Monitoring Station	**Concentrations (ppm)**																	
	VOCs		**CO**		**SO_2**		**NO**		**NO_2**		**NH_3**		**H_2S**		**CH_4**		**O_3**	
	Dry	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**	**Dry**	**Wet**
SP1	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.06	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.06	0.04
SP2	0.0	0.0	0.0	1.0	0.04	0.02	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP3	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP4	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.01	0.0	0.0	0.02	0.0
SP5	0.03	0.0	3.7	0.0	0.02	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP9	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
SP10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP12	0.02	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP13	0.03	0.0	2.1	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.08	0.0	0.0	0.0	0.0
SP14	0.01	0.0	2.3	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP18	0.02	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.06	0.0
SP19	0.0	0.0	1.2	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.15	0.0	0.0	0.04	0.0	0.0	0.09	0.02
SP20	0.0	0.0	2.0	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.17	0.0	0.20	0.0	0.0	0.0	0.0	0.0
SP21	0.21	0.0	12.3	4.4	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.09	0.0	0.0	0.0	0.0	0.10	0.0
SP22	0.20	0.0	8.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP23	0.0	0.0	2.1	0.0	0.07	0.0	0.0	0.0	0.0	0.0	0.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP24	0.15	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP29	0.18	0.0	4.0	3.2	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.02
SP30	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.01	0.0	0.0	0.0	0.0
SP31	0.0	0.0	2.8	0.0	0.14	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP32	0.05	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP33	0.0	0.0	1.1	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP34	0.12	0.0	2.5	1.0	0.0	0.03	0.0	0.02	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.0
SP35	0.0	0.0	1.7	1.5	0.07	0.04	0.0	0.02	0.0	0.06	0.0	0.06	0.0	0.02	0.0	0.0	0.0	0.0
SP36	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.02	0.0
SP37	0.0	0.0	8.0	0.0	0.0	0.0	0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP38	0.13	0.04	6.0	1.4	0.0	0.0	0.02	0.08	0.01	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.04	0.01
SP39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP43	0.19	0.0	12.2	0.9	0.0	0.03	0.03	0.03	0.01	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0
SP44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP45	0.16	0.0	7.4	4.3	0.0	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP46	0.0	0.12	1.3	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.04	0.0	0.0	0.04	0.0
SP47	0.10	0.0	1.1	1.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.04	0.0	0.05	0.0	0.0	0.02	0.02
SP48	0.0	0.05	1.0	0.0	0.0	0.0	0.0	0.01	0.0	0.02	0.0	0.04	0.0	0.01	0.0	0.0	0.0	0.0
SP49	0.26	0.02	1.8	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean	**0.12**	**0.06**	**3.64**	**2.68**	**0.06**	**0.03**	**0.07**	**0.03**	**0.02**	**0.06**	**0.29**	**0.04**	**0.20**	**0.03**	**0.0**	**0.0**	**0.06**	**0.02**
SD	**0.08**	**0.04**	**3.13**	**2.85**	**0.04**	**0.01**	**0.08**	**0.03**	**0.02**	**0.05**	**0.42**	**0.02**	**0.0**	**0.02**	**0.0**	**0.0**	**0.03**	**0.01**
FMEnv Limit	-		**20.0 (0)**	**20.0 (0)**	**0.10 (1)**	**0.10 (0)**	-	-	-	-	-	-	-	-	-	-	-	-
WBG Limit	-		-	-	-		**0.11 (0)**	-	-	-	-	-	-	-	-	-	-	-

Frequency of limit exceedance in parenthesis
Source: Sustainabiliti Field Work, 2021

Table 4.6: Extrapolated 24-Hour Equivalents of the Measured Gaseous Pollutants during the Dry and Wet Seasons Study in and around the Proposed Project Site

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP1	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.02
SP2	0.00	0.00	0.00	0.51	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP3	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP4	0.00	0.00	1.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.01	0.00
SP5	0.02	0.00	1.90	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP9	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
SP10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP12	0.01	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP13	0.02	0.00	1.08	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.00	0.00	0.00	0.00
SP14	0.01	0.00	1.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP18	0.01	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.03	0.00
SP19	0.00	0.00	0.62	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.02	0.00	0.00	0.05	0.01
SP20	0.00	0.00	1.03	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.09	0.00	0.10	0.00	0.00	0.00	0.00	0.00
SP21	0.11	0.00	6.31	2.26	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.00
SP22	0.10	0.00	4.10	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP23	0.00	0.00	1.08	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP24	0.08	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP29	0.09	0.00	2.05	1.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01
SP30	0.00	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
SP31	0.00	0.00	1.44	0.00	0.07	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP32	0.03	0.00	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP33	0.00	0.00	0.56	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP34	0.06	0.00	1.28	0.51	0.00	0.02	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
SP35	0.00	0.00	0.87	0.77	0.04	0.02	0.00	0.01	0.00	0.03	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00
SP36	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.00
SP37	0.00	0.00	4.10	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP38	0.07	0.02	3.08	0.72	0.00	0.00	0.01	0.04	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.02	0.01
SP39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP43	0.10	0.00	6.26	0.46	0.00	0.02	0.02	0.02	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
SP44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP45	0.08	0.00	3.80	2.21	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP46	0.00	0.06	0.67	5.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.02	0.00
SP47	0.05	0.00	0.56	0.51	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00	0.03	0.00	0.00	0.01	0.01
SP48	0.00	0.03	0.51	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00
SP49	0.13	0.01	0.92	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Mean	0.06	0.03	1.87	1.38	0.03	0.01	0.04	0.02	0.01	0.03	0.15	0.02	0.10	0.02	0.0	0.0	0.03	0.01
SD	0.04	0.02	1.61	1.46	0.02	0.00	0.04	0.01	0.01	0.02	0.22	0.01	0.0	0.01	0.0	0.0	0.02	0.01
FMEnv Limit			10 (0)	10 (0)	0.01 (10)	0.01 (5)	0.04 (3)	0.04 (1)	0.04 (0)	0.04 (1)	0.28 (1)	0.28 (0)	0.01 (1)	0.01 (5)	-	-	0.10 (0)	0.10 (0)

Frequency of limit exceedance in parenthesis

Source: Sustainabiliti Field work, 2021

Table 4.7: Mean Measured 1-Hour Suspended Particulates Matter during the Wet and Dry Seasons Study

Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	32.8	6.1	217.6	18.0	241.1	21.0
SP2	33.2	9.4	222.7	35.5	246.9	61.4
SP3	31.9	7.5	233.5	35.2	260.5	76.5
SP4	19.2	7.8	162.8	33.5	252.0	47.0
SP5	23.4	7.0	136.8	35.8	149.3	48.2
SP6	38.9	4.7	636.6	40.6	874.7	67.1
SP7	25.1	7.1	177.2	23.9	198.4	25.1
SP8	25.6	5.7	162.4	22.8	178.8	27.1
SP9	27.5	5.4	172.7	28.3	191.4	32.6
SP10	25.1	4.9	90.0	17.0	97.8	19.5
SP11	28.0	4.8	83.2	18.4	96.4	23.4
SP12	22.6	5.2	73.4	23.5	77.9	24.1
SP13	25.1	5.4	160.2	23.7	183.4	26.8
SP14	25.2	5.0	135.9	23.6	146.7	35.9
SP15	20.2	6.1	119.1	27.6	130.7	28.9
SP16	21.1	5.3	144.6	77.4	172.7	106.4
SP17	21.5	8.8	134.6	79.6	148.4	121.5
SP18	22.4	5.3	136.8	22.9	154.2	26.6
SP19	3.6	7.4	49.0	54.7	65.1	67.6
SP20	21.1	4.3	146.9	37.5	164.8	47.4
SP21	22.6	5.2	142.8	48.6	164.9	83.1
SP22	21.7	15.1	109.0	123.9	119.9	167.0
SP23	25.0	15.7	168.1	113.0	208.4	160.0
SP24	20.8	5.9	135.3	245.6	153.0	521.1
SP25	20.7	7.0	117.5	111.9	135.6	143.9
SP26	18.9	9.7	113.3	74.0	127.6	91.2
SP27	18.4	48.2	124.2	2133.6	149.6	2725.9
SP28	49.5	17.6	268.8	307.5	321.5	434.4
SP29	18.4	11.9	130.9	63.5	151.2	73.9
SP30	17.7	9.3	114.1	38.8	135.0	54.8
SP31	17.8	15.5	101.2	52.9	111.8	63.4
SP32	17.7	12.3	74.3	41.6	77.4	47.2
SP33	18.5	131.5	95.9	231.5	108.0	262.3
SP34	19.1	20.2	92.9	106.3	102.3	129.3
SP35	18.2	34.9	99.2	288.7	111.2	347.3
SP36	18.7	20.3	97.3	181.5	106.9	267.1

Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP37	26.5	44.9	167.3	515.7	189.1	650.7
SP38	25.6	49.3	162.4	122.7	178.8	147.3
SP39	17.6	9.8	54.2	77.0	55.8	91.7
SP40	15.3	3.8	54.3	140.8	57.4	225.5
SP41	18.6	12.1	67.9	318.2	72.7	425.5
SP42	26.0	2.3	93.0	469.2	104.6	600.5
SP43	14.1	16.7	527.0	80.9	710.0	130.9
SP44	13.1	20.0	65.9	63.2	82.9	86.0
SP45	15.4	-	155.4	-	204.7	-
SP46	13.9	-	66.5	-	76.7	-
SP47	23.0	103.9	100.3	676.3	104.3	765.0
SP48	20.8	94.5	135.3	566.7	153.0	638.2
SP49	18.9	125.6	113.3	886.0	127.6	992.0
SP50	25.1	-	177.2	-	198.4	-
Mean	**22.2**	**21.0**	**146.4**	**186.4**	**172.6**	**239.6**
SD	**7.0**	**31.0**	**102.1**	**347.2**	**140.9**	**434.4**
FMEnv Limit					**600 (2)**	**600 (6)**
WBG Limit	**-**	**-**	**-**	**-**	**-**	**-**

Frequency of limit exceedance in parenthesis

Table 4.8: Extrapolated 24-Hour Equivalents of the Measured Suspended Particulates for Dry and Wet Seasons.

Monitoring Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	16.8	3.1	111.6	9.2	123.7	10.8
SP2	17.0	4.8	114.3	18.2	126.7	31.5
SP3	16.4	3.8	119.8	18.1	133.6	39.2
SP4	9.9	4.0	83.5	17.2	129.3	24.1
SP5	12.0	3.6	70.2	18.4	76.6	24.7
SP6	20.0	2.4	326.6	20.8	448.8	34.4
SP7	12.9	3.6	90.9	12.3	101.8	12.9
SP8	13.1	2.9	83.3	11.7	91.7	13.9
SP9	14.1	2.8	88.6	14.5	98.2	16.7
SP10	12.9	2.5	46.2	8.7	50.2	10.0
SP11	14.4	2.5	42.7	9.4	49.5	12.0
SP12	11.6	2.7	37.7	12.1	40.0	12.4
SP13	12.9	2.8	82.2	12.2	94.1	13.7
SP14	12.9	2.6	69.7	12.1	75.3	18.4
SP15	10.4	3.1	61.1	14.2	67.1	14.8
SP16	10.8	2.7	74.2	39.7	88.6	54.6
SP17	11.0	4.5	69.1	40.8	76.1	62.3
SP18	11.5	2.7	70.2	11.7	79.1	13.6
SP19	1.8	3.8	25.1	28.1	33.4	34.7
SP20	10.8	2.2	75.4	19.2	84.5	24.3
SP21	11.6	2.7	73.3	24.9	84.6	42.6
SP22	11.1	7.7	55.9	63.6	61.5	85.7
SP23	12.8	8.1	86.2	58.0	106.9	82.1

Monitoring Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP24	10.7	3.0	69.4	126.0	78.5	267.3
SP25	10.6	3.6	60.3	57.4	69.6	73.8
SP26	9.7	5.0	58.1	38.0	65.5	46.8
SP27	9.4	24.7	63.7	1094.6	76.8	1398.5
SP28	25.4	9.0	137.9	157.8	164.9	222.9
SP29	9.4	6.1	67.2	32.6	77.6	37.9
SP30	9.1	4.8	58.5	19.9	69.3	28.1
SP31	9.1	8.0	51.9	27.1	57.4	32.5
SP32	9.1	6.3	38.1	21.3	39.7	24.2
SP33	9.5	67.5	49.2	118.8	55.4	134.6
SP34	9.8	10.4	47.7	54.5	52.5	66.3
SP35	9.3	17.9	50.9	148.1	57.1	178.2
SP36	9.6	10.4	49.9	93.1	54.8	137.0
SP37	13.6	23.0	85.8	264.6	97.0	333.8
SP38	13.1	25.3	83.3	63.0	91.7	75.6
SP39	9.0	5.0	27.8	39.5	28.6	47.0
SP40	7.8	1.9	27.9	72.2	29.4	115.7
SP41	9.5	6.2	34.8	163.3	37.3	218.3
SP42	13.3	1.2	47.7	240.7	53.7	308.1
SP43	7.2	8.6	270.4	41.5	364.3	67.2
SP44	6.7	10.3	33.8	32.4	42.5	44.1
SP45	7.9	-	79.7	-	105.0	-
SP46	7.1	-	34.1	-	39.4	-
SP47	11.8	53.3	51.5	347.0	53.5	392.5
SP48	10.7	48.5	69.4	290.7	78.5	327.4
SP49	9.7	64.4	58.1	454.6	65.5	508.9
SP50	12.9	-	90.9	-	101.8	-
Mean	**11.4**	**10.8**	**75.1**	**95.6**	**88.6**	**122.9**
SD	**3.6**	**15.9**	**52.4**	**178.1**	**72.3**	**222.9**
FMEnv Limit	**-**	**-**	**-**	**-**	**250 (2)**	**250 (7)**
WBG Limit	**25 (1)**	**25 (5)**	**80 (15)**	**80 (12)**	**-**	**-**

Frequency of limit exceedance in parenthesis

Investigated Airshed Classification: Since 1-hour averaging period ambient air quality standards' breaches were in 2 - 4% of the sampling locations and 24-hour averaging period ambient air quality standards' breaches were recorded in 2 – 16% of the locations, the proposed project area can be described as un-degraded airshed using the World Bank classification. Therefore, the airshed can be described as having excellent carrying capacity for construction and operation activities of the proposed 38 km 4th Mainland Bridge.

An air emission dispersion modelling study carried out on the proposed 4th Mainland Bridge in Lagos to determine its impacts on the proposed host airshed. The findings have assisted to arrive at some levels of conclusion and recommendations that can assist operation of the project in a sustainable manner, especially as it concerns the airshed.

It can be concluded that:

i. the major sources of air emissions on the proposed 4th Mainland Bridge in its operation phase are vehicles including cars, buses/suvs and trucks;

ii. four average daily traffic flow of 41500 vehicles/day, 45500 vehicles/day, 49500 vehicles/day and 53500 vehicles/day are anticipated on the bridge;
iii. the maximum ground level concentrations of CO, SO_2, SPM and VOCs associated with vehicular emissions in the operation phase of the proposed bridge are within their respective limits;
iv. the NO_X concentration from vehicular emissions in the proposed project breach its respective 1-hour and 24-hour averaging periods FMEnv and WBG limits; and
v. improved free flow of traffic in the study area accompanying the proposed bridge will assist to achieve reduced air pollutants

To maintain the predicted maximum concentrations of ground level air pollutants from the proposed project it is recommended that adequate traffic management is put in place to ensure that average 60 km/hr speed investigated is sustained. This will ensure that traffic gridlocks are minimized on the bridge thus eliminating its associated air emissions.

4.3.3 Ambient Noise Levels

The major sources of noise during the study were commercial activities, vehicular movement, boat movement on the water, electric power generation and construction activities. The noise levels within the study area and control stations were determined using a digital, battery-powered, sound pressure level meter (EXTEC Instruments, US Model 407730). The measured day-time ambient noise levels obtained during the fieldwork are summarized in Table 4.5.

In the proposed project area, the minimum ambient noise levels were 28.6 – 65.2 dB(A) in the dry season but 28.6 – 65.8 dB(A) in the wet season (Table 4.9). The measured maximum ambient noise levels in the dry season were 34.9 – 79.4 dB(A) but 34.9 – 85.2 dB(A) in the wet season with background noise levels of 28.8 – 66.2 dB(A) and 28.8 – 67.1 dB(A) in the dry and wet seasons respectively. As presented in Figure 4.8, the wet seasons ambient noise levels were higher than that of the dry season in about 60% of the sampling locations.

The minimum ambient noise levels in the area were within the 70 dB(A) industrial area ambient noise limit in all the sampling locations in the two seasons, the maximum noise levels breached this limit in 8% and 12% of the sampling locations in the dry and wet seasons respectively (Table 4.9). However, the background noise levels of the area were also within this limit in all the sampling locations both in the dry and wet seasons. The 55 dB(A) World Bank Day-time ambient noise limit was breached in 12% of the sampling locations in the dry season but in 18% of the locations in the wet season while the maximum noise levels breached this limit in 26% and 42% of the sampling locations in the dry and wet seasons respectively. The background noise levels of the area breached this day-time limit in 14% of the sampling locations in the dry season but in 18% of the locations in the wet season. Commercial activities, vehicles and electric power generators are the major sources of noise identified during the study.

Table 4.9: Measured Ambient Noise Levels in the Area during the Dry and Wet Seasons Study

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	34.4	34.7	46.1	40.8	36.49	34.8

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP2	36.1	35.5	49.9	40.3	36.9	35.8
SP3	31.9	35.4	38.7	40.3	32.3	35.5
SP4	33.1	35.1	47.7	41.3	34.4	35.2
SP5	33.3	35.1	49.7	37.8	33.5	35.1
SP6	41.6	35.9	63.0	55.9	42.8	36.1
SP7	35.0	34.9	40.7	47.0	35.1	34.9
SP8	30.5	35.5	40.7	56.1	31.1	35.7
SP9	30.9	35.2	39.9	39.4	31.9	35.2
SP10	32.6	37.1	38.7	43.8	33.0	37.2
SP11	44.8	37.0	47.9	46.4	45.3	37.4
SP12	28.6	38.5	34.9	58.7	28.8	40.5
SP13	30.0	43.1	41.1	55.1	32.1	43.9
SP14	34.7	42.4	49.3	58.7	35.4	42.9
SP15	42.6	37.4	45.1	53.4	42.9	39.7
SP16	42.5	44.7	62.0	47.7	45.8	45.4
SP17	32.3	38.1	39.0	50.5	32.6	39.5
SP18	39.0	39.5	43.1	49.0	39.4	40.8
SP19	30.2	59.8	40.8	82.2	30.3	61.2
SP20	32.8	43.8	39.3	54.7	33.9	44.1
SP21	53.4	44.1	69.2	66.5	56.4	46.8
SP22	41.1	53.6	51.4	58.7	42.1	54.3
SP23	56.9	37.4	64.1	52.4	57.5	39.1
SP24	37.2	45.2	47.0	53.6	38.1	45.5
SP25	49.9	40.2	54.8	52.6	50.3	41.7
SP26	33.7	29.7	46.1	48.8	34.6	33.7
SP27	34.6	57.0	42.7	71.2	35.2	56.0
SP28	42.4	40.9	49.4	53.2	43.7	41.2
SP29	39.6	39.9	53.3	46.0	42.5	40.4
SP30	38.9	29.7	49.5	46.2	40.8	30.7
SP31	34.8	30.5	47.7	46.9	35.1	37.4
SP32	30.3	44.1	37.8	69.4	31.1	44.1
SP33	33.6	37.7	38.3	52.3	34.1	37.8
SP34	36.5	48.4	44.8	64.5	37.1	49.3
SP35	50.8	64.7	62.5	85.2	51.7	65.2
SP36	53.4	60.4	58.4	69.5	53.9	60.8
SP37	63.7	35.1	74.0	41.3	64.6	35.2
SP38	60.3	51.4	73.1	66.9	63.9	53.3
SP39	42.6	49.9	45.1	58.8	42.9	50.9
SP40	52.3	44.2	62.7	63.2	52.5	47.8
SP41	34.6	65.8	42.7	77.0	35.0	67.1
SP42	42.4	60.3	47.3	71.8	42.6	62.3
SP43	65.2	40.1	79.3	49.1	66.2	40.8
SP44	49.4	56.1	59.2	63.1	51.3	56.6
SP45	60.3	56.1	68.9	63.1	61.4	56.6
SP46	36.9	30.0	46.2	41.1	38.3	32.1
SP47	30.0	62.1	41.1	74.0	32.1	63.7
SP48	62.1	28.6	79.4	34.9	63.7	28.8
SP49	28.6	34.0	34.9	40.3	28.8	35.1
SP50	34.0	-	40.3	-	35.1	-

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
Industrial Area Limit	70 (0)	70 (0)	70 (4)	70 (6)	70 (0)	70 (0)
Residential Area Limit	55 (6)	55 (9)	55 (13)	55 (21)	55 (7)	55 (9)

Frequency of limit exceedance in parenthesis

Source: Sustainabiliti Field work, 2021

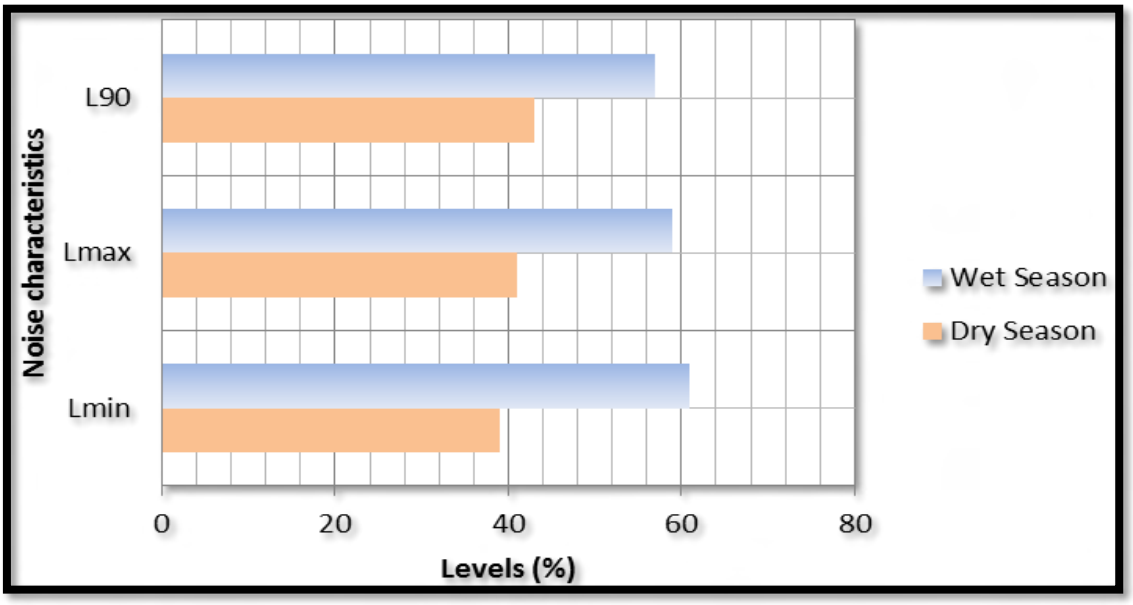


Figure 4.8: Seasonal Trend of Ambient Noise Levels in the Area during the Study

4.3.3.1 Noise Dispersion modelling

Ambient noise levels associated with the proposed 4th Mainland Bridge project have been investigated in this study using the Enterprise Edition of Noise Map 2000 Version 2.7.1.

Vehicles are its major source of noise in the operation phase with Sound Power Level (SPL) established to be 102 – 114 dB(A). The ambient noise level associated with traffic on the proposed bridge could breach the 45 dB(A) and 55 dB(A) night-time and day-time respective limits within 300 m of its sideways. Also, the cumulative noise levels breach the 45 dB(A) night-time limit in 37% of the investigated areas in the dry season but in 41% of the locations in the wet season. The dry season cumulative noise breaches the 55 dB(A) day-time limit in 22% of the investigated locations but in 27% of the locations in the wet season. However, the cumulative noise is within the 70 dB(A) industrial area limit of the World Bank.

4.3.4 Water Quality

A total of Fifty (50) Underground water and Fifty (50) surface water samples were collected for analysis. Tables 4.10 and 4.11 show the sampling locations and coordinates.

Table 4.10: Underground Water Sampling Locations and Coordinates

S/N	Sample Name	Latitude & Longitude	Description of Sampling Environment
1	Ayetoro (near Jetty)	N0562230 0723061	Open Hand dug well at the fishing community
2	Ayetoro Community Control	N0561280 0723665	Hand dug open well. Sales of building materials was noticed at the location

3	Bayeku Community	N0561280 0724045	Open Hand dug well in a small farmland besides an uncompleted building
4	MTR Gardens, OPIC	N0543554 0734753	Tap water in front of MTR Gardens, OPIC
5	RCCG Isheri Riverview Estate	N0543547 0734965	Open well within the Redeemed Christian Church of God compound close to Sinoki Estate
6	Doregos Folarin Drive Isheri	N0545369 0733992	Open well besides a treatment plant inside residential building
7	Fatgbems Filling Station OPIC	N0543540 0735202	Borehole water from the supermarket within the filling station
8	Sparklight Estate gate	N0543194 0735222	Borehole water collected at the gate (Security Post)
9	Taiwo Street, Mawere Community	N0548731 0735449	Closed well in a residential compound
10	Mawere / Isheri Road	N0548708 0735548	Borehole water from borehole project (2020) in Mawere
11	Mawere Community GW 2	N0548648 0735512	Covered well in residential compound
12	Igbe Community (Control)	N0561938 0728403	Closed Shallow well in a residential compound behind a school (The Child Schools)
13	Igbe Affa Community	N0561120 0728673	Shallow hand dug well in a block making factory compound
14	Oluwafemi Avenue, Igbe Road	N0560910 0728935	Tap water from a residential building
15	Igbogbo/Agunfoye Community	N0561329 0727877	Borehole at a residential building which was hilly and surrounded with buildings undergoing construction
16	Agunfoye Community	N0561591 0727073	Hand dug well in front of uncompleted building in a swampy area
17	Ogunlewa Street Igbogbo (Control)	N0558236 0728699	Borehole at a residential building
18	Lonex Garden Isheri	N0544686 0734272	Well water from shallow well a residential compound
19	Isheri / OPIC (Control)	N0543233 0734498	Borehole from Checkmate Hotel premises
20	Third gate Isheri	N0546229 0733796	Open well close to third gate and surrounded by uncompleted building
21	Wawa Bus Stop (Control)	N05457420739116	Borehole water from Car Wash premises
22	Arepo Community (Control)	N0546537 0740141	Borehole located at the back of a shopping complex
23	Elepe Laaga	N0561044 0729958	Tap water from residential Building with surrounding farming activities
24	Muyi Ogunowo Street, Elepe	N0560958 0730843	Tap water from residential building
25	Erunwe/Radio, Erinwe community	N0559589 0732199	Tap Water from residential building
26	Erunwe Interchange	N0558834 0732888	Tap water from Car Wash
27	Erunwe / Itamaga Control	N0559679 0733317	Borehole from residential building
28	Sawmill, Itamaga	N0559679 0733317	Borehole from mosque and transporters office, Sawmill
29	NASFAT Itamaga	N0559679 0733317	Tap water from mosque
30	LASPOTECH Mini Mosque	N0558846 0733984	Tap water from the mosque within the school premises
31	LASPOTECH, Environmental School of Environmental Studies	N0557912 0733686	Tap water from Department of Architectural Technology Laspotech
32	LASPOTECH Staff Quarters	N0557310 0734474	Tap water from staff quarters
33	LASPOTECH /Odogunyan Control	N0557483 0736423	Tap Water from Enyo/ Tantalizers Premises
34	Modupe / Ishawo	N0552267 0736035	Borehole in front of Sharon Castle premises
35	Ori-Okuta / Ishawo	N0553889 0736158	Borehole in residential building
36	Omo Jesu, Mawere Road, Tapa	N0549019 0736221	Borehole at residential building at the back of a shop

37	Ifelodun street, Tapa	N0549212 0735877	Borehole inside a compound
38	Mallo Filling Station, Agric (Control)	N0553317 0732174	Borehole located within the filling station
39	David Alaka / Sagamu Road	N0556412 0734072	Borehole water at residential building
40	Titus Street, Apeka / Sagamu Road	N0555579 0734526	Closed Shallow well at Residential building
41	Abraham Adesanya / Ten Families Estate	N0555579 0734526	Closed Shallow well at Residential building
42	Total Filling station/ Abraham Adesanya	N0565551 0715338	Borehole within the filling station besides a bar
43	Nipco gas / Lagos-Epe express way (Control)	N0566533 0715590	Borehole located inside the gas station
44	Abraham Adesanya / Ogombo Road	N0564715 0714798	Borehole in front of Zatae food mart and services hub
45	TCN Ajah Sub region	N0563135 0715133	Borehole located behind the security post within PHCN facility
46	Addo Road, Ajah	N0563555 0716792	Open well located within car wash besides 4eva villa
47	Langbasa Road, / Red house, Ajah (Control)	N0564585 0718527	Open well besides on-going construction of residential building
48	Oke-ira Kekere Bus stop	N0564354 0717756	Open well located behind a shopping complex opposite Oke-ira Kekere Central Mosque
49	Eyita Ojokoro Road	N0554829 0735319	Borehole water from residential building
50	Sabo/Banuso (Control)	N0556081 0732607	Borehole from NIPCO Filling station

Source: Sustainabiliti Limited Fieldwork, 2021

Table 4.11: Surface Water Sampling Locations and Coordinates

S/N	Sample Name	Latitude & Longitude	Description of Sampling Environment
1	Ayetoro 1	N0562903 E0721466	Centre of the sea, transport activities by boat
2	Ayetoro 2	N0562566 E0722102	Halfway to the Aiyetoro Jetty. Fishing and transport activities on the water. Plastic and disposable pack on water, presence of water hyacinth.
3	Ayetoro 3 Control	N0562958 E0723140	Towards Ijede, dredging activities, cattle egrets around, presence of mangrove forest.
4	Bayeku Fishing Community	N0561550 E0722238	Presence of Cattle egrets, fishing, transportation and sand mining activities, Plastic Pollution on water.
5	Aiyetoro 5	N0562358 E0722782	Near Fishing community settlement. Presence of water hyacinth.
6	Lekki 1	N0563615 E0717244	Oke Ira nla Jetty near Addo Badore Road. Fishing community settlement near the Jetty.
7	Lekki 2	N0563766 E0717511	In between Oke Ira nla and Oke Ira Kekere, fishing communities. Transport activities. Wreck sand mining equipment on the shore.
8	Lekki 3	N0564032 E0718046	Dredging and sand mining activities.
9	Lekki 4	N0563389 E0719187	Langbasa area, transport activities, residential buildings on shore.
10	Lekki 5	N0563120 E0718919	Mid Sea at Langbasa area
11	Lekki 6	N0562577 E0718398	Langbasa left side of the proposed bridge.
12	Lekki 7 Control	N0562491 E0719322	Langbasa area with fewer activities.
13	Lekki 8 control	N0562583 E0719743	Langbasa area with fewer activities.
14	Lekki 9 control	N0563206 E0720213	Langbasa area with fewer activities.
15	Lekki 10	N0562198 E0720905	Towards Aiyetoro with fewer activities.
16	Lekki 11	N0562829 E0721443	Mid sea towards Aiyetoro with fewer activities.
17	Lekki 12	N0563227 E0721563	Towards Aiyetoro.

18	Ebute Ikorodu 1	N0552901 E0730036	Close to the Jetty, Logistic activities, fishing activities, industrial and residential buildings situated on shore.
19	Ebute Ikorodu 2	N0552655 E0730336	Dredging activities, fishing activities, vegetation on water, Oil and Grease on surface water.
20	Ebute Ikorodu 3 Control	N0552845 E0729394	Fewer activities area with abandoned bridges.
21	Baiyeku 2 Control	N0559780 E0722389	Dredging equipment.
22	Baiyeku 3	N0560708 E0722481	Dredging activities.
23	Egbin 1	N0567356 E0724874	Behind Eghin Thermal Station, fishing and sand dredging activities.
24	Egbin 2	N0567025 E0724823	Away from Eghin Thermal Station, fishing and sand dredging activities.
25	Egbin 3 Control	N0567054 E0724512	Dredging activities in the area
26	Ijede 1	N0566294 E0724791	Dredging activities.
27	Ijede 2 Control	N0565915 E0724989	Fewer activities, residential buildings.
28	Ijede 3	N0564858 E0724960	Sand mining activities.
29	Baba Onigedu Creek A	N0563144E0724774	Mangrove forest, evidence of bush clearing on either side. Source of drinking water to Aiyetoro community.
30	Baba Onigedu Creek B Control	N0563238 E0724572	Mangrove forest, fewer activities.
31	Baba Onigedu Creek C	N0563404 E0724385	Mangrove forest, close to Lagoon entrance.
32	Baba Aiyetoro Creek A	N0562651 E0723375	Wetland, presence of periwinkles on marshy land, vegetation cover, smells of hydrogen sulphide.
33	Baba Aiyetoro Creek B Control	N0562762 E0723358	Wetland, presence of periwinkles on marshy land, vegetation cover.
34	Baba Aiyetoro Creek C	N0562782 E0723262	Mangrove forest, close to Lagoon entrance.
35	Idi Agbon Creek A	N0562472 E0723146	Wetland, presence of periwinkles on marshy land, vegetation cover.
36	Idi Agbon Creek B Control	N0562544 E0723106	Wetland, presence of periwinkles on marshy land, vegetation cover.
37	Idi Agbon Creek C	N0562552 E0723032	Mangrove forest, close to Lagoon entrance.
38	Igbe 2 Afa Stream	N0561448 E0728600	Vegetation cover, Road construction, spiritual bathing, palm wine selling
39	Igbe 3 Afa Stream	N0561490 E0728592	Vegetation cover, Road construction, spiritual bathing, palm wine selling
40	Igbe 4 Afa Stream	N0561476 E0728640	Vegetation cover, Road construction, spiritual bathing, palm wine selling
41	Igbe 1 Afa Stream	N0561414 E0728600	Vegetation cover, Road construction, spiritual bathing, palm wine selling
42	Itamaga	N0558863 E0732873	Vegetation cover, Road construction, spiritual bathing, palm wine selling
43	Erunwe	N0558887 E0732819	Vegetation cover, Road construction, spiritual bathing, palm wine selling
44	Isheri river 1 Control	N0542799 E0735700	Upstream, fewer activities, presence of water hyacinth
45	Isheri river 2	N0542571 E0735349	Fishing activities, vegetation presence, Dredging machine on water
46	Isheri river 3	N0542443 E0734946	Kara market, cattle drinking on water, slaughtering activities, washing, open defecation, solid waste on the shore
47	Isheri river 4	N0541932 E0734764	Kara market, cattle drinking on water, slaughtering activities, washing, open defecation, solid waste on the shore

48	Isheri river 5	N0541999 E0734649	Abattoir point of liquid waste discharge, open burning, open defecation, solid waste on the shore
49	Isheri river 6	N0542437 E0734444	Behind Golden Spring Hotel, sand mining using boat.
50	Isheri river 7	N0542455 E0734194	Behind Palace, sand mining using boat, transport activities.

Source: Sustainabiliti Limited Fieldwork, 2021

4.3.4.1 Groundwater and Surface Water Quality

Underground water sampling area include Ayetoro, Agunfoye/Igbogbo, Igbe, Elepe, Erunwe, Itamaga, Lagos state Polytechnic, Banuso/Sagamu Road, Eyitan Ojokoro, Agric Isawo, Tapa, Mawere, Isheri, Opic, Sparklight Estate, Ado Oke Ira Nla, 10 Families Estate, Powerline, Ado Road and Abraham Adesanya. Plate 4.2 and Plate 4.3 show water collection/ sampling in some areas along the project corridor.

Areas covered during the surface water sampling were Lagos Lagoon (Lekki Ajah Oke Ira nla, Langbasa, Aiyetoro, Baiyeku, Ebutte Ikorodu, Ijede, Egbin axis), Ogun River at Isheri Olofin and Stream at Igbe, Itamaga and Erunwe (see Plate 4.4).

Plate 4.2: Collection of Groundwater from Borehole at Sparklight Estate, Ogun State

Plate 4.3: Collection of groundwater and Measurement of in-situ parameters from well at a mechanic workshop located inside Ten family estate, Abraham Adesanya, Lagos State

Plate 4.4: Surface water Sampling and In-situ Parameters Measurement at Lagos Lagoon and Igbe Stream Community

Plate 4.5: Picture showing 4MB ESIA Baseline Data Gathering Team during Fieldwork

Table 4.12: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Ayetoro (near Jetty)	Ayetoro Community Control	Bayeku Community	MTR Gardens, OPIC	RCCG Isheri Riverview Estate	Doregos Folarin Drive Isheri	Fatgbems Filling Station OPIC	SON LIMIT (NIS 554:2015)
Appearance	Slightly Turbid	Slightly Turbid	Slightly Turbid	Colourless and Clear	Slightly Turbid	Slightly Turbid	Slightly Turbid	-
Temperature (^{0}C)	24.5	27.0	28.2	29	31	33	32	Ambient
pH	**6.4**	**5.3**	**4.6**	7.0	6.2	6.9	**4.1**	6.5-8.5
Colour (TCU[a])	2.0	5.0	2.0	0.0	3.0	4.0	2.0	15.0
Turbidity(NTU)	**48.8**	**20.2**	**70.8**	0.53	**57.2**	**15.6**	**45.4**	5.0
Conductivity	971	133.9	43.9	403	570	529	572	1000
Acidity (mg/L)	10.24	20.49	30.74	10.25	40.98	10.25	30.74	-
Alkalinity (mg/L)	107.98	8.64	8.64	285.07	181.41	203.01	ND	-
Total Hardness (mg/L)	**192.33**	53.67	26.84	85.88	**447.28**	71.56	107.35	150.0
Calcium Hardness (mg/L)	109.13	44.73	17.89	69.78	322.04	53.67	89.46	-
Magnesium Hardness (mg/L)	83.19	8.95	8.94	16.10	125.23	17.89	17.89	-
Total Solids (mg/L)	696	106.7	36.1	286	413	385.0	412.0	-
Total Suspended Solids (mg/L)	6.0	12.0	5.0	0.0	8.0	10.0	6.0	-
Total Dissolved Solids (mg/L)	**690**	94.7	31.1	286	405	375.0	406.0	500
Phosphate (mg/L)	2.91	0.48	0.32	1.15	2.01	1.05	1.34	-
Nitrate (mg/L)	1.03	1.10	0.91	0.54	1.09	0.64	0.67	50.0
Sulphate(mg/L)	11.0	31.70	10.16	7.49	12.18	10.17	14.0	100.0
Chloride (mg/L)	**335.72**	85.58	17.12	37.52	160.95	174.44	246.85	250.0
Sodium Chloride (mg/L)	553.94	141.20	28.24	61.91	265.57	287.83	407.31	NS
METALS								
Iron (mg/L)	**3.37**	**5.91**	**0.65**	**0.89**	**3.27**	**2.61**	**1.19**	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	**0.004**	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	0.26	ND	ND	ND	0.11	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	0.01	ND	ND	**35.23**	**0.46**	**1.79**	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source : JESL** 2021

Table 4.12a: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Sparklight Estate gate	Taiwo Street, Mawere Community	Mawere / Isheri Road	Mawere Community GW 2	Igbe Community (Control)	Igbe Affa Community	Oluwafemi Avenue, Igbe Road	SON LIMIT (NIS 554:2015)
Appearance	Colourless and Clear	Colourless and Clear	Slightly Turbid	Colourless and Clear	Colourless and Clear	Colourless with particles	Colourless and Clear	-
Temperature (^{0}C)	39	30	29	30	27.9	28.5	29.1	Ambient
pH	6.5	**6.2**	**5.8**	**5.8**	**5.3**	6.6	**5.4**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity (NTU)	0.71	0.49	**13.6**	3.73	0.28	**14.1**	0.21	5.0
Conductivity	367	193.3	156.9	75.2	61.5	159.6	49.3	1000
Acidity (mg/L)	15.36	10.25	30.78	5.12	15.37	20.49	15.36	-
Alkalinity (mg/L)	298.03	34.55	38.87	21.60	12.92	86.39	12.96	-
Total Hardness (mg/L)	80.51	62.62	76.04	43.83	14.31	100.19	15.20	150.0
Calcium Hardness (mg/L)	69.77	44.73	62.62	32.20	10.73	84.08	12.52	-
Magnesium Hardness (mg/L)	10.73	17.89	13.42	11.62	3.57	16.10	2.68	-
Total Solids (mg/L)	261	137.0	115.0	53.3	43.1	117.7	35.1	-
Total Suspended Solids (mg/L)	0.0	0.0	3.0	0.0	0.0	3.0	0.0	-
Total Dissolved Solids (mg/L)	261	137.0	112.0	53.3	43.1	114.7	35.1	500
Phosphate (mg/L)	0.16	0.25	1.10	0.16	2.15	0.62	0.08	-
Nitrate (mg/L)	0.10	0.8	0.92	0.12	1.77	1.81	0.02	50.0
Sulphate(mg/L)	7.14	8.17	9.55	6.39	10.06	8.99	6.01	100.0
Chloride (mg/L)	49.04	12.84	59.57	167.86	13.17	6.91	10.53	250.0
Sodium Chloride (mg/L)	80.92	21.18	98.30	276.97	21.72	11.40	17.38	NS
METALS								
Iron (mg/L)	ND	**1.28**	**1.72**	0.17	**0.44**	**0.53**	**0.53**	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	**0.17**	**0.10**	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	0.001	ND	ND	0.003	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	**0.34**	**0.37**	**0.49**	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.12b: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Igbogbo/Agunfoye Community	Agunfoye Community	Ogunlewa Street Igbogbo (Control)	Lonex Garden Isheri	Isheri / OPIC (Control)	Third gate Isheri	Wawa Bus Stop (Control)	SON LIMIT (NIS 554:2015)
Appearance	Colourless with Particles	Slightly Turbid	Colourless and Clear	Colourless and clear	Slightly Turbid	Slightly Turbid	Slightly Turbid	-
Temperature (^{0}C)	26.9	25.2	30.4	27	27	27.0	28.0	Ambient
pH	8.03	**6.2**	**5.3**	7.6	7.0	6.7	6.5	6.5-8.5
Colour (TCU[a])	0.0	1.0	0.0	0.0	3.0	0.0	2.0	15.0
Turbidity (NTU)	2.37	**13.50**	3.22	1.08	63.1	**5.91**	**29.6**	5.0
Conductivity	709.0	86.1	49.3	414	311	**6270**	511	1000
Acidity (mg/L)	184.43	15.37	20.49	10.24	10.24	30.73	10.25	-
Alkalinity (mg/L)	270.0	86.39	12.96	246.20	159.81	997.76	73.43	-
Total Hardness (mg/L)	**214.69**	50.98	14.31	67.98	**205.74**	**1775.70**	26.84	150.0
Calcium Hardness (mg/L)	175.33	44.73	11.63	53.67	161.02	1207.66	13.42	-
Magnesium Hardness (mg/L)	39.36	6.26	2.68	14.31	44.72	568.05	13.42	-
Total Solids (mg/L)	503.0	65.50	34.9	294	227	4440.4	300.0	-
Total Suspended Solids (mg/L)	1.0	4.0	0.0	0.0	6.0	0.4	5.0	-
Total Dissolved Solids (mg/L)	**502.0**	61.50	34.9	294	221	**4440.0**	295.0	500
Phosphate (mg/L)	0.25	0.57	0.12	0.25	1.28	0.91	1.90	-
Nitrate (mg/L)	0.02	1.04	0.07	0.10	0.92	2.06	1.38	50.0
Sulphate(mg/L)	29.0	12.0	5.32	8.14	12.06	25.10	12.0	100.0
Chloride (mg/L)	44.10	23.04	11.19	75.70	9.55	**3472.42**	108.62	250.0
Sodium Chloride (mg/L)	72.77	38.02	18.46	124.91	15.75	5729.49	179.22	NS
METALS								
Iron (mg/L)	ND	**3.22**	**0.71**	**1.72**	**3.05**	**1.59**	**1.92**	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	0.01	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	**0.005**	ND	ND	**0.004**	**0.03**	ND	0.003
Zinc (mg/L)	ND	0.42	0.19	ND	ND	0.09	ND	3.0
Chromium (mg/L)	ND	**0.09**	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	0.02	0.02	0.03	ND	ND	**27.10**	**5.75**	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** ***JESL*** 2021

Table 4.12c: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Arepo Community (Control)	Elepe Laaga	Muyi Ogunowo Street, Elepe	Erunwe/Radio, Erinwe community	Erunwe Interchange	Erunwe / Itamaga Control	Sawmill, Itamaga	SON LIMIT (NIS 554:2015)
Appearance	Colourless and clear	Colourless and Clear	Colourless and Clear	Colourless and clear	Colourless and clear	Colourless and Clear	Colourless and Clear	-
Temperature (^{0}C)	29	27.3	29.8	28.6	30.8	30.4	29.3	
pH	**5.0**	**5.1**	**5.5**	**4.5**	**4.4**	**4.2**	**4.5**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity (NTU)	0.24	0.30	0.62	1.19	0.31	**5.34**	0.37	5.0
Conductivity	87.1	30.0	20.3	28.4	34.1	57.1	20.0	1000
Acidity (mg/L)	15.36	20.49	5.12	20.49	30.73	10.24	10.25	-
Alkalinity (mg/L)	8.64	12.96	8.64	4.32	4.32	4.32	4.32	-
Total Hardness (mg/L)	12.52	8.94	9.84	14.31	8.94	10.73	8.95	150.0
Calcium Hardness (mg/L)	7.15	5.37	7.16	10.73	7.15	8.94	7.16	-
Magnesium Hardness (mg/L)	5.36	3.57	2.68	3.57	1.78	1.78	1.79	-
Total Solids (mg/L)	61.9	21.30	14.3	20.1	24.2	40.3	14.2	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	61.9	21.30	14.3	20.1	24.2	40.3	14.2	500
Phosphate (mg/L)	0.15	0.25	0.10	0.18	0.36	0.29	0.16	-
Nitrate (mg/L)	0.07	1.06	0.16	0.14	0.24	0.15	0.20	50.0
Sulphate(mg/L)	7.30	6.02	7.15	7.22	8.77	9.18	8.0	100.0
Chloride (mg/L)	30.94	21.39	6.58	16.13	11.19	12.51	8.23	250.0
Sodium Chloride (mg/L)	51.05	35.30	10.86	26.61	18.46	20.64	13.58	NS
METALS								
Iron (mg/L)	**1.10**	0.24	ND	ND	**0.70**	**4.89**	**0.61**	0.30
Lead (mg/L)	ND	**0.49**	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	0.30	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	0.003	0.001	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	1.24	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	**0.34**	ND	ND	ND	ND	**2.31**	0.14	0.20

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.12d: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	NASFAT Itamaga	Laspotech Mini Mosque	Laspotech, Environmental School of Environmental Studies	Laspotech Staff Quarters	Laspotech /Odogunyan Control	Modupe / Ishawo	Ori-Okuta / Ishawo	SON LIMIT (NIS 554:2015)
Appearance	Colourless and Clear	Slightly Turbid	Colourless & clear	Colourless & clear	Colourless & clear	Colourless & clear	Colourless and Clear	-
Temperature (^{0}C)	31.7		28.7	28.4	28.1	28	28	
pH	**5.3**	8.05	**4.9**	**4.5**	**4.5**	**6.2**	6.2	6.5-8.5
Colour (TCU^a)	0.0	1.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.14	**48.10**	0.17	0.1	0.95	0.34	0.44	5.0
Conductivity	16.45	**1,383.0**	19.58	33.2	53.4	222	222	1000
Acidity (mg/L)	5.12	204.92	10.24	5.12	5.12	10.25	5.12	-
Alkalinity (mg/L)	8.64	390.0	8.64	4.32	4.32	56.15	8.64	-
Total Hardness (mg/L)	8.05	**166.39**	7.16	14.31	5.37	91.25	17.89	150.0
Calcium Hardness (mg/L)	5.36	128.82	3.58	8.94	3.58	75.14	10.73	-
Magnesium Hardness (mg/L)	2.68	37.57	3.58	5.37	1.79	16.10	7.15	-
Total Solids (mg/L)	11.7	982.0	13.9	23.5	38.0	158.0	158	-
Total Suspended Solids (mg/L)	0.0	4.0	0.0	0.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	11.7	**978.0**	13.9	23.5	38.0	158.0	158	500
Phosphate (mg/L)	0.52	0.23	0.32	0.16	0.14	0.82	0.46	-
Nitrate (mg/L)	0.30	1.0	0.14	0.10	0.06	1.10	0.37	50.0
Sulphate(mg/L)	8.10	51.0	6.15	7.22	6.10	6.82	9.29	100.0
Chloride (mg/L)	11.19	**592.45**	11.52	9.87	11.19	32.58	10.20	250.0
Sodium Chloride (mg/L)	18.46	977.54	19.01	16.29	18.46	53.76	16.84	NS
METALS								
Iron (mg/L)	**2.02**	0.22	**1.70**	**2.20**	0.14	**0.80**	**2.67**	0.30
Lead (mg/L)	ND	0.01	ND	ND	ND	0.01	ND	0.01
Copper (mg/L)	ND	0.01	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	**0.19**	ND	ND	ND	ND	0.02
Cadmium (mg/L)	**0.006**	ND	ND	0.002	ND	ND	**0.006**	0.003
Zinc (mg/L)	0.29	0.08	ND	0.002	ND	0.31	ND	3.0
Chromium (mg/L)	ND	0.01	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	0.06	0.13	0.10	ND	**0.29**	0.09	0.20

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.12e: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Omo Jesu, Mawere Road, Tapa	Ifelodun street, Tapa	Mallo Filling Station, Agric (Control)	David Alaka / Sagamu Road	Titus Street, Apeka / Sagamu Road	Abraham Adesanya / Ten Families Estate	Total Filling station/ Abraham Adesanya	SON LIMIT (NIS 554:2015)
Appearance	Colourless and clear	Colourless and clear	Colourless and Clear	**Slightly Turbid**	**Slightly Turbid**	Colourless and Clear	Colourless and Clear	-
Temperature (^{0}C)	28	29	31	26.2	28.1	29	27	
pH	**4.5**	**5.1**	**5.7**	**4.4**	**5.5**	**6.4**	**6.4**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.26	4.97	0.26	1.19	**6.35**	3.33	0.17	5.0
Conductivity	162.5	105.5	278	88.2	155.3	418	29.9	1000
Acidity (mg/L)	25.61	15.36	15.37	10.25	15.37	40.98	5.12	-
Alkalinity (mg/L)	8.64	8.64	47.51	8.64	21.60	112.30	77.75	-
Total Hardness (mg/L)	44.72	38.46	82.29	15.21	42.94	129.71	62.62	150.0
Calcium Hardness (mg/L)	22.62	33.99	69.77	14.31	35.78	104.66	53.67	-
Magnesium Hardness (mg/L)	22.10	4.47	12.52	0.89	7.16	25.05	8.94	-
Total Solids (mg/L)	115	55.0	198.0	62.7	110.1	297.0	213.0	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-
Total Dissolved Solids (mg/L)	115	55.0	198.0	62.7	110.0	297.0	213.0	500
Phosphate (mg/L)	0.85	0.32	0.19	0.30	1.31	0.21	0.10	-
Nitrate (mg/L)	0.36	0.14	0.06	1.15	0.52	0.44	0.07	50.0
Sulphate(mg/L)	7.18	6.09	7.10	8.12	8.04	8.16	6.02	100.0
Chloride (mg/L)	25.34	15.47	62.87	16.13	32.91	50.36	40.81	250.0
Sodium Chloride (mg/L)	41.82	25.52	103.73	26.61	54.31	83.09	67.34	NS
METALS								
Iron (mg/L)	**1.29**	**3.02**	0.02	**0.33**	0.03	0.07	**0.53**	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	0.01	ND	0.001	ND	ND	0.001	ND	0.003
Zinc (mg/L)	0.378	0.30	0.01	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	**1.67**	0.10	**4.03**	ND	0.08	ND	ND	0.20

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.12f: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

PARAMETERS	Nipco gas / Lagos-Epe express way (Control)	Abraham Adesanya / Ogombo Road	TCN Ajah Sub region	Addo Road, Ajah	Langbasa Road, / Red house, Ajah (Control)	Oke-ira Kekere Bus stop	Eyita Ojokoro Road	Sabo/Banuso (Control)	SON LIMIT (NIS 554:2015)
Appearance	Colourless and Clear	Colourless and Clear	Colourless and clear	**Slightly Turbid**	**Turbid**	**Slightly Turbid**	**Slightly Turbid**	Colourless and clear	-
Temperature (^{0}C)	28	28.2	28	28	28	29	27.8	31.3	
pH	6.3	**5.9**	**5.4**	6.8	6.5	6.6	**4.2**	**6.3**	6.5-8.5
Colour (TCU^a)	0.0	0.0	0.0	3.0	6.0	1.0	1.0	0.0	15.0
Turbidity(NTU)	0.31	0.53	0.28	**64.1**	**422**	**7.01**	**17.7**	1.0	5.0
Conductivity	116.4	253.0	49.1	707	511	415	96.7	379	1000
Acidity (mg/L)	5.12	5.12	5.12	46.10	61.48	40.98	15.37	10.25	-
Alkalinity (mg/L)	38.87	25.92	8.64	263.48	194.37	146.86	4.32	47.51	-
Total Hardness (mg/L)	64.40	125.24	25.04	**330.98**	**259.42**	**187.86**	14.31	33.99	150.0
Calcium Hardness (mg/L)	53.67	107.35	16.10	259.42	169.96	131.50	10.73	21.47	-
Magnesium Hardness (mg/L)	10.73	17.89	8.94	71.56	89.45	56.36	3.58	12.52	-
Total Solids (mg/L)	82.6	180.0	34.8	509	378.0	297.0	72.5	269.0	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	8.0	15.0	2.0	4.0	0.0	-
Total Dissolved Solids (mg/L)	82.6	180.0	34.8	**501.0**	363.0	295.0	68.5	269.0	500
Phosphate (mg/L)	0.10	0.38	0.83	1.22	1.89	1.02	2.10	0.18	-
Nitrate (mg/L)	0.04	0.41	0.57	1.06	0.74	0.31	1.31	0.25	50.0
Sulphate(mg/L)	5.29	9.18	9.55	14.10	12.11	8.24	14.02	7.20	100.0
Chloride (mg/L)	10.53	29.62	18.43	197.48	125.07	60.89	20.74	83.93	250.0
Sodium Chloride (mg/L)	17.38	48.88	30.41	325.85	206.37	100.47	34.21	138.49	NS
METALS									
Iron (mg/L)	**0.34**	**1.54**	**0.513**	**3.32**	**8.43**	**3.30**	**1.16**	0.21	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	0.003	ND	ND	ND	ND	0.002	0.003
Zinc (mg/L)	ND	ND	0.13	ND	0.74	0.74	0.02	0.24	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	0.04	ND	ND	0.05
Manganese (mg/L)	ND	0.20	**0.31**	**0.37**	**0.56**	ND	**0.64**	**1.69**	0.20

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.13: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	Ayetoro (near Jetty)	Ayetoro Community Control	Bayeku Community	MTR Gardens, OPIC	RCCG Isheri Riverview Estate	Doregos Folarin Drive Isheri	Fatgbems Filling Station OPIC	SON LIMIT (NIS 554:2015)
Appearance	Turbid	Slightly Turbid	Colourless and Clear	Colourless and Clear	Colourless and Clear	Slightly Turbid	Slightly Turbid	-
Temperature (^{0}C)	27.5	29.2	28.3	32	30	31	32	Ambient
pH	**6.4**	**3.7**	**5.4**	7.1	6.7	6.9	**4.9**	6.5-8.5
Colour (TCU[a])	4.0	3.0	0.0	0.0	0.0	3.0	0.0	15.0
Turbidity(NTU)	**121**	**62.8**	1.15	2.92	2.97	**5.50**	**50.5**	5.0
Conductivity	1345	424	192.3	681	453	906	935	1000
Acidity (mg/L)	5.12	15.37	10.25	ND	5.12	10.25	25.62	-
Alkalinity (mg/L)	164.13	ND	164.13	293.71	151.18	224.60	0.0	-
Total Hardness (mg/L)	**169.97**	53.67	26.84	89.46	134.18	**214.69**	62.62	150.0
Calcium Hardness (mg/L)	100.63	31.78	15.89	52.97	79.44	127.10	37.07	-
Magnesium Hardness (mg/L)	69.34	21.89	10.95	36.94	54.74	87.59	25.54	-
Total Solids (mg/L)	962	316	125	483	322	652.0	666.0	-
Total Suspended Solids (mg/L)	8.0	9.0	0.0	0.0	0.0	8.0	2.0	-
Total Dissolved Solids (mg/L)	**954**	307	125	483	322	**644.0**	**664.0**	500
Phosphate (mg/L)	1.86	0.26	0.10	1.21	0.89	0.01	0.61	-
Nitrate (mg/L)	0.99	2.01	0.72	0.70	2.05	1.53	1.45	50.0
Sulphate(mg/L)	9.02	19.60	8.20	8.12	13.0	30.1	15.10	100.0
Chloride (mg/L)	245.21	85.58	106.97	59.25	52.66	138.24	**253.44**	250.0
Sodium Chloride (mg/L)	404.59	141.20	176.56	97.75	86.89	228.09	418.17	NS
METALS								
Iron (mg/L)	**1.04**	**3.89**	ND	ND	ND	ND	**1.05**	0.30
Lead (mg/L)	ND	ND	0.01	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.20

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.13a: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	Sparklight Estate gate	Taiwo Street, Mawere Community	Mawere / Isheri Road	Mawere Community GW 2	Igbe Community (Control)	Igbe Affa Community	Oluwafemi Avenue, Igbe Road	SON LIMIT (NIS 554:2015)
Appearance	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	-
Temperature (^{0}C)	33	29	30	29	26.8	26.2	28.5	Ambient
pH	7.2	**5.5**	**5.8**	**5.4**	**6.0**	7.0	**5.5**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.62	4.70	1.69	0.25	2.08	1.26	0.34	5.0
Conductivity	741	143.2	443	105.5	165.2	252	61	1000
Acidity (mg/L)	ND	5.12	5.12	10.25	5.12	5.12	5.12	-
Alkalinity (mg/L)	319.63	25.92	77.75	8.64	21.60	103.66	12.96	-
Total Hardness (mg/L)	76.93	35.78	76.93	42.94	53.67	91.25	8.95	150.0
Calcium Hardness (mg/L)	45.55	21.19	45.55	25.42	31.78	54.02	5.30	-
Magnesium Hardness (mg/L)	31.38	14.59	31.38	17.52	21.89	37.23	3.65	-
Total Solids (mg/L)	527	102.0	316.0	74.9	117.0	179.0	43.3	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	**527**	102.0	316.0	74.9	117.0	179.0	43.3	500
Phosphate (mg/L)	0.07	ND	0.20	0.14	ND	0.40	ND	-
Nitrate (mg/L)	0.30	5.22	1.97	0.35	7.0	2.10	3.88	50.0
Sulphate(mg/L)	8.02	12.2	10.06	7.10	4.1	9.21	7.0	100.0
Chloride (mg/L)	**1282.0**	52.66	72.41	42.79	55.95	46.08	55.95	250.0
Sodium Chloride (mg/L)	2115.29	86.89	119.48	70.60	92.32	76.03	92.32	NS
METALS								
Iron (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	**0.55**	ND	ND	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.13b: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	Igbogbo/Agunfoye Community	Agunfoye Community	Ogunlewa Street Igbogbo (Control)	Lonex Garden Isheri	Isheri / OPIC (Control)	Third gate Isheri	Wawa Bus Stop (Control)	SON LIMIT (NIS 554:2015)
Appearance	Colourless with Particles	Slightly Turbid	Colourless and Clear	Colourless and clear	Colourless and clear	Slightly Turbid	Slightly Turbid	-
Temperature (^{0}C)	27.2	27.2	28.5	32	32	30	32.0	Ambient
pH	6.5	**6.4**	**5.2**	7.5	7.4	6.7	**5.9**	6.5-8.5
Colour (TCU[a])	0.0	1.0	0.0	0.0	0.0	0.0	2.0	15.0
Turbidity (NTU)	4.70	**13.50**	0.43	0.88	0.85	4.54	**62.3**	5.0
Conductivity	206.0	206	76.6	689	591	**5740**	488	1000
Acidity (mg/L)	10.25	5.12	5.12	ND	5.12	10.25	5.12	-
Alkalinity (mg/L)	146.86	60.47	12.96	285.07	120.94	259.16	77.75	-
Total Hardness (mg/L)	107.47	71.56	26.84	57.25	57.25	**1252.38**	116.29	150.0
Calcium Hardness (mg/L)	63.62	42.37	15.89	33.89	33.89	741.41	68.84	-
Magnesium Hardness (mg/L)	43.85	29.19	10.95	23.36	23.36	510.97	47.45	-
Total Solids (mg/L)	146.0	148.0	54.4	490	382	4111.4	350.0	-
Total Suspended Solids (mg/L)	0.0	2.0	0.0	0.0	0.0	1.0	4.0	-
Total Dissolved Solids (mg/L)	146.0	146.0	54.4	490	382	**4110.0**	346.0	500
Phosphate (mg/L)	ND	0.30	0.10	0.20	0.04	0.87	1.08	-
Nitrate (mg/L)	3.54	1.72	0.25	1.47	1.15	1.95	1.55	50.0
Sulphate(mg/L)	21.6	13.5	5.46	9.10	34.0	21.60	11.60	100.0
Chloride (mg/L)	**584.22**	70.76	54.31	59.25	74.06	**1711.52**	110.26	250.0
Sodium Chloride (mg/L)	963.97	116.76	89.61	97.75	122.19	2824.01	181.93	NS
METALS								
Iron (mg/L)	0.20	ND	ND	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	0.01	0.02	ND	ND	0.02	0.01
Copper (mg/L)	ND	ND	0.08	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	0.08	ND	ND	ND	ND	**8.35**	**0.33**	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.13c: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	Arepo Community (Control)	Elepe Laaga	Muyi Ogunowo Street, Elepe	Erunwe/Radio, Erinwe community	Erunwe Interchange	Erunwe / Itamaga Control	Sawmill, Itamaga	SON LIMIT (NIS 554:2015)
Appearance	Colourless and clear	Colourless and Clear	Colourless and Clear	Colourless and clear	Colourless and clear	Colourless and Clear	Colourless and Clear	-
Temperature (^{0}C)	33	25	25	27	26	28	27	
pH	**5.2**	**6.0**	**5.9**	**4.3**	**3.9**	**3.8**	**3.9**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity (NTU)	0.20	0.20	0.17	0.59	0.28	0.55	0.23	5.0
Conductivity	158.4	67.8	143.5	47.8	70.9	70.1	43.2	1000
Acidity (mg/L)	5.12	25.62	120.55	51.23	25.62	25.62	25.62	-
Alkalinity (mg/L)	8.64	64.79	25.0	43.19	43.19	64.79	64.79	-
Total Hardness (mg/L)	14.31	44.73	11.22	53.67	26.84	53.67	44.73	150.0
Calcium Hardness (mg/L)	8.47	18.25	6.65	21.89	17.62	31.77	26.48	-
Magnesium Hardness (mg/L)	5.84	26.48	4.57	31.77	9.22	21.89	18.25	-
Total Solids (mg/L)	112	48.9	102	34.2	50.5	49.9	30.3	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	112	48.9	102	34.2	50.5	49.9	30.3	500
Phosphate (mg/L)	0.12	0.16	0.09	ND	ND	0.02	ND	-
Nitrate (mg/L)	0.19	1.22	0.12	1.45	1.55	2.16	3.24	50.0
Sulphate(mg/L)	7.01	7.18	7.0	3.98	4.30	4.18	4.0	100.0
Chloride (mg/L)	59.25	52.66	6.95	42.79	51.02	44.43	41.40	250.0
Sodium Chloride (mg/L)	97.75	86.89	11.46	70.60	84.18	73.32	67.88	NS
METALS								
Iron (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.13d: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	NASFAT Itamaga	Laspotech Mini Mosque	Laspotech, Environmental School of Environmental Studies	Laspotech Staff Quarters	Laspotech /Odogunyan Control	Modupe / Ishawo	Ori-Okuta / Ishawo	SON LIMIT (NIS 554:2015)
Appearance	Colourless and Clear	Colourless and Clear	Colourless & clear	Colourless & clear	Colourless & clear	Colourless & clear	Colourless and Clear	-
Temperature (^{0}C)	26	26	28	28	27	29	31	
pH	**4.2**	**4.7**	**5.2**	**4.2**	**4.7**	**5.2**	**5.3**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.12	0.71	0.12	0.17	1.32	0.10	0.30	5.0
Conductivity	27.3	35.5	28.1	48.9	120.6	382	43.3	1000
Acidity (mg/L)	25.62	5.12	5.12	25.62	5.12	10.25	5.12	-
Alkalinity (mg/L)	64.79	17.28	12.96	43.19	12.96	8.64	8.64	-
Total Hardness (mg/L)	26.84	17.89	26.84	17.89	17.89	33.99	10.73	150.0
Calcium Hardness (mg/L)	15.89	10.6	15.89	10.6	10.6	20.12	6.35	-
Magnesium Hardness (mg/L)	10.95	7.29	10.95	7.29	7.29	13.87	4.38	-
Total Solids (mg/L)	19.5	25.3	20.0	34.7	85.0	268.0	30.8	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	19.5	25.3	20.0	34.7	85.0	268.0	30.8	500
Phosphate (mg/L)	0.19	0.17	0.19	0.16	0.10	0.76	0.35	-
Nitrate (mg/L)	0.56	1.15	0.82	1.02	0.33	1.14	0.69	50.0
Sulphate(mg/L)	8.21	38.2	6.04	2.45	7.17	6.96	8.02	100.0
Chloride (mg/L)	57.60	46.08	47.73	64.18	49.37	65.83	36.21	250.0
Sodium Chloride (mg/L)	95.04	76.03	78.75	105.90	81.46	108.62	59.74	NS
METALS								
Iron (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	0.02	ND	ND	ND	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.13e: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	Omo Jesu, Mawere Road, Tapa	Ifelodun street, Tapa	Mallo Filling Station, Agric (Control)	David Alaka / Sagamu Road	Titus Street, Apeka / Sagamu Road	Abraham Adesanya / Ten Families Estate	Total Filling station/ Abraham Adesanya	SON LIMIT (NIS 554:2015)
Appearance	Colourless and clear	Colourless and clear	Colourless and Clear	Colourless and Clear	**Slightly Turbid**	Colourless and Clear	Colourless and Clear	-
Temperature (^{0}C)	29	30	32	28	28	32	33	
pH	**5.2**	**5.3**	**5.9**	**4.2**	**5.9**	**6.4**	6.5	6.5-8.5
Colour (TCU^a)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.13	0.32	0.25	0.31	**39.5**	2.55	0.31	5.0
Conductivity	240	248	506	173.4	305	774	621	1000
Acidity (mg/L)	10.25	5.12	5.12	5.12	15.37	5.12	5.12	-
Alkalinity (mg/L)	8.64	12.96	47.51	8.64	34.55	142.50	95.02	-
Total Hardness (mg/L)	32.20	89.46	75.14	35.78	53.67	**259.42**	78.72	150.0
Calcium Hardness (mg/L)	19.06	52.97	44.48	21.19	31.78	153.58	46.60	-
Magnesium Hardness (mg/L)	13.14	36.49	30.66	14.59	21.89	105.84	32.12	-
Total Solids (mg/L)	170	175.0	359.0	123.0	217.5	549.0	441.0	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	0.0	0.5	0.0	0.0	-
Total Dissolved Solids (mg/L)	170	175.0	359.0	123.0	217.0	**549.0**	441.0	500
Phosphate (mg/L)	0.51	0.29	0.10	ND	0.72	0.11	ND	-
Nitrate (mg/L)	1.18	0.41	0.21	6.79	2.05	0.30	16.52	50.0
Sulphate(mg/L)	8.0	6.67	7.30	2.10	9.16	7.52	88.0	100.0
Chloride (mg/L)	52.66	54.31	88.87	55.95	69.12	70.76	72.41	250.0
Sodium Chloride (mg/L)	86.89	89.61	146.63	92.32	114.05	116.76	119.48	NS
METALS								
Iron (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	0.11	0.03	ND	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	ND	**0.22**	ND	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.13f: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Wet Season)

PARAMETERS	**Nipco gas / Lagos-Epe express way (Control)**	**Abraham Adesanya / Ogombo Road**	**TCN Ajah Sub region**	**Addo Road, Ajah**	**Langbasa Road, / Red house, Ajah (Control)**	**Oke-ira Kekere Bus stop**	**Eyita Ojokoro Road**	**Sabo/Banuso (Control)**	**SON LIMIT (NIS 554:2015)**
Appearance	Colourless and Clear	Colourless and Clear	Colourless and clear	**Slightly Turbid**	**Slightly Turbid**	Colourless and clear	Colourless and clear	Colourless and clear	-
Temperature (^{0}C)	34	34	34	34	33	33	29	27.8	
pH	**6.2**	**5.9**	**5.9**	6.8	6.9	6.7	**4.4**	**5.5**	6.5-8.5
Colour (TCU[a])	0.0	0.0	0.0	3.0	2.0	0.0	0.0	0.0	15.0
Turbidity(NTU)	0.41	0.20	0.46	**37.7**	**17**	2.30	0.23	0.0	5.0
Conductivity	262	509	114.6	2010	1005	940	116.6	461	1000
Acidity (mg/L)	5.12	5.12	5.12	25.62	10.25	5.12	15.37	10.25	-
Alkalinity (mg/L)	51.83	30.24	17.28	371.46	164.13	146.86	8.64	34.55	-
Total Hardness (mg/L)	84.09	107.35	26.84	**536.74**	**250.48**	**259.42**	26.84	56.68	150.0
Calcium Hardness (mg/L)	49.78	63.56	15.89	317.75	102.19	153.58	15.89	33.56	-
Magnesium Hardness (mg/L)	34.31	43.79	10.95	218.99	148.29	105.84	10.95	23.12	-
Total Solids (mg/L)	186	361	81.6	1210	720	667	82.8	328.0	-
Total Suspended Solids (mg/L)	0.0	0.0	0.0	10	7.0	0.0	0.0	0.0	-
Total Dissolved Solids (mg/L)	186	361	81.6	**1200**	**713**	**667**	82.8	328.0	500
Phosphate (mg/L)	0.08	0.31	0.74	1.19	0.55	0.08	0.52	0.10	-
Nitrate (mg/L)	6.04	0.48	0.81	1.35	0.82	2.34	1.20	0.22	50.0
Sulphate(mg/L)	51.2	9.06	9.27	14.51	11.19	8.06	13.22	7.08	100.0
Chloride (mg/L)	42.79	54.31	44.43	227.11	106.97	80.64	57.60	77.35	250.0
Sodium Chloride (mg/L)	70.60	89.61	73.32	374.72	176.56	133.05	95.04	127.62	NS
METALS									
Iron (mg/L)	ND	ND	ND	**1.83**	ND	ND	ND	ND	0.30
Lead (mg/L)	ND	ND	ND	0.005	ND	ND	ND	ND	0.01
Copper (mg/L)	ND	ND	ND	ND	ND	ND	0.06	ND	1.0
Nickel (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.02
Cadmium (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.003
Zinc (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	3.0
Chromium (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.05
Manganese (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	0.20

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainibiliti 2021

Table 4.14: Physico-Chemical Quality of Underground Water Samples around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	**Ayetoro 1**	**Ayetoro 2**	**Ayetoro 3 Control**	**Bayeku 4 Fishing Community**	**Aiyetoro 5**	**Lekki 1**	**Lekki 2**	**Lekki 3**	**FMENV Limit**
Appearance	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	Colourless & Clear
Temperature (^{0}C)	30.3	32.3	31.5	31.1	31.5	30.0	30.2	30.2	
Conductivity µS/cm	29,500	3,.600	33,300	41,400	42,000	52,600	49,100	48,700	
Turbidity (NTU)	1.08	1.85	3.80	7.01	4.69	10.1	1.55	4.16	
pH	7.27	7.44	7.43	7.52	7.34	7.35	7.45	7.43	6.0 – 9.0
Total Hardness (mg/L)	984.02	733.54	787.21	500.95	814,05	1,145.04	143.13	1082.42	
Chloride (mg/L)	375.22	520.04	437.75	539.79	533.21	**641.82**	**664.86**	**612.20**	600.0
Sodium Chloride (mg/L)	619.11	858.07	722.30	890.65	879.79	1059.00	1097.02	1010.13	
Total Solid (mg/L)	14,741.0	17,272.0	16,601.5	20,602.0	21,302.0	26,302.0	24,501.0	24,301	
Total Suspended Solid (mg/L)	1.0	2.0	1.5	2.0	2.0	2.0	1.0	1.0	30.00
Total Dissolved Solid (mg/L)	**14,740**	**17,270.0**	**16,600.0**	**20,600.0**	**21,300.0**	**26,300.0**	**24,500.0**	**24,300.0**	2000.00
Phosphate (mg/L)	0.93	0.81	0.96	0.85	0.67	0.82	0.35	0.26	
Sulphate (mg/L)	13.09	11.66	12.14	14.0	13.81	12.12	15.04	13.15	
Nitrate (mg/L)	0.22	0.27	0.24	0.36	0.41	0.19	0.19	0.11	
Dissolved Oxygen (mg/L)	6.66	6.53	6.48	6.71	6.80	6.55	6.56	6.51	
Chemical Oxygen Demand (mg/L)	25.0	22.0	20.0	49.0	27.0	26.0	23.0	19.0	80.00
Biochemical Oxygen Demand (mg/L)	16.0	14	12.0	30.0	17.0	16.0	14.00	12.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.20	1.59	1.64	1.79	0.77	1.05	1.48	0.46	
PAHs (mg/L)	0.09	0.07	0.13	0.62	0.12	0.22	0.33	0.09	
BTEXs (mg/L)	0.43	0.44	0.13	0.28	0.0	0.0	0.0	0.0	
Salinity (ppt)	3.23	4.00	3.59	4.13	4.09	4.19	4.97	4.96	
METALS (mg/L)									
Iron	ND	ND	0.03	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	0.0	0.05	<1.00
Cadmium	0.01	0.43	0.01	0.02	0.02	0.02	0.03	0.03	<1.00
Nickel	0.36	0.02	0.55	0.73	0.74	**1.02**	**1.06**	**1.24**	<1.00
Chromium	0.09	0.001	004	0.03	ND	ND	0.02	0.04	<1.00
Manganese	0.01	0.004	0.02	0.01	0.01	0.0	0.0	0.03	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainabiliti Limited 2021

Table 4.14a: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	**Lekki 4**	**Lekki 5**	**Lekki 6**	**Lekki 7 Control**	**Lekki 8 control**	**Lekki 9 control**	**Lekki 10**	**Lekki 11**	**FMENV Limit**
Appearance	Slightly Turbid	Slightly Turbid	Slightly Turbid	Slightly Turbid	Slightly Turbid	Slightly Turbid	Slightly Turbid	lightly Turbid	Colourless & Clear
Temperature (^{0}C)	30.5	30.7	30.4	30.9	30.6	30.5	30.7	30.3	
Conductivity µS/cm	38,500	30,500	31,900	30,200	28,500	27,700	33,200	30,000	
Turbidity (NTU)	5.0	1.51	2.0	2.32	2.48	1.67	2.23	1.54	
pH	7.42	7.49	7.73	7.37	7.44	7.25	7.44	7.53	6.0 – 9.0
Total Hardness (mg/L)	679.87	626.18	1073.47	1127.15	590.41	536.74	590.41	724.59	
Chloride (mg/L)	48.54	437.75	**839.30**	434.46	447.63	362.05	473.96	411.42	600.0
Sodium Chloride (mg/L)	792.90	722.30	1389.85	716.86	738.59	597.39	782.03	678.85	
Total Solid (mg/L)	19,230.8	15,250.6	15,920.8	15,080.6	14,240.7	13,820.5	16,620.8	15,360.6	
Total Suspended Solid (mg/L)	0.8	0.6	0.8	0.6	0.7	0.5	0.8	0.6	30.00
Total Dissolved Solid (mg/L)	**19,230.0**	**15,250.0**	**15,920.0**	**15,080.0**	**14,240.0**	**13,820.0**	**16,620.0**	**15,360.0**	2000.00
Phosphate (mg/L)	0.54	0.50	0.56	0.49	12.04	1.65	0.86	0.47	
Sulphate (mg/L)	14.10	12.62	11.31	12.08	12.09	14.16	11.48	10.22	
Nitrate (mg/L)	0.28	0.24	0.29	0.21	0.21	0.25	0.17	0.19	
Dissolved Oxygen (mg/L)	6.63	6.68	6.55	6.66	6.51	6.71	6.40	6.40	
Chemical Oxygen Demand (mg/L)	21.0	26.0	22.0	30.0	25.0	21.0	27.0	32	80.00
Biochemical Oxygen Demand (mg/L)	13.0	16.0	14.0	19.0	16.0	13.0	17.0	20.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.94	1.03	1.34	0.85	1.42	0.43	0.37	0.27	
PAHs (mg/L)	0.29	0.31	0.38	0.26	0.43	0.04	0.06	0.08	
BTEXs (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.15	0.0	
Salinity (ppt)	4.97	4.96	3.98	3.37	3.62	3.36	3.23	3.05	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	<1.00
Nickel	**1.22**	**1.13**	**1.04**	**1.15**	**1.22**	**1.13**	**1.11**	**1.14**	<1.00
Chromium	0.04	ND	0.01	ND	0.19	ND	0.24	ND	<1.00
Manganese	0.03	ND	ND	0.002	ND	0.01	ND	0.001	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainabiliti Limited 2021

Table 4.14b: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	Lekki 12	Ebute Ikorodu 1	Ebute Ikorodu 2	Ebute Ikorodu 3 Control	Baiyeku 2 Control	Baiyeku 3	Egbin 1	Egbin 2	FMENV Limit
Appearance	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	Colourless & Clear
Temperature (^{0}C)	30.4	29.5	29.5	29.5	29.9	29.9	30.2	31.0	
Conductivity µS/cm	30,700	67,400	68,200	71,700	47,500	42,500	34,700	34,500	
Turbidity (NTU)	1.24	11.0	6.94	6.36	6.89	488	2.03	4.11	
pH	7.38	7.28	7.33	7.61	7.78	7.70	7.80	7.82	6.0 – 9.0
Total Hardness (mg/L)	706.70	1,413.41	1,637.04	1,780.17	1,019.79	1,118.2	912.45	1,019	
Chloride (mg/L)	388.38	**8,080.36**	**855.76**	**954.50**	**668.15**	546.37	516.75	599.03	600.0
Sodium Chloride (mg/L)	640.83	13,332.60	1,412.01	1,574.93	1,102.45	901.51	852.63	988.40	
Total Solid (mg/L)	15,350.5	33,602.0	34,102.0	35,901.0	23,901.0	21,301.0	17,401.0	17,251.0	
Total Suspended Solid (mg/L)	0.5	2.0	2.0	1.0	1.0	10.	1.0	1.0	30.00
Total Dissolved Solid (mg/L)	**15,350.0**	**33,600.0**	**34,100.0**	**35,900.0**	**23,900.0**	**21,300.0**	**17,400.0**	**17,250.0**	2000.00
Phosphate (mg/L)	0.70	0.55	0.14	0.12	0.10	0.22	0.31	0.38	
Sulphate (mg/L)	12.59	11.66	12.31	18.30	26.19	13.20	10.50	9.76	
Nitrate (mg/L)	0.30	0.33	0.19	0.20	0.17	0.16	1.20	0.59	
Dissolved Oxygen (mg/L)	6.84	6.61	6.71	6.87	6.64	6.68	6.65	6.74	
Chemical Oxygen Demand (mg/L)	29.0	38.0	40.00	42.00	38.00	39.00	42.00	45.00	80.00
Biochemical Oxygen Demand (mg/L)	18.0	24.0	25.0	26.0	23.0	24.0	26.0	28.0	50.00
0il & Grease (mg/L)	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.78	0.39	1.34	0.53	0.81	0.63	1.22	1.56	
PAHs (mg/L)	0.10	0.03	0.22	0.06	0.19	0.17	0.09	0.60	
BTEXs (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.58	0.0	
Salinity (ppt)	3.30	6.73	6.98	6.93	5.03	4.46	3.90	3.86	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	**20.84**	ND	<1.00
Copper	0.01	0.01	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.02	0.01	0.02	0.04	0.03	0.02	0.02	0.02	<1.00
Nickel	**1.36**	**1.35**	**1.24**	**1.19**	**1.27**	**1.03**	**1.06**	**1.10**	<1.00
Chromium	ND	0.002	0.01	ND	ND	ND	ND	ND	<1.00
Manganese	ND	0.08	ND	0.02	0.002	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainabiliti Limited 2021

Table 4.14c: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	Egbin 3 Control	Ijede 1	Ijede 2 Control	Ijede 3	Onigedu Creek A	Onigedu Creek B Control	Onigedu Creek C	Aiyetoro Creek A	FMENV Limit
Appearance	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	33.4	32.2	31.4	30.4	28.9	29.0	29.9	30.6	
Conductivity µS/cm	31,400.0	30,700.0	32,600.0	38,500.0	13,170.0	17,320.0	35,100.0	40,900.0	
Turbidity (NTU)	3.43	8.80	3.10	3.54	20.0	17.9	12.1	16.4	
pH	7.79	7.85	7.87	7.88	7.01	6.94	6.94	7.0	6.0 – 9.0
Total Hardness (mg/L)	778.27	912.45	1,109.25	814.05	375.72	500.95	778.27	885.61	
Chloride (mg/L)	421.30	473.96	480.54	552.95	204.07	266.60	325.85	542.58	600.0
Sodium Chloride (mg/L)	695.14	782.03	792.90	912.37	9439.89	439.89	537.65	961.25	
Total Solid (mg/L)	15,811.5	15,362.0	16,311	19,241.2	6,585.0	8,664.0	1,258.5	20,405.0	
Total Suspended Solid (mg/L)	1.5	2.0	1.0	1.2	5.0	4.0	5.0	5.5	30.00
Total Dissolved Solid (mg/L)	**15,810.0**	**15,360.0**	**16,310.0**	**19,240.0**	**6,580.0**	**8,660.0**	**12,580**	**20,400**	2000.00
Phosphate (mg/L)	1.10	0.82	0.97	0.50	0.61	0.99	0.45	0.43	
Sulphate (mg/L)	22.10	19.65	18.32	14.11	15.0	16.92	14.21	19.30	
Nitrate (mg/L)	0.31	0.27	0.40	0.06	0.38	0.51	0.19	0.26	
Dissolved Oxygen (mg/L)	6.37	6.76	6.59	6.72	6.73	6.59	6.65	6.41	
Chemical Oxygen Demand (mg/L)	42.00	38.00	29.0	35.00	32.00	30.00	44.0	48.0	80.00
Biochemical Oxygen Demand (mg/L)	26.00	24.00	24.00	22.00	20.00	18.00	28.0	30.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.14	0.18	0.31	1.60	0.12	0.72	1.89	1.35	
PAHs (mg/L)	0.0	0.04	0.11	0.48	0.0	0.38	1.04	0.31	
BTEXs (mg/L)	0.0	0.0	0.0	0.27	0.0	0.15	0.69	0.17	
Salinity (ppt)	3.45	3.51	3.65	4.18	1.86	2.77	4.31	4.43	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.02	ND	0.03	0.03	0.01	0.01	0.02	0.03	<1.00
Nickel	**1.06**	**1.10**	0.90	0.95	0.76	0.76	0.76	0.85	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	0.01	ND	ND	0.08	0.04	0.30	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** Sustainabiliti Limited 2021

Table 4.14d: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	Ayetoro Creek B Control	Ayetoro Creek C	Idi Agbon Creek A	Idi Agbon Creek B Control	Idi Agbon Creek C	Igbe 2 Affa River	Igbe 3 Affa River	Igbe 4 Affa River	FMENV Limit
Appearance	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	31.2	30.0	31.2	32.0	31.2	30.7	30.4	29.8	
Conductivity µS/cm	40,800	42,000	45,400	42,300	42,000	169.2	156.4	155.5	
Turbidity (NTU)	10.8	10.3	51.0	5.32	7.54	33.7	13.5	16.3	
pH	7.07	6.93	7.03	6.80	6.84	6.90	6.9	6.90	6.0 – 9.0
Total Hardness (mg/L)	1,449.19	1,091.36	1,270.28	585.78	966.12	161.02	125.24	161.02	
Chloride (mg/L)	**6,023.0**	**628.66**	**5,364.97**	**625.36**	549.66	**947.92**	52.66	59.25	600.0
Sodium Chloride (mg/L)	9,938.35	1,037.28	8,852.0	1,031.85	906.94	15,464.07	86.89	97.75	
Total Solid (mg/L)	20,404.5	21,304.0	22,708.0	2,1202.0	21,002	130.0	118.0	118	
Total Suspended Solid (mg/L)	4.5	4.0	8.0	2.0	2.0	10.0	7.0	8.0	30.00
Total Dissolved Solid (mg/L)	**20,400**	**21,300**	**22,700**	**21,200**	**21,000**	120.0	111.0	110.0	2000.00
Phosphate (mg/L)	0.14	0.15	0.13	0.17	1.20	1.05	0.99	0.87	
Sulphate (mg/L)	17.0	15.0	11.0	18.0	22.71	19.05	18.31	14.30	
Nitrate (mg/L)	0.18	0.11	0.10	0.14	0.31	0.20	0.17	0.15	
Dissolved Oxygen (mg/L)	6.63	6.38	6.45	6.30	5.95	6.54	6.48	6.55	
Chemical Oxygen Demand (mg/L)	45.0	48.0	44.0	49.0	41.0	33.0	32.0	36.0	80.00
Biochemical Oxygen Demand (mg/L)	28.0	29.0	27.0	31.0	25.0	21.0	20.0	22.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	1.55	0.40	0.39	0.59	0.24	0.66	0.15	0.09	
PAHs (mg/L)	0.44	0.13	0.08	0.16	0.05	0.20	0.0	0.0	
BTEXs (mg/L)	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Salinity (ppt)	4.43	4.45	4.45	4.47	4.38	0.08	0.07	0.07	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	<1.00
Nickel	0.84	0.73	0.55	0.60	0.53	0.35	0.28	0.14	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	0.002	ND	ND	0.01	0.02	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.14e: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	Igbe 1 Affa River Control	Itamaga Stream	Erunwe Stream	Ogun River Isheri 1 Control	Ogun River Isheri 2	Ogun River Isheri 3	Ogun River Isheri 4	Ogun River Isheri 5	FMENV Limit
Appearance	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	39.6	30.2	31.0	33.4	30.2	35.1	35.3	34.9	
Conductivity µS/cm	144.0	389.0	498.0	920.0	1,122.0	873.0	876.0	1,141.0	
Turbidity (NTU)	21.55	96.1	20.2	355.0	255.0	68.4	73.7	111.0	
pH	6.80	7.1	7.2	7.0	7.2	7.4	7.6	7.5	6.0 – 9.0
Total Hardness (mg/L)	107.35	232.59	178.91	107.35	125.24	116.29	134.18	152.08	
Chloride (mg/L)	59.25	62.58	78.99	78.99	82.28	102.03	75.70	75.70	600.0
Sodium Chloride (mg/L)	97.75	103.19	130.34	130.34	135.77	168.35	124.91	124.91	
Total Solid (mg/L)	113.0	289.0	362.0	671.0	812.0	629.0	635.0	820.0	
Total Suspended Solid (mg/L)	10.0	13.0	8.0	18.0	15.0	9.0	10.0	12.0	30.00
Total Dissolved Solid (mg/L)	103.0	276.0	354.0	653.0	797.0	620.0	625.0	808.0	2000.00
Phosphate (mg/L)	1.16	1.09	1.15	0.95	1.10	3.05	2.90	2.02	
Sulphate (mg/L)	15.15	16.02	17.19	14.64	18.13	21.62	20.41	19.0	
Nitrate (mg/L)	0.18	0.20	0.47	0.41	0.46	1.17	1.10	0.91	
Dissolved Oxygen (mg/L)	6.64	6.68	6.43	6.54	6.41	6.10	6.34	6.50	
Chemical Oxygen Demand (mg/L)	35.0	51.0	54.0	39.0	42.0	56.0	54.0	51.0	80.00
Biochemical Oxygen Demand (mg/L)	21.0	32.0	38.0	24.0	26.0	35.0	34.0	31.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.28	0.14	0.16	1.49	1.68	0.41	0.18	0.21	
PAHs (mg/L)	0.07	0.02	0.05	0.37	0.44	0.12	0.0	0.15	
BTEXs (mg/L)	0.0	0.0	0.0	0.19	0.12	0.0	0.0	0.0	
Salinity (ppt)	0.07	0.18	0.23	0.43	0.53	0.41	0.41	0.54	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	<1.00
Nickel	0.14	0.20	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	0.01	0.02	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.14f: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	**Igbe 1 Affa River Control**	**Itamaga Stream**	**Erunwe Stream**	**Ogun River Isheri 1 Control**	**Ogun River Isheri 2**	**Ogun River Isheri 3**	**Ogun River Isheri 4**	**Ogun River Isheri 5**	**FMENV Limit**
Appearance	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	39.6	30.2	31.0	33.4	30.2	35.1	35.3	34.9	
Conductivity µS/cm	144.0	389.0	498.0	920.0	1,122.0	873.0	876.0	1,141.0	
Turbidity (NTU)	21.55	96.1	20.2	355.0	255.0	68.4	73.7	111.0	
pH	6.80	7.1	7.2	7.0	7.2	7.4	7.6	7.5	6.0 – 9.0
Total Hardness (mg/L)	107.35	232.59	178.91	107.35	125.24	116.29	134.18	152.08	
Chloride (mg/L)	59.25	62.58	78.99	78.99	82.28	102.03	75.70	75.70	600.0
Sodium Chloride (mg/L)	97.75	103.19	130.34	130.34	135.77	168.35	124.91	124.91	
Total Solid (mg/L)	113.0	289.0	362.0	671.0	812.0	629.0	635.0	820.0	
Total Suspended Solid (mg/L)	10.0	13.0	8.0	18.0	15.0	9.0	10.0	12.0	30.00
Total Dissolved Solid (mg/L)	103.0	276.0	354.0	653.0	797.0	620.0	625.0	808.0	2000.00
Phosphate (mg/L)	1.16	1.09	1.15	0.95	1.10	3.05	2.90	2.02	
Sulphate (mg/L)	15.15	16.02	17.19	14.64	18.13	21.62	20.41	19.0	
Nitrate (mg/L)	0.18	0.20	0.47	0.41	0.46	1.17	1.10	0.91	
Dissolved Oxygen (mg/L)	6.64	6.68	6.43	6.54	6.41	6.10	6.34	6.50	
Chemical Oxygen Demand (mg/L)	35.0	51.0	54.0	39.0	42.0	56.0	54.0	51.0	80.00
Biochemical Oxygen Demand (mg/L)	21.0	32.0	38.0	24.0	26.0	35.0	34.0	31.0	50.00
oil & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.28	0.14	0.16	1.49	1.68	0.41	0.18	0.21	
PAHs (mg/L)	0.07	0.02	0.05	0.37	0.44	0.12	0.0	0.15	
BTEXs (mg/L)	0.0	0.0	0.0	0.19	0.12	0.0	0.0	0.0	
Salinity (ppt)	0.07	0.18	0.23	0.43	0.53	0.41	0.41	0.54	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	<1.00
Nickel	0.14	0.20	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	0.01	0.02	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.14g: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Dry Season)

Parameters	Ogun River Isheri 6	Ogun River Isheri 7	FMENV Limit
Appearance	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	34.4	33.1	
Conductivity µS/cm	1,688.0	1,928.0	
Turbidity (NTU)	108.0	96.8	
pH	7.5	7.4	6.0 – 9.0
Total Hardness (mg/L)	214.69	214.69	
Chloride (mg/L)	95.45	**724.11**	600.0
Sodium Chloride (mg/L)	157.49	1,194.77	
Total Solid (mg/L)	1,212.0	1,380.0	
Total Suspended Solid (mg/L)	12.0	10.0	30.00
Total Dissolved Solid (mg/L)	**1,200.0**	**1,370.0**	2000.00
Phosphate (mg/L)	1.68	1.70	
Sulphate (mg/L)	16.08	17.19	
Nitrate (mg/L)	0.32	0.45	
Dissolved Oxygen (mg/L)	6.7	6.9	
Chemical Oxygen Demand (mg/L)	48.0	50.0	80.00
Biochemical Oxygen Demand (mg/L)	30.0	31.0	50.00
0il & Grease (mg/L)	0.0	0.0	10.00
TPH (mg/L)	0.33	0.64	
PAHs (mg/L)	0.09	0.17	
BTEXs (mg/L)	0.0	0.0	
Salinity (ppt)	0.81	0.93	
METALS (mg/L)			
Iron	ND	ND	20.00
Lead	ND	ND	<1.00
Copper	ND	ND	<1.00
Zinc	ND	ND	<1.00
Cadmium	0.01	0.01	<1.00
Nickel	ND	ND	<1.00
Chromium	ND	ND	<1.00
Manganese	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.15: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Ayetoro 1	Ayetoro 2	Ayetoro 3 Control	Bayeku 4 Fishing Community	Aiyetoro 5	Lekki 6	Lekki 7	Lekki 8	FMENV Limit
Appearance	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless & Clear
Temperature (^{0}C)	30.8	30.9	31.0	30.3	30.8	30.4	30.8	31.3	
Conductivity µS/cm	12600	12530	11820	17220	12270	10700	12400	12540	
Turbidity (NTU)	4.27	5.94	7.28	3.57	9.22	3.80	2.58	4.84	
pH	7.66	7.63	7.58	7.69	7.60	7.57	7.54	7.59	6.0 – 9.0
Total Hardness (mg/L)	518.84	626.19	590.41	626.19	465.17	617.25	545.68	402.56	
Chloride (mg/L)	**4212.98**	**4147.15**	**3620.53**	**5513.08**	**3528.25**	**3192.65**	**3982.58**	**3636.99**	600.0
Sodium Chloride (mg/L)	6951.42	6842.80	5973.87	9096.58	5838.10	5267.87	6571.26	6001.03	
Total Solid (mg/L)	8,952.0	8901.0	8391.8	12202.2	8711.5	7560.0	8800.0	8900.0	
Total Suspended Solid (mg/L)	2.0	1.0	1.8	2.2	1.5	0.0	0.0	0.0	30.00
Total Dissolved Solid (mg/L)	**8,950.0**	**8900.0**	**8390.0**	**12200.0**	**8710.0**	**7560.0**	**8800.0**	**8900.0**	2000.00
Phosphate (mg/L)	0.82	0.79	1.02	0.77	0.59	0.71	0.29	0.32	
Sulphate (mg/L)	14.10	13.98	48.6	15.5	14.37	11.04	14.80	13.60	
Nitrate (mg/L)	1.34	1.02	1.14	1.01	1.08	0.48	0.51	0.41	
Dissolved Oxygen (mg/L)	6.50	6.48	6.47	6.54	6.49	6.43	6.41	6.60	
Chemical Oxygen Demand (mg/L)	28.0	23.0	21.0	51.0	25.0	28.0	26.0	15.0	80.00
Biochemical Oxygen Demand (mg/L)	19.0	15.0	14.0	34.0	16.0	17.0	16.0	10.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.0	1.47	1.71	1.97	0.89	1.21	1.68	0.42	
PAHs (mg/L)	0.0	0.10	0.39	0.55	0.33	0.38	0.44	0.04	
BTEXs (mg/L)	0.27	0.35	0.22	0.34	0.0	0.0	0.0	0.0	
Salinity (ppt)	6.64	6.59	6.20	9.24	6.45	5.58	6.50	6.60	
METALS (mg/L)									
Iron	ND	ND	ND	ND	ND	ND	ND	0.03	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	ND	ND	0.02	0.01	0.02	ND	ND	ND	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.15a: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	**Lekki 9**	**Lekki 10**	**Lekki 11**	**Lekki 12 Control**	**Lekki 13 control**	**Lekki 14 control**	**Lekki 15**	**Lekki 16**	**FMENV Limit**
Appearance	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless and Clear	Colourless & Clear
Temperature (^{0}C)	32.0	31.7	31.0	32.4	33	32.9	33.3	33.9	
Conductivity µS/cm	9040	8970	12210	11610	10390	9960	10150	10530	
Turbidity (NTU)	2.86	4.47	6.21	4.08	2.94	4.83	2.90	3.34	
pH	7.55	7.55	7.61	7.69	7.78	7.64	7.79	7.78	6.0 – 9.0
Total Hardness (mg/L)	402.56	304.15	375.72	384.66	330.99	313.09	653.03	626.19	
Chloride (mg/L)	**2748.31**	**2731.85**	**3587.62**	**3686.36**	**2962.25**	**3028.08**	**3225.56**	**3093.91**	600.0
Sodium Chloride (mg/L)	4534.71	4507.56	5919.57	6082.49	4887.72	4996.33	5322.18	5104.95	
Total Solid (mg/L)	6420.0	6380.0	8670.0	8270.0	7300.0	7070.0	7210.0	7490.0	
Total Suspended Solid (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.00
Total Dissolved Solid (mg/L)	**6420.0**	**6380.0**	**8670.0**	**8270.0**	**7300.0**	**7070.0**	**7210.0**	**7490.0**	2000.00
Phosphate (mg/L)	0.53	0.41	0.30	0.44	4.06	1.12	0.35	0.48	
Sulphate (mg/L)	15.16	12.09	49.4	11.95	12.10	15.20	10.20	11.04	
Nitrate (mg/L)	0.43	0.58	1.97	0.36	5.02	1.31	0.42	0.33	
Dissolved Oxygen (mg/L)	6.39	6.44	6.43	6.34	6.36	6.33	6.22	6.19	
Chemical Oxygen Demand (mg/L)	19.0	26.0	28.0	31.0	24.0	23.0	26.0	34.0	80.00
Biochemical Oxygen Demand (mg/L)	12.0	17.0	18.0	19.0	15.0	14.0	16.0	21.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	1.40	2.11	0.83	0.92	1.37	0.31	0.44	0.31	
PAHs (mg/L)	0.48	0.57	0.29	0.31	0.29	0.01	0.02	0.12	
BTEXs (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.18	0.0	
Salinity (ppt)	4.67	4.64	6.41	6.05	5.38	5.18	5.27	5.50	
METALS (mg/L)									
Iron	0.01	ND	ND	ND	ND	0.66	0.68	0.93	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	ND	ND	ND	ND	ND	0.01	ND	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.15b: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Lekki 17	Ebute Ikorodu 18	Ebute Ikorodu 19	Ebute Ikorodu 20	Baiyeku 21	Baiyeku 22	Egbin 23	Egbin 24	FMENV Limit
Appearance	Colourless and Clear	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	**Slightly Turbid**	Colourless & Clear	Colourless & Clear	Colourless & Clear
Temperature (^{0}C)	32.9	30.9	30.6	30.7	30.6	30.9	30.2	30.4	
Conductivity µS/cm	11830	12270	12480	11920	13090	13940	9350	9390	
Turbidity (NTU)	4.29	6.72	10.1	6.96	70.5	5.75	5.17	3.97	
pH	7.72	7.44	7.45	7.36	7.58	7.64	7.50	7.54	6.0 – 9.0
Total Hardness (mg/L)	697.76	822.99	751.43	894.56	626.19	590.41	733.54	411.49	
Chloride (mg/L)	**3818.01**	**3554.70**	**4048.41**	**4048.41**	**3785.10**	**4147.15**	**2797.68**	**2863.51**	600.0
Sodium Chloride (mg/L)	6299.72	5865.26	6679.88	6679.88	6245.41	6842.80	4616.18	4724.79	
Total Solid (mg/L)	8420.0	8712.2	8862.4	8461.0	9303.0	9911.0	6640.0	6660.0	
Total Suspended Solid (mg/L)	0.0	2.2	2.4	1.0	3.0	1.0	0.0	0.0	30.00
Total Dissolved Solid (mg/L)	**8420.0**	**8710.0**	**8860.0**	**8460.0**	**9300.0**	**9910.0**	**6640.0**	**6660.0**	2000.00
Phosphate (mg/L)	0.61	0.48	0.12	0.15	0.16	0.25	0.37	0.41	
Sulphate (mg/L)	12.88	12.10	12.70	18.85	24.41	14.02	11.88	10.35	
Nitrate (mg/L)	1.17	0.71	1.04	0.77	0.33	0.50	1.29	1.22	
Dissolved Oxygen (mg/L)	6.24	6.32	6.39	6.42	6.44	6.53	6.87	6.83	
Chemical Oxygen Demand (mg/L)	32.0	40.0	44.00	43.00	40.00	41.00	39.00	41.00	80.00
Biochemical Oxygen Demand (mg/L)	21.0	26.0	28.0	27.0	25.0	26.0	25.0	27.0	50.00
0il & Grease (mg/L)	0.0	1.0	1.2	1.0	0.9	0.0	0.0	0.0	10.00
TPH (mg/L)	0.23	0.47	1.67	0.66	0.0	0.32	0.42	1.82	
PAHs (mg/L)	0.02	0.23	0.38	0.19	0.0	0.05	0.13	0.44	
BTEXs (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	
Salinity (ppt)	6.23	6.45	6.57	6.27	6.91	7.40	4.84	4.86	
METALS (mg/L)									
Iron	0.92	ND	ND	ND	0.95	0.57	ND	ND	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	0.09	ND	ND	ND	ND	0.04	ND	0.04	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	ND	ND	ND	ND	0.01	0.03	0.03	0.03	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.15c: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Egbin 25	Ijede 26	Ijede 27	Ijede 28	Onigedu Creek 29	Onigedu Creek 30	Onigedu Creek 31	Aiyetoro Creek 32	FMENV Limit
Appearance	Colourless & Clear	Colourless & Clear	Colourless & Clear	Colourless & Clear	**Turbid**	**Turbid**	**Slight Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	30.1	30	30.5	30.6	32.9	35.8	38.5	37.9	
Conductivity µS/cm	9540.0	8580.0	9010.0	9640.0	221.0	257.0	914.0	4560.0	
Turbidity (NTU)	7.0	3.35	5.23	6.14	10.9	11.8	10.2	16.0	
pH	7.56	7.57	7.57	7.62	7.07	6.90	6.90	6.65	6.0 – 9.0
Total Hardness (mg/L)	500.95	679.87	554.63	697.76	107.34	286.26	196.80	357.82	
Chloride (mg/L)	**2830.60**	**2731.85**	**2863.51**	**3044.54**	394.97	362.05	493.71	**1234.27**	600.0
Sodium Chloride (mg/L)	4670.48	4507.56	4724.79	5023.49	651.70	597.39	814.62	2036.55	
Total Solid (mg/L)	6770.0	6090.0	6390.0	6850.0	163.0	190.0	656.0	3294.6	
Total Suspended Solid (mg/L)	0.0	0.0	0.0	0.0	6.0	7.0	3.0	4.6	30.00
Total Dissolved Solid (mg/L)	**6770.0**	**6090.0**	**6390.0**	**6850.0**	157.0	183.0	653.0	**3290.0**	2000.00
Phosphate (mg/L)	0.01	0.71	0.90	0.45	0.44	0.40	0.37	0.36	
Sulphate (mg/L)	38.7	18.19	17.06	13.99	14.02	15.55	13.08	16.20	
Nitrate (mg/L)	1.14	0.59	0.68	0.22	0.59	0.61	0.46	0.58	
Dissolved Oxygen (mg/L)	6.78	6.69	6.71	6.66	6.17	5.91	5.68	5.73	
Chemical Oxygen Demand (mg/L)	37.00	39.00	37.00	38.00	34.00	28.00	42.0	46.0	80.00
Biochemical Oxygen Demand (mg/L)	23.00	25.00	22.00	24.00	23.00	18.00	26.0	28.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.56	0.28	0.39	1.51	0.84	0.96	1.77	1.47	
PAHs (mg/L)	0.25	0.11	0.16	0.37	0.18	0.29	0.44	0.43	
BTEXs (mg/L)	0.0	0.0	0.0	0.19	0.0	0.05	0.45	0.21	
Salinity (ppt)	3.45	4.43	4.66	5.01	0.10	0.12	0.43	2.35	
METALS (mg/L)									
Iron	ND	ND	ND	0.42	ND	3.06	0.54	0.17	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	0.14	0.23	0.27	0.41	0.19	0.22	0.15	0.39	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.03	0.03	0.02	0.04	0.05	0.05	0.05	0.05	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.15d: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Aiyetoro Creek 33	Aiyetoro Creek 34	Idi Agbon Creek 35	Idi Agbon Creek 36	Idi Agbon Creek 37	Igbe Affa River 38	Igbe Affa River 39	Igbe Affa River 40	FMENV Limit
Appearance	**Turbid**	**Slightly Turbid**	**Turbid**	**Turbid**	**Slightly Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	40.7	37.9	39.0	37.0	36.0	30.0	30.4	30.0	
Conductivity µS/cm	4880	6850	2460	2920	3190	406	399	386	
Turbidity (NTU)	15.7	16.0	23.3	19.9	17.9	72.0	130	83.2	
pH	6.96	6.91	7.04	6.90	7.06	7.16	7.07	7.03	6.0 – 9.0
Total Hardness (mg/L)	357.82	468.17	178.91	357.80	268.37	125.24	161.02	161.02	
Chloride (mg/L)	**1464.67**	**1892.55**	**757.02**	**954.50**	**954.50**	427.88	575.99	378.51	600.0
Sodium Chloride (mg/L)	2416.70	3122.71	1249.08	1574.93	1574.93	706.0	950.39	624.54	
Total Solid (mg/L)	3485.5	4883.0	1726.0	2072.2	2272.4	301.0	293.0	281.0	
Total Suspended Solid (mg/L)	5.5	3.0	6.0	2.2	2.4	12.0	10.0	7.0	30.00
Total Dissolved Solid (mg/L)	**3480**	**4880.0**	**1720.0**	**2070**	**2270.0**	289.0	283.0	274.0	2000.00
Phosphate (mg/L)	0.21	0.18	0.19	0.21	0.81	1.08	0.59	0.72	
Sulphate (mg/L)	16.8	14.79	12.25	18.8	19.40	19.63	17.04	15.06	
Nitrate (mg/L)	0.43	0.24	0.31	0.19	1.15	1.20	0.67	0.49	
Dissolved Oxygen (mg/L)	5.58	5.85	5.61	5.84	5.86	6.58	6.57	6.56	
Chemical Oxygen Demand (mg/L)	48.0	51.0	47.0	53.0	44.0	31.0	30.0	35.0	80.00
Biochemical Oxygen Demand (mg/L)	30.0	32.0	29.0	33.0	27.0	19.0	19.0	21.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	0.77	0.59	0.0	0.0	0.59	2.05	0.26	0.58	
PAHs (mg/L)	0.21	0.17	0.0	0.0	0.27	0.51	0.07	0.23	
BTEXs (mg/L)	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Salinity (ppt)	2.49	3.53	1.19	1.44	4.38	0.19	0.18	0.18	
METALS (mg/L)									
Iron	2.61	3.23	12.26	15.01	4.99	1.13	19.53	3.15	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	0.24	0.24	0.13	0.17	0.24	0.14	0.22	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.05	0.03	0.06	0.05	0.06	0.05	0.07	0.06	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

Table 4.15e: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Igbe Affa River 41	Itumaga Stream 42	Erunwe Stream 43	Ogun River Isheri 44	Ogun River Isheri 45	Ogun River Isheri 46	Ogun River Isheri 47	Oun River Isheri 48	FMENV Limit
Appearance	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	29.8	34.6	34.2	31.1	33.5	34.6	34.8	33.9	
Conductivity µS/cm	446.0	550.0	363.0	219.0	225.0	225.0	235.0	231.0	
Turbidity (NTU)	37.3	36.2	117	129.0	131.0	124.0	117.0	122.0	
pH	7.19	7.34	7.25	7.19	7.21	7.25	7.15	7.29	6.0 – 9.0
Total Hardness (mg/L)	178.91	286.26	178.91	107.35	304.15	71.56	125.24	107.35	
Chloride (mg/L)	362.05	394.97	78.99	**625.36**	**625.36**	**625.36**	**691.19**	**691.19**	600.0
Sodium Chloride (mg/L)	597.39	651.70	130.34	1031.85	1031.85	1031.85	1140.47	1140.47	
Total Solid (mg/L)	328.0	401.0	271.0	166.0	170.0	168.0	178.0	174.0	
Total Suspended Solid (mg/L)	11.0	11.0	14.0	10.0	10.0	8.0	11.0	10.0	30.00
Total Dissolved Solid (mg/L)	317.0	390.0	257.0	156.0	160.0	160.0	167.0	164.0	2000.00
Phosphate (mg/L)	1.10	0.34	0.90	0.80	0.91	0.01	1.30	0.86	
Sulphate (mg/L)	16.02	16.3	15.6	15.12	17.55	6.10	18.40	18.70	
Nitrate (mg/L)	1.39	3.28	5.13	1.21	1.38	4.49	1.61	1.05	
Dissolved Oxygen (mg/L)	6.63	6.64	6.75	6.19	6.08	6.09	6.08	6.10	
Chemical Oxygen Demand (mg/L)	34.0	49.0	50.0	32.0	36.0	55.0	51.0	49.0	80.00
Biochemical Oxygen Demand (mg/L)	20.0	30.0	31.0	20.0	23.0	34.0	32.0	30.0	50.00
0il & Grease (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.00
TPH (mg/L)	1.49	0.19	0.21	0.34	0.79	0.29	0.24	0.58	
PAHs (mg/L)	0.14	0.0	0.0	0.07	0.24	0.0	0.0	0.27	
BTEXs (mg/L)	0.0	0.0	0.0	0.0	0.27	0.0	0.0	0.0	
Salinity (ppt)	0.21	0.18	0.17	0.10	0.10	0.10	0.11	0.10	
METALS (mg/L)									
Iron	4.81	4.19	ND	3.33	3.16	4.52	14.47	4.43	20.00
Lead	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Copper	ND	0.22	0.27	0.31	0.28	0.40	0.39	0.39	<1.00
Zinc	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Cadmium	0.06	0.05	0.05	0.08	0.06	0.09	0.07	0.08	<1.00
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	<1.00
Manganese	ND	ND	ND	ND	ND	ND	ND	ND	5.00

Note : ND = Non – Detectable ; NS =Not Specified **Source :** JESL 2021

Table 4.15f: Physico-chemical Analysis Results of Surface Water Sample around the 4th Mainland Bridge Study Area (Wet Season)

Parameters	Ogun River Isheri 49	Ogun River Isheri 50	FMENV Limit
Appearance	**Turbid**	**Turbid**	Colourless & Clear
Temperature (^{0}C)	35.0	35.9	
Conductivity µS/cm	230.0	232.0	
Turbidity (NTU)	108.0	96.8	
pH	7.13	7.21	6.0 – 9.0
Total Hardness (mg/L)	143.13	268.37	
Chloride (mg/L)	559.94	460.79	600.0
Sodium Chloride (mg/L)	923.24	760.31	
Total Solid (mg/L)	172.0	174.4	
Total Suspended Solid (mg/L)	8.0	8.40	30.00
Total Dissolved Solid (mg/L)	164.0	166.0	2000.00
Phosphate (mg/L)	1.22	1.30	
Sulphate (mg/L)	15.54	16.39	
Nitrate (mg/L)	1.80	1.95	
Dissolved Oxygen (mg/L)	6.13	5.87	
Chemical Oxygen Demand (mg/L)	42.0	50.0	80.00
Biochemical Oxygen Demand (mg/L)	30.0	31.0	50.00
0il & Grease (mg/L)	0.0	0.0	10.00
TPH (mg/L)	0.0	0.32	
PAHs (mg/L)	0.0	0.18	
BTEXs (mg/L)	0.0	0.0	
Salinity (ppt)	0.10	0.11	
METALS (mg/L)			
Iron	2.99	2.77	20.00
Lead	ND	ND	<1.00
Copper	0.37	0.33	<1.00
Zinc	ND	ND	<1.00
Cadmium	0.07	0.09	<1.00
Nickel	ND	ND	<1.00
Chromium	ND	ND	<1.00
Manganese	ND	ND	5.00

Note: ND = Non – Detectable ; NS =Not Specified **Source:** JESL 2021

4.3.4.2 Microbial Analysis

Results of microbial analysis on surface and groundwater samples are presented in the tables below.

Table 4.16: Result of Microbiological Analysis of Underground Water Samples Around the 4th Mainland Bridge Study area (Dry season)

Sample Code	Sampling Coordinates	Total Heterotrophic Count (cfu/ml)	Total Coliform Count MPN (cfu/100ml)	Faecal Coliform	SON Standard NIS 554 :2015 Coliform Count	Organisms Isolated
Ayetoro (near Jetty)	N0562230 0723061	$2.0X10^2$	17	Nil	10	*Bacillus spp*
Ayetoro Community Control	N0561280 0723665	$7.0x10^1$	9	Nil	10	*Enterobacter spp*
Bayeku Community	N0561280 0724045	Nil	<2	Nil	10	No Growth
MTR Gardens, OPIC	N0543554 0734753	Nil	<2	Nil	10	No Growth
RCCG Isheri Riverview Estate	N0543547 0734965	Nil	<2	Nil	10	No Growth
Doregos Folarin Drive Isheri	N0545369 0733992	Nil	<2	Nil	10	No Growth
Fatgbems Filling Station OPIC	N0543540 0735202	$5.0x10^1$	2	Nil	10	*Enterobacter spp*
Sparklight Estate gate	N0543194 0735222	$7.0x10^1$	2	Nil	10	*Enterobacter spp*
Taiwo Street, Mawere Community	N0548731 0735449	$3.0x10^1$	<2	Nil	10	*Bacillus spp*
Mawere / Isheri Road	N0548708 0735548	$5.0x10^1$	<2	Nil	10	*Enterobacter spp*
Mawere Community GW 2	N0548648 0735512	Nil	<2	Nil	10	No Growth
Igbe Community (Control)	N0561938 0728403	$2.0x10^1$	4	Nil	10	*Bacillus spp*
Igbe Affa Community	N0561120 0728673	Nil	<2	Nil	10	No Growth
Sample Code	**Sampling Coordinates**	**Total Heterotrophic Count (cfu/ml)**	**Total Coliform Count MPN (cfu/100ml)**	**Faecal Coliform**	**SON Standard NIS 554 :2015 Coliform Count**	**Organisms Isolated**
Oluwafemi Avenue, Igbe Road	N0560910 0728935	Nil	<2	Nil	10	No Growth
Igbogbo/Agunfoye Community	N0561329 0727877	$2.0x10^1$	<2	Nil	10	*Enterobacter spp*

Agunfoye Community	N0561591 0727073	$2.0x10^1$	<2	Nil	10	*Enterobacter spp*
Ogunlewa Street Igbogbo (Control)	N0558236 0728699	$8.0x10^1$	9	Nil	10	*Enterobacter spp*
Lonex Garden Isheri	N0544686 0734272	$3.0x10^1$	<2	Nil	10	*Enterobacter spp*
Isheri / OPIC (Control)	N0543233 0734498	Nil	<2	Nil	10	No growth
Third gate Isheri	N0546229 0733796	$6.0x10^1$	6	Nil	10	*Enterobacter spp*
Wawa Bus Stop (Control)	N0545742 0739116	Nil	<2	Nil	10	No Growth
Arepo Community (Control)	N0546537 0740141	Nil	<2	Nil	10	No Growth
Elepe Laaga	N0561044 0729958	$5.0x10^1$	7	Nil	10	*Enterobacter spp*
Muyi Ogunowo Street, Elepe	N0560958 0730843	$5.0x10^1$	4	Nil	10	*Enterobacter spp*
Erunwe/Radio, Erinwe community	N0559589 0732199	$2.5x10^1$	7	Nil	10	*Enterobacter spp*
Erunwe Interchange	N0558834 0732888	$2.0x10^1$	2	Nil	10	*Bacillus spp*
Sample Code	**Sampling Coordinates**	**Total Heterotrophic Count (cfu/ml)**	**Total Coliform Count MPN (cfu/100ml)**	**Faecal Coliform**	**SON Standard NIS 554 :2015 Coliform Count**	**Organisms Isolated**
Erunwe / Itamaga Control	N0559679 0733317	$3.0x10^1$	7	Nil	10	*Enterobacter spp*
Sawmill, Itamaga	N0559679 0733317	$1.0x10^1$	2	Nil	10	*Enterobacter spp*
NASFAT Itamaga	N0559679 0733317	$3.0x10^1$	9	Nil	10	*Bacillus spp*
Laspotech Mini Mosque	N0558846 0733984	$4.0x10^1$	6	Nil	10	*Enterobacter spp*
Laspotech, Environmental School of Environmental Studies	N0557912 0733686	$5.0x10^1$	6	Nil	10	*Bacillus spp*
Laspotech Staff Quarters	N0557310 0734474	$2.0x10^1$	2	Nil	10	*Enterobacter spp*
Laspotech /Odogunyan Control	N0557483	$5.0x10^1$	6	Nil	10	*Enterobacter spp*

	0736423					
Modupe / Ishawo	N0552267 0736035	Nil	<2	Nil	10	No Growth
Ori-Okuta / Ishawo	N0553889 0736158	$7.0x10^1$	9	Nil	10	*Enterobacter spp*
Omo Jesu, Mawere Road, Tapa	N0549019 0736221	$2.0x10^1$	<2	Nil	10	*Enterobacter spp*
Ifelodun street, Tapa	N0549212 0735877	$3.5x10^1$	4	Nil	10	*Bacillus spp*
Mallo Filling Station, Agric (Control)	N0553317 0732174	$5.0x10^1$	2	Nil	10	*Bacillus spp*
Sample Code	**Sampling Coordinates**	**Total Heterotrophic Count (cfu/ml)**	**Total Coliform Count MPN (cfu/100ml)**	**Faecal Coliform**	**SON Standard NIS 554 :2015 Coliform Count**	**Organisms Isolated**
David Alaka / Sagamu Road	N0556412 0734072	Nil	<2	Nil	10	No Growth
Titus Street, Apeka / Sagamu Road	N0555579 0734526	<2	<2	<2	10	No growth
Abraham Adesanya / Ten Families Estate	N0564649 0715307	$5.0x10^1$	6	Nil	10	*Enterobacter spp*
Total Filling station/ Abraham Adesanya	N0565551 0715338	Nil	<2	Nil	10	No Growth
Nipco gas / Lagos-Epe express way (Control)	N0566533 0715590	Nil	<2	Nil	10	No Growth
Abraham Adesanya / Ogombo Road	N0564715 0714798	Nil	<2	Nil	10	No Growth
TCN Ajah Sub region	N0563135 0715133	Nil	<2	Nil	10	No Growth
Addo Road, Ajah	N0563555 0716792	$7.0x10^1$	9	Nil	10	*Enterobacter spp*
Langbasa Road, / Red house, Ajah (Control)	N0564585 0718527	$5.0x10^1$	7	Nil	10	*Enterobacter spp*
Oke-ira Kekere Bus stop	N0564354 0717756	$3.0x10^1$	9	Nil	10	*Bacillus spp*
Eyita Ojokoro Road	N0554829 0735319	$2.0x10^1$	<2	Nil	10	*Bacillus spp*
Sabo/Banuso (Control)	N0556081 0732607	$4.0x10^1$	4	Nil	10	*Enterobacter spp*

Note: <2 signifies No bacteria growth

Table 4.17: Result of Microbiological Analysis of Underground Water Samples Around the 4th Mainland Bridge Study area (Wet season)

Sample Code	Sampling Coordinates	Total Heterotrophic Count (cfu/ml)	Total Coliform Count MPN (cfu/100ml)	Faecal Coliform	SON Standard NIS 554 :2015 Coliform Count	Organisms Isolated
Ayetoro (near Jetty)	N0562230 0723061	4.0x102	11	Nil	10	Bacillus spp
Ayetoro Community Control	N0561280 0723665	5.0x101	2	Nil	10	Enterobacter spp
Bayeku Community	N0561280 0724045	3.0x101	<2	Nil	10	Enterobacter spp
MTR Gardens, OPIC	N0543554 0734753	3.0x102	4	Nil	10	Enterobacter spp
RCCG Isheri Riverview Estate	N0543547 0734965	5.0x102	6	Nil	10	Bacillus spp
Doregos Folarin Drive Isheri	N0545369 0733992	1.0x102	2	Nil	10	Bacillus spp
Fatgbems Filling Station OPIC	N0543540 0735202	6.0x101	<2	Nil	10	Enterobacter spp
Sparklight Estate gate	N0543194 0735222	3.0x101	<2	Nil	10	Bacillus spp
Taiwo Street, Mawere Community	N0548731 0735449	8.0x102	7	Nil	10	Bacillus spp
Mawere / Isheri Road	N0548708 0735548	4.0x102	4	Nil	10	Enterobacter spp
Mawere Community GW 2	N0548648 0735512	3.0x101	<2	Nil	10	Enterobacter spp
Igbe Community (Control)	N0561938 0728403	2.0x101	4	Nil	10	Bacillus spp
Igbe Affa Community	N0561120 0728673	3.0x101	6	Nil	10	Bacillus spp
Sample Code	Sampling Coordinates	Total Heterotrophic Count (cfu/ml)	Total Coliform Count MPN (cfu/100ml)	Faecal Coliform	SON Standard NIS 554 :2015 Coliform Count	Organisms Isolated
Oluwafemi Avenue, Igbe Road	N0560910 0728935	8.0x101	2	Nil	10	Bacillus spp
Igbogbo/Agunfoye Community	N0561329 0727877	5.0x101	<2	Nil	10	Bacillus spp
Agunfoye Community	N0561591	3.0x101	2	Nil	10	Enterobacter spp

	0727073					
Ogunlewa Street Igbogbo (Control)	N0558236 0728699	5.0x101	<2	Nil	10	Enterobacter spp
Lonex Garden Isheri	N0544686 0734272	1.0x102	2	Nil	10	Enterobacter spp
Isheri / OPIC (Control)	N0543233 0734498	Nil	<2	Nil	10	No growth
Third gate Isheri	N0546229 0733796	7.0x102	4	Nil	10	Enterobacter spp
Wawa Bus Stop (Control)	N0545742 0739116	Nil	<2	Nil	10	No Growth
Arepo Community (Control)	N0546537 0740141	9.0x102	4	Nil	10	Enterobacter spp
Elepe Laaga	N0561044 0729958	1.0x101	<2	Nil	10	Enterobacter spp
Muyi Ogunowo Street, Elepe	N0560958 0730843	2.0x102	2	Nil	10	Enterobacter spp
Erunwe/Radio, Erinwe community	N0559589 0732199	5.0x102	6	Nil	10	Enterobacter spp
Erunwe Interchange	N0558834 0732888	8.0x101	2	Nil	10	Bacillus spp
Sample Code	Sampling Coordinates	Total Heterotrophic Count (cfu/ml)	Total Coliform Count MPN (cfu/100ml)	Faecal Coliform	SON Standard NIS 554 :2015 Coliform Count	Organisms Isolated
Erunwe / Itamaga Control	N0559679 0733317	Nil	<2	Nil	10	No Growth
Sawmill, Itamaga	N0559679 0733317	2.0x102	6	Nil	10	Enterobacter spp
NASFAT Itamaga	N0559679 0733317	5.0x101	<2	Nil	10	Bacillus spp
Laspotech Mini Mosque	N0558846 0733984	4.0x101	4	Nil	10	Enterobacter spp
Laspotech, Environmental School of Environmental Studies	N0557912 0733686	2.0x102	7	Nil	10	Bacillus spp
Laspotech Staff Quarters	N0557310 0734474	3.0x102	2	Nil	10	Enterobacter spp
Laspotech /Odogunyan Control	N0557483 0736423	Nil	<2	Nil	10	No Growth

Modupe / Ishawo	N0552267 0736035	5.0x101	4	Nil	10	Enterobacter spp
Ori-Okuta / Ishawo	N0553889 0736158	Nil	<2	Nil	10	No Growth
Omo Jesu, Mawere Road, Tapa	N0549019 0736221	3.0x101	<2	Nil	10	Enterobacter spp
Ifelodun street, Tapa	N0549212 0735877	Nil	<2	Nil	10	No Growth
Mallo Filling Station, Agric (Control)	N0553317 0732174	Nil	<2	Nil	10	No Growth
Sample Code	Sampling Coordinates	Total Heterotrophic Count (cfu/ml)	Total Coliform Count MPN (cfu/100ml)	Faecal Coliform	SON Standard NIS 554 :2015 Coliform Count	Organisms Isolated
David Alaka / Sagamu Road	N0556412 0734072	2.0x102	2	Nil	10	Enterobacter spp
Titus Street, Apeka / Sagamu Road	N0555579 0734526	7.0x102	6	Nil	10	Enterobacter spp
Abraham Adesanya / Ten Families Estate	N0564649 0715307	3.0x102	<2	Nil	10	Enterobacter spp
Total Filling station/ Abraham Adesanya	N0565551 0715338	1.0x102	2	Nil	10	Enterobacter spp
Nipco gas / Lagos-Epe express way (Control)	N0566533 0715590	1.5x102	2	Nil	10	Enterobacter spp
Abraham Adesanya / Ogombo Road	N0564715 0714798	Nil	<2	Nil	10	No Growth
TCN Ajah Sub region	N0563135 0715133	5.0x101	<2	Nil	10	Bacillus spp
Addo Road, Ajah	N0563555 0716792	4.0x102	6	Nil	10	Enterobacter spp
Langbasa Road, / Red house, Ajah (Control)	N0564585 0718527	5.0 x 102	4	Nil	10	Enterobacter spp
Oke-ira Kekere Bus stop	N0564354 0717756	3.0x102	4	Nil	10	Bacillus spp
Eyita Ojokoro Road	N0554829 0735319	6.0x102	4	Nil	10	Bacillus spp
Sabo/Banuso (Control)	N0556081 0732607	1.5x102	2	Nil	10	Enterobacter spp

Table 4.18: Microbiological Analysis Result of Surface water samples Around the 4th Mainland Bridge Study Area (Dry Season)

Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard for Coliform Count	Comments
Ayetoro 1	N0562903 E0721466	2.0 x 102	Nil	17.0	7.0	40.0	Nil	Nil	5000	Enterobacter spp
Ayetoro 2	N0562566 E0722102	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Ayetoro 3 Control	N0562958 E0723140	3.0 x101	Nil	7.0	2.0	20.0	Nil	Nil	5000	Enterobacter spp
Bayeku Fishing Community	N0561550 E0722238	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Aiyetoro 5	N0562358 E0722782	4.0 x102	Nil	<2	-	-	Nil	Nil	5000	Enterobacter spp
Lekki 1	N0563615 E0717244	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Lekki 2	N0563766 E0717511	2.0 x101	Nil	<2	-	-	Nil	Nil	5000	Bacillus spp
Lekki 3	N0564032 E0718046	5.0 x101	Nil	<2	-	-	Nil	Nil	5000	Bacillus spp
Lekki 4	N0563389 E0719187	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Lekki 5	N0563120 E0718919	3.0 x101	Nil	2.0	1.0	10.0	Nil	Nil	5000	Enterobacter spp
Lekki 6	N0562577 E0718398	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Lekki 7 Control	N0562491 E0719322	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments
Lekki 8 control	N0562583 E0719743	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth

Lekki 9 control	N0563206 E0720213	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Lekki 10	N0562198 E0720905	4.0 x101	Nil	<2	-	-	Nil	Nil	5000	Bacillus spp
Lekki 11	N0562829 E0721443	3.0 x101	Nil	<2	-	-	Nil	Nil	5000	Bacillus spp
Lekki 12	N0563227 E0721563	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Ebute Ikorodu 1	N0552901 E0730036	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Ebute Ikorodu 2	N0552655 E0730336	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Ebute Ikorodu 3 Control	N0552845 E0729394	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Baiyeku 2 Control	N0559780 E0722389	5.0 x101	Nil	<2	-	-	Nil	Nil	5000	No growth
Baiyeku 3	N0560708 E0722481	2.0 x101	Nil	<2	-	-	Nil	Nil	5000	No growth
Egbin 1	N0567356 E0724874	Nil	Nil	<2	-	-	Nil	Nil	5000	No growth
Egbin 2	N0567025 E0724823	Nil		<2	-	-	Nil	Nil	5000	No growth
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments
Egbin 3 Control	N0567054 E0724512	Nil		<2	-	-	Nil	Nil	5000	No growth
Ijede 1	N0566294 E0724791	Nil		<2	-	-	Nil	Nil	5000	No growth
Ijede 2 control	N0565915 E0724989	Nil		<2	-	-	Nil	Nil	5000	No growth
Ijede 3	N0564858 E0724960	Nil		<2	-	-	Nil	Nil	5000	No growth

Baba Onigedu Creek A	N0563144 E0724774	Nil		<2	-	-	Nil	Nil	5000	No growth
Baba Onigedu Creek B Control	N0563238 E0724572	1.5x101		2.0	1.0	10.0	Nil	Nil	5000	Bacillus spp
Baba Onigedu Creek C	N0563404 E0724385	2.0x102		<2	-	-	Nil	Nil	5000	Bacillus spp
Baba Aiyetoro Creek A	N0562651 E0723375	Nil		<2	-	-	Nil	Nil	5000	No growth
Baba Aiyetoro Creek B Control	N0562762 E0723358	Nil		<2	-	-	Nil	Nil	5000	No growth
Baba Aiyetoro Creek C	N0562782 E0723262	Nil		<2	-	-	Nil	Nil	5000	No growth
Idi Agbon Creek A	N0562472 E0723146	Nil		<2	-	-	Nil	Nil	5000	No growth
Idi Agbon Creek B Control	N0562544 E0723106	Nil		<2	-	-	Nil	Nil	5000	No growth
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments
Idi Agbon Creek C	N0562552 E0723032	Nil		<2	-	-	Nil	Nil	5000	No growth
Igbe 2 Afa Stream	N0561448 E0728600	1.0 x 102		<2	-	-	Nil	Nil	5000	No growth
Igbe 3 Afa Stream	N0561490 E0728592	Nil		<2	-	-	Nil	Nil	5000	No growth
Igbe 4 Afa Stream	N0561476 E0728640	Nil		<2	-	-	Nil	Nil	5000	No growth
Igbe 1 Afa Stream	N0561414 E0728600	Nil		<2	-	-	Nil	Nil	5000	No growth

Itamaga	N0558863 E0732873	1.0 x102		2	1.0	10.0	Nil	Nil	5000	Bacillus spp
Erunwe	N0558887 E0732819	2.0 x101		<2	-	-	Nil	Nil	5000	Bacillus spp
Isheri river 1 Control	N0542799 E0735700	2.0 x101		2	1.0	10.0	Nil	Nil	5000	Bacillus spp
Isheri river 2	N0542571 E0735349	Nil		<2	-	-	Nil	Nil	5000	No Growth
Isheri river 3	N0542443 E0734946	Nil		<2	-	-	Nil	Nil	5000	No Growth
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard (Coliform Count)	Comments
Isheri river 4	N0541932 E0734764	Nil		<2	-	-	Nil	Nil	5000	No Growth
Isheri river 5	N0541999 E0734649	Nil		<2	-	-	Nil	Nil	5000	No Growth
Isheri river 6	N0542437 E0734444	Nil		<2	-	-	Nil	Nil	5000	No Growth
Isheri river 7	N0542455 E0734194	Nil		<2	-	-	Nil	Nil	5000	

Note: <2 signifies No bacteria grow

Table 4.19: Microbiological Analysis Result of Surface water samples Around the 4th Mainland Bridge Study Area (Wet Season)

Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard for Coliform Count	Comments
Ayetoro 1	N0562903 E0721466	1.0x101	Nil	<2	Nil	Nil	5000	Bacillus spp	1.0x101	Nil
Ayetoro 2	N0562566 E0722102	2.0x101	Nil	<2	Nil	Nil	5000	Bacillus spp	2.0x101	Nil
Ayetoro 3 Control	N0562958 E0723140	5.0x101	Nil	<2	Nil	Nil	5000	Enterobacter spp	5.0x101	Nil
Bayeku Fishing Community	N0561550 E0722238	1.0x102	Nil	2	Nil	Nil	5000	Enterobacter spp	1.0x102	Nil
Aiyetoro 5	N0562358 E0722782	1.0x102	Nil	2	Nil	Nil	5000	Enterobacter spp	1.0x102	Nil
Lekki 1	N0563615 E0717244	8.0x102	Nil	7	Nil	Nil	5000	Bacillus spp	8.0x102	Nil
Lekki 2	N0563766 E0717511	9.0x102	Nil	7	Nil	Nil	5000	Bacillus spp	9.0x102	Nil
Lekki 3	N0564032 E0718046	6.0x102	Nil	6	Nil	Nil	5000	Bacillus spp	6.0x102	Nil
Lekki 4	N0563389 E0719187	4.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	4.0x102	Nil
Lekki 5	N0563120 E0718919	5.0x102	Nil	<2	Nil	Nil	5000	Enterobacter spp	5.0x102	Nil
Lekki 6	N0562577 E0718398	5.0x102	Nil	<2	Nil	Nil	5000	Bacillus spp	5.0x102	Nil
Lekki 7 Control	N0562491 E0719322	1.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	1.0x102	Nil
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments

Lekki 8 control	N0562583 E0719743	9.0x102	Nil	6	Nil	Nil	5000	Enterobacter spp	9.0x102	Nil
Lekki 9 control	N0563206 E0720213	2.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	2.0x102	Nil
Lekki 10	N0562198 E0720905	2.0x102	Nil	<2	Nil	Nil	5000	Bacillus spp	2.0x102	Nil
Lekki 11	N0562829 E0721443	4.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	4.0x102	Nil
Lekki 12	N0563227 E0721563	8.0x102	Nil	7	Nil	Nil	5000	Enterobacter spp	8.0x102	Nil
Ebute Ikorodu 1	N0552901 E0730036	6.0x101	Nil	<2	Nil	Nil	5000	Bacillus spp	6.0x101	Nil
Ebute Ikorodu 2	N0552655 E0730336	1.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	1.0x102	Nil
Ebute Ikorodu 3 Control	N0552845 E0729394	1.5x102	Nil	<2	Nil	Nil	5000	Enterobacter spp	1.5x102	Nil
Baiyeku 2 Control	N0559780 E0722389	3.0x102	Nil	<2	Nil	Nil	5000	Bacillus spp	3.0x102	Nil
Baiyeku 3	N0560708 E0722481	1.0x102	Nil	<2	Nil	Nil	5000	Bacillus spp	1.0x102	Nil
Egbin 1	N0567356 E0724874	6.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	6.0x102	Nil
Egbin 2	N0567025 E0724823	7.0x102	Nil	4	Nil	Nil	5000	Enterobacter spp	7.0x102	Nil
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments
Egbin 3 Control	N0567054 E0724512	2.0x102	Nil	<2	Nil	Nil	5000	Enterobacter spp	2.0x102	Nil
Ijede 1	N0566294 E0724791	1.2x102	Nil	4	Nil	Nil	5000	Enterobacter spp	1.2x102	Nil

Ijede 2 control	N0565915 E0724989	1.5x102	Nil	<2	Nil	Nil	5000	Bacillus spp	1.5x102	Nil
Ijede 3	N0564858 E0724960	1.0x102	Nil	<2	Nil	Nil	5000	Enterobacter spp	1.0x102	Nil
Baba Onigedu Creek A	N0563144 E0724774	5.0x102	Nil	7	Nil	Nil	5000	Bacillus spp	5.0x102	Nil
Baba Onigedu Creek B Control	N0563238 E0724572	5.0x101	Nil	<2	Nil	Nil	5000	Bacillus spp	5.0x101	Nil
Baba Onigedu Creek C	N0563404 E0724385	2.0x101	Nil	2	Nil	Nil	5000	Bacillus spp	2.0x101	Nil
Baba Aiyetoro Creek A	N0562651 E0723375	1.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	1.0x102	Nil
Baba Aiyetoro Creek B Control	N0562762 E0723358	1.5x102	Nil	2	Nil	Nil	5000	Bacillus spp	1.5x102	Nil
Baba Aiyetoro Creek C	N0562782 E0723262	1.0x102	Nil	<2	Nil	Nil	5000	Enterobacter spp	1.0x102	Nil
Idi Agbon Creek A	N0562472 E0723146	1.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	1.0x102	Nil
Idi Agbon Creek B Control	N0562544 E0723106	3.0x101	Nil	2	Nil	Nil	5000	Bacillus spp	3.0x101	Nil
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard Coliform Count	Comments
Idi Agbon Creek C	N0562552 E0723032	5.0x101	Nil	<2	Nil	Nil	5000	Bacillus spp	5.0x101	Nil
Igbe 2 Afa Stream	N0561448 E0728600	8.0x102	Nil	4	Nil	Nil	5000	Bacillus spp	8.0x102	Nil
Igbe 3 Afa Stream	N0561490 E0728592	5.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	5.0x102	Nil
Igbe 4 Afa Stream	N0561476 E0728640	3.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	3.0x102	Nil

Igbe 1 Afa Stream	N0561414 E0728600	2.5x102	Nil	4	Nil	Nil	5000	Bacillus spp	2.5x102	Nil
Itamaga	N0558863 E0732873	7.0x102	Nil	17	Nil	Nil	5000	Bacillus spp	7.0x102	Nil
Erunwe	N0558887 E0732819	4.0x101	Nil	4	Nil	Nil	5000	Bacillus spp	4.0x101	Nil
Isheri river 1 Control	N0542799 E0735700	3.0x101	Nil	7	Nil	Nil	5000	Enterobacter spp	3.0x101	Nil
Isheri river 2	N0542571 E0735349	5.0x102	Nil	4	Nil	Nil	5000	Enterobacter spp	5.0x102	Nil
Isheri river 3	N0542443 E0734946	6.0x101	Nil	2	Nil	Nil	5000	Bacillus spp	6.0x101	Nil
Sample Code	Sampling Coordinates	Heterotrophic Bacteria Count (cfu/ml)	Faecal Coliform (cfu/ml)	Coliform Count (MPN /100ml)	Lower Limit	Upper Limit	Hydrocarbon Utilizing Bacteria (cfu/ml)	Hydrocarbon Utilizing Fungi (cfu/ml)	NESREA Standard (Coliform Count)	Comments
Isheri river 4	N0541932 E0734764	3.0x101	Nil	2	Nil	Nil	5000	Bacillus spp	3.0x101	Nil
Isheri river 5	N0541999 E0734649	2.0x102	Nil	2	Nil .	Nil	5000	Bacillus spp	2.0x102	Nil
Isheri river 6	N0542437 E0734444	3.0x101	Nil	4	Nil	Nil	5000	Bacillus spp	3.0x101	Nil
Isheri river 7	N0542455 E0734194	2.0x102	Nil	2	Nil	Nil	5000	Bacillus spp	2.0x102	Nil

Note: <2 signifies No bacteria grow

4.3.4.3 Discussions of Results on Water Quality Analyses

The results obtained for the physical and chemical parameters of 4th Mainland Bridge Project, Lagos Underground water samples showed that parameters such as pH (SON Limit 6.5 – 8.5), turbidity (SON Limit 5.0 NTU), total dissolved solids (SON Limit 500 mg/L), chloride (SON Limit 250 mg/L), total hardness (SON Limit 150 mg/L), Iron (SON Limit 0.3 mg/L), Manganese (SON Limit 0.2 mg/L) and Lead (SON Limit 0.01 mg/L) were not within permissible limit of Standard Organization of Nigeria (SON) Limit for drinking water in some of the sampled locations. The potential reason for the observed deviation could be attributed to factor such as disturbance of the sediment bed and saline nature of the underground water.

The results obtained for the physical and chemical parameters of 4th Mainland Bridge Project, surface water samples showed that all the parameters were below the maximum permissible limit of Federal Ministry of Environment Limits except for slightly turbid appearance and turbid appearance (FMEnv Limit Colourless and Clear) in some locations; total dissolved solids (FMEnv Limit 2000 mg/L) and chloride (FMEnv Limit 600 mg/L) in some of the locations which did not comply with Federal Ministry of Environment Limits.
High Total Coliform Count was detected at some of the Surface water samples obtained during the Environmental Impact Assessment (ESIA) exercise. Coliform count in water samples can be treated using chlorination, it is essential that chlorine demand of water be determined prior to dosing, so as to avoid possibility of over dosing or under dosing of chlorine which consequently may result into residual chlorine.

The industrial activities along and around the coastal area could be a contributing factor to the pollution indicating parameters of the Lagoon water. These need to be taken care of since accumulation of the pollutants over time will have bioaccumulation effects on the aquatic habitat and by large the overall ecosystem. Wastewater treatment is a vital component in any community without which water-borne pathogens can spread resulting in diseases and degradation of receiving water bodies.

High Coliform Count was detected at some of the Ground water samples obtained during the ESIA exercise. The organism isolated are mostly non-fecal coliforms such as *Enterobacter spp* and *Bacillus spp* while fecal coliforms which could be pathogenic were not detected. Coliform count in water samples can be treated using chlorination. However, it is essential that chlorine demand of water be determined prior to dosing, so as to avoid possibility of over dosing or under dosing of chlorine which consequently may result into residual chlorine.

4.3.5 Hydrobiology and Fisheries

Phytoplankton: The phytoplankton assemblage of 4MB water bodies consisted of species previously reported for other Nigerian waters (Opute, 1991; Nwankwo, 1995; Jeje and Sowunmi, 2001; Yakub *et al*, 2011, 2013; Onyema, 2008; 2013). The assemblage were all freshwater species this is because the Lekki lagoon, R. Ogun and associated water bodies are fresh (Emmanuel 2010; Adesalu and Nwankwo, 2012). The prevailing physical, chemical and biological conditions of the Lagoons of Southwest Nigeria, is determined largely by salinity which closely associated with tidal and seasonal changes (Olaniyan, 1969; Amadi 1990) and salinity penetration into Lekki viba these processes had been reported by Badejo *et al*. (2014)

be not pronounced. In addition, *Oscillatoria* sp. (blue-green algae), *Melosira sp, Nitzchia sp*. and *Closterium* sp. (desmids) have been associated with polluted water bodies in Nigeria (Kelly and Alli, 1973; Jeje and Sowunmi, 2001) and rated by Palmer (1969) and Willén (2000) as indicators. Adesalu and Nwankwo, (2012) reported these genera from Lekki Lagoon and associated each with certain degree of organic pollution. This was perhaps not totally out of place considering the prevailing condition as suggested by Tables10 and 11. Dominance of algal abundance by blue-green algae is a definitive feature of water bodies with external nutrient inputs (Pearl, 1995, Willén, 2000, Jeje and Sowunmi, 2001). The high abundance of blue-green and green algae was a response to regular and high supply of nutrients that supports algal bloom. Considerable proportion phytoplankton identified have been associated with nutrient-rich water bodies (Kelly and Alli, 1973; Pearl, 1995; Willén, 2000; Jeje and Sowunmi, 2001) and eventually pollution.

Zooplankton: The diversity, richness and abundance of zooplankton is greatly reduced in comparison with previous reports on Nigerian water bodies. The zooplankton assemblage was largely similar to previous reports from Nigerian coastal waters (Opute 1991; Egborge 1994) or lagoons of southwest Nigeria (Lawal-Are *et al*., 2009; Nkwoji, *et al*., 2010; Onyema 2013; Yakub *et al*., 2016). The zooplankton reported in this study were largely associated with freshwater or low salinity (Opute,1991; Onyema 2013) as observed in the prevailing moderate salinity (Table 6) during study. In addition, the inadequacy of phytoplankton of high nutritional value (Pearl, 1995) due to dominance by blue-green algae observed also contributed. *Arcella vulgaris, Phacus spp Euglena acus*. (Protozoan) and *Brachionus anguillaris, B.c. calyciflorus. Notholca.* (rotifer) have been previously associated with certain degree of pollution from several water bodies (Kelly and Alli, 1973; Sládeček, 1973; Pearl, 1995; Willén, 2000; Jeje and Sowunmi, 2001). The associated niche of decomposers with protozoans, makes it possible for protozoan to survive environment rich in organic content, condition mainly associated with pollution.

Plankton are the natural food organisms for numerous aquatic organisms with fin- and shell-fishes being the most familiar. In addition, the activities of plankton forms the foundation that drives the ecosystem services needed to support the quality and sustenance of life. Live foods are able to swim in water column and are constantly available to finfish and shellfish larvae in nature feed as small phytoplanktonic and zooplanktonic organisms. Providing appropriate live food at proper time play a major role in achieving maximum growth and survival of the young ones of finfish and shellfish, and by extension fisheries on which economic well-being of numerous fisherfolks depends. Steady decline in health and quality been reported in lagoons of Southwest Nigeria by Akpata and Ekundayo (1978), Ajao (1996), Chukwu and Nwankwo (2003), Don-Pedro *et al*., (2004), Nubi *et al*., (2008), Nkwoji (2010), Amaeze *et al.*, (2012); Onyema (2013), Ajani and Balogun, (2015).

Benthos: The diversity and density of benthic fauna from Lekki Lagoon was dominated by molluscs, which is similar to previous reports from the lagoons in Southwest Nigeria (Ajao and Fagade, 1990; Ajao, 1996; 2002; Nkwoji *et al*., 2010; Nkwoji and Igbo, 2010; Balogun *et al*., 2011).

Fish and Fisheries: The ichthyofauna from this study is lower than those reported by King (1996), Emmanuel (2010) and Emmanuel and Osibona (2013). The assemblage is however comparable despite the time between studies. The present area of study is presently accommodating increasing active human activities results of which agreed with observation of Amaeze *et al*., (2012) and Thomas and Ogunnowo (2017) but not limited to: drop in water quality, disturbed breeding and feeding grounds, particularly high turbidity, fish mortality, damages to fishing gear, increased fishing range and relocation of fisherfolks. The observation reported here can therefore be acceptable as fairly representative. The diversity in sizes of fish collected was an indication of its ability to support maximum fish growth possible, irrespective of species. The health of fishes could therefore be a reflection of disruption in homeostasis by drop in water quality of 4MB catchment water bodies which necessitated reallocation of resources from growth and reproduction (Wendelaar-Bonga, 1997; Hoque *et al*., 1998). The present physical and chemical condition of the Lagoon (Tables 4.47 and 4.48) is moderately conducive for aquatic life.

Specific conclusions:

1. The proposed 4MB catchment is located within one of Lagoons of Southwest Nigeria known as Lekki Lagoon and R. Ogun one of the major rivers of Southwest Nigeria
2. All the water bodies under consideration are at present experiencing increasing disturbance with all activities presently associated with the waters; in addition to water quality deficits.
3. The proponent will be advised to undertake environmental evaluations to define additional inputs from the project.
4. Best practices should be enforced.

4.3.6 Soil and Land Use

The aerial map or imageries of the proposed route for the bridge indicates that the selected route passes mostly through the existing freshwater swamp areas of the adjoining settlements/towns. Typically, freshwater swamp areas are intentionally reserved for nature conservation and are often left undeveloped except in some places where such areas are used for Peri-Urban agriculture (mainly aquaculture/fish and dry season crops' farming).

In general, soils along the route are mostly peaty, containing varying amounts of fine sand, silt and clay. Thus, the soils are soft, poorly drained with surface abundant organic materials thus physically aggressive with high potential for subsidence. The very low to low bulk density values recorded are typical of peaty soils while the fibrous nature of the surface organic materials accounted for the high porosity of the top 0 – 30 cm of the soils. Seasonal variations in the particle size distribution of the soils are not significantly different, and both the top and subsoils are highly homogeneous in regards to sand, silt and clay particles distribution with seasons. Results are shown in tables below.

Table 4.20: Soil Sampling Locations, Morphological Characteristics and Sampling Environment (Dry & Wet Seasons)

Sampling Location/Coordinates	**Soil Colour**				**Sampling Environment/ Surrounding Land Cover**
	Topsoil (0 – 15cm)		**Subsoil (15 – 30cm)**		
	Munsell Notation	**Colour Name**	**Munsell Notation**	**Colour Name**	

Ayetoro Jetty: 06 32 26.1N 003 33 50.5E	10YR 5/1	Gray	10YR 5/2	Gray	Floodplain of Lagos Lagoon. Mostly peaty moist soils with *Typha* sp., *Paspalum* sp., and *Dalbergia* sp. Ground water table less than 30cm. Essentially a wet land
Ayetoro Control-1 06 32 32.9N 003 33 25.9E	10YR 2/1	Black	10YR 2/1	Black	Fresh water swamp with mostly *Typha* sp. and *Acrostichum aureum.* Peaty soils with groundwater table less than 20cm
Bayeku-1 06 33 02.1N 003 33 12.7E	2.5 YR 2.5/1	Reddish black	2.5 YR 2.5/1	Reddish black	Freshwater swamp forest containing mostly *Raffia hookeri* and *Elias guinensis* and other freshwater associated plants. Typical wetland
Igbogbo-1: 06 25 28.0 N 003 33 13.5E	2.5YR 3/3	Dark reddish brown	2.5YR 3/3	Dark reddish brown	Typical freshwater swamp forest with Peaty Soils. Major plants are *Raphia hookeri*, grasses, sedges and ferns
Igbogbo-2 (Prosperity Estate within Elumo Igbogbo): 06 35 18.0 N 003 33 19.7 E	10YR 2/1	Black	10YR 2/1	Black	Flooded Freshwater swamp forest with Peaty Soils. Most plants are Few *Raffia hookeri* and Ferrn
Igbogbo -3: 06 35 08.7 N 003 33 20.2 E	10YR 2/1	Black	10YR 2/1	Black	Peaty soils within moist to wet freshwater swamp forest. *Alcohnea cordifolia* and ferns mostly
Igbogbo Control -1 06 34 52.7 N 003 33 17.1 E	2.5 YR 4/6	Red	2.5 YR 4/6	Red	Mosaic of fallow, farmland and patches of freshwater swamp forest. Soils are brownish to red due to overburden of washed in brown soils from the upland
Igbogbo – 4: 06 34 47.0 N 003 33 23.7 E	5YR 2.5/1	Black	5YR 2.5/1	Black	Freshwater swamp forest peaty soils with mostly *Raphia hookeri*, Ferns and *Alcohornea cordifolia*
Igbogbo -5 (Iretu Agunfoye) 06 34 09.6 N 003 33 38.8 E	7.5YR 2.5/1	Black	7.5YR 2.5/1	Black	Freshwater swamp forest with *Raphia hookeri* and ferns. Typically, peaty soils.
Igbogbo -6: 06 33 11.1 N 003 33 40.4 E	5YR 2.5/1	Black	5YR 2.5/1	Black	Peaty Soils in freshwater swamp forest. Plants are mostly *R.hookeri* and associated plants
Bayeku Control-1: 06 33 25.5 N 003 32 51.3 E	5YR 3/2	Dark reddish brown	5YR 3/1	Very dark gray	Riparian forest along a tributary draining into the freshwater swamp forest along the main Route for the proposed 4th Mainland Bridge. Major plants are *R. hookeri*, oil palms, and Bamboo.
Igbogbo – 7: Oloja LCDA 06 35 06.6 N 003 33 35.6 E	5YR 2.5/1	Black	5YR 2.5/1	Black	Freshwater swamp forest with *Raphia hookeri*, Oil palm, Fish Ponds, Plantain and Ferns
Igbogbo-8: Alagemo Fish Pond 06 34 41.0N 003 33 38.9 E	10YR 3/1	Very dark gray	10YR 3/1	Very dark gray	Freshwater water swamp with Bamboo and cassava at the upland area. Harvesting of Cat Fish was on-going as at the time of field sampling
Igbogbo-9: 06 35 09.1 N 003 33 31.6 E	10YR 3/1	Very dark gray	10YR 3/1	Very dark gray	Freshwater swamp with mineral, moist to wet soils with *Asphilia* sp., *Alcohornea cordifolia* and oil palm

Igbogbo-10: Elepe Community 06 36 07.9 N 003 33 04.3 E	5YR 2.5/1	Black	5YR 2.5/1	Black	Plantain Plantation with large scale Poultry Farm. Dark mineral soils within the RoW of the proposed bridge
Igbogbo-11: 06 36 40.5 N 003 33 02.0 E	2.5YR 2.5/1	Reddish blabk	5YR 2.5/1	Black	Newly opened up freshwater swamp forest with maize, leafy vegetables and young Plantain plants
Igbogbo-12: Egbeyemi Idi-Iroko 06 37 25.3 N 003 32 29.7 E	7.5YR 3/3	Dark brown	7.5YR 3/3	Dark brown	Freshwater swamp forest with *Alcohornea cordifolia*, ferns, and *R.hookeri*
Igbogbo-13: Ita Maga (Radio/Car wash) 06 37 46.7 N 003 31 56.8 E	10R 4/4	Red	2.5YR 5/6	Red	Within the built – up area of Ikorodu. Gas filling plant is close to the sampling point.
4MB -14: Within Lagos State Poly 06 38 05.9 N 003 31 27.4 E	7.5YR 3/2	Dark brown	7.5YR 3/3	Dark brown	Within the Teaching and Research Farm Area. Here, 132 KV Transmission Line crosses the proposed bridge
4MB-15: Oke-Gbegun, Sagamu Road 06 38 05.9 N 003 31 27.4 E	10YR 7/4	Very Pale Brown	10YR 7/4	Very Pale Brown	Built up area of Ikorodu.
4MB-16: Built up area. 06 38 05.9 N 003 31 27.4 E	7.5YR 3/3	Dark brown	7.5YR 3/3	Dark brown	Swampy part of the built up area
4MB-17: Sosanya Street, Off CAC Agbeye 06 39 00.1N 003 29 51.7 E	2.5Y 4/1	Dark gray	2.5Y 4/1	Dark gray	Freshwater swamp forest deeply flooded as at the time of field investigations.
4MB-18: 06 39 26.1 N 003 29 30.0 E	10YR 3/1	Very dark gray	10YR 3/1	Very dark gray	Freshwater swamp forest with *Raphia hookeri*, *Alcohornea cordifolia*, grasses and sedges and few stands of Oil Palm. SOCAM Church closed-by. Poorly drained peaty soils.
4MB-19: Ori-Okuta Estate 06 39 33.5 N 003 29 04.2 E	5YR 3/3	Dark reddish brown	5YR 3/3	Dark reddish brown	Freshwater swamp forest with *Raphia hookeri*, *Alcohornea cordifolia*, grasses and sedges and few stands of Oil Palm, Okra, and Leafy vegetables
4MB-20: Agbede Road 06 39 33.6 N 003 28 34.6 E	7.5YR 3/2	Dark brown	7.5YR 4/3	Brown	Within built up area of the Freshwater swamp forest. An existing bridge passes across the proposed bridge. Maize, Pawpaw, Leaf vegetables and Plantain around sampling point.
4MB-21: Ishawo Area of Influence of the Project 06 39 40.8 N 003 28 16.6 E	7.5 YR 2.5/1	Very dark brown	7.5 YR 2.5/1	Very dark brown	Wide inland valley with freshwater swamp forest off the route but drains into the route. Oil palm, Pawpaw, Cacao and few other arable crops around the sampling point.
4MB-22: 06 39 30.5 N 003 28 08.6 E	10YR 2.5/1	Black	10YR 2.5/1	Black	Peaty Soils with Freshwater swamp forest with *Raphia hookeri*, *Alcohornea cordifolia*, grasses and sedges and few

					stands of Oil Palm, Maize plot and Two Wooden Constructed Churches around the sampling point
4MB-23: End of Accessible Land Area within Lagos State 06 39 05.3 N 003 27 28.9 E	10YR 4/4	Dark yellowish brown	10YR 5/6	Yellowish brown	Flat, lowland rainforest area with very plastic, very sticky, hard (dried) Clayey soils in annually flooded terrain supporting grasses and sedges, heavily grazed land area
4MB-24: Beginning of the Accessible Ogun State end of the Bridge 06 38 26.4 N 003 25 54.1 E	10YR 3/1	Very dark gray	10YR 3/1	Very dark gray	Flat, lowland rainforest area with very plastic, very sticky, hard (dried) Clayey soils in annually flooded terrain supporting grasses and sedges, heavily grazed land area
4MB-25: 06 38 25.7 N 003 25 22.6 E	10YR 4/1	Dark gray	10YR 4/1	Dark gray	Flat, lowland rainforest area with very plastic, very sticky, hard (dried) Clayey soils in annually flooded terrain supporting grasses and sedges, heavily grazed land area
4MB-26: 06 38 25.3 N 003 24 52.8 E	5YR 5/2	Olive gray	5YR 5/2	Olive gray	Flat, lowland rainforest area with very plastic, very sticky, hard (dried) Clayey soils in annually flooded terrain supporting grasses and sedges, heavily grazed land area
4MB-27: Point of inflection of the bridge within Isheri Estate 06 38 25.0 N 003 24 14.6 E	7.5YR 3/2	Dark brown	7.5YR 3/2	Dark brown	Flat, lowland rainforest area with very plastic, very sticky, hard (dried) Clayey soils in annually flooded terrain supporting grasses and sedges, heavily grazed land area
4MB-28: Within Built up area of Isheri Estate 06 38 43.6 N 003 23 59.4 E	10YR 4/4	Dark yellowish brown	10YR 4/4	Dark yellowish brown	Marshland, deeply flooded as at the time of field investigation. Typha sp. predominant. Sampling point is surrounded by built up areas in the estate
4MB-29: Interchange with Lagos-Ibadan expressway. 06 39 05.4 N 003 23 35.0 E	5YR 3/1	Very dark gray	10YR 4/6	Red	An area with predominantly commercial/ vehicular activities.
4MB-30: Ajah Lagoon End of the Bridge 06 29 21.5 N 003 34 42.0 E	7.5YR 5/6	Strong brown	7.5YR 5/6	Strong brown	Along the Lagoon Shoreline are Woody houses supported by woody stands. A church under construction is closed-by to the sampling point
4MB-31: Just Outside of Divine Home Estate in Ajah along a drainage canal 06 28 41.2 N 003 34 54.1 E	5Y 6/1	Gray	10YR 7/4	Very pale brown	A drainage Canal is closed-by which is parallel and lies within the RoW of the proposed bridge
4MB-32: Landing point of the bridge by Abraham Adesanya Estate. 06 28 09.8 N 003 35 07.3 E	10YR 4/2	Dark grayish brown	10YR 4/2	Dark grayish brown	Built up area marking the beginning of the bridge by an Estate. The area is a busy Roads' junction

4MB-33: Control Point Along Ogogo Road, Ajah 06 27 49.9 N 003 35 07.2 E	10YR 5/4	Yellowish brown	10YR 5/4	Yellowish brown	Undeveloped parcel of land along Ogogo Road in Ajah about 500m away from the end of the bridge
4MB-34: Control Point along Ajah - Epe Road 06 28 26.0N 003 35 57.7 E	10YR 5/4	Yellowish brown	10YR 5/4	Yellowish brown	Within an Horticultural Nursery garden along Ajah – Epe Road just before the Lagos Business School
4MB-35: Control Point along the route of the bridge within Ajah 06 28 36.0 N 003 35 00.00 E	2.5YR 5/2	Weak red	2.5YR 5/2	Weak red	Freshwater swamp close to Abraham Adesanya Estate in Ajah
4MB-36: Oke Ira Jetty, Another Control Point 06 29 23.8 N 003 34 47.5 E	7.5 YR 3/2	Dark brown	7.5 YR 3/2	Dark brown	Oke-Ira Jetty is situated in Ajah.

Table 4.21: Statistical Summary of the Physical Properties of the Topsoils along the Route of the Proposed Bridge with Seasons

Statistic (n= 41)	**Particle Size Distribution (%)**			**Bulk Density**	**Porosity**
	Sand	**Silt**	**Clay**	**(g/cm^3)**	**(%)**
	First Season Top Soil (0 – 15 cm) – Dry Season				
Min	0	2.4	0	0.13	47.66
Max	97.6	98.5	66.3	1.39	95.12
Mean	33.55	56.37	10.05	0.77	70.94
Std	**34.58**	**31.10**	**15.57**	**0.42**	**15.72**
	Second Season Top Soil (0 – 15 cm) – Wet Season				
Min	0.1	0.2	0.0	0.1	66.6
Max	99.6	97.1	82.5	0.9	96.8
Mean	37.9	37.4	24.6	0.5	81.6
Std	**36.7**	**31.0**	**26.6**	**0.2**	**8.7**

Table 4.22: Statistical Summary of the Physical Properties of the Subsoils along the Route of the Proposed Bridge with Seasons

Statistic (n=41)	**Particle Size Distribution (%)**			**Bulk Density**	**Porosity**
	Sand	**Silt**	**Clay**	**(g/cm^3)**	**(%)**
	First Season Subsoil (15 – 30 cm) -Dry Season				
Min	0	2.7	0	0.19	38.84
Max	97.3	99.8	85.4	1.62	92.87
Mean	32.91	54.29	12.80	0.82	69.01
Std	35.00	31.45	19.72	0.44	16.43
	Second Season Subsoil (15 – 30 cm) – Wet Season				
Min	0.0	0.0	0.0	0.1	62.8
Max	99.9	99.8	80.8	1.0	97.2
Mean	33.1	39.2	25.7	0.5	80.0
Std	35.7	33.3	24.2	0.3	10.1

Table 4.23: Statistical Summary of the Chemical Properties of Topsoils along the Proposed Route for the Bridge with Seasons

Statistic (n = 41)	pH	Exch Cations				Ex-Ch Acidity	ECEC	BS	OC	T-N	Avail-P	BTEX	TPH		Phenol
		Ca	Mg	Na	K								AH	PAH	
		(Cmol/kg Soil)						(%)			(mg/kg)				
	Topsoils (0 – 15 cm) Dry Season														
Min	4.2	0.011	0.269	1.113	0.024	0.01	2.63	94	0.12	0.09	5.8				
Max	6.9	1.499	3.002	11.23	1.059	0.01	6.07	99.5	1.23	0.24	95.6				
Mean	5.76	0.35	2.46	1.58	0.36	0.01	4.57	97.30	0.31	0.16	78.21				
Std	0.639	0.372	0.478	1.548	0.231	0.000	0.785	1.343	0.297	0.038	14.221				
	Topsoils (0 – 15 cm) Wet Season														
Min	4.8	0.01	0.16	0.03	0.03	0.00	0.02	78.30	0.08	0.00	0.06	-	0.42	0.00	-
Max	8.6	2.57	2.09	3.00	5.60	5.60	4.41	98.80	6.24	0.12	210.34	-	3.43	0.20	-
Mean	6.2	0.58	1.71	0.11	0.33	2.27	2.40	96.69	0.34	0.03	21.72	-	1.84	0.07	-
Std	1.1	0.50	0.43	0.46	1.11	1.77	0.68	3.24	0.02	0.02	38.98	-	0.75	0.05	-

Table 4.24: Statistical Summary of the Chemical Properties of Subsoils along the Proposed Route for the Bridge with Seasons

Statistic (n=41)	pH	Exch Cations				Ex-Ch Acidity	ECEC	BS	OC	T-N	Avail-P	BTEX	TPH		Phenol
		Ca	Mg	Na	K								AH	PAH	
		(Cmol/kg Soil)						(%)			(mg/kg)				
	Subsoils (15 – 30 cm) Dry Season														
Min	5.1	0.008	0.913	0.676	0.02	0.01	2.13	94.5	0.11	0.08	65.45				
Max	8.3	1.618	2.927	1.591	0.653	0.01	6.31	99.3	1.31	0.22	94.8				
Mean	6.40	0.43	2.40	1.31	0.32	0.01	4.42	97.48	0.31	0.15	79.04				
Std	0.94	0.49	0.45	0.17	0.22	0.00	1.01	1.32	0.32	0.04	8.31				
	Subsoils (15 – 30 cm) Wet Season														
Min	4.9	0.01	0.08	0.03	0.02	0.00	0.96	94.60	0.42	0.00	0.04	-	0.40	0.00	-
Max	8.4	22.00	2.17	1.70	0.45	6.00	4.38	99.10	6.24	0.08	108.35	-	2.59	0.30	-
Mean	6.1	1.03	1.74	0.09	0.04	2.70	2.31	97.33	3.29	0.02	17.94	-	1.22	0.08	-
Std	1.0	3.39	0.37	0.27	0.07	1.94	0.61	1.28	1.73	0.02	20.46	-	0.62	0.08	-

4.3.6.1 Land Use

Numerous human and economic activities were observed and largely dependent on the lagoon including but not limited to sand mining, water transport, port and container and religious prayers and spirituality.

In towns, the course of these water bodies has been greatly altered and modified by Road construction, residential buildings, business activities, religious activities and other human activities. Wine tapping and sale, fuel wood sale, mat productions, bamboo harvest and sale

and collection and processing of immature stage of edible insect were observed as water dependent activities within the township adjacent to water bodies. Religious activities and spirituality were also observed. Pictures of some human/ land use activities found around the project area are shown in Plate 4.6.

Table 4.25: Land Use Quantitative Analysis

S/N	Land Use	Landuse	Distance in Km	Percentage %
1	Built-up Area	Residential/Commercial/Academics and Religious Institutions	9.3Km	24.47%
2	Agriculture land use	Fishery, Poultry, Grazing, Rainfed agriculture practices etc.	5.8 Km	15,26%
4	Forest/Mangrove Area	Forest (reserved or disturbed /mangrove) area.	15.5 Km	40.78%
5	Water Body	Dams, Lakes, streams, rivers, sea, Ocean.	7.4 Km	19.47%
Total			**38Km**	**100%**

Human Activities around the Lagoon

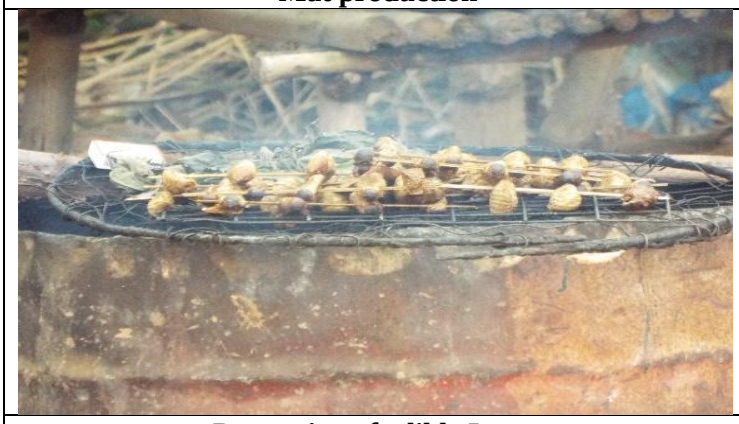
Baiyeku Jetty/Water transport

Ikorodu Port

Sand mining

Religious altar and activities

Human activities associated with township water bodies

	
Mat production	**Wine tapping and sale**
	
Processing of edible Insect	**Bamboo sales**
	
Fuel wood	**Religious altar**
Human activities on Ogun River at Isheri	
	
fufu production	**Sand mining**

	
Water transport	**Under bridge motor parks**

Plate 4.6: Human activities on River Ogun at Isheri

4.3.7 Biodiversity Studies (Dry Season)

The biodiversity survey along the proposed bridge project sets out to quantitatively assess the distribution and diversity of the flora and fauna to be affected by the proposed bridge project such that the results could be used to:

- provide qualitative and quantitative baseline information on the existing status of the vegetation and wildlife of the project area.
- improve existing knowledge about the wildlife and vegetation of the area to be affected by the proposed 4MB project; and
- asses the distribution and the relative abundance of key taxa likely to be affected by the proposed 4MB project.

The biodiversity field investigation of the project corridor was carried out between 22nd and 26th of February 2021 for the dry season, while the wet season biodiversity field investigation was carried out between 17th and 21st of May 2021. The studies were carried out in accordance with the existing regulations and standards and was also witnessed by representatives of the Federal Ministry of Environment Abuja.

The sampling effort was done based on the physical characteristics of the project corridor, diversity of the habitats, flora and fauna and availability of existing ecological baseline information. In all cases, based on the site situation, the team ensured proper and applicable survey techniques so as to effectively describe the characteristic of the flora and fauna population in the area and these activities includes:

a. Site characterization
b. Identification of Important species, endemicity and its conservation status
c. Transect and quadrant laying
d. Active searching
e. Interview

4.3.7.1 Vegetation Study

The vegetation of an area constitutes the totality of the plants in that area. Vegetation is one of the most important expressions of the health of an environment as it epitomizes climatic and edaphic conditions. Vegetation further reflects the level of human interference with nature and its state in many situations reflects the level of human well-being, regulation of water quality

and balance in soil and air; as well as playing a role in climate are some of the important attributes of vegetation.

The vegetation of the study area assumes importance both as indicator of the status of the environment and as natural resource base, since human inhabitants of the localities, based on their level of economic development, depend on plants for various aspects of their daily lives.

The vegetation comprises both wet and dry land species. A substantial part of the site is a marshy wetland having characteristic mangrove species like *Dryopteris filix-mas, Raphia hookeri, Elaeis guineensis, Avicennia germinans, Rhizophora mangle, Alchornea cordifolia*, *Sporobolus pyramidalis*, and *Cyperus articulatus* forming the dominant species. Apart from the wetland, a smaller portion of dry arable land also exists along the proposed project route. Most herbaceous species found were green and nourished due to high level of water table in the area. Species like *Chromolaena odorata, Sida corymbosa, Sida acuta*, *Commelina diffussa, Elusine indica*, and *Panicum maximum* were quite abundant. (Table 4.26) below shows the dominant plant species along proposed project area and Plate 4.7 shows vegetation found in various sites along the project area.

Table 4.26: Checklist of Dominant Plant Species Found Along the Proposed Project Route

S/N	Plant Species	Habit	Density
1.	*Alchornea cordifolia*	Shrub	Abundant
2.	*Avicennia germinans*	Tree	Abundant
3.	*Chromolaena odorata*	Herb	Abundant
4.	*Cocos nucifera*	Palm	Abundant
5.	*Dryopteris filix-mas*	Herb	Abundant
6.	*Elaeis guineensis*	Palm	Abundant
7.	*Imperata cylindrica*	Grass	Abundant
8.	*Paspalum vaginatum*	Grass	Abundant
9.	*Raphia hookeri*	Palm	Abundant
10.	*Rhizophora mangle*	Tree	Abundant

A marshy section of the Study Site showing *Dryopteris filix- mas* as a dominant species

A section of the vegetation showing *Chromolaena odorata* as a dominant species

Biodiversity Expert standing by *Rhizophora mangle* in the mangrove area

***Elaeis guineensis* interspersed with *Chromolaena odorata* dominant species in the study area**

Raphia hookeri (Palm tree)a dominant species in the study area

Plate 4.7: Vegetation found in various sites along the project area

Table 4.27: Checklist of Some Economic Plant Found Along the Proposed Project Route

S/N	Species	Common Name	Uses
1	*Aleo vera*	Aloe vera	Medicinal
2	*Anacardium occidentale*	Cashew	Fruit/Cash
3	*Ananas comosus*	pineapple	Fruit
4	*Azadirachta indica*	Neem plant	Medicinal
5	*Blighia sapida*	Ishin	Fruit/ Medicinal
6	*Carica papaya*	Pawpaw	Fruit
7	*Celosia argentea*	Celosia	Vegetable
8	*Citrus limon*	Lime orange	Medicinal
9	*Citrus sinensis*	Orange	Fruit
10	*Cocos nucifera*	Coconut	Fruit
11	*Colocasia esculenta*	Cocoyam	Food
12	*Elaeis guineensis*	Oil Palm	Cash
13	*Gossy4MB PMTm hirsutum*	Cotton	Cash
14	*Lycopersicon esculentus*	Tomato	Vegetable
15	*Mangifera indica*	Mango	Fruit
16	*Manihot esculenta*	Cassava	Food/Cash
17	*Morinda lucida*	Brimstone tree	Medicinal
28	*Musa paradisiaca*	Plantain	Food
19	*Musa sapientum*	Banana	Fruit

20	*Occimum gratissimum*	Scent leaf	Medicinal
21	*Saccharum officinarum*	Sugar cane	Fruit
22	*Spondias mombin*	Hog plum	Medicinal
23	*Talinum triangulare*	Water leaf	Vegetable
24	*Telfaria occidentalis*	Ugwu leaf	Vegetable
25	*Terminalia catappa*	Almond	Fruit
26	*Vernonia amygdalina*	Bitter leaf	Vegetable

4.3.7.2 Coastal Vegetation Species and Economic Importance

Due to the nature of the soils along the shore it is common to find tree species possessing plank-like buttresses, stilt roots, or an elaborate fibrous root system which helps them to anchor deep down the sandy soil. The coastal/shore vegetation is dominated by *Chromolaena odorata, Chrysobalanus incaco, Dalbergia ecastaphyllum, Drepanocarpus lanatus* and *Rauvolfia vomitoria.*

Table 4.28: Checklist of Vegetation Species in the Coastal Area and their Economic Importance

S/N	Scientific Name	Family	Common Name	Uses
1	Alchornea cordifolia	Euphorbiaceae	Eepa (Y)	Diarrhoea
2	Andropogon gayanus	Poaceae	Gamba grass	Fodder
3	Alstonia boonei	Apocynaceae	Ahun (Y)	Malaria
4	Bridelia ferruginea	Euphorbiaceae	Ira (Y)	Tooth-ache
5	Byrsocarpus coccineus	Connaraceae	Amuje wewe	Gonorrhoea
6	Cassia rotundifolia	Caesalpinioideae	Epa ile (Y)	
7	Catharanthus roseus	Apocynaceae	Rose periwinkle	Diabetes, Hypertension
8	Chromolaena odorata	Asteraceae	Agatu (Y)	Wound treatment
9	Chrysobalanus incaco	Chrysobalanaceae	Awónrinwán(Y)	Dysentery
10	Cleome viscosa	Capparidaceae	Ekuya(Y)	
11	Cocos nucifera	Arecaceae	Agbon (Y), Coconut (E)	Diarrhoea, treat burns
12	Cyclosorus dentatus	Thelypteridaceae		
13	Dalbergia ecastaphyllum	Papilionoideae		Dysentery
14	Desmodium tortuosum	Papilionoideae		Anti-inflamatory
15	Desmodium ramossisimum	Papilionoideae	Udodo (Y)	Anti- inflamatory
16	Diospyros tricolor	Ebenaceae		Antibiotic
17	Dodonaea viscosa	Sapindaceae		Sore throat
18	Drepanocarpus lanatus	Papilionoideae		
19	Dissotis rotundifolia	Melastomataceae	Dogunrasin(Y)	
20	Elaeis guineense	Arecaceae	Ope- eyin(Y), Oil palm(E)	Malaria, Measles
21	Emilia coccinea	Asteraceae	Odundun(Y)	Craw-craw, Syphilis,
22	Ficus sur	Moraceae	Opoto (Y)	Dysentery
23	Hybanthus enneaspermus	Violaceae	Abiwere (Y)	Easy delivery.
24	Hyptis suaveolens	Lamiaceae	Arunfofo (Y)	Fevers, wounds
25	Ipomoea involucrate	Convolvulaceae	Ododo-odo(Y)	Parasitic infection

26	Kylinga erecta	Cyperaceae	Ako-ewuro-odo(Y)	
27	Luwigia abyssinica	Onagraceae		Stomach healing
28	Mariscus alternifolius	Cyperaceae	Ikeregun(Y)	Gonorrhoea
29	Mussaenda polita	Rubiaceae		
30	Pennisetum hordeioides	Poaceae		
31	Pontederia Crassipes	Pontederiaceae	Water hyacint	Weaving and AntiInflammatory,
32	Raphia hookeri	Arecaceae	Ope Oguro (Y)	Gin, Palm wine
33	Rauvolfia vomitoria	Apocynaceae	Asofeyeje(Y)	Malaria
34	Scleria depressa	Poaceae	Labelabe(Y)	Menstrual cycle
35	Scoparia dulcis	Scrophulariaceae		Liver problem
36	Spigelia anthelmia	Loganiaceae	Aparan(Y)	Anthelmintic
37	Starchytarpheta jamaiscensis	Verbenaceae		Wound healing
38	Tetracera alnifolia	Dileniaceae	Opon(Y)	Dysentery
39	Tridax procumbens	Asteraceae	Igbalode(Y)	Diarrhoea
40	Typha latifolia	Typhaceae		
41	Waltheria indica	Sterculiaceae	Ewe-epo(Y)	Anaemia
42	Ximena Americana	Olacaceae		Fever

***Pontederia Crassipes* water hyacinth seen around the project site**

***Jatropha Tanjorensis* (*Efo Iyana Ipaja*, Hospital Too far) found along the project**

Plate 4.8: Vegetation found in along the project area

4.3.7.3 Secondary Forest/ Regrowth Forest

The previously disturbed forest is now characterized with trees and shrubs, some of the plant encountered include *Musanga cecropiodes, Anthrocleista vogellii, Lophira alata, Elaeis guineensis, Cleistopholis patens, Aspilia africana, Mitragyna ciliate, Alcornea cordfolia, Acacia spp.* And sparsely distributed trees including *Elaeis guineensis* and large numbers of *Raphia hookerii.* Herb present were *Triumfetta rhomboidea, Aspilia africana Costus lucanusianus, neptunia oleracea, chromolaena odorata, Mimosa pudica, Urena lobata, sida acuta, scoparia dulcis,* Grasses and a few sedges dominated the vegetation. They include *panicum maximum, sporobolus pyramidalis, kyllinga nemoralis, Eupatorium odoratum, pennisitum purpureum, selerie depressa, laportea spp,* etc.

Table 4.29: Checklist of Vegetation Species in the Regrowth (Secondary) Forest and their Economic Importance

S/N	Scientific Name	Family	Common Name	Uses
1	Abrus precatorious	Papilionoideae	Omisinmisin (Y)	Intestinal worms
2	Alchornea cordifolia	Euphorbiaceae	Eepa (Y)	Diarrhoea
3	Andropogon gayanus	Poaceae	Oruwa (Y), Gamba grass (E)	Fodder
4	Alstonia boonei	Apocynaceae	Ahun (Y)	Malaria
5	Anthocleista vogelii	Loganiaceae	Sapo (Y)	anti-inflammatory
6	Anthonotha macrophyla	Casalpinioideae	Agbigba (Y)	Malaria
7	Caladium bicolour	Araceae	Christ plant (E)	Wound treatment
8	Carica papaya	Caricaceae	Ibepe (Y), Pawpaw (E)	Worm expellant
9	Catharanthus roseus	Apocynaceae	Rose periwinkle (E)	Diabetes, hypertension,
10	Carpolobia lutea	Polygalaceae	Osunsun (Y)	Erection
11	Castalia kolly	Rubiaceae	Isepe agbe (Y)	Typhoid
12	Chromolaena odorata	Asteraceae	Agatu (Y)	Wound treatment
13	Chrysobalanus incaco	Chrysobalanacee	Awónrinwán (Y)	Dysentery
14	Cleistopholis patens	Annonaceae	Apako (Y)	Pain-killer
15	Clerodendrum splendens	Verbanaceae	Opo-isi (Y)	Anti-inflammatory
16	Cocos nucifera	Arecaceae	Agbon (Y), Coconut (E)	Diarrhoea, treatment of burns
17	Comedian diffusa	Commelinaceae	Itopere (Y)	Bladder infection
18	Costus afar	Zingiberaceae	Ireke omode (Y)	Cough, swellings
19	Cnestis ferruginea	Connaraceae	Omu-aja (Y)	stomach troubles
20	Crotalaria sp	Papilionoideae		
21	Cyathula prostrata	Amaranthaceae	Areyinkosun (Y)	Ringworms
22	Desmodium ramossisimum	Papilionoideae	Udodo (Y)	
23	Desmodium triflorum	Papilionoideae	Atiponna (K)	
24	Drepanocarpus lanatus	Papilionoideae		
25	Dissotis rotundifolia	Melastomataceae	Dogunrasin (Y)	
26	Elaeis guineenses	Arecaceae	Ope- eyin (Y), Oil palm (E)	Malaria, Measles
27	Emilia coccinea	Asteraceae	Odundun (Y)	Craw-craw, Syphilis,
28	Ficus spp.	Moraceae		
29	Ficus sur	Moraceae	Opoto (Y)	Dysentery
30	Ficus trichopoda	Moraceae		
31	Harungana madagascariensis	Gutifferae	Amuje (Y)	Trypanosomiasis, Pile
32	Hallea ledermannii	Rubiaceae		Antibacterial
33	Icacina tricantha	Icacinaceae	Gbegbe (Y)	Toothache
34	Ipomoea involucrata	Convolvulaceae	Ododo-odo (Y)	Parasitic infection
35	Kylinga erecta	Cyperaceae		
36	*Lophira alata,*	Ochnaceae	Red wood	Timber
37	Luwigia abyssinica	Onagraceae		Stomach healing
38	Manihot esculenta	Euphorbiaceae	Paki (Y), Cassava (E)	Gonorrhoea,
39	Mangifera indica	Anacardiaceaea	Mango (E)	Diarrhoea, piles
40	Maesobotrya barterii	Euphorbiaceae	Olowun (Y)	Laxatives
41	Mariscus ligularis	Cyperaceae		
42	Momordica charantia	Cucurbitaceae	Ejinrin wewe (Y)	Pile
43	Musa paradisiaca	Musaceae	Ogede agbagba (Y) Plantain (E)	Epilepsy, Diabetes,
44	*Musa sapientum*	Banana	Ogede Paranta (Y) Banana (E)	fruit
45	Mussaenda polita	Rubiaceae		
46	Mussanga cecropidioides	Moraceae	Agbawo (Y)	Tapeworms
47	*Raphia hookerii.*	Arecaceae	Oguro(Y)	Wine
48	Rhaphiostylis Beninese	Olacaceae	Itapara (Y)	Oral treatment
49	Oldenlandia corymbosa	Rubiaceae	Oyigi (Y)	Swellings
50	Oplismenus burmannii	Poaceae	Ite-oka (Y)	Eye treatment

51	Pauridiantha hirtella	Rubiaceae		Stomach troubles
52	Passiflora foetida	Passifloraceae		
53	Parquetina nigrescens	Periplocaceae	Ogbo (Y)	Blood tonic.
54	Peltophorum macrocarpum	Caesalpinioideae		
55	Rauvolfia vomitoria	Apocynaceae	Asofeyeje (Y)	Malaria
56	Scleria depressa	Poaceae	Labelabe (Y)	Menstrual cycle
57	Scoparia dulcis	Scrophulariaceae		Liver problem
58	Sporobolus pyramidalis	Poaceae	Cat tail	
59	Starchytarpheta jamaiscensis	Verbenaceae		Wound healing
60	Sterculia tragacantha	Sterculiaceae	Alawefon (Y)	Laxatives
61	Tetracera alnifolia	Dileniaceae	Opon (Y)	Dysentery
62	Trema orientalis	Ulmaceae	Afere (Y)	Pains
63	Triumffeta cordifolia	Tiliaceae	Akeeri (Y)	Antibiotic
64	Uapaca staudtii	Euphorbiaceae	Abo-ekun (Y)	
65	Urena lobata	Malvaceae	Okeriri (Y)	Dysentery
66	Vernonia amygdaline	Asteraceae	Ewuro (Y)	Pile
67	Waltheria indica	Sterculiaceae	Ewe-epo (Y)	Anaemia
68	Raphia vinifera	Arecaceae	Oguro (Y)	Wine

Table 4.30: Checklist of Vegetation Species in the Swamp Area and their Economic Importance

S/N	Scientific Name	Family	Common Name	Uses
1	Abrus precatorious	Papilionoideae	Omisinmisin (Y)	Intestinal worms
2	Alchornea cordifolia	Euphorbiaceae	Eepa (Y)	Diarrhoea
3	Ananas comosus	Bromeliaceae	Ope-oyinbo (Y) Pineapple (E)	Sore throats, arthritis
4	Andropogon gayanus	Poaceae	Oruwa (Y), Gamba grass (E)	Fodder
5	Alstonia boonei	Apocynaceae	Ahun (Y)	Malaria
6	Anthocleista vogelii	Loganiaceae	Sapo (Y)	Anti-inflammatory
7	Anthonotha macrophylla	Casalpinioideae	Agbigba (Y)	Malaria
8	Aspilia Africana	Asteraceae	Yunriyun (Y)	Rheumatism
9	Asystasia gangetica	Acanthaceae	Lobiiri (Y)	Asthma
10	Calamus deerratus	Arecaceae	Rattan (E)	
11	Calopogonum mucunoides	Papilionoideae		
12	Sabicea calycina	Rubiaceae	Ogan-aparo (Y)	Back ache
13	Campylospermum flavum	Ochnaceae	Nkanka (Y)	Laxative
14	Carpolobia lutea	Polygalaceae	Osunsun (Y)	Erection
15	Chromolaena odorata	Asteraceae	Agatu (Y)	Wound treatment
16	Chrysobalanus incaco	Chrysobalanaceae	Awónrinwán (Y)	Dysentery
17	Cleistopholis patens	Annonaceae	Apako (Y)	pain-killers
18	Lygodium sp	Shizeaeaceae		
19	Costus afar	Zingiberaceae	Ireke omode (Y)	Cough, swellings
20	Cnestis ferruginea	Connaraceae	Omu-aja (Y)	stomach troubles
21	Crotalaria sp	Papilionoideae		
22	Carica papaya	Caricaceae	Ibepe (Y), Pawpaw (E)	Worm expellant
23	Pycreus distans	Cyperaceae		
24	Cyrtospermum senegalensis	Araceae	Ope igbo (Y)	Cough, ,ulcer
25	epanocarpus lanatus	Papilionoideae		
26	Diodia scandens	Rubiaceae	Dasa (Y)	Epilepsy
27	Dissotis rotundifolia	Melastomataceae	Dogunrasin (Y)	
28	Elaeis guineense	Arecaceae	Ope- eyin (Y), Oil palm (E)	Malaria, Measles
29	Eleusine indica	Poaceae	Gbegisona (Y)	Anthelmintics
30	Emilia coccinea	Asteraceae	Odundun (Y)	Craw-craw, Syphilis,

31	Ficus sp	Moraceae		
32	Ficus trichopoda	Moraceae		
33	Harungana madagascariensis	Gutifferae	Amuje (Y)	Trypanosomiasi, Pile
34	Hallea ledermannii	Rubiaceae		Antibacteria
35	Icacina tricantha	Icacinaceae	Gbegbe (Y)	Toothache
36	Imperata cylindricum	Poaceae	Ekan (Y)	Tumours, Sedative
37	Ipomoea involucrate	Convolvulaceae	Ododo-odo (Y)	Parasitic infection
38	Indigofera SP.	Papilionoideae		
39	Ludwigia suffruticosa	Onagraceae	Ako-ewuro-odo (Y)	
40	Luwigia abyssinica	Onagraceae		Stomach healing
41	Manihot esculenta	Euphorbiaceae	Paki (Y), Cassava (E)	Gonorrhoea,
42	Maesobotrya barterii	Euphorbiaceae	Olowun (Y)	Laxatives
43	Memecylon sp	Melastomataceae		
44	Mariscus alternifolius	Cyperaceae	Ikeregun (Y)	Gonorrhoea
45	Mariscus ligularis	Cyperaceae		
46	Musa paradisiaca	Musaceae	Ogede agbagba (Y) Plantain (E)	Epilepsy, Diabetes,
47	Mussaenda polita	Rubiaceae		
48	Mussanga cecropidioides	Moraceae	Agbawo (Y)	Tapeworms
49	Cyclosorus dentatus	Thelyteridaceae		
50	Nymphaea lotus	Nymphaeaceae	Osibata (Y)	Sedative
51	Oldenlandia corymbosa	Rubiaceae	Oyigi (Y)	Swellings
52	Oplismenus burmannii	Poaceae	Ite-oka (Y)	Eye treatment
53	Pauridiantha hirtella	Rubiaceae		Stomach troubles
54	Passiflora foetida	Passifloraceae		
55	Paspalum vaginatum	Poaceae		
56	Pennisetum pedicellatus	Poaceae		
57	Pennisetum hordeioides	Poaceae		
58	Pentodon pentandrous	Rubiaceae		Lactation stimulant
59	*Phyllostachys edulis*	*Poacceae*	Oparun (Y) Bamboo (E)	Construction
60	Nauclea sp.	Rubiaceae		
61	Psidium guajava	Myrtaceae	Guava (E)	Toothache
62	Psychotria sp	Rubiaceae		
63	Pityrogramma calomelanos	Adianthaceae		
64	Raphia vinifera	Arecaceae	Oguro (Y)	Wine
65	Rauvolfia vomitoria	Apocynaceae	Asofeyeje (Y)	Malaria
66	Sacciolepis Africana	Poaceae		
67	Scleria depressa	Poaceae	Labelabe (Y)	Menstrual cycle
68	Smilax kraussiana	Smilacaee	Igbagho (Y)	Kidney problem
69	Scoparia dulcis	Scrophulariaceae		Liver problem
70	Senna alata	Caesalpinioideae	Asuwon oyinbo (Y)	Antibiotic
71	Setaria barbata	Poaceae		Convulsions
72	Sorghum arundinaceaum	Poaceae		Haemorrhage
73	Spondianthus preusii	Euphorbiaceae	Abuwa (Y)	Rodenticides
74	Sporobolus pyramidalis	Poaceae	Cat tail	
75	Spigelia anthelmia	Loganiaceae	Aparan (Y)	Anthelmintic
76	Starchytarpheta jamaiscensis	Verbenaceae		Wound healing
77	Sterculia tragacantha	Sterculiaceae	Alawefon (Y)	Laxatives
78	Struchium sparagonophora	Asteraceae	Ewuro-odo (Y)	Dysentery
79	Tetracera alnifolia	Dileniaceae	Opon (Y)	Dysentery

80	Trema orientalis	Ulmaceae	Afere (Y)	Pains
81	Tristema hirtum	Melastomataceae	Apiko (Y)	Menstrual cycle
82	Typha latifolia	Typhaceae		
83	Urena lobata	Malvaceae	Okeriri (Y)	Dysentry
84	Waltheria indica	Sterculiaceae	Ewe-epo (Y)	Anaemia
85	Justicia sp	Papilionoideae		
86	Raphia vinifera	Arecaceae	Asofeyeje (Y)	Malaria
87	Tridax procumbens	Asteraceae	Igbalode (Y)	Diarrhoea

Table 4.31: Checklist of Vegetation Species in the Herbaceous / Marsh Area and their Economic Importance

S/N	Scientific Name	Family	Common Name	Uses
1	*Acrosticum aureum*	Adiathaceae		Wound treatment
2	*Alchornea cordifolia*	Euphorbiaceae	Eepa (Y)	Diarrhoea
3	*Agelaea triflora*	Connaraceae		
4	*Andropogon gayanus*	Poaceae	Oruwa (Y), Gamba grass (E)	Fodder
5	*Alstonia boonei*	Apocynaceae	Ahun (Y)	Malaria
6	*Anthocleista vogelii*	Loganiaceae	Sapo (Y)	Anti-inflammatory
7	*Aspilia Africana*	Asteraceae	Yunriyun (Y)	Rheumatism
8	*Borreria scabra*	Rubiaceae	Isakoro (Y)	Skin diseases
9	*Calopogonum mucunoides*	Papilionoideae		
10	*Chromolaena odorata*	Asteraceae	Agatu, Akintola (Y)	Wound treatment
11	*Chrysobalanus incaco*	Chrysobalanacee	Awónrinwán (Y)	Dysentery
12	*Lygodium sp*	Shizeaeaceae		
13	*Cyperus sp.*	Cyperaceae		
14	*Pycreus distans*	Cyperaceae		
15	*Drepanocarpus lanatus*	Papilionoideae		
16	*Diodia scandens*	Rubiaceae		
17	*Dissotis rotundifolia*	Melastomataceae	Dasa (Y)	Epilepsy
18	*Elaeis guineense*	Arecaceae	Ope- eyin (Y), Oil palm (E)	Malaria, Measles
19	*Emilia coccinea*	Asteraceae	Odundun (Y)	Craw-craw, Syphilis,
20	*Ficus sp*	Moraceae		
21	*Ficus trichopoda*	Moraceae		
22	*Harungana madagascariensis*	Gutifferae	Amuje (Y)	Trypanosomiasis, Pile
23	*Imperata cylindricum*	Poaceae	Ekan (Y)	Tumours, Sedative
24	*Ipomoea involucrata*	Convolvulaceae	Ododo-odo (Y)	Parasitic infection
25	*Luwigia abyssinica*	Onagraceae		Stomach healing
26	*Manihot esculenta*	Euphorbiaceae	Paki (Y), Cassava (E)	Gonorrhoea,
27	*Maesobotrya barterii*	Euphorbiaceae	Olowun (Y)	Laxatives
28	*Mariscus ligularis*	Cyperaceae		
29	*Mussanga cecropidioides*	Moraceae	Agbawo (Y)	Tapeworms
30	*Nymphaea lotus*	Nymphaeaceae	Osibata (Y)	Sedative
31	*Oldenlandia corymbosa*	Rubiaceae	Oyigi (Y)	Swellings
32	*Passiflora foetida*	Passifloraceae		
33	*Pentodon pentandrous*	Rubiaceae		Lactation stimulant
34	*Platycerum bifurcatum*	Polypodiaceae		
35	*Pityrogramma calomelanos*	Adianthaceae		
36	*Raphia vinifera*	Arecaceae	Oguro (Y)	Wine
37	*Sacciolepis africana*	Poaceae		
38	*Scleria depressa*	Poaceae	Labelabe (Y)	Menstrual cycle
39	*Scoparia dulcis*	Scrophulariaceae		Liver problem
40	*Senna alata*	Caesalpinioideae	Asuwon oyinbo (Y)	Antibiotic
41	*Setaria barbata*	Poaceae		Convulsions
42	*Sporobolus pyramidalis*	Poaceae	Cat tail	
43	*Spigelia anthelmia*	Loganiaceae	Aparan (Y)	Anthelmintic
44	*Starchytarpheta jamaiscensis*	Verbenaceae		Wound healing

45	*Sterculia tragacantha*	Sterculiaceae	Alawefon (Y)	Laxatives
46	*Struchium sparagonophora*	Asteraceae	Ewuro-odo (Y)	Dysentery
47	*Tetracera alnifolia*	Dileniaceae	Opon (Y)	Dysentery
48	*Trema orientalis*	Ulmaceae	Afere (Y)	Pains
49	*Tristema hirtum*	Melastomataceae	Apiko (Y)	Menstrual cycle
50	*Triumfetta cordifolia*	Tiliaceae	Akeeri (Y)	Antibiotic
51	*Waltheria indica*	Sterculiaceae	Ewe-epo(Y)	Anaemia
52	*Perotis indica*	Poaceae		
53	*Nauclea latifolia*	Rubiaceae	Egbesi(Y)	Measles, Sores
54	*Sida acuta*	Malvaceae	Iseketu(Y)	Intestinal worm
55	*Vitex grandiflora*	Verbenaceae	Oori(Y)	Arthritis

Phyllostachys edulis on fire around the proposed Project Area (Bush Burning Activities)

Vegetation Studies (Transect laying during the studies)

Biodiversity study team during fieldwork

Expert observing species biodiversity on field

Plate 4.9: Vegetation found in along the project area

Fauna Investigation: The study area in the past before the advent of urbanization supports an array of plant and animal species. According to historical backgrounds, the well branched trees are habitats to avifauna species, crawling reptiles, arboreal primates, arthropods, molluscs and small mammals. The ecological homogeneity provided by the large Palm tree populations implies that a uniform range of species are observable of large areas. However, just as in most parts of the state, urban encroachment, Road construction and unregulated hunting has pushed further into remoter parts of the forest. The wild life species prevailing in the area in both seasons varied from invertebrates to large reptiles, birds and small mammals.

Generally, the invertebrate groups consist of several arthropod groups including butterflies, moths, dragon flies, water boatman, beetles, praying mantes, grass hoppers, spiders, ants and termites. The arthropods were varied and impacted variously on the ecosystem as well, the invertebrate phyla also included molluscs (the giant African land snail).

Table 4.32: Arthropods Species in the Study area

S/N	Common Names	Orders
1	Lady bird beetle	Coleoptera
2	Butterfly (white)	Lepidopetera
3	Butterfly (yellow)	Lepidoptera
4	Barnacles	Thecostraca
5	Wasp	Hymenoptera
6	Bee (Honey) and Hives	Hymenoptera
7	Dragon fly	Odonata
8	Common Beetle	Coleoptera
9	Rhinocerous beetle	Coleoptera
10	Grass hopper	Orthoptera
11	Tailor Ants	Hymenoptera
12	Fire Ants	Hymenoptera
13	House Flies	Diptera
14	Praying mantis	Dictyoptera
15	Sand Flies	Diptera
16	Mosquitoes	Diptera
17	Goose barnacle	Pedunculata

Table 4.33: Molluscs Species in the Study area

S/N	Scientific Names	Family	Common Names	Local name
1	*Achachatina marginata*	Achatinidae	Giant west African Snail	Igbin,
2	*Cerithidea Obtusa*	Potamididae	horn shell, mud creeper	Perriwinkle,
3	*Pila polita*	*Ampularidae*	Water snail	Ishawuru

Wildlife team during the interview with community members

FMEnv Officials and Sustainability Supervisor on site during the wildlife studies

	
Cerithidea Obtusa (horn shell mud creeper) periwinkle found around project site	Pila polita (freshwater snail shell) around the proposed project route
	
Fire ants (Solenopsis sp) crawling on the leafy parts of a plant	A millipede (*Tibiomus* sp.) on crawling on the ground
	
An ant hole on the forest floor	Leaves eaten up by biting and chewing insects most probably grasshoppers

Plate 4.10: Pictures of Fauna Found around the Project Area

Only one species of annelid was also reported on the soil. An amphibian species Haplobatracus sp was said to have been sighted during the study at the Lekki/Ajah axis of the proposed Road project corridor. Although there were signs of active egg laying by the amphibians in various moist areas. The reptiles observed also included skinks, lizards, monitor lizards, boars, pythons and venomous snakes. The mammalian groups include giant rats, gazelles, grass cutters, porcupines, ant eaters, bats and deer

Table 4.34: Annelids Species in the Study area

S/N	Scientific Names	family	Common Names	Local Name
1	*Libyodrilus terrestris*	*Lumbricidae*	Earthworm	Ekolo

Table 4.35: Amphibian Species in the Study Locations

S/N	Scientific Names	Family	Common Names	Local Name
1	*Pyxicephalus edulis*	Dicroglossidae	Frog	Konko
2	amiethophrynus	Bufonidae	African giant Toad	Opolo

Table 4.36: Reptiles and Non-Avain Reptile Species in the Study Locations

S/N	Scientific names	Family	Common Names	Local Names
1	*Agama agama agama*	*Agamidae*	Lizard	Alangba
2	*scincomorpha*	*scincidae*	Skink	Alarunbere
3	*Varanus sp.*	*varanidae*	Monitor Lizard	Alegba
4	*Python regius*	*phytonidae*	Python (royal), Boa	Ojola
5	*Elaphe obsoleta*	*Colubridae*	Rat Snake	
6	*Dendoaspis viridis*	*Elapidae*	West African green mamba	*ogba*
7	*Dendroaspis polylepis*	*Elapidae*	African Black Mamba	*Agbadu*
8	*Naja melanoleuca*	*Elapidae*	Black Cobra	*Sebe dudu*
9	*Crocodylus niloticus*	*Crocodylidae*	*Nile crocodile*	*ooni*

Table 4.37: Mammals Species in the Study Locations

S/N	Scientific names	Common Names	Local Name
1	*Glaucomys volans*	African Giant Rat	
2	*Thryonomys swindereanus*	Grass Cutter	*Oya*
3	Sylvicapra grimmia	Gray Duiker	
4	*Cercopithecus mona*	Mona monkey	

Grasscutter (Evidence of Hunting Activities around the project Area)

Hunted Antelope around the proposed project area

Nest of a Waver Bird found on the ground

A Weaver Bird (*Ploceus cucullatus)* perched on a Palm Tree

Cattle Rearing activities within the project corridor

Cattle Egret (*Bubulcus ibis*)

Plate 4.11: Pictures of wildlife in the project area

The wildlife observed in the project area also includes a variety of Avian species mostly dominated by Hawks and Village weaver birds which nested on every available space on palm trees. See table 4.38 for details.

Table 4.38: Avian Species in the Study Locations

S/N	Common Names	Scientific names
1	Palm swift	*Cypsiums pariuus*
2	Lizard buzzard	*Caopifalco monogammiscus*
3	African ban owl	*Tyto alba*
4	Swallow	*Hirundo sp.*
5	Green fruit pigeon	*Treon australis*
6	Parrot (Red Tail)	*Amazona sp.*
7	Horn bill	*Buceros bicornis*
8	Cattle egret	*Ardeola ibis*
9	Crow (pied)	*Corvus albus*
10	Black kite	*Muluus migrant*
11	Senegalese coucul	*Centropus senegalensis*
12	Weaver bird	*Ploceus cuculantus*
13	Bush fowl	*Francolinus bicalcaratus*
14	African Harrier Hawk	Polyboroides typus
15	Bronze Mannikin	*Lonchura cucullata*
16	Pied Crow	*Corvus albus*

4.4 Socio- Economic Baseline Conditions

4.4.1 Socio-Economic Environment

Owing to the objectives and achievable goals of the 4MB project, it is important to establish the socio-economic baseline and/or characteristics of the people in the host communities. The socio-economic baseline is the description of the characteristics of the people as they were at the project time. Basically, it includes information about demographic data, life style, occupations, economic, health and educational statuses as well as their perceptions of impacts.

4.4.1.1 Socio-Economic Assessment

The main objective of the consultations with stakeholders is to discuss the proposed project's environmental and social implications and to identify alternatives for consideration. Specifically, the consultations seek to achieve the following objectives:

- To provide some information about the proposed project;
- To provide opportunities for stakeholders to discuss their concerns and offer recommendations;
- To gain insight on the role of each stakeholder in the implementation of the environmental and social safeguards as well as structures in place for the management of the proposed facilities;
- To provide and discuss with stakeholders the alternatives considered to reduce anticipated impacts;
- To identify and verify significance of environmental, social and health impacts; and
- To inform the process of developing appropriate mitigation and management options.

4.4.1.2 Socio – Economic Baseline Survey

4.4.1.2.1 Objectives of the Baseline Survey and Scope of Work

The main objective of the baseline survey was to obtain socio-economic data and information on the communities and households along the proposed 4MB project corridor.

The specifically the socio-economic baseline survey is to:

- Identify the sources and type of income in communities.
- Evaluate expenditure patterns in communities.
- Asses living conditions such as the status of houses, livelihood assets, land uses production trends etc.
- Evaluate existing economic activities in the communities along the project corridor.
- Assess availability and quality of infrastructure services such as health, education, transportation and communication, institutions;
- Assess the level of income in households in the communities.
- Assess population characteristics (age, sex, migration, social relationships)
- Document various resources available, resource uses and markets (e.g. farms/livestock and the uses)
- Assess attitudes, perception and views towards existing proposed project
- identify the most appropriate indicators for monitoring and evaluation, including being able to measure differentiated impacts on different groups within the communities.

4.4.1.2.2 Sources of Data

The main source of data for the baseline studies is primary data collected in the communities along the corridors of the proposed bridge project. The primary data is made up of both quantitative and qualitative data. The qualitative data provide insights for a greater understanding of the locality, the local population and the potential impacts of constructing the bridge along project area, while the quantitative data provide an important database to facilitate the later evaluation of the project. Secondary data in form of official documents and publications were also reviewed to provide important background information.

4.4.1.2.3 Methods used in the Study

A combination of research methods was used for the study to cover issues examined as itemized in the objectives above. These research methods include the following:

- Review of secondary data (SD);
- Reconnaissance survey to identify all communities in the project corridors and to sensitize communities or members about the proposed studies and project;
- In-depth interviews (IDIs) with community leaders of the sampled communities (traditional leader, women leaders, religious leaders, youth leader, etc;
- Focus Group Discussions (FGDs) in the sampled communities along the project corridors with groups of adult males, adult females and youths:
- Direct observations (DO) in the selected project areas using a checklist of items;
- A Quick-Scan Analysis of Income-Generating Activities in the Study Area.
- On-the-Spot Non-Participant Ethnographic Observation and Assessment, and
- Participatory tools during FGDs, specifically community mapping, Venn diagram and paired needs ranking and develop case studies, wherever relevant, from examples provided in the discussions or IDIs.

4.4.2 Age and Sex of Respondents

The age distribution of the respondents' revealed that across the clusters the respondents are in their productive age. This is identified with specific details showing that in the Ikorodu majority (65.0%) of the respondents are between 31 and 60 years old. In the OPIC cluster the distribution shows that 35.6% of the population are less than or equal to 30 years old, 20.5% are between 31 to 40 years old and 24.4 % of the respondents are between 41 to 50 years old. Also following the trend above are the inhabitants in the Ajah cluster of the study which had majority (60.8%) of the sampled respondents were within 30 and 50 years of age.

With respect to sex there was a preponderance of male across the clusters. From the information gathered from the household composition of the survey, 67.0% of the residents in the sampled communities are males while 33.0% are females in the Ikorodu cluster. Also established is the preponderance (66.7%) of male than female (33.3%) in the OPIC cluster, likewise the Ajah cluster followed this pattern with a notable proportion (63.0%) of the population been male, while 37.0% were female.

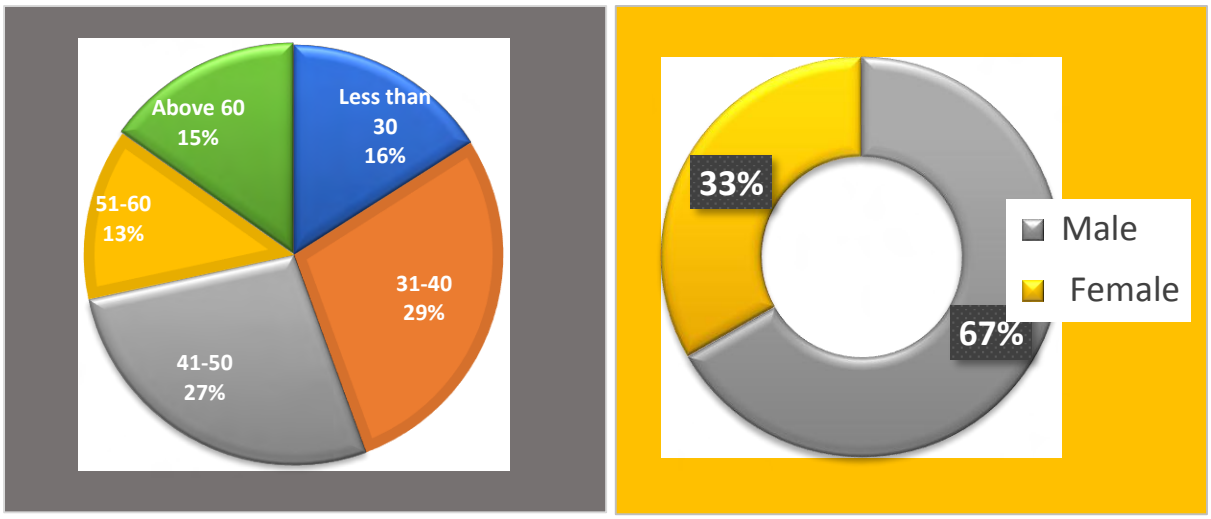


Figure 4.9: Distribution of Respondents by Age and Sex

4.4.3 Religion of Respondents

The religious affiliation of the respondents across the clusters depict that we have Christians, Muslims and traditional worshipers alike. However, Christianity and Islam are the two major religions being practiced by the residents in the sampled communities. As indicated, 48.9% and 45.6% of respondents respectively were Christians and Muslims respectively in the Ikorodu cluster. Also observed in the OPIC cluster was a fair balance of both the Christians (48.9%) and Muslims (45.6%) in the community. Also appreciated was a fraction (4.4%) of the community members that are traditional worshippers. Moreover, 53.7% and 42.3% were Muslim and Christian respectively, while 5.0% of the residents claimed to engaged in traditional religion practices. This was the case for the respondents in the Ajah cluster of the study.

4.4.4 Ethnicity and Marital Status

Considering the ethnic background of the respondents, most of the communities are heterogeneous in ethnic composition, though majority (85.1%) are of Yoruba ethnic group of different dialectic groups from different parts of southwestern Nigeria. This is the case in the Ikorodu cluster of the study. The same trajectory is what is available in the OPIC cluster of the study where there is a significant proportion (91.1%) of members of the community from the Yoruba ethnic group. It is however appreciated that the community equally has other ethnic groups in the community, they include Igbo, Hausa and others, these are represented by 2.2%, 2.2% and 4,4% respectively. In the Ajah cluster we have majority (61.5%) of residents in the area to be of Yoruba ethnic groups, however there are some areas that are dominated by other ethnic groups such as Hausa at the Ram and cattle market at Alasia Ajah close to Abraham Adesanya round about, while Oke-Ira Nla which is a fishing community dominated by people from Ilaje and Ijaw ethnics group from Ondo state and Awori from Badagry in Lagos State.

The marital status of the sample subjects across the three clusters reveals that most of the respondents were married. In the Ikorodu cluster 73.6% are married, 22.0% are single, while 5.0% are devoiced and only 2.0% are widowed. For the OPIC cluster it is noted that a sizable proportion of the population in the community are married (71.1%). 22.2% of the community member are single, and the divorced and widowed status are represented by 4.4% and 2.2%

respectively. In the Ajah cluster the trend was similar as the result of the marital status of respondents' shows that 82.0% were married, 25.8% were single while 5.9% were widowed.

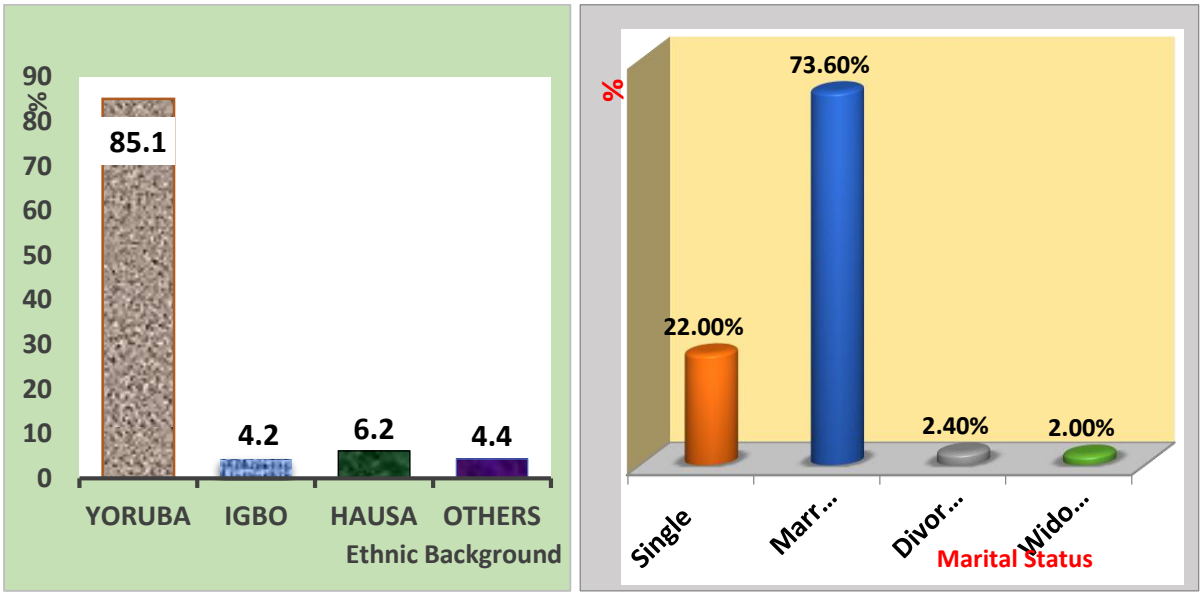


Figure 4.10: Ethnicity and Marital Status of Respondents

4.4.5 Educational Status of Respondents and Period Spent Living in the Project Area

Considering the educational attainment of the inhabitants, statistics from the Ikorodu cluster shows that 44.4%, 28.9% and 13.3% of the respondents had secondary, tertiary and primary education respectively. The result further reveals that 11.1% of the respondents have no formal education, while 2.2% had functional literacy. For respondents in the OPIC cluster 44.4%, 28.9% and 13.3% of the respondents represents those that have acquired secondary education, tertiary education and primary education respectively. While in the Ajah cluster most (43.3%) of the respondents had secondary school education, 25.7% had primary education while 15.0% had tertiary education and 24.3% indicated that they had no formal education.

Findings across the clusters revealed that the inhabitants have spent considerable length of time as residents in these communities. Also revealed was that there is no sharp difference of natives s and non- natives in the community. Across the clusters we have different tribes cohabiting peacefully across the clusters.

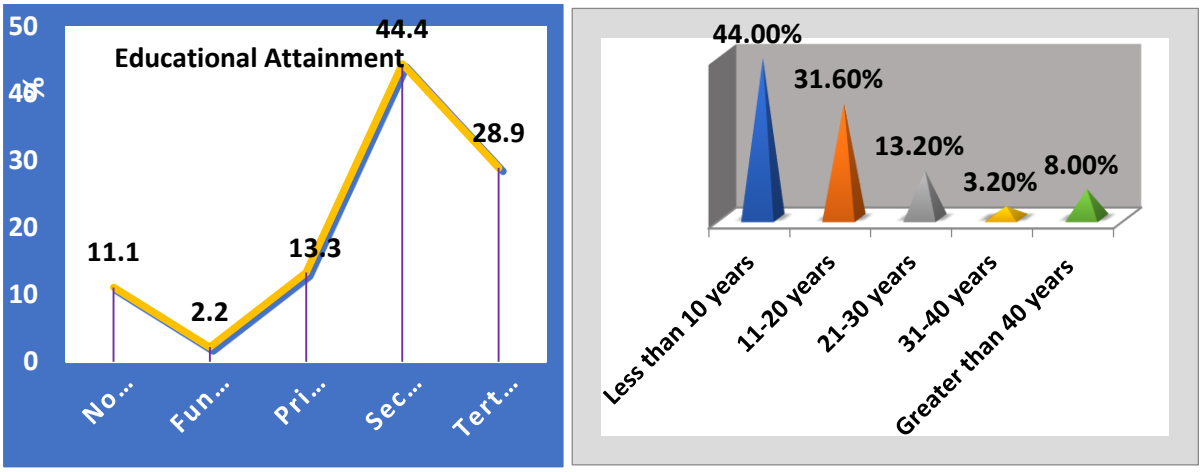


Figure 4.11: Eductaional Level and Period Spent/ Lived in the Project Area

Data from the findings reveals that across the clusters the inhabitants have a fairly large household size. In the Ikorodu cluster 46.7% had between six to ten persons, while 18.9% of the respondents have household size of more than 10 members. In the OPIC axis a distribution of the respondents according to their household size reveals that 46.7% of the respondents have between 6-10 members in their household, 35.4% and 18.9% have less than 5 and above 10 members respectively. While in the Ajah cluster information of the household composition survey reveals that 64.0% of the respondents had between 6 – 10 household members, while 36.0% had more than 10 household members.

4.4.6 Income Distribution

Considering the income generating activities of the respondents, the study revealed that the respondents are engaged in both formal and informal income generating activities. Some of the respondents have their employment or business enterprises within and around their abode, others have their income generating activities far from their residence. Some activities mentioned includes the following but is not limited to trading/marketing, civil service/other salaried employment and craft/artisan, trading/marketing, fishing, civil service/other wage jobs, transporters etc. It was also interesting to know that some of the inhabitants are retirees.

The result of the distribution of respondents by monthly income earnings revealed the cosmopolitan nature of the study area, where more than half of the respondents earned above ₦40,000, unlike what is obtainable in rural and/or peri-urban areas where majority earn less than ₦50,000 monthly. Looking at the income generated by respondents in the study are vis a vis the current economic realities of Nigeria. Their net income is relatively small.

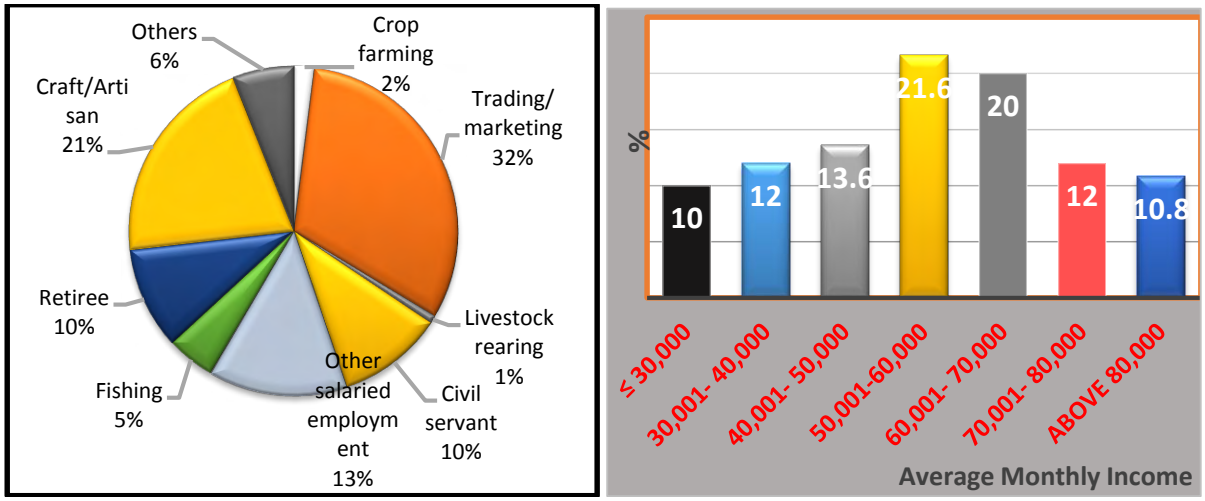


Figure 4.12: Income Distribution among Respondents

4.4.7 Health and Environmental Conditions of Respondents

Generally, the health status in the area was considered to be good as expressed by significant proportion (82.0%) of the respondents. This is a good stage upon which their human resource capital can be harnessed. However, common diseases as identified by the respondents and discussant during FGDs conducted include; fever, malaria, typhoid, and cough are common sicknesses that effect people in the area.

The study revealed that the traditional leadership structure and the Community Development Associations (CDAs) are the common leadership structure identified across the clusters. It was

also revealed that these leaders are responsive to the needs and aspirations of the community inhabitants.

In the Ikorodu cluster the major environmental challenges faced by the inhabitants of the sampled communities as indicated by the respondents are erosion (42%), flooding (32%) and pollution (26%). In the OPIC cluster erosion (45.1%) and flooding (44.4%) were the most prominent among the environmental problems faced by the respondents. It is observed that the poor drainage and channelization of the Roads are the major causes of this environmental hazard as well as overflowing of the river bank. Although in the Ajah cluster flooding, pollution and erosion, were identified as environmental problems in the area as indicated by 45.0%, 35.0% and 20.0% of the respondents respectively. The flooding and erosion problems were said to result from blockage of runoff water channels by waste in some areas of the study communities, as well as overflowing of the lagoon bank during heavy downpour.

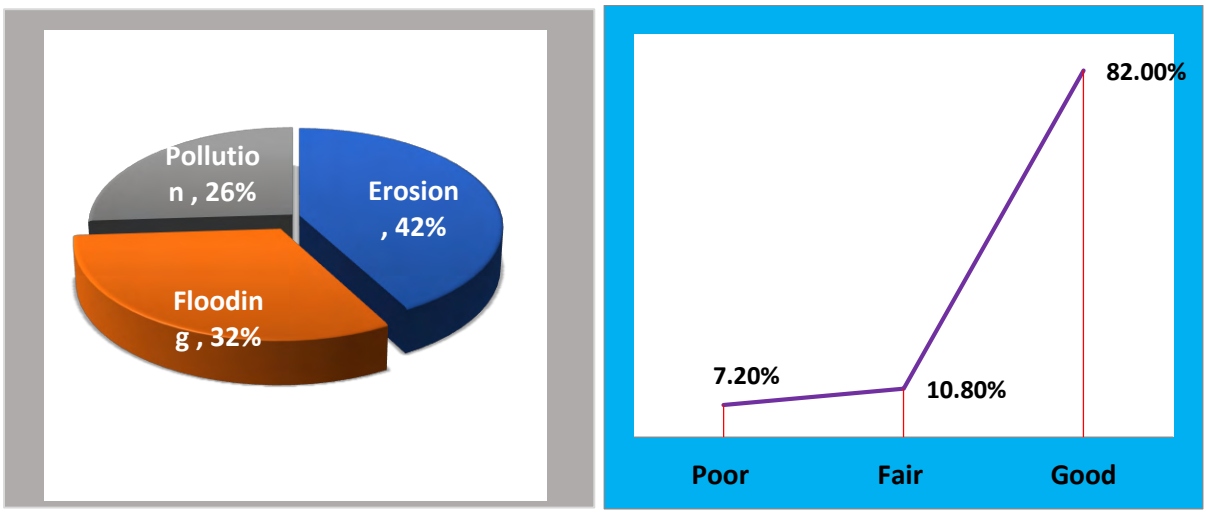


Figure 4.13: Health status and environental challenges of respondents

Across board the community inhabitants were aware of the proposed fourth mainland bridge project; they are also aware of the span/ stretch of the bridge. Findings revealed that the residents are aware of and are eager and expectant of its eventual flag off. It was also established that the community inhabitants have a cordial relationship with officials of the fourth mainland bridge project

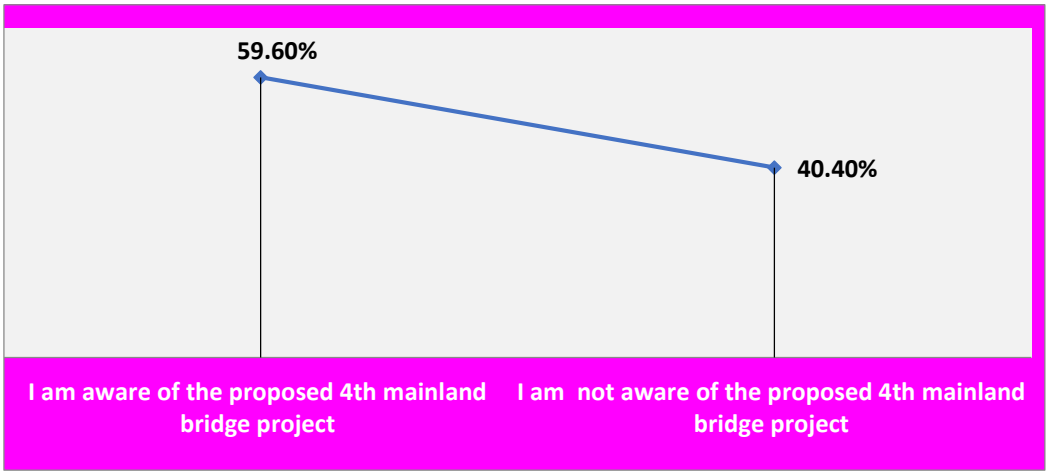


Figure 4.14: Level of awareness of about the 4th mainland brige project

4.4.8 Community Needs Assessment

Needs of various communities were assessed and results are shown in tables below.

Table 4.39: Pair-wise Needs Ranking chart for Adult Male in Igbogbo community

	Road	**Hospital**	**Electricity**	**Tertiary institution**	**Adequate security**	**Local government (LG)**
Road		Road	Road	Road	Road	Road
Hospital			Hospital	Hospital	Hospital	LG
Stable electricity				Electricity	Electricity	LG
Tertiary Institution					Security	LG
Adequate security						LG
Federal structured Local Government						

S/n	**Needs Identified**	**Number of occurrences in chart**	**Ranking of priority**
1.	Road	5	1st
2.	Hospital	3	3rd
3.	Stable electricity	2	4th
4.	Tertiary Institution	0	6th
5.	Adequate security	1	5th
6.	Local Government	4	2nd

Table 4.40: Pair-wise Needs Ranking chart for Adult Female in Agbede community

	Road	**Electricity**	**Hospital**	**Market**	**Employment**
Road		Road	Road	Road	Road
Electricity			Electricity	Market	Employment
Hospital				Hospital	Employment
Market					Market
Employment					

S/n	**Needs Identified**	**Number of occurrences in chart**	**Ranking of priority**
1.	Road	4	1st
2.	Electricity	1	4th
3.	Hospital	1	4th
4.	Market	2	2nd
5.	Employment	2	2nd

Table 4.41: Pair-wise Needs Ranking chart for youth in Agbede community

	Good drainage	**Road**	**Health centre**	**School**	**Market**
Good drainage		Drainage	Drainage	Drainage	Drainage
Road			Road	Road	Road
Health centre				Health centre	Health centre
School					School
Public Market					

S/n	**Needs Identified**	**Number of occurrences in chart**	**Ranking of priority**
1.	Good drainage	4	1st
2.	Road	3	2nd
3.	Health centre	2	3rd
4.	School	1	4th
5.	Market	0	5th

Across the clusters it was revealed that the inhabitants belong to several social and economic interest groups that serves their social and economic interest. The following are some of the groups they belong to: cooperative society, informal savings and credit society, town development union, religious groups etc.

4.4.9 Conflict Resolution and Leadership Structure

In respect of past and present conflict situation across the clusters, it was reveals during data collection exercise that at present there is no conflict in the communities under study. However, the respondents raised areas of threats that may lead to conflict in the future. They include the poor handling of compensation activities, none, poor and or delayed payment of compensation for the affected houses along the project corridor. Also identified as a threat is the security of the communities as the project will open up spaces, bring infrastructural development and consequently lead to increase in population of the community. Hence, there is likelihood that there will be increase in crime rate in these communities.

The community inhabitants especially people of Oke-Ira Kekere, identify the traditional leadership structure as the social control system in their community, they also attested that their leaders are always responsive to their needs and demands in the community. Figure 4.26 below is a chart showing the organogram of the leadership structure in the community. Meanwhile, the leader of Hausa ethnic group at Alasia market is 'Seriki' who oversees the activities of people at the market to ensure there is peace and harmony in the area. It was gathered that if there is any conflict among people at the market, people report to the 'Seriki' for amicable resolution.

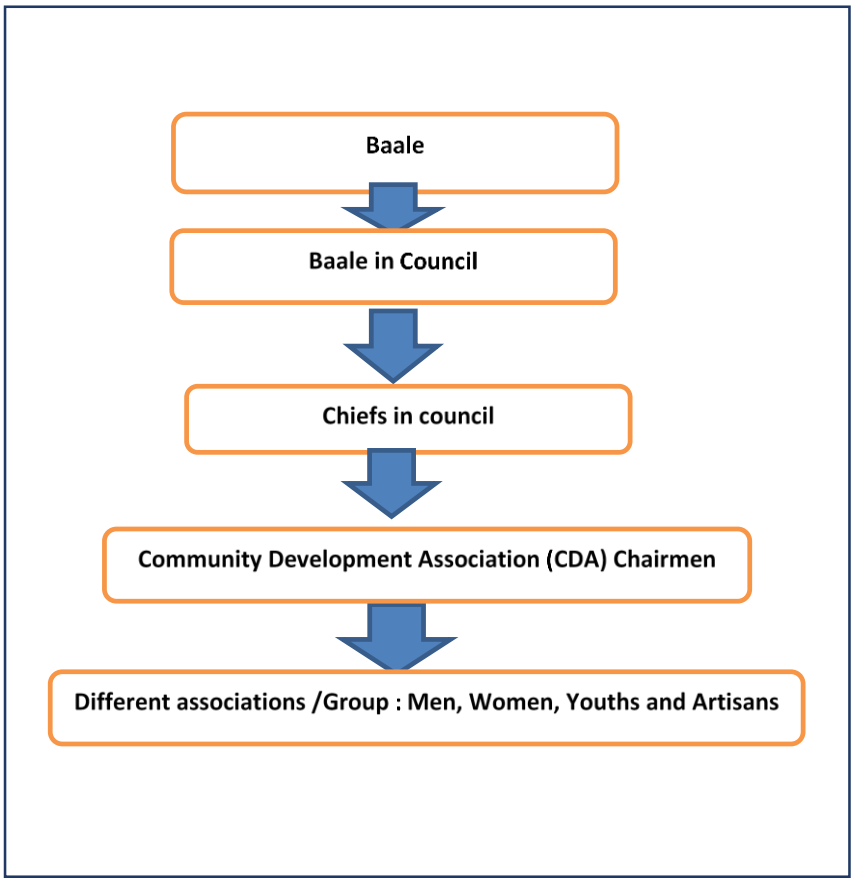


Figure 4.15: Organogram Showing the Leadership Structure in Communities around Project Area

With respect to availability and access to natural resources **t**here have been reduction in the availability of natural resources especially land resources in the communities across the clusters. This is attributed to increase in population, urbanization, industrial and business activities. All these factors brought about increase in the demand for land resources.

Considering the perceived impact of the fourth mainland bridge project and issues of potential resettlement, relocation and livelihood restoration, the respondents identified that the benefits of the project out weights its cost some of the positive impacts includes the following but is not limited to infrastructural development, ease of transportation, reduction in travel time, increase in the cost of asset (land) within the affected communities along the project corridor etc. however they also identified transfer shock and relocation from their livelihood activities as potential costs associated with the proposed project.

Table 4.42: Mitigation of Some Social Impacts

Consequences	**Mitigating measures**
1. Increased Population	i. Proper sensitization and awareness on the impacts of the project ii. Special accommodation for workers iii. Use of local/resident workers iv. Government incentives v. Education vi. Promotion of family planning
2. Pollution	i. Provision of proper and adequate waste disposal system ii. Proper sensitization of the community iii. Construction works should not be done at night iv. Expedite project v. Use of reusable and eco-friendly technology vi. Increase efficiency of operation to reduce waste vii. Recycling of wastes viii. Proper channeling of wastes against passage into water bodies
3. Miscreants/Increased Social Vices	i. Engaging local/resident workers ii. Provision of adequate security iii. Use of local security iv. Adequate sensitization and awareness v. Legislation against workers misbehavior vi. Good remuneration
4. Increased Traffic	i. Proper sensitization and awareness ii. Adequate Traffic Management Plan iii. Provision of alternative route iv. Repair of current Road networks v. Creating a time schedule for work vi. Engaging law enforcement agency to help control traffic vii. Good drainage
5. Building Demolition	i. Proper sensitization and awareness ii. Community engagement/dialogue iii. Resettlement action plan iv. Adequate consultation
6. Means of Livelihood Destruction	i. Proper sensitization and awareness ii. Community engagement iii. Resettlement action plan iv. Job opportunity for local residence v. Adequate compensation vi. Adequate dialogue and consultation vii. Training on livelihood diversification

4.4.10 Summary of Socio-Economic Baseline and Recommendations

In view of the foregoing the study concludes that:

- The respondents are in their productive age across the clusters:
- The traditional leadership structure and the Community Development Associations (CDA) is prominent in the communities along the project corridor. It is also upheld that the leaders are responsive to the needs of their subjects.
- Across the clusters there is a preponderance of male to female in the communities

- Across the clusters with respect to religion we have prominently have Christians and Muslims. We also have a fraction of the respondents as traditional worshippers
- The study also revealed that the inhabitants are predominantly Yorubas, however, we have divers ethnic groups represented across the clusters and have spent considerable length of time in the communities
- Majority of the respondents were married
- The respondents have fairly large household size
- The respondents are average income earners and are engaged in both informal and formal income generating activities.
- Flooding, erosion and air pollution are the main environmental challenges experiences by the sample subjects across the clusters studied.
- Inhabitants are adequately aware of the proposed fourth mainland bridge project and are prepared for its eventual commencement.
- There is no conflict in the communities at the moment. However, triggers to conflict which include improper handling of relocation and compensation and insecurity as a result of population increase are identified as triggers to conflict.
- There is a huge depletion of natural resources most importantly land, owing largely to urbanization and industrialization.

Recommendations

- The project officials and other stakeholders should constantly relate with the community leadership structure to further strengthen legitimization and serve as bridge builder between the project officials and the affected communities.
- The project officials should adopt the use of local content (community members) where and when they are available and show readiness and requisite skills for the job description.
- As part of its social responsibility environmental issues bedeviling the affected communities should be factored in the design of the project to avert such in future,
- Issues revolving around compensation and relocation of affected families should be promptly and adequately handled with transparency and fairness.
- For communities with potential influx of population, adequate security measures which includes but is not limited to the building of police station is advised.
- All activities and actions should be done with a view to having sustainable development; this is with a view to address issues of natural resource depletion.

4.5 Gender Based Violence

Gender is a critical variable in the development process. It identifies the social differences between men/boys and women/girls. It particularly addresses women's interests as regards their roles in relation to those of men. Interactive sessions were held on Gender Based Violence (GBV) with women in various communities between March- May, 2021 within the following dates; 15th March, 17th March, 18th March, 28th April, 29th April, 30th April, 1st May, 2021. The meetings were held in local dialect (**Yoruba)** and English to aid comprehension among participants in the following communities, and summary of women consultation are included in annex 7.

Potential Causes/ Triggers: Construction, particularly of major infrastructure projects such as the 4th Mainland bridge, can be a high-risk environment for GBV/SEA affecting community members, workers and service users.

GBV/SEA risks can intensify within local communities when there are large influxes of male workers from outside the area. Such workers often come without their families and have large disposable incomes relative to the local community, and this can pose a risk in terms of sexual harassment, violence and exploitative transactional relationships. These risks are higher where workers come into close contact with the local community, for example on access routes, construction sites, or when living together in remote areas.

Land acquisition that occurs during the construction phase also increases the risks of GBV/SEA. Individuals who make decisions about resettlement and compensation can abuse this power to sexually exploit vulnerable community members, such as those in female-headed households. This risk is exacerbated in places where women cannot legally hold land titles and are therefore more easily removed from their land.

4.5.1 GBV Methodology

This assessment was conducted using the following methods;

- Community Consultation meetings- Consultation meetings were held across all the communities affected by the project
- Focus Group Discussion- A total of 9 FGDs was conducted across project communities
- Key Informant Interview- Interviews with key informants (KIIs): KIIs were conducted with women who have enough knowledge of the community and the main GBV issues. These include leaders of women groups and women who have worked on previous Road construction sites in the communities
- Observation- Systematic observation was done to further understand the demography of communities and participants were also observed to understand their perception of GBV risks related to the project.

4.5.2 Key Findings on GBV Related Issues in Communities around Project Area

Several gender-related issues were taken into account for the purpose of this assessment: -

- The degree of women participation in the project. The assessment covered the perceived challenges that women/girls may face as a result of the civil works. This includes constraints and perceived fears. In addition, this part also assessed how they perceived the project will bring benefit to them; how satisfied they were with project implementation.
- Perceived change of roles. The changes of roles of men and women at different times and their relations and if there was any increased participation of women in community management roles as a result of the intervention. Time burden also assessed as it is crucial for gender sensitive development interventions. This also includes changes in mobility
- Gender equality and equity. If there would be any change in access and control over resources, and power relations in a household and at the community level.

Table 4.43: GBV Findings

FINDINGS	
i.	The project will attract new people to the area, especially unskilled construction workers, and increase the amount of disposable cash in the area, especially for local traders and business people. This may lead to increase of crime in the area and exacerbate the risk of gender-based violence and sexual abuse/exploitation.
ii.	Construction projects are associated with an increase in sexually transmitted diseases such as STIs and, HIV/AIDS due to the influx of immigrant workmen interacting with the local people. Construction teams, as well as the greater number of drivers, who are expected to pass through the project community and settlements, can also cause social upheaval among communities near the site.
iii.	All the Communities except for Aiyetoro, Ikorodu have government owned healthcare facilities serving them however it should be noted that the uptake of services in these facilities by community members is very low. These could be as a result of proximity as some of these facilities are far from the communities.
iv.	It was also observed from the FGDs that most of the communities make use of organized community security arrangements. Although, most all of the communities have public security posts serving their community they opted for a community owned arrangement. Aiyetoro, Ikorodu does not have a police post/station. Communal conflicts are resolved by the community leaders.
v.	Women in most of the communities engage in trading and allow their children to hawk their goods. This will expose children in the community to sexual harassment/exploitation which could increase when civil works commence.
vi.	There is a potential that gender inequality might occur during project construction through unequal distribution of work, discrimination against women, and unequal pay for women, among others. Sexual harassment against women might also happen as a result of mixing of women and men at the construction site. In most of the community meetings women were poorly represented.

Plate 4.12: Showing billboard and shirt worn by Secretary to Kabiyesi depicting GBV

Plate 4.13: Picture of Women Consultation at Adegboruwa Palace, Igbogbo Ikorudu

Table 4.44: Draft GBV Action Plan

ACTION	ACTIVITY	RESPONSIBLE	INDICATOR
Gender equal participation in the baseline surveys	Meetings with women's groups	Consultant	Minutes of meetings
Assess specific needs and constraints of women	Include a specific approach in ESIA	Consultant	ESIA
Identify key GBV risks that may be associated with the project	Analysis of meetings results	Consultant	ESIA report
Build capacity of service providers	• Build the capacity of health care providers and security agencies in project communities to respond to GBV issues. • Equip government health facilities to provide care to GBV survivors	Implementing Agency	Trainings and equipment
Include GBV clauses in all Standard Bidding Documents	• Ensure all contractors have capacity to respond/manage GBV incidence.	Implementing Agency	Bidding documents and contracts
Mandatory contractors' code of conduct on GBV and sexual harassment	• Conduct GBV training for all project personnel • Ensure that clauses in the code of conduct is well understood by contractors and their staff	Implementing Agency Consultant	Signed Code of Conduct document
Appointment of NGO to monitor GBV/SEA during the project implementation	-The TPM will monitor project to ensure adherence to GBV prevention protocols throughout project implementation	Implement Agency	Progress report on GBV/SEA
Develop a clear specific internal "Reporting and Response Protocol" to guide relevant stakeholders in case of GBV/SEA incidents.	• a toll free line	Implement Agency	Updates on GBV/SEA
Set up a GBV Grievance Redress Mechanism	• Representatives from the community, monitoring NGO and implementing agency. • this committee must be trained to adequately respond to GBV incidences	Implementing Agency Consultant	Progress report on GBV and GRM
Create awareness among residents in the community about GBV	• Stakeholder engagement should be continuous throughout project life • SBC materials and billboards should be provided in project communities,	Implementing Agency Consultant	Flyers/Billboards (both in English and Local Language) erected around project site.

Conclusion: Construction projects are associated with an increase in sexually transmitted diseases such as STIs and, HIV/AIDS due to the influx of immigrant workmen interacting with the local people. Construction teams, as well as the greater number of drivers, who are expected to pass through the trade centres and settlements, can also cause social upheaval among communities near the site. Implementing a GBV action plan will mitigate against any GBV occurrence.

Recommendations

i. The Lagos State Government has a comprehensive and effective response structure for GBV response. In order to effectively mitigate the GBV risks associated with the 4th Mainland Bridge it will be recommended that the Implementing Agency establish a strong linkage with the Lagos State Domestic and Sexual Violence Response Team (LSDSVRT).

ii. The project should have a GBV-Specific GRM, however, if the project is not be able to set up such, a member of the LSDSVRT should be part of the Grievance Redress Committee in order to effectively handle GBV-related cases.
iii. Stakeholder Engagement should be continuous through every phase of the project in order to effectively create awareness on possible GBV risks and the mitigation measures that have been put in place.

4.6 Peoples' Perceptions, Fears and Expectations from The Project

4.6.1 General Opinion about the Proposed 4MB project

The household respondents expressed various opinions about the proposed 4MB project, with more than half making favourable comments that it is a good project, that it will enhance development, it will lead to further development of the area and the entire community, it will boost business, reduce traffic congestion, as well as reduce the number of 'agberos' and area boys and social miscreants, who were said to often cause problems especially around Abraham Adesanya Junction, Addo and Oke-Ira Nla on the Island Section, and around Baiyeku, Igogbo, Ikorodu on the Mainland Section. However, about one-fifth of the respondents had negative opinion about the project, complaining about and in demolition of structures, shops, etc. Also, some of the FGD discussants said they would like to know when exactly demolition works is likely to kick start and to know how many days or weeks, they will be given to move out their belongings from their affected properties, and specifically want to know if they would be given compensation before the structures are demolished. They gave examples of property owners who lost their structures to Road Projects and have not been compensated by the LASG over three years since the incidence.

As may be expected, there were more unfavourable opinions by the business operators than both the individual household respondents and the Key Informants. Generally, the In-Depth interviewees had more favourable opinions about the project than the individual household respondents.

Some of the respondents who had favourable opinions about the project also expressed concern about the plight of people who will be displaced or whose shops and business facilities will be demolished, but as some also reasoned, people would have to endure some suffering in order to enjoy the benefits. As some of them said, nothing good comes easily without some costs. They concluded by advising that the government should compensate people whose businesses and properties will be affected without unnecessary delays to alleviate their sufferings.

Some of them also expressed concern that it was likely to lead to increase in rent and general prices, although it is debatable whether this is generally positive or negative. For instance, the landlords would probably be happy with rent increase, while the tenants will be unhappy about the same. Generally, the respondents pleaded for compensation for people affected.

The negative effects indicated by the business operators includes complaints about the demolition of shops and business premises, displacement of traders, leading to joblessness for many people, loss of customers, loss of sources of livelihood, reduction of sales/business. However, about one-fifth said they were not going to be affected in any way by the project, while some of the respondents also said they would wait until the project is completed for them to know fully how they would be affected. Some of the business operators also looked at the

project from a positive perspective, saying it is for the ultimate good of the people and Lagos State as a whole, saying it could lead to more businesses in the future, improved environment, improved transportation, and reduction of traffic congestion. Respondents in Ikorodu Area generally welcomed the idea of the proposed 4MB as they saw it as an opportunity tp interconnect with neighbouring areas particularly reducing travel time to the Island. However, even among the traders, some (especially the petty traders) said they were not affected much, with some saying all they needed to do was to carry their wares and move to another location.

4.6.2 Possible Effects of the Project on People and Households

The respondents thought the 4MB project could affect them in various ways, both positive and negative, although more people thought it would have more positive than negative effects. The potential positive effects that were mentioned by some of the respondents include: increased business opportunities, improved transportation systems, cheaper transportation costs and generally better life. However, about one third of the household respondents mentioned negative effects, including demolition of own or spouse's shops and structures, displacement of people from their houses and businesses, unemployment, and increased traffic. Furthermore, some complained about loss of income, because the market was not moving like before.

4.6.3 Possible Effects of the Project on the Communities

Similar opinions were expressed about the possible effects of the project on the communities. More than half of the household respondents mentioned positive effects including improved environment, development of communities, improved transportation system, and better roads. However, one-fifth said their communities are not likely to be affected in any way or could not say how it could affect their communities, while nearly one-quarter mentioned negative effects, including the demolition of houses and shops, displacement of people and businesses.

4.6.4 Problems that the Proposed 4MB Project Could Bring to the affected Communities

The respondents mentioned various problems that they thought the 4MB Project could bring to the community, including the return of the increase in house rent, destruction of public infrastructure, demolition of houses, displacement of people (residents and traders/business people), loss of jobs for displaced traders and business people; increase in the cost of transportation (during construction), increased poverty, health hazards, community congestion as a result of the influx of more people; and increased traffic in the communities.

Some of the in-depth respondents expressed concern that some of the displaced traderscould start harassing people in the communities by taking to theft and other forms of crime as a result of joblessness during construction but transport operators (drivers, conductors, motor garage touts, etc.) saw the benefit of reduced travel times and ease of access to the Island which will improve the efficiency of their operations

Some also opined that it could lead to increases in air-borne diseases arising from the dust from the construction works.

Furthermore, some FGD discussants said it could compound economic/financial problems for some people, especially traders who might have taken loans for their businesses, and who may not be able to pay the loans back if they are displaced or their shops/business premises are destroyed without compensation. They also said it could lead to general price increase.

4.6.5 Solutions to Problems the Project could cause for the community

Various solutions were proffered by the respondents to the identified problems, including: construction of shops, adequate compensation for project affected persons, provision of alternative accommodation for people affected, and that the construction works should be completed quickly in order to minimise the effects on people. Some opined that alternative shops and houses should have been put in place before the commencement of demolition works. Some also counseled that the government should be sympathetic to the plight of the people and give development a human face.

Solutions proffered by the in-depth respondents and FGD discussants include provision of low-cost/affordable shops and houses for people displaced, employment of the transport operators in the government transport scheme, government should assist affected people to relocate to alternative places, government should pay adequate compensation for affected people, and that the government should ensure quick completion of the project in order to minimize the inconvenience for the people.

4.6.6 Possible effects of the project on women, children and youth

Most of the respondents thought the project would have positive effects on women and children, who they said would be able to walk safely on the streets without fear of being molested or attacked by the area boys and thieves because of the perception that Solar Street Lights will be provided for illumination at night. Some also said the 4MB project has the potential of creating employment opportunities for women, as well as young people in general, although some also talked about the possible negative impact on women who are family breadwinners and those who are responsible for the feeding and upbringing of their children.

4.6.7 Benefits of the project for People and Households

Some of the benefits that the household respondents mentioned for people and households from the project include: more accessible/improved roads, improved transportation, eradication of traffic jam, increased employment opportunities, increased business, and more income, although a few of the respondents did not mention specific benefits or simply said they did not know. For business operators and key informants, possible benefits of the project were said to include: improved/more beautiful environment and community, easier/smoother travel time to the Island.

4.7 Stakeholders Identification, Consultation and Engagement

This section identifies all stakeholders and ensures proper consultation and engagement of all stakeholders, including the communities bordering the proposed project. It also explains the approach and methodology for the consultation, information disclosure, and documents the way environmental and social concerns raised by stakeholders and the Public in consultation events and activities are addressed. A stakeholders' engagement plan is then presented to explain how consultations will be carried out for the next steps of the project.

4.7.1 Objectives of The Consultations

The main objective of the Consultation Process is to acquire and disseminate information, identify and address legislative, community and environmental concerns and to suggest

appropriate mitigation measures for all identified negative impacts to ensure that the project is people's friendly.

Furthermore, other purpose of consultation is to protect the interests of affected project communities, especially the poor and vulnerable and ensure project sustainability. This process gives room for effective discussion, dialogue and agreements amongst all parties interested in or are to be affected by a proposed project. The overall result would be the optimization of the potentials of the proposed project and maximization of its benefits. It ensures that any fear or apprehension about the nature, scale and impact of the project shall be addressed fully; hence eliminating costly delays.

Below are other objectives of consultation:

- ❖ Ensure that any fears or apprehensions about the nature, scale and impacts of the proposed project have been fully addressed;
- ❖ Avoid any misunderstanding about the project;
- ❖ To make the project environmentally and socially sustainable, and enhance the project's acceptance
- ❖ Securing public and stakeholder opinions towards enhancing the project benefits and minimizing its adverse impacts on the PAPs.
- ❖ Involving the PAPs on resettlement planning, including the type and volume of compensation expected, livelihood options and nature and extent of assistance in order to restore their livelihoods following the economic displacement.
- ❖ Canvass the inputs, views and concerns; and take account of the information and views of the public in the project design and in decision making.
- ❖ Obtain local and traditional knowledge that may be useful for decision-making;
- ❖ Facilitate consideration of alternatives, mitigation measures and trade-offs and ensure that important impacts are not overlooked and benefits maximized;
- ❖ Reduce conflict through the early identification of contentious issues;
- ❖ Provide an opportunity for the public to influence the designs and implementation in a positive manner;
- ❖ Improve transparency and accountability in decision-making; and increase public confidence in the project.

4.7.2 Stakeholder Engagement Approach and Methodology

In order to obtain the views representative of a broad spectrum of the stakeholder including those in disadvantaged positions, a multi-pronged approach was followed by reaching out to every segment of the identified stakeholders announcing the project and the opportunity to participate both verbally and in writing (Letters to stakeholders)

Basic forms of public consultation at the bottom, rising to full public participation at the top was adopted and these include:

- ❖ Informing - telling participants about some decision which has already been taken (for example explaining the reasons for, or benefits of, something contentious or criticised);
- ❖ Consulting - seeking participants' ideas or views as an input to some decision which the council/government will take

- ❖ Deciding together - sharing the decision with the community; giving the community some real power; and
- ❖ Supporting community decisions - allowing the community to make the decision with the council/government at most providing advice or comment

At the early stage, capacity of all stakeholders was enhanced with the manner and level of background information conveyed to them which were presented in no technical language and generally made sufficiently clear. Empowering the stakeholders through this manner of information transfer enabled them to participate meaningfully and to the best of their ability as much as reasonably possible.

4.7.2.1 Consultation Plan, Strategies and Tools

The engagement with all the potential stakeholders was done through consultations-based methodologies throughout the project lifecycle. Special attention will be given for the following:

- Engagement of the affected PAPs/households/communities and vulnerable or disadvantaged groups in order to ensure their effective participation through the proposed Project, particularly in the resettlement studies and
- The cross-cutting issues, such as gender as well as the conflict-sensitive issues.

Consultations are being carried out to comply with the World Bank's ESS 5 and ESS 10, which warrants interactions with the local community groups, NGOs, social groups, local private sector, and the Government departments before the implementation of the proposed Project.

Identifying and consulting with stakeholder representatives, especially community leaders, served as an efficient way for LSMOWI PIU to disseminate information to large numbers of stakeholders and receive information from them. However, it is essential that these people are genuine advocates of the views of their constituents with common interest in respect to the project and affected properties on the project corridor. These include representatives of Landlords / ladies, shop owners, religious organisations and business owners.

Some Questions that Assisted Stakeholders identification

- Who will be affected by the negative environmental and social impacts of the project, both on- and off-site?
- Who will benefit from the project other than the project sponsor and investors?
- Who will be responsible for implementing measures designed to avoid, mitigate, or compensate for the project's negative impacts?
- Whose cooperation, expertise, or influence would be helpful to the success of the project?
- Who are the most vulnerable, least visible, and voiceless for whom special consultation efforts may have to be made?
- Who supports or opposes the changes that the project will bring?
- Whose opposition could be detrimental to the success of the project?

To reach the hearts of the stakeholders, appropriate engagement approaches was adopted. This included focus groups discussions, individual or small group interviews, surveys, formal referrals, key-person meetings, etc. The approach chosen reflected the engagement objectives,

stakeholder capacity, cost and time constraints, and whether qualitative or quantitative information was required.

The consultation strategy for the EIA / RAP activities evolved around the provision of a full opportunity for involvement of all stakeholders. Concerns raised by the stakeholders are documented and incorporated in this report to enable proper project planning. In achieving an effective stakeholder consultation, the following procedures were followed while engaging the communities.

- Development of Communication plan: The development of a communication plan for this study was influenced greatly by the pre-consultation meetings. This was important as communication strategies must take into consideration the peculiar characteristics of the audiences. Taking cognizance of the peculiar characteristics of our stakeholders, Yoruba was the main language of communication while English was sparingly used. The use of Yoruba helped us in building more trust as stakeholders were able to relate with what we presented and made valid contributions.
- Discussion with Stakeholders: Further to the above, a one-day Stakeholders for the Environmental and Social Impact Assessment (ESIA) for the 4MB Project was employed in engaging stakeholders fo;;owed up with various sets of formal Consultations and engagements in public places after due notification.

These different strategies that enabled us to get more data useful for the execution of the project include the following;

- Community meetings
- Focus Group Discussions
- Community Resettlement/Welfare Committee to be Inaugurated
- Key informal interviews via one-on-one discussions
- One on one engagements with project affected persons (using structured questionnaires)
- Consultations with relevant agencies, organizations and government officers

The consultation plan, strategies and tools are given in Table 4.45.

Table 4.45: Consultation plan and Strategies

S. No.	Project Stage	Stakeholder Groups	Consultation Methods	Issues/Topics for the Discussion	Responsible Entity	Status
1.	**Pre construction**	• Host communities and PAPs • youths and women • Lagos Parks and Gardens • RTEAN / LASPG • Market Men and Women • MDAS • CSO/CBOs/Trade Union • NGOs	• Invitation by letter, phone calls and by SMS • pre-public consultation meetings • One on one consultation • Public meetings • Focus groups discussion • Interviews with key stakeholders	• Disclosure of project information • Planning and designing • Identification of affected items and PAPs • RAP census and preparation • Valuation of Affected assets • Establishment of grievance redress committee • Implementation of the RAP	• ESS Consultant • LSMOWI PIU • ACE	Completed

S. No.	Project Stage	Stakeholder Groups	Consultation Methods	Issues/Topics for the Discussion	Responsible Entity	Status
2.	**Construction**	• Host communities and PAPs • LASTMA • youths and women • LASPG / RTEAN • MDAS • NGOs • CSO/CBOs/Trade Union	• Public meetings	• Disclosure of project workplan • Traffic issues	• ESS Consultant • LSMOWI PIU • ACE • Contractor	**Pending**
3.	**Operational**	• LASTMA • NURTW • CSO/CBOs/Trade Union			• LSMOWI PIU	**pending**

4.7.3 Stakeholder Identification and Mapping

Stakeholder identification which involves identifying people, groups of people and organisations who are interested in the proposed project was conducted. This was considered important to understand the stakeholder list as the basis for stakeholder analysis. Stakeholder mapping which is the visual process of laying out all the stakeholders of the project was carried out to know and understand individual or group of stakeholders who may have power to influence the process of project implementation and others that have vested interest in the proposed project. The essence of the stakeholder mapping exercise was to get a visual representation of all the people who can influence the project and how they are connected.

4.7.3.1 Target Stakeholder Groups

Target stakeholder groups for the stakeholder engagement process have included:

- ❖ Concerned Federal and State MDAs (Implementing Agencies)
- ❖ State-level (Alausa, Ikeja; Oke Mosan Abeokuta) and LGA-level (Eti=Osa, Ikorodu and Owode Obafemi) authorities and technical services
- ❖ Customary authorities (Traditional Institutions)
- ❖ Communities and households affected by the proposed project along the preferred emerging
- ❖ Horizontal route alignment
- ❖ Industrial and commercial actors affected by the proposed project, if any
- ❖ NGOs and other civil society organizations in the fields of nature conservation, community development and human rights
- ❖ Professional group(s)

The list of stakeholders for the project is given in Table 4.46.

Table 4.46: List of Stakeholders

S. No.	Stakeholder Category	Stakeholders	Identified stakeholders
1.	Affected Parties	• Owners and Users of Affected Property • Government Ministries and Agencies	• Federal Ministry of Environment

		• State legislative bodies • Local Government Authorities • Local land users • State level Business groups	• Lagos / Ogun State Ministry of Physical Planning and Urban Development • Lagos / Ogun State Ministry of Transport • Lagos / Ogun State Ministry of Environment • Lagos / Ogun State Ministry of Land • Local Government Authority • Community Interest Groups • Grievance Redress Committee • CSO/CBOs/Trade Unions • Resettlement Committee/ Resettlement steering committee etc.
2.	Other interested Parties	• Mass media • Security Agencies • NGOs/CBOs • Citizen's Groups (residents associations, clubs and societies) • Professional Bodies • Community Leaders • Local Businesses	
3.	Vulnerable Groups	• Citizen's Groups (including women organizations) • Local Groups of Vulnerable Persons	

4.7.4 Stakeholders Engagement Activities

The stakeholders at various level have been engaged for the project. The extent of stakeholders' involvement was based on the significance of the impacts spread out over a number of communities. The project affected persons were more consulted in order to appreciate their concerns and views about the project. Other community leaders in these areas were consulted in addition to other opinion leaders.

The three main categories of stakeholder groups are given below:

- ❖ Affected Parties – persons, groups and other entities within the Project Area of Influence (PAI) that are directly influenced (actually or potentially) by the project and/or have been identified as most susceptible to change associated with the project, and who need to be closely engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures;
- ❖ Other Interested Parties – individuals/groups/entities that may not experience direct impacts from the Project but who consider or perceive their interests as being affected by the project and/or who could affect the project and the process of its implementation in some way; and
- ❖ Vulnerable Groups – persons who may be disproportionately impacted or further disadvantaged by the project(s) as compared with any other groups due to their vulnerable status and that may require special engagement efforts to ensure their equal representation in the consultation and decision-making process associated with the projects.

This categorization is based on the requirements of the ESS10 of the World Bank regarding the categories of Stakeholders to be considered in the course of project planning.

4.8 Discussion with Stakeholders and Summary of Consultation

After the presentations, some stakeholders raised issues and concerns over the proposed development. The issues and concerns raised centred round the following:

- Pavement should be construction towards the drainages and not towards the road
- Expectation of shops owners along the project corridor
- What would become of the Livelihood of PAPs.
- Construction Phase commencement date
- Prior notice duration before PAPs would be asked to leave

4.8.1 Public / Stakeholder Consultations

Public consultation and participation are essential because they afford the stakeholders the opportunity to contribute to both the design and implementation of the project activities and reduce the likelihood for conflicts. It also provides an avenue to enlighten stakeholders of their choices and rights with regards to compensation and resettlement if need be. Stakeholders can be categorized as Direct or Indirect beneficiaries/ affected persons

- **Direct** project beneficiaries are people from communities provided with access to the Roads and footbridges rehabilitated under the project, within a 2-kilometer range.
- **Indirect** project beneficiaries are the tradable sectors of the economy and the private sector, whose growth will be supported by the job creation opportunities and market opportunities supported by enhanced connectivity.
- **Directly** affected persons are people who have been adversely affected by the project within 2km the project area, (e.g. involuntary resettlement, loss of properties, loss of access etc.).
- **Indirectly** affected persons have been adversely affected because of the project impacts/ proximity to project area (e.g. traffic congestion etc.)

Information about the project was shared with the stakeholders, to enable meaningful contribution, and enhance the success of the project.

4.8.2 Consultation Strategy

The public consultation strategy for the ESIA activities evolved around the provision of a full opportunity for involvement of all stakeholders. Concerns raised by the stakeholders are documented and incorporated in this report to project planning. In achieving an effective stakeholder consultation, the following procedures were followed while engaging the communities.

1. **Pre-consultation:** Initial visitation to the communities ensured familiarities with the Consultant team. During these pre-public consultation meetings, we contacted and engaged representatives of key community actors including executives of landlord associations, community associations, religious organizations, and non-government organizations such as the transporters associations (Association and National Union of Road Transport Workers), community/opinion leaders, and people living with disability, women groups and youth groups. These initial meetings were used to prepare the mind of the community ahead of the forum meeting. Key critical stakeholders are vital in building trust and entering the field for public communication and consultations.
2. **Development of Communication plan:** The development of a communication plan for this study was influenced greatly by the pre-consultation meetings. This was important as communication strategies must take into consideration the peculiar characteristics of the audiences. Taking cognizance of the peculiar characteristics of our stakeholders, Yoruba

was the main language of communication while English was sparingly used. The use of Yoruba helped us in building more trust as stakeholders were able to relate with what we presented and made valid contributions.

3. **Discussion with Stakeholders:** Further to the above, one-on-one and community meetings, telephone conversations and group discussions were employed in engaging stakeholders.

These different strategies enabled us to get more data useful for the execution of the project. Where group discussion took place, we ensured moderation in order to control for dominance. The Consultant socioeconomic team utilized both qualitative and quantitative methods (In-depth interviews (IDI), Focus Group discussion (FGD), administration of questionnaire as well as key informant interviews).

	
IDI with a Leader at Oke-Ira Nla	Cross Section of Men of Magodo Community and ESIA Team during Community Engagement
	
FGD with Women Group	FGD with Youth Group of Agbede Olunla

Plate 4.14: Some Pictures of Stakeholder Consultations around the Project Area

The project site was visited by the Consultant team, Officials pf the Federal Ministry of Environment (FMEnv) Abuja and other relevant MDAs and Local Government representatives. The community forum had women group, representatives of the physically challenged, schools, market men and women, transport unions, social groups, landlord associations, and traditional institutions, among others. This collectively made the meeting generate diverse issues and robust information as it relates to the socio-economic impacts flooding has on their lives and how the proposed project will affect their livelihoods.

Table 4.47: Key Issues Raised during the Consultation

Language of Communication:	English & Yoruba
Introduction	The team members were introduced by professor Oyin Oladeji the team head for the socio-economic team. A proper introduction was done to further inform the people of the purpose of our coming. The stakeholders raised concerns about their fears which was answered by Professor Oyin Oladeji and the ESIA team
Key Stakeholders	Community Leaders; Executives of Landlord Associations; Women and Youth Groups; NGO/CBOs, Vulnerable Groups, Religious Groups (Christian and Muslim); Opinion Groups, Consultant's Team: Experts, Research Assistants and Enumerators

Venue	Ikorodu
Date	**15/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Pa Koko Jacob Yabena raised concerns about the fear of losing his farm land and asked if there'll be proper compensation if he were to lose his farm land.	All affected persons will be duly compensated
The stakeholders asked to know the exact position/location of where the bridge will pass through	He stated that we only know the communities where the bridge will pass through and that some people will still come for the mapping out of the bridge.
The vulnerable group were present and they expressed that the government should put them into consideration in the creation/construction of the bridge. So as to make movement easier for them	Prof Oyin made it clear that it will be clearly noted in our report.
Venue	**Ayetoro**
Date	**15/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
One of the attendees raised his concern about the bridge going through the community	It was clearly stated to him that that the bridge was going to pass through the mash land
Issues of livelihood being cut off	The government will make sure everybody affected will be duly compensated
The residents of the community raised issues of not having good water and expressed that they had to go a long distance to go get water to drink and asked the government to intervene	It will be stated in the report
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Mr. Adenubi asked about the positive and negative impacts the creation of the bridge would pose to their houses and livelihood.	Professor Oyin responded that there is no development that does not come with its positive and negative aspects. But assured that whoever is affected will be duly compensated, and that the bridge will bring about much needed development to the people of the community.
Professor Osho asked about the commencement date, where the bridge will pass.	It was stated that according to the Lagos State Government the plan was for it to commence by the end of this year (2021) but before that, other activities need to take place which includes the ESIA, RAP, before construction will begin. Mr. Adesua further explained where the bridge will come from and stated the communities it will pass through
Venue	**Bashir community**
Date	**17/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Mr. Akinpelu asked to be enlightened more about the project, he also asked if houses will be demolished and if they are going to be what, will be the mode of compensation	Prof Oyin responded by saying everybody affected will be duly compensated
Mr. Olatunji Bello raised issues about one of his properties being destroyed without being duly compensated and asked if this project wouldn't be like the lather.	Prof Oyin responded that this project is funded by an international body and that everybody affected will be duly compensated.
The stakeholders expressed that a design should have been brought to the consultation and they asked if a copy of the report will be available for the people.	Prof Oyin stated that a copy of the report will be available at the local government offices for 21 days then a meeting will be head in which key stakeholders will be invited to have a discussion.
The LCDA chairman asked when the inception of the project will commence. He also asked if the youths/people of the community will be employed.	Prof Oyin stated that the people of the community will be carried along during the construction of the project
The people of the community suggested alternative routes where the bridge can pass through.	There's already a blue print for the bridge in Lagos State plan for over 20 years
Venue	**Ijokoro Community**
Date	**17/3/2021**

Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
A question was asked by one of the stakeholders asking which house will be affected and if they'll be compensated	All the affected people affected will be duly compensated.
The people of the community complained about the bad Road that leads to their community.	It will be noted in the report
Venue	**Agbede Isheri Agric**
Date	**17/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Mrs. Albert raised the issue of how the government plans to compensate those that will be affected	Those affected will be duly compensated
Will people without C of O be compensated?	Those that have legal documents will be paid
Venue	**Shared Divine Estate**
Date	**18/3/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Mr. Anibaba Afolabi wanted to know the precise location the bridge will pass through.	It's on the internet
Will the people affected be compensated	Yes
What time will construction commence	By the end of the year 2021
Venue	**Isheri Olofin**
Date	**28/4/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Chief Isiaka asked if there'll be compensation for land taken.	All affected persons will be duly compensated
Chief Jimo Ayide said there have been cases where the government have forcefully taken their land and he asked if this wouldn't be the case.	Prof Oyin responded that the project is being financed by the IFC and every affected person will be compensated
Venue	**Okera-Kekere**
Date	**29/4/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
Alhaji Razak asked about the exact location where the bridge will pass through and he also asked when the construction of the bridge will commence	He stated that we only know the communities where the bridge will pass through and that some people will still come for the mapping out of the bridge and according to the Lagos state government construction should begin by December 2021
Mr. Muruf Dosumu asked if people without C of O will be compensated and he also made a suggestion saying the government should have created more rail lines instead of a fourth mainland bridge	All affected persons will be duly compensated if there's a proof of ownership
Venue	**Okera-Nla**
Date	**30/4/2021**
Feedback of stakeholders (Issues and concerns raised)	**How concerns were addressed**
One of the stakeholders asked if their houses will be destroyed	Some houses will be affected and all affected will be duly compensated.
The Baale Chief Oloye Ajanoku commended the efforts of the Lagos state government and hopes the bridge will bring about much needed development to the community as a whole.	
The people of the community complained about the issue of flooding during the raining season which makes carrying out their daily activities nearly impossible for them.	It will be looked into
Venue	**Idiroko**
Date	**1/5/2021**
Issues, comments and concerned raised	**Answers**
Mr. Fashakin commended the effort of the government and asked about the dimension of the bridge, health risks the construction of the bridge might pose to the people of the community.	Prof Oyin explained that one of the main reasons we came is evaluate and see the potential risks involved so as to mitigate it
Mr. Felix commended the efforts of the government and said the 4th mainland bridge is a very much welcomed development	
Mr. Fabuleje asked how the bridge will benefit the people of the community	Prof. Oyin made it clear that the bridge will benefit the people and it will bring about development to the community
Venue	**Surulere Itamaga**
Date	**1/5/2021**
Issues, comments and concerned raised	**Answers**
Mr. Bodun Bakare asked what benefits does the bridge bring to the people of the community and he commended the efforts of the	It will bring about a lot of development to the community.

Lagos State government and said the fourth mainland bridge project has been long overdue	
Mr. Joseph Abiola asked that if houses were to be demolished, what will be the mode of compensation	Prof Oyin responded by saying everybody affected will be compensated. Valuers will be brought to value any property that is going to be demolished to determine the cost of the property.
One of the stakeholders asked if people without C of O will be duly compensated	All affected persons will be compensated

4.9 Grievance Redressal Mechanism

Grievance mechanisms provides a formal avenue for affected groups or stakeholders to engage with the project implementers or owners on issues of concern or unaddressed impacts. Grievances are any complaints or suggestions about the way a project is being implemented. They may take the form of specific complaints for damages/injury, concerns about routine project activities, or perceived incidents or impacts. Identifying and responding to grievances supports the development of positive relationships between projects and affected groups/communities, and other stakeholders.

4.9.1 Grievance Redress Process

There is no ideal model or one-size-fits-all approach to grievance resolution. The best solutions to conflicts are generally achieved through localized mechanisms that take account of the specific issues, cultural context, local customs, and project conditions and scale.

In its simplest form, grievance mechanisms can be broken down into the following primary components:

- Receiving and registering a complaint.
- Acknowledge grievance
- Screening and assessing the complaint.
- Formulating a response.
- Selecting a resolution approach.
- Implementing the approach.
- Announcing the result.
- Tracking and evaluating the results.
- Learning from the experience and communicate back to all parties involved.
- Preparing a timely report to management on the nature and resolution of grievances.

The best solutions to conflicts are generally achieved through localized mechanisms that take account of the specific issues, cultural context, local customs, and project conditions and scale.

4.9.2 Awareness of GRM

GRM should be given a wide publicity among stakeholder groups such as affected parties, government agencies, and civil society organizations. Effective awareness of GRM process makes people better understanding about their options, depending on the types of complaints. Awareness campaigns should be launched to give publicity to the roles and functions of the GRM.

Awareness should include the following components:

- Scope of the project, planned construction phases, etc.;

- Types of RCCs (resettlement commission committee) available; purposes for which the different GRMs can be accessed, e.g., construction-related grievances, grievances related to physical and economic displacement,
- Eligibility to access the GRM.
- How complaints can be reported to those RCC and to whom, e.g., phone, postal and email addresses, as well as information that should be included in a complaint;
- Procedures and time frames for initiating and concluding the grievance redress process; boundaries and limits of GRM in handling grievances; and roles of different agencies such as project implementer and funding agency.
- A variety of methods that can be adopted for communicating information to the relevant stakeholders. These methods could include display of posters in public places such as in government offices, project offices, community centers, hospitals and health clinics of the area.

Expectations when Grievance Arise: When local people present a grievance, they expect to be heard and taken seriously. Therefore, the personnel in charge and others such as the engineers involved in one aspect of the project or other must convince people that they can voice grievances and work to resolve them without retribution.

It should be understood that all or any of the following is or are expected from the project management/channel of grievance resolution by the local people:

- Acknowledgement of their problem,
- An honest response to questions/issues brought forward,
- An apology, adequate compensation,
- Modification of the conduct that caused the grievance and some other fair remedies.

Management of reported grievances: The procedure for managing grievances should be as follows:

a) The affected person files his/ her grievance, relating to any issue associated with the resettlement process or compensation, in writing or phone to the project Resettlement and Compensation committee. Where it is written, the grievance note should be signed and dated by the aggrieved person. And where it is phone, the receiver should document every detail.
b) A selected member of the Site Committee will act as the Project Liaison Officer who will be the direct liaison with PAPs in collaboration with an independent agency/NGO person to ensure objectivity in the grievance process.
c) Where the affected person is unable to write, the local Project Liaison Officer will write the note on the aggrieved person's behalf.
d) Any informal grievances will also be documented

CHAPTER FIVE: POTENTIAL AND ASSOCIATED ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENTS

5.1 Introduction

This chapter presents the analysis of all the environmental and social impacts specific to the proposed 4MB project activities, in relation to the World Bank's ESS 2-8, and other local and international indicators. The impact assessment covers the pre-construction, construction and operational phases of the project vis-à-vis the nature of the impact, the magnitude of impact, the cumulative nature of the impact and the potential for minimizing the impact.

5.2 Impact Assessment Methodology

Potential environmental and social impacts were identified based on-site visits, interviews with APs, stakeholder engagement, environmental sampling, collection of relevant and available secondary data, review of relevant project documents such as the feasibility study, survey reports, etc. The significance of potential impacts was assessed using the criteria and methodology described below.

5.2.1 Impact Magnitude

The potential impacts have been categorized as major, moderate, minor or nominal, based on consideration of parameters such as: (i) duration of the impact; (ii) spatial extent of the impact; (iii) reversibility; (iv) likelihood; and (v) legal standards and established professional criteria. The magnitude of potential impacts has been identified according to the categories outlined below.

Table 5.1: Parameters for Determining Magnitude

Parameter	Major	Moderate	Minor	Minimal
Duration	Long-term (more than 15 years)	Medium-term Lifespan of the project (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent	Widespread far beyond project boundaries	Beyond immediate project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries, with no detectable potential impact
Reversibility	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Potential impact requires a year or so for recovering with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains almost constant
Legal standards and established professional criteria	Breaches national standards and/or international guidelines/ obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable

Parameter	Major	Moderate	Minor	Minimal
Likelihood of occurrence	Occurs under typical operating or construction conditions (Certain)	Occurs under worst case (negative impact) or best case (positive impact) operating conditions (Likely)	Occurs under abnormal, exceptional or emergency conditions (Occasional)	Unlikely to occur

5.2.2 Sensitivity of Receptor

The sensitivity of an environmental receptor (a parameter that may be affected by the project) has been determined based on review of the local population (including proximity/numbers/vulnerability) and presence of features at the project sites or the surrounding area. Criteria for determining receptor sensitivity are given in the Table below:

Table 5.2: Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very High	**1.** Vulnerable receptor with no capacity to absorb proposed changes or minimal opportunities for mitigation.
High	**2.** Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Medium	**3.** Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	**4.** Vulnerable receptor with good capacity to absorb proposed changes and/or good opportunities for mitigation

5.2.3 Assigning Significance

Following the assessment of magnitude, and the quality and sensitivity of the receiving environment or potential receptor has been determined; the significance of each potential impact is established using the impact significance matrix shown in Table 5.3

Table 5.3: Significance of Impact Criteria

Magnitude of Impact	Sensitivity of Receptors			
	Very High	High	Medium	Low
Major	Critical	Major	Moderate	Minor
Moderate	Major	Major	Moderate	Minor
Minor	Moderate	Moderate	Minor	Minimal
Minimal	Minimal	Minimal	Minimal	Minimal

5.2.4 Cumulative Impact Matrix

Potential environmental impacts during the pre-construction, construction, and operation phases of the project are presented in a matrix form in Tables 5.4 below:

Table 5.4: Potential and Associated Impacts of the Proposed Lagos 4MB project

Issues	Potential Impacts	Sensitivity	Magnitude	Significance Priorto Mitigation
1. Pre- construction				
A. Physical Environment				
Mobilization, Site clearance, Demolitionof existing Bus Stops	Impairment of air quality	Very High	Very High	Critical
	Noise and vibration nuisance	Very High	Very High	Critical
B. Socio-Economic Environment				
Mobilization, Site clearance, Demolition of existing Bus Stops	Armed robbers/Area Boys attack	Major	Major	Major
	Interference with road transportation	Very High	Major	Critical
	Kidnappings	Major	Major	Major
	Road traffic accidents	Very High	Major	Critical
	Increase in income	-	-	Positive
	Opportunities for contracting	-	-	Positive
	Increase in social vices	Medium	Minor	Minor
Land acquisition	Loss of land	High	Major	Major
	Third party agitation	Medium	Moderate	Moderate
	Change in Land Use	Medium	Moderate	Moderate
Resettlement	Improved livelihood	-	-	Positive
	Improved micro and macro economy	-	-	Positive
	Compensation payment	-	-	Positive
Workers Recruitment	Increase in income	-	-	Positive
	Increase in social vices	Medium	Moderate	Moderate
	Increase opportunity for business and employment	-	-	Positive
	Opportunities for contracting	-	-	Positive
	Removal of historically significant cultural andaesthetic landmark features	Medium	Moderate	Moderate
	Inequitable distribution of available job opportunities	Medium	Moderate	Moderate
	Agitation for employment opportunities from locals	Medium	Moderate	Moderate
2. Construction Phase				
A. Physical Environment				
	Impairment of air quality	High	Minor	Moderate

Issues	Potential Impacts	Sensitivity	Magnitude	Significance Priorto Mitigation
Removal of encumbrances along thecorridor, Relocation of Utilities, Removalof shrubs and top soil, Removal &carting way of unsuitable material,Construction activities, Commissioning, Electric power generation, Water provision and consumption, Removal ofProject Office and Testing Laboratory, Demobilization and Waste Generation	Noise and vibration nuisance	Medium	Moderate	Moderate
	Acceleration of erosion	Medium	Moderate	Moderate
	Alteration of local topography and drainagepattern	Medium	Moderate	Moderate
	Change in land use	Medium	Moderate	Moderate
	Contamination of soil, groundwater and surfacewater	Medium	Moderate	Moderate
	Eroded wastes deposited into drainages	Medium	Moderate	Moderate
	Groundwater depletion	Medium	Moderate	Moderate
Material storage	Impairment of air quality	Medium	Moderate	Moderate
	Noise and vibration nuisance	Medium	Minor	Major
B. Biological Environment				
The 4MB transverse fully built-up areas with negligible impact on the surrounding areas which is devoid of plants				
C. Socio-Economic Environment				
Removal of encumbrances along thecorridor, Relocation of Utilities, Removalof shrubs and top soil, Removal &carting way of unsuitable material,Construction activities, Commissioning, Electric power generation, Water provision and consumption, Removal ofProject Office and Testing Laboratory, Demobilization and Waste Generation	Armed robbers/Bandits attacks	Major	Major	Major
	Creation of avenues for skills development and acquisition	-	-	Positive
	Damage to road infrastructure	Medium	Moderate	Moderate
	Disruption of services of public utilities on the road corridor	Medium	Moderate	Moderate
	Improved micro and macro economy	-	-	Positive
	Increase demand on social infrastructure	Medium	Moderate	Moderate
	Increase in income	-	-	Positive
	Increase in social vices	Medium	Moderate	Moderate
Issues	**Potential Impacts**	**Sensitivity**	**Magnitude**	**Significance Priorto Mitigation**
	Increase opportunity for business and employment	-	-	Positive
	Injuries & death from falling objects	Very High	Major	Major
	Interference with road transportation	Medium	Moderate	Moderate
	Kidnapping	Very High	Major	Major
	Loss of employment/ income	Medium	Moderate	Moderate

	Opportunities for contracting	-	-	Positive
	Physical and economic displacement	Medium	Moderate	Moderate
	Removal of historically significant cultural andaesthetic landmark features	Medium	Moderate	Moderate
	Road traffic accidents	Very High	Major	Major
	Third party agitation	Medium	Moderate	Moderate
	Work site accidents	Very High	Major	Critical
Material storage	Road traffic accidents	Very High	Major	Critical
3. Operation Phase				
A. Physical Environment				
Transportation on the Road	Contamination of soil, groundwater and surfacewater Contamination of groundwater	Medium	Moderate	Moderate
	Impairment of air quality	Medium	Moderate	Moderate
	Noise and vibration nuisance	Medium	Moderate	Moderate
Waste Disposal	Blockage of drainage pattern	Low	Minor	Minor
B. Biological Environment				
The 4MB transverse fully built-up areas with negligible impact on the surrounding areas which is devoid of plants				
	Loss of vegetation along the RoW	Medium	Moderate	Moderate
C. Socio-economic Environment				
Transportation on the Road	Armed robbers/Bandits attacks	Very High	Major	Critical
	Creation of avenues for skills development	-	-	Positive
	Damage to road infrastructure	Medium	Moderate	Moderate
	Deliberate mutilation of road	Medium	Moderate	Moderate
	Gradual depreciation of the roadway and ancillary facilities	Medium	Moderate	Moderate
	Improved livelihood	-	-	Positive

Issues	Potential Impacts	Sensitivity	Magnitude	Significance Priorto Mitigation
	Improved micro and macro economy	-	-	Positive
	Increase in income	-	-	Positive
	Increase demand on social infrastructure	Low	Minor	Minor
	Increase in social vices	Medium	Minor	Minor
	Increase opportunity for business and employment	-	-	Positive
	Kidnapping	Very High	Major	Major

	Major depreciation of the roadway and ancillaryfacilities	Medium	Moderate	Moderate
	Reduction in man-hour loss due to traffic congestion	Medium	Moderate	Moderate
	Road traffic accidents	Very High	Major	Critical
	Security and criminal incidents (thefts, extortionsetc.) around bus stations	Medium	Moderate	Moderate
Maintenance	Increased business and employment opportunity	-	-	Positive
	Work site accidents	Very High	Major	Critical

5.3 Environmental and Social Impacts

5.3.1 Pre-Construction Phase

5.3.1.1 Impacts on Physical Environment

- ❖ Ambient Air deterioration from release of dusts and gaseous emissions
- ❖ Noise and Vibration from the use of machineries and motorized equipment
- ❖ Vegetation loss from land clearing and preparation activities
- ❖ Fauna Habitat alteration and displacement due to site clearing
- ❖ Exposure of soil to erosion and loss of quality from excavation
- ❖ Generation of vegetal wastes, other cleared materials and construction wastes

5.3.1.2 Impacts on Biological Environment

As earlier mentioned, the 4MB transverse fully built-up areas with negligible impact on the surrounding areas which is generally devoid of plants.

5.3.1.3 Impacts on Socio-Economic Environment

- ❖ Traffic congestion and increased risk of road traffic accidents and injuries
- ❖ Risk of occupational accidents, injuries and diseases

5.3.2 Construction Phase

5.3.2.1 Impacts on Physical Environment

Positive	Negative
❖ Propagation of vegetal cover ❖ Restoration of flora habitat ❖ Ecological balance and conservation ❖ Soil stabilization and regeneration	❖ Ambient Air deterioration from release of dusts and gaseous emissions ❖ Noise and Vibration from the use of machineries and motorized equipment ❖ Soil erosion from exposure of soil to rain and wind ❖ Slope instability arising from excavation in active areas ❖ Predisposition of soil to erosion resulting from improper abandonment of borrow pit ❖ Water pollution due to sedimentation and siltation from runoff from spoils ❖ Soil contamination and loss of soil quality. ❖ Generation of spoils and other construction wastes ❖ Underground water pollution from spillages & leakages from oil storage tanks. ❖ Increased surface water run-off due to diversion during construction. ❖ Removal of trees and flowers from ser backs and along the fence of residences and Offices along the corridor

5.3.2.2 Impacts on Biological Environment

As earlier mentioned, the 4MB transverse open spaces in order to minimize demolition of structures and displacement of persons along the preferred project alignment. This will adversely impact on the flora and fauna along the project corridor.

5.3.2.3 Impacts on Socio-Economic Environment

Positive	Negative
❖ Employment of local labour for construction and landscaping activities	❖ Demolition of structures, disruption and loss of livelihood ❖ Damage to existing underground public utility cables and pipes and disruption of services

❖ Support for local entrepreneurs, especially small and medium scale enterprises (SMEs) as laborer would patronize them for food, water, and basic necessities. ❖ Reduced risk of social vices/ unrest: When locals are employed, they would be engaged in work and this could lead to potential reduction in risk of civil unrest as well as improved social security to vulnerable groups. ❖ Promotes local economic development and livelihoods especially in rural and low-income urban areas where economic activities are limited ❖ Provides skills transfer to workers (essential for routine road maintenance by labour) ❖ Locals' participation during the project instils a higher sense of ownership of infrastructure in local communities.	❖ Traffic congestion and increased risk of road traffic accidents and injuries Health and safety risks associated with falls and drowning in improperly abandoned borrow pits ❖ Risk of occupational accidents, injuries and diseases ❖ HIV/AIDS and other STDs arising from the interactions amongst the workforce and the host community ❖ Injuries from accidental discharge of construction materials during transportation to site ❖ Social stress and disruptions due to lack of local labour

5.3.3 Operational Phase

5.3.3.1 Impacts on Physical Environment

Positive	Negative
❖ Reduced vulnerability to flooding hazards ❖ Lesser vulnerability of people and property, ❖ Improved disaster preparedness for adverse events; ❖ Increased resilience of communities at risk of flooding, and the preservation of assets of households and businesses against flood risk ❖ Improved solid waste management ❖ Reduced environmental pollution especially air pollution	❖ Reoccurrence of flooding as a result of uncontrolled solid waste disposal in the stream or side drains causing blockage

5.3.3.2 Impacts on Biological Environment

As earlier mentioned, the 4MB transverse fully built-up areas with negligible impact on the surrounding areas which is devoid of plants

5.3.3.3 Impacts on Socio-Economic Environment

Positive	Negative
❖ Reduced mortality and morbidity from water related diseases ❖ Diversification of livelihood and increased productivity. ❖ Reduction in public spending on replacement and rehabilitation of infrastructure ❖ Creation of employment ❖ Reduced traffic congestion in the area/ state. ❖ Road infrastructure improvement, rehabilitation of pedestrian walkways to improve walking conditions and accessibility to public transport services, rehabilitation of	❖ Occupational accidents and injuries

drainage, improvements of road junctions, and construction of new bus terminals (a hub for passenger pick up and drop off) and installation of a number of additional bus stops/ flags at each 4MB. Buses will be sheltered, maintained and refueled at a bus depot. ❖ Women, youths, children and the elderly/ vulnerable would benefit through improved access to markets, health services, social services (school, police offices etc).	

CHAPTER SIX: MITIGATION MEASURES FOR ASSOCIATED AND POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

6.1 Introduction

This Chapter is designed to ensure that suitable procedures or mitigation measures are provided to corresponding manage/reduce the identified associated and potential impacts of the proposed 4MB project to a level as low as reasonably practicable throughout the life cycle of the project. The identified potential and associated impacts of the proposed 4MB have been identified and evaluated while the impacts significance (adverse and beneficial) have also been discussed in chapter five. Consequently, the mitigation and enhancement measures for the adverse and beneficial impacts of the proposed project are presented in this chapter. This chapter therefore presents the mitigation, enhancement and/or alternative measures for the adverse and beneficial impacts of the proposed project.

6.2 Mitigation Measures

The summary of the impacts due to the project and the proposed mitigation measures are given in Table 6.1.

Table 6.1: Summary of the impacts due to the project and the proposed mitigation measures

Project Phase Activity	Impacts	Mitigation Measures
Pre-construction		
Physical Environment		
Mobilization, Site clearance, Demolitionof existing Structures	Impairment of air quality	• LSMOWI PIU shall ensure the use of only pre-mobilized vehicles; • LSMOWI PIU shall ensure controlled use of all vehicles; • LSMOWI PIU shall ensure that engines are turned off when not in use; • LSMOWI PIU shall ensure use of low sulphur fuels (< 5000 ppm); • LSMOWI PIU shall ensure micrositing of generators and stationary sources of emissions within construction sites away from sensitive receptors as far aspracticable; • LSMOWI PIU shall ensure regular water sprinkling of clearing area to minimizedust re-suspension; and • LSMOWI PIU shall ensure monitoring of grievances to identify if any dustrelated issues are reported for additional mitigation measures
	Noise and vibration nuisance	LSMOWI PIU shall ensure: • regular maintenance of vehicles; • vehicles are turned off when not in use; • vehicles are fitted with effective silencers; • micro-siting of noisiest activities / stationary sources away from sensitivereceptors where practicable • monitoring of grievances to identify if any noise related issues arereported for additional mitigation measures
Socio-economic Environment		
Mobilization, Site clearance, Demolitionof existing Bus Stops	Armed robbers/Area Boys attack Kidnappings	LSMOWI PIU shall: • develop/implement Security Management Protocol • make adequate security arrangements • ensure workers are sensitized on security • verify that security personnel have been adequately trained for their role; • ensure that all security incidents reported to LSMOWI PIU are investigated; • when employing any security personnel or engaging a security contractor, make reasonable enquiries to investigate the employment and criminal record of individuals or firms. LSMOWI PIU will not employ or use

Project Phase Activity	Impacts	Mitigation Measures
		any individuals or companies that are known to have abused or violatedhuman rights in the past.
	Interference with road transportation	LSMOWI PIU shall: • conduct haulage of construction materials at off-peak periods (9:30 am-1:30 pm, 2:30 pm - 3:30 pm) • shall develop & implement a Traffic Management Plan, considering the recommendations of the General EHS Guidelines (Section 3.4 Traffic Safety) • ensure contractor avoid mobilizing during 'rush hour' traffic • ensure contractor use side streets and less busy roads for movementduring busy peak hours (only when necessary)
	Road traffic accidents	LSMOWI PIU shall ensure that contractor: • maintains all vehicles in good working conditions before any trip • conducts competency training for all engaged drivers • imposes load and speed limits • installs appropriate signage along the road corridor • holds regular safety meeting with engaged workers
	Increase in income	LSMOWI PIU shall: • engage significant number of community people along the road corridor • give local contractors adequate protection
	Opportunities for contracting	
	Increase in social vices	LSMOWI PIU shall: • develop Code of Conduct for Project Workers including behavioral commitments on GBV/SEA, outline appropriate behaviours to help avoidnegative interactions with local communities and promote a positive working environment and Prohibit working under the influence of alcoholand prohibited drugs • sensitize workers on Code of Conduct contents • promote campaign for abatement of abuse of drugs, alcohol and sexualpromiscuity along the corridor • ensure that contractor enforces the alcohol and drug policy for staff; and • ensure regular medical check-up are conducted for project work force
Land acquisition	Loss of land	LSMOWI PIU shall:
Project Phase Activity	**Impacts**	**Mitigation Measures**
	Third party agitation	

	Change in Land Use	• engage all stakeholders and relevant legal and regulatory authorities inland acquisition and obtaining approval; • develop a standalone Resettlement Action Plan (RAP) and resettlementmeasures for land acquisition & loss of livelihood implemented from the RAP report; • institute and Implement Grievance Redress Mechanism (GRM) to dealwith complaints; • conduct Monthly Grievance Redress Status & Review Meetings; and • restrict land take for the project to the RoW
Resettlement	Improved livelihood	• LSMOWI PIU shall ensure implementation of the full recommendations of theRAP
	Improved micro and macro economy	
	Compensation payment	
Workers Recruitment	Increase in income	LSMOWI PIU shall • engage significant community people along the corridor • give local contractors adequate protection. Contracts with contractorsmust reference these measures as binding requirements, and these requirements must flow down to subcontractors. • Not employ person under the age of 16 on the Project. • not employ person under the age of 18 as a Project Worker if their work ispotentially hazardous • not use any forced labour or people who have been trafficked. • provide Project Workers with a clear contract of employment prior to starting their work on the Project and updated whenever there are changes to their employment terms and conditions. Contracts will clearlydetail workers' rights, including at the time of retrenchment. As well as providing written contracts, the contract of employment must be explained verbally to Project Workers, particularly for those who are illiterate. A written record of the worker contract must be kept at the time of hire of each contracted Project Worker.
	Increase opportunity for business and employment	
	Opportunities for contracting	
	Removal of historically significantcultural and aesthetic landmark features	• LSMOWI PIU shall engage all stakeholders about locations of historically significant cultural and aesthetic landmark features on the corridor
Project Phase Activity	**Impacts**	**Mitigation Measures**

		• A Chance Finds Procedure shall be developed which sets out the approach to be taken should any physical cultural resources be discovered (e.g. archaeological sites, historical sites, human remains, cemeteries, graves or other objects) in accordance with National CulturalPolicy (Nigeria) and World Bank ESS 8. Steps to be included in the chancefinds procedure may include: stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained; notify the relevant authorities of the find; implement measures to protect or remove the find in accordance with the requirements of Nigeria and World Bank ESS 8; and document and record any chance finds which may occur.
	Inequitable distribution of availablejob opportunities	• LSMOWI PIU shall develop Affirmative Action Plan as part of Labour Management Procedures (LMP) on Inclusive employment which forbidsdiscriminatory hiring and promotes hiring of competent persons from traditionally-disadvantaged groups. There shall be no discrimination during any aspect of employment, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion,termination of employment or retirement, and disciplinary practices.
	Agitation for employment opportunities from locals	• Adoption/Disclosure of local content policy to accommodate local hiringfor unskilled hands, including setting targets for local hiring and procurement
Construction Phase		
Physical Environment		
Removal of encumbrances along the corridor, Relocation of Utilities, Removal of shrubs and top soil, Removal & carting way of unsuitable material,	Impairment of air quality	LSMOWI PIU shall ensure: • controlled use of all mobile plants; • mobile and stationary engines are turned off when not in use; • regular water sprinkling of clearing area to minimize dust re-suspension; • LSMOWI PIU shall ensure use of low sulphur fuels (< 5000 ppm); • LSMOWI PIU shall ensure micrositing of generators and stationary sources of emissions within construction sites away from sensitive receptors as far as practicable;
Project Phase Activity	**Impacts**	**Mitigation Measures**
Construction activities, Commissioning, Electric power generation, Water		• LSMOWI PIU shall ensure regular water sprinkling of clearing area to minimizedust re-suspension; and • LSMOWI PIU shall ensure monitoring of grievances to identify if any dust related issues are reported for additional mitigation measures

provision and consumption, Removal of Project Office andTesting Laboratory, Demobilization and Waste Generation	Noise and vibration nuisance	LSMOWI PIU shall ensure: • regular maintenance of mobile and stationary plants; • mobile and stationary plants are turned off when not in use; • mobile and stationary plants are fitted with effective silencers; • micro-siting of noisiest activities / stationary sources away from sensitivereceptors where practicable • Monitoring of grievances to identify if any noise related issues arereported for additional mitigation measures
	Acceleration of erosion Alteration of local topography and drainage pattern	LSMOWI PIU shall ensure: • controlled land clearing; • vegetation removal limited to the needed coverage area; and • avoid creation of unnecessary steep slopes
	Contamination of soil, groundwaterand surface water	LSMOWI PIU shall ensure: • that fuels and lubricants spills are always avoided; • refueling shall be undertaken on hardstanding as far as practicable; • fuel and chemical storage areas are provided with secondarycontainment • measures to avoid or reduce the generation of wastewater such as use ofdrip trays, regular maintenance of oil/water separators, regular dischargeof domestic wastewater into sewage septic tanks • Use of asbestos containing materials will be avoided • Use of ozone depleting substances will be avoided • regular collection and disposal of wastes • Contractors shall develop a spill response plan
	Eroded wastes deposited into drainages	LSMOWI PIU shall ensure that: • Wastes are properly segregated; and • Wastes disposal is contracted to approved contractor by LAWMA
Project Phase Activity	**Impacts**	**Mitigation Measures**
		• Contractors shall develop a waste management plan in line with thewaste hierarchy, setting out measures to reduce, reuse and recycle wastes as far as practicable
	Groundwater depletion	LSMOWI PIU shall ensure: • groundwater is not used for construction work; and • water consumption is effectively managed

Material storage	Impairment of air quality	LSMOWI PIU shall ensure that: • materials are stored far away from access road; • vehicles and stationary plants are turned off when not in use; and • sand and granites are covered when not in use
Biological Environment The 4MB transverse open areas with major impact on the surrounding areas A comprehensive Biodiversity Action Plan is being developed for effective conservation and management of Buffer Zones to be created along the proposed Bridge Alignment and the Coordinates will be Gazetted to legally prevent encroachment in future		
Socio-economic Environment		
Removal of encumbrances along	Creation of avenues for skillsdevelopment and acquisition	• LSMOWI PIU shall support entrepreneurial skill development and opportunitiesfor community members
Project Phase Activity	**Impacts**	**Mitigation Measures**
the corridor, Relocation of Utilities, Removal of shrubs and top soil, Removal & carting way of unsuitable material, Construction activities,Commissioning, Electric power generation, Water provision and consumption, Removal of Project Office andTesting Laboratory, Demobilization and Waste Generation	Damage to road infrastructure	LSMOWI PIU shall ensure: • removal of debris or obstacles from accidents or natural causes; • repair of damage caused by traffic accidents and natural causes; • repair of traffic signs and road markings
	Disruption of services of public utilitieson the road corridor	LSMOWI PIU shall: • liaise with relevant parties to relocate all electric poles and water pipesbefore construction; • engage telecom operators to remove and re-install all fiber-opticcable installations on the corridor before works commence
	Increase demand on social infrastructure	LSMOWI PIU shall ensure: • Development/implementation of Worker Camp Management Plan • provision of mobile toilets; • regular supply of potable water; and • provision of first aid facilities

	Injuries & death from falling objects	LSMOWI PIU shall ensure: • that workers and visitors to sites are provide with adequate personalprotective equipment (PPE) • creation of awareness amongst communities on increase in traffic • provision of First Aid facilities at sites; • enforcement of the use of PPEs at sites; and • carrying out job hazard analysis • An Occupational Health and Safety (OHS) Plan for construction shall identify measures using the hierarchy of control to prevent accident orinjury from: physical hazards, such as equipment, noise and working atheight; chemical hazards, including air quality, chemical use, fire and explosives; and biological hazards.
	Loss of employment/ income	LSMOWI PIU shall ensure: • All dismissals are carried out in accordance with the law and contracted terms. Notice periods, final payments and benefits must be provided in fulland in a timely manner; • some of the workers are engaged in other profitable ventures; • continuous disengagement workshops and training are organized
Project Phase Activity	**Impacts**	**Mitigation Measures**
	Physical and economic displacement	LSMOWI PIU shall: • limit land acquisition to the minimum required through theadoption of mitigation hierarchy; • provide compensation and livelihood restoration measures basedon a Resettlement Action Plan (RAP)
	Work site accidents	LSMOWI PIU shall ensure: • that workers and visitors to sites are properly kitted with PPE; • creation of awareness amongst local communities on increase in traffic; • provision of First Aid facilities at sites; • enforcement of the use of PPE at sites; and • carry out a job hazard analysis
Material storage	Road traffic accidents	• LSMOWI PIU shall ensure that materials are stored far away from access road
Operational Phase		
Physical Environment		

Transportation on the Road	Contamination of soil, groundwaterand surface water	LSMOWI PIU shall ensure: • that fuels and lubricants spills are always avoided; and • refueling shall be undertaken on hardstanding as far as practicable
	Impairment of air quality Noise and vibration nuisance	LSMOWI PIU shall ensure: • Regular maintenance of the road according to design specifications • drivers on the road are encouraged on appropriate use of horn
Waste Disposal	Blockage of drainage pattern	LSMOWI PIU shall ensure: • that fuels and lubricants spills are always avoided • spill response standard operating procedures in place • regular collection and disposal of wastes • stockpiles are regularly evacuated by approved LAWMA contractors • spoil dumps shall be evacuated by approved LAWMA contractors • Stockpiles Management Plan in developed and activated
Biological Environment The 4MB transverse open areas with major impact on the surrounding areas A comprehensive Biodiversity Action Plan is being developed for effective conservation and management of Buffer Zones to be created along the proposed Bridge Alignment and the Coordinates will be Gazetted to legally prevent encroachment in future		
Socio-economic Environment		
Project Phase Activity	**Impacts**	**Mitigation Measures**
	Deliberate mutilation of road	• LSMOWI PIU shall ensure all affected portion of the road infrastructure is fixedafter installation; • LSMOWI PIU shall develop inspection and maintenance plan for operation; • LSMOWI PIU shall ensure regular checks to identify areas requiring maintenance
	Gradual depreciation of the roadway and ancillary facilities	LSMOWI PIU shall ensure: • Clearing of pavement; • Mowing and maintenance of plants; • Clearing of ditches and culverts; • Repair of traffic signs and road markings; • Shoulder grading; and • Pothole patching and crack sealing
	Major depreciation of the roadwayand ancillary facilities	LSMOWI PIU shall ensure: • re-graveling, resealing/surface dressing and overlay; • maintenance of traffic signs and road markings; • repair of cut and fill slopes; and • Repair of ancillary facilities such as bus stops

	Reduction in man-hour loss due totraffic congestion	LSMOWI PIU shall ensure: • smooth movement of vehicles along the corridor; and • prompt picking of passengers at bus stops
	Security and criminal incidents (thefts, extortions etc.) around bus stops	LSMOWI PIU shall ensure: • develop/implement Security Management Protocol for the corridor • adequate security arrangements on the road • Provision of security cameras at bus stops • Installation of solar-powered lightings in the vicinity the bus stops
Maintenance	Increased business and employment opportunity	LSMOWI PIU shall ensure that: • qualified workers from the coverage areas are engaged in road services; • business interests are encouraged along the corridor; • advertisements along the road are properly managed
	Work site accidents	• LSMOWI PIU shall ensure drivers along the road obey all traffic rules • LSMOWI PIU shall ensure only licensed drivers operate on the road • LSMOWI PIU shall Implement Traffic Management Plan for the road

6.2.1 Mitigation Measures for Pre-Construction Phase

At the pre-construction phase of the proposed 4MB, the major project activities withsignificant negative impacts for mitigation and the positive impacts meant to be enhanced include: Mobilization, Site clearance, Demolition of existing Bus Stops, Land acquisition Resettlement and Workers Recruitment. All these were given adequate attention when their impacts mitigation measures were determined.

6.2.1.1 Mitigation Measures for Physical Environment

The identified impacts in the physical environment of this phase are Impairment of airquality and Noise and vibration nuisance. Mobility required in this phase will demandfuel combustion which may result in air pollution in addition to heat generation from combustion activities.

6.2.1.2 Impairment of air quality

Impairment of air quality due to operation of the mobile plants in the phase shall be controlled by ensuring the use of only pre-mobilized vehicles, controlled use of all vehicles, engines are turned off when not in use, use of low sulphur fuels (< 5000 ppm), and micrositing of generators and stationary sources of emissions within construction sites away from sensitive receptors as far as practicable. Also, there sha l be regular watersprinkling of clearing area to minimize dust re-suspension; as well as monitoring of grievances to identify if any dust related issues are reported for additional mitigation measures.

6.2.1.3 Noise and Vibration Nuisance

For these impacts to be controlled, it is expected that vehicles that are in good conditionto aid complete combustion and support efficient fuel consumption shall be requiredbecause this will help in reduction of air emissions. There will also be micro-siting of noisiest activities / stationary sources away from sensitive receptors where practicablewhile grievances to identify if any noise related issues are reported for additional mitigation measures shall be monitored. During the course of this proposed 4MB project, LSMOWI PIU shall ensure that these are achieved.

6.2.1.4 Mitigation Measures for Biological Environment

The 4MB transverse majorly open areas with the aim of avoiding extensive demolition of structures and minimizing involuntary resettlements however it will have major impact on the surrounding areas which has vegetation n. A comprehensive Biodiversity Action Plan shall be developed for effective conservation and management of Buffer zones to be created along the proposed 4MB alignment with the coordinates Gazetted to legally prevent future encroachment.

6.2.1.5 Mitigation Measures for Socio-Economic Environment

The identified socio-economic impacts associated with mobilization, site clearance and demolition of existing bus stops project activities in this phase are: Armed robbers/Area Boys attack, Kidnappings, Interference with road transportation, Road traffic accidents, Increase in income, Opportunities for contracting and increase in social vices. Land acquisition will create loss of land, third party agitation and change in land use impacts while resettlement activities shall create improved livelihood, improved micro and macro economy and compensation payment impacts. The workers recruitment activity shall create other impacts including

increase in income, increase opportunity for business and employment, opportunities for contracting, removal of historically significant cultural and aesthetic landmark features, inequitable distribution of available job opportunities and agitation for employment opportunities from locals.

6.2.1.6 Armed robbers/Area Boys attack and Kidnappings

These security challenges shall be tackled in the proposed project phase by the development and implementation of Security Management Protocol; make adequate security arrangements and ensure that workers are sensitized on security. With these, these impacts shall be effectively tackled.

6.2.1.7 Interference with road transportation

As common on most of Lagos roads, heavy traffic gridlocks are anticipated in this phase of the project but adequate mitigation measures have been put in place to ensure that commuters and other road users along the corridors have no much difficulties in managing this challenge. For this impact, LSMOWI PIU shall conduct haulageof construction materials at off-peak periods and Traffic Management Plan shall be developed and implemented. Also, LSMOWI PIU shall ensure that contractor avoid mobilizing during 'rush hour' traffic while contractor shall be guided on how to use side streets and less busy roads for movement during busy peak hours when necessary.

6.2.1.8 Road traffic accidents

For this impact to be effectively managed, LSMOWI PIU shall ensure that contractor maintain all vehicles in good working conditions before any trip and competency training shall be conducted for all engaged drivers by the contractors. Also there shallbe load and speed limits imposed on the vehicles involved in this phase and appropriate signage shall be installed along the road corridor with regular safety meeting being held with engaged workers.

6.2.1.9 Increase in income/ Opportunities for contracting

These are positive impacts that must be enhanced and for this to be achieved, LSMOWI PIU shall engage significant number of community people along the roadcorridor as well as giving local contractors adequate protection during this project implementation. Similarly, no person under the age of 16 shall be employed on the Project, no person under the age of 18 will be employed as a Project Worker if their work is potentially hazardous, the Project will not use any forced labour or people whohave been trafficked, All Project Workers shall be provided with a clear contract of employment prior to starting their work on the Project and updated whenever there are changes to their employment terms and conditions. Contracts will clearly detail workers' rights, including at the time of retrenchment. As well as providing written contracts, the contract of employment must be explained verbally to Project Workers, particularly for those who are illiterate. A written record of the worker contract must be kept at the time of hire of each contracted Project Worker.

6.2.1.10 Increase in social vices

Except social vices are combatted, this may affect the image of the proposed projectduring this phase. For it to be achieved, LSMOWI PIU shall develop Code of Conduct for Project Workers including behavioral commitments on GBV/SEA. Also, workers shall besensitized on Code of

Conduct contents, promote campaign for abatement of abuse of drugs, alcohol and sexual promiscuity along the corridor and ensure that contractor enforces the alcohol and drug policy for staff. There shall also be regular medical check-up conducted for the proposed project work force.

6.2.1.11 Loss of land/ Third party agitation/ Change in Land Use

The issue of land is easy to handle in Lagos especially when it comes under government land need for public interest. This notwithstanding, for these impacts to be effectively handled, LSMOWI PIU shall engage all stakeholders and relevant legal andregulatory authorities in land acquisition and obtaining approval for the project. It shall also implement Resettlement measures for Land acquisition & loss of livelihood as documented in the standalone RAP report. For the impacts, LSMOWI PIU shall institute andImplement Grievance Redress Mechanism (GRM) to deal with complaints as well as conduct Monthly Grievance Redress Status & Review Meetings. Land take for the project shall also be restricted to the established RoW.

6.2.1.12 Improved livelihood/Improved micro and macro economy/Compensation payment

Because of the importance of these impacts, RAP has been commissioned, executedand the reports submitted. For the impacts to be effectively managed, LSMOWI PIU shallensure full recommendations of the RAP.

6.2.1.13 Increase in income/ Increase opportunity for business and employment

LSMOWI PIU shall engage significant community people along the corridor and give local contractors adequate protection. Contracts with contractors shall reference these measures as binding requirements, and these requirements shall flow down to subcontractors. Also, no person under the age of 16 shall be employed on the Projectwhile no person under the age of 18 will be employed as a Project Worker if their workis potentially hazardous. The Project will not use any forced labour or people who havebeen trafficked and all project workers shall be provided with a clear contract of employment prior to starting their work on the Project and updated whenever there are changes to their employment terms and conditions. Contracts will clearly detail workers' rights, including at the time of retrenchment. As well as providing written contracts, the contract of employment must be explained verbally to Project Workers, particularly for those who are illiterate. A written record of the worker contract must be kept at the time of hire of each contracted Project Worker.

6.2.1.14 Removal of historically significant cultural and aesthetic landmark features

LSMOWI PIU shall engage all stakeholders about locations of historically significant cultural and aesthetic landmark features on the corridor. A Chance Finds Procedure shall bedeveloped which sets out the approach to be taken should any physical cultural resources be discovered (e.g. archaeological sites, historical sites, human remains, cemeteries, graves or other objects) in accordance with National Cultural Policy (Nigeria) and World Bank ESS 8.

6.2.1.15 Inequitable distribution of available job opportunities

LSMOWI PIU shall develop Affirmative Action Plan as part of Labour Management Procedures (LMP) on Inclusive employment which forbids discriminatory hiring and promotes hiring of competent persons from traditionally-disadvantaged groups. Withthis, the impact shall be effectively tackled. There shall be no discrimination during any aspect of employment,

including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, accessto training, job assignment, promotion, termination of employment or retirement, anddisciplinary practices.

6.2.1.16 Agitation for employment opportunities from locals

With adoption/disclosure of local content policy by LSMOWI PIU to accommodate localhiring for unskilled hands, this impact shall be mitigated.

6.2.2 Mitigation Measures for Construction Phase

The several activities identified in this phase shall create many impacts along the corridor. These activities include removal of encumbrances along the corridor, relocation of utilities, removal of shrubs and top soil, removal & carting way of unsuitable material, construction activities, commissioning, electric power generation,water provision and consumption, removal of project office and testing laboratory, demobilization and waste generation and material storage. Excellent mitigation measures have been proposed for these impacts as indicated below.

6.2.2.1 Mitigation Measures for Physical Environment

About seven impacts are identified in the physical environment of the proposed project. Their mitigation measures are further discussed in this subsection.

6.2.2.2 Impairment of air quality

LSMOWI PIU shall ensure: controlled use of all mobile plants; mobile and stationaryengines are turned off when not in use and there shall be regular water sprinkling of clearing area to minimize dust re-suspension.

Noise and vibration nuisance

LSMOWI PIU shall ensure the regular maintenance of mobile and stationary plants and these shall be turned off when not in use. The mobile and stationary plants shall also be fitted with effective silencers for this same noise reduction.

Acceleration of erosion/ Alteration of local topography and drainage pattern

LSMOWI PIU shall ensure: controlled land clearing and vegetation removal shall be limitedto the needed coverage area. During the construction along the corridor, LSMOWI PIU shall also avoid creation of unnecessary steep slopes. With these in place, these impacts shall be effectively controlled.

Mitigation Measures for Socio-Economic Environment

Removal of encumbrances along the corridor, relocation of utilities, removal of shrubsand top soil, removal & carting way of unsuitable material, construction activities, commissioning, electric power generation, water provision and consumption, removal of project office and testing laboratory as well as demobilization and waste generation are the identified project activities with significant impacts on the socio- economic environment in this phase of the project.

Creation of avenues for skills development and acquisition

A key socio-economic impact of the proposed project is this positive impact. To ensure that it is realized, LSMOWI PIU shall support entrepreneurial skill development and opportunities for community members during the project.

Damage to road infrastructure

It is not unlikely that there may be unintentional damages done to existing road infrastructure along the corridor. To mitigate the impact, LSMOWI PIU shall ensure the removal of debris or obstacles from accidents or natural causes. Also repair ofdamage caused by traffic accidents and natural causes shall be promptly attendedto while repair of traffic signs and road markings shall be carried out along with this.

Increase demand on social infrastructure

At the planning stage of this proposed project, LSMOWI PIU identified the need to protectsocial infrastructure presently available along the corridor. To achieve this, there shall be development/implementation of Workers Camp Management Plan, provision of mobile toilets, regular supply of potable water and provision of mobile clinic for those engaged in the construction activities.

Injuries & death from falling objects/ Work site accidents

To avoid this impact at the construction site, LSMOWI PIU shall ensure that workers and visitors to sites are properly kitted as well as creating awareness amongst communities on increase in traffic. There will also be provision of First Aid facilities at sites, enforcement of the use of PPEs at sites and carrying out job hazard analysis.

Loss of employment/ income

The proposed project is anticipated to last one year after which construction workerswill be disengaged. To minimize the impacts associated with this, LSMOWI PIU shall ensurethat some of the workers are engaged in other profitable ventures. Also continuous disengagement workshops and training shall be organized for them periodically.

Physical and economic displacement

This impact is anticipated and to mitigate it, LSMOWI PIU shall limit land acquisition to the minimum required through the adoption of mitigation hierarchy. Compensation and livelihood restoration measures based The Resettlement Action Plan (RAP) shall also be implemented.

6.2.3 Mitigation Measures for Operational Phase

Mitigation Measures for Physical Environment

Contamination of soil, groundwater and surface water

During transportation on the road there is high possibility of road and water contamination due to oil and fuel spills. To mitigate this impact, LSMOWI PIU shall ensure that fuels and lubricants spills are always avoided and there shall be regular collection and disposal of wastes along the corridor.

Impairment of air quality/ Noise and vibration nuisance

This impact shall be addressed by LSMOWI PIU ensuring that regular maintenance of the road according to design specifications drivers on the road are encouraged. There will also be appropriate use of horn guided through road signs to control noise impact.

Blockage of drainage pattern

Improper wastes disposal along the corridor is anticipate to create this impact. For it to be addressed, LSMOWI PIU shall ensure that that fuels and lubricants spills are always avoided, proper handling of used oil by maintenance staff during servicing and regular collection and disposal of wastes. LSMOWI PIU discouraging transportation activities beyond the right of way along the corridor.

Mitigation Measures for Biological Environment

The 4MB transverse fully built-up areas with negligible impact on the surrounding areas which has scanty vegetation and mostly devoid of plants. It is recommended that efforts should be made to replace the trees and plants removed at the construction phase through a deliberate revegetation scheme to boost air quality on the corridor

Mitigation Measures for Socio-Economic Environment

Transportation on the Road as well as Maintenance are the major activities with socio-economic impacts along the corridor in this phase.

Gradual depreciation of the roadway and ancillary facilities

LSMOWI PIU shall ensure clearing of pavement, mowing and maintenance of plants, clearing of ditches and culverts, repair of traffic signs and road markings, shoulder grading and pothole patching as well as crack sealing. With this the impact shall be reduced to minimal.

Major depreciation of the roadway and ancillary facilities

With re-graveling, resealing/surface dressing and overlay; maintenance of traffic signsand road markings; repair of cut and fill slopes; and repair of ancillary facilities such as bus stops, this impact shall be mitigated hence, LSMOWI PIU shall ensure that these aredone.

Reduction in man-hour loss due to traffic congestion

The smooth movement of vehicles along the corridor and prompt picking of passengers at bus stops are the mitigation measures to ensure that these impacts are enhanced and this shall be carried out along the corridor.

Security and criminal incidents (thefts, extortions etc.) around bus stops

With the current this situation about security measures in Lagos, there is no fear that this impact will be properly managed. To sustain this, LSMOWI PIU shall ensure: the development/implementation of Security Management Protocol for the corridor. There shall also be adequate security arrangements on the road while provision of security cameras at bus stops shall not be jettisoned. Installation of solar-powered lightings in the vicinity the bus stops shall also be implemented by LSMOWI PIU.

Increased business and employment opportunity

LSMOWI PIU shall ensure that qualified workers from the coverage areas are engaged in services; business interests are encouraged along the corridor; and advertisements along the road are properly managed for the impact to be properly mitigated.

Work site accidents

Lagos State government values every life committee to its care and this shall be observed in the proposed project. For the impact, LSMOWI PIU shall ensure drivers alongthe road obey all traffic rules. Also, LSMOWI PIU shall ensure only licensed drivers operateon the road and the Traffic Management Plan for the road shall be faithfully implemented.

6.3 Identification of Potential Environmental, Social impacts & Mitigation Measures

This presents a detailed analysis of beneficial and adverse impacts of various components of the selected project alternative on the physical, biological and human (social, cultural and economic) environments. Identification of potential impacts is performed by identifying interactions between the Project's potential impact sources and the environmental and social components in the Project area, with guidance from stakeholder consultations/ feedback as well as experience of the ESIA experts on similar projects.

Potential impact sources (i.e. Project activities or components) were identified and described for each Project phase (pre-construction, construction, operation and decommissioning). The importance of potential impacts identified by these means is then assessed. Impact assessment consists of determining the importance of potential impacts on physical, biological, and human environments at each stage of the Project.

Impacts are either positive or negative. A positive impact is considered to represent an improvement on the baseline conditions of the affected environmental or social component as a result of the Project, while a negative impact is considered to contribute to its deterioration. Appropriate mitigation measures shall be identified to prevent, minimise, mitigate or compensate for adverse environmental and/or social impacts. Roles and responsibilities to implement measures shall be clearly defined. The cost of the measures shall be estimated, including the cost for environmental and social capacity building and gender mainstreaming.

6.4 Summary of Potential Beneficial Impacts

Beneficial Impacts: Potential benefits of the proposed project can be observed during construction and post- construction includes;

Construction Phase: Positive impacts of the proposed project on stakeholders/ beneficiaries during the construction phase shall include but not limited to the following:

- Local employment and skills development: During construction, the project would provide job opportunities to women and youth.
- Support for local entrepreneurs, especially small and medium scale enterprises (SMEs) as labourers would patronize them for food, water, and basic necessities.
- Reduced risk of social vices/ unrest: When locals are employed, they would be engaged in work and this could lead to potential reduction in risk of civil unrest as well as improved social security to vulnerable groups.
- Promotes local economic development and livelihoods especially in rural and low-income urban areas where economic activities are limited

- Provides skills transfer to workers (essential for routine Road maintenance by labour)
- Locals' participation during the project instils a higher sense of ownership of infrastructure in local communities.

Post Construction/ Operational Phase: Positive impacts of the proposed project during the post construction phase shall include the following:

- Reduced traffic congestion in the area/ state.
- Improved access in remote and inaccessible areas.
- Construction of technically sound and economically efficient infrastructure
- Optimizes the use of local resources
- Women, youths, children and the elderly/ vulnerable would benefit through improved access to markets, health services, social services (school, police offices etc).

6.5 Potential Adverse Impacts

KEY

Colour code	Meaning
	Low
	Medium
	High

Table 6.2: Summary of Potential Impacts and mitigation measures

Activities	Potential Impact	Mitigation measures	Rating
PRE-CONSTRUCTION			
Establishment of temporary construction camps	Reduction in Air quality	• Limited wetting of sites and or unloading and reloading points should be done to reduce dust raising • Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use. • Construction traffic speed control measures should be enforced on unpaved Roads.	
Mobilization of equipment	Increased Noise	• Drivers should be trained to drive responsibly and avoid horning, screeching etc. • Noise suppression equipment (e.g. mufflers, noise baffles etc.) should be used for equipment that generate noise. • Noise levels should not exceed the recommended FMEnv limits.	
Establishment of bridge foundations	Topsoil stripping/ filling along the alignment	• Limit clearing of acquired lands to the minimum required, giving due consideration to forest conservation zones in the area.	
Clearing of vegetation along the alignment	Impact on Terrestrial Fauna	• Use native species to re-vegetate the cleared portions as much as feasible after construction • Replace vegetation cover through replanting/ Landscaping after construction	
CONSTRUCTION			
• Trucks conveying construction materials • Construction of access Road • Machinery/ equipment such as mixers, etc.	Increased Noise Decreased Air Quality	• Construction contractors should operate only well-maintained engines, vehicles, trucks and equipment. • A routine maintenance program for all equipment, vehicles, trucks and power generating engines should be in place. • The project should ensure the use of good quality fuel and lubricants only • Sprinkling of water on sites and unpaved Roads to reduce dust • Trucks carrying construction materials such as sand, quarry dust, laterite etc. will have the buckets covered with tarpaulin or appropriate polythene material to and fro project site. • Construction traffic speed control measures should be enforced on unpaved Roads (speed limits through communities should be ≤50km/hr on unpaved Roads and near or at project site should be ≤30 km/hr).	

		• Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use	
Construction activities	Increase Noise and vibration Decreased Air Quality	• Contractors should be mandated to use equipment and vehicles that are in good working order and that have some noise suppression equipment (e.g. mufflers, noise baffles) intact and in working order: This can be achieved by making it a component of contractual agreements with the construction contractors. • Engines of vehicles/trucks and earth-moving equipment should be switched off when not in use. • Contractors will be required to implement best driving practices when approaching and leaving the site (speed limit of ≤30 km/hr) to minimize noise generation created through activities such as unnecessary acceleration, horning and breaking squeal. • Enforce the use of ear muffles, where noise level exceeds the recommended FMEnv limit.	
• Waste generated from workers (food etc.) • Debris during construction materials/ activities	Solid and Effluent Waste	• Training and awareness on safe waste disposal in construction camps for all workers • Prepare and implement a comprehensive Waste Management Plan (WMP) for every construction site • Adequate waste receptacles and facilities should be provided at project sites/camp sites • Final disposal should be at licensed disposal sites • Spent or waste oil from vehicles and equipment should be collected and temporarily stored in drums or containers at site • Waste oil should be disposed of by oil marketing companies or agents approved or recognized and have the capacity to undertake oil disposal • Install waste disposal receptacles and signs in strategic places within the construction camps • Provide training and awareness on need to avoid littering • All Fuel storage tanks/sites should be properly secured to contain any spillage • Contractors should be mandated to implement a hazardous materials management plan that includes specification for proper storage and handling of fuels, oil, wastes, and other potentially hazardous materials as well as a plan for containment and clean-up of accidental spills into the aquatic environment. • Ensure the construction camps have toilets and connected to the sewer system	
Removal of vegetation/ soil,	Visual Impacts	• Landscaping of facilities after construction and restoration of disturbed areas e.g. borrow pits	
Site clearing and disturbance of environment/ habitat	Impact on fauna and habitat	• The Project workforce and local communities should be educated to ensure that the importance of environmental protection and nature conservation are effectively communicated and that wider appreciation of environmental issues and construction best practice are fostered. • Avoid unnecessary exposure and access to sensitive habitat areas • For identified or suspected sensitive habitats (swamps/ wetlands), regular inspection or monitoring should be carried out in the area prior to start and during work. • If sensitive habitats are encountered, project activities should cease and the Project should consult 4MB PMT/ FMEnv/ ESIA Team to determine the appropriate course of action.	

		• Prohibition on hunting and consumption of bush meat by labourers/ workforce • Erect warning signs in wildlife crossing points/ areas and avoid routing the Roads in wildlife areas • Provide training to drivers on speed in wildlife areas • Before and during installation of project facilities/ bridge construction, if sensitive aquatic mammals are spotted/ observed in the vicinity of the work area, the project/ contractor should execute measures to avoid destruction or disturbance. • There shall be visual check for mammals within 500m and adequate time lapse after sighting of any animal before start of driving operations/ noise generating equipment. • Project staff must report sightings of any injured or dead aquatic life (fishes)/ mammals immediately, regardless of whether the injury or death is caused directly by a project activity. The report should include the date and location of the animal and the species identification or a description of the animal.	
Site clearing	Impact on Flora/ Vegetation loss	• Replanting/ Landscaping after construction works to replace vegetation cover. • Limit clearing of acquired lands to the minimum required, giving due consideration to forest conservation zones in the area. • Use existing path ways/Roads to the extent practicable. • Use native species to re-vegetate the cleared portions during reclamation	
Excavation	Soil Erosion	• If feasible, avoid construction work in the rainy season. • Minimize land clearing areas as much as possible to avoid unnecessary exposure of bare ground to the elements of the weather/ erosion • Re-vegetate cleared areas as early as possible using native plant species	
Excavation, improper waste disposal, spillage of lubricants, waste oil/ fuels etc.	Decreased Water Quality	• No garbage/refuse, oily wastes, fuels/waste oils should be discharged into drains or onto site grounds • Fuel storage tanks/sites should be properly secured to contain any spillage • Maintenance and cleaning of vehicles, trucks and equipment should take place offsite especially where project sites are close to water bodies. • Toilet facilities should be provided for construction workers to avoid indiscriminate defecation in nearby bush or local water bodies	
Movement of trucks, equipment and personnel in/ out of site/ project area.	Impact on traffic and public safety	• Restrict access to work areas thereby discouraging increased human activities in the area; • Only Road worthy vehicles and trucks should be used to avoid frequent breakdowns on the Roads • Develop and implement a Traffic Management Plan (TMP) • Only experienced drivers should be employed Contractors must provide training for drivers; • Installation of traffic signages/ rules, etc. and establish speed limits; • Notify Road users/ communities on transport ways diversion and warning signs. • Movement of trucks and equipment should be during traffic off peak period • Enforce safe driving and take disciplinary action against repeat offenders	
Construction/ excavation	Water Abstraction	• Obtain water abstraction permits from the Water Authority for use in construction • Avoid disruption of water pipes and utilities, and if there would be an unavoidable disruption, inform residents/ users ahead in order to enable proper planning and reduced impact	
Construction activities	Hydrology Impacts/Changes	• Maintain environmental flow reserves for the river/ lagoon • Retain water in reservoir during drought/ dry season and ensure that water retention in dam is controlled to ensure that adequate reserve is left to flow downstream for users.	
OPERATIONAL/ MAINTENANCE PHASE			

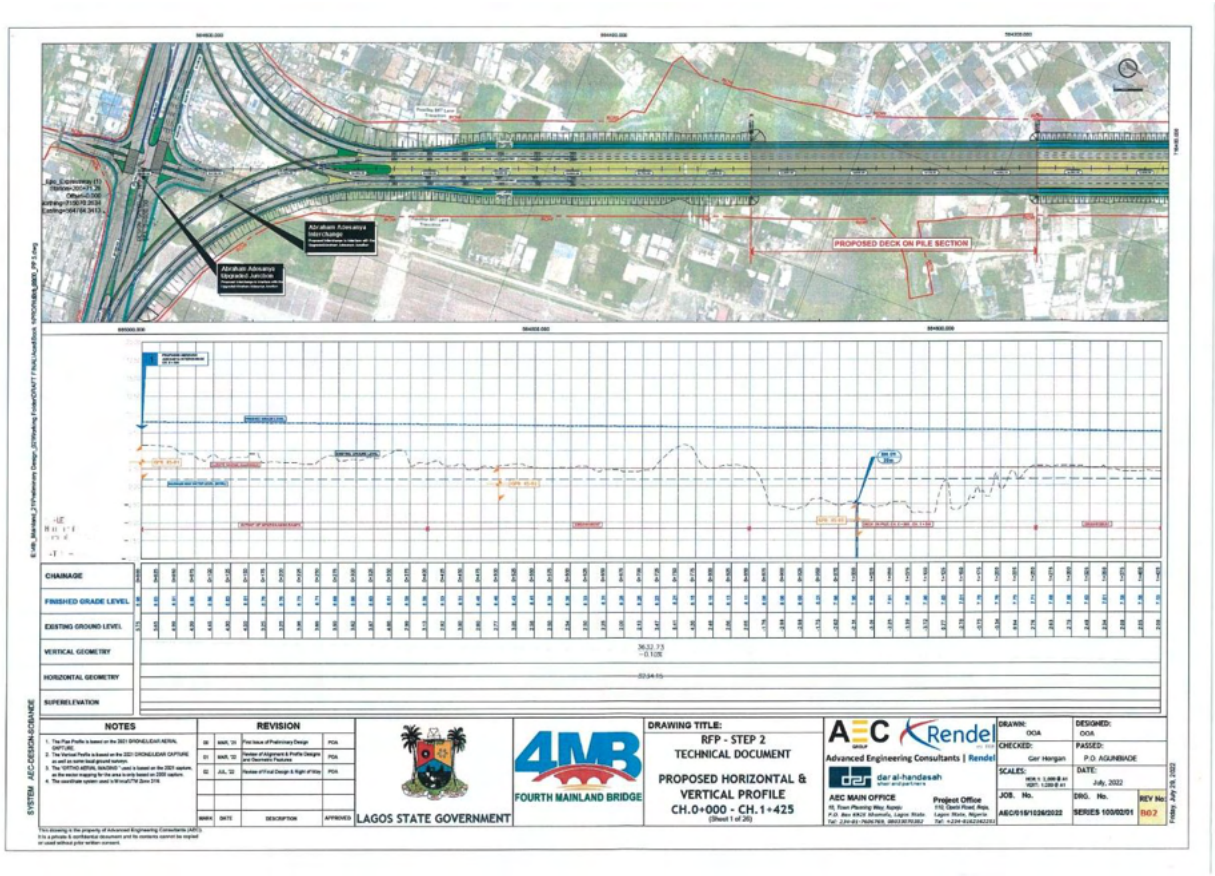
Re-painting of bridge, Road maintenance etc.	Waste/ effluent discharged into soil, aquatic environment etc.	• Avoid accidental spillage/ leakage of paints, adhesives, coal tar, etc • Ensure proper waste management by workforce	
	Occupational Health and Safety	• Develop and implement a comprehensive and project specific Occupational Health and Safety Plan (OHSP). • All Contractors shall be required to maintain OHS plans and safety audit to ensure that safety measures are adhere to at all times • Training of workforce on work-related accidents and prevention measures. • Provision and appropriate use of PPE (such as reflective jackets, Safety boots, etc.)	
Maintenance works/ temporary closure of sections of the bridge	Traffic congestion	• Traffic signages, cones, tapes etc. should be used to cordon off areas that are being repaired/ maintained. • Ensure proper enlightenment and adequate time lapse to inform Road users of the planned maintenance activities. • Provide an alternative route if the Road/ bridge would be temporarily closed for maintenance • Maintenance works should be carried out during traffic off peak periods.	
SOCIAL IMPACTS			
Mobilization and construction works Influx of people (migrant workers, sub-contractors and suppliers) etc	Risks associated with labour influx include; Labour and employment related impacts	• Development of site specific labour influx management plan • Ensure that the local communities are given priority in relation to employment and provided with training (skilled) to provide future labour in the project e.g. operation and maintenance. • Ensure that workers are provided satisfactory working conditions and work environment including pay in accordance with standard rates applicable. • Ensure that child labour is prohibited in the project;	
	Community agitation and civil unrest over the project/ demolition of houses	• Employ good communication strategies to foster relationship with communities and a GRM can be used to mitigate conflicts that may arise between both parties (workers and residents/ locals) • Provision of a standalone RAP to address all resettlement issues. • Encourage mutual existence between the workers and the communities by appointing a community liaison officers (CLO) and sign Memorandum of Understanding (MOU) with the host communities where applicable. • Sensitize the general public on the importance of the project through Stakeholder engagement so as to establish a co-operative and open working relation especially with residents within the immediate project area • Educate workers on the culture and norms of the host communities;	
	GBV/ SEA, HIV/AIDS Spread and other related public health diseases.	• Design GBV/SEA and HIV/AIDS awareness, sensitisation and prevention program, Health campaigns etc. for each project that extends to the host communities as a whole. • Implement the GBV action plan and recommendations (section 4.2.9) including a GBV Code of conduct should be developed and implemented.	
	Increased pressure on existing infrastructure	• Provide camps for construction workers with basic amenities/ utilities to reduce pressure on existing infrastructure	
Construction and Demolition Activities	Impact on Physical Cultural Resources (PCR)/ archaeological interest / existing ecologically sensitive areas	• The pre-construction surveys should identify cultural heritage resources and existing ecologically sensitive areas that the project should avoid and by-pass these resources. • The Project should implement a chance find procedure and reporting system to be used by contractors in the event that a cultural heritage feature or ecologically sensitive item/issue is encountered • Adequate measures shall be taken to avoid impact on cultural resources such as graveyards and shrines. Where this is impossible, due consultation and compensation shall be arranged for the owners	

Stakeholder engagement, Interaction between labour force etc.	Risk of COVID 19	• Physical distancing: Ensure social distancing and provide face masks, hand sanitizers etc. during consultation, on site etc. • Split the site into separate working zones manned by specific teams that do not mix, so that each person works with only a few others. If teams need to enter other working zones, ensure that the previous teams have left. This may also mean altering resumption and closing periods for different workers/ shifts to avoid large concentrations of workers at site entrances/exits. • If workers have to work in close proximity, for example during lifting or maintenance activities, keep numbers to a minimum and ensure masks are worn. • Provide adequate hand-washing stations wherever possible throughout the site, including at entrances, exits and in eating or rest areas, equipped with soap, clean water and paper towels together with appropriately sealed disposal bins (preferably pedal operated to prevent hand contact with the lid). • See details on Covid-19 prevention in links below; • **ILO**: https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/instructionalmaterial/wcms_764847.pdf • **CDC**: https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/construction-workers.html • **LAGOS:** http://safetycommission.lagosstate.gov.ng/wp-content/uploads/sites/157/2020/05/Sectorial-Guidelines_LASG-compressed.pdf • See a sample plan in Annex 9	
Demolition	Physical Displacement	• A standalone RAP would be prepared for all impacts related to ESS 5: Land acquisition, restrictions on land use and involuntary resettlement • All affected persons to be given relocation assistance (cash or kind) by the Project to enable them move their properties to new locations • If a site is acquired, the government may relocate persons and their families as well as community facilities to be affected. The affected families should not be made to incur any cost during the relocation period. A resettlement plan should be prepared for this area with the proposed RAP as a guide.	
Temporary/ permanent displacement for structures along the proposed project design/ corridor	Loss of employment and livelihoods	• Social assessments and socio-economic surveys would be undertaken to assess these issues and provide measures in accordance with the Resettlement Action Plan (RAP). • Those whose livelihood is affected should be assisted to ensure they will not be worse off as a result of the project. This can include livelihood assistance, provision of new jobs immediately without any loss of income. • Contractors should use local labor as much as possible and where available. As much as possible, all unskilled labor should be contracted or obtained from the local community.	
Construction works	Impacts on human health/ traffic safety	• A comprehensive and site specific OHS plan shall be developed and implemented which will outline procedures for avoiding health and safety incidents and for emergency medical treatment. This will be achieved by making it a component of contractual agreement. • Construction workers should be educated to adhere to basic rules with regard to protection of public health, including most importantly hygiene and disease (HIV/AIDS) prevention. • All construction and other workers will be sufficiently trained in the safe methods pertaining to their area of work to avoid injuries. • Road worthy vehicles/trucks should be used and only experienced drivers/operators should be employed. • Trucks carrying construction materials such as sand, quarry dust, laterite etc. will have the buckets covered with tarpaulin or appropriate polythene material to and fro project site. • Except for areas secured by fencing, all active construction areas will be marked with high-visibility tape to reduce the risk accidents involving pedestrians and vehicles. Erect Road safety signs and speed bumps in accident prone zones.	

		• Install adequate lightening system for night travelers in accident prone zones	
	GBV/ SEA, HIV/AIDS Spread and other related public health diseases.	• Design GBV/SEA and HIV/AIDS awareness, sensitisation and prevention program, Health campaigns etc. for each project that extends to the host communities as a whole. • A GBV action plan including a GBV Code of conduct should be developed and implemented.	
CUMULATIVE IMPACTS			
Environmental	Impact on Land use	• Increased development in most areas especially in rural/peri-urban communities	
	Impact on Water resources	• Gradual depreciation in wetlands and resources derived from wetlands. • Water pollution as a result of runoffs from construction activities, sediments, pollutant loading (through spilled oil, fuels, grease, heavy metals, suspended solids) etc. and resultant effect on aquatic life and human health.	
	Vegetation	• Loss of vegetation/ forest cover may increase the adverse effects of Climate change.	
Social	Appreciation in Property value	• Properties within the project corridor would increase in value, these it serves as a good investment option. This is beneficial for investors but adverse for tenants as there may be inflation in accommodation costs/ rents.	
	Socio- economic	• Employment growth, changing community cohesion, building displacements • Increase in population as more people would migrate to these areas when there is an access Road and with development in the area.	

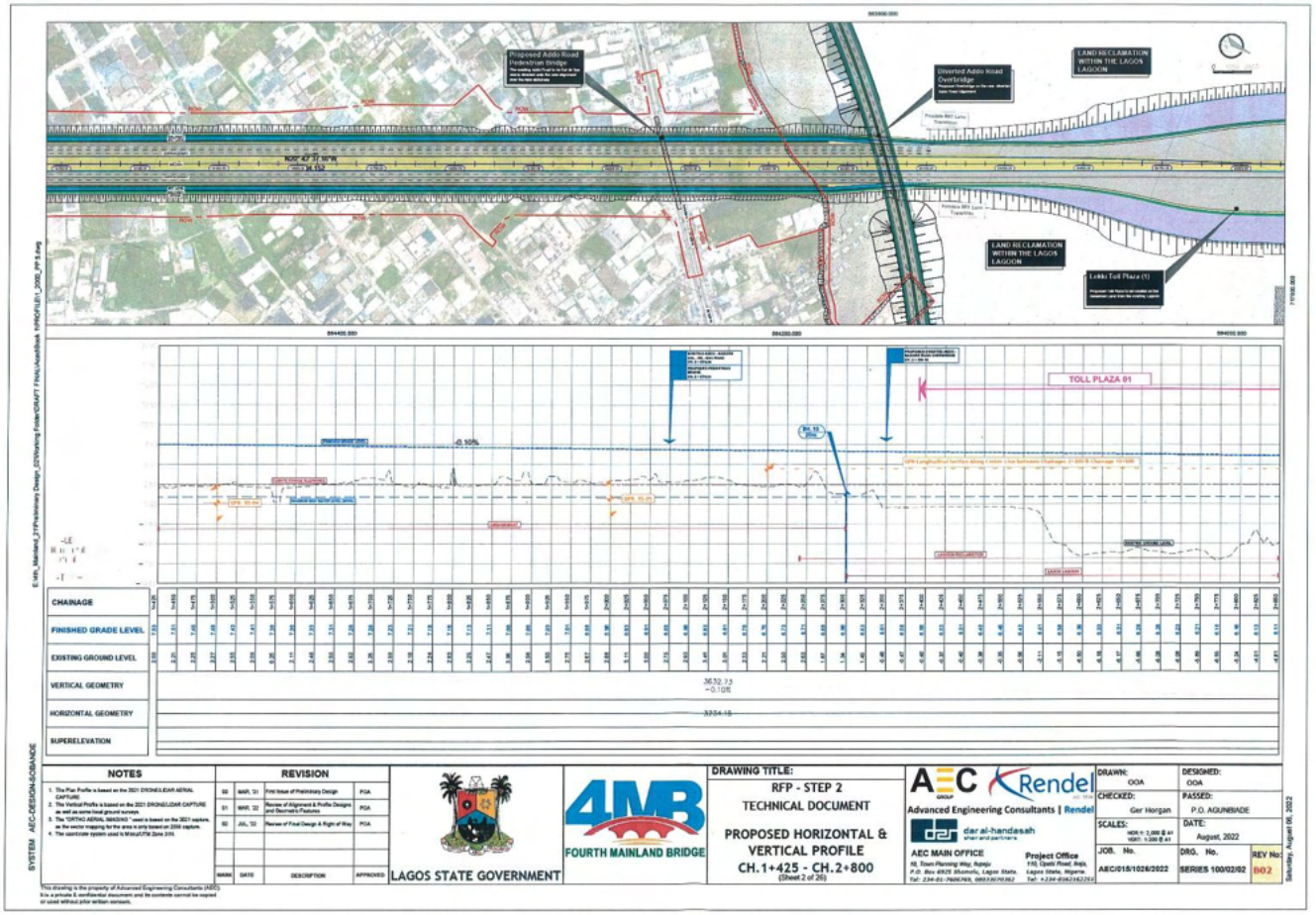
Specific Impacts of the proposed 4th Mainland Bridge Project

At the take-off point of the proposed 4th Mainland Bridge on the Abrahan Adesanya Housing Estate Junction (Chainage 20+7128 on the Lekki – Epe Expressway (Northing=715070.2634 Easting=564784.3413) there is a major Interchange directing traffic to and from the proposed 4MB Project.

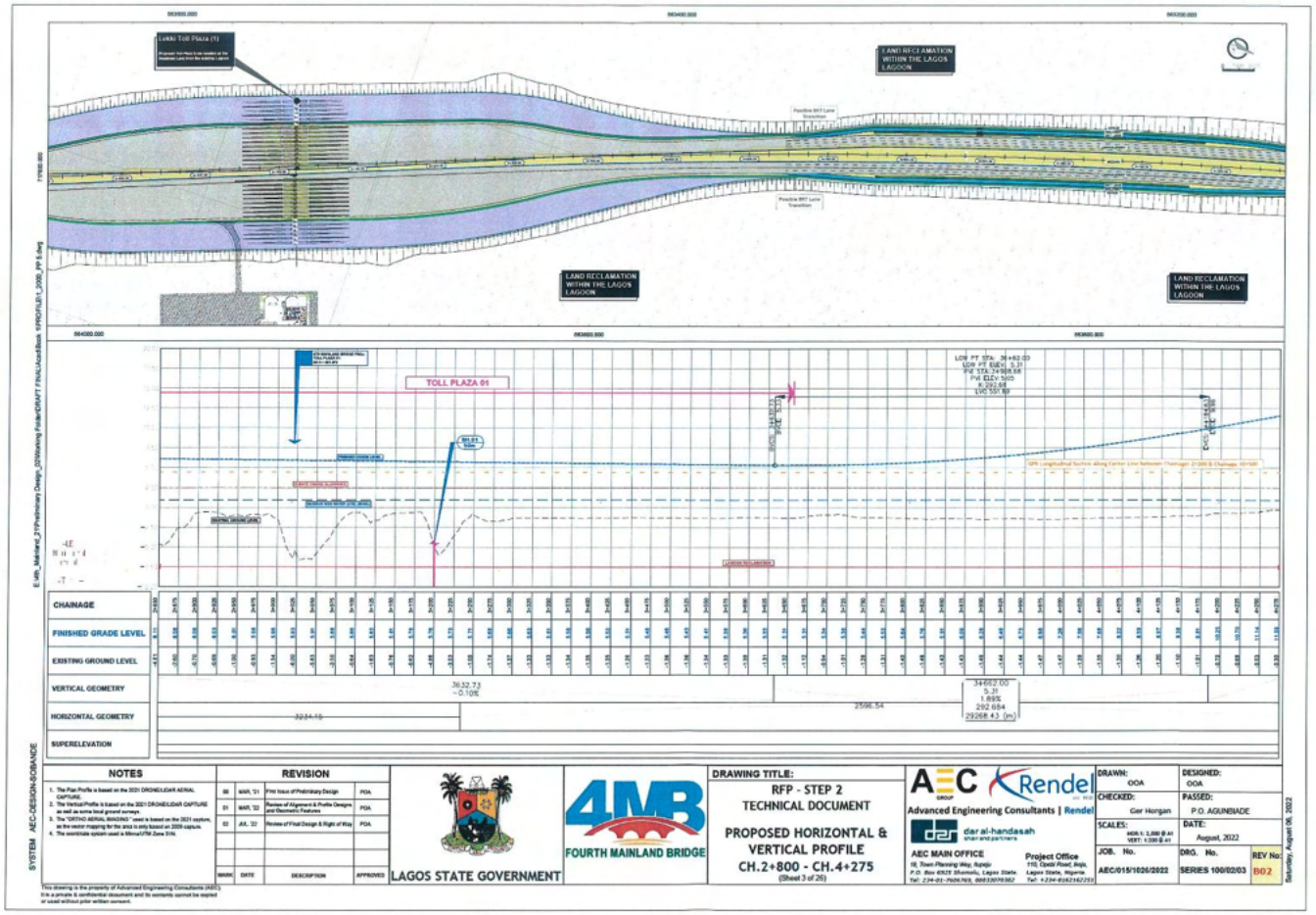


At Chainages 19+70 and 20+40 the existing Lekki – Epe Expressway is to be diverted to Outside lanes under "Advance Works" as part of the contract, at Abraham Adesanya, the proposed Interchange to interface with the Upgraded Abraham Adesanya Junction, for ease of entrance and exit from the proposed 4MB Project. The 3-lane Road tapers off to a 2-lanes from Chainage 6.25)

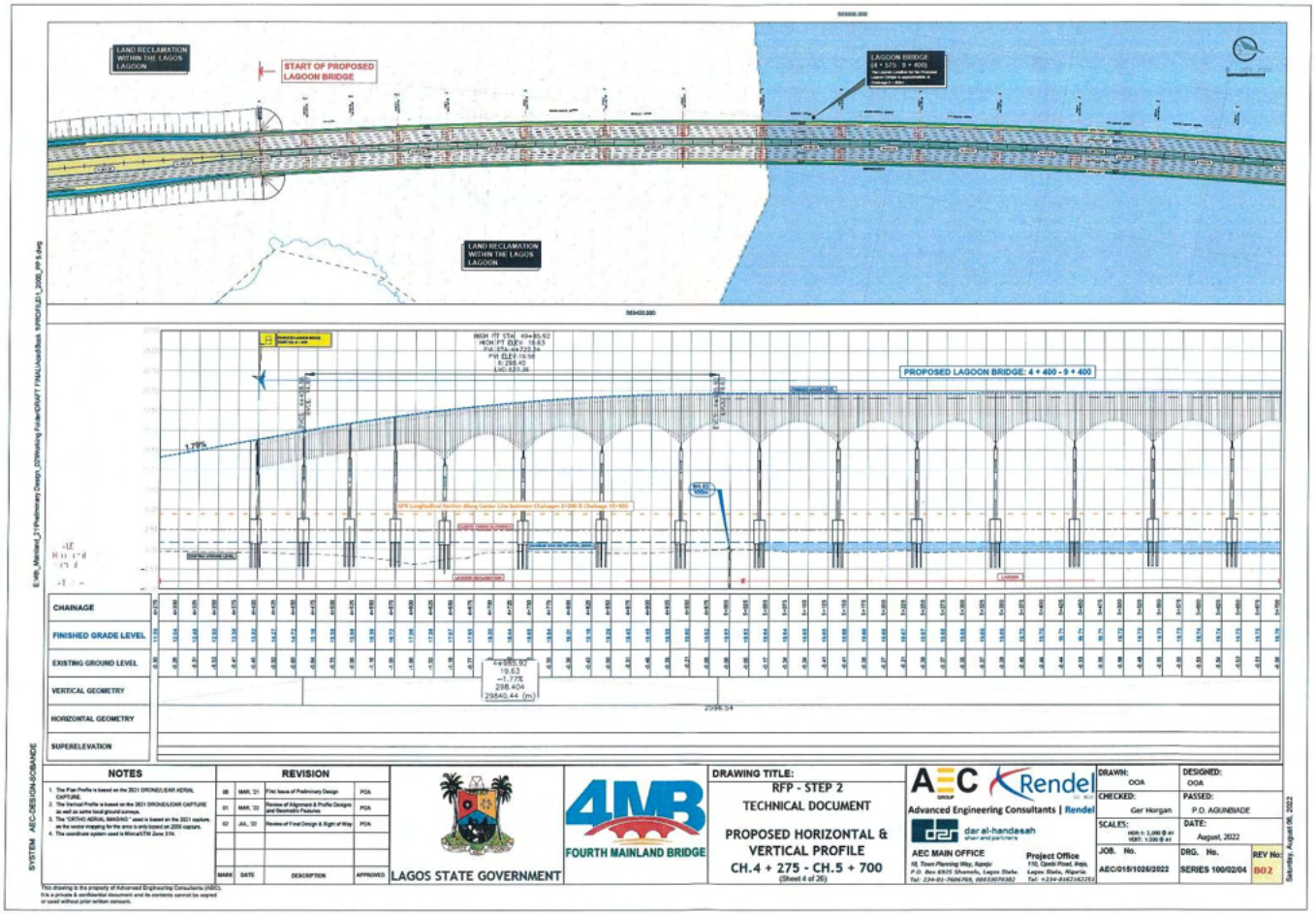
There exist structures on both sides of the ROW which will have to be removed to accommodate the proposed Alignment.



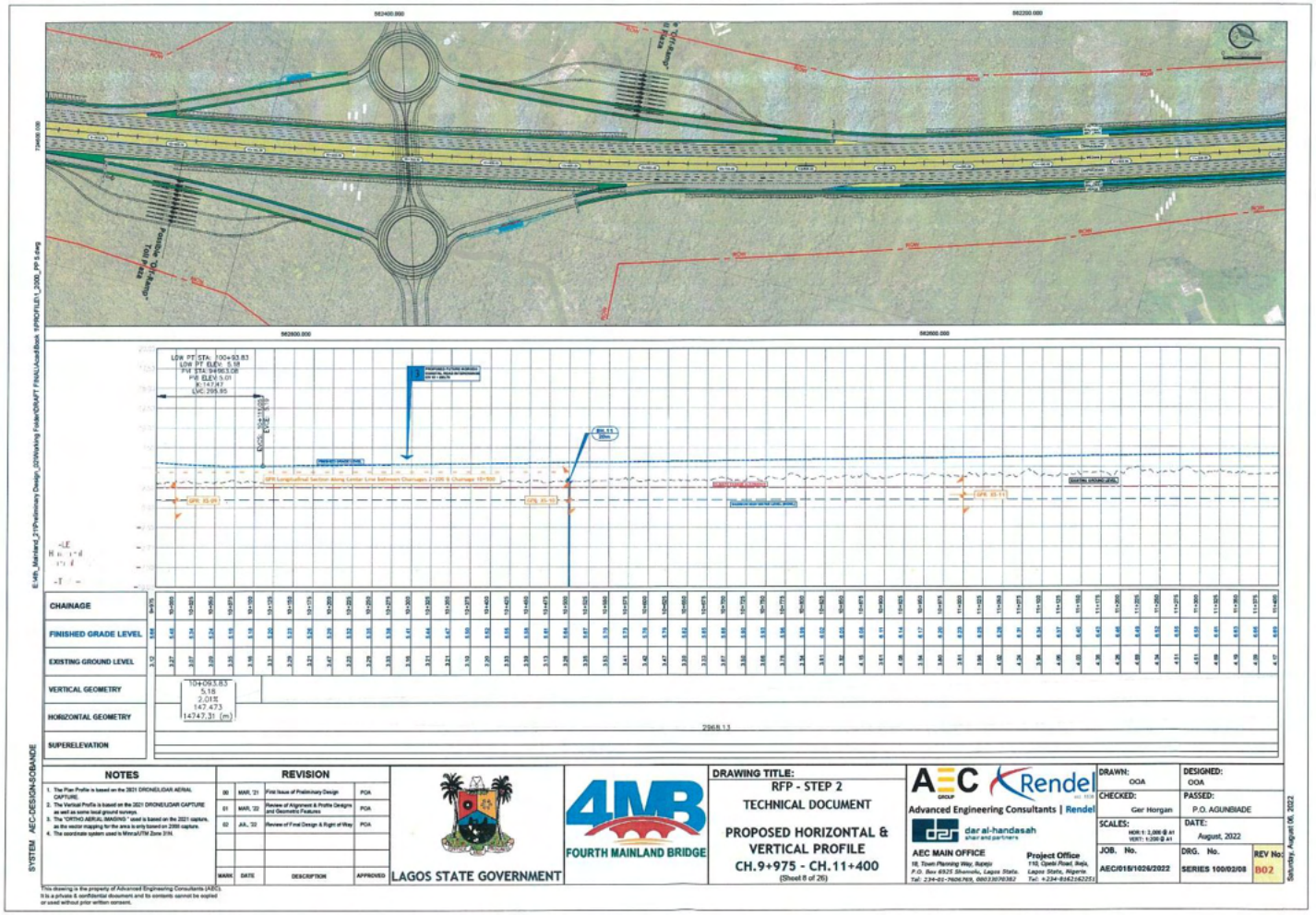
At Chainage 2+350, it is proposed that there will be a Addo Road Pedestrian Bridge such that the existing Addo Road to be Cul de Sac is diverted unto the new alignment over the New Motorway for ease of access to road users at this point. Also, at Chainage 2+350, an Overbridge is proposed on the new diverted Addo Road Alignment which is .500m from the existing shoreline of Addo / Badore. Reclamation of land within the neigbouring Lagos Lagoon is planned.



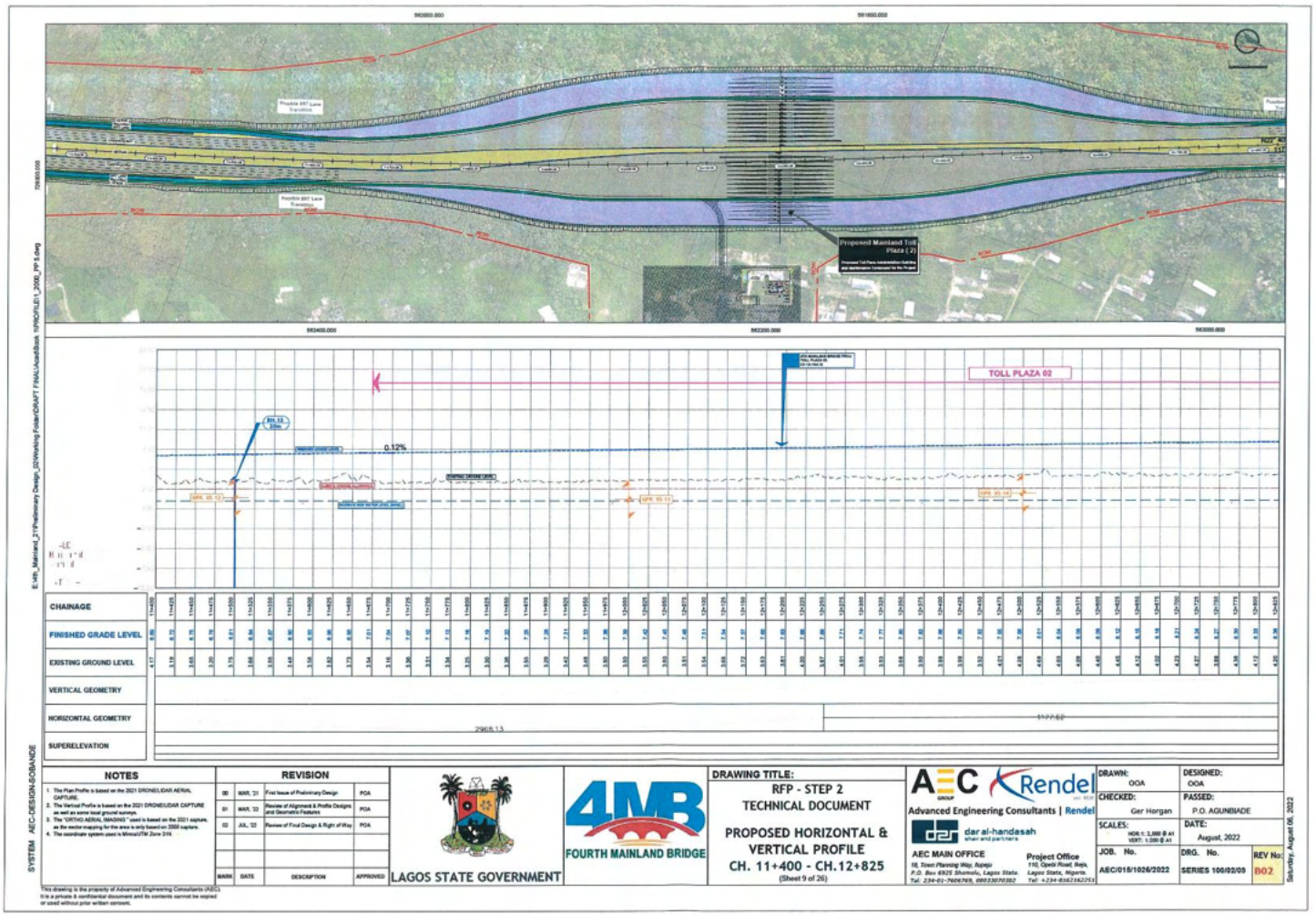
At Chainage 3.00, a Toll Plaza (Lekki Toll Plaza 1) is proposed to be located on the reclaimed Land from the existing Lagoon. The carriageway has been widened from Chainage 2+700 to Chainage 3+400 to accommodate the traffic build-up on the approach and exit from the proposed Lekki Toll Plaza. It is expected that there will be a slight increase in vehicular emission and an increase in particulate matters with an adverse effect on air quality at this location. It will be necessary to enforce waste management regulations at this location to checkmate the bad habit of throwing out waste onto the roads at Toll points.



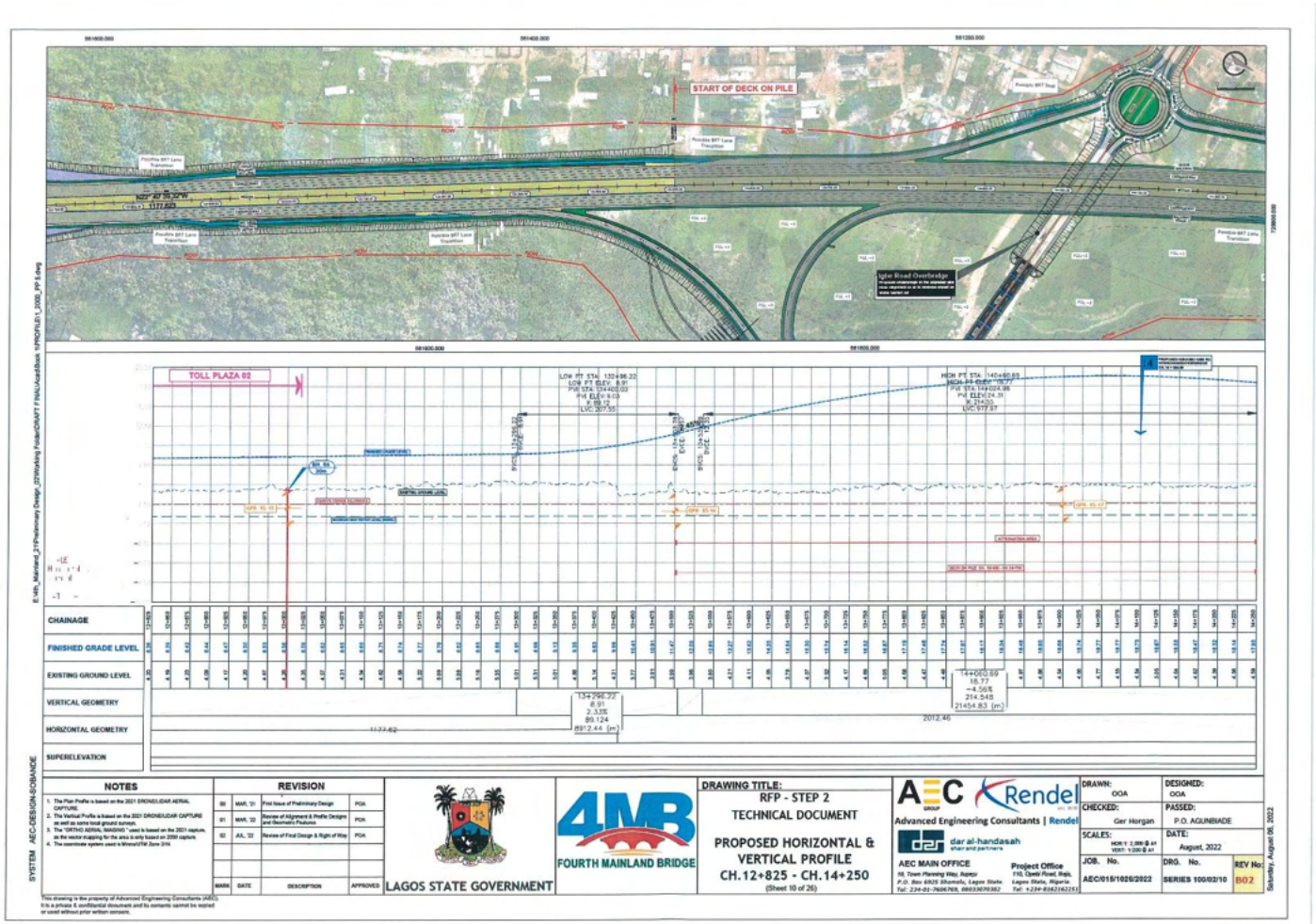
The launch location for the proposed 5km long Lagoon Bridge (4 + 400 - 9 + 400) is approximately at Chainage 4 + 400m. The proposed Lagon Bridge has forty-eight (48) Piers located 100m apart at Chainages 4+637.50 to 9+337.50 and 2 Abutments at Chainages 4+400 and 9+400. The risk of marine pollution from throwing / dumping of refuse and waste products into the Lagos Lagoon from road users on the Bridge stretch is high. Ahigh metal mesh barrier is recommended to prevent this occurrence in conjunction with massive environmental awareness. Installation of CCTV Cameras with imposition of fines on offenders will serve as deterrence.



It is proposed that an ‘‘Off-Ramp’’ Toll Plaza is located at Chainage 10+000 on the approach from Lekki – Epe Expressway and Chainage 10+600 on the approach from Ikorodu. A BRT Stop is proposed at Chainage 10+450 on the approach from Lekki – Epe Expressway and Chainage 10+150 on the approach from Ikorodu. These developments will result in loss of built-up structures and farmland on both sides of the proposed Alignment.



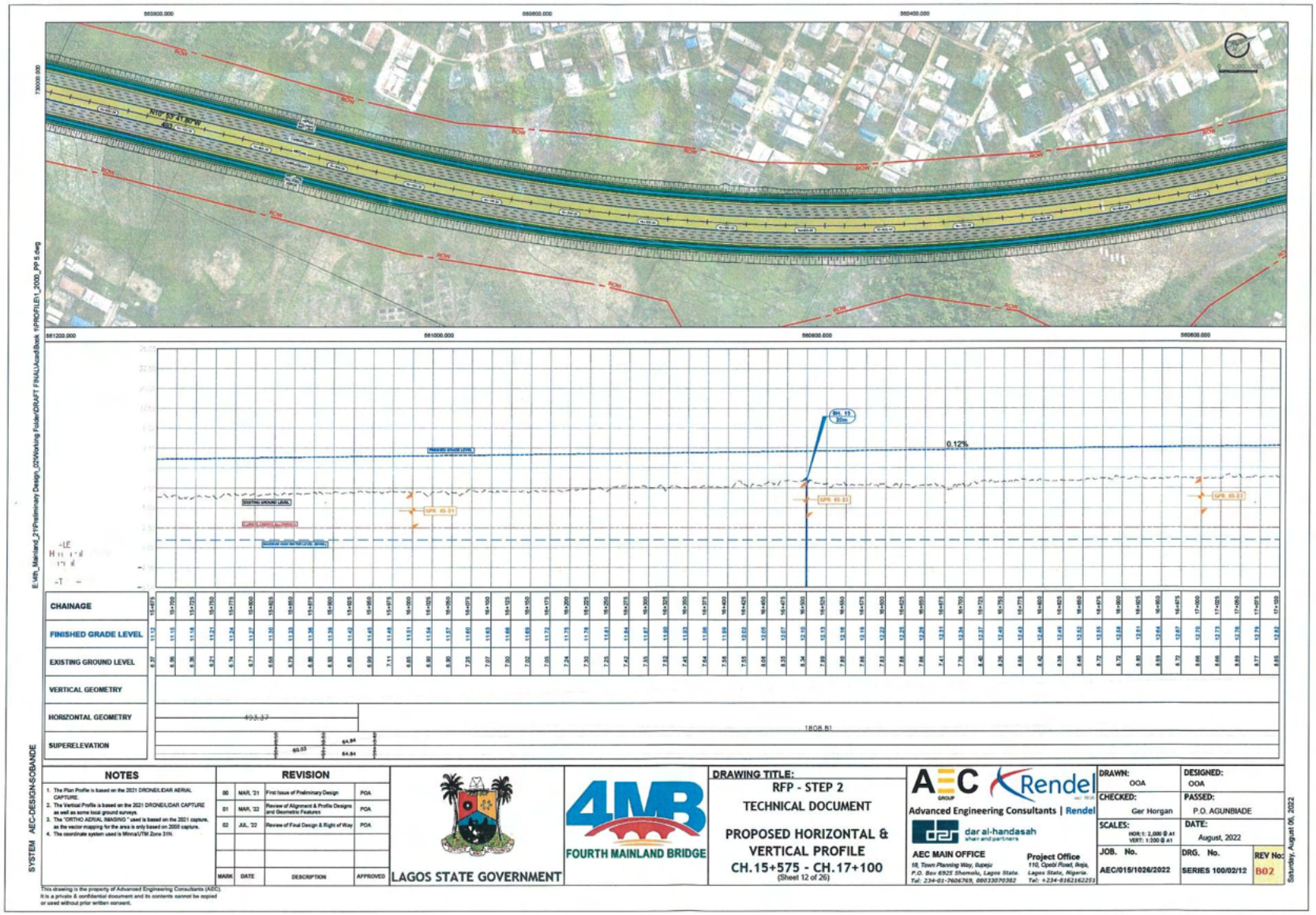
At Chainage 12+100, a Toll Plaza (Mainland Toll Plaza), Administration Building, and Maintenance Compound for the Project is proposed. A few buildings will be affected by this proposed Toll Plaza complex. A widening of the carriageway / pavement from Chainage 11+600 to Chainage 12+600 to accommodate the increased flow of traffic at the proposed Mainland Toll Plaza has been incorporated in the design.

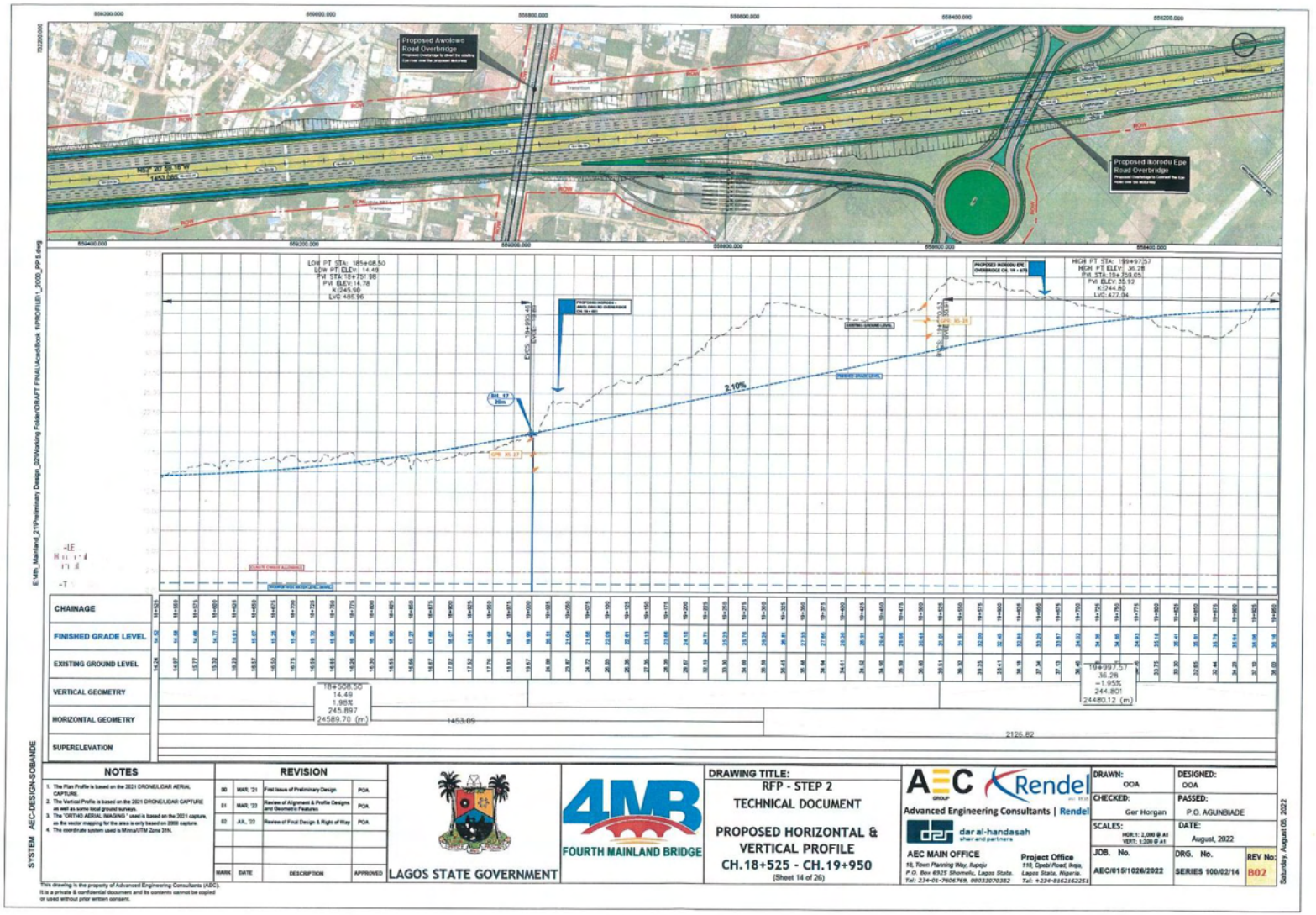


Between Chainage 12+400 on the Lekki approach and Chainage 14+600 on the Ikorodu approach, two Off Ramp Toll Plazas and an Overbridge (Igbe Road Overbridge) is proposed along with an Underbridge on the upgraded Igbe Road Alignment so as to minimize impact on works carried out. The Interchange and accompanying construction works will have both environmental and social impacts on the neighbouring community. A seasonal stream runs through the area with the possibility of being used as a waste dumpsite by roa users.

The carriageway at the approach and exit of Igbe Interchange has been widened to accommodate the increase in vehicular traffic from both the Underbridge and Overbridge at the proposed interchange.

In compliance with the decision of the project proponents to minimize demolition of buildings along the preferred 4MB Alignment, the Design Engineers have chosen an Alignment that avoids built-up areas in as much as feasible as evident in the proposed road alignment from Chainage 6+70 to Chainage 20+000 on the Mainland Section of the proposed Project.


CHAINAGE
FINISHED GRADE LEVEL
EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
0.12%
NOTES
REVISION
LAGOS STATE GOVERNMENT
FOURTH MAINLAND BRIDGE
DRAWING TITLE:
RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.15+575 - CH.17+100
(Sheet 12 of 26)
Advanced Engineering Consultants | Rendel
AEC MAIN OFFICE
Project Office
DRAWN: OOA
DESIGNED: OOA
CHECKED: Ger Horgan
PASSED: P.O. AGUNBIADE
SCALES:
DATE: August, 2022
JOB. No. AEC/015/1026/2022
DRG. No. SERIES 100/02/12
REV No: B02

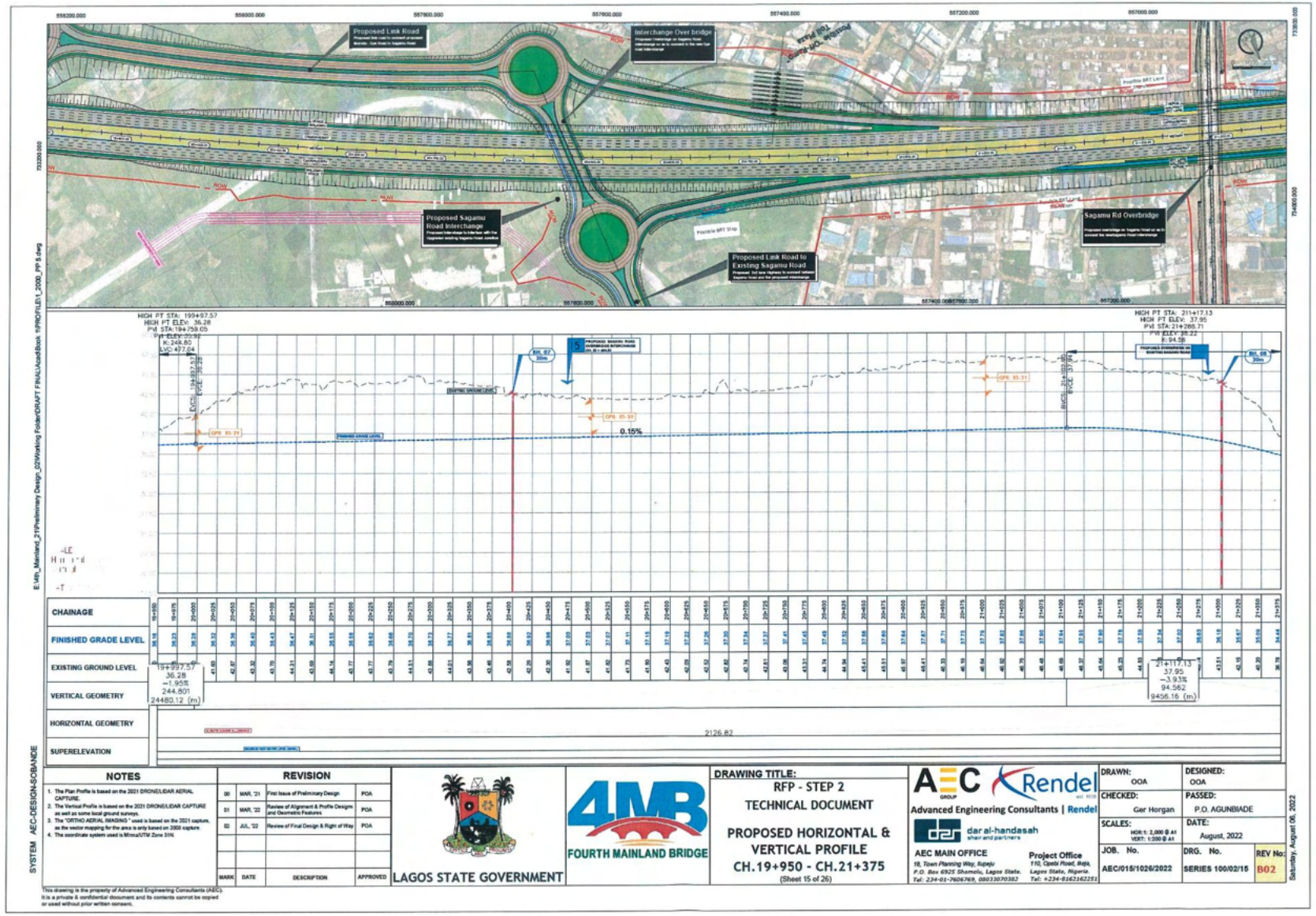


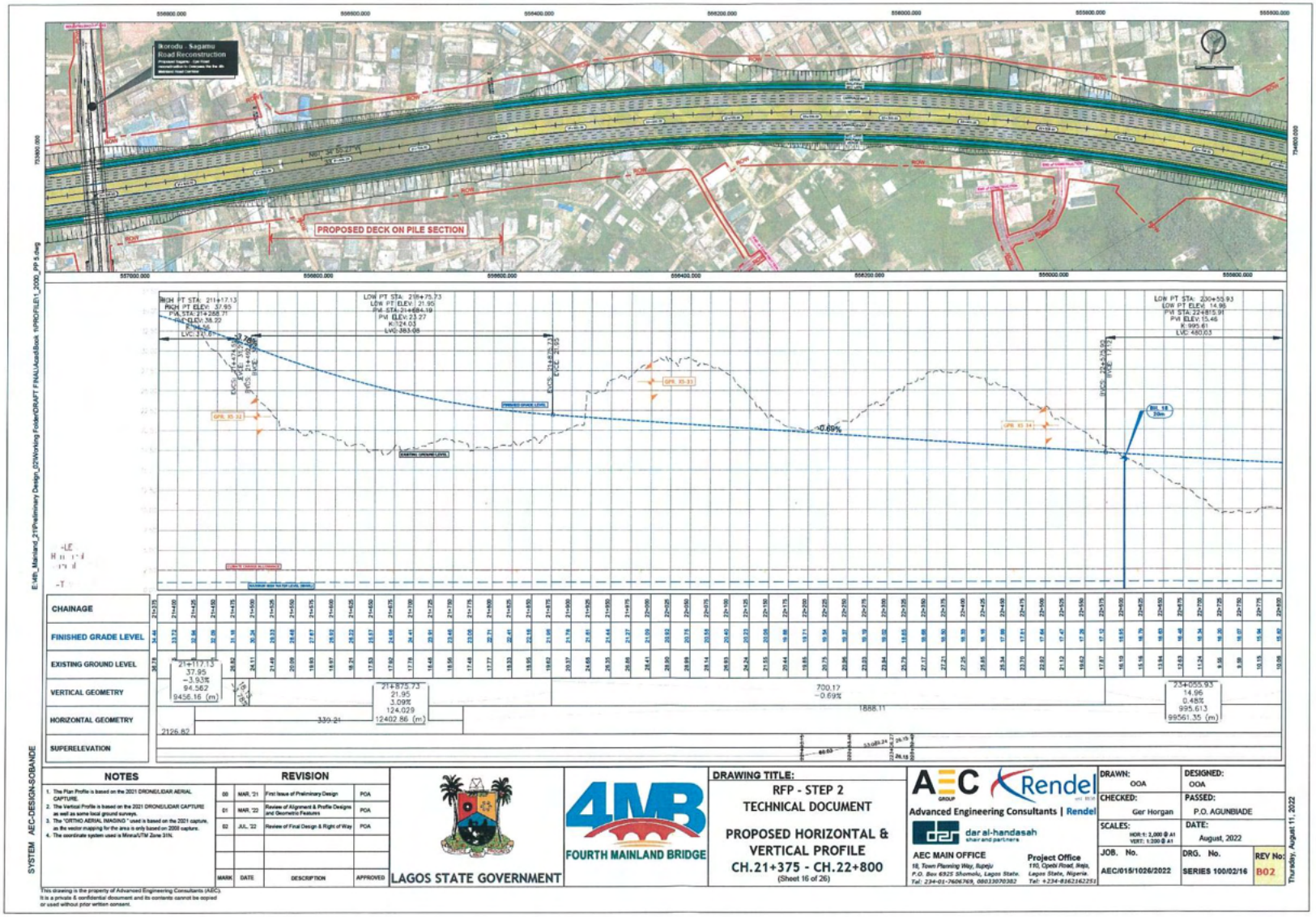
Ikorodu is the major settlement on the Mainland Section of the proposed Project and efforts have been made to avoid trasversing the alignment through built-up areas. An Overbridge has been proposed on the existing Awolowo Road to divert the existing Epe rRoad

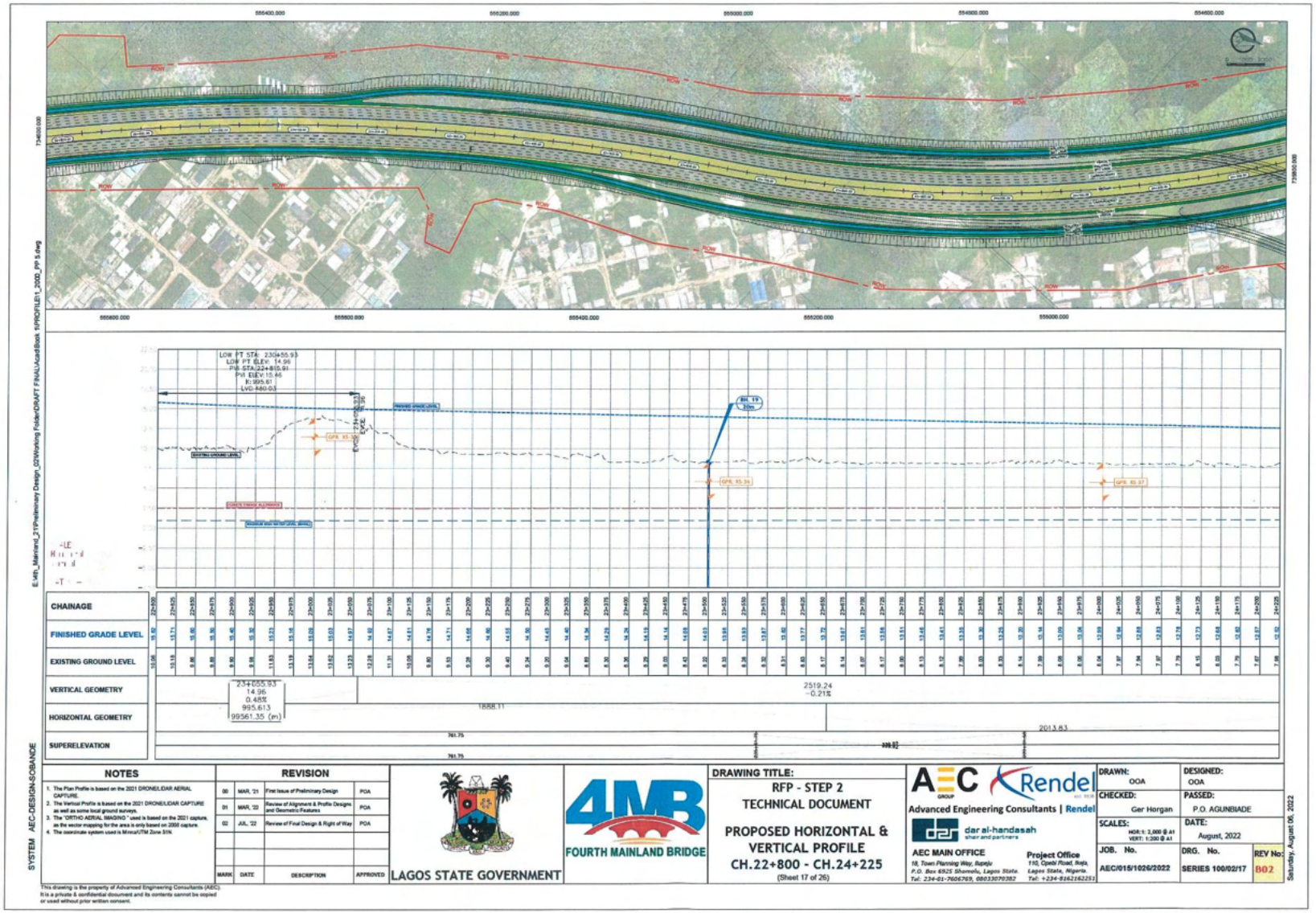
over the proposed Motorway, such that the existing Epe Road will now become a Cul-de-Sac and is diverted onto a new alignment over the proposed Motorway. This ensures that the traffic gridlock currently being experienced at the Awolowo Road – Epe Road Junction will be removed. There is also a reconstruction proposed for the Ikorodu – Shagamu Road Junction with the proposed Sagamu – Epe Road reconstruction to Overpass the 4th Mainland Bridge Corridor, thus removing the bottleneck experienced on this axis. This reduces travel time on the corridor and provides a reasonable alternative to road users going to Epe / Ijebu Ode, Ore Benin Expressway and those traveling to Sagamu / Ibadan Expressway. It also provides a viable link to the proposed Lagos – Abuja Expressway Project

The proposed Alignment passes through a highly built-up area from Chainage 21+300 to Chainage 22+800 before passing through the Lagos State Government-owned Lagos Polytechnic campus at Ikorodu.

At Chainage 27+000, the proposed Alignment interfaces with the proposed Underbridge to go over the Upgraded existing Isawo Road alignment and joins the proposed Isawo Link Road to connect between the Isawo Road and the proposed Isawo Interchange. There is a proposed future connection to Isawo Interchange for further development in the Isawo area. At Isawo, the Agric Isawo Konu Road is under reconstruction and is linked to the proposed Highway with a proposed future connection to Isawo Interchange for future development in the neighbouring Obafemi – Owode Local Government Area in the South Ogun State area


Proposed Link Road
Interchange Over bridge
Proposed Sagamu Road Interchange
Sagamu Rd Overbridge
Proposed Link Road to Existing Sagamu Road
0.15%
CHAINAGE
FINISHED GRADE LEVEL
EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
2126.82
NOTES
REVISION
LAGOS STATE GOVERNMENT
FOURTH MAINLAND BRIDGE
DRAWING TITLE:
RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.19+950 - CH.21+375
(Sheet 15 of 26)
Advanced Engineering Consultants | Rendel
dar al-handasah
AEC MAIN OFFICE
Project Office
DRAWN: OOA
DESIGNED: OOA
CHECKED: Ger Horgan
PASSED: P.O. AGUNBIADE
SCALES:
DATE: August, 2022
JOB. No. AEC/015/1026/2022
DRG. No. SERIES 100/02/15
REV No: B02


Ikorodu - Sagamu
Road Reconstruction
PROPOSED DECK ON PILE SECTION
CHAINAGE
FINISHED GRADE LEVEL
EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
NOTES
1. The Plan Profile is based on the 2021 DRONE/LIDAR AERIAL CAPTURE.
2. The Vertical Profile is based on the 2021 DRONE/LIDAR CAPTURE as well as some local ground surveys.
3. The "ORTHO AERIAL IMAGING " used is based on the 2021 capture, as the vector mapping for the area is only based on 2008 capture.
4. The coordinate system used is Minna/UTM Zone 31N.
REVISION
MARK
DATE
DESCRIPTION
APPROVED
LAGOS STATE GOVERNMENT
FOURTH MAINLAND BRIDGE
DRAWING TITLE:
RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.21+375 - CH.22+800
(Sheet 16 of 26)
Advanced Engineering Consultants | Rendel
dar al-handasah
AEC MAIN OFFICE
Project Office
DRAWN: OOA
DESIGNED: OOA
CHECKED: Ger Horgan
PASSED: P.O. AGUNBIADE
SCALES:
DATE: August, 2022
JOB. No. AEC/015/1026/2022
DRG. No. SERIES 100/02/16
REV No: B02
SYSTEM AEC-DESIGN-SCBANDE
Thursday, August 11, 2022


CHAINAGE
FINISHED GRADE LEVEL
EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
NOTES
REVISION
LAGOS STATE GOVERNMENT
FOURTH MAINLAND BRIDGE
DRAWING TITLE:
RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.22+800 - CH.24+225
(Sheet 17 of 26)
AEC MAIN OFFICE
Project Office
DRAWN: OOA
DESIGNED: OOA
CHECKED: Ger Horgan
PASSED: P.O. AGUNBIADE
SCALES: HOR:1: 2,000 @ A1 VERT: 1:200 @ A1
DATE: August, 2022
JOB. No. AEC/015/1026/2022
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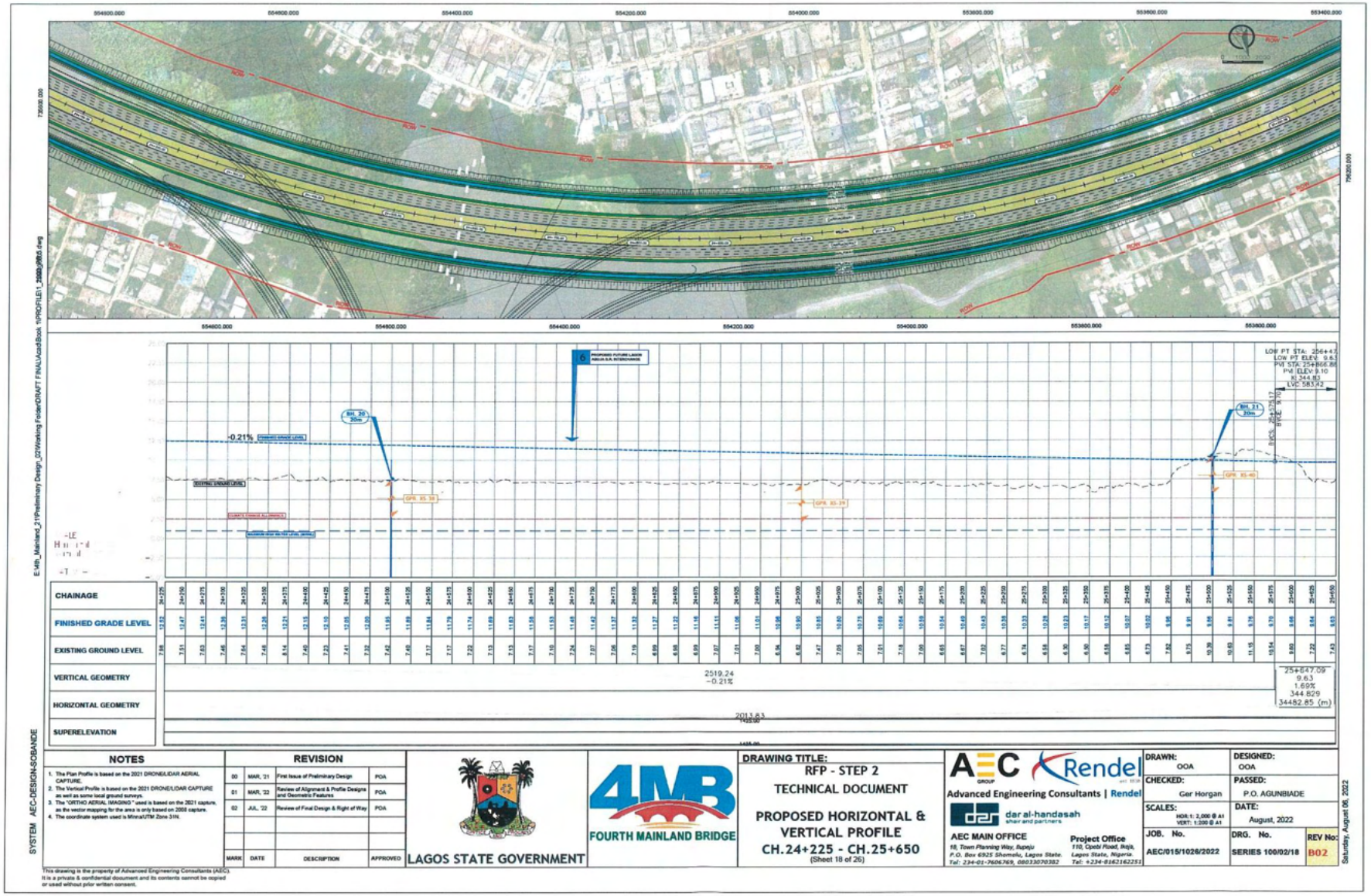
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1. The Plan Profile is based on the 2021 DRONE/LIDAR AERIAL CAPTURE.
2. The Vertical Profile is based on the 2021 DRONE/LIDAR CAPTURE as well as some local ground surveys.
3. The "ORTHO AERIAL IMAGING" used is based on the 2021 capture, as the vector mapping for the area is only based on 2008 capture.
4. The coordinate system used is Minna/UTM Zone 31N.
REVISION
MARK | DATE | DESCRIPTION | APPROVED
00 | MAR, '21 | First Issue of Preliminary Design | POA
01 | MAR, '22 | Review of Alignment & Profile Designs and Geometric Features | POA
02 | JUL, '22 | Review of Final Design & Right of Way | POA
LAGOS STATE GOVERNMENT
FOURTH MAINLAND BRIDGE
DRAWING TITLE:
RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.24+225 - CH.25+650
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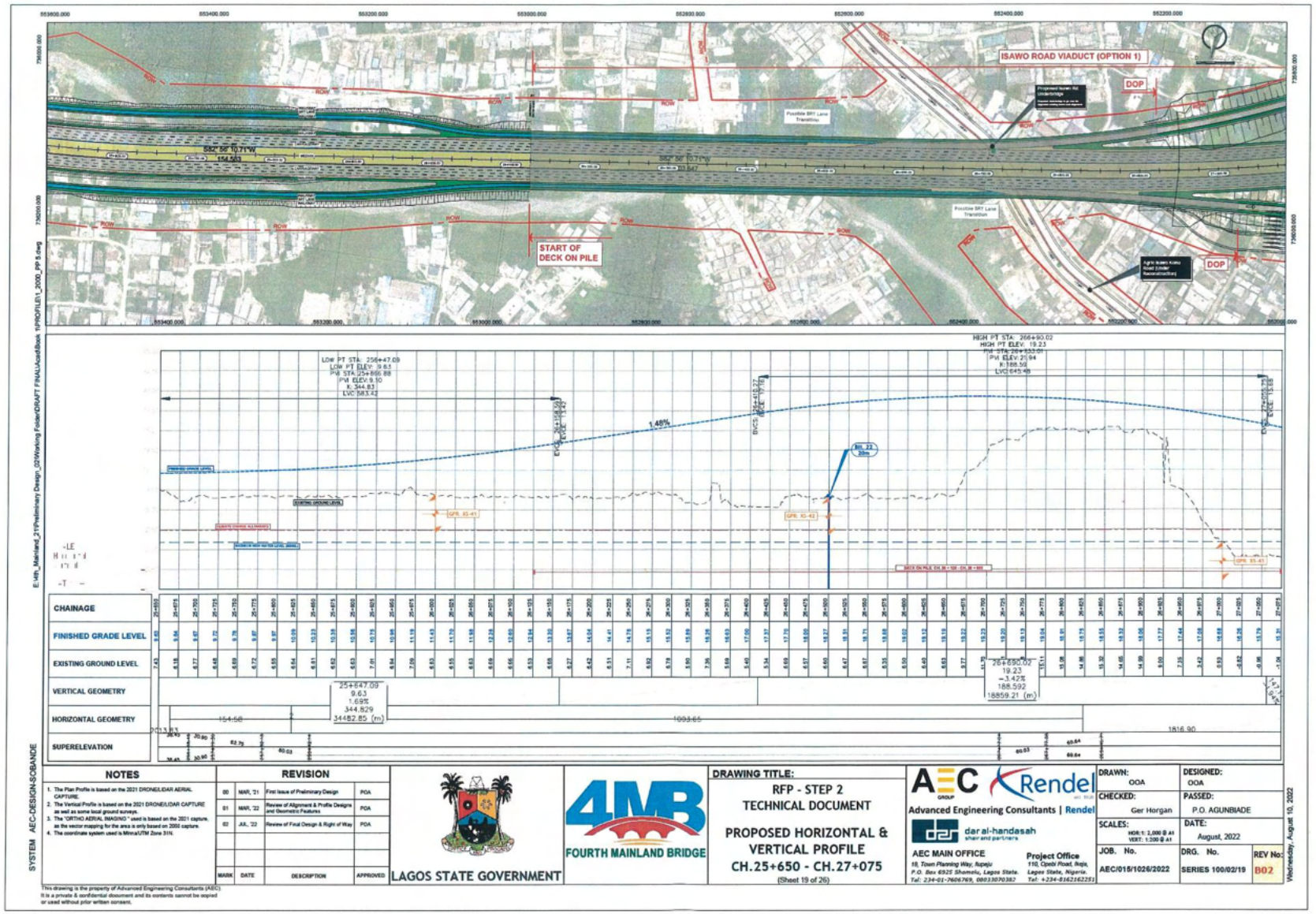
Saturday, August 06, 2022


ISAWO ROAD VIADUCT (OPTION 1)
START OF DECK ON PILE
DOP
DOP
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VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
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REVISION
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DRAWING TITLE:
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TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.25+650 - CH.27+075
(Sheet 19 of 26)
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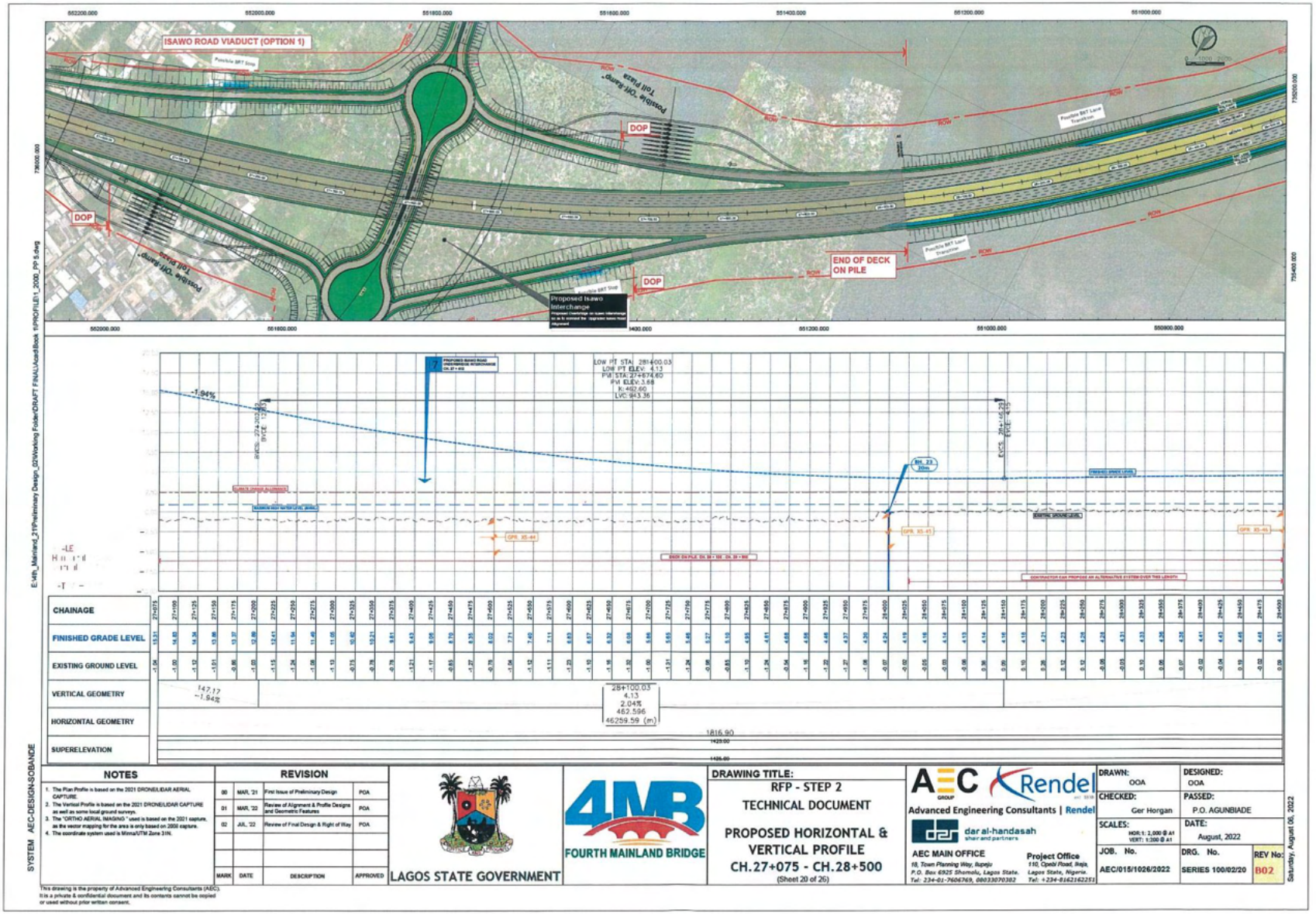
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Proposed Isawo Interchange
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EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
NOTES
REVISION
LAGOS STATE GOVERNMENT
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PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.27+075 - CH.28+500
(Sheet 20 of 26)
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DATE: August, 2022
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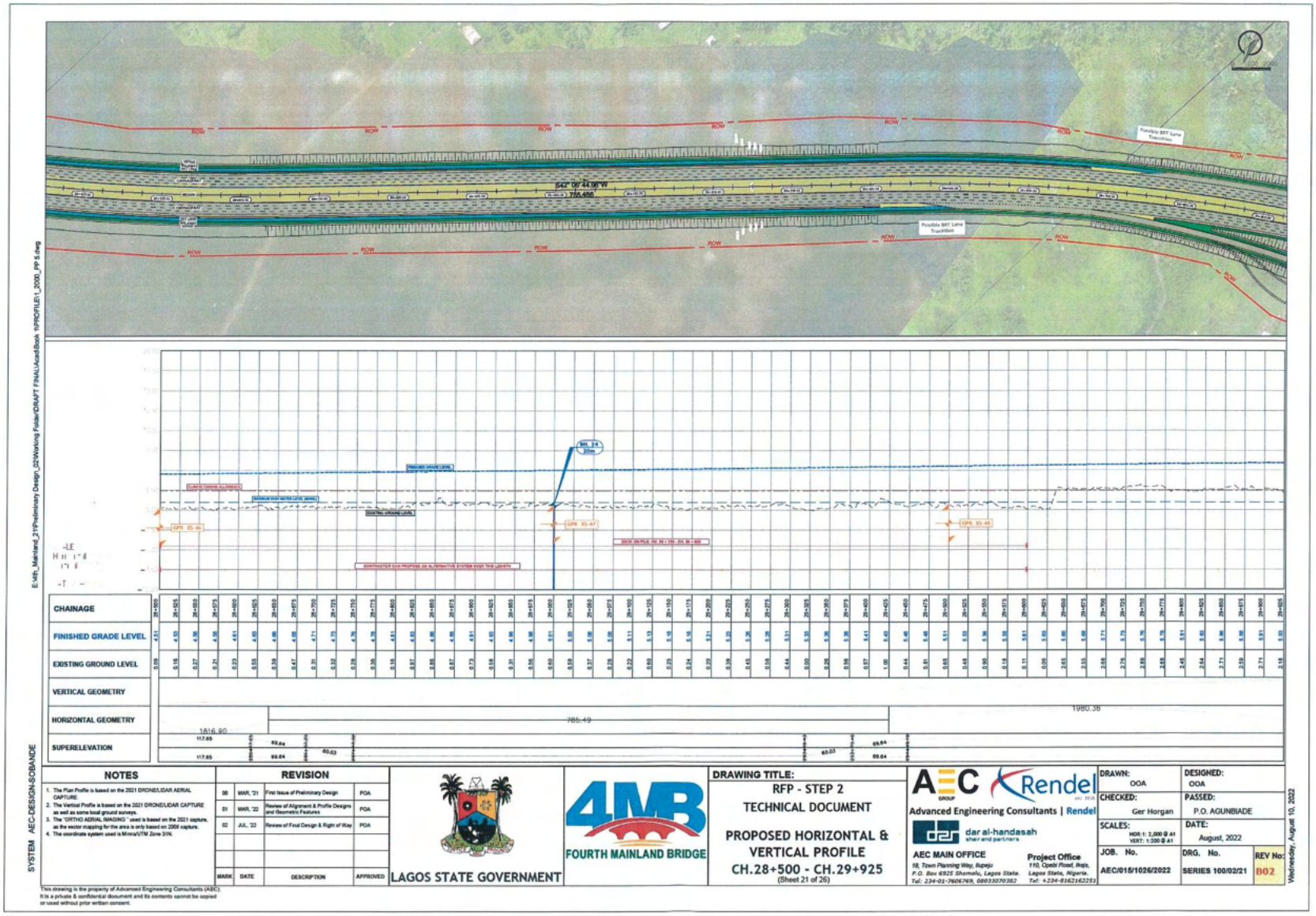
REV No: B02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HORIZONTAL GEOMETRY
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1. The Plan Profile is based on the 2021 DRONE/LIDAR AERIAL CAPTURE.
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TECHNICAL DOCUMENT
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CH.28+500 - CH.29+925
(Sheet 21 of 26)
Advanced Engineering Consultants | Rendel
dar al-handasah
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DATE: August, 2022
JOB. No. AEC/015/1026/2022
DRG. No. SERIES 100/02/21
REV No: B02
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Wednesday, August 10, 2022
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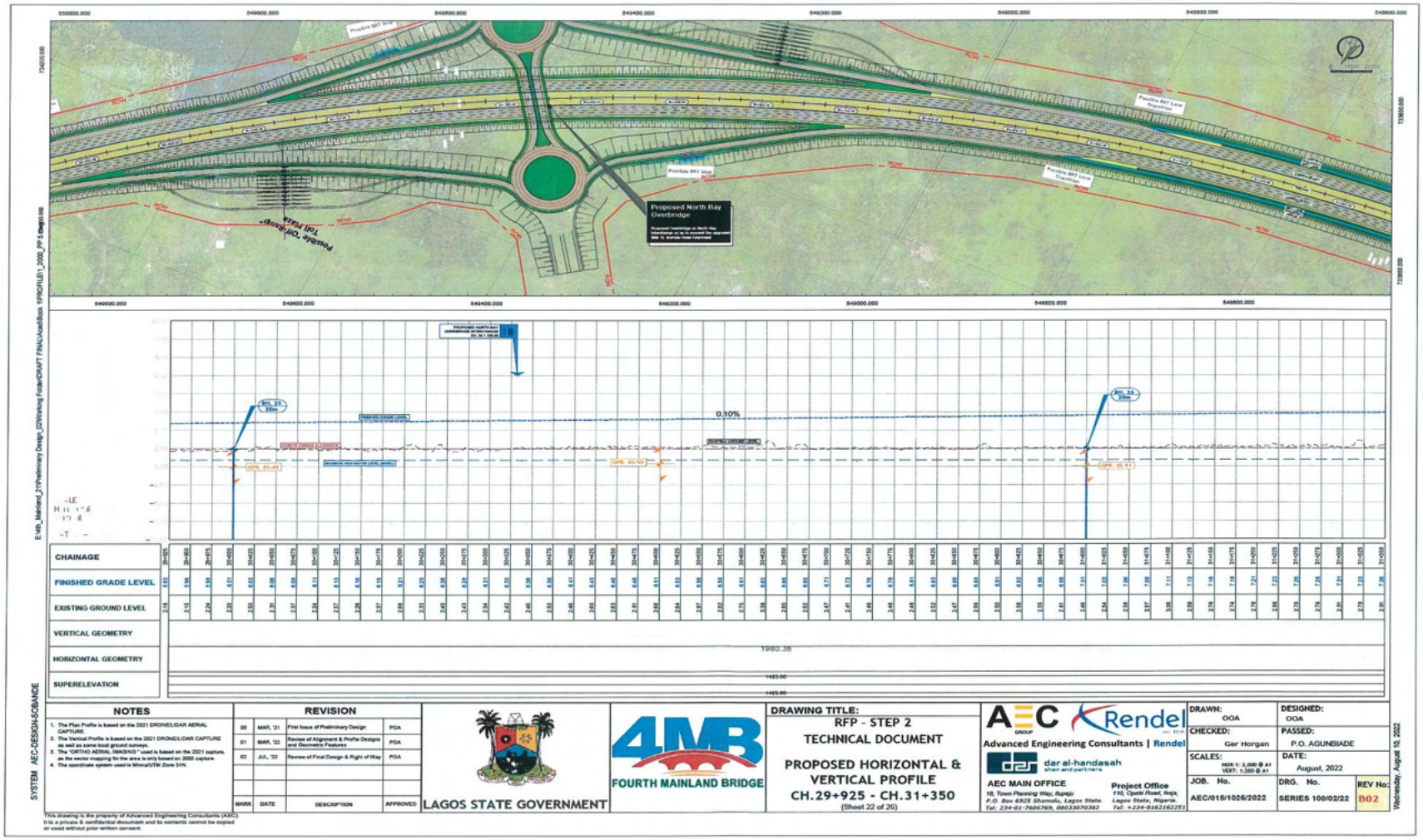
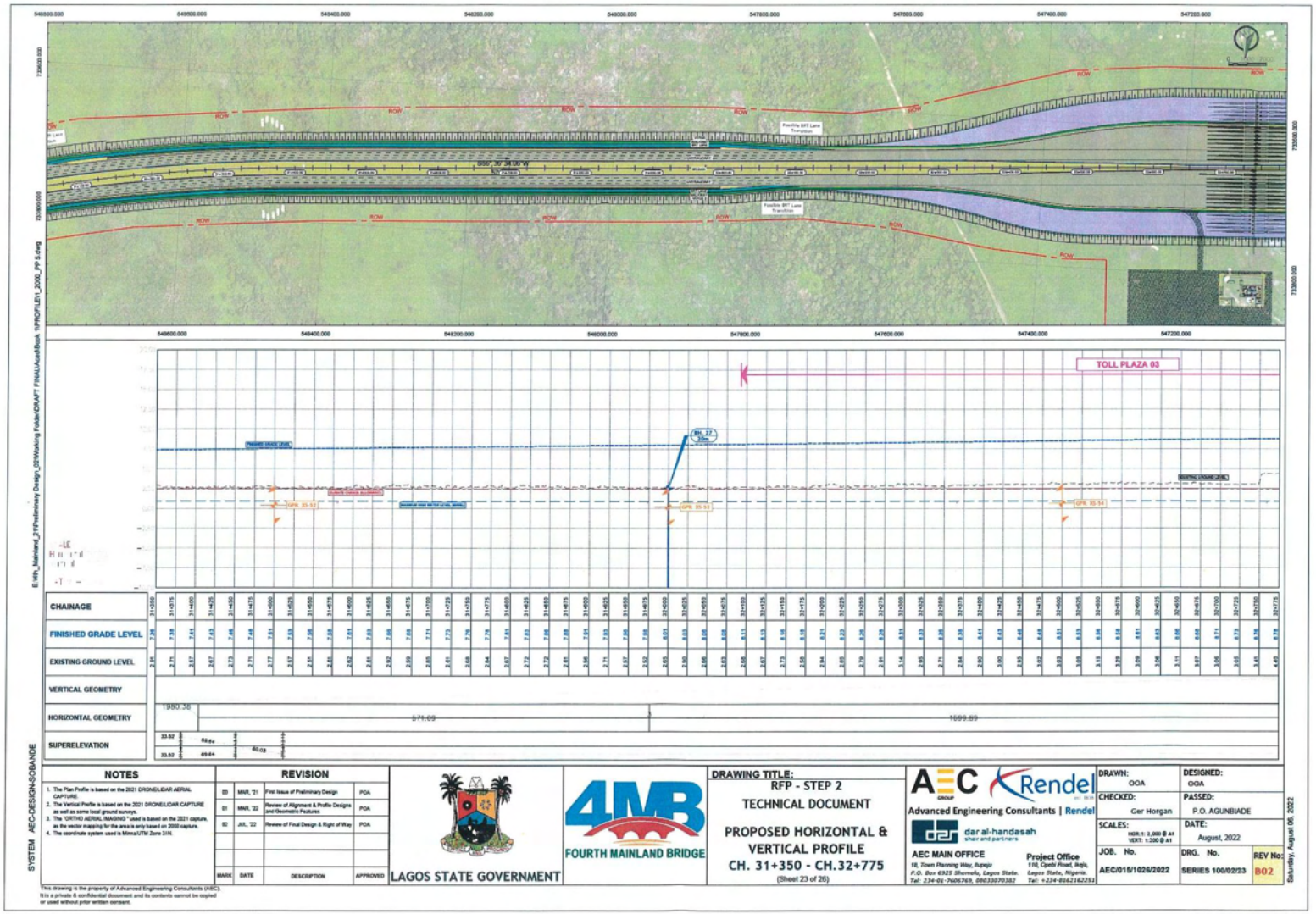
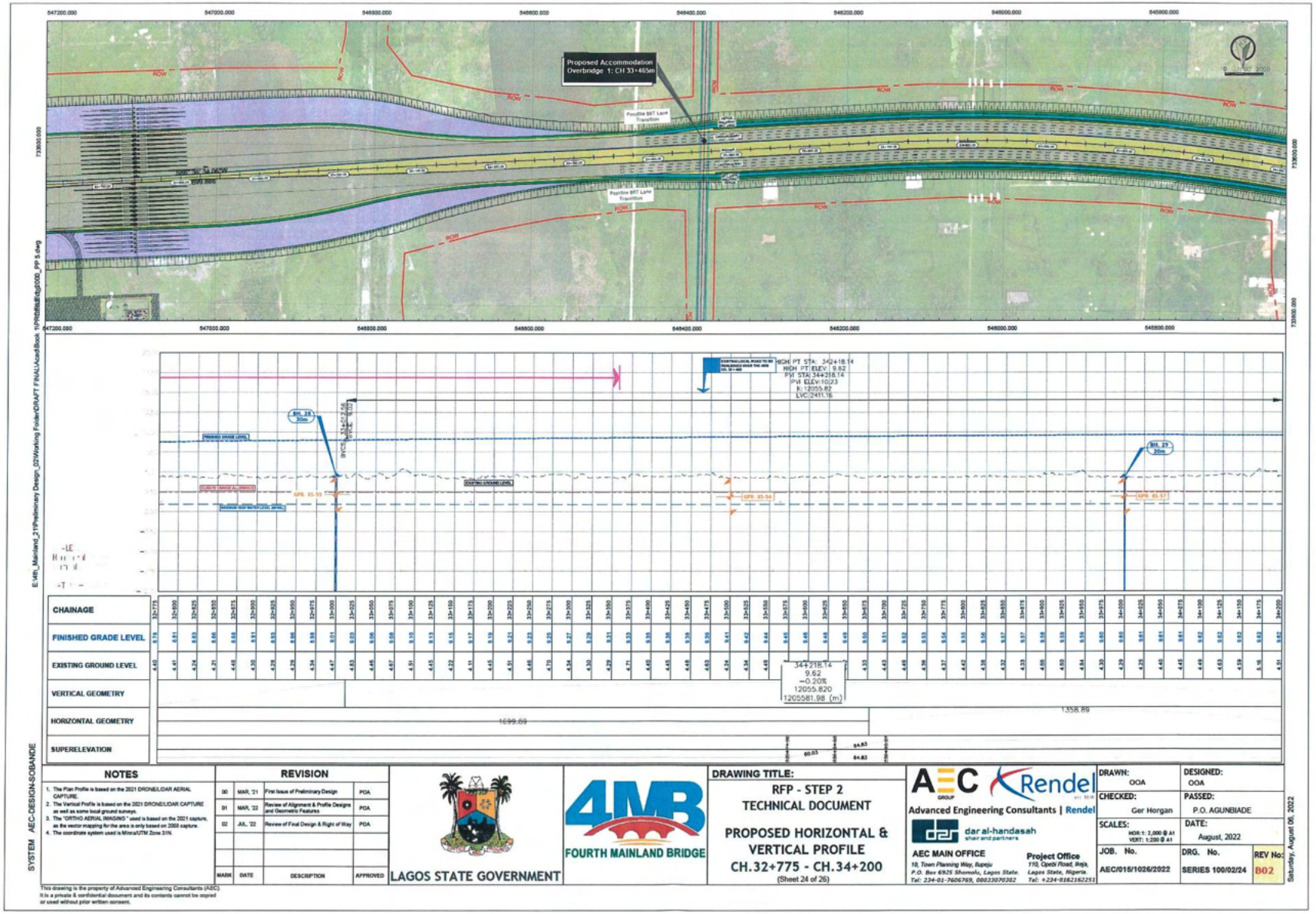


Chainage 29+800 and Chainage 30+800, it is proposed to have an Off Ramp Toll Gate on either side with the proposed North Bay Overbridge on the proposed North Bay Interchange so as to connect the upgraded Mile 12 Ikorodu Highway Alignment. As at the time of the Field Studies, there were no built-up structures in this axis though farmers were observed on their farms. The stand-alone RAP Report will indicate if structures have sprung up and the necessary mitigation measures to be adopted



Chainage 32+700, is a proposed Toll Gate with a widening of the carriageway from Chainage 32+100 to Chainage 33+250 to accommodate the increased vehicular traffic at the Toll Plaza.


Proposed Accommodation Overbridge 1: CH 33+465m
CHAINAGE
FINISHED GRADE LEVEL
EXISTING GROUND LEVEL
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
SUPERELEVATION
NOTES
REVISION
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RFP - STEP 2
TECHNICAL DOCUMENT
PROPOSED HORIZONTAL & VERTICAL PROFILE
CH.32+775 - CH.34+200
(Sheet 24 of 26)
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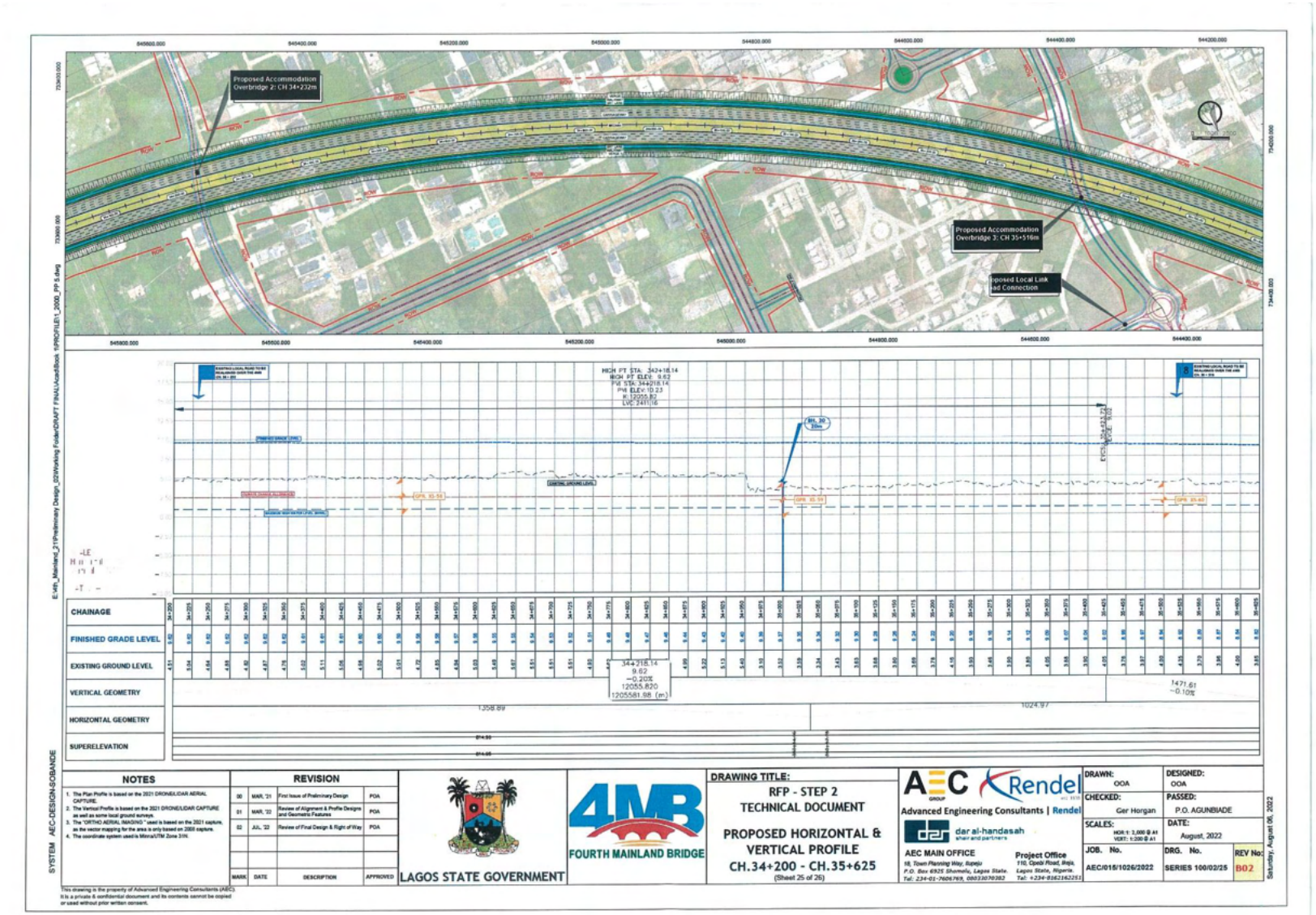
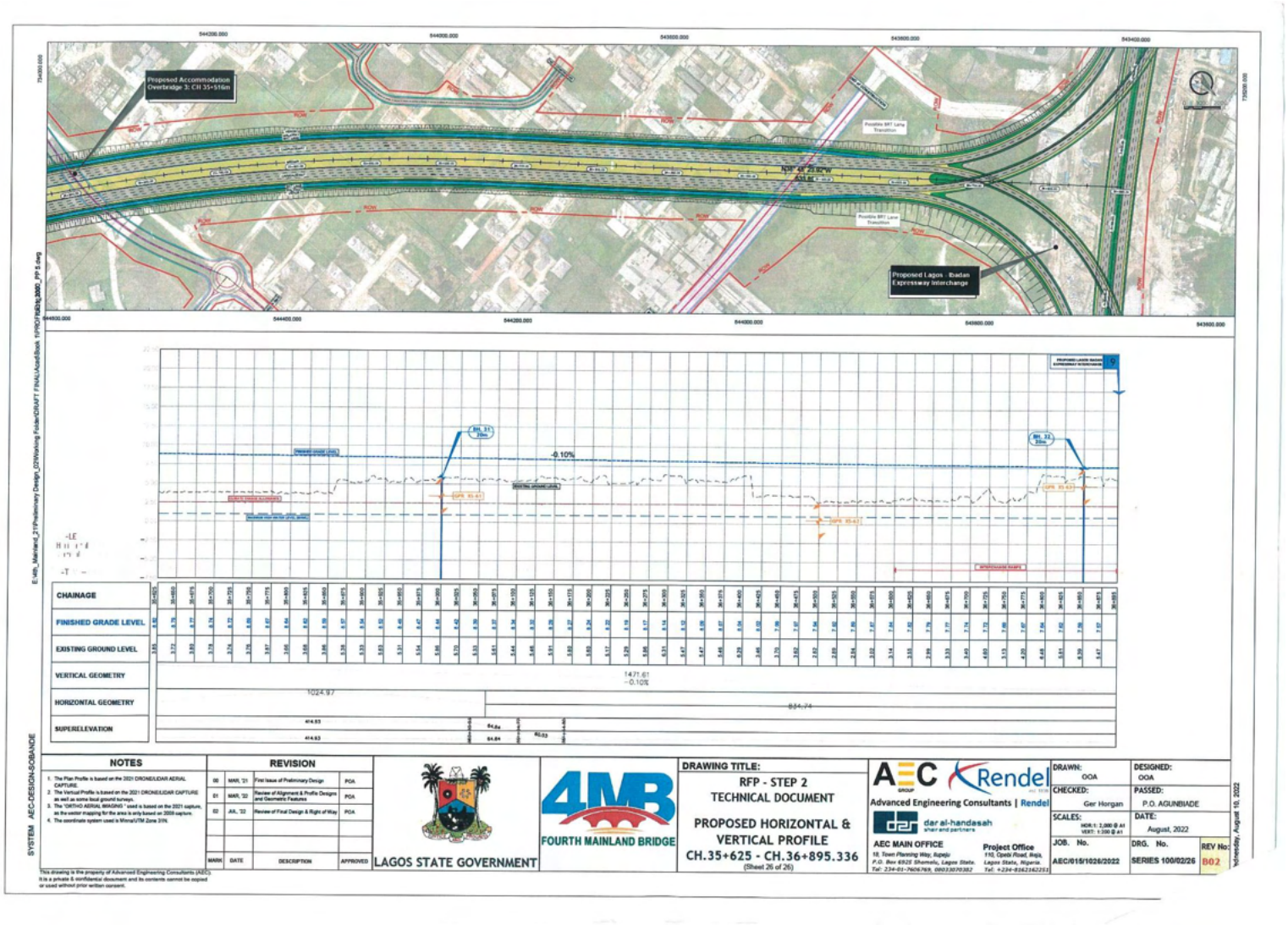
DRG. No. SERIES 100/02/24
REV No: B02



Proposed Accommodation Overbridge on either side at Chainage 35+516m and Chainage 33+465m



An Interchange with the Lagos – Ibadan Expressway is planned at Chainage 36+700 with the proposed Project's Terminal Point at Chainage 36+895.34.

Ikorodu Master Plan and the proposed 4th Mainland Bridge Project

Ikorodu Sub-Region is a conurbation of built-up settlements with large expanse of wetlands and rainforests zones located on the north-eastern boundary of Lagos State. In the early 1980s, it was largely agrarian and characterized by a few communities. However, as a present major gateway corridor from the metropolis to adjoining state and the regional road, it has experienced rapid urbanization and population influx over the decades accompanied by challenges such as traffic congestion, inadequate infrastructure, encroachment on agricultural land uses, land management conflicts, environmental degradation, sea level rise and flooding. To address these challenges and harness the intrinsic potentials in the Sub-Region, this master plan was prepared to guide physical development and socio-economic growth of the Sub-Region for the next twenty (20) years.

The delineated coverage area for the master plan is 48,058.25 Hectares and constitutes parts of three LCDAs (Ikosi-Ejinrin, Agboyi-Ketu and Ikosi-Isheri) in addition to Ikorodu LGA, Ikorodu North, Ikorodu West, Imota, Igbogbo-Baiyeku and Ijede LCDAs. The Sub-Region's historical background, urbanisation trends, existing land uses, social and physical infrastructure, hydrologic and hydrogeologic attributes, housing stock, natural and ecological resources, cultural and tourism potentials as well as traffic and transportation challenges were assessed. Findings have been validated to ascertain the reliability of the collected data and was used as the basis for proposals and interventions for the next 20 years

Ikorodu Sub-Region

Ikorodu Sub-Region at present functions as a major gateway corridor to the metropolis and the state with an estimated population of about 1.8 million. In the last three decades, Ikorodu Sub-Region is acknowledged as one of the fastest growing regions of Lagos State. This is made evident by remarkable growth in physical development, socio-economic transformation and population influx due to urban sprawl from the Lagos Metropolis and Ogun State. In the early 1980's the region was characterised by few towns and communities known for agricultural facilities besides major institutional developments like the Lighter Terminal at Ebute-Ikorodu and Voice of Nigeria at Ibeshe.

However, the Sub-Region has experienced speedy transition from a group of satellite towns of agriculture land use region to a cluster of urbanised communities with vast industrial development in Odogunyan, Parafa and Ibeshe communities while major agricultural resource developments are located across the Sub- Region especially in Agbowa, Imota, Gberigbe, Ikorodu, Itamaga and Odogunyan.

Consequently, the Sub-Region is bedeviled with the following myriad of challenges:

- Extensive land encroachments especially on government acquired land holdings which has resulted in fragmented land parceling, uncontrolled urban growth and slum formation.
- Geographic and topographical constraints as well as uncoordinated dredging activities especially in the lagoon area, coupled with unsustainable environmental practices have resulted in loss of biodiversity and increased vulnerability to flooding and land erosion in some areas.
- Declining rural population and uncoordinated urban growth have also resulted in declining agricultural activities and attendant food security vulnerabilities.

- Safety and security constraints, increased violence and lingering inter-border disputes also portend a threat to the development of the Sub-Region if not addressed significantly.

The observed challenges provided a good insight into roots of developmental constraints within the Sub-Region over the years. Bearing in mind the strengths, weaknesses, and threats to the development of the Ikorodu Sub-Region, the major opportunities for sustainable development in the short and medium term lie in a diversified economic development. Special focus was placed on the following.

- Rejevenation of the industrial and agricultural sectors in order to provide jobs,
- Coordination of rural development to decentralise urban growth and check food insecurity,
- Promotion of Ikorodu's natural advantage by the development of the water front potential and strengthening of the multi-modal transport modes.
- There is also the need for (re)development and regeneration via infrastructure upgrade and effective land use management.

Transportation Infrastructure

The transport infrastructure goal is to provide a mobility that is adequate to the needs of the Sub-Region which is forecasted to see an increase in population of nearly four times in the next twenty years. In the Sub-Region, road and waterways are the major modes of transportation, although the road network takes precedence. Presently, the aforementioned roads which bears the brunt of road travel of the Sub-Region, suffers deficiency which ranges from bad carriageway condition, lack of parking garages at major activity centers and Bus-stops, poor drainage condition, poor level of service at major intersections, inadequate road furniture, threat to green mobility.

Highlights of the proposal for the road infrastructure include the densification, restructuring and hierarchizing of the road and street network.

Existing Road Infrastructure, 2016	***Proposed Road Infrastructure, 2036***
52.2km Arterial Roads	247.3Km Arterial Roads
183.7km Collector Roads	299.9Km Major Collector Roads
3,554.8km Local Roads	422.6Km Minor Collector Roads
`	3,471.1Km Local Roads

Ikorodu Sub-Region is a prominent part of the North-Eastern Part of Lagos. Due to its teeming growth in population which is home to about 1,752,403 people in 2016, and by 2036, the projected population will exceed 6 million inhabitants.

The findings from the baseline report in regard to majority of the Sub-Region resident trip purpose is home-base trip and work trip. The migration population into the Sub-Region is as a result of the present housing affordability in the Ikorodu Sub-Region. By the year 2036, projected inhabitants will put a lot of pressure on its currently overstretched transport infrastructure.

However, available transport infrastructure, in the Sub-region was initially designed to accommodate a certain traffic volume for a period of time. Institutional weakness and lack of Government funding has made virtually all means of mobility suffer neglect.

In Ikorodu Sub-region, road and waterway transport are the major means transportation. The road network is widely used in the Sub-Region, we have the arterial roads, which are the Federal Government maintained roads and which is about 52 kilometers road network. The Collector roads, which are maintained by the State Government which totals about 183

kilometers, while the local feeders which are being managed by the State and Local Government.

At present, the aforementioned road which bears the road network of the Sub-Region, suffers deficiency which ranges from bad carriageway condition, lack of parking garages at major activity centres and bus-stops, poor drainage condition, poor level of service at major intersections, inadequate road furniture, threat to green mobility.

Water transportation is another means of transportation used by the residents of the Sub-Region, with 13 jetties majorly owned by private individuals and are being supervised by Lagos- State Waterways Authority (LASWA) from baseline report, trip purpose is majorly ''work''. It provides short travel time for its users, and connects Victoria Island, Baiyeku Lamgbasa, Ajah, CMS and Badore. Most of these jetties are in bad condition, inadequate ferries to move passengers during peak, have made the means of transportation less effective.

The proposed 4th Mainland Bridge Project has he major portion on the Mainland Section which but for some stretch in Obafemi – Owode Local Government in Ogin State is embedded within the Ikorodu Sub Region from Chainage 9+400 at Baiyeku in Igbogbo-Baiyeku LCDA till it gets to Ishawo at Chainage

The major challenges currently being experienced in the Ikorodu Sub Region which are aimed to be solved with the implementation of the recently launched Ikorodu Master Plan.

From the Baseline Scenario of the Ikorodu Master Plan, these were the major issues raised by the Stakeholders:

Wider Access and Connectivity

The Ikorodu Sub-Region is located at the north-eastern end of Metropolitan Lagos and serves as one of the city's regional transportation nexus with access to Ogijo and Sagamu at its northern end, Epe and Ijebu-Ode at its eastern end. It also provides linkages to areas within coastal proximity by the Lagos Lagoon where the Lekki, Victoria Island part of Lagos metropolis is also connected to the sub-region. The construction of the proposed 4th Mainland Bridge will enhance the maritime transportation at Baiyeku with easy and direct access through the Ferry Terminal and provide access and connectivity across the waterways.

Road Network Characteristic

Ikorodu sub-region is endowed with a radial pattern of road network converging in the core area of the city. The total road network of the sub-region is about 3790.62 km which consists of approximately 52.17 kilometers of arterial, 183.69 kilometers of collector roads and 3,554.76 kilometers of local feeders. The proposed 4th Mainland Bridge will further enhance the Road network in the Ikorodu Sub Region through easy linkage and access to:

a: Lagos - Ikorodu Road

Lagos - Ikorodu Road, which is the major access road linking the Sub-Region to Lagos metropolis extends in a West-East direction from Mile 12 to Ikorodu Roundabout - the core of Ikorodu Town. With the incorporation of a BRT lane on the proposed Project carriageway, it facilitates the introduction of a BRT Route from Ikorodu to the Island axis

b. Ikorodu - Sagamu Road

Ikorodu-Sagamu Road is the major link from Lagos passing through to the northern part of the country and has contributed more to the lateral spatial expansion of Ikorodu township. It originates from Ikorodu Roundabout and extend towards the northern end of the Sub-Region.

The proposed 4th Mainland Bridge provides a link to the existing Ikorodu – Shagamu Road with the reconstruction and Overbridge at Awolowo Road Junction.

c. Ikorodu - Itoikin Road

Ikorodu-Itoikin Road also serves to support the link to the eastern part of Nigeria. This road provides good access to small settlements and villages in the hinterlands. It originates from Sabo area around the core of Ikorodu Town and extends towards the eastern end of the Sub-Region. The proposed 4th Mainland Bridge provides a link to the existing Ikorodu – Shagamu Road with the reconstruction and Overbridge at Awolowo Road Junction. An Overbridge has been proposed on the existing Awolowo Road to divert the existing Epe Road over the proposed Motorway, such that the existing Epe Road will now become a Cul-de-Sac and is diverted onto a new alignment over the proposed Motorway. This ensures that the traffic gridlock currently being experienced at the Awolowo Road – Epe Road Junction will be removed. There is also a reconstruction proposed for the Ikorodu – Shagamu Road Junction with the proposed Sagamu – Epe Road reconstruction to Overpass the 4th Mainland Bridge Corridor, thus removing the bottleneck experienced on this axis. This reduces travel time on the corridor and provides a reasonable alternative to road users going to Epe / Ijebu Ode, Ore Benin Expressway and those traveling to Sagamu / Ibadan Expressway. It also provides a viable link to the proposed Lagos – Abuja Expressway Project

Access through the Coastal Region

Ikorodu Sub-Region is bounded on its southern boundary by large expanse of water body (Lagos Lagoon), thus, creating a good opportunity for water transportation between the sub-region and areas like Lagos-Island, Ikoyi - Victoria Island and Ibeju-Lekki.
The proposed road grants this directly and faster.

Gberigbe and its environs can link up to the proposed 4th Mainland Bridge through the Igbe Road Interchange and road users at Isawo – Agric can link through the reconstruction and Interchange at Isawo.

Igbogbo-Baiyeku LCDA is in the south-western part of the Sub- Region and it is substantially framed by the Lagos Lagoon in the western and southern boundaries while the eastern boundary is framed by Ijede LCDA and the north by Ikorodu LGA and partly in the northeast boarder by Ikorodu West LCDA. Igbogbo-Baiyeku LCDA shares the single largest waterfront area of the Lagos Lagoon from Ipakodo in the north west southward to Ibeshe Ishashi, Ofin, Oreta, Ajebo, Baiyeku, Araromi and Aiyetoro, all being part of the Lagos Lagoon waterfront settlements.
The Ikorodu Local Government Area is located at the central location of the Sub-Region. The project derives its name from this local government being the previous divisional headquarter of the area when Lagos State was created in 1976. The Local Government retains its central influence over other areas. It is bordered by five other LCDA namely the Ikorodu West LCDA in the west, Igbogbo-Baiyeku LCDA in the south, Ijede LCDA in the south-east, Imota LCDA in the east and Ikorodu North in the north.

CHAPTER SEVEN: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

7.1 Introduction

This chapter provides the Environmental and Social Management Plan (ESMP) for the proposed 4MB project, aimed to prevent, minimize and mitigate any potential adverse environmental and social impacts and enhance the beneficial impacts throughout the project's design, construction and operational phases.

The purpose of the ESMP is to ensure that environmental and social impacts and risks identified during the ESIA process and recommendations put forward are effectively managed during the implementation of the project. The ESMP also takes into consideration monitoring requirements to ensure the successful implementation of the project in line with the requirements of the WB and applicable national legislation and regulations, towards meeting standards on environmental and social management performance throughout life of the project.

7.2 Objectives and Content of the ESMP

The overall objective of this environmental and social management plan (ESMP) is to allow the project owner, the supervision engineer and the contractors to clearly understand their responsibilities in implementing the different actions and measures that LSMOWI PIU committed for the project, as a result of the ESIA.

The ESMP also includes the actions needed to implement these measures, including the following features:

- The ESMP provides a description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);
- Mitigation measures based on the potential environmental and social impacts describing with technical details each mitigation measure;
- The ESMP also includes monitoring objectives that specify the type of monitoring activities that will be linked to the mitigation measures. Specifically, the monitoring section of the ESMP provides:
    - A specific description, and technical details, of monitoring measures that include the parameters to be measured, frequency of measurements, and definition of thresholds that will signal the need for corrective actions;
    - Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation.
- Estimate of the costs of the measures and activities recommended; and
- Establish a structure that will ensure compliance by Lagos State and its contractors with the ESMP.

7.3 ESMP Implementation & Institutional Arrangements

This section provides an assessment of the existing institutional arrangement within LSMOWI PIU and, reflects on capacity building / training issues that need to be addressed to ensure timely implementation of ESMP. The institutional arrangement proposed for this project has been presented here with newly defined roles and responsibilities. The responsibility of implementing the mitigation measures lies with the Safeguards team of LSMOWI PIU. All construction activities being taken up by the contractor through International Competitive Bidding. The Supervising Engineer shall monitor the implementation of the work on behalf of LSMOWI PIU. The contractor will be responsible for planning all Environmental and Social Management Plan (ESMP) activities. In the pre-construction phase of the project the Supervising Engineer shall study the ESMP to identify environmental issues and arrive at a suitable strategy for implementation.

7.3.1 Implementation Arrangements

The LSMOWI PIU is responsible for the implementation of the provisions made within the ESMP through its Safeguards Officers. The services of Supervising Engineer will be procured to assist the Safeguards Officers for monitoring the environmental and social aspects of the project during implementation.

The proposed institutional arrangement for the ESMP implementation is shown in Figure 7.1 below.

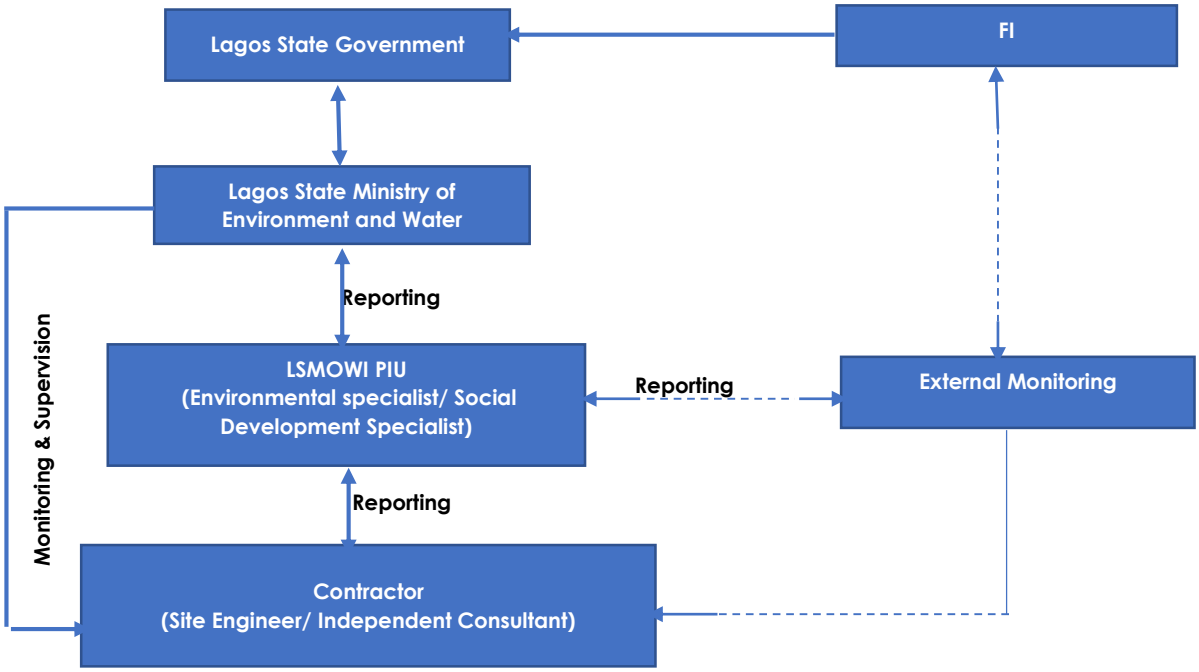


Figure 7.1: Institutional Arrangement for ESMP Implementation

7.3.2 Institutional Arrangements

The implementation of ESMP is important. For this, an institutional framework has been developed and roles and responsibilities of the various line departments are made. Some capacity development program is also identified as part of the ESMP as sub-project. Responsibilities of the relevant institutions are outlined in Table 7.1.

Table 7.1: Institutional Safeguards Responsibilities for ESMP

S/N	Category	Responsibilities
1.	Safeguards Unit	<u>Environmental Safeguards</u> ❖ Collate environmental baseline data on relevant environmental characteristics of the selected project sites; ❖ Analyze potential community/individual sub-projects and their environmental impacts; ❖ Ensure that project activities that are implemented will in accordance to best practices and guidelines set out in the site specific ESMP; ❖ Identify and liaise with all stakeholders involved in environment related issues in the project; and be responsible for the overall monitoring of mitigation measures and the impacts of the project during implementation. <u>Social Safeguards</u> ❖ Develop, coordinate and ensures the implementation of the social aspects of the ESMP ❖ Identify and liaise with all stakeholders involved in social related issues in the project; ❖ Conduct impact evaluation and beneficiaries' assessment; and ❖ Establish partnerships and liaise with organizations, Community Based Organizations (CBOs) and Civil Society Organizations (CSOs).
2.	LSMOWI PIU	❖ Liaise closely with Lagos State Ministry of Environment and Water Resources in preparing a coordinated response on the environmental and social aspects of project development respectively; ❖ Safeguards due diligence
3.	Lagos State Ministry of Environment and Water Resources	❖ Environmental compliance overseer at the State level ❖ Lead role - provision of advice on screening, scoping, review of draft ESMP report (in liaison with Federal Ministry of Environment) ❖ Site assessment and monitoring of ESMP implementation
4.	Federal Ministry of Environment	❖ Implementing authority, has the mandate to: ❖ Ensure the smooth and efficient implementation of the project's various technical programmes ❖ Cooperate through a Steering Committee that provides guidance to the technical aspects of all project activities; ❖ Maintain and manage all funds effectively and efficiently for the projects
5.	Federal Ministry of Environment/ EIA Department and NESREA	❖ Lead role - provision of advice on screening, scoping, review of draft ESMP report (in liaison with State Ministry of Environment), receiving comments from stakeholders, public hearing of the project proposals, and convening a technical decision-making panel, Project categorization for EA, Applicable standards, Environmental and social liability investigations, Monitoring and evaluation process and criteria
6.	Other relevant State Government MDAs	❖ Other MDAs come in as and when relevant areas or resources under their jurisdiction or management are likely to be affected by or implicated projects. ❖ They participate in the EA processes and in project decision-making that helps prevent or minimize environmental and social impacts and to mitigate them. These institutions may also be required, issue a consent or approval for an aspect of a project; allow an area to be included in a project; or allow impact to a certain extent or impose restrictions or conditions, monitoring responsibility or supervisory oversight
7.	FI	❖ Overall supervision and provision of technical support and guidance. ❖ Recommend additional measures for strengthening the management framework and implementation performance; ❖ Supervising the application and recommendations of sub- project ESMPs.

8.	Contractor	❖ Compliance to BOQ specification in procurement of material and construction
9.	Site Engineers / Supervisors	❖ Provide oversight function during construction and decommissioning
10	Local Government	❖ Provide oversight function across subproject in LGAs for ESMP compliance ❖ Liaising with the PIU. Engage and encourage carrying out comprehensive and practical awareness campaign for ❖ the proposed sub-projects, amongst the various relevant grass roots interest groups
11	Local Community	❖ Promote environmental awareness ❖ Assist and liaise with other stakeholders to ensure proper siting and provision of approval for such sites ❖ Support with provision of necessary infrastructures and engage/ encourage carrying out comprehensive and practical awareness campaign for the proposed projects, amongst the various relevant grass roots interest groups.
12	CDA	❖ Ensure Community participation by mobilizing, sensitizing community members;
13	NGOs / CSOs	❖ Assisting in their respective ways to ensure effective response actions, Conducting scientific researches
14	Others/General Public	❖ Identify environmental and social issues that could derail the project and support project impacts and mitigation measures, Awareness campaigns

7.3.3 Training and Capacity Strengthening Plan

Training is essential for ensuring that the ESMP provisions are implemented efficiently and effectively. Based on the assessment of the institutional capacities of the different agencies that will be involved in the implementation of the ESMP, the following broad areas of capacity building have been identified and recommended for the LSMOWI PIU and other relevant agencies for effective implementation of the ESMP.

- ❖ Environmental and Social Management Plan (ESMP);
- ❖ Environmental and Social Monitoring and Audit;
- ❖ Solid waste Management;
- ❖ Disaster Risk Reduction/Management;
- ❖ Environmental and Social Reporting;
- ❖ Construction Health Safety and Environment.

The type of trainings proposed to be organized during the project period and estimated cost is given in Table 7.2 below. The cost estimates are based on the assumption that the training program will be held in Lagos State; resource persons are likely to come from other parts of the country and therefore require travel allowances; participants will come from institutions at state levels.

7.3.4 Training of Contractor Personnel

The Environmental and Social Consultant will be required to provide sufficient training to the contractor's team in order to ensure they are fully aware of the relevant aspects of the ESMP and are able to fulfill their roles and functions.

This training will be a requirement of contract for the Contractor. Specific training should be provided for workers that have specific tasks associated with the implementation of the ESMP

such as Training on General Environmental Awareness to foster the implementation of environmentally sound practices.

Table 7.2: Proposed Training Programme for the Implementation of ESMP

Capacity Building Activity	**Proposed Topics**	**Target Audience**	**Duration**	**Estimated Budget $**
Module 1: Training on Environmental and Social Management Plan Implementation	❖ Overview of Environmental and Social Impact ❖ Assessment Process ❖ Overview of Potential Environmental and Social Impacts of Project ❖ Environmental Pollution & Control ❖ Environmental Engineering ❖ Environmental and Social Management Plan ❖ Environmental Performance Monitoring – Monitoring ❖ Mitigation Measures in ESMP ❖ Environmental and Social Audits ❖ Environmental Reporting	❖ Relevant staff of Lagos State Ministry of Environment and Water Resources ❖ FMEnv (EA) ❖ Officers of LSMOWI PIU - Environmental ❖ Specialist/Social Development ❖ Specialist ❖ LAWMA and other relevant MDAs ❖ LGA departments, NGOs, ❖ CBOs., Contractor	2 days	4,500.00
Module 2: Training on Construction HSE	❖ Introduction to Construction HSE ❖ Overview of Health and Safety ❖ Construction Incidents: Causation, Investigation & Reporting ❖ Excavation Safety ❖ Construction Site Inspection ❖ Personal Protective Equipment	❖ Relevant staff of Lagos State ❖ Ministry of Environment and Water Resources ❖ FMEnv (EA) ❖ Officers of PIU-Environmental ❖ Specialist/Social Development Specialist, and other relevant ❖ MDAs LGA departments, ❖ NGOs, CBOs. Contractor	2 days	4,500.00
Module 3: Training on Disaster Risk Reduction/Management And Solid waste Management	DRR/DRM concepts and applications Solid waste mangement	Relevant staff of the Lagos State Ministry of Environment and Water Resources FMEnv (EA), LASEPA Officers of LSMOWI PIU-Environmental Specialist/Social Development Specialist, and other relevant MDAs LGA departments, NGOs, CBOs.	2 days	3,000.00
Total cost of training				12,000.00

7.4 Mitigation and Enhancement Measures

The Environmental and Social mitigation and enhancement measures, monitoring and management responsibility for impact during both the construction and operation of the 4MB 1 project is elucidated in Table 7.3.

LSMOWI PIU will adopt and impose these measures for construction phase as conditions of contract on the contractors hired for the project.

The contractors will produce and submit to the Supervision engineer a Worksite ESMP, which contents will be the following:

Table 7.3: Environmental and Social mitigation and enhancement measures, monitoring and management responsibility

1.	**Environmental policy**	➢ Declaration of ESHS policy signed by the managing director of the Contractor and clearly defining the commitment of the Contractor in terms of (i) ESHS management for its construction sites and (ii) compliance with the ESHS Specifications of the Contract.
2.	**Worksite -ESMP**	➢ Target and content of the Worksite Environmental and Social Management Plan ➢ Preparation and updating schedule ➢ Quality assurance and validation
3.	**ESHS resources**	➢ Human resources: – ESHS Manager – ESHS Supervisors – Person in charge of relations with stakeholders – Medical personnel ➢ Logistics & communications: – ESHS vehicles – IT stations – In situ noise, air and water measuring equipment – Analysis laboratory used ➢ Reporting: – Weekly inspections – Monthly – Accident / Incident
4.	**ESHS regulations**	➢ Definition of standards for the applicable national ESHS regulations and the ESHS recommendations of institutions affiliated to the United Nations (WHO, ILO, IMO, IFC), applicable to the execution of works: – Discharge standards – Minimum wage – Day and/or night traffic restrictions – Other ➢ Definition of ESHS standards for the industry applied
5.	**ESHS operational inspection resources**	➢ Site tracking procedure: – Frequency – Personnel – Assessment criteria ➢ Non-conformity handling and detection procedure: – Distribution information – Notification depending on the level of importance allocated to non-conformities – Tracking of the closing of the non-conformities ➢ Management of data on tracking and non-conformities: – Archiving – Use as a performance indicator
6.	**Project Areas**	➢ Description of Project Areas (as per definition in Sub-Clause **Error! R eference source not found.** of the ESHS Specifications): – Number

		– Location on a topographical map – Activities – Opening & closing schedule – Access ➢ Reference to the Appendix: an Environment Protection Plan (EPP) for each Project Area
7.	**Health and Safety Plan**	➢ Identification and characterisation of health and safety risks, including the exposure of personnel to chemicals, biological hazards and radiation ➢ Description of working methods to minimise hazards and control risks ➢ List of the types of work for which a work permit is required. ➢ Personal protection equipment. ➢ Presentation of the medical facilities at Project Areas: – Healthcare centre, medical equipment and allocation of medical staff – Medical acts that can be carried out on-site – Ambulance, communications – Referring hospital ➢ Evacuation procedure for medical emergencies. ➢ Description of the internal organisation and action to be taken in the event of an accident or incident.
8.	**Training plan**	➢ Basic training for non-qualified staff ➢ Health & safety training
9.	**Labour Conditions**	➢ Description of Human Resource Policy for construction works of direct and indirect workers
10.	**Local recruitment**	➢ Local labour requirements: – Job descriptions and the levels of qualifications required – Recruitment procedure and deployment schedule – Initial training to be provided by the Contractor for each job description ➢ Location and management of the local recruitment office(s)
11.	**Traffic Management Plan**	➢ Description of the fleet of vehicles/machinery used for the execution of the Works ➢ Deployment (Project Area & schedule) and maintenance sites for each vehicle and machine ➢ Mapping of itineraries, travel times, and areas where speeds are limited ➢ Dust suppression: – Mapping or road sections where dust reduction initiatives apply – Water points identified or to be created for refuelling tanker trucks – Capacity of the tanker trucks used and calculation of the number of trucks required – Width of the track to determine if one watering run or equivalent is adequate (narrow track) or if two runs are required (wide track) – Number of watering or equivalent operations proposed per day depending on the climate
12.	**Dangerous products**	➢ Inventory of dangerous products per Project Area and per period ➢ Transport and storage conditions and chemical incompatibility
13.	**Effluents**	➢ Characterisation of effluents discharged to the receiving environment ➢ Facilities for the treatment or pre-treatment of effluents ➢ Measures for reducing the sediment content of rainwater runoff

		➢ Measures for monitoring the efficiency and performance of facilities for reducing sediment content of rainwater runoff ➢ Resources and methods for monitoring effluent and rainwater runoff quality
14.	**Noise and vibrations**	➢ Estimation of the frequencies, duration, days of the week and noise levels per Project Area
15.	**Waste**	➢ Inventory of waste per Project Area and per period ➢ Collection, intermediate storage, handling and treatment methods for ordinary or inert waste ➢ Storage and handling methods for dangerous waste
16.	**Clearing and revegetation**	➢ Methods & schedule for clearing vegetation and earthwork activities ➢ Methods, species and schedule for the revegetation of Project Areas disturbed by the Works
17.	**Biodiversity**	➢ Schedule for adequate fauna and flora management ➢ Measures for minimizing impact on fauna and flora species based on the Contracting Authority procedures ➢ Measures for monitoring the efficiency and performance of the plan in place ➢ Measures for limiting IAS ➢ Measures for monitoring the efficiency and performance of the plan in place
18.	**Prevention of erosion**	➢ Location of zones suffering from erosion ➢ Methods and schedule for the implementation of anti-erosive actions, including topsoil storage
19.	**Documentation on the Project Area condition**	➢ List and cover of viewpoints ➢ Imaging method ➢ Archiving photographs
20.	**Rehabilitation**	➢ Method and schedule for Project Area rehabilitation
21.	**Appendices**	➢ Environment Protection Plans (number and location specified in Section 6 "Project Areas" above): – Marking out of the Project Area perimeter on a map – Definition of zones for vegetation clearing, zones for the storage of usable timber, zones for burning of green waste – Definition of on-site activities: construction, storage areas, accommodation areas, offices, workshops, concrete making units – Layout of activity areas on the Project Area: construction works, production/operation areas, rehabilitation and closure – Zones for the storage of topsoil, spoil from earthworks, materials – Access routes and checkpoints – Project Area occupancy schedule – Organisation of Project Area preparation – Liquid discharge outlet points – Proposed sampling points for monitoring water quality – Atmospheric emission outlet points – Location of the storage site for dangerous products – Location and mapping of waste treatment facilities when handled by an external service provider – Any other information relating to the environmental management of the Project Area

		➢ Emergency plan: – Description of facilities – Characterisation of hazards – Emergency situations – Organisation structure - roles and responsibilities – Emergency procedures – Human and material resources – Triggering of the plan – Reporting ➢ Bailiff's sworn reports as specified in Sub-Clauses and of the ESHS Specifications.

Table 7.4: Environmental and Social Management Plan for 4MB

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Design and Pre-construction Phase						
A. Physical Environment						
Interference with Drainage Patterns	Temporary flooding hazards	Appropriate Selection of alignment/ Appropriate siting of bus bays to avoid channel interference. If unavoidable, an expert will review the structural design, specifications.	Alignment Selection	Consultation with local authorities and design engineers – Once	Design Consultant, Supervision Engineer	LSMOWI PIU
B. Environmental Resources						
Siting of construction storage yards and construction facilities	Impact to the existing environment	Construction facilities should be placed at suitable distance (more than the approved RoW) from water bodies, natural flow paths, important ecological habitats and residential areas	Water and Air Quality	GoN and IFC Air quality Standards and Water Quality standards, whichever is stringent	Consultant during baseline and before mobilization	LSMOWI PIU
Cutting of Trees	Loss of Trees	The loss of trees should be minimized by selection of route/alignment with less impact on trees	Tree Loss	Tree Enumeration by Consultant, Contractor and Lagos State Parks and Gardens Agency (LASPARK)	Environmental Consultant, Supervision Engineer, Contractor	LSMOWI PIU, Lagos State Parks and Gardens Agency (LASPARK)
C. Socio-Economic Resources						
Land Acquisition and or Involuntary Resettlement	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land	Public complaints	Rates paid as per the Resettlement plan/Frame work for the project – Once	Appointed NGOs, CBOs	LSMOWI PIU
Encroachment into commercial properties/ local businesses	Loss of income	Avoid routes/ alignment/ siting of facilities on land having commercial establishments/ local businesses Compensation paid for any temporary / permanent loss of business	Route Selection, Public Complaints	Consultation with local authorities and design engineers – Once Rates paid as per the Resettlement plan/Frame work for the project	Appointed NGOs, CBOs	LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Construction Phase						
Physical Environment						
Site Clearing, Earthwork involving excavation, fill and cut activities, compaction civil works	Soil erosion and surface runoff	• Construction near seasonal rivers, erosion and flood-prone areas should be restricted to the non-rainy season. • Construction work should be carefully designed to minimize obstruction or destruction to natural drainage. • Erosion control measures such as water bars, gabions, straw bales, and re-vegetation will be implemented during and after construction phases. • Re-vegetation efforts will be implemented to ensure long-term recovery of the area and to prevent significant soil erosion problems.	Soil Erosion	Visual inspection (Turbidity and sedimentation) – per public complaint – Once each time	Contractor, Supervision Engineer	Environmental Specialist, LSMOWI PIU
	Construction Wastes	• Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time. • Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste. • Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste. • Use of construction materials containing recycled content wherever possible and in accordance with accepted standards. • Facility for waste collection and its storage at site and safe transportation to the disposal sites and disposal methods at designated area shall be provided.	Construction wastes at construction sites	GoN and IFC standards. Six monthlies	Contractor	Supervision Engineer, Environmental Specialist, LAWMA and LSMOWI PIU
Construction Sites, Construction Labour Camps	Generation of Domestic Solid Wastes	• The Contractor will provide proper storage bins for collection and storage of wastes. • Wastes will be regularly transferred to municipal wastes sites	Construction sites/ Labour Camps	GoN and IFC standards	Contractor through contract provisions under supervision of Contract Conditions, LSMOWI PIU	Environmental Specialist, LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Civil works	Impacts on Geomorphology and Hydrology, increased local runoff	• Good use of engineering best practice must be maintained during construction. • Ensure wastewater from cleaning of equipment and other civil works is not disposed of in water bodies instead it should be collected and treated.	Construction sites	Visual Inspection	Contractor	Environmental Specialist, LSMOWI PIU
Excavation and use of heavy machinery	Impacts on topography	• The construction works such as road grading, filling of large holes and formidable concrete sides for culverts and drainages should be carried out. • Old drainage systems should be maintained if available and new ones should be constructed • Site specific safety plans should be developed and properly implemented by construction companies executing sub-projects. • Effective public consultation through active involvement of all affected stakeholders.	Visual Inspection if any alteration is seen	Visual Inspection	Contractor	Environmental Specialist, LSMOWI PIU
Generation of Dust due to Construction Activities Air Emission from Equipment and	Impairment of ambient air quality	• Regular spraying of water to dust-generating areas. • Covering excavated soil/dump during off-work with tarpaulin. • Provide temporary enclosure of dust-generating construction area/activities. • Trucks transporting construction materials that generate dust will be covered. • Implement traffic management to minimize vehicular emissions. • Sprinkle and cover stockpiles of loose construction materials (e.g., fine aggregates, sand) • Ensure that vehicles and other equipment are regularly inspected and schedule maintenance if need be. Also ensure that vehicles and machineries comply with international standards for exhaust emission. • Dust masks should be provided to all personnel	Ambient Air Quality	GoN and IFC Air Quality Standard - Six Monthly	Contractor	Supervision Engineer, Environmental Specialist, LSMOWI PIU, FMEnv
Noise and Vibrations from Construction	Increased Noise Levels	• Construction equipment to be well maintained.	Noise Levels	GoN standards	Contractor	Supervision Engineer, Environmental

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Equipments and Vehicles		• Provide temporary enclosure of noise-generating activities and equipment; • Construction works will be limited to daytime (6:00am – 10:00pm) only [National Environmental (Noise Standards and Control) Regulations, 2009), S.I. No. 35 and as specified in Schedule VII to these Regulations] and Noise Standards and Control First Scheduled.				Specialist, LSMOWI PIU
Water Pollution due to increased sedimentation and runoff due to construction activities	This impact is site-specific and will be of concern to project sites close to water streams. Sediments can significantly impact surface waters and wetlands with silts and pollutants such as heavy metals, hydrocarbons and toxic substances. Runoff from rainfall can further lead to erosion of the road. Drainage channels from the roads to nearby watercourses are receptors of soils eroded from the road surfaces. These eroded sediments can adversely affect the aquatic ecosystem and can even increase the risk of flooding and eutrophication.	• Regular inspection of the project sites will be needed. • Construction like dykes, sediments basins should be considered in order to divert the flow of sediments. • Define flood plain boundaries and pollutants of concern, and conduct resource inventory and information analysis. • Identify sensitive areas in order to protect surface water and prevent non-point source pollution.	Water Quality	GoN and IFC water quality standards, whichever is more stringent	Contractor through contract provisions under supervision of LSMOWI PIU	Environmental Specialist, LSMOWI PIU
Construction activities and Provision of Facilities for the Construction Workers	Impairment of water quality due to wastewater discharges	• Minimize construction activities during monsoons • Construction workforce facilities to include proper sanitation (soak pits/septic tanks), water supply and waste disposal facilities • Mobile toilet facilities, which will be provided for the workforce be maintained, emptied daily and disposed of at approved sites.	Water Quality (pH, BOD/COD, suspended solids, other) during major earthworks	GoN and IFC water quality standards – whichever is more stringent - Six Monthly	Contractor through contract provisions through approved third-party laboratory Contractor through contract provisions	Supervision Engineer, Environmental Specialist, LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
		• Separate mobile toilets will be provided for male and female workers • Sewage can be composted in compost bin (mixtures of sewage, straws and hays), which can be feed to soils as source of manure for the community. Thus, recycling of sewage waste. • The Contractor should ensure that proper storage facilities are provided at worksites. They should be leak proof and fitted round with bunds to prevent leakage into the water streams. • Development and implementation of proper Waste Management Plans (WMPs) by the Contractor (s).	Amenities for Workforce	Presence of proper sanitation, water supply and waste disposal facilities - Visual inspection (Continuous)		Supervision Engineer, Environmental Specialist, LSMOWI PIU
A. Biological Resources						
Trimming / Cutting of Trees within RoW	Loss of Vegetation	• Trees that can survive cutting should be pruned or transplanted • The Contractor will be required to clear vegetation only in designated areas.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities	Presence of target species in RoW following vegetation clearance – Once.	Contractor, LSMOWI PIU under the supervision of the Lagos State Parks and Gardens Agency (LASPARK)	LSMOWI PIU, Lagos State Parks and Gardens Agency (LASPARK)
Wood/ vegetation activities by construction workers	Loss of vegetation and deforestation	• Construction workers prohibited from harvesting wood in the project area. • Contractor to provide cooking facilities to camps • Proper awareness programme regarding conservation of flora including ground vegetation to workers	Illegal wood/vegetation harvesting (area in m^2, number of incidents reported)	Complaints by local people or other evidence of illegal harvesting – Once	Contractor under contract conditions	Supervision Engineer, Environmental Specialist, LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Construction Activities	Impact on Fauna and wildlife- Though this impact is not foreseen, but there may be temporary loss of habitats and will be site specific	• Co-operate with relevant MDAs such as the Department of Livestock, Conservation Parks, LASPARK, Zoos and Zoological department of the University of Lagos for housing of possible animals that may be relocated as a result of the construction. • Ensure that the risks and impacts on the biodiversity and habitats are suitably identified and appropriate precautionary approach measures are taken as per safeguards policies such the ESS 6 of Biodiversity Conservation and Sustainable Management of Living Natural Resources	Habitat Loss		Contractor, LSMOWI PIU under the supervision of the Lagos State Parks and Gardens Agency (LASPARK), Department of Livestock	LSMOWI PIU, Lagos State Parks and Gardens Agency (LASPARK), Department of Livestock
Disturbance to Fauna by Construction Workers	Effect on Fauna	• Prevent work force from disturbing the flora, fauna including hunting of domestic animals, wildlife and do fishing in water bodies. • Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all workers	Habitat Loss	Complaints by local people or other evidence of illegal hunting – As and when reported	Contractor under supervision of LSMOWI PIU	Environmental Specialist, LSMOWI PIU
B. Socio-Economic Environment						
Construction Activities leading to impacts on traffic	Existing travel patterns will be heavily impacted during the construction phase of the project in the states.	• A good traffic management plan should be developed which will specify; safety rules on speed limits while driving, trainings to enable drivers to be responsive to local conditions, procedures for dealing with accidents involving injury to local people and livestock and restriction of heavy vehicle movements to specific access roads. • Carefully site stock piling areas, work depots and work sites in good locations, which will alleviate possible traffic congestions. • Information on road closure should be made publicly on local radio stations and television. Signage advising on closures and detours should be strategically placed along the roadsides. • Ensuring that all road signs are put in place and detours made possible to divert traffic. • Ensuring that these detours will not penalize businesses established along the corridors during	Traffic Congestions	Construction schedules/Detours	Contractor	Supervision Engineer, Environmental Specialist, Social Development Specialist, Communication Specialist, LSMOWI PIU, Lagos State Traffic Management Authority, (LASTMA)

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
		construction (decrease in the number of customers due to these detours) • Ensure alternative footpaths are provided for local residents, and ensure they are accessible to disabled persons. • Relevant State Government Agencies such as the Lagos State Transport Management Authority & Federal Road Safety Commission will be engaged by the contractor all through the construction period to ensure that safety is maintained throughout the construction phase.				
Construction schedules for alignment	Noise nuisance to neighboring properties	• Construction activities will not be undertaken during the night and local communities informed of the construction schedule	Timing of the construction Noise Levels (dB (A)	Construction as per scheduled timings only	Contractor through contract conditions	LSMOWI PIU
Temporary Use of Land	Losses to neighboring land uses/ values	• Contract clauses specifying careful construction practices. • As much as possible existing access ways will be used. • Productive land will be reinstated following completion of construction. • Compensation will be paid for loss of production, if any.	Contract clauses Design basis and layout. Reinstatement of land status (area affected, m2). Implementation of Tree/Crop compensation (amount paid). Compensation as per the RAP	Incorporating good construction management, design engineering practices - Once. Consultation with affected parties immediately after completion of construction and after the first harvest – Once.	All compensation will be paid by LSMOWI PIU as included in the RAP. In case, temporary use of land by Contractor is not included in the RAP, all compensation paid by Contractor will be within the provisions of RAP	LSMOWI PIU
In case of chance find of physical cultural recourses	Loss/theft of precious archaeological item	• In case of chance find of physical cultural resources and property/archaeological features, the relevant authorities will be informed at once	Chance find	GoN Regulations - Continuous	Contractor through the provisions of contract conditions under	Environmental Specialist, Social Development

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
and property/archaeological features	uncovered in digging at sites	• The Social Development Specialist needs to ensure that thorough discussions are carried out during the Focus Group meeting addressing Archaeology and cultural issues. • The World Bank ESS 8 on Cultural Heritage will be applied to enable the Social Officer administer the right tool to avoid cases of conflicts in the communities.			supervision of LSMOWI PIU	Specialist, LSMOWI PIU, Archaeological Department
Health & Safety Issues	Occupational H&S	• Engage and designated H& S officer (engineer) for each site (if there are multiple sites) and each work area responsible for H&S Manager who must be engaged by the construction supervision contractor prior to the start of construction for each contract/site. • Only trained and certified workers will be permitted to work with any electrical equipment. • First aid box and personal protective equipment, PPE (such as helmet, safety shoes, eye protection glass, ear plugs, waist belt, mask, hand gloves, body protective apron, ear muff and insulating boots, as needed) must be provided to the workers, and ensure their use by workers. • Safety signs as needed at the construction sites. • Ensure the management of construction debris and handling of hazardous materials; • Ensure the use of reflectors at night as well as signposts, placement of caution tapers and guard rails at construction sites that involve drainages, trenches and canals • Safety barriers and warning signs surrounding the construction site. • Formulate and implement an emergency risk management plan (by the contractor). Emergency Response Procedures (ERP):	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness).	GoN and IFC EHS Guidelines - Monthly	Contractor through contract provisions under supervision of LSMOWI PIU	Environmental Specialist, Social Development Specialist, Communication Specialist, LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
	Community H &S	• Emergency response procedures will be developed, including communication protocols for interaction with local and regional emergency response providers, protocols for shutting down power, firefighting response procedures, provision of appropriate firefighting equipment, training for workers on fire response, and record keeping. • Medical emergency response procedures will be developed covering both workers and community members (when affected by project related activities), including communication protocols for interaction with local and regional emergency response providers, first aid equipment on site, contact information for the nearest ambulance and medical facilities, training for workers on initial on-site emergency response, protocols for informing and transferring injured workers to local or provincial health centers, and record keeping. • At least one trained first-aid worker will be available at the construction site. Training will be provided to workers in all aspects of the ERP.				
Employment Generation	Employment will be generated as work force i.e local artisans and labourers migrants will be utilized Though construction works are not large-scale, this impact will have an indirect influence in the increase in crime rate, traffic, and hike in rents, prostitution and spread of diseases.	• Ensure that individuals from project affected communities especially local and unskilled labour are employed as labourers and artisans. This should be communicated to the contractor. • Promote women employment at all level of responsibility and governance. • Public consultation will be implemented to address any situation of wrong notion created by members of the communities. • The campsite for workers should be located remotely away for the community. • Contractors and Project managers should ensure that the workers are prohibited from patronising prostitutes and the use of alcohol and drugs within the site areas.	Any incident	As per local laws	Contractor under the provisions of contract conditions	Community Development Specialist, Social Development Specialist, Communication Specialist - LSMOWI PIU, MDAs - Lagos state Ministry of Works. Lagos state Ministry of Women Affairs, Community Development, Social Welfare and Poverty alleviation
	Social stress and	• Root causes should be identified and addressed.	Reported Incidents	Public	Contractor	GRC - LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
	disruption due to project activities and unrest between the construction workers and community members Impact Source: • Civil work activities. • Human Governance. (Corrupt practices)	• Some of the construction workers should come from the communities. • Address governance and mobilize communities. • Community members should be enlightened about Grievance Redress Mechanism procedures while the social development specialist need to keep a database of complaints and grievances as well as put in place a structure to ensure prompt resolution of conflict		Consultations and as per local laws		
Labour Camps, Interaction of the Construction workers and local community	Health Problems (HIV/STDs)	• Effort will be made to enlighten the employees on HIV/AIDS and STD awareness program in each of the project areas. • Imported workers if used should have proper housing and sanitary facilities. • Other activities will include treating other sexually transmitted diseases, distributing condoms, and providing counseling, screening, and support services for employees. • Medical examinations should be performed on new employee and repeated regularly throughout the term of employment. • Each contractor should have operating procedures that control unsafe behaviours amongst personnel especially considering the fact that there will huge influxes of workers and the likely spread of STD's due to possible sexual interactions between workers and members of the project affected communities. • Liaise with appropriate health focused NGOs to promote HIV/STDs awareness, HIV Voluntary Confidential Counselling and Testing as well as put in place appropriate referral linkage for Most at Risk Populations. If needed, PLWHAs could be referred to the nearest HIV treatment programme center(s) where they can access free treatment and support.	Reported Incidents	Training and Awareness Programmes - Continuous	Contractor under the provisions of contract conditions	Environmental Specialist, Social Development Specialist, Communication Specialist - LSMOWI PIU

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
		• Provision of proper human waste disposal facilities for the construction workers. • Good sanitation including proper waste disposal at its operation and residential accommodations. • Participate in environmental sanitation initiatives in communities where its workers are domiciled. • Avoid any deterioration in public health and environmental sanitation as a result of the project.				
Poor hygienic conditions in labour camps. Overloading of existing facilities	Water Borne Diseases (e.g. Cholera, Dysentery, Amoebiasis, Salmonellosis etc.)	• Participate on improvement of community sanitation and public health through the community development programs. • Involvement of NGOs and civil societies in waste management and healthcare activities. • Maintenance of good drainage at construction areas to avoid creation of stagnant water bodies. • Proper reservoir operation, engage in disease surveillance and insecticide sprays to prevent the proliferation of the disease vector; conduct routine medical check-ups and development of medical facilities. • Government programs to improve existing medical and health services in the local communities should be supported as much as possible by the Project. This includes Mosquito control programs such as the distribution of insecticide treated nets to affected community members. • Provision of good sanitation including proper waste disposal at its operation and residential accommodations. • Participate in environmental sanitation initiatives in communities where its workers are domiciled.	Reported incidents of diseases	Awareness and Trainings Health Checkups - Continuous	Contractor under the contract conditions	LSMOWI PIU
Operation / Maintenance Phase						
Increase in number of vehicles plying the road	Increased traffic	• The traffic management plan should be used to address movement of vehicles during the early	Traffic flow, Complaints by Local Community	GoN standards Annually	Third Party Approved Agency	LSMOWI PIU, LASTMA

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
		hours of the morning when members of the community are still asleep. • Keeping proper records of complaints in the complaints register.				
Roadway runoff, wastes (municipal solid wastes, effluent, hazardous wastes etc.)	Impairment in Water Quality	• Development of proper Waste Management plans • Roadway runoff will not be placed directly into watercourses but allowed to flow over grassed or pervious pavements in order to permit the settling out of fine materials. • Divert the flow of surface water around the site to prevent contamination from storm water (by pollutants, soil or any other material from the site). • It is also important to develop a site drainage plan to reduce storm water flow and sediment load before storm water is discharged from the site.	Surface and Ground Water Quality	GoN standards of water and waste water quality, Annual	Third party approved Agency	LSMOWI PIU
Increased vehicles	Increase in vehicular emissions and air pollution	• Roadside plantation to absorb air pollution •	Ambient Air Quality	GoN Standards	Third Party Approved Agency	LSMOWI PIU
Increased Traffic	• Increase in traffic within the roads • Increase in economic growth. • Increase in migration	• Ensure that all road signs are completed with speed limits zones and traffic signs in place. • Provide pedestrian pathways within the settlements of the communities. • Measure suggested for the construction phase should be carried forward to the operational stage.	Road signages		LSMOWI PIU, Lagos State NESREA	LSMOWI PIU, Lagos State NESREA
	• Accessibility to Women, elderly and disabled persons	• Ensure accessibility and security of all bus stops and facilities along the corridors for vulnerable people, including women, elderly persons, and disabled people. • Wide path to handle wheelchairs. • Public lighting to ensure secure access for vulnerable people. • Priority access to the service for vulnerable people. • Minimize distances between transport modes			LSMOWI PIU LASWA Ministry of Women Affairs	LSMOWI PIU LASWA Ministry of Women Affairs

Project Activity	Potential Impact	Mitigation Measures	Parameters to be Monitored	Standards/ Measurement / Frequency	Implementational Responsibility	Institutional Responsibility
Operation Activities	• Resource efficiency and energy saving	• Search for technical solutions to save energy and resources, for example water savings, LED lighting, etc.	Energy efficient and energy saving technologies		LSMOWI PIU	LSMOWI PIU
Employment Opportunities due to Project Operation	• Improved economic growth • Presence of new small business enterprises	• Conducting a persuasive approach of community involvement, and proactively providing guidance to help maintain the road and bridges. • Co-operating with the relevant departments to help in building economic centres such as market places. • Promoting women employment at all level of responsibility and governance. • The feeder roads to connect the settlement areas with the road	Number of jobs created Indicators for income generation for women		Social Development Specialist LSMOWI PIU, MDAs -Lagos state Ministry of Women Affairs and Poverty alleviation	Social Development Specialist LSMOWI PIU, MDAs -Lagos state Ministry of Women Affairs and Poverty alleviation
Operation and Maintenance Civil Works	• Exposure of workers to accidents, working in potential weather extremes, contact with natural hazards such as insects e.g. mosquito	• Development of inspection and maintenance programmes. • Clearly mark road signs and hazards symbols within the location to minimise road accidents.	Reported Incidents	Periodic maintenance Number of programmes and percent of staff/ workers covered	Environmental Specialist LSMOWI PIU, Lagos state NESREA, Lagos State Emergency Management, and Lagos State Safety Commission.	Environmental Specialist LSMOWI PIU, Lagos state NESREA, Lagos State Emergency Management, and Lagos State Safety Commission.

7.5 Environmental and Social Monitoring

Environmental and Social monitoring is an effective tool in making necessary recommendations and adopt suitable control strategies so that menace of rising environmental pollution and social issues could be minimized and a relief be extended to the people including labours in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To assess what impacts have occurred;
- To evaluate the performance of mitigation measures proposed in the ESMP.
- To ensure that the conditions of necessary consent and approvals are adhered to.
- To suggest improvements in management plan, if required
- To see that benefits expected from the EA are achieved as the project proceeds.
- To meet legal and community obligations.

7.5.1 Monitoring Program

The environmental and social mitigation measures suggested in the ESMP requires periodic monitoring of environmental and social parameters during the construction and operational phases. program will focus on the scope of monitoring, monitoring parameters and frequency, data processing, and quality control requirements within the area of impact of the project.

Activities to be monitored include: all planning, coordination and management activities related to the implementation of safeguard issues; the identification of corrective and preventive actions; records of health and safety matters and training activities; worker and community near misses, minor, lost days, fatal accidents during construction and operation with a target of zero incident; consultations with project APs (as and when needed, particularly during the implementation); feedback, trouble shooting and project related grievances; preparation of progress and monitoring reports as required by the FI; and verifying the projects overall compliance with safeguard measures and its progress towards achieving the intended loan outcomes. Other environmental good practices include sanitary waste management, noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment. Table 7.5 lists out the Environmental and Social Monitoring plan to be carried out for the 4MB 1 project.

Table 7.5: Environmental and Social Monitoring Plan to be carried out for the 4MB project:

Item	Parameters	Location	Frequency	Standards	Implementing Agency	Budget (US$)	Budget (Naira)
Construction Phase							
Water Quality	pH, BOD, DO, COD, coliform, Oil and grease	Construction sites and domestic waste water discharge sites	Quarterly	WHO Standard / National Environmental Surface and Groundwater Quality Control) Regulations, 2011, S.I. No. 22, Vol. 98	Approved Laboratory through the Contractor	4,724.20	2,125,500.00
Noise/ Vibration/	Day and Night Noise Levels (dB(A)	Construction sites; Near residential and sensitive location	Four times a year	FI Standard / National Environmental (Noise Standards and Control) Regulations,	Approved Laboratory through the Contractor	4,724.20	2,125,500.00

Item	Parameters	Location	Frequency	Standards	Implementing Agency	Budget (US$)	Budget (Naira)
				2009), S.I. No. 35 and as specified in Schedule VII to these Regulations] and Noise Standards and Control First Scheduled.			
Air Quality	PM $_{10}$, PM $_{2.5}$, SO_2, NO_x	Construction sites; Near residential and sensitive location	Four times a year	FI Standard / National Environmental (Air Quality Control) Regulations, 2014), S.I. No. 64	Approved Laboratory through the Contractor	7,177.99	3,188,250.00
Soil Erosion	Topsoil stockpile, detention ponds construction, intercepting ditches, rehabilitate construction sites	All spoil disposal sites and construction sites	Four times a year and once during rainy season	Visual inspection (Turbidity and sedimentation) – per public complaint	Approved Laboratory through the Contractor	9,187.83	4,080,960,00
Hygiene and disease Assessment	Health status Hygiene status Availability of clean drinking water. HIV/AIDS Awareness	Construction sites and work camps and resettlement areas	Monthly	National Environmental Health Practice Regulations, 2016 National Environmental Sanitation and Wastes Control Regulations 2009	Contractor	7, ,177.99	3,188,250.00
Operation Phase							
Air Quality	TSP (PM_{10}), CO, SO_2, NO_2,	Road sections where there are residential areas and sensitive locations	Four Times a year	FI Standard / National Environmental (Air Quality Control) Regulations, 2014), S.I. No. 64	LSMOWI PIU through approved laboratory	9,187.83	4,080,960.00
Noise Levels	Leq dB (A)	Road sections where there are residential areas and sensitive locations	Four Times a year	FI Standard / National Environmental (Noise Standards and Control) Regulations, 2009), S.I. No. 35 and as specified in Schedule VII to these Regulations] and Noise Standards and Control First Scheduled.	LSMOWI PIU through approved laboratory	14,356.33	6,376,500,00
Traffic Flow	Vehicle numbers – road use (against predictions)	Roads	Once a year	Lagos State Traffic Policy	LSMOWI PIU	7, ,177.99	3,188,250.00
Exchange rate @ 1 US$ = 444.17 NGN					Total	**58.766.30**	**26,099,110.00**

Note: Budgeted Amount is on a Quarterly basis except Hygiene and Disease Assessment (monthly) and Traffic Flow (yearly during Operational Phase).

Abbreviations:
$PM_{2.5}$ - Particulate Matter <2.5µm; PM_{10} - Particulate Matter <10µm; SPM- Suspended Particulate Matter; CO – Carbon Monoxide; NO2 Nitrogen Oxide; SOx – Sulphur Oxides; DO - Dissolved Oxygen; BOD - Biological Oxygen Demand; COD – Chemical Oxygen Demand

7.6 Monitoring and Evaluation

Monitoring and evaluation as an integral part of Environmental and Social Impact Assessment (ESIA) aim to track compliance of regulatory requirements and evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts. This involves

ensuring the negative environmental and social impacts identified in the ESIA are effectively mitigated in the construction and operations of the 4MB. Hence, monitoring will be carried out during all the stages of the project to ascertain the impact and the findings will inform management's decisions regarding impact control.

This section sets out requirements for the monitoring of the environmental and social impacts of the 4MB sub-project activities. Monitoring of environmental and social indicators will be mainstreamed into the overall monitoring and evaluation system for the project. This will ensure proper and timely implementation of environmental and social mitigation measures identified. Monitoring at regular intervals during implementation and for a specified period in the post-implementation stages is necessary to identify and implement any change/improvement needed in the execution of the sub-project activities or the mitigation measures.

In specifics, monitoring mechanisms or processes will be put in place to address the following:

- Monitor changes in the environmental conditions by the construction and operation of 4MB.
- Provide information on the actual nature and extent of key impacts through a feedback mechanism
- Determine whether the established mitigation measures have resulted in dealing with the negative environmental and social impacts associated with the project.
- Track compliance with human resources procedures, occupational health, safety, and security risks management.
- Determine long-term and residual effects.
- Establish whether further monitoring is to be extended in some areas.

The project will adopt both compliance and effects monitoring. Compliance monitoring entails inspection or field data collection to track adherence to prescribed actions. This will be adopted during the construction phase to ascertain whether recommended impact mitigation and management plans have been carried out or not, in determining the overall environmental performance of the project. Effects monitoring, on the other hand, will help document the consequences of activities on one or more environmental components, and usually involves physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

LSMOWI PIU through its Environmental and Social safeguards Division and under the responsibility of LSMOWI PIU's Managing Director will be in charge of monitoring all E&S-related activities and compliance with the provisions of the ESIA and ESMPs.

A list of indicators for monitoring in the implementation and post-implementation stages is given in Table 7.6 below, which describes the Monitoring and Evaluation framework for the ESMP. These indicators will be specified for each sub-project.

Table 7.6: Monitoring and Evaluation Plan for 4MB project

Project Phase	Proposed impact Mitigation Measure	Monitoring indicators	Implementation schedule	Monitoring Tools/Means of Verification (MoV)	Responsibility for Monitoring	Timing/ Frequency of Monitoring	Cost (US$)
Pre-construction Phase	E&S Risk Mitigation Measures	Environmental accountability trainings conducted Environmental and social studies carried out and plans prepared Environmental and social monitoring mechanisms been established Effective feedback from project affected persons Environmental, social, health and broader impacts identified and mitigation measures designed	Before commencement of civil works	Records of trainings/engagement, Copies of ESS report and plans	Environmental Specialist LSMOWI PIU Social Development Specialist LSMOWI PIU M&E Specialist, LSMOWI PIU Communication Specialist, LSMOWI PIU	Daily/Weekly/ Monthly/ Quarterly	500,000
Construction phase	E & S Risk Mitigation Measure	Standard Operating Procedures for best environmental practices established Contractor compliance with safe-works procedure Availability of emergency planning framework	During implementation of civil works	Copies of SOPs, Compliance report, Copies of emergency framework	Environmental Specialist LSMOWI PIU, Social Development Specialist LSMOWI PIU, M&E Specialist, LSMOWI PIU, Community Development Specialist, LSMOWI PIU, Disaster Risk Management Specialist, LSMOWI PIU, Contractor, Communication Specialist, LAMAT, Environmental and social expert, Contractor Environmental and social expert	Daily/Weekly/ Monthly/ Quarterly	225,000
Operations and maintenance Phase	E & S Risk Mitigation Measures	Environmental and social monitoring mechanisms implemented ESMP recommendations implemented Success in mitigation measures. Disaster management in place. Complaints from communities	During operations and maintenance to project closure	Records of engagement, Copy of Disaster Management Plan, Complaint's register, observations	Environmental Specialist LSMOWI PIU, Social Development Specialist LSMOWI PIU, M&E Specialist, LSMOWI PIU, Contractor, Communication Specialist, LSMOWI PIU	Daily/Weekly/ Monthly/ Quarterly	145,000
Total							**870,000**

7.7 Environmental Management Cost

Compliance with the ESMP has been prepared based upon optimum and reasonable costs that are derived upon minimisation of mitigation measures on a "least-cost" basis. Without such expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities. The main benefits of the mitigation plan are

(i) ensuring that environmental standards are met during design, construction, and operation of the project; and

(ii) providing offsets to negate project impacts especially ecological impacts. Table 7.7 gives the estimated costs for implementation of ESMP

Table 7.7: Estimated Costs for Implementation of ESMP

S. No.	Items	Cost in US$	Cost in Naira
Pre-construction Stage			
1	Cost of compensatory afforestation and transplantation of trees (in case needed)	191,874.73	85,225,000.00
Construction Stage			
2.	Estimated Cost towards EMP (Contractor's cost): EMP mitigation costs which includes all items listed in 7.3	55,031.31	24,443,259.00
3.	**ESMP Implementation and Monitoring**		
	Environment monitoring for air, water, noise, soil testing (4 measurements per year during construction for 4MB)	147,770.99	65,635.440.00
	Public Consultations, Grievance Redress (4 times a year 4MB)	21,613.35	9,600,000,00
	Purchase of Health and Safety equipment yearly	40,525.02	18,000,000.00
	Training in Environmental monitoring/Medical camps for workmen and society including check-ups of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS and health awareness program on regular basis	62,476.08	27,750,000.00
	Mid-term audit of E&S performance	82,400.88	36,600,000.00
4.	**Operation / Maintenance Phase**		
	Environment monitoring for air, noise, soil testing (4 measurements per year during construction for 4MB)	85,552.83	38,000,000.00
		687,245.11	**305,253,659.00**

CHAPTER EIGHT: REMEDIATION PLANS AFTER DECOMISSIONING / CLOSURE

8.1 Introduction

Projects are usually designed with an expected lifespan and so, no matter how long the design life, all projects eventually close out. The lifespan may sometimes be less than planned, while in some cases; it can be extended with proper planning and maintenance. The longevity of any development project is primarily dependent on a number of factors including:

- ❖ Availability of raw materials
- ❖ Durability of equipment and machinery
- ❖ Profitability of the project
- ❖ Usefulness and acceptability of project performance

This project is planned to last for at least 50 years. However, if and when the likely operator of the proposed 4MB project development is to be demolished, the project proponent would need to decommission the entire system.

While this is not expected to occur within the next twenty to thirty years, it is, all the same, necessary to start planning, at this stage, for the closure stage, when the use of the terminals and bus parks and infrastrucrual facilities have to be discontinued. For this reason, therefore, this chapter of the report discusses succinct plans for the closure/decommissioning of the proposed 4MB project.

8.2 Decommissioning and Abandonment Plan

The decommissioning and abandonment plan has its focus protecting public health and safety, eliminating environmental damage and liabilities and allowing the project site to be restored to its original state/ use or converted into other uses.

For the proposed 4MB Project, the following are planned to take place prior to decommissioning of the project:

- A preliminary site contamination /facility inventory will be carried out and documented to assist in the decommission process;
- Site inspections and hazard characterization will take place and concerns will be identified;
- Communication with relevant stakeholders to obtain necessary inputs into the final decommissioning plan; and
- Negotiation with relevant government authorities on the final decommissioning plan, including schedules, monitoring requirements and permits such as demolition permits

The proposed 4MB 1 project has an anticipated life expectancy of a minimum of 50 years, during which time this facility will be maintained to operate safely and efficiently. At some point in the future upon completion of its operational life, the facility will be decommissioned and or abandoned. A decommissioning and abandonment plan will be developed to reduce and remediate environmental and social impacts associated with project infrastructure and operation decommissioning.

The Decommissioning Plan shall be executed at end of the Project life-span taking cognizance of all relevant regulatory requirements. This plan shall also take into account environmental

rehabilitation. Environmental rehabilitation shall include the removal of all surface facilities and excess hydrocarbon waste, as well as revegetation of localized natural flora. Government approved hazardous material disposal sites shall be used if any hazardous materials are collected.

Associated decommissioning activities in accordance with Environmental Protection Measures and Standards of Good Practice are listed below:

- Removal of site infrastructure and waste;
- Removal of all civil structures and associated infrastructure;
- All remaining materials and hydrocarbons as well as hazardous waste shall be removed and stored appropriately for disposal
- All waste will be disposed in an appropriate manner in line with regulatory requirements and
- Reusable materials shall be resold to other end users or where possible recycled.

Clean up and Transport:

- When decommissioned, all products within piping and storage infrastructure shall be removed from said system along with all associated infrastructure and possible contaminated soils; and
- Roadways and natural drainage patterns will be reinstated where practicable.

8.3 Facility Abandonment

Prior to abandonment, a review of the site infrastructure will be carried out to address items to be decommissioned and abandoned. The following issues will be addressed during abandonment process:

- All equipment deemed potentially hazardous will be removed from the site and disposed of in accordance with government regulations.
- Buildings, surface structures and other infrastructures, which will no longer be required will be properly dismantled, demolished and removed.
- Concrete foundations will be demolished to near surface grade and the concrete debris disposed of in an appropriate landfill. Buildings or foundations to be retained shall be subjected to Structural Integrity test and passed as fit for human habitation/use, failing which they shall be dismantled and removed as described above.
- An assessment of soil contamination in the location or vicinity of the buildings and other facilities shall be conducted and appropriate remediation measures will be implemented to treat or excavate and remove contaminated soil as required.
- Access and site roads deemed no longer required shall be reclaimed by removing the asphalt surface and scarifying the surface. Where erosion and sedimentation is a potential concern, suitable plant species shall be planted along the prepared roadway surface. For areas where erosion and sedimentation are not a concern, the scarified surface will be left to revegetate naturally.
- Culverts will be removed and natural drainage patterns will be restored wherever practicable.
- Power to the sites shall be terminated and the service disconnected at the source.
- The electrical lines, Transformers, and other electrical installations shall be removed along with the poles.

- The equipment associated with the water supply will be removed and any drilled boreholes shall be plugged with concrete. The underground water line will also be removed and the area graded.
- The sewage holding tank and associated underground piping will be removed from the site.
- Site lighting will be removed along with all lighting hardware and poles.
- Underground pipes, conduits and cables will be terminated a minimum depth below the surface grade and allowed to remain unless there is a regulatory stipulation to remove them, in which case they will be removed and the areas graded and rehabilitated.

8.4 Wastes Management during Decommissioning

8.4.1 Gaseous Emissions

There will be minor air emissions from construction equipment associated with decommissioning and abandonment operations. Also, particulate matters will be generated during decommissioning of civil structure. Appropriate mitigation measures as already indicated in chapter six of this report shall be implemented.

8.4.2 Liquid Wastes

Liquids wastes that could emanate from the decommissioning of the facility include sewage/ wastewater from septic tanks, waste transformer oil, waste oil from machineries. Sewage/ wastewater from septic tanks shall be properly dislodged using the Lagos State Wastewater Management Office (LSWMO) approved PSP dislodgers while all waste oils shall be carefully collected and containerized. The waste oil shall be resold to other end users for firing of furnaces.

8.4.3 Solid Wastes

Solid wastes from the decommissioning activities shall include all demolition wastes such as concrete debris, iron rods, metal cuttings, disused wooden materials etc., disused equipment/ machineries, disused vehicle parts, disused office furniture amongst others. All waste material will be sorted and material not deemed acceptable for reuse or recycling will be disposed off at approved landfill site through the use of LAWMA or her approved PSP Operators.

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS

9.1 Introduction

The ESIA aims at protecting and enhancing the environment in which the project is to be deployed to meet the needs of the communities without compromising the integrity of the environment and socioeconomic setup of project affected areas. The ESIA has therefore described in detail the processes the project will follow to maximize its compliance to statutory requirements as well as those of project sponsors and minimize the impacts of the project on the general environment.

Effective monitoring will be conducted to ensure that the Action Plans/ procedures stipulated in this document are appropriate and effectively being implemented to meet the project's Environmental and Social objectives and promote sustainability.

9.2 Recommendations

A summary of recommendations for ESIA includes;

- Ensure implementation and monitoring of the ESMP in this document
- Avoid environmentally sensitive habitat areas and exposed soils should be re-vegetated with native vegetation immediately after construction to prevent erosion.
- All affected persons to be given relocation assistance (cash or kind) by the Project to enable them move their properties to new locations, i.e. in accordance with the proposed RAP.
- Covid-19 preventive measures should be strictly observed.
- Undertake intermittent and unannounced monitoring on Occupation Health and Safety (OHS) on site.
- Develop and implement a traffic management plan and ensure alternative routes are motorable and safe for motorists and pedestrians.
- Develop a detailed waste management plan and ensure proper waste management through project phases.
- Ensure stakeholder engagement throughout the project life cycle.

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APPENDIX

Appendix A: Sampling Methodology

A1. Scope of Work and Field Methodology

Nine gaseous pollutants monitored during the study were ammonia (NH_3), carbon monoxide (CO), hydrogen sulphide (H_2S), nitric oxide (NO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), methane (CH_4) and volatile organic compounds (VOCs). The ambient air was also analysed for particulates with diameter less than 2.5 microns ($PM_{2.5}$), 10 microns (PM_{10}) and Total Suspended Particles (TSP). Also measured were ambient noise levels and meteorological parameters.

A1.1 Meteorological Parameters

The EXTECH 45170 Environmental Meter was used for measurements of some meteorological parameters during the fieldwork. This is a multi-function environmental monitoring instrument used to measure major environmental conditions including air temperature, relative humidity, wind speed, and light intensity.

A1.2 Air Sampling for Particulate Matter

Particulate matter (PM) was measured with AEROCET 531S Particle Mass/ Particle Count Monitor, an equipment from Met One Instruments. It is handheld, battery operated and completely portable unit measuring five mass ranges of TSP: PM_1, $PM_{2.5}$, PM_4, PM_7, PM_{10}, and TSP with a concentration range of 0 – 1000 µg/m^3 and 0 – 3000000 particle cubic foot (and resolution of 0.1 µg/m^3). The PM Monitor samples at a flow rate of 2.83 l/min. To measure, the monitor is placed at 1 m above the ground level, switched on in the environment of interest and the measured concentration read directly on the screen after particle capturing. The respirable fractions of the total particulates were the focus of this measurement.

A1.3 Air Sampling for Gaseous Pollutants

Oxides of nitrogen (NO and NO_2), sulphur dioxide (SO_2) carbon monoxide (CO), Volatile organic compounds (VOCs), hydrogen sulphide (H_2S), ammonia (NH_3), ozone (O_3) and methane (CH_4) were measured with the *insitu* Aeroqual Series 200 and the WolfPackTM Modular Area Monitors. The Aeroqual monitor has facility from which concentration for the last 5 minutes can be determined. For measurement, the monitor is placed at 1 m above ground level and switched. The measured concentration is then displayed. Ammonia (NH_3) was measured with sensor ENG-1808140-005 having detection range of 0 – 100 ppm and 0.1 ppm resolution while NO and NO_2 were measured with sensor ENW-2402150-009 having a detection range 0 – 1 ppm and 0.001 ppm resolution. Aeroqual Head sensor ESO-2502155-007 was used to monitor SO_2 and EHS/EHS2 for H_2S with both having detection limit of 0 – 10 ppm. Their resolution is 0.01 ppm. Both VOCs and CO were monitored with sensors VM-2305142-025 and ECN-2811140-015 respectively. While VOCs sensor has a detection limit of 0 – 25 ppm, CO sensor's limit is 0 – 100 ppm with both having a resolution of 0.1 ppm.

A1.4 Noise Measurements

Noise measurements were taken with a digital, battery-powered, sound pressure level meter (EXTEC Instruments, US Model 407730). It has both A and C weighting and 0.1 dB resolution with fast/slow responses. The meter is also equipped with a build-in calibration check (94 dB), tripod mount, and analogue DC/AC conditioned outputs of 10mV/dB and utilized a 0.49 " (12.3 mm) condenser microphone. To measure the noise levels at any of the sampling locations, the sound level meter was placed at a distance of at least 3 m from any barrier or other sound reflecting sources and at about 1.2 – 1.5 m above ground level. Measurements were taken by setting the sound level meter to the "A" weighting network.

These methods are as recommended by the Federal Ministry of Environment (FEPA, 1991).

A2 Ambient Air Quality and Noise Assessment Study Approach

The present air quality status and airshed classification according to the World Bank Guidelines were determined using the national and World Bank standards (Table A1). The measured noise levels were also compared with the permissible noise levels of the Federal Ministry of Environment (Table A2) and that of the World Bank (Table A3).

Table A1: Ambient Air Quality Standards Considered in the Study

Air Pollutant	Time Average	Limit (µg/m3)	
		FMEnv	World Bank
NH_3	24-hr	0.28 ppm	-
CO	24-hr	11,400 (10 ppm)	-
SO_2	1-hr	260 (0.1 ppm)	-
	24-hr	26 (0.01 ppm)	20
NO_X	1-hr	-	200
	24-hr	75 – 113 (0.04 – 0.06 ppm)	-
H_2S	24-hr	0.008	
Ozone	24-hr	0.1 ppm	
VOCs	24-hr	160	-
$PM_{2.5}$	24-hr	-	25
PM_{10}	24-hr	-	80
TSP	24-hr	250	-

Table A2: Nigeria's Standard Noise Levels (FEPA, 1991)

Duration per Day, hour	Permissible Exposure Limit, dB (A)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Table A3: Maximum Allowable Log Equivalent (hourly measurements), in dB (A)*

Receptor	Day-time (7:00 – 22:00)	Night-time (22:00 – 7:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

*(World Bank, 1999)

ANNEXES

Annex 1 Terms of References

DRAFT TERMS OF REFERENCE for LAGOS 4TH MAINLAND BRIDGE ENVIRONMENTAL & SOCIAL SAFEGUARDS INSTRUMENTS

1.0 Background

The Lagos State Government is implementing the 4th Mainland Bridge project (4MB) with financing support from a Consortium of International Finance Providers. Designed to cover a distance of 38 kilometres, the project will be constructed under a build, operate and transfer (BOT) concession and the state's public-private partnership programme for a period of 30 years.

The Bridge, which is geared towards economic growth in the State, is expected to be financed and constructed in a Public Private Partnership (PPP) initiative and would be delivered in three years.

The need for the bridge had become imperative following the phenomenal growth of Lagos State with a population of over 21 million people, which has in turn increased commercial activities and traffic gridlock, which has made it imperative to have a 4th Mainland Bridge that will serve as an alternative route to the Eastern axis and decongest traffic in the State. More importantly this bridge will provide the required transportation compliment to the rapidly growing industrial activities on the Eti-Osa – Lekki – Epe corridor of the State.

The proposed alignment of the Bridge will pass through Lekki, Langbasa and Baiyeiku towns along the shoreline of the Lagos Lagoon estuaries, further running through Igbogbo River Basin and crossing the Lagos Lagoon estuaries to Itamaga Area in Ikorodu. It will also cross through the Itoikin Road and the Ikorodu – Sagamu Road to connect Isawo inward Lagos Ibadan Expressway at Ojodu Berger axis.

Road projects are generally intended to improve the economic and social welfare of people. Increased Road capacity and improved pavements can reduce travel times and lower the costs of vehicle use, while increasing access to markets, jobs, education and health services and reducing transport costs for both freight and passengers.

For all the positive aspects of Road projects, they may also have significant negative impacts on nearby communities and the natural environment. People and properties may be in the direct path of Road works and affected in a major way. People may also be indirectly affected by projects, through the disruption of livelihood, loss of accustomed travel paths and community linkages, increases in respiratory problems due to air pollution, and injury from Road accidents. Disturbances to the natural environment may include soil erosion, changes to stream and underground water, and interference with animal and plant life. Roads bring people, and people bring development. New Roads may induce development in previously undeveloped areas, sometimes significantly affecting the sensitive environments and the lifestyles of indigenous people. Roads are agents of change, and can be responsible for both benefits and damage to the existing balance between people and their environment.

1.1 Applicable Safeguards for the 4MB Project

The **4MB Project** activities involve major-sized civil works such as construction of infrastructure and stabilization or rehabilitation along the proposed Alignment. These could result in environmental and social impacts thus triggering the World Bank's Safeguard Policies including:

- Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Environmental and Social Standard 2: Labor and Working Conditions;
- Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management;
- Environmental and Social Standard 4: Community Health and Safety;
- Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Environmental and Social Standard 8: Cultural Heritage; and
- Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure.

The environmental and social safeguards concern at the national level are to be addressed through the national instruments established by the FMEnv which are the ESIA or ESMP and RAP. Furthermore, in following international best practices the project would prepare the Environmental and Social Commitment Plan (ESCP) in accordance with Annex 2 of ESSI as required under the current World Bank ESS standard in addition to the Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF) under the OP 4.01 policy. These framework instruments need to be translated into specific, costed, measurable, and monitorable actions for specific intervention sites through the preparation of site-specific management and action plans.

ESMF: In general, the ESMF specifies the procedures to be used for preparing, approving and implementing

(i) Environmental and Social Assessments (ESIA) and or

(ii) Environmental and Social Management Plans (ESMPs) for individual civil works packages developed for each sub-project. ESMPs are essential elements for Category A & B projects

***RPF*.** The RPF applies when land acquisition leads to the temporary or permanent physical displacement of persons, and/or loss of shelter, and /or loss of livelihoods and/or loss, denial or restriction of access to economic resources due to project activities. It sets out the resettlement and compensation principles, organizational arrangements and design criteria to be applied to meet the needs of project-affected people and specifies the contents of a Resettlement Action Plan (RAP) for each package of investments. A Resettlement Policy Framework (RPF), which serves as a practical tool during the programme formulation, design, implementation and monitoring, will prepared for 4MB Project which will serve as a guide for the present terms of reference.

2.0 SPECIFIC OBJECTIVES:

The specific objective is for the Consultant to assist Lagos State to validate the Environmental and Social (E&S) screening and categorization to be done by the Federal Ministry of Environment and prepare Environmental and Social Impact Assessment (ESIA) for the proposed 4MB Project, using feasibility reports and designs from the Engineering Consultant, in compliance with the World Bank environmental, social safeguards policies and procedures as well as the local laws and guidelines administered by Lagos State Ministries of Environment & Water Resources, Works & Infrastructure, Transportation, Physical Planning & Urban Development, Women Affairs & Social Welfare as well as Federal Ministry of Environment guidelines and procedures.

3.0 GOAL OF THE CONSULTANCY SERVICE

The goal of the consultancy is to prepare site-specific safeguard instruments to manage Environmental & Social risks associated with construction works on the proposed 4MB Project.

4.0 RATIONALE FOR THE STUDY

Following the initial plan of rolling out the 4MB Project works; the preparation of environmental and social safeguards instruments commenced based on the identified sites and associated scope of works described in attached Project Alignment Map**.** These sites with the proposed associated scope of works formed the basis for the safeguards preparation as described in the Terms of Reference (ToR) for the assignment.

In view of the foregoing, this Draft terms of reference highlights the works that need the preparation of safeguard instruments based on the Federal Ministry of Environment (FMEnv) E&S categorization and World Bank Environmental and Social Safeguards policies triggered.

5.0 DESCRIPTION OF REQUIRED SAFEGUARD INSTRUMENTS

5.1 Environmental & Social Impact Assessment (ESIA)

A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented, or if it is located in an ecologically sensitive area. These environmental and social impacts may affect an area bRoader than the sites or facilities subject to physical works. Environmental Assessment for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance.

The site specific ESIA for the proposed 4MB Project shall identify and evaluate potential environmental and social impacts that sub-project activities may pose, which shall be done in consultation with stakeholders, including project affected persons (PAPs). Public consultations are critical in preparing proposals for sub-project activities likely to have impacts on the

environment and populations within the project site. The public consultations shall identify key issues and determine how concerns of all stakeholders will be addressed in the ESIA.

Within the broader context of the elements considered in an ESIA, an Environmental & Social Management Plan (ESMP) must be included as a practical tool for the management of the E&S risks assessed in the ESIA. Section 5.2 provides a concise description of an ESMP.

5.2 Environmental & Social Management Plan (ESMP)

The Environmental and Social Management Plan is an instrument that details the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental and social impacts or to reduce them to acceptable levels; and the actions needed to implement these measures with associated costs

The ESMPs shall therefore, as a minimum,

1. identify and evaluate potential environmental and social impacts of the entire project (construction of a bridge) infrastructures and civil works management
2. highlight environmental and social management measures to ensure environmental, social, and health performance of the entire sub-projects;
3. outline the measures to be implemented to prevent and mitigate the negative social and environmental impacts identified in the social and environmental assessment;
4. identify the three key areas:
    - implementation of prevention and mitigation measures,
    - institutional strengthening and training (including specific training for Contractors and their staff), and
    - environmental and social monitoring.
5. include the responsible parties, institutional setups and collaborations as well as the strengthening and training recommended, timelines, and costs for each measure.
6. develop a monitoring framework to guide the monitoring and evaluation of the progress in implementing the recommended actions including but not limited to: monitoring of water levels, water quality, noise levels, air quality, and social parameters e.g. risks associated with labour influx (Gender Based violence, Sexual exploitation and abuse, child labour), grievances and complaint, physical and economic displacement, etc.
7. include the methodologies, sampling, frequencies, thresholds, equipment, materials, staffing and resources needed for data collection and for corrective actions.

The ESMPs should consist of a well-documented set of site-specific mitigation, monitoring, and institutional actions to be taken before and during implementation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. It should also include the measures needed to implement these actions, addressing the adequacy of the monitoring and institutional arrangements at upstream and downstream in the intervention sites.

5.3 Resettlement Action Plans (RAPs)

As part of the requirements of ESS5, a full Resettlement Action Plan (RAP) is required for a known project site whenever land acquisition affects more than 200 people, takes more than 10 percent of any holding, and involves physical relocation of population. An abbreviated RAP (ARAP) is however acceptable if fewer than 200 people are displaced. Even if more than 200 people are affected, if all land acquisition is minor (10 percent or less of all holdings is taken) and no physical relocation is involved, a full RAP is required. For the purpose of the priority investments being done as part of the 4MB Project a full RAP preparation is expected.

The aim of the RAP is to identify and assess the human impact of the proposed works at the interventions described above, and to prepare an Action Plan to be implemented in coordination with the civil works in line with World Bank Policy and Nigeria policies and laws. Experience has shown that involuntary resettlement can cause loss of income, assets, and community ties that, especially among the poor, can be essential for survival and wellbeing. In extreme cases, involuntary resettlement can lead to the dissolution of families, impoverishments and health problems. The Resettlement Action Plan will identify the project affected persons (PAPs), engage them in participatory discussions regarding the plan and formulating a plan of action to adequately compensate people for their losses.

The Policy of the World Bank is to ensure that persons involuntarily resettled caused by the taking of land in the context of a project supported by the Bank, have an opportunity to restore or improve their level of living to at least the pre-project level. Project affected people should participate in the benefits of the project and they should be given options regarding how they restore or improve their previous level of living. In the proposed 4MB Project it is not sufficient for communities to passively accept project works and the impacts of these works. Rather they must be mobilized to contribute actively to project design and implementation and to maintain the works following implementation. This feature underscores the need for accurate analysis of local social organization.

6.0 Environmental & Social Impact Assessment (ESIA)

The consultant is expected to work in close collaboration with the Technical Consultants (Advanced Engineering Consultants) and Project Implementation Team (PIT) of the Lagos State Ministry of Works & Infrastructure, and with other relevant MDAs and consultants as directed by the PIT. The environmental and social impact of the proposed works will be assessed and an action plan developed to mitigate the negative impacts. The consultant will equally consider the capacity of existing institutions to manage the expected environmental and social concern presented in the Environmental and Social Management Plan.

The consultant will have to receive the draft technical studies in order to take into account the technical variants of the proposed activities and also in return, inform the technical design consultants of any major constraint that may arise due to the social and environmental situation on the ground. The consultant will visit the entire project area as delimited in the given detailed design. The consultant will take into account the proposed civil engineering designs, vegetative land management measures and other activities aimed at reducing or managing runoff that would be carried out within the sub-watershed. The consultant will assess natural resources and infrastructures that will be potentially affected during project implementation and operation and select the management strategies needed to ensure that environmental and social risks are appropriately mitigated.

The ESIA Report shall be presented in a concise format containing all studies, processes, analyses, tests and recommendations for the proposed intervention. The report shall focus on the findings, conclusions and any recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. It should provide a description of the specialist studies undertaken and the report should include a bibliography, maps, photographs, diagrams and any other diagrammatic representation needed to facilitate understanding of the main text, detailed data should be presented in annexes or a separate volume. Unpublished documents used in the assessment should also be included or referenced in an appendix and the location of the originals of such documents indicated.

For sites in screening Category I (or ESS1 category A), the scope of the consultant's assignment shall include:

- Reviewing existing documentation of the 4MB Project such as the feasibility studies, Project Appraisal Document (PAD), the draft technical studies for the infrastructural works and other relevant documents
- Reviewing the Environmental Safeguards Policies of the World Bank especially Environmental Assessment (ESS1);
- Describing the proposed project by providing a synthetic description of the project relevant components and presenting plans, maps, figures and tables;
- Identifying the policy, legal and administrative framework relevant to the project.
- Defining and justifying the project study area for the assessment of environmental and social impacts;
- Describing and analysing the physical, biological and social environment conditions in the study area before project implementation. This analysis shall include the interrelations between environmental and social components and the importance that the society and local populations attach to these components, in order to identify the environmental and social components of high value or presenting a particular interest; Description of the project environment shall be obtained from a combination of literature review, in-situ measurements and laboratory analyses of samples;

- The following biophysical should follow the standards set by the environmental health and safety guidelines (EHSGs) taken into consideration but not limited to; Climate, Air and Noise, Topography, Surface Water Quality, Ground Water Quality, Storm Water runoff, drainage pattern and aquifer characteristics, Soil, biological aspects: flora and fauna, endemic and endangered species.

- Sampling of relevant biophysical parameters within the project area of influence including air, noise, water and soil using in-situ and laboratory analysis as appropriate. Discuss the results and its implications for the proposed project. Sampling should be done in an accredited Federal Ministry of Environment Laboratory.

- Collate data on the size and social structure of the local population, and assessment of the groups/people expected to be impacted directly or indirectly by the project: their needs, their demands, their ability to deal with change, physical and economic displacements likely to occur, impact on Road users (school children, business owners, etc.), health assessments, waste management practices, the existing human capital in the form of education and skills and the potential for improving that, gender issues, and vulnerable groups, and the need for measures of mitigation;

- Social context on issues specific to women which includes:
  - Existing gender country diagnostics/country action plans;
  - Existing services available from Gender Based Violence (GBV) Services Providers;
  - Where health centres are located and what types of services are offered (e.g., whether they treat sexually transmitted diseases, provide reproductive health services, have supplies of rape kits including post-exposure prophylactics and emergency contraception, etc.);
  - Whether women have easy access to these services, and if they have mobility and/or economic constraints that may impede access; and,
  - Information obtained from consultations carried out in the preparation of the project[1]

- Presenting and analysing alternatives to the proposed project, including the "without project" option, by identifying and comparing the alternatives on the basis of technical, economic, environmental and social criteria;

- For the selected alternative, identifying and assessing potential importance of beneficial and adverse environmental and social, direct and indirect, short and long-term, temporary and permanent impacts, on the basis of a rigorous method;

- Determine the project's social impacts on health and social well-being; quality of the living environment; economic material well-being; Family and community; and gender relations

- Identify the range of potential project affected persons / communities in the catchment area, the socio - economic activities and the impact on these activities and also proffer appropriate mitigation measures as required.

- Present a summary of the impacted communities for the project: location, access, population (number, demographic and social characteristics); economy (employment rate, income distribution); services (types, capacity, and adequacy) and housing. Concern is the ability to provide work force, service new development and absorb and adjust to growth (worker/family). The report should identify and assess the social impacts identified during the public consultation process and those that, based on consultant's experience, are also likely to occur. In some instances, the affected communities may not be aware of or be in a position to identify all the social impacts that may occur. However, this does not mean that they will not occur. In such cases the consultant should use his/her experience to identify additional social impacts that have not been raised by the public. A summary of the views of the population should include vulnerable groups, determined through thoroughly documented discussions with local communities. These meetings and discussions must be documented and should show how issues and problems raised are or will be resolved

- <u>Pay particular attention to the impacts of the project on vulnerable and marginalized individuals and groups (including but not limited to mobility impaired individuals and groups and People Living with Disability)</u>

- Identify key uncertainties and risks**:** Identify and communicate any key uncertainties and risks associated with the accuracy of the findings of the social assessment, as well as of the proposed project. Some sources of uncertainty and risk commonly associated with projects are linked to: (a) Lack of adequate information at the community level; (b) Creation of employment and business opportunities for members from the local, historically

[1] Information obtained from GBV survivors must not be documented in the ESMP report. Survivor must always be referred to the nearest GBV Service Providers identified by the Project.

disadvantaged communities; (c) The influx of job seekers and construction workers to the area and the impact on services; etc.

- Assess the impact of the construction on individuals and groups whose livelihoods are tied to the route/Road (motor cycle taxi and tricycle operators etc.). As part of consultations, the ESIA should identify the potential negative impact on the livelihoods of these individuals and groups and propose appropriate mitigation measures

- Assess the risk of gender-based violence, sexual exploitation, child abuse and labour in-migration as a result of construction activities[2]. The assessment will be followed by a detailed description of required mitigation measures

- Assess potential impact of the project on property access and suggest measures to minimize the effects on property access

- Information will be gathered from field surveys and secondary data sources (interviews, structured questionnaires, in-depth interviews and focus group discussions).

- Defining appropriate mitigation/enhancement measures to prevent, minimise, mitigate, or compensate for adverse impacts or to enhance the project environmental and social benefits, including responsibilities and associated costs;

- Detailed overview of measures that will need to be taken to mitigate the negative social impacts identified and the procedures for their implementation;

- Addressing potential cumulative effects taking into account other initiatives planned in the study area and its impacts on adjoining communities and infrastructures;

- Developing an environmental and social monitoring program, including indicators, institutional responsibilities and associated costs; addressing the potential residual environmental and social impacts following the implementation of mitigation measures;

- As appropriate, prepare an environmental hazard plan including an analysis of the risk of accident, the identification of appropriate security measures and the development of a preliminary contingency plan;
- Assess the capacity available to implement the proposed mitigation measures and identify institutional responsibilities and needs for capacity building if necessary, to implement the recommendations of the environmental and social assessment and associated cost;

- Identifying institutional responsibilities and needs for capacity building if necessary, to implement the recommendations of the environmental and social assessment;

- Capacity building programmes should include amongst other topics on: GBV sensitization, prevention and awareness; HSE safety in workplace; Community and Stakeholder Engagement in relation to the project, etc. Contractors and their staff should participate in these training;

- Gain a good understanding of the communities likely to be affected by the project by preparing a

[2]The World Bank Group developed a "Good Practice Note on Addressing Gender Based Violence in Investing Project Financing involving Major Civil Works" <http://pubdocs.worldbank.org/en/399881538336159607/Good-Practice-Note-Addressing-Gender-Based-Violencev2.pdf> [28th September 2018]. Guidance on GBV, SEA, SH prevention and mitigation measures can be obtained from the document

Community Profile which includes: (a) a thorough stakeholder identification and analysis; (b) a discussion of the socio-political setting; (c) an assessment of the differing needs, interests, values and aspirations of the various subgroups of the affected communities including a gender analysis; (d) an assessment of their impact history, i.e. their experience of past projects and other historical events; (e) a discussion of trends happening in those communities; (f) a discussion of the assets, strengths and weaknesses of the communities; and (g) optionally the results of an opinion survey. This task is typically called profiling, fulfilling the requirements for ESS10 Stakeholder Engagement and Information Disclosure;

- Carrying out consultations with primary and secondary stakeholders in order to obtain their views and preoccupations about the project. These consultations shall occur during the preparation of the ESIA reports to identify key environmental and social issues and impacts, and after completion of the draft reports to obtain comments from stakeholders on the proposed mitigation/enhancement measures;

- Consultations with stakeholders shall preferably as units as may be deemed appropriate for meaningful and unbiased discussions; on the objective of the project and applicable consequences or impacts and mitigation measures, and document clearly the discussions, concerns, input, questions and how each question or concerns were addressed;

- Develop an appropriate, all inclusive (women, youth, aged and all other vulnerable groups) stakeholders engagement plan, which should include procedures and timelines for future consultations throughout the sub-project implementation;

- Fully inform community members about: (a) the project; (b) similar projects elsewhere to give them a sense of how they are likely to be affected; (c) how they can be involved in the ESIA; (d) their procedural rights in the regulatory and social performance framework for the project; and (e) their access to grievance and feedback mechanisms, following the Grievance Mechanism of the Annex ESS10;

- Devise inclusive participatory processes and deliberative spaces to help community members: (a) understand how they will be impacted; (b) determine the acceptability of likely impacts and proposed benefits; (c) make informed decisions about the project; (d) facilitate community visioning about desired futures; (e) contribute to mitigation and monitoring plans; and (f) prepare for change.

- Develop procedures for handling grievances and complaints with respect to the Grievance Redress Mechanism (GRM) of the Project and traditional systems in the communities in accordance tothe Grievance Mechanism of the Annex ESS10;

- Develop a set of Environmental, Social, Health and Safety (ESHS) requirements and costs that mitigation costs that would be incorporated into the bidding documents to be used in the procurement of the civil works. The costing to be prepared for the ESHS costs in the bidding documents must summarise the mitigation cost requirements of the contractor as they have been identified in the Environmental and Social management Plan prepared in this assessment;

- Develop other action plans such as Waste Management plan, Traffic Management Plan, Labour Influx management plan, Community/Occupational Health and Safety Plans, Stakeholder Engagement Plan, etc., where relevant and

- Prepare a detailed Environmental and Social Management Plan (ESMP). The ESMP should capture:
  - The potential environmental and social impacts resulting from project activities
  - The proposed mitigation measures;

- The institutional responsibilities for implementation;
- The monitoring indicators;
- The institutional responsibilities for monitoring and implementation of mitigation measures;
- The estimated costs of activities; and
- A calendar for implementation.

- Preparing the ESIA Reports according to the generic contents presented in Appendix A hereafter.

6.2 Environmental & Social Management Plans

The consultant is expected to work in close collaboration with the Technical Consultants (Advanced Engineering Consultants) and Project Implementation Team (PIT) of the Lagos State Ministry of Works & Infrastructure, and with other relevant MDAs and consultants as directed by the PIT. The prospective consultancy firm will assess the environmental and social impact of the proposed works and develop an action plan to mitigate the negative impacts. The consultant will equally consider the capacity of existing institutions to manage the expected environmental and social concern presented in the Environmental and Social Management Plans.

The consultant will have to receive the draft technical studies to take into account the technical variants of the proposed activities and also in return, inform the technical design consultants of any major constraint that may arise due to the social and environmental situation on the ground. The consultant will visit the entire project area as delimited in the given detailed design. The consultant will take into account the proposed civil engineering designs, vegetative land management measures and other activities aimed at reducing or managing runoff that would be carried out within the sub-watershed. The consultant will assess natural resources and infrastructures that will be potentially affected during project implementation and operation and select the management strategies needed to ensure that environmental and social risks are appropriately mitigated.

The ESMPs reports shall be presented in a concise format containing all studies, processes, analyses, tests and recommendations for the proposed intervention. The report shall focus on the findings, conclusions and any recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. It shall provide a description of the specialist studies undertaken and include a bibliography, maps, photographs, diagrams and any other diagrammatic representation needed to facilitate understanding of the main text, detailed data should be presented in annexes or a separate volume. Unpublished documents used in the assessment should also be included or referenced in an appendix and the location of the originals of such documents indicated.

For sites screened into Environmental Screening Category I (or World Bank ESS1 category A), the work of the consultant shall include:

1. Reviewing existing documentation of the 4MB Project such as the ESMF, Project Appraisal Document (PAD), the draft technical studies for the infrastructural works;
2. Reviewing the Environmental Safeguards Policies of the World Bank safeguards policies especially Environmental Assessment (ESS1);

3. Describing the proposed project by providing a synthetic description of the project relevant components and presenting plans, maps, figures and tables;
4. Identifying the policy, legal and administrative framework relevant to the project;
5. Describing and analysing the physical, biological and social environment conditions in the study area before project implementation. This analysis shall include the interrelations between environmental and social components and the importance that the society and local populations attach to these components;
6. Collate data on the size and social structure of the local population, and assessment of the groups expected to be impacted directly or indirectly by the project: their needs, their demands, their ability to deal with change, the existing human capital in the form of education and skills and the potential for improving that, gender issues, and vulnerable groups, and the need for measures of mitigation;
7. Other socio-economic issues to address specific on women include:
    a. Existing gender country diagnostics/country action plans;

    b. Existing services available from Gender Based Violence (GBV) Services Providers;

    c. Where health centres are located and what types of services are offered (e.g., whether they treat sexually transmitted diseases, provide reproductive health services, have supplies of rape kits including post-exposure prophylactics and emergency contraception, etc.);

    d. Whether women have easy access to these services, and if they have mobility and/or economic constraints that may impede access; and,

    e. Information obtained from consultations carried out in the preparation of the project3

8. Identifying the range of potential project affected persons / communities in the catchment area, the socio - economic activities and the impact on these activities and also proffer appropriate mitigation measures as required.
9. Health Impact Assessment (HIA) to facilitate the reduction or avoidance of negative impacts of the project on human health and enhance positive impacts. HIA profiling should bRoadly identify the key aspects of the population's health status, particularly those factors that may be susceptible to change or that may act as indicators of anticipated health impacts.; Establish social baseline for pre - project intervention;
10. Determine the project's social impacts on health and social well-being; quality of the living environment; economic material well-being; Family and community; and gender relations
11. Present a summary of the impacted communities for the project: location, access, population (number, demographic and social characteristics); economy (employment

3 Information obtained from GBV survivors must not be documented in the ESMP report. Survivor must always be referred to the nearest GBV Service Providers identified by the Project.

rate, income distribution); services (types, capacity, and adequacy) and housing. Concern is the ability to provide work force, service new development and absorb and adjust to growth (worker/family). The report should identify and assess the social impacts identified during the public consultation process and those that, based on consultant's experience, are also likely to occur. In some instances, the affected communities may not be aware of or be in a position to identify all the social impacts that may occur. However, this does not mean that they will not occur. In such cases the consultant should use his/her experience to identify additional social impacts that have not been raised by the public. A summary of the views of the population should include vulnerable groups, determined through thoroughly documented discussions with local communities. These meetings and discussions must be documented and should show how issues and problems raised are or will be resolved

12. Pay attention to the impacts of the project on vulnerable and marginalized individuals and groups (including but not limited to mobility impaired individuals and groups and People Living with Disability);
13. Assess the impact of the construction on individuals and groups whose livelihoods are tied to the route/Road (motor cycle taxi and tricycle operators etc.). As part of consultations, the ESMP should identify the potential negative impact on the livelihoods of these individuals and groups and propose appropriate mitigation measures;
14. Assess potential impact of the project on property access and suggest measures to minimize the effects on property access;
15. Information will be gathered from field surveys and secondary data sources (interviews, structured questionnaires, in-depth interviews and focus group discussions);
16. Identify key uncertainties and risks**:** Identify and communicate any key uncertainties and risks associated with the accuracy of the findings of the social assessment, as well as of the proposed project. Some sources of uncertainty and risk commonly associated with projects are linked to: (a) Lack of adequate information at the community level; (b) Creation of employment and business opportunities for members from the local, historically disadvantaged communities; (c) The influx of job seekers and construction workers to the area and the impact on services; etc.
17. Defining appropriate mitigation/enhancement measures to prevent, minimize, mitigate, or compensate for adverse impacts or to enhance the project environmental and social benefits, including responsibilities and associated costs;
18. Include mitigation measures for prevention of GBV/Sexual Exploitation and Abuse (SEA) issues4 with emphasis on escalating cases to identified GBV Service Providers within the communities/states.
19. Addressing potential cumulative effects taking into account other initiatives planned in the study area and its impacts on adjoining communities and infrastructures;

4 The World Bank Group developed a "Good Practice Note on Addressing Gender Based Violence in Investing Project Financing involving Major Civil Works" <http://pubdocs.worldbank.org/en/399881538336159607/Good-Practice-Note-Addressing-Gender-Based-Violencev2.pdf> [28th September 2018]. Guidance on GBV, SEA, SH prevention and mitigation measures can be obtained from the document

20. Developing an environmental and social monitoring program, including indicators, institutional responsibilities and associated costs;
21. As appropriate, preparing an environmental hazard plan including an analysis of the risk of accident, the identification of appropriate security measures and the development of a preliminary contingency plan;
22. Assess the capacity available to implement the proposed mitigation measures and identify institutional responsibilities and needs for capacity building if necessary, to implement the recommendations of the environmental and social assessment and associated costs
23. Identifying institutional responsibilities and needs for capacity building if necessary, to implement the recommendations of the environmental and social assessment;
24. Capacity building programmes should include amongst other topics on: GBV sensitization, prevention and awareness; HSE safety in workplace; Community and Stakeholder Engagement in relation to the sub-project, etc. Contractors and their staff should participate in these trainings;
25. Carrying out consultations with primary and secondary stakeholders in order to obtain their views and preoccupations about the project. These consultations shall occur during the preparation of the ESMP reports to identify key environmental and social issues and impacts, and after completion of the draft reports to obtain comments from stakeholders on the proposed mitigation/enhancement measures.
26. *Consultations with stakeholders shall preferably as units as may be deemed appropriate for meaningful and unbiased discussions; on the objective of the project and applicable consequences or impacts and mitigation measures, and document clearly the discussions, concerns, input, questions and how each question or concerns were addressed*;
27. Develop an appropriate, all inclusive (women, youth, aged and all other vulnerable groups) stakeholders engagement plan which should include procedures and timelines for consultation throughout the sub-project implementation;
28. Gain a good understanding of the communities likely to be affected by the project by preparing a Community Profile which includes: (a) a thorough stakeholder analysis; (b) a discussion of the socio-political setting; (c) an assessment of the differing needs, interests, values and aspirations of the various subgroups of the affected communities including a gender analysis; (d) an assessment of their impact history, i.e. their experience of past projects and other historical events; (e) a discussion of trends happening in those communities; (f) a discussion of the assets, strengths and weaknesses of the communities; and (g) optionally the results of an opinion survey. This task is typically called profiling.
29. Fully inform community members about: (a) the project; (b) similar projects elsewhere to give them a sense of how they are likely to be affected; (c) how they can be involved in the ESMP; (d) their procedural rights in the regulatory and social performance framework for the project; and (e) their access to grievance and feedback mechanisms.
30. Devise inclusive participatory processes and deliberative spaces to help community members: (a) understand how they will be impacted; (b) determine the acceptability of

likely impacts and proposed benefits; (c) make informed decisions about the project; (d) facilitate community visioning about desired futures; (e) contribute to mitigation and monitoring plans; and (f) prepare for change.

31. Development of the procedures for handling grievances and complaints associated with the sub-project with respect to the Grievance Redress Mechanism (GRM) of the Project and traditional systems in the communities. The GRM must be inclusive and accessible to all.

32. Develop a set of Environmental, Social, Health and Safety (ESHS) requirements and costs that mitigation costs that would be incorporated into the bidding documents to be used in the procurement of the civil works. The costing to be prepared for the ESHS costs in the bidding documents must summarise the mitigation cost requirements of the contractor as they have been identified in the Environmental and Social management Plan prepared in this assessment;

33. Develop other site-specific plans such as Waste Management plan, Traffic Management Plan, Labour Influx management plan, etc., where relevant and

34. . The ESMP should capture:
    a. The potential environmental and social impacts resulting from project activities
    b. The proposed mitigation measures;
    c. The institutional responsibilities for implementation;
    d. The monitoring indicators;
    e. The institutional responsibilities for monitoring and implementation of mitigation measures;
    f. The estimated costs of activities; and
    g. A calendar for implementation.

35. Preparing the ESMP Reports according to the generic contents presented in Appendix B hereafter.

6.3 Resettlement Action Plans

The following specific tasks are to be performed by the consultant.

TASK 1:

(I) Provide a concise description of the study area including but not limited to socio-demographic information, settlement pattern, land use pattern, economic production systems, household characteristics, household and individual production systems, social structures and religious practices.

(ii) Identification of project components or activities that lead to displacement or restriction of access, characterization of the displacement types attributable to project activities, delineation of the zone of impact of such components or activities, consideration of alternatives to avoid or minimize resettlement or restricted access and establishment of mechanisms to minimize

resettlement, displacement, and restricted access, to the extent possible, during project implementation.

(ii) Validate the choice of resettlement instrument determined from the client's screening exercise. The criteria for the development of either a RAP or an ARAP will be determined during the reconnaissance visits to be conducted by the consultant and will be reported in the Inception Report.

TASK 2:

(i) Conduct detailed socio-economic studies with the involvement of potentially affected people which will include a complete census of PAPs (survey shall be done of all the families, businesses, public buildings, farms and other infrastructure) covering:

a. Current occupants of the affected area as a basis for design of the RAP and to clearly set a cut-off date, the purpose of which is to exclude subsequent inflows of people from eligibility for compensation and resettlement assistance;
b. Standard characteristics of displaced households, including a description of production systems, labour, and household organization; and baseline information on livelihoods (including, as relevant, production levels and income derived from both formal and informal economic activities) and standards of living (including health status) of the displaced population;
c. Magnitude of the expected loss, total or partial, of assets, and the extent of displacement, physical or economic.GIS technology is highly required for the census with all man-made features being geo-referenced. The use of hand held GPS device will facilitate establishing the coordinates of each property identified GPS should be complimented by use of aeriel photography. The census includes data on age, gender, occupation, income, sources of livelihood of all persons who live on or derive a living from the area of land as well as information on houses, businesses and other structures in use in the affected area.
d. Each land parcel, structure or affected economic asset should be numbered, geo-referenced, photographed, and described in detail. Construction materials, roofing, and measurements should be noted in accordance with the standards in use in the particular state or federal standards. All information should be kept in a single folder (physical or virtual) for easy retrieval and cross tabulation. The use of a simple database manager is recommended such as Access or Foxpro
e. Information on vulnerable groups or persons, for whom special provisions may have to be made;
f. Provisions to update information on the displaced people's livelihoods and standards of living at regular intervals so that the latest information is available at the time of their displacement, and to measure impacts (or changes) in their livelihood and living conditions.
g. Land tenure, property, and transfer systems, including an inventory of common property natural resources from which people derive their livelihoods and sustenance, non-title-based usufruct systems (including fishing, grazing, or use of forest areas) governed by local recognized land allocation mechanisms, and any issues raised by different tenure systems

in the sub project area;

h. Patterns of social interaction in the affected communities, including social support systems, and how they will be affected by the sub-project;
i. Public infrastructure and social services that will be affected; and
j. Social and cultural characteristics of displaced communities, and their host communities, including a description of formal and informal institutions. These may cover, for example, community organizations; cultural, social or ritual groups; and non-governmental organizations (NGOs) that may be relevant to the consultation strategy and to designing and implementing the resettlement activities.

TASK 3: Analyze the legal and institutional framework governing land use and matters covered under the scope of OP. 4.12 in Nigeria. This should cover the following:

a. Scope of existing land and property laws governing resources, including state-owned lands under eminent domain and the nature of compensation associated with valuation methodologies; land market; mode and timing of payments, etc;
b. Applicable legal and administrative procedures, including a description of the grievance procedures and remedies available to PAPs in the judicial process and the execution of these procedures, including any available alternative dispute resolution mechanisms that may be relevant to implementation of the RAP for the interventions;
c. Relevant laws (including customary and traditional law) governing land tenure, valuation of assets and losses, compensation, and natural resource usage rights, customary personal law; communal laws, etc related to displacement and resettlement, and environmental laws and social welfare legislation;
d. Laws and regulations relating to the agencies responsible for implementing resettlement activities in the sub-projects;
e. Definition of displaced persons or PAPS and criteria for determining their eligibility for compensation and other resettlement assistance, including relevant cut-off dates.
f. Gaps, if any, between local laws covering resettlement and the Bank's resettlement policy, and the mechanisms for addressing such gaps; and
g. Legal steps necessary to ensure the effective implementation of RAP activities in the sub-projects, including, as appropriate, a process for recognizing claims to legal rights to land, including claims that derive from customary and traditional usage, etc and which are specific to the sub-projects.

TASK 4: Assess and describe the institutional framework governing RAP implementation in the context of this project. This should cover;

a. Agencies and offices responsible for resettlement activities and civil society groups like NGOs that may have a role in RAP implementation;
b. Institutional capacities of these agencies, offices, and civil society groups in carrying out RAP implementation, monitoring, and evaluation; and
c. Activities for enhancing the institutional capacities of agencies, offices, and civil society groups, especially in the consultation and monitoring processes.

TASK 5

(i) Describe the methodology used for valuing losses, or damages, for the purpose of determining their replacement costs and provide a description of the proposed types and levels of compensation consistent with national and local laws and measures, as necessary, to ensure that these are based on acceptable values (e.g. market rates).

The consultant will do the following:

- ✓ Establish criteria for determining the resettlement eligibility of affected households: Eligibility criteria must be advantageous to women and other vulnerable groups, including those without legal title to assets. The eligibility criteria will be disclosed to affected communities and other project stakeholders as part of task 5. Feedback from the disclosure process will be used in the delivery of compensation and or livelihood restoration.
- ✓ Prepare an entitlements matrix listing all likely impacts. It will identify
    - o all categories of affected persons,
    - o all types of loss associated with each category, and
    - o all types of compensation and assistance to which each category is entitled.
- ✓ Prepare standards for compensation and livelihood restoration: Prepare a formula for setting full replacement costs for assets lost, including land. Establish options for culturally acceptable replacements for lost services, cultural sites, common property, or access to resources for subsistence, income, or cultural activities.
- ✓ Prepare options for relocation and income restoration: These will build on the existing social, economic, and cultural parameters both of displaced persons and of host communities. Provide for relocation costs, lost income, and income support during transition. Where appropriate, prepare relocation plans including selection and preparation of relocation sites. Make provisions for landownership, tenure and transfer, and access to resources.
- ✓ Where incomes must be restored, provide for needs assessment, employment generation, and credit disbursement: Where affected persons are to change their occupation, provide for training and vocational support mechanisms. Review the likely environmental impact of the resettlement process and build in plans to mitigate any adverse environmental effects.
- ✓ Make special provision for vulnerable groups

(ii) Describe the compensation and other resettlement measures that will assist each category of eligible PAPs to achieve the resettlement objectives. Beyond compensation, these measures should include programs for livelihood restoration, grievance mechanisms, consultations, and disclosure of information.

TASK 6

(i) Conduct stakeholder's consultation consistent with the World Bank's policy on consultation and disclosure, a strategy for consultation with, and participation of, PAPs and host communities on resettlement issues being addressed in the RAP. The consultations should cover all required resettlement measures, including:

a. Arrangements for prompt tendering of any payment due the hosts for land or other assets provided to PAPs;
b. Conflict resolution involving PAPs and other stakeholders; and
c. Livelihood restoration and any additional services for promotion of socio-economic resilience of PAPs.

(ii) A Public Consultation and Disclosure Plan must be prepared and submitted for approval by the consultant along with the Inception Report.

(iii) All consultations conducted during the preparatory process must be attended by the representative of the client and means of verification (MOVs) must be submitted along with the draft report

(iv) In line with bank's policy on consultation, separate consultations must be carried out with women in safe spaces.

(i) The final RAP report should include:

a. Description of the strategy for consultation with and participation of PAPs and hosts in the design and implementation of resettlement activities;
b. Summary of the consultations and how PAPs' views were taken into account in preparing the resettlement plan; and
c. Review of resettlement alternatives presented and the choices made by PAPs regarding options available to them, including choices related to forms of compensation and resettlement assistance, to relocating as individual families or as parts of pre-existing communities or kinship groups, to sustaining existing patterns of group organization, and to retaining access to cultural property (e.g. places of worship, pilgrimage centers, cemeteries); and
d. Arrangements on how PAPs can communicate their concerns to project authorities throughout planning and implementation, and measures to ensure that vulnerable groups (including indigenous peoples, ethnic minorities, landless, children and youth, and women) are adequately represented.

TASK 7

(I) Establish Grievance Redress procedures which should provide mechanisms for ensuring that an affordable and accessible procedure is in place for third-party settlement of disputes arising from resettlement. These mechanisms should take into account the availability of judicial and legal services, as well as community and traditional dispute settlement mechanisms (*Reference should be made to the 4MB Project's Grievance Redress Mechanism guidelines).*

TASK 8

(i) Define RAP implementation responsibilities of various agencies, offices, and local representatives. These responsibilities should cover

a. delivery of RAP compensation and rehabilitation measures and provision of services;
b. appropriate coordination between agencies and jurisdictions involved in RAP implementation; and

c. measures (including technical assistance) needed to strengthen the implementing agencies' capacities of responsibility for managing facilities and services provided under the project and for transferring to PAPs some responsibilities related to RAP components (e.g. community-based livelihood restoration; participatory monitoring; etc).

(ii) Develop an implementation schedule covering all RAP activities from preparation, implementation, and monitoring and evaluation should be included. These should identify the target dates for delivery of benefits PAPs and a clearly defined closing date. The schedule should indicate how the RAP activities are linked to the implementation of the overall project.

(iii) Develop estimate of costs the RAP which should provide detailed (itemized) cost estimates for all RAP activities, including allowances for inflation, population growth, and other contingencies; timetable for expenditures; sources of funds; and arrangements for timely flow of funds. These should include other fiduciary arrangements consistent with the rest of the project governing financial management and procurement.

TASK 9

(i) Propose arrangements for monitoring of RAP activities by the implementing agency, and the independent monitoring of these activities, should be included in the RAP section on monitoring and evaluation. The final evaluation should be done by an independent monitor or agency to measure RAP outcomes and impacts on PAPs' livelihood and living conditions. The RPF has examples of performance monitoring indicators to measure inputs, outputs, and outcomes for RAP activities; involvement of PAPS in the monitoring process; evaluation of the impact of RAP activities over a reasonable period after resettlement and compensation, and using the results of RAP impact monitoring to guide subsequent implementation.

To guide the deliverables described above, Annex C provides a sample outline of a typical RAP report. Annex D also gives a template/sample for summarizing PAPs' consultations.

Annex A

Contents of the Environmental & Social Impact Assessment (ESIA) Report

ANNEX A: CONTENTS OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

The contents of the ESIA Report will include but not be limited to the following. It shall be noted that the presentation of the Report may be adapted pending on the nature and specific requirements of the proposed 4MB Project and structure.

1.0 Executive Summary

This section shall present in a non-technical language a concise summary of the ESIA Report with a particular attention on the processes and procedures used; baseline conditions; the alternatives considered; mitigation/enhancement measures; monitoring program; consultations

with stakeholders; capabilities of environmental and social units and actions to strengthen those capacities; and cost implications. This Executive Summary shall be written in English and a local language, if necessary, for public consultations.

1.1 Introduction

The Introduction shall indicate the purpose of the ESIA, present an overview of the proposed project to be assessed, as well as the project's purpose and needs. This section identifies the project sponsor and the consultant assigned to carry out the ESIA. It shall also briefly mention the contents of the ESIA Report and the methods adopted to complete the assessment.

1.2 Policy, Legal and Administrative Framework

This chapter concerns the policy, legal and administrative framework within which the ESIA is carried out. It presents the relevant environmental and social policies of the Bank as well as the national and state legal requirements and related constraints (e.g. practices that may discriminate or exclude any stakeholder group) relevant to the project. It provides information on the environmental requirements of any co-financiers, and identifies relevant international environmental/social agreements to which the country is a signatory.

1.3 Project Description and Justification

The first part of this chapter shall describe the proposed project and its geographic location, ecological, social, economic and temporal context: project location, various project components, capacity, construction activities, facilities, staffing, working conditions, availability and source of raw materials, schedule of works, and offsite investments that may be required.

This section shall determine and characterise the anticipated liquid, solid and gaseous discharges from the processes, as well as the sources of nuisance such as noise, odours, visual nuisances, etc. It shall indicate the need for any resettlement plan or vulnerable group's development plan. It shall at least include a map showing the project location and area of influence.

The project justification shall examine the economic, environmental and social perspectives. It shall also justify these interventions by looking at the Need for the project, the value of the project, and benefits expected from the project.

Overall the description and justification of the project shall cover at least the following elements:

- Project Location
- Spatial requirements (sites required for works).
- Project layout characteristics (including site location map).
- Natural and human resources requirements.
- Temporary (during construction) and permanent infrastructures.

- Existing and proposed location of human settlements and public services such as health centres and accident and emergency units.
- Construction activities (land clearing, burning, excavation, blasting, extracting, filling, compacting, waterways crossing, use of heavy machinery, etc.).
- Anticipated liquid, solid (including waste) and gaseous emissions, and sources of nuisances (at construction and operation stages).
- Construction schedules and costs.
- Maintenance works and associated costs.

1.4 Description of the Project Environment

This chapter shall first define the spatial boundaries and limits of the study area, usually referred to as Area of Potential Project Influence (APPI), and including clearly defined buffer zones, in order to encompass all project direct and indirect impacts. The description and analysis of the physical, biological and human conditions shall address relevant environmental and social issues within this area, including any changes anticipated before project implementation.

Within the social environment, key issues that shall be considered include population characteristics and trends, revenue disparities, gender issues, health problems, prevalent economic activities, natural resource access and ownership, land use patterns and civil society organisation level. Community safety with respect to the infrastructural works and issues associated with Child labour, labour influx into communities. The ESIA will assess issues associated with Child labour, Gender Based Violence/ Sexual Exploitation.

Land issues, possible displacement, impact of economic displacement.

Carrying out a study of the possible effects of the project on historical/archaeological sites, heritage/artifacts, native religious or harvest sites, shrines, graveyards of the affected communities and mechanism for handling chance finds.

It shall also address the interrelations between the environmental and social components and the importance (value) that the society and local populations attach to these components, in order to identify the environmental and social components of high value or presenting a particular interest. A particular attention shall be given to the rare, threatened, sensitive or valorised environmental and social components.

The information presented shall be relevant to decisions about project location, design, operations as well as environmental and social management. Maps, figures and tables shall be included in this chapter to better illustrate the various environmental and social components.

1.5 Project Options and Alternatives

This part of the ESIA Report consists an analysis of the various feasible Options and alternatives to the project. Options will typically include the No Project option, delay project,

or go ahead as planned, while the alternatives will consider possible design modifications, or change in location of the planned activities as well as a change in the technology to be used for project implementation including the "without project" option. It shall also present an overview of the expected sustainability of the project activities from the perspectives of technical, economic, environmental and social criteria, as well as of public views and concerns.

1.6 Potential Environmental and Social Impacts and Mitigation/Enhancement Measures

This chapter shall present a detailed analysis of beneficial and adverse impacts of various components of the selected project alternative on the physical, biological and human (social, cultural and economic) environments. The methodology of assessment, based on a rigorous scientific method, shall be first presented. Then all environmental and social, direct and indirect, short and long-term, temporary and permanent impacts shall be described and assessed, indicating their importance level and their probability of occurrence. The importance level may be assessed on the basis of the nature, extent, intensity and duration of the impact, as well as on the sensitivity of the potentially affected environmental and social components and perceptions of the public. Irreversible or unavoidable impacts shall be clearly identified. Cumulative effects shall also be addressed taking into account other projects or actions planned in the study area.

Appropriate mitigation measures shall be identified to prevent, minimise, mitigate or compensate for adverse environmental and/or social impacts. Moreover, enhancement measures shall be developed in order to improve project environmental and social performance. Roles and responsibilities to implement measures shall be clearly defined. The cost of the measures shall be estimated, including the cost for environmental and social capacity building and gender mainstreaming, Residual impacts after mitigation shall be presented.

1.7 Environmental Hazard Management

Whenever relevant, this chapter shall describe the security measures and propose a preliminary contingency plan for the construction and operation phases of the project (possible contingency situations, major actions to properly react to accidents, responsibilities and means of communications).

For projects that may cause major technological accidents whose consequences may exceed the project site, the ESIA shall include an analysis of the technological accident risk: identification of hazard and potential consequences, estimation of the consequences' magnitude and frequency, and risk estimation and evaluation.

1.8 Environmental and Social Management Plan

This section will present the environmental and social impacts, mitigation measures, monitoring indicators, institutional responsibilities and costs associated with implementation of these measures based on proposed project activities. The general and specific environmental

and social management requirements shall be clearly elucidated. Among others, these shall include mitigation measures for dust control, noise and gaseous emissions control, health and safety, labour influx management plans, HIV/AIDS Advocacy and management, Management of Gender Based Violence and Sexual Exploitation and Abuse. It shall also describe the requirements for environmental monitoring, including surveillance measures aiming at ensuring that the proposed mitigation and enhancement measures are effectively implemented during the implementation phase, environmental and social monitoring activities designed to measure and evaluate the project impacts on some key environmental and social components of concern and to implement remedial measures, frequency of monitoring. Indicators, roles and responsibilities shall be clearly defined. A capacity building plan will be developed to enable the effective implementation of the measures outlined in the ESMP table and the ESIA report. The cost of the program shall be estimated, including the cost for capacity building.

1.9 Public Consultations

This chapter shall summarise the actions undertaken in the identification and analysis of stakeholders including: PAPs, interested parties, vulnerable persons/groups, Civil Society Organisations, NGOs, etc. The consultation will require providing information about the proposed project to the stakeholders and obtaining feedback on their views and suggestions. Information garnered will be documented in the ESIA Report.

1.10 Summary and Recommendations

The summary and recommendations shall specify the environmental and social acceptability of the project, taking into account the impacts and measures identified during the assessment process. It shall also identify any other condition or external requirement for ensuring the success of the project.

2.0 Annexes

- Summary of World Bank Safeguard Policies
- List of the professionals and organisations having contributed to the preparation of the ESIA Report.
- List of consulted documents, including project-related reports.
- Baseline data referred to in the Report.
- Record of consultation meetings with primary and secondary stakeholders.
- General Environmental Management Conditions for Constructions/Civil Works.
- Relevant site-specific plans developed
    - References

The Environmental and Social Impact Assessment which includes a detailed ESMP shall include, but not limited to the following:

- Cover page
- Table of Contents
- List of Tables
- List of Figures

- List of Acronyms and their definitions
- Executive Summary
- **Chapter 1:** Introduction
  - Background
  - Objectives and Justification of the Proposed Project
- **Chapter 2:** Policy, legal, institutional and administrative framework
- **Chapter 3**: Description of the Proposed Project
- **Chapter 4**: Description of Project Environment and Baseline Studies
- **Chapter 5:** Analysis of Project Alternatives
- **Chapter 6**: Identification of Potential environmental and social impacts and Mitigation Measures
- **Chapter 7 :** Environnemental & Social Management Plan (ESMP) includng:
  - Discussion of the potential adverse environmental and social impacts of the proposed project
  - Proposed mitigation measures and institutional responsibilities for Implementation including cost estimates;
  - Environmental and Social Monitoring programs and instructional responsibilities for implementation including cost estimates;
  - Capacity Building Plan
  - Implementation schedule of project activities
  - Contractual measures
  - Indicative budget for ESIA implementation
  - ESIA disclosure
- **Chapter 8:** Preparation of an Environmental & Social Monitoring Programme.
- **Chapter 9**: Public/ Stakeholder Consultations
- **Chapter 10:** Grievance Redress Mechanism (GRM)
- **Chapter 11:** Recommendations
- **References**
- **Annexes**
  - Annex 1: Terms of Reference
  - Annex 2: Summary of World Bank safeguards policies
  - Annex 3: Records of Stakeholder Consultations and List of Persons met including photos
  - Annex 4 : General Environnemental Management Conditions Construction Contractes
  - Annex 5: Occupational Health and Safety (OHS) Plan
  - Annex 6: Sample of Questionnaire for socio-economics
  - Annex 7: Waste Management Plan
  - Annex 8: Traffic Management Plan
  - Annex 9: Environmental and Social Performance Monitoring Checklist
  - Annex 10: Labour influx management plan
  - Description of the GBV risk (including a GBV Action Plan), and more bRoadly the ESHS expectations, and include appropriate mitigation measures. The basis of the GBV Action Plan should be provided as part of the ESMP.[5]

[5]The GBV Action Plan needs to include specific **arrangements** for the project by which GBV risks will be addressed. This includes considerations such as: a) Awareness Raising Strategy, which describes how workers and local communities will be sensitized to GBV risks, and the worker's responsibilities under the Code of Conduct (CoC); b)GBV Services Providers to which GBV survivors will be referred, and the services which will be available; and, c) GBV **Allegation Procedures:** How the project will provide information to employees and the community on how to report cases of GBV CoC breaches to the GRM.

Annex B

Contents of the Environmental & Social Management Plan (ESMP)

ANNEX B: CONTENT OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP report will include but not limited to the following topics:

1.1 Preliminary pages

Cover page

Table of contents

List of acronyms and their definitions

Executive Summary

1.2 Chapter 1: Introduction

8. Description of the proposed intervention

9. Rationale for ESMP

10. Study methodology employed

11. Relevant Maps

1.3 Chapter 2: Project Description and Justification

12. Description of the Planned Interventions, including project location, construction details and work schedules

13. Provide justification for the project

14. Analysis of alternatives

1.4 Chapter 3: Institutional and Legal Framework

15. Summary of relevant state and federal policies, legal, regulatory, and administrative frameworks

16. World Bank safeguard policies triggered by the project and the proposed activities

17. Relevant international treaties and agreements including those relating to ILOlabour conventions, etc., which Nigeria is signatory to.

1.5 Chapter 4: Biophysical Environment and Socio-Economic Characteristics

18. Description of the area of influence and environmental and social baseline conditions

19. Analysis of existing livelihoods opportunities, income, gender characteristics (including country and state diagnostics on GBV), age profile, health, transport access, waste management practices, existing community structures, land use and economic activities in the communities, etc.

1.6 Chapter 5: Assessment of Potential Beneficial and Adverse Environmental and Social Impacts

20. Methods and techniques used in assessing and analyzing the environmental and social impacts of the proposed project

21. Discussion of the potentially significant beneficial and adverse environmental and social impacts of the proposed project.

1.7 Chapter 6: Environmental and Social Management Plan (ESMP), including:

22. Discussion of potential adverse environmental and social impacts of the proposed sub-projects

23. Discussion of the proposed mitigation measures, describing technical details, each mitigation measure, type of impact and conditions under which it is required with designs, equipment descriptions and operating procedures; The estimation of any residual environmental and social impacts should be discussed with mitigation measures consistent with other mitigation plans required for the project (Such as mitigation measures suggested for RAP) according to the ESS1 Annex 1 ;

24. Highlight and define the roles, responsibilities and institutional arrangements for the implementation of the ESMP (these are fundamental to the effective implementation of the environmental and social safeguard measures);

25. Institutional roles and responsibilities for monitoring and implementation of mitigation;

26. Present in a tabular format, the potential adverse impacts associated with proposed sub-project activities (in phases- pre-rehabilitation, rehabilitation and operation), mitigation measures, monitoring indicators, responsibilities, costs for mitigation and monitoring;

27. Inclusion of mitigation measures to address GBV issues (in alignment with the GBV Framework for the project), child labour, risks associated with labour influx, etc., in the ESMP table;

28. Monitoring and evaluation plan, including suitable indicators with specific description, technical details of monitoring measures, parameters to be measured, method to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions; a monitoring and reporting procedures ensuring early detection of conditions that necessitate particular mitigation measures, and providing information on the progress and results of mitigation;

29. ESMP Training requirements and Capacity Building Plan;
30. Along with the ESIA and ESMP, the project should prepare the Environmental and Social Commitment Plan (ESCP) in accordance with the Annex 2 of ESS1.

1.8 Chapter 7: Consultation with Stakeholders

31. This chapter shall summarize the actions undertaken to identify and consult with the stakeholders (Project-Affected Persons (PAPs), other interested parties as well as identified vulnerable persons and groups, NGOs, Civil Society Organizations).
32. Meetings and discussions must be documented and should show how issues and problems raised are or will be resolved.
33. The detailed minute of the consultation meetings shall be presented in annex to the ESMP.

1.9 Chapter 8: Grievance Redress Mechanism (GRM)

34. Description of grievance redress mechanism to address situations of conflicts or disagreements about project activities

1.9 Chapter 9: Summary and Recommendations

2.0 Annexes

Annex 1: List of site contact.

Annex 2: Summary of World Bank Safeguard Policies

Annex 3: General Environnemental Management Conditions for Constructions/Civil Works.

Annex 4: References

Annex 5: Photos

Annex C

Sample Outline of a Resettlement Action Plan (RAP)

Annex C: Sample outline of a Resettlement Action Plan (RAP)

The scope of requirements and level of detail of the resettlement plan vary with the magnitude and complexity of resettlement. The plan is based on up-to-date and reliable information about (a) the proposed project and its potential impacts on the displaced persons and other adversely affected groups, (b) appropriate and feasible mitigation measures, and (c) the legal and institutional arrangements required for effective implementation of resettlement measures.

Minimum Elements of a Resettlement Plan

1. **Description of the project.** General description of the project and identification of the project area.

2. **Potential impacts.** Identification of: (a) the project components or activities that give rise to displacement, explaining why the selected land must be acquired for use within the

timeframe of the project; (b) the zone of impact of such components or activities; (c) the scope and scale of land acquisition and impacts on structures and other fixed assets; (d) any project-imposed restrictions on use of, or access to, land or natural resources; (e) alternatives considered to avoid or minimize displacement and why those were rejected; and (f) the mechanisms established to minimize displacement, to the extent possible, during project implementation.

3. **Objectives**. The main objectives of the resettlement program.

4. **Census survey and baseline socio-economic studies.** The findings of a household-level census identifying and enumerating affected persons, and, with the involvement of affected persons, surveying land, structures and other fixed assets to be affected by the project. The census survey also serves other essential functions: (a) identifying characteristics of displaced households, including a description of production systems, labor, and household organization; and baseline information on livelihoods (including, as relevant, production levels and income derived from both formal and informal economic activities) and standards of living (including health status) of the displaced population; (b) information on vulnerable groups or persons for whom special provisions may have to be made; (c) identifying public or community infrastructure, property or services that may be affected; (d) providing a basis for the design of, and budgeting for, the resettlement program; (e) in conjunction with establishment of a cut-off date, providing a basis for excluding ineligible people from compensation and resettlement assistance; and (f) establishing baseline conditions for monitoring and evaluation purposes. (g) As the Bank may deem relevant, additional studies on the following subjects may be required to supplement or inform the census survey: (h) land tenure and transfer systems, including an inventory of common property natural resources from which people derive their livelihoods and sustenance, non-title-based usufruct systems (including fishing, grazing, or use of forest areas) governed by local recognized land allocation mechanisms, and any issues raised by different tenure systems in the project area; (i) the patterns of social interaction in the affected communities, including social networks and social support systems, and how they will be affected by the project; and (j) social and cultural characteristics of displaced communities, including a description of formal and informal institutions (e.g., community organizations, ritual groups, nongovernmental organizations (NGOs)) that may be relevant to the consultation strategy and to designing and implementing the resettlement activities.

5. **Legal framework.** The findings of an analysis of the legal framework, covering (a) the scope of the power of compulsory acquisition and imposition of land use restriction and the nature of compensation associated with it, in terms of both the valuation methodology and the timing of payment; (b) the applicable legal and administrative procedures, including a description of the remedies available to displaced persons in the judicial process and the normal timeframe for such procedures, and any available grievance redress mechanisms that may be relevant to the project; (c) laws and regulations relating to the agencies responsible for implementing resettlement activities; and (d) gaps, if any, between local laws and practices covering compulsory acquisition, imposition of land use restrictions and provision of resettlement measures and ESS 5, and the mechanisms to bridge such gaps.

6. **Institutional Framework**. The findings of an analysis of the institutional framework covering (a) the identification of agencies responsible for resettlement activities and NGOs/CSOs that may have a role in project implementation, including providing support for

displaced persons; (b) an assessment of the institutional capacity of such agencies and NGOs/CSOs; and (c) any steps that are proposed to enhance the institutional capacity of agencies and NGOs/CSOs responsible for resettlement implementation.

7**. Eligibility**. Definition of displaced persons and criteria for determining their eligibility for compensation and other resettlement assistance, including relevant cut-off dates.

8. **Valuation of and compensation for losses.** The methodology to be used in valuing losses to determine their replacement cost; and a description of the proposed types and levels of compensation for land, natural resources and other assets under local law and such supplementary measures as are necessary to achieve replacement cost for them.

9. **Community participation.** Involvement of displaced persons (including host communities, where relevant) (a) a description of the strategy for consultation with, and participation of, displaced persons in the design and implementation of the resettlement activities; (b) a summary of the views expressed and how these views were taken into account in preparing the resettlement plan; (c) a review of the resettlement alternatives presented and the choices made by displaced persons regarding options available to them; and (d) institutionalized arrangements by which displaced people can communicate their concerns to project authorities throughout planning and implementation, and measures to ensure that such vulnerable groups as indigenous people, ethnic minorities, the landless, and women are adequately represented.

10. **Implementation schedule**. An implementation schedule providing anticipated dates for displacement, and estimated initiation and completion dates for all resettlement plan activities. The schedule should indicate how the resettlement activities are linked to the implementation of the overall project.

11. **Costs and budget**. Tables showing categorized cost estimates for all resettlement activities, including allowances for inflation, population growth, and other contingencies; timetables for expenditures; sources of funds; and arrangements for timely flow of funds, and funding for resettlement, if any, in areas outside the jurisdiction of the implementing agencies.

12. **Grievance redress mechanism**. The plan describes affordable and accessible procedures for third-party settlement of disputes arising from displacement or resettlement; such grievance mechanisms should take into account the availability of judicial recourse and community and traditional dispute settlement mechanisms.

13. **Monitoring and evaluation.** Arrangements for monitoring of displacement and resettlement activities by the implementing agency, supplemented by third-party monitors as considered appropriate by the Bank, to ensure complete and objective information; performance monitoring indicators to measure inputs, outputs, and outcomes for resettlement activities; involvement of the displaced persons in the monitoring process; evaluation of results for a reasonable period after all resettlement activities have been completed; using the results of resettlement monitoring to guide subsequent implementation.

14. **Arrangements for adaptive management**. The plan should include provisions for adapting resettlement implementation in response to unanticipated changes in project conditions, or unanticipated obstacles to achieving satisfactory resettlement outcomes.

Additional Planning Requirements where Resettlement involves Physical Displacement

15. When project circumstances require the physical relocation of residents (such as internally displaced persons (IDP), resettlement plans require additional information and planning elements. Additional requirements include:

16. **Transitional assistance.** The plan describes assistance to be provided for relocation of household members and their possessions (or business equipment and inventory where applicable). The plan describes any additional assistance to be provided for households choosing cash compensation and securing their own replacement housing, including construction of new housing. If planned relocation sites (for residences or businesses) are not ready for occupancy at the time of physical displacement, the plan establishes a transitional allowance sufficient to meet temporary rental expenses and other costs until occupancy is available.

17. **Site selection, site preparation, and relocation.** When planned relocation sites are to be prepared, the resettlement plan describes the alternative relocation sites considered and explains sites selected, covering (a) institutional and technical arrangements for identifying and preparing relocation sites, whether rural or urban, for which a combination of productive potential, locational advantages, and other factors is better or at least comparable to the advantages of the old sites, with an estimate of the time needed to acquire and transfer land and ancillary resources; (b) identification and consideration of opportunities to improve local living standards by supplemental investment (or through establishment of project benefit-sharing arrangements) in infrastructure, facilities or services; (c) any measures necessary to prevent land speculation or influx of ineligible persons at the selected sites; (d) procedures for physical relocation under the project, including timetables for site preparation and transfer; and (e) legal arrangements for regularizing tenure and transferring titles to those resettled, including provision of security of tenure for those previously lacking full legal rights to land or structures.

18. **Housing, infrastructure, and social services.** Plans to provide (or to finance local community provision of) housing, infrastructure (e.g., water supply, feeder Roads), and social services (e.g., schools, health services); plans to maintain or provide a comparable level of services to host populations; any necessary site development, engineering, and architectural designs for these facilities.

19. **Environmental protection and management.** A description of the boundaries of the planned relocation sites; and an assessment of the environmental impacts of the proposed resettlement and measures to mitigate and manage these impacts (coordinated as appropriate with the environmental assessment of the main investment requiring the resettlement).

20. **Consultation on relocation arrangements.** The plan describes methods of consultation with physically displaced persons on their preferences regarding relocation alternatives available to them, including, as relevant, choices related to forms of compensation and transitional assistance, to relocating as individual households families or with pre-existing communities or kinship groups, to sustaining existing patterns of group organization, and for relocation of, or retaining access to, cultural property (e.g. places of worship, pilgrimage centers, cemeteries).

21. **Integration with host populations.** Measures to mitigate the impact of planned relocation sites on any host communities, including (a) consultations with host communities and local governments; (b) arrangements for prompt tendering of any payment due the hosts for land or

other assets provided in support of planned relocation sites; (c) arrangements for identifying and addressing any conflict that may arise between those resettled and host communities; and (d) any measures necessary to augment services (e.g., education, water, health, and production services) in host communities to meet increased demands upon them, or to make them at least comparable to services available within planned relocation sites.

22**. If land acquisition or restrictions on use of, or access to, land or natural resources may cause significant economic displacement, arrangements to provide displaced persons with sufficient opportunity to improve, or at least restore, their livelihoods are also incorporated into the resettlement plan, or into a separate livelihood's improvement plan. These include:**

23. **Direct land replacement**. For those with agricultural livelihoods, the resettlement plan provides for an option to receive replacement land of equivalent productive value or demonstrates that sufficient land of equivalent value is unavailable. Where replacement land is available, the plan describes methods and timing for its allocation to displaced persons. 26. Loss of access to land or resources. For those whose livelihood is affected by loss of land or resource use or access, including common property resources, the resettlement plan describes means to obtain substitutes or alternative resources, or otherwise provides support for alternative livelihoods.

24. **Support for alternative livelihoods**. For all other categories of economically displaced persons, the resettlement plan describes feasible arrangements for obtaining employment or for establishing a business, including provision of relevant supplemental assistance including skills training, credit, licenses or permits, or specialized equipment. As warranted, livelihood planning provides special assistance to women, minorities or vulnerable groups who may be disadvantaged in securing alternative livelihoods.

25. **Consideration of economic development opportunities**. The resettlement plan identifies and assesses any feasible opportunities to promote improved livelihoods as a result of resettlement processes. This may include, for example, preferential project employment arrangements, support for development of specialized products or markets, preferential commercial zoning and trading arrangements, or other measures. Where relevant, the plan should also assess the feasibility of prospects for financial distributions to communities, or directly to displaced persons, through establishment of project-based benefit-sharing arrangements.

26. **Transitional support.** The resettlement plan provides transitional support to those whose livelihoods will be disrupted. This may include payment for lost crops and lost natural resources, payment of lost profits for businesses, or payment of lost wages for employees affected by business relocation. The plan provides that the transitional support continues for the duration of the transition period.

Annex D: Sample Table and Contents of Consultation Activity Summary

Location and Communities Represented	**Meeting Dates**	**Attendees**	**Discussion Summary**
Example:			

Sample Contents: Public Consultation and Disclosure Plan (PCDP)
Introduction

Project Description

Applicable Laws, Regulations and Policies to Public Engagement

Stakeholder Analysis

Areas of Influence/Stakeholders

Description of Stakeholders

Stakeholder Engagement

Previous Public and Agency Consultations

Community Engagement Activities

Community Engagement Activities

Phase 1 - Initial Stakeholder Consultation

Phase 2 Release of the RAP Terms of Reference and Draft PCDP

Phase 3 - Release of RAP Consultation Summary Report

Summary of Key Issues

Future Consultation Events

Phase 4 - Release of the RAP Report and Action Plans

Phase 5 - Planning Consultation

Phase 6: Ongoing Project Communication

Disclosure Plan

Suggested Samples of Tables

- Consultation Activity Summary
- Summary of Previous Key Issues
- Initial Government Agency Consultations
- Summary of Phase 1 NGO Meetings
- Summary of Community Discussions
- Summary of Issues from Community Meetings
- Key Issues/Actions from Community Meetings
- Summary of Key Issues and Responses
- Summary of Future (Phase 4) Consultation Activities per Stakeholder Group
- Summary of Previous Consultation Activities
- Consultation Materials

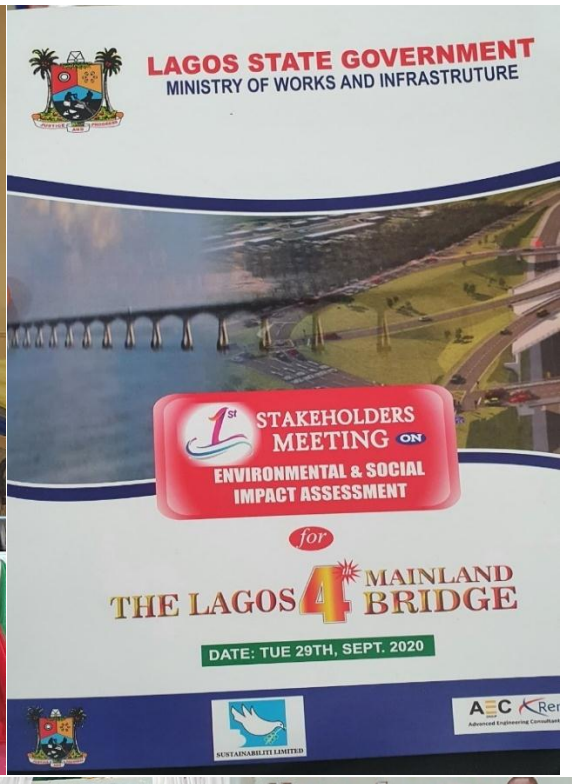
Grievance Redress Mechanism/Complaints form

Annex 2 Summary of World Bank Safeguard Triggered for this Project

- Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Environmental and Social Standard 2: Labor and Working Conditions;
- Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management;
- Environmental and Social Standard 4: Community Health and Safety;
- Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
- Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Environmental and Social Standard 8: Cultural Heritage; and
- Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure.

Annex 3 Records of Stakeholder Consultations and photos

APPENDIX 1: PICTURES FROM THE 1st STAKEHOLDERS CONSULTATION ON THE 4MB ESIA AND RAP STUDIES, 29TH SEPTEMBER 2020



The ESIA and RAP Studies Team with MOWI Officials

APPENDIX 2: Minutes and Photographs from Community-based Stakeholders Engagement and Consultations held at Abraham Adesanya Estate Lekki-Ajah Lagos State on 16th November 2020

- Arrival of Community Stakeholders, Project Team and Government Officials at 12:20pm
- The meeting commenced at 12:40pm. The spokesperson Mrs Adelana called and introduced members of the high table. The representatives of all the communities were called to the high table.
- The Opening prayer was done by Mrs Selena Mao
- The Opening speech was rendered by Mrs Adelana
- The welcoming speech was given by Mr Raheem Owokoniran
- Project introduction and description was done by Mr Babatola Johnson (AEC)

The Questions, Comment and Concerns of the community as well as the responses from the Project Engineer (Engr. Ajanaku Tokunbo) are highlighted in the table below

	Questions, Comments and Concerns	Responses
1	Mr Ejiofo asked for the duration / timeline of the project and if alternate routes will be provided. He also expressed his concern on what measures are being put in place to manage traffic.	Engr Tokunbo Ajanaku addressed the issues raised on time management and assured the people that the project will be completed within the stipulated time. He also assured the stakeholders that traffic managements experts will be employed to tackle the issue of traffic so as to make the projects easier for the people
2	Mr Osas asked about the exact routes the project is going to pass through and he also commended the efforts of the government and he also raised a concern about the issue of flooding and pleaded with government to look into it.	The project has drainage channel with the Road which will manage the flooding issues.
3	Mr Yekini expressed his concerns about previous projects being done by the government not being completed within the stipulated time and asked if the fourth mainland bridge will be different.	Engr Tokunbo promised that the project will be completed within the stipulated period
4	Designs of the proposed project not being available to the populace and he advised the designs should be made easily accessible to the people so as to get a better understanding of the project.	Projects designs will be available and easily accessible to all
5	The issue of Bio-diversity and asked what plans are being put in place so the proposed project doesn't affect the natural habitat.	Measures are being put in place to protect our natural habitats.
6	Information about the houses that will be destroyed.	The information will be provided when available.

Vote of thanks was given by Dr Kayode Oluwagbuyi. He assured the stakeholders that there'll be toll free line where people can call and vital information would be given.

Closing prayer was given by Mrs Selena Mao at 2:05pm.

APPENDIX 3: Minutes and Photographs from Community-based Stakeholders Engagement and Consultations held at Stakeholders Consultation at Power line Addo Road (Okera Nla)

- The meeting commenced at 2:40pm. The spoke person Mrs Adelana called and introduced members of the high table. The representatives of all the communities were called to the high table.
- The Opening prayer was done by Alhaja Titilope
- The Opening speech was rendered by Mrs Adelana
- The welcoming speech was given by Mr Raheem Owokoniran
- Project introduction and description was done by Mr Tola Johnson (AEC)

The Questions, Comment and Concerns of the community as well as the responses from the Project Engineer (Engr. Ajanaku Tokunbo) are highlighted in the table below.

	Questions, Comments and Concerns	Responses
1	Mr Olarewaju asked if houses were to be demolished will there be compensation for people who do not have their C of O	Yes, people affected will be compensated
2	Alhaji Abdulateef raised the issue of traffic management; how will traffic be managed because the area already experiences terrible traffic	Experts will be employed to tackle the issue of traffic
3	Will the project benefit the people of the community and advised that the people of the community should be employed when the project commences	Indigenes will be employed when construction begins and noted that no child labour will be tolerated.
4	The issue of insecurities in the community with the latest issue of a bullion van that was robbed along the Ajah Road.	He urged the people that they and the government will have to work together to solve the issue of insecurity as much as the project opens up the community to security threats.
5	Captain Lawal (retired) raised an issue about a previous project the government did and abandoned mid-point which left some part of their properties destroyed without any form of compensation from the LASG.	Assured the people that the project will be completed within the given time and all issues pertaining to compensation will be addressed in the RAP.
6	Mrs Lanre complained about the traffic congestion in ajah and hoped the government will find a solution to quickly ease the traffic issue.	Traffic managers will be employed to tackle the issue of traffic.

Closing remarks by Mr Akim Adeniji
Vote of thanks by Dr Kayode Oluwagbuyi
Closing prayer by Mrs Lanre By 4:35pm




APPENDIX 4: Minutes and Photographs from Community-based Stakeholders Engagement and Consultations held at IGBOGBO

The meeting was held at the palace of the King (AAfin Adegboruwa Igbogbo).

- The meeting commenced with an opening prayer by the representative of the Chief Imam by 1:23pm.
- This was followed immediately by the speech from the senior special assistant to the Governor on works and infrastructure (Mr. Rauf Owokoniran) Highlight of the speech is as follows:
  - Lagos State Government is committed to infrastructural development in the state as this is evident with the various construction works going on the state and particularly in Ikorodu.
  - The purpose of this meeting is to seek help, cooperation and participation for the proposed Fourth mainland Bridge project.
- Project introduction and description done by Mr Tola Johnson (AEC), Highlights are as follow:
  - No demolition of houses within that region as the preferred emerging horizontal route alignment have taken advantage of the swamp / Wetland to avoid demolition of structures

The Questions, Comment and Concerns of the community as well as the responses from Engr. Ajanaku Tokunbo are highlighted in the table below

	Questions, Comments and Concerns	Responses
1.	Elder Oniteri : • Will there be infrastructure on the CBD Igbogbo like we have in other places?	Yes, CBD are interventions to promote the area and improve the socioeconomic status of area.
2.	There is perennial flooding problem in Igbe. Would the 4MB Project solve this?	Igbe-Igbogbo Road and Ishawo Road and Alpha Bridge are to compliment the 4th Mainland Bridge, when they are all completed the problem of flooding will be solved.
3.	Will there be Toll Gate along the 4th Mainland Bridge?	Yes, every smart city in the world has tolled bridges. But this will be done in the best way and with proper stakeholders' engagement.
4.	Alhaji Tajudeen from Bayegun: Maps should be distributed and contact address for further enquires	Every necessary information shall be provided and in addition, there will be site specific consultations where communities can ask their questions and participate.
5.	They should compensate people whose houses would be demolished in Igbogbo and environs	The Government is working on compensation and this will be addressed in the RAP
6.	Will the setback affect the house?	With the existing status of the place it is not affecting houses in this axis, however, people should desist from selling land and building house in those places along the preferred emerging horizontal route alignment
7.	How will the project affect the poorest section of population?	The project has a lot of benefit which will improve the socio-economic status of the communities around the project area and open doors to various opportunities. This is not the only project going on in Lagos State, there are many other projects targeted to improving the livelihood of the citizens
8.	Rev Dr Odije: What is the duration of the project	On paper the construction period is 3 years
9.	Consideration for the employment of the indigenes in the project execution	Lagos State has always mandated every project in the state to Employ the indigene and this project will not be an exception

APPENDIX 5: Minutes and Photographs from Community-based Stakeholders Engagement and Consultations held at Jubilee Estate

- Opening Prayer by 3:56pm Mrs. Adelana
- Speech By SSG:
  - Awareness of the fourth mainland bridge
  - Solicit for support and corporation from the community
  - Input and contributions from the communities welcomed
- Engineer Iwayemi Olalekan (AEC) did the project description

Comments Concerns, Question and responses

	Comments Concerns and Question	Responses
1.	CDC Chairman Ikorodu North: Is there a solid arrangement for compensation in the event of demolition of houses on the corridor? How will the project affect LASPOTECH and what will be the compensation for them	Yes, there is plan for compensation and this will be addressed in the RAP
2.	Arch. Ajibade Adejumo: Master plan is taking significant part of their land as well as the railway station We expect a stakeholders' meeting on the Lagos State Poly with the Project Team to deliberate on the way forward	A special consultation we be made in the Lagos State Poly to collectively work out the best way to go about it.
3.	Biodun Sunday Ikorodu West CDC What about the Agric. - Ishawo Road where demolition in of houses took place in 2017, and there has been no compensation paid to the affected persons till date?	Agric Ishawo Road was awarded because it feeds into the 4th Mainland Bridge and work is in progress. Compensation may be delayed due to some verifications but it will be paid before project commencement.
4.	Eyita - Ijoko Road is 7.2 meters wide and it is not adequate to feed into the 4th Mainland Bridge.	The Road is sufficient and there is room for further expansion
5.	Apeka people are not informed about the stakeholders meeting, PAPs should be informed and how about compensation for the affected persons?	Consultation is in stages, we are still going to do site specific consultation for your community. Resettlement Action Plan is an integral part of the project and will address all issues on compensation
6.	Ibrahim Adewale Taiwo: What is the LASG doing to alleviate the problems at Epe Road in Ikorodu?	The Road is currently receiving attention Eleko – Epe Road project has been flagged off by the Governor.
7.	What is your advice to those who have properties along the project corridor?	They should be prepared and get there documents ready for verification as part of the requirements for compensation under the RAP.
8.	Will alternate route be made available during construction?	Yes, that is a must of every project of this nature
9.	What is the duration of the project?	3 years
10.	Let there be local engagement of workers	The project will engage the qualified indigene.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APPENDIX 6: Minutes and Photographs from Community-based Stakeholders Engagement and Consultations on 4th Mainland Bridge held at Journalist Estate, Arepo.

- Opening Prayer by 11:24am Mrs Funke Fadugba Chairperson Journalist Estate Resident Association
- Speech by SSG:
  - Purpose of the meeting explained
  - Solicit for support and corporation from the community
  - Input and contributions from the communities welcomed
  - Engineer Iwayemi Olalekan (AEC) did the project description

Comments Concerns, Question and responses

	Comments Concerns and Question	Responses
1.	How do you want to manage the existing flood issues with this new project?	The project has drainage channel with the Road which will manage the flooding issues.
2.	Mr Akinlolu from Arepo: There is no synergy between the Lagos and Ogun Government on this project which is evident by the absence of Ogun representatives in this meeting	Ogun state is carried along, We are working to synergize and hopefully from next meeting the will be well represented
3.	What are the measures in place to tackle the security issues that will likely accompany this project?	We will have to work together on the issue of security as much as the project opens up the community to security threats, the Project Team are also open to security threat within the community as the project progresses.
4.	What are the plans for the already sold land on the project corridors?	Virgin land will be affected by the project along this axis but this will be addressed in the RAP
5.	Akogun: Complained about the ineffective method of communication of this meeting?	Apologies, the meeting was rescheduled severely due to some internal reasons that was why we will do better next time.
6.	Mr Kehinde Adeyemo: Is the design cast in stone?	The design is opened to modification as consultation with the stakeholders progresses
7.	What is the plan to handle the increased traffic issues the project will bring considering the fact that there are existing traffic problems already?	Professional Traffic Management expertise we will be brought on board and it will also be managed together with the input from the communities
8.	Is the project a state project which of the states will handle the construction works at the Arepo axis?	The Project is Lagos State owned but in partnership with Ogun State.
9.	When will the bids be open and what are the timelines? Does the project consider all the environmental impact and necessary mitigation measures	The project will be done in multiple phases and they will be done simultaneously. The environmental and social impacts are given serious consideration and necessary mitigation measures will be taken into account in the ESIA and RAP Studies
10	Will the Road be tolled?	Yes, it will be tolled. It is a way the users of the facilities will contribute to the project's future maintenance, progress and usage.

Closing remarks by Mr Akim Adeniji

Vote of thanks by TPL Odunjebe

Closing prayer by Alhaji Alawotan by 12:35pm


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MINISTRY OF WORKS AND INFRASTRUCTURE
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APPENDIX 7: Attendance list of consultations and meetings on the proposed Fourth mainland bridge.

ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO COMMUNITIES

1

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 12:00PM – 2:30PM **VENUE:** ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1.	ABDUL RAFEEM OLOWONUBAH	SSA MOWI	[illegible]		[signature]
2	SULYMAN BELLO	LEKKI ESTATES RESIDENTS ASSOCIATION	08155570368	[illegible]@gmail.com	[signature]
3	Hon Agbaje Taiwo	ETI-OSA EAST LCDA	08100068170	Agbaje@gmail.com	[signature]
4	Daniel Joseph	ETI OSA EAST LCDA	08161533222	kdt9149@gmail.com	[signature]
5	Hon. Odedina Nurudeen. O	Eti-osa East LCDA	08035645730	odedinan@yahoo.com	[signature]
6	Sir. Akinpelu Emmanuel	Facilities Mgt Office Abraham Adesanya Est.	08023016324	heman@akinpeluvaluers.com	[signature]
7	TPL ODUJEBE O.O	MPP & UD	08023275745	lekeojebe@yahoo.com	[signature]
8	TPL. SOLADEMI -TAIWO E.O	✓	08023168192	anunitire@gmail.com	[signature]
9	OMOTOSHO UTHMAN A	MOE & WR	08077539687	uthmanomotosho1720@gmail.com	[signature]
10	JERRY NWAJIOFOR	EDEN GARDENS ESTATE	08037445501	unclejerry4u@yahoo.com	[signature]

2

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 12:00PM - 2:30PM **VENUE:** ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
11	Engr. Iwayemi Olalekan	AEC	07069159851	iwayemilumey@gmail.com	[signature]
12	Alh. Muniru - Ogunleye	Ogombo	08033431552	Muniru.oganleye@yahoo.com	[signature]
13.	Pastor John Godson	Deeper Life Bible Church	07035195548	praiseingodson@gmail.com	[signature]
14	Hon John Campos	[illegible] - OSA	07023038726	Camposjohn [illegible]@Yahoo	[signature]
15	Fabunmi - Dusti - A	Rt1 - OSA East	08033912164	fabudas@yahoo.co.uk	[signature]
16	AYO ODUFUYE	Lekki Gardens Phase 3	07015841160	ayoodufuye@gmail.com	[signature]
17	Hon Olayemi Ganiu	Ajah	08121704762	olayemiganiu@gmail.com	[signature]
18					
19					
20					

3

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 12:00 PM – 2:30 PM VENUE: ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
21	Ogbeide Osas	HFP Eastline Shopping Complex HFP Engineering (Nig) Ltd	08023253586	osasogbeide007@yahoo.com	[signature]
22	Chinedu Sike	HFP East Line Shopping Complex	08033565588	Chuddysyke@yahoo.com	[signature]
23	Ade Adebisi	"	08169645655		[signature]
24	Orimolade Rotimi	.	08026134678	[illegible]	[signature]
25	Funmi Pratt	Min. of Works & Infrastructure	08164534318	msfunmi[illegible]-85@gmail.com	[signature]
26	Femi Oke	Graceland Estate	08055791030	femostical@yahoo.com	[signature]
27	WALE ADEBAYO (ARC)	IDOWU DABIRI CDA	08023024939	adebayowalex@gmail.com	[signature] 16/11/2020
28	Akodu Morenike	Public Affairs Works	[illegible]	kepakodu[illegible]@gmail.com	[signature]
29	Kamal Alafishe	Abraham Adesanya Est	0803712864 9	Kamal4real@yahoo	[signature]
30	SOLANA ORE-OLUWA	Ibejulekki Connect LERSA	07066320082	ore@ibejulekkiconnect.com	[signature]

4

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 12:00PM – 2:30PM VENUE: ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA).

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
31	IGBONOBA – PATRICK	LEKKI GARDENS	07046264625	Patrick.Igbonoba@yahoo.com	[signature]
32	ISIBOR LIBERTY	LEKKI GARDENS	08063815757	liberlib2001@yahoo.com	[signature]
33	OGUNDIPE KINDNESS	Ibeju Lekki Connect/LERSA	08065891920	Kindptee@yahoo.com	[signature]
34	Celina O Amao	Abraham Adesanya Estate	0803226650[illegible]	[illegible]	[signature]
35	Alh memudu Bakar	ogombo	08083420378		[signature]
36	Ikechukwu Kalu	Femi Okunnu Phase 2 Estate	08032002458	ikechuk@gmail.com	[signature]
37	ALH RASAKI OGUNLANA	AJAH Baba oja	08033313944		[signature]
38	Alhaji Kabiru Yekini	Ajah Baale Council	08023365523	Kabyek@gmail.com	[signature]
39	ODEWOLE ALEX	CHAPLIN COURT OGOMBO ROAD.	08067608717	odewolealex@gmail.com	[signature]
40	OTULANA KAMAL. O	Ogombo Community	08023203288	Gbenga Otulana.Gmail.com	[signature]

5

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 12:00pm – 2:30pm **VENUE:** ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
41	Kayode Abimbola	MWI	08023057756	smithbim@yahoo.com	
42	Adediran Kofoworola.	MWI	08148801798	kofoworolaadediran@gmail.com	
43	Olanrewaju Alex E.	MOWI	08033470537	lizzylexy@yahoo.com	
44	Disu Abdulwahab	MWI		wahabdisu@yahoo.com	
45	Adeniran Adepetun	MOWI	08022153615	Adepetun_niran@yahoo.com	
46	SHOGAOLU OLUGBENGA .G.	MOWI	0802088 6264	oshogaolu@gmail.com	
47	Grace Alegba	News Agency of Nig.	09093938525	edichagrace@gmail.com	
48	Nkasiobi Oluikpe	Daily Independent	08084454432	nkasioluikpe@gmail.com	
49	Dayo Ayoyemi	Tribune	08033312577	dayoayoyemi@yahoo.com	
50	Okey Iroegbu-Chikezie	The Nation	08062351642	quirchizcities@yahoo	

6

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 12:00PM – 2:030 PM **VENUE:** ABRAHAM ADESANYA, LOFAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
51	Tayo Olorunyomi	RadioLagos/EkoFM	08055445179	tayoolorunyomi@gmail.com	[signature]
52	Hon. Azeez O. Al-Ameen	LEGISLATOR	08060032814	aluintal44@Gmail.com	[signature]
53	Akinmoladun Adeoye	Information	08027959286	smartstico@gmail.com	[signature]
54	Oladojin Oladunse	Information	08027665239	Laolaquade@yahoo.com	[signature]
55	Folami Jubril	LTV	07034681526	jubrilfolami@yahoo.com	[signature]
56	Agbele Titilola	AEC	08023198023	titiloagbele@gmail.com	[signature]
57	Ola Johnson	AEC	08050777701	babatoladjohnson@gmail.com	[signature]
58	Adekunle Owolabi	DAR	07035639664	owolabi-adekunle@dar.com	[signature]
59	OLUWAGBUYI KAB	SUSTAINABILITI LTD	08033026092	kayoluwagbuyi@gmail.com	[signature]
60	KOLAPO SOLESI	VGCPORA	08032005580	KSolesi@gmail.com	[signature]

7

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 12:00pm - 2:30pm VENUE: ABRAHAM ADESANYA, 10 FAMILIES, HFP, OGOMBO

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
61	Akindele Taiwo	ogombo	08037281032	taiwojoe40@gmail.com	
62	Tseighe Emmanuel	IBEJU Lekki Connect Abraham Adesanya	08135480518	epsilocybin@gmail.com	
63	Pastor John Godson	Deeper life Bible Church Ajah	07035195548	Praiseikgodson@gmail.com	
64	Awo Tobiloba Julius	Env. Consultant Sustainability Limited	08107488196	Juliusawo45@yahoo.com	

POWERLINE- ADDO (OKERA NLA) ADDO ROAD COMMUNITIES

11

1

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 3:00PM – 5:30PM **VENUE:** POWERLINE ADDO (OKERA NLA) ADDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	Abdul Raheem - Oluwaseun	SSA TO GOV MOWI	08033083383		[signature]
2	Ajanaku Tokunbo	MoWI	0802 498 2288	tknbajax@gmail.com	AA
3	OLUWAGBUYI KAYODE	SUSTAINABILITI LIMITED	08033026092	kayoluwagbuyi@gmail.com	[signature]
4	Alh Kamilu O. Sulaimon	BAALE Okeira Nla	08023610616		[signature]
5	Cpl. ODUJERE	MPP & UD	08023275745	lekoyole@yah...	[signature]
6	Chief Murtala	Olori of Ajah	08023778042	Baba Oba of Addo	[signature]
7.	Gp Capt T A Lawal (rtd)	MHE	08033749299		[signature]
8	S. I. OLAYINKA	MEMBER	08033484985	OKE-IRANLA	[signature]
9.	Adebanjo Abdul Rasheed	Infinity Estate	08023205325	Oke-Ira Nla, Addo Rd.	[signature]
10	Gladys Ilofah	Infinity est, Addo	08055814370	ilofahg@yahoo.com	[signature]

2

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 3:00PM – 5:30PM **VENUE:** POWERLINE ABBO (OKERA NLA) ABBO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
11	Kayode Abimbola	MWI	08023057756	smithbim@yahoo.com	
12	Olanrewaju Alero	MOWI	08033470537	uzzyleezy@yahoo.com	
13	Opejemi Aromasodu	Marshy Hill Estate	08035364755	opejemi_aromasodu@yahoo.com	
14	Adepetun Adeniran	MOWI	08022153615	Adepetun_niran@yahoo.com	
15	SHOGAOLU OLUGBENGA G.	MOWI	08020886264	oshogaolu@gmail.com	
16	Adigoke Clement	Marshyhill Estate	08033438858	clemadegoke@yahoo.com	
17	OMOTOSHO USMAN	MOE $WR	08077539687	Uthumanomotosho1720@gmail.com	
18	Dr. Jerry Nwakobi	Jerico Group Ltd	08033048486	bamaldemyslegal@gmail.com	
19	Disu Abdulwahab	MWI		wabaabdisu@yahoo.com	
20	Adediran Kafowoola	MWI	08148801798	kafowoolaadediran@gmail.com	K.H.Ade

3

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 3:00PM – 5:30 PM **VENUE:** POWERLINE ADDO (OKERA NLA) ADDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
21	Rasaq Usman	MEGA ESTATE CHAIRMAN	08023158401	[illegible]@gmail.com	[signature]
22	Agbugbu Esther	Goodness Estate	08141154466	Agbugbu54334 Kesteegm	[signature]
23	Funsho Odunuye	Akure	08130103259	Funsho72@hotmail.com	[signature]
24	Yusuf Babatunde	Marshyhill est	08024997866	babatworld@gmail.com	[signature]
25	Busari O.T	Marshyhill	08027629222	bustay74@gmail.com	[signature]
26	Mustapha Abideen	Marshy Hill	08030675304	aamustapha2476@gmail.com	[signature]
27	Owolabi Fatimoh	Oke Ira Kekere Comm	08132584614	Funmilayofatimoh at o dot com	[signature]
28	Olalekan Hakeed	Oke ucanla	08023214111	Ola let & Bro	[signature]
29	Ejemi E Favour	Badore Addo	07034731602	unclefavour2005@yahoo.com	[signature]
30	Adeyelu Olasoji	Badore, Unity Estate	08038568026	xojahsa@gmail.com	[signature]

4

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 3:00PM-5:30PM VENUE: POWERLINE ADDO (OKERA NLA) ADDO ROAD.

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL &SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
31	Florence Oyedele	Lado ogudo	08142657540		
32	MRS DOLAPO COKER	SAMUEL OBODO AVE OKE-IRA NLA	08033342192		[signature]
33	Kaseem Olanrewaju	salu obodo AV oke-ira nla	08037129248	Lanrekaseem@G-mail.com	[signature]
34	ADEFALO TOYIN	OKE-IRA NLA	09023300656		[signature]
35	Tafa Zubair Aliy	Oke Ira Nla	07085577297	tafzib@yahoo.com	[signature]
36	HAMMED SAHEED E.	OKE-IRA NLA	08032964701	Shavybaba18@Gmail.com	[signature]
37	SHEU BALOGUN	OKE-IRA NLA	07032813488		[signature]
38	ADESHINA AKEEM ADEBOLA	OKE-IRA NLA	08130914404		[signature]
39	LAWAL AYOBAMI ABASS	OKE-IRA NLA	08130100559	LILBASS@Gmail.com	[signature]
40	AKINSOLA. SULAIMON	OKE-IRA-NLA	08163530206		[signature]

5

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 3:00PM-5:30PM VENUE: POWERLINE ABBO (OKERA NLA) ABDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
41	HIGH CHIEF. U. OBIALOR	OKEIRANLA	08160205253		[signature]
42	Binta Isah	Okeranla	08038809919	[illegible]	[signature]
43	Onyebuchi Okoro	Divin Homes estate	08060677776	buchimm@yahoo.com	[signature]
44	Hon Buhari Yinusa O.	Badore Eti-osa	08023096618		[signature]
45	Lookman-Yinusa		0702530016		[signature]
46	ADEYEMI O. AYORA	OKE-IRANLA	07063760752 08024114622		[signature]
47	Adeyemi AZeez	20 Abebo	07067964220		[signature]
48	DAHUNSI HAFEEZ	LANGBASA CDA	08036268183		[signature]
49	Ajibola Sulaimon	Okeranla CDA	08186525168		[signature]
50					

Mrs Coker

6

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 3:00PM – 5:30PM **VENUE:** POWERLINE ABDO (OKERA NLA) ADDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
51	Semiu Afanda		08033501622	AfandaSemu g.com	[signature]
52	Iyiutiu - Yunusa		08055058840	Isholaeleslin 2014@gmail.com	[signature]
53	Alhaji Abdul-Afeez Olowo		08083748374	8 Chief Salu Oledo Ave Okera Nla	[signature]
54	Usman Kayode Lamore		08092288072	—	[signature]
55	Balogun Abdulateef		08038300246	8 Chief Salu Oledo Okera Nla	[signature]
56	O. K Oshinloye		[illegible]	24 Salu Oledo Okera Nla	[signature]
57	Hon Ajelogja Tawa		08100068170	Ajejetawa@gmail.com	[signature]
58	Hon Odediran Nurudeen O.		08035645730	Odedinern@yahoo.com	[signature]
59	Hon JOHN CAMPOS		08023038726	CamposJohn 75 @ Yahoo	[signature]
60	ALH Titilope		08033248851		[signature]

7

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 TIME: 3:00PM – 5:30 PM VENUE: POWERLINE ADO (OKERA NLA) ADDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
61	Prince Taiwo Owosho	Infinity Estate	08027759070	[illegible]@yahoo.com	[signature]
62	Agbede Titilola	AEC	08023198023	titilolaagbede@gmail.com	[signature]
63	Adekunle Onilolabi	DAR	07035639664	onilolabi-adekunle@dar.com	[signature]
64	Gilbert A. Adimale	Mastery Hill Estate	08033052777		[signature]
65	Sulaimon A. Musbaudeen	Oke Ira Nla C.D.A	08028467182	—	[signature]
66	Ado-Imoisili James	✓	07083810083	adoimoisili@gmail.com	[signature]
67	Dele Ajeigbe	PORA Okeirank CDA	0803-702-2169 WhatsA 08183183522	delekenny58@gmail.com	[signature]
68	Anthony Ibah	PORA CDA Ira-Nla	08034482619	ibahtony@gmail.com	[signature]
69	Alh. Alebiosu Salu	Chairman P.C.R.C. Agbogbasa	08033007322		[signature]
70	Anifatu Akola	Salu Obodo	08039482827		[signature]

8

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 16-11-2020 **TIME:** 2:30PM-5:30PM **VENUE:** POWERLINE ADDO (OKERA NLA) ADDO ROAD

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
71	MR IBRAHIM COLE		08038583241		
72	Adebayo Abdul Rasheed	Infinity Estate Env. Consultant	08023205325	aradebayo@yahoo.co.uk	
73	Awo Tobiloba Julius	Sustainab ltd	08107488196	Juliusawo45@yahoo.com	

ATTENDANCE LIST AT BAYEKU AYETORO, AGUNFOYE, IGBOGBO, EGBE, ELEPE & ERUNWEN COMMUNITIES

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:30 - 3:30pm **VENUE:** BAYEKU AYETORO, AGUNFOYE, IGBOGBO, EGBE, ELEPE, ERUNWEN

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	Tola Johnson	AEC	08050777701	babatoladjohnson@gmail.com	[signature]
2	Adekunle Owolabi	DAR	07035639664	owolabi.adekunle@dar.com	[signature]
3	Iwayemi Olalekan	AEC	07069159851	iwayemilumsy@gmail.com	[signature]
4	Mordi Lillian	AEC	07038058003	mordilellian@gmail.com	[signature]
5	Kalejaye Yetunde		07082274854		[signature]
6	Akintoyeje Joseph	Igbogbo Bayeku LCDA Procurement	08060395035	akintoyejejohnson@gmail.com	[signature]
7	KASALI AZEEZ O	Igbogbo/Bayeku LCDA Staff	0802231268	alaazeel2003@yahoo.com	[signature]
8	Olayode Arewa	Igbogbo Bayeku LCDA	0818193387 67	olayode072 gmail	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:00 – 3:30pm **VENUE:** BAYEKU, AJETORO AGUNTOYE, IGBOGBO, IGBEE, ELEPE & ERUNWEN COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
9	Nwogu Nicholas	Ikorodu	08025578482	[illegible]@gmail.com	
10	Osuji Athanasius	Ikorodu	08068629066		
11	Kosiowei Williams	Ikorodu	08052811527	miegbekosiowei@yahoo.com	
12	Ibeke Shedrack	Igbogbo	08080977643		
13	Abbey James Benson	Igbogbo	08025770417	JamesBenson@gmail.com	
14	Adebayo-Fatai	Igbogbo R.TEAM (ROAD)	08126147265	Owogonda@gmail.com	
15	Ogunyemi Olatunbosun	Igbogbo R.TEAM (ROAD)	08096150534		
16	BAKARE Afeez	N.R.R.T.I.W Igbogbo	08023851127	TANISEwuse	B.Afeez

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: Nov. 17th 2020 **TIME:** 12:00 – 3:30 PM **VENUE:** BAYEKU, ATLETORO, AGUNFOYE, IGBO GBO, IGBE, ELEPE & ERUNWEN COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
17	Adesina S. Adekunle	IGBOGBO Resident	08079950573	adesinaadekunle676@gmail.com	
18	CHIEF NURAIN A. DAVIES	BAYEKU ✓	08080360512	—	
19	Bamigboye Rufus B.	Igbe Resident	08034878145	Delebule@gmail.com	
20	Alhaja Fawsat T. Ojewole	Igbe —	08023144339	fawsatojewole@gmail.com	
21	Abayomi Adelakun	CDC Chairman Bayeku/Igbogbo	08183434123	yomilakun@yahoo.com	
22	Jackson Adegbenga Badekale	Igbe —	08034282856	rehobothgra@gmail.com	
23	PRINCE EMILOJU ILARA	C.D.C 2nd VICE Igbogbo/Bayeku	08023425417	—	
24	MR. Femi Ogunlusyo	CDC, Gen. Sec.	08055163992	Olugay14@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 TIME: 12:00PM - 3:30 pm VENUE: BANEKU, AYETORO, AGUNFOYE, IGBOGBO, IGBE, ELEPE & ELUNWEN COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
25	PRO FASHOLA.	CAN IGBOGBO	08022545710	fashola.Bobatunde@gmail.com	
26	REV AJAYI	CAN IGBOGBO	08023239438	AmosAj...@yahoo.com	
27	PASTOR OLADOKUN	CAN IGBOGBO	08133466512	Truegreatable church@gmail.com	
28	PASTOR AKINOLA	CAN IGBOGBO	08024271867		
29	PASTOR SUNDAYO	CAN IGBOGBO	08066194864		
30	OTUNBA OGUNDE	CDA/CDC	07057011960	aduit7778@yahoo.com	
31	PRINCE FEMI ADELAJA	CDA/CDC	08056141423	contactfemiadelaja@gmail.com	
32	Ekundayo Olushola	CDA/CDC	08053538596	Sholaekundayo@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:00 - 3:30PM **VENUE:** BAYEKU AYETORO, AGUNFOYE, IGBOGBO, IGBE, ELEPE & ERUNWEN COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
33	OBI PAULINUS CHUKWUDI	Igbogbo - Community	08039694137	belovedpaul2003@gmail.com	[signature]
34	NWAEZE U. BENJAMIN	" "	08033915924	Saintbenbestatgmail.com	[signature]
35	INNOCENT ONWUBIWE	✓ ✓	08023809344		[signature]
36	SEYI OGUNLARU	✓ ✓	08023234010	syogr@yahoo.com	[signature]
37	SIKIRU SULAIMAN	Laaga/Elepe	0802320077[illegible]	akinsulaiman@yahoo.	[signature]
38	DAYO BALOGUN	✓ ✓	0802 328 4093	dayobalogun@gmail.com	[signature]
39	ABOLAJI JOSEPH	IGBOGBO	08051994455		[signature]
40	AWOYEMI FUNKE	Igbogbo/Bayeku	08093580537	funkeawoyemi@gmail.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
41	Fatai. O. Aremu	CDC Financial Sec	08027406563	azkarlat@yahoo.com	
42	Mrs felicia Ibrahim	CDA Sec.	08033264685		
43	AJIBODE MURISIKU ISIAKA	TREASURER BAYEKU CENTRAL CDA REP BANKE OF BAYEKU	09055607888	morseegishaq@gmail.com	
44	ALH. ISA GBADAMOSI	CDC Member	08032458790		
45	Pastor Samson Ogunrinde	CDC ZONE I chair	08028623968		
46	Mr. Isiaka Oladunni	CDA chairman	08023526725		
47	Pastor(Mrs) F.A Akoja	CDC EXCO	08026537599		
48	Afinjuola Ibrahim	Ifesowapo Ameje Lantan CDA Chairman	07054795144	afinjuolaibrahim@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:…………………… TIME:…………………… VENUE:……………………

SUBJECT:……………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
49	MR IBIYEYE RAZAQ	CDC LEADER	08081991272	biodunyeye016@gmail	[signature]
50	MR ADEYEMO WASIU O	ESTEEM CDA	08029718677	djadward1975@gmail	[signature]
51	mR Kehinde Disu	CDC LEADER	08184579116		[signature]
52	Enikuomehin Felix	LCDA	08097238788	felixenikuomehin@gmail	[signature]
53	Hon Lukia ; Opeyemi : [illegible]	IBLCDA	08024921029		[signature]
54	Kehinde Oladunn	LCDA	08028457401		[signature]
55	Olusola Aransiola	CDA leader	08032005713	olusoar@gmail.com	[signature]
56	Tomi Alale	CDA Executive	08025596459	yomialale@gmail.com	Tomi

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17/11/20 **TIME:** 12.00 PM **VENUE:** OBA PALACE IGBOGBO

SUBJECT: LAGOS 4 MB STAKEHOLDERS' MEETING

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
57	ADAMS SODEINDE SOBERU	AGUNFOYE/IGBOGBO	08096388844	adamsgonidasodeig@gmail.com	[signature]
58	LATEEF SODEINDE SOBERU	AGUNFOYE/IGBOGBO	08038445347	—	[signature]
59	MOSHOOD AWOSANYA JEJE	AGUNFOYE/IGBOGBO	08025924161	—	[signature]
60	JOHNSON AWOSANYA OLU	AGUNFOYE/IGBOGBO	08023088749	—	[signature]
61	KEHINDE OREDIPE	AGUNFOYE/IGBOGBO	09035921986	awosanyajohnson@g-mail.com	[signature]
62	ISIAKA KALEEM	AGUNFOYE/IGBOGBO	08026424134	—	[signature]
63	TAOFEEK SALISU KASUMU	AGUNFOYE/IGBOGBO	—	—	[signature]
64	Otuyele Michael	Apeka	08060246913	ofom01@gmail.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
65	TPL. Daela AKindele - D	LASPPPA/MPP&UD	08033316726	akin.dada92@gmail.com	
66	Folarin O T	"	08033464358	laspeak.folarin@gmail.com	
67	TPL Akinsanya Tawa T.	LASPPA/MPP&UD	08037157233	akins_san@yahoo.com	
68	ENGR. S.A. ODUWAYE	LASECA/MPP&UD	08033574077	excaper2013@gmail.com	
69	OLU. Ajiboye	IGBOSBO LCDA RADOLU CDA	08033268938	oneajiboye2007@yahoo	
70	OLADELE EBENEZER	APEKA NORTH CDA	08066603067	oladelaebenezer1960@g.main	
71	Babatunde Afuwape	Igbogbo/Bayeku LCDA	08037773698	baaysmeyan@yahoo.com	
72	Orabador Adesegun	Igbogbo/Bayeku LCDA	08027058518	Tosron01@Gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
73	OLAYIWOLA OLABODE M	BAYELSA	08062377725	mjbomat@yahoo.com	
74	ADESINA OLADAPO.O	BAYELSA	07066028066	[illegible]	
75	Olanrewaju Akeem .G.	MOWI	08033470537	ezzylexy@yahoo.com	
76	Kayode Agbimbola	MOWI	08023057756	smithbim@yahoo.com	
77	Samson A.Folasom	MOWT W	08026675865		
78	Prince Kunle Oyekanmi	Omitoro C/A of Ijede Rd.	08033034774	Koyekanmi.ko@gmail.com	
79	Com. Wole Ajayi	Ifako Ijaiye	07065860263	aj_wolex@yahoo.com	
80	T.O.D Oyesanya	Owode	08029415434	tod2015@yahoo.com	

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:………………………… **TIME:**………………………… **VENUE:**…………………………

SUBJECT:…………………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
81	Nkasiobi Oluikpe	Media	08084454432	nkasioluikpe@gmail.com	[signature]
82	Tayo Olorunyomi	Media	08055445499	tayoolorunyomi@gmail.com	[signature]
83	OLUWAGBUYI KAYODE	SUSTAINABILITI LIMITED	08033026042	kayoluwagbuyi@gmail.com	[signature]
84	AJANAKU TOKUNBO	MOWI	0802 498 2288	tknbajax@gmail.com	AA
85	Oladejo Oladunse	Information	08027665239	kaolugudus@yah.com	[signature]
86	Grace Alegba	News Agency of NG	09093938525	edichagrace@gmail.com	[signature]
87	Okuy Preghan-Chukezie	The Nation	08062351642	qurchizcities@yahoo.com	[signature]
88	Dayo Ayeyemi	Tribune	08033312570	dayoayeyemi@yahoo.com	
89	Olabanji Fawowe	MEDIA	08170694576	fawevibes@gmail.com	[signature]
90	Oluwatumininu Adetoro	Media	09097239082	Itunuadetoro@gmail.com	[signature]

4MB FOURTH MAINLAND BRIDGE · LAGOS STATE GOVERNMENT · Rendel

THE FOURTH MAINLAND BRIDGE PROJECT

SUSTAINABILITY LIMITED · dar · AEC

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:……………………… **TIME:**……………………… **VENUE:**………………………

SUBJECT:………………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
91	Emmanuel Eleweke	IGBOGBO	08034546884	lewekstonic9@gmail.com	[signature]
92	Stella Egike	Agunfoye	07058354288		[signature]
93	CHIGOZIE JULIUS	IGBOGBO	08131108895		[signature]
94	Adeniran Adepetun	MOWI	08022153615	Adepetun_niran@yahoo.com	AA
95	SHOGAOLU OLUGBENGA G.	MOWI	08020886264	oshogaolu@gmail.com	[signature]
96	Com BAKARE GBENMINIYI	N.U.R.T.W. Igbogbo	08096662993		[signature]
97	Modupe Apata	Agunfoye	08093314890	modupeapata99@gmail	[signature]
98	Ayodele Adeyinka	Emuren	08021299221	ayodelefestusrig@gmail.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
99	Ayeni Michael B.	Igbogbo	08089122371	ayenimichaelb@yahoo.com	
100	Ogunyemi Olabode	Igbogbo.	08028789898	Holabod23@gmail.com	
101	Alhaji Waheed Adekoya	Igbogbo	08091643209	wideKoya@yahoo.com	
102	Towolawi Olawale	IGBOGBO	08028373811	towolawi olawale@yahoo.com.	
103	ELDER JIDE ONITIRI	SELEWU, IGBOGBO	08023191038	joaonitiri60@yahoo.com	
104	Kabir Kareem	Ijede	08077720430	Kfkprime@yahoo.com	
105	Chief S.ADE-AJALA	IJEDE	08038486281		
106	High Chief Babatunde Ogunmuyiwa	Odofin of Ijede	08029498105		

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
107	BAALE. TITILOLA-OBAFEMI	IJEDC	08034652083		
108	SABA Lookman	GEGENLA	08023008675		
109	SAKIRU IDOWU	Igbogbo	08090550918		
110	ANIMASAUN OLUMUYIWA	IGBE LAARA	08026580806		
111	BLDR. KUFERIJI SOLOMON	BAYEKU	08039585328	Solomanwisdom@yahoo.com	
112	DAVID B.A	IGBOGBO	08033283803	teedeeqd@yahoo.com	
113	J. ABAYOMI TAIWO	NIGERIAN INSTITUTION OF SURVEYORS	08023075192	EDALERE@YAHOO.COM	
114	Oluwadoromi Segun	Elepe	08182075858	oluwadoromisegun@yahoo.co.uk	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: TUE NOV. 17TH **TIME:** .... **VENUE:** IGBOGBO OBA PALACE, IKORODU

SUBJECT: ....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
115	ELDER IFEMADE	ABUNFOYE HERITAGE ESTATE	08033800142	Elder Muyiwa @ yahoo.com	[signature]
116	AGBELE TITILOPA	AEC	08023198023	titilolaagbele@gmail.com	[signature]
117	Adedeji Adebayo	SSA's office	08067919876	adedejiadegs@yahoo.com	[signature]
118	AJASA Sunday Ofuh	BALE KAPO	08055302671	AJASA Sunday at yahoo	[signature]
119	Chief Samson Balia	OLUGBE	08083339155	Isede ... —	[signature]
120	ADEYEMI BENSON	S.A. IGBOGBO/B	08062753622	aosbenson@gmail.com	[signature]
121	ENGR. MANUWA	CDA	08150763998	MANUWAKINGSLEY @ YAHOO.com	K.M.

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
122	ALH TAJUDEEN O. BISU	CHIEF IMAM of BAYEKU	08023131465	—	
123	Imam Abdul Ganiu Gazdi	Imam Ratibi Igbogbo	08023752494	Gazelabdulganiu@gmail.com	
124	Adebayo Omotayo	C/Iman Igbogbo	08074479332		
125	Sulaimon - Shittu	C/Iman Bayeku	08023214874		
126	OLAIARE COMFORT OMADUNNI	IGBOGBO YOUTH COALITION	07053752701	comfortoladunni.O@gmail.com	
127	Shittu H. Olumuyiwa	IGBOGBO DEVELOPMENT ASSOCIATION (IDA)	0802825-1235	hamsewnsholanke@yahoo.com	

Chiefs

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
128	CHIEF KATODE OLANUBI	BAALE ENU ABIYE JAS KINGDOM	08029757635		
129	Chief Jelili A. Sanni	ADEBORUWA IN-COUNCIL CHIEF	08027490457	Sanni Jelili039@gmail.co.	
130	Chief Sarafa Tijani	Baale of Ilado Odunade	08028353433		
131	CHIEF Sofiu Ayeni	Baale of Igbe Adeyanku	08027201553		
132	Chief Titilola Okafemi	Baale of Igbe Olaja	08034052723		
133	Chief Razak Banjoko	Baale of Igbe Laaro	08023429041		
134	Chief Paul Dawodu	Baale of Igbe Deyinde	08027702797		
135	Chief Ayoola Olugbode	Baale of Selewu Orondo	08038607056		
136	Chief Wahid Odunlami	Baale of Lajo	08028325987	-	
137	Chief Biliamin Fajuyi	Baale of Oweta	08056539035		

Chiefs

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
138	CHIEF TAJUDEEN A.	ODOFIN OF IGBOGBO KINGDOM	08028839033		
139	HIGH CHIEF BABATUNDE OGUNMUTIWA	ODOFIN OF IJEDE KINGDOM	08029498105		
140	CHIEF AYOBAMI OBAYIOMI	OTUNBA OF IGBOGBO KINGDOM	08022786002		
141	CHIEF BABATUNDE AGORO	APENA OF IGBOGBO KINGDOM	08028376604		
142	CHIEF OLUWAM J.A.	BALOGUN OF "	08023227227		
143	CHIEF TAIWO KALEJAIYE	GBASEMO OF " "	08128197489		
144	CHIEF ALEBIOSU	OLOTU EREKU " "	08084387455		
145	CHIEF KEHINDE FAMUYI	ORADOLU " "	08027575838		
146	CHIEF OLUKOLABI GANIU	AYANFOLU " "	08023605590		
147	CHIEF FOLORUNSHO DIJA	FAMADE " "	08027498234		

Clergys

Contd.

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
148	Chief Moshood Jamiu	Bank of Lagos	08059353714		

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** ..... **VENUE:** .....

SUBJECT: .....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
149	Hon. Jumoh Ogunmuyiwa	FMR. CHAIRMAN LSLCDA	08023232456	ogunmuyiwajumoh.adeleke@gmail.com	
150	Hon ADEGBENGA BASANYA	FMR CHAIRMAN ✓	08055270020	adegbengabasanya@gmail.com	
151	HON. TAIWO ORENUGA	FMR. EXECUTIVE SECRETARY	08028110079	taiyeorenuga@yaa.com	
152	Daini Olusesan	Chairman	08187270111	dainisesan@yahoo.com	
153	Akodu Keji	Rep (Individual)	08023381320	kejiakodu11@gmail	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:……………………………… **TIME:**………………………………… **VENUE:**……………………………………………………………………

SUBJECT:……

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
184	ABDUL RAHEEM OWOKONIRAN	SSA TO GOV	08033063383		[signature]

Consultion

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:………… TIME:………… VENUE:…………

SUBJECT:…………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
155	Hon. Ade-Ayeni	See Local gvt	08068989800	hadeyayeni@gmail.com	[signature]
156	Hon. Alimi	Leader of house	08033237160		[signature]
157	Hon. Lekan. Ashafa	Deputy Leader	08054044185	Ashafaolalekan@gmail.com	[signature]
158	Hon. Wasiu-Olomu	M L House	08028885776	wasiuolom@live.com	[signature]
159	Hon Aronoro-M.Ko	✓	08180038383		
160	Hon. Kolejo. A.	✓	08105010253	mkolejo77@gmail	[signature]
161	W. A. Yusuf	Supervisor	08094515846	Waheed A. Yusuf	[signature]
162	Hon. T. Obayomi	✓	08022831497	Obayomitaiwo@ebo.gmail.com	[signature]

Conveners

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:............ **TIME:**............ **VENUE:**............

SUBJECT:............

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
163	Hon. YAYA	Supervisor	08156465461	trust2ya@gmail.com	[signature]
164	HON. YAHYAH	✓	08023909292	rodsanangel@gmail.com	[signature]
165	Hon. EUNICE	✓	07033531999		[signature]
166	MRS. ADATA	SA. MEDIA	08093314890	Modupeadata99@gmail	[signature]
167	MR. YEMI. ONILEDE	S.A. WASTE MGT	07019449126		[signature]
168	HON. TITI. ADEGBOYEGA	VICE CHAIRMAN	08093992055	[illegible]@Gmail	[signature]
169	ADEYEMI - BENSON	S.A CIVIL ENG	08062753622	cosbenson@gmail.com	
170	MR. Jenrade M.A	I care	08021443549	mjenrade@yahoo.com	[signature]

ATTENDANCE LIST AT ITAMAGA –AGRIC, SAWMILL (SAGAMU ROAD) EYITA/OJOKORO, AGRIC-OWUTU, ISHAWO, TAPA COMMUNITIES

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17/11/2020 **TIME:** 12:00pm – 3:30pm **VENUE:** ITAMAGA, SAWMILL (SAGAMU ROAD), EYITA/OJOKORO, AGRIC-OWUTU, ISHAWO, TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	Mrs. C. B. Adelana	Ayangburen Jubilee Est Ikd	08033051729	[illegible]@gmail.com	[signature]
2	Mr. D. A. Amadi	"	08166866858	✓	[signature]
3	George Amadi	Ayangburen Jubilee Estate, Ikorodu	09024931542	olusegun.afolabi@gmail.com	[signature]
4	Akinpelu Anthony	Okegbegun CDA I Ikorodu North by Poly	08086863307	tonymuyi@yahoo.com	[signature]
5	Pst Awonuyi Oluwatoyin	Jubilee Estate	08030748651	toyinny1@yahoo.com	[signature]
6	Dr. Funde Adisa	Okegbegun CDA II Ikorodu North	08030645391	[illegible]@gmail	[signature]
7	ELD OLUMIDE FRANCIS	AYANGBUREN JUB. EST. IKORODU	08054842668	Francis [illegible].com	[signature]
8	Balogun Olufolake	7 Olu Balogun Str. off Idowu Lawani, Off Bob Sheriff, Ijede Estate Ikorodu	080-33191535	mobalogun5@yahoo.com	[signature]
9	Comrade Ugwu Matthew	14 New Life Baptist Church St. Okegbegun Sawmill Ikorodu	08033532895	ugwu60@gmail.com	[signature]
10	The Revd Obasan Adedoyin	Isawo Community & Environs	08023270643	adedoyinobasan8@gmail.com	[signature]

2

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17 — 11 — 2020 TIME: 12: 00PM – 2:30PM VENUE: ITAMAGA, SAWMILL (SAGAMU ROAD), EYITA / ODOKORO, AGRIC–OWUTU, ISHAWO & TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
11	Adeshina Ogunkoya	Eyita-Oriokuta / Otto Koro	08037209176	adeshinaogunkoya@gmail.com	[signature]
12	SOLADEMI-TAIWO E. O	MPP & UD	08023168192	aniwitire@gmail.com	[signature]
13	LAMINA BAMIDELE	IKORODU NORTH D. OFFICE	08024171555	bamidelelamina@gmail.com	[signature]
14	AKINSANYA T. T.	LASPPPA / MPP&UD	08037157233	gcms_sam@yahoo.com	[signature]
15	Adeyinka Abiodun	JUBILEE ESTATE CDA	08038193919	deyinkabiodun@yahoo.com	[signature]
16	Ogunlewe A. F.	LASBCA/MPP&UD	08022149030	ogunleweadewale@gmail.com	[signature]
17	OLAYORI ISLAMIAT-O	LASBCA/MPP&UD	08024661632	olayoriislamiat@gmail.com	[signature]
18	Kuyoro Adedayin S.	LASBCA/MPP&UD	08099766421	kuyoroadedayin35@gmail.com	
19	Oladosu Oladiran	Jubilee Estate CDA	07034463275	dirantobi@yahoo.com	[signature]
20					

3

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:00PM – 3:30PM **VENUE:** ITAMAGA, SAWMILL (SHEARAU ROAD) EGITA/OJOKORO, AGRIC-OWUTU, ISHAWO & TARA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
21	ARC. AJIBADE AJEYEMO	LAGOS STATE Poly	08033087112	ajibadeajeyemo@gmail.com	
22	ENGR. TAOFIK WAHAB	LASPOTECH	08023147972	segunfwahab14@gmail.com	
23	TPL PETER FOSUDO	LASPOTECH	08033004108	ladefosudo@yahoo.com	
24	DR (MRS) VICTORIA ADENLE-SAHEED	LASPOTECH	08030652511	victoriasaheed@yahoo.com	
25	TPL (MRS) YETUNDE ADEDINI	LASPOTECH	08033553742	adedinidaday@gmail.com	
26	Odunayo [illegible]	Jubilee Social Sec	08056632724	odunjacobs@yahoo.com	
27	Ojo mariam A.	"	08023060222	mabodun47@gmail.com	
28	Bello Ibrahim Dabato	NIMASA NIG.	08023700367	bellodabato@gmail.com	
29	Bello Ganiyu Taiwo	Jubilee Estate	08033086885	gatbel@yahoo.com	
30					

4

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:00pm – 3:30pm **VENUE:** ITAMAGA, SAWMILL (SAGAMU ROAD) EYITA / OJOKORO, AGRIC-OWUTU, ISHAWO & TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
31	NIYI ODUGBESI, JP	SLG, IKA NORTH	08033350746	nodugbesi@gmail.com	[signature] 17/11
32.	Hon Bola Adaramola	WAPA Ikd north	08024410449	princessbimbo6@gmail.com	[signature]
33	Ameen Olawale Agunsile	Vice Chairman Ikorodu North LCDA	08122592090	lameenboy@yahoo.com	[signature]
34	Shokunbi Afeez, Peter	Eyita Ojokoro	07085947565	Blackfis@gmail.com	[signature]
35.	George Ajoh	—	08037000620	georgeajoh@yahoo.com	[signature]
36	TAYE DAKENO		08025999225	Dareno Godsnel@Gmail	[signature]
37.	Olusola Aransiole	—	08032005713	olusgov@gmail.com	[signature]
38	Otuyele Michael	—	08060246913	ofom01@gmail.com	
39	Tomi Alale	Apeke Estate	0802596459	yomialale@gmail.com	[signature]
40	Oladele Ebenezer	Apeke north estate	08060603087	oladeleebenezer1960@gmail.com	[signature]

5

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 TIME: 12:00PM – 3:30PM VENUE: ITAMAGA, SAW MILL (SAGAMU ROAD) EYITA/OJOKORO, AGRIC-OWUTU, ISHAWO, TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
41	Prince Niran Ogunbanwo	CDC Ikorodu North	08023134320	adfunkse@yahoo.co.uk	[signature]
42	ALH SONIBARE LUKMAN	CDC CHAIRMAN IKORODU LOCAL GOVT	08033038703	sonibarelukh@gmail.com	[signature]
43	RAHEEM IDOWU BASHIR.	CDC CHAIRMAN IKRD WEST	08182005658	RAHEEM BASHIR60 at dot (Sunny.	[signature]
44	ABIODUN. D. SUNDAY	CDC GEN-SEC. IKORODU WEST	08059762150	dabsun2001 2@yahoo.co.uk	[signature]
45	OMOGORIOLA OTIKI	ORIJA CDA ASS. SEC.	08178242467 (whatsapp) 07033814960	Omogoriolaotiki@gmail.com	[signature]
46	Adetifa Adeshina	AREKA NORTH	08023346233	adeshina4@yahoo.com	[signature]
47.	Ogunbo Ademike	CDC Ikd North	08035278822	Monsambadipe@gmail.com	[signature]
48.	Emmanuel Julie Adu	CDD Ikd W	08037147040	Gconsult@gmail.com	[signature]
49.	Henry Oduko	Apeka North	08156267023	odukohenny@gmail.com	[signature]
50	ADEBAYO Lukman	Jubilee Estate Ikd	08059504568	5581882640@gmail.com	[signature]
51	MR POPOOLA	JUBILEE ESTATE	815153...		

THE FOURTH MAINLAND BRIDGE PROJECT

6

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 **TIME:** 12:00PM – 3:30PM **VENUE:** ITAMAGA, SAWMILL, EYITA/OJOKORO, ISHAWO, AGRIC-OWUTU, TAPA

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
51	Ayoola Alabi-Davies	Jubilee	08111751189		[signature]
52	Osaze Ahiabhoda	Jubilee	08061579360	sazzyduke@gmail.com	[signature]
53	Adewusi Tunde	" "	08029117030	tundeadewusi@yahoo.com	[signature]
54	Bakare omojayo	— —	07082264032		[signature]
55	Belewu Idayat	Jubilee	08029766449	Idayah2019@gmail.com	[signature]
56	Mr. Eleghede fadil	"	07031305000	Elder fadil@gmail.com	[signature]
57	Mrs Eleghede Haliat	"	08062093358	lamidayo05@gmail.com	[signature]
58	Hon. S.O.B Abimbade	LAHA REP Ikorodu 1	08023000612	sobnetworks2007@gmail.com	[signature]
59	Mrs Sulaymon	Jubilee	08181927098	Sulaymonsheriffron36@gmail.com	[signature]
60	Mrs Mustapha Taiwo	Jubilee	08168252088	Mustaphatee199@gmail.com	[signature]
	Abdulrasaq Farhan Folashade	Jubilee	08178847854	abdulrasaqfarhan@gmail.com	[signature]

7

4MB FOURTH MAINLAND BRIDGE — LAGOS STATE GOVERNMENT — Rendel

THE FOURTH MAINLAND BRIDGE PROJECT

SUSTAINABILITY LIMITED — dar — AEC

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-1[illegible]-2020 **TIME:** 12:00 - 3:30pm **VENUE:** ITAMAGA, SAWMILL (SAGAMU ROAD), EWUTA/OJOKORO, AGRIC - OWUTU, ISHAWO & TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
61	AGBELE TITILOLA	AEC	08023158023	titilolagbele@gmail.com	[signature]
62	Adepetun Adeniran	MOWI	08022153615	Adepetun_niran@gmail.com	[signature]
63	Adekunle Owolabi	DAR	07035639664	owolabi.adekunle@dar.com	[signature]
64	Tola Johnson	AEC	08050777701	babatoladjohnson@gmail.com	[signature]
65	SHOGAOLU OLUGBENGA.G.	MOWI	08020886264	oshogaolu@gmail.com	[signature]
66	Kayode Abimbola	MOWI	08023057756	smithbim@yahoo.com	[signature]
67	Olanrewaju Alese	MOWI	08033470537	lizzyleszy@yahoo.com	[signature]
68	OGIDAN ADEBOTUN DAVID	OJOKORO/EGUTA	07089573275 08069801641	movrondot@gmail.com Oladunni.bashir@gmail.com	[signature]
69	HRH MAMOOD. O. OYEBAJO	Baale of Eguta	08054180083	olatunjiaramide@gmail	[signature]
70					

8

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 17-11-2020 TIME: 12:00 – 3:35PM VENUE: ITAMAGA, SAWMILL (SAGAMU ROAD), EWU/OJOKORO, AGRIC-ONIWAYA, ISHAWO & TAPA COMMUNITIES

SUBJECT: STAKEHOLDERS' MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
71	Adeshina Oladega ~~Animashaun Mujiwa~~	OLOJU-AGBALA	08028357055	—	[signature]
72	Animashaun mujiwa		08038155454		[signature]
73	Matti Tawo	Ikorodu Local Govt	08078594444	[illegible]	[signature]
74	MRS T. T. Kosoko	—	09054383[illegible]	—	[signature]
75	Mr A. Onasanya		08033318092	adegtdeine[illegible]@yahoo.com	[signature]
76	Apenna Zainab. O.	Jubilee Estate, KAD	08034396587	zapenna02@gmail.com	[signature]
77	AKIN SULAIMAN	APEKA	08023200771	akinsulaiman@yahoo	[signature]
78	Awo Toslaba Julius	Sustainability	08107488196	Juliusawo48@yahoo.com	[signature]
79					
80					

AREPO, OPIC, MAWERE, ISHERI, SPARKLIGHT ESTATE & OTHER COMMUNITIES

11

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 23/11/2020 **TIME:** **VENUE:** JOURNALIST ESTATE

SUBJECT: CONSULTATION (AREPO, OPIC, MAWERE, ISHERI, SPARKLIGHT ESTATE & OTHER COMMUNITIES)

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
11	TPl. ODUJEBE O. O	MPP & UD	08023275745	lekayobe@yahoo.com	[signature]
12	Tola Johnson	AEC	08050777701	babatundejohnson@gmail	[signature]
13	Ajanaku Tokunbo	MoWI	0802 498 2288	tknbajax@gmail.com	AA
14	Patrick Akpon	Opic Isheri	08034916214	elspruce01@gmail.com	[signature]
15	Adedeji Akolade	Civic Engagement	08146234455	adedeji.akolade2@gmail.com	[signature]
16	Hundeyin Kolawole	✓	08023092918	kolawolehuny@gmail.com	[signature]
17	Alade Kehinde	✓	08083865336	kennyboy4show@yahoo.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:…………………… **TIME:**…………………… **VENUE:**……………………………………

SUBJECT:……………………………………………………………………………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	AJAO, MUTAIR. A	Office of Civic Eng	08023131456	ajaomutair@g.mail com.	[signature]
2.	ABALL RAHEEM OLALEKAN [illegible]	SSA TO GOV MOW I	08033065383		[signature]

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:…………… TIME:…………… VENUE:……………

SUBJECT:……………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	Mr Victor Atere	V. chairman, Beachland Est. Arepo	08054508473	victor.atere@gmail.c	
	Femi Elufidiya	ACCDA PRO	08030812579	femielufidiya@gmail.co	
	Afolayan Kamodele Michael	Banku	07025947484		
	ARAFAT IBRAHIM	Banky	07066193084		
	Alli Musa Elegbede	Isheri Olofin/MAWERE	07060547755		
	Chief Morufu Mu-ibi	MAWERE Town	08027019742		
	Chief Lukmon Taiwo	MAWERE Town	08028339962		
	Oyebo Prosper L.	Isheri / mawere	07032783571 [illegible]		
	Niran Adepetun	MOWI	08022158615	Adepetun.niran@yahoo.com	
	FAISAL BIDMOS	Vice chairman AREPO Havana Estate	08023240048	fbidmos@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 23/11/2020 **TIME:** ..... **VENUE:** JOURNALIST ESTATE AREPO

SUBJECT: .....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	Aromire Kabiru	Arepo	08063589457		
2	Akinola Oluwiran	VOERA Est. Arepo	08032003953	ak.oluwiran@gmail.com	
3	Ganiyu Kazeem	Glowlaw Est Arepo	08034272415	ajinde351@gmail.com	
4	Afilala Odeyemi	Unity Estate, Arepo	08102164228	aticomsoft@yahoo.com	
5.	GBAYODE SOMUYIWA Esq.	Journalists Estate ph1	08022924487	gbayode@gmail.com	
6	JIDE OKE, Esq	✓	08023116200	jideoke2003@yahoo.com	
7	Adeyemo Kelvinde	VOERA ESTATE	08033324544	kelvinde adeyemo 225@gmail.com	
8	Deborah AJIGA	Glowlaw/ACCSA Arepo CDA Gen Sec	08034260504	ajiga@gmail.com	
9	Charles Nnadi		08032678989	medichenles5@gmail.com	
10	Chief Muhammed Hakeem	MAWERE	08023814382		

4MB FOURTH MAINLAND BRIDGE LAGOS STATE GOVERNMENT Rendel **THE FOURTH MAINLAND BRIDGE PROJECT** SUSTAINABILITY LIMITED dar AEC

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:………………… **TIME:**………………… **VENUE:**…………………

SUBJECT:…………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	Oludare Majowa	Journalist Estate Arepo	08094000076	daremajo@yahoo.com Omajowa@globalfinancedigest.com	
	Okay Iregbu-Chiteze	The Nation	08062351642	quizliscitiesr@yahoo.com	
	Olanrewaju Smith	Citiview Estate, Warewa-Arepo	08099992341	Smithola la@ Yahoo.Com.au	Smith
	Kayode Abimbola	MOWI	08023057756	smithbim@yahoo.com	B.S
	Olanrewaju Alex	MOWI	08033470537	uzzyleay@yahoo.com	
	Shogaolu Olugbenga .G.	MOWI	08020886264	oshogaolu@gmail.com	
	Fadugba Olufunke	Journalists Estate	08033033398	Kadaraminiegmail.com	
	Shokunbi Yinka	Journalists Est-1	08054104719	yinkashokunbi1@gmail.com	
	Bello Mikail. A	Gloryland	08033917764	Bellomikailakinade@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:..... **TIME:**..... **VENUE:**.....

SUBJECT:.....

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	Arc Ogunsoya Idowu	Arepo	08037204150	idowu@hu.com	
	Alayaki Adebanke	Arep	08033216411	banwealayaki@gmail.com	
	Adeyinka Adebayo	Arepo	08086900000	tahk2adeyinka@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:…………………………… TIME:…………………………………… VENUE:……………………………………………………………………………

SUBJECT:………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1.	Fashola Ibrahim	Gloryland / ACCDA Welfare Secretary	08077333377	Ibrahimfashola@yahoo.com	[signature]
2.	Adekoya oladele	Gloryland Estate Arepo	08053000330		[signature]
3	Chief Lukmon Noah	Mawere Village	08023292367	Adetolabo@Yahoo.com	[signature]
4	Stanley Tochi	Value Xchange	08164102592	[illegible]@gmail.com	[signature]
5	ALFA AZEEZ AGBEJUSI	MAWERE VILLAGE	07057213406		[signature]
6	PRINCE MOSHOOD A. ABUDU	MAWERE VILLAGE	08058030847	Moshood@Abudu.com	[signature]
7	Chief Ismail. G. Abdullahi	Baale Maba Mawere / Maba village	09099369197	Gbenga@.Com	[signature]
8	Asha Gafeon A.	Church st / Arepo	08035037235	ashagafeon@yahoo.com	[signature]
9	Valentino Buoro	Journalist Est Arepo	08033085413	businessradio1004@gmail.com	[signature]
10	Prince AZEEZ - ISIAKA	MOKETI Ishori - Olofin	08023189177	business -	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:………………… **TIME:**………………… **VENUE:**…………………

SUBJECT:…………………

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	Chief Kabiru Moah Akinlolu	Baale Alagbole Mokiti Isheri Motha	08034724724		[signature]
	PASTOR G. O. OGUNTOMI	PASTOR THE APOSTOLIC CHURCH NIGERIA, AREPO	08039432948	oguntomioluwasanmi@gmail.com	[signature]
	High Chief Jimoh Fasina	Bale Arigbede village	08028466604		[signature]
	High Chief Ahao Ojelade	Bale Banku village	08108698189		[signature]
	Chief Samuel A. Ojelade	Sect for Onilubu family	08073079791		[signature]
	Chief Taiwo Akinbuwa	Adele of Warwa	08136596200		[signature]
	Chief Basiru Awolaja	Banku Village Seriki Malafin	08035847920		[signature]
	Pastor Moses Anani	Shalom Estate Arepo	0902 813 1010		[signature]
	TPL Solademi-Taiwo, Enitan	MPP&UD	08023168192	anunitire@gmail.com	[signature]
	Tpl Adekunle Owolabi	DAR	07036639664	owolabi.adekunle@dar.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:........................ **TIME:**........................ **VENUE:**........................

SUBJECT:........................

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	ENGR JOHN TOSIN	CHAIRMAN HAVANNA Arepo ESTATE	07033771617	johntosin@hotmail.com	[signature]
	TPL Obayomi O.A.	MPP & UD	08023360084	yomilolly@yahoo.com	[signature]
	Chief muyindeen Abudu	4a Eluku Close Iseri Olofin	08023894709		M. Abudu
	Chief monsurru Ayodu	Osin Iseri olofin	08127630069	—	[signature]
	Chief Saidi Adekunle		08023323364	—	[signature]
	AGBELE TITILOLA	AEC	08023198023	titilolagbele@gmail.com	[signature]

THE FOURTH MAINLAND BRIDGE PROJECT

STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE:............ **TIME:**............ **VENUE:**............

SUBJECT:............

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
	ALAMUTU OLAWALE	MABWERA - Mokore, Arg bede, Banku & WAREWAASS	08023259373	walealamutu@gmail.com	[signature]
	Nkasiobi Oluikpe	Media	08084454432	nkasioluikpe@gmail.com	[signature]
	Tayo Olonnyomi	Media	08055445[illegible]	tayoolonnyomi@gmail.com	[signature]
	Bayo Ayeyemi	Media	0803312[illegible]	bayoayeyemi@yahoo.com	[signature]
	Grace Alegba	Media	09093938525	edichagrace@gmail.com	[signature]
	Wahab Disu	MWI		wahabdisu@yahoo.com	[signature]
	OGUNSAWE, David	JERDA 1	08028280819	davesawe@gmail.com	[signature]
	ABIOLA NUGA	Arepo-Magboro	08027501679	biolanuga2012@gmail.com	[signature]
	Losisi Famuyiwa Kunle	Arepo	07019861881	Kaylor3 1958@gmail.com	[signature]
	Folashade Famuyiwa	Arepo	08033006001	Sadecomus@yahoo.com	[signature]

APPENDIX 8: Pictures and Photographs from the Scoping Workshop

Pre-scoping Workshop

Dr. Kayode Oluwagbuyi of Sustainabiliti Limited, showing the Project Alignment on a Map to Mr. Tombre and Mr. James Kolawole of the Federal Ministry of Environment (on the Left), and representatives of the Technical Consultant, AEC (to the Right)

Institutional Scoping Workshop with the Federal Ministry of Environment

Public Scoping Workshop with the Federal Ministry of Environment

Picture showing a cross section of the dignitaries during the scoping workshop.

Remarks by Mr. James Kolawole of the Federal Ministry of Environment, Abuja

Project Presentation by Engr. Tokunbo Ajanaku

Dr. Kayode Oluwagbuyi of Sustainabiliti Limited, (EIA Consultants), responding to Questions

Remarks by an Official of the Lagos State Ministry of Urban Development and Physical Planning

Closing remarks by Alhaji R. Owokoniran

Cutting of a Cake at the end of the Scoping Workshop

APPENDIX 9: List of Participants at Scoping Workshop

Pre-Scoping Workshop

THE FOURTH MAINLAND BRIDGE PROJECT
STAKEHOLDERS' CONSULTATION FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 1-12-2020 TIME: 11:20AM VENUE: SUSTAINABILITI CONFERENCE HALL

SUBJECT: PRE-SCOPING WORKSHOP MEETING

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	James F Kolawole	FMEnv. Abuja	08057097045	jiklag@yahoo.com	
2	Tombere, E. C.	FMENV	08135254206	emmanuel ctombere @gmail..com	
3	Tola Johnson	AEC	08050777701	babatoladjohnson@gmail.com	
4.	Titiloga Agbele	AEC	08023198023	titilolagbele@gmail.com	
5	Awo Titiloba Julius	Sustainabiliti	08107488196	Juliusawo45@yahoo.com	
6	OLUWAGBUYI KAYODE	✓	08033026092	kayoluwagbuyi@gmail.com	

Institutional Scoping Workshop with the Federal Ministry of Environment

THE FOURTH MAINLAND BRIDGE PROJECT

SCOPING WORKSHOP FOR THE
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 2-12-2020 **TIME:** 10:30AM **VENUE:** SUSTAINABILITI CONFERENCE HALL

SUBJECT: SCOPING WORKSHOP

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
1	James Kdawole	FMEnv. Abuja	08057097045	jiklag@yahoo.com	
2	Tola Johnson	AEC	08050777701	babatoladjohnson.com	
3.	Mordi Lillian.	AEC	07033058003.	mordilillian@gmail.com	
4	Tutilola Agbele	AEC	08023198023	tutilolagbele@gmail.com	
5	Somolu Olaoluwa	MPP&UD DM	08023211153	somolulaoluwa@yahoo.com	
6	David Adekugbe, S.A.	MPP&UD DM	08023445690	Subaadekugbe@gmail.com	
7.	Oyelakin Tosin	Sustainabiliti Ltd	07034297995	tosinoye2010@gmail.com.	
8.	OLONISAKIN MICHAEL	Sustainabiliti Ltd	08132968426	Mikeolonisakin@gmail.com	
9.	SHOGAOLU OLUGBENGA.G.	MOWI	08020886264	oshogaolu@gmail.com	
10	Olanrewaju Alex.E.	MOWI	08033470537	alex.olanrewaju@gmail.com	

THE FOURTH MAINLAND BRIDGE PROJECT

SCOPING WORKSHOP FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 2-12-2020 **TIME:** 10:30 AM **VENUE:** SUSTAINABILITI CONFERENCE HALL

SUBJECT: SCOPING WORKSHOP

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
11	Aleniran Adepetun	MOWI	08022153615	Adepetun-niran@yahoo.com	
12	Tpl Obayomi O. Amos	MPP&UD (RMD)	08023360084	yomilolly@yahoo.com	
13	Tpl Agboola O.M.	MPP&UD(RMD	08084338840	agboola2.mgeed@gmail.com	
14	SEGUN-OSHALIKI	P.A.V (MINISTRY OF WORKS)	08064234047	segale2@yahoo.com	
15	ORIMOLAJE ROTIMI	P.A.V (MINISTRY OF WORKS & INFRA)	08026134678	molodetimi@gmail.com	
16	OLUWAGBUYI Kayode	SUSTAINABILITI LTD	08033026092	kayoluwagbuyi@sustainabiliti.com	
17	Ajanaku Tokunbo	LASG MoWI	0802 498 2288	tknbajax@gmail.com	
18	Kayode Abimbola	LASG MOWI	08023057758	Smithbim@yahoo.com	
19	Awo Tobiloba Julius	Sustainabiliti Limited	08107488196	Juliusawo45@yahoo.com	
20	Segale Oluwaseyi. A	Sustainabiliti Limited	08057170507	Segale.oluwaseyi@yahw.com	

THE FOURTH MAINLAND BRIDGE PROJECT

SCOPING WORKSHOP FOR THE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 2-12-2020 **TIME:** 10:30AM **VENUE:** SUSTAINABILITI CONFERENCE HALL

SUBJECT: SCOPING WORKSHOP

GENERAL ATTENDEES LIST

S/N	NAME	DEPARTMENT/MINISTRY	PHONE NUMBER	E-MAIL	SIGNATURE
21	OBATNOR OSATO CHIOMA	SUSTAINABILITI LIMITED	0806 3495809	Chiomaobamor01@gmail.com	
22	Ajuclua, Chyelukachukwu Michael	Sustainabiliti Limited	0903296301	ajuclua01@gmail.com	
23	Agunbiade Peter. O	AEC MA	08033070582	peter.agunbiadeaec.org.ng	
24	Iwayemi Olalekan O.	AEC	07069159851	iwayemilumsy@gmail.com	
25	OBUMUCA. N. A	MoWI	08023360499.		
26	Ade Adebisi	MoWI	07062215258		
27	Adekunle Owolabi	DAR	07035639664	owolabi.adekunle@dar.com	
28					
29					
30					

Public Scoping Workshop with the Federal Ministry of Environment

4MB FOURTH MAINLAND BRIDGE | LAGOS STATE GOVERNMENT | Rendel

THE FOURTH MAINLAND BRIDGE PROJECT

SUSTAINABILITY LIMITED | dar | AEC

SCOPING WORKSHOP FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 03-12-2020 **TIME:** .... **VENUE:** NIS AUDITORIUM

SUBJECT: ESIA SCOPING WORKSHOP FOR THE FOURTH MAINLAND BRIDGE PROJECT

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THE FOURTH MAINLAND BRIDGE PROJECT

SCOPING WORKSHOP FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 3-12-2020 TIME: 10:30AM VENUE:

SUBJECT:

GENERAL ATTENDEES LIST

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4MB Rendel **THE FOURTH MAINLAND BRIDGE PROJECT** dar AEC

SCOPING WORKSHOP FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 3-12-2020 TIME: 10:30 AM VENUE: ...

SUBJECT: ...

GENERAL ATTENDEES LIST

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THE FOURTH MAINLAND BRIDGE PROJECT

SCOPING WORKSHOP FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

DATE: 3/12/2020 **TIME:** 10:30Am **VENUE:**

SUBJECT: ESIA SCOPING WORKSHOP

GENERAL ATTENDEES LIST

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A cross section of members of Oke-Ira Nla and ESIA team during community engagement

Annex 4 General Environmental & Social Management Conditions for Construction Contracts

In addition to these general conditions, the Contractor shall comply with any specific Environmental Management Plan (EMP) or Environmental and Social Management Plan (ESMP) for the works he is responsible for. The Contractor shall inform himself about such an ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of that ESMP. If the Contractor fails to implement the approved ESMP after written instruction by the Supervising Engineer (SE) to fulfil his obligation within the requested time, the Owner reserves the right to arrange through the SE for execution of the missing action by a third party on account of the Contractor.

Notwithstanding the Contractor obligation under the above clause, the Contractor shall implement all measures necessary to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by any environmental performance requirements specified in an ESMP. In general these measures shall include but not be limited to: (a) Minimize the effect of dust on the surrounding environment resulting from earth mixing sites, asphalt mixing sites, dispersing coal ashes, vibrating equipment, temporary access Roads, etc. to ensure safety, health and the protection of workers and communities living in the vicinity of dust producing activities.

(b) Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

(c) Ensure that existing water flow regimes in rivers, streams and other natural or irrigation channels is maintained and/or re-established where they are disrupted due to works being carried out.

(d) Prevent bitumen, oils, lubricants and waste water used or produced during the execution of works from entering into rivers, streams, irrigation channels and other natural water bodies/reservoirs, and also ensure that stagnant water in uncovered borrow pits is treated in the best way to avoid creating possible breeding grounds for mosquitoes.

(e) Prevent and minimize the impacts of quarrying, earth borrowing, piling and building of temporary construction camps and access Roads on the biophysical environment including protected areas and arable lands; local communities and their settlements. In as much as possible restore/rehabilitate all sites to acceptable standards.

(f) Upon discovery of ancient heritage, relics or anything that might or believed to be of archeological or historical importance during the execution of works, immediately report such findings to the SE so that the appropriate authorities may be expeditiously contacted for fulfillment of the measures aimed at protecting such historical or archaeological resources.

(g) Discourage construction workers from engaging in the exploitation of natural resources such as hunting, fishing, and collection of forest products or any other activity that might have a negative impact on the social and economic welfare of the local communities.

(h) Implement soil erosion control measures in order to avoid surface run off and prevents siltation, etc.

(i) Ensure that garbage, sanitation and drinking water facilities are provided in construction worker scamps.

(j) Ensure that, in as much as possible, local materials are used to avoid importation of foreign material and long distance transportation.

(k) Ensure public safety, and meet traffic safety requirements for the operation of work to avoid accidents.

- The Contractor shall indicate the period within which he/she shall maintain status on site after completion of civil works to ensure that significant adverse impacts arising from such works have been appropriately addressed.
- The Contractor shall adhere to the proposed activity implementation schedule and the monitoring plan / strategy to ensure effective feedback of monitoring information to project management so that impact management can be implemented properly, and if necessary, adapt to changing and unforeseen conditions.
- Besides the regular inspection of the sites by the Supervising Engineer for adherence to the contract conditions and specifications, the Owner may appoint an Inspector to oversee the compliance with these environmental conditions and any proposed mitigation measures. State environmental authorities may carry out similar inspection duties. In all cases, as directed by the SE, the Contractor shall comply with directives from such inspectors to implement measures required to ensure the adequacy rehabilitation measures carried out on the biophysical environment and compensation for socio-economic disruption resulting from implementation of any works.
- All vessels (drums, containers, bags, etc.) containing oil/fuel/surfacing materials and other hazardous chemicals shall be bonded in order to contain spillage. All waste containers, litter and any other waste generated during the construction shall be collected and disposed off at designated disposal sites in line with applicable government waste management regulations.
- All drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations.
- Used oil from maintenance shall be collected and disposed off appropriately at designated sites or be reused or sold for re-use locally.
- Entry of runoff to the site shall be restricted by constructing diversion channels or holding structures such as banks, drains, dams, etc. to reduce the potential of soil erosion and water pollution.
- Construction waste shall not be left in stockpiles along the Road, but removed and reused or disposed of on a daily basis.
- If disposal sites for clean spoil are necessary, they shall be located in areas, approved by the SE, of low land use value and where they will not result in material being easily washed into drainage channels. Whenever possible, spoil materials should be placed in low-lying areas and should be compacted and planted with species indigenous to the locality.
- The Contractor shall obtain appropriate licenses/permits from relevant authorities to operate quarries or borrow areas.
- The location of quarries and borrow areas shall be subject to approval by relevant local and national authorities, including traditional authorities if the land on which the quarry or borrow areas fall in traditional land.
- New extraction sites: a) Shall not be located in the vicinity of settlement areas, cultural sites, wetlands or any other valued ecosystem component, or on high or steep ground or in areas of high scenic value, and shall not be located less than 1km from such areas. b) Shall not be located adjacent to stream channels wherever possible to avoid siltation of river channels. Where they are located near water sources, borrow pits and perimeter drains shall surround quarry sites. c) Shall not be located in archaeological areas. Excavations in the vicinity of such areas shall

proceed with great care and shall be done in the presence of government authorities having a mandate for their protection. d) Shall not be located in forest reserves. However, where there are no other alternatives, permission shall be obtained from the appropriate authorities and an environmental impact study shall be conducted. e) Shall be easily rehabilitated. Areas with minimal vegetation cover such as flat and bare ground, or areas covered with grass only or covered with shrubs less than 1.5m in height, are preferred. f) Shall have clearly demarcated and marked boundaries to minimize vegetation clearing.

- Vegetation clearing shall be restricted to the area required for safe operation of construction work. Vegetation clearing shall not be done more than two months in advance of operations.
- Stockpile areas shall be located in areas where trees can act as buffers to prevent dust pollution. Perimeter drains shall be built around stockpile areas. Sediment and other pollutant traps shall be located at drainage exits from workings.
- The Contractor shall deposit any excess material in accordance with the principles of these general conditions, and any applicable ESMP, in areas approved by local authorities and/or the SE.
- Areas for depositing hazardous materials such as contaminated liquid and solid materials shall be approved by the SE and appropriate local and/or national authorities before the commencement of work. Use of existing, approved sites shall be preferred over the establishment of new sites.
- To the extent practicable, the Contractor shall rehabilitate the site progressively so that the rate of rehabilitation is similar to the rate of construction.
- Always remove and retain topsoil for subsequent rehabilitation. Soils shall not be stripped when they are wet as this can lead to soil compaction and loss of structure.
- Topsoil shall not be stored in large heaps. Low mounds of no more than 1 to 2m high are recommended.
- Revegetate stockpiles to protect the soil from erosion, discourage weeds and maintain an active population of beneficial soil microbes.
- Locate stockpiles where they will not be disturbed by future construction activities.
- To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired.
- Remove toxic materials and dispose of them in designated sites. Backfill excavated areas with soils or overburden that is free of foreign material that could pollute groundwater and soil.
- Identify potentially toxic overburden and screen with suitable material to prevent mobilization of toxins.
- Ensure reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long-term land use, and allow natural regeneration of vegetation.
- Minimize the long-term visual impact by creating landforms that are compatible with the adjacent landscape.
- Minimize erosion by wind and water both during and after the process of reinstatement.
- Compacted surfaces shall be deep ripped to relieve compaction unless subsurface conditions dictate otherwise.
- Revegetate with plant species that will control erosion, provide vegetative diversity and, through succession, contribute to a resilient ecosystem. The choice of plant species for rehabilitation shall be done in consultation with local research institutions, forest department and the local people. Water Resources Management.
- The Contractor shall at all costs avoid conflicting with water demands of local communities.

- Abstraction of both surface and underground water shall only be done with the consultation of the local community and after obtaining a permit from the relevant Water Authority.
- Abstraction of water from wetlands shall be avoided. Where necessary, authority has to be obtained from relevant authorities.
- Temporary damming of streams and rivers shall be done in such a way avoids disrupting water supplies to communities downstream, and maintains the ecological balance of the river system.
- No construction water containing spoils or site effluent, especially cement and oil, shall be allowed to flow into natural water drainage courses.
- Wash water from washing out of equipment shall not be discharged into water courses or Road drains.
- Site spoils and temporary stockpiles shall be located away from the drainage system, and surface run off shall be directed away from stockpiles to prevent erosion.
- Location of access Roads/detours shall be done in consultation with the local community especially in important or sensitive environments. Access Roads shall not traverse wetland areas.
- Upon the completion of civil works, all access Roads shall be ripped and rehabilitated.
- Access Roads shall be sprinkled with water at least five times a day in settled areas, and three times in unsettled areas, to suppress dust emissions.
- Blasting activities shall not take place less than 2km from settlement areas, cultural sites, or wetlands without the permission of the SE.
- Blasting activities shall be done during working hours, and local communities shall be consulted on the proposed blasting times.
- Noise levels reaching the communities from blasting activities shall not exceed 90 decibels.
- Unusable materials and construction elements such as electro-mechanical equipment, pipes, accessories and demolished structures will be disposed of in a manner approved by the SE. The Contractor has to agree with the SE which elements are to be surrendered to the Client ís premises, which will be recycled or reused, and which will be disposed of at approved landfill sites.
- As far as possible, abandoned pipelines shall remain in place. Where for any reason no alternative alignment for the new pipeline is possible, the old pipes shall be safely removed and stored at a safe place to be agreed upon with the SE and the local authorities concerned.
- AC-pipes as well as broken parts thereof have to be treated as hazardous material and disposed of as specified above. 48. Unsuitable and demolished elements shall be dismantled to a size fitting on ordinary trucks for transport.
- In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of AIDS.
- Adequate Road signs to warn pedestrians and motorists of construction activities, diversions, etc. shall be provided at appropriate points.
- Construction vehicles shall not exceed maximum speed limit of 40km per hour.
- Should the Contractor, deliberately or accidentally, damage private property, he shall repair the property to the owner's satisfaction and at his own cost. For each repair, the Contractor shall obtain from the owner a certificate that the damage has been made good satisfactorily in order to indemnify the Client from subsequent claims.
- In cases where compensation for inconveniences, damage of crops etc. are claimed by the owner, the Client has to be informed by the Contractor through the SE. This compensation is in general settled under the responsibility of the Client before signing the Contract. In unforeseeable cases, the respective administrative entities of the Client will take care of compensation.

- Within 6 weeks of signing the Contract, the Contractor shall prepare an EHS-MP to ensure the adequate management of the health, safety, environmental and social aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an EMP for the works. The Contractor is EHS-MP will serve two main purposes:
- For the Contractor, for internal purposes, to ensure that all measures are in place for adequate HSE management, and as an operational manual for his staff.
- For the Client, supported where necessary by a SE, to ensure that the Contractor is fully prepared for the adequate management of the HSE aspects of the project, and as a basis for monitoring of the Contractor is HSE performance.

The Contractor is EHS-MP shall provide at least:

- A description of procedures and methods for complying with these general environmental management conditions, and any specific conditions specified in an EMP;
- A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- A description of all planned monitoring activities (e.g. sediment discharges from borrow areas) and the reporting thereof; and
- The internal organizational, management and reporting mechanisms put in place for such.

The contractor's EHS-MP will be reviewed and approved by the Client before start of the works. This review should demonstrate if the contractor's EHS-MP covers all of the identified impacts, and has defined appropriate measures to counteract any potential impacts.

The Contractor shall prepare bi-weekly progress reports to the SE on compliance with these general conditions, the project EMP if any, and his own EHS-MP. An example format for a Contractor HSE report is given below. It is expected that the contractor's reports will include information on:

- HSE management actions/measures taken, including approvals sought from local or
- national authorities;
- Problems encountered in relation to HSE aspects (incidents, including delays, cost
- consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects; and
- Observations, concerns raised and/or decisions taken with regard to HSE management during site meetings.

It is advisable that reporting of significant HSE incidents be done as soon as practicable. Such incident reporting shall therefore be done individually. Also, it is advisable that the Contractor keeps his own records on health, safety and welfare of persons, and damage to property. It is advisable to include such records, as well as copies of incident reports, as appendices to the bi-weekly reports. Example formats for an incident notification and detailed report are given below. Details of HSE performance will be reported to the Client through the SE's reports to the Client

The Contractor shall provide sufficient training to his own personnel to ensure that they are all aware of the relevant aspects of these general conditions, any project EMP, and his own EHS-MP, and are able to fulfil their expected roles and functions. Specific training be provided to those employees that have particular responsibilities associated with the implementation of the EHS-MP. General topics should be:

- HSE in general (working procedures);
- Emergency procedures; and
- Social and cultural aspects (awareness raising on social issues).

It is expected that compliance with these conditions is already part of standard good workmanship and state of the art as generally required under this Contract. The item incompliance with Environmental Management Conditions in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable HSE impact. Example Format: HSE Report Contract: Period of reporting: HSE management actions/measures: Summarize HSE management actions/measures taken during period of reporting, including planning and management activities (e.g. risk and impact assessments), HSE training, specific design and work measures taken, etc. HSE incidents: Report on any problems encountered in relation to HSE aspects, including its consequences (delays, costs) and corrective measures taken. Include relevant incident reports. HSE compliance: Report on compliance with Contract HSE conditions, including any cases of non-compliance. Changes: Report on any changes of assumptions, conditions, measures, designs and actual works in relation to HSE aspects.
Concerns and observations: Report on any observations, concerns raised and/or decisions taken with regard to HSE management during site meetings and visits. Signature (Name, Title Date): Contractor is Representative Example Format: HSE Incident Notification Provide within 24hrs to the Supervising Engineer Originators Reference No:

Date of Incident: Time: Location of incident: Name of Person(s) involved: Employing Company: Type of Incident: Description of Incident: Where, when, what, how, who, operation in progress at the time (only factual) Immediate Action: Immediate remedial action and actions taken to prevent reoccurrence or escalation Signature (Name, Title, Date): Contractor is Representative

Annex 5 Occupational Health and Safety (OHS) Plan

1.0 INTRODUCTION

Every project poses its HSE risks. This plan was necessitated to meet up with OHS standards and to achieve the objectives set for the proposed project. The project team shall undertake to ensure high performance standards and conformity with contract requirements by managing the works in a systematic and thorough manner.

2.0 PROJECT DESCRIPTION

The project entails the Construction of Fourth Mainland Bridge

2.1 Purpose

The purpose of this document is to describe the Project Occupational Health and Safety (OHS) plan for the proposed bridge reconstruction and the specific management controls, risk control systems and workplace precautions required to ensure compliance with Occupational Health and Safety Laws and Standards.

2.2 HSE Objectives

The Objectives for this plan are to:

- Adopt a positive Health & Safety Culture.
- Adopt the principles of prevention to avoid risk.
- Complete the project without incident (Zero fatalities, Zero Lost Time Injury (LTI) or occupational illness).

2.3 Scope of Work

The Project Occupational Health and Safety (OHS) plan covers the scope of works defined in the contract. This includes Preconstruction, Construction, Operation & Maintenance and Decommissioning phases.

2.4 Policy Statement

In addition to the existing HSE policy, other policies shall be developed which includes:

- Substance Abuse Policy – Prohibiting the consumption or possession of narcotics, drugs, alcohol and other banned substances
- Emergency Response Policy – Stating commitment to ensure adequate resources and arrangement are in place in the case an emergency.
- Community Affairs Policy – Stating commitment to foster healthy relationships with communities through observance of the highest standard of conduct.
- Road Safety Policy–Stating commitment to complying with Road Traffic regulations and continuously improving its Road safety performance by implementing a Road Safety Management Plan (RSMP)

3.0 KEY RESPONSIBILITIES

Involvement of all in implementing, maintaining and continually improving OHS processes is the key to successful completion and achievement of quality objectives set by the management. All project personnel shall therefore be required to be familiar with the content of this OHS plan and shall participate in implementing, maintaining and improving the management system.

It is the responsibility of the project manager and all key personnel to ensure that the requirements for quality are fulfilled for works under their responsibility.

All new staff and staff who are given new responsibilities are to be inducted into the requirements set out in this plan in general and into their function and responsibilities in particular.

3.1 Project Manager Responsibilities

- Set good example in HSE issues.
- Ensure the availability of resources essential to establish, implement, maintain and improve the OHS Management System.
- Define, document and communicate roles, allocate responsibilities and accountabilities, delegating authorities, to facilitate effective OHS management.
- Ensure that all of the activities undertaken in the Project conform to Nigerian legislation, client requirements or international standards when applicable.
- Review objectives achievements throughout the year.

3.2 Project Supervisors Responsibilities

- Enforcing all phases of the established HSE plan.
- Set good example in HSE issues.
- Preparing Job Hazard Analysis when required.
- Ensuring the safety of all workers associated with the site.
- Conducting HSE inspections.
- Ensuring workers are competent for their allocated tasks.
- Attending and participating in HSE meetings.
- Participating in accident investigations.

3.3 HSE Manager/Supervisor Responsibilities

- Prepare relevant OHS documentation and procedures.
- Monitor the efficient implementation of OHS requirements.
- Participate and organize the OHS risk assessments.
- Advise management of compliance and of conditions requiring attention.
- Conduct regular HSE inspections.
- Make thorough analysis of statistical data and inspections; delineates problem areas; and makes recommendation for solutions.
- Take part in the review of all OHS incidents and assist in investigating incident.
- Monitor the efficient implementation of the Project's OHS requirements.
- Organize the Project's OHS risk assessment exercises.
- Check on the use of all types of personal protective equipment specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements where indicated.

3.4 HSE Advisor Responsibilities

- Check on the use of all types of personal protective equipment specifies the use of appropriate PPE for the various work activities. Evaluates their effectiveness and suggests improvements.

- Conduct independent inspections to observe conformance with established OHS Plan and determines the effectiveness of individual elements of the plan (pre-task briefing, weekly toolbox talk, etc)
- Establish contact with Subcontractors with the objective of maintaining good relations and coordination of accident prevention activities and compliance with the established OHS plan.
- Correct unsafe acts and unsafe conditions.
- Deliver HSE induction/orientation course to all employees, including subcontractors.
- Deliver HSE awareness course and toolbox talk.
- Advise employees on OHS matters.

3.5 All employees Responsibilities

- Take all reasonable and practical steps to care for their own health and safety and avoid affecting the health and safety of co-workers and the general public.
- Follow all instructions and use the equipment properly
- Not interfere with any safety arrangements.
- Report any circumstances which may not comply with the project's OHS management system.

4.0 Competency

All personnel required to operate or work with any equipment or machine must be competent, be tested for each equipment that he/she shall be operating. All personnel who as part of their profession require licensing or certification must obtain the necessary certification before he/she shall be allowed to work on the site.

5.0 Fitness

All personnel working on site shall be required to be certified medically fit to do so by an approved medical facility or Medical Doctor (pre-employment medical examination)

6.0 HSE Training

6.1 Induction/Orientation

Every new or rehired employee and Subcontractors employees must undergo mandatory OHS orientation / induction. The purpose of the Induction is to educate workers and make them aware of the major potential hazards he or she shall come into contact with while working on the site; also, it is one more opportunity to stress the importance of HSE being the first priority in the operations.

The content of the HSE orientation / induction shall cover the following subjects:

- Site safety rules.
- Personnel protective equipment requirements (PPE).
- Environmental sensitivity and protection.
- Preparation and planning of the job (Daily Pre-task talk).
- Emergency plan and muster points.

6.2 Project Specific HSE Training

In addition to the HSE orientation /induction, there shall be specific site HSE trainings which shall cover the following topics:

- Manual handling.
- Electrical Safety
- Emergency Prevention, Preparedness and Response
- Work at height training
- First Aid training (for site First Aiders)
- Lifting and Rigging
- Safe Driving techniques (for drivers)

7.0 Hazard identification & HSE risk assessment

7.1 Project HSE Risk Assessment

The project HSE risk assessment shall be developed and recorded. The Project's HSE risk assessment shall be conducted by a team consisting of HSE Manager/ Supervisor and technical managers/supervisors. It must be approved by the Project manager.

7.2 Fire Risk Assessment

A fire risk assessment shall be developed and recorded. A fire safety plan shall be in place in the site.

7.3 Job Hazard Analysis

Job hazard analysis is required when the hazards and risks associated with a specific task is to be identified so as to implement control measures. The HSE department together with the technical managers/supervisors shall develop a job hazard analysis when applicable.

Annex 6 Labour influx management procedures

Section 1: OVERVIEW OF LABOUR USE ON THE PROJECT

Number of Project Workers: The total number of workers to be employed on the project, and the different types of workers: direct workers, contracted workers and community workers. Where numbers are not yet confirmed, an estimate should be provided.

Characteristics of Project Workers: To the extent possible, a bRoad description and an indication of the likely characteristics of the project workers e.g. local workers, national or international migrants, female workers, workers between the minimum age and 18.

Timing of Labor Requirements: The timing and sequencing of labor requirements in terms of numbers, locations, types of jobs and skills required.

Contracted Workers: The anticipated or known contracting structure for the project, with numbers and types of contractors/subcontractors and the likely number of project workers to be employed or engaged by each contractor/subcontractor. If it is likely that project workers will be engaged through brokers, intermediaries or agents, this should be noted together with an estimate how many workers are expected to be recruited in this way.

Migrant Workers: If it is likely that migrant workers (either domestic or international) are expected to work on the project, this should be noted and details provided. A labour in-migration plan should be included in this LMP if there is going to be substantial population of migrant workers as a result of the project.

Section 2: ASSESSMENT OF KEY POTENTIAL LABOR RISKS: This section describes the following, based on available information:

Project activities: The type and location of the project, and the different activities the project workers will carry out.

Key Labor Risks: The key labor risks which may be associated with the project (see, for example,

- The conduct of hazardous work, such as working at heights or in confined spaces, use of heavy machinery, or use of hazardous materials
- Likely incidents of child labor or forced labor, with reference to the sector or locality
- Likely presence of migrants or seasonal workers
- Risks of labor influx or gender based violence
- Possible accidents or emergencies, with reference to the sector or locality
- General understanding and implementation of occupational health and safety requirements

Section 3: BRIEF OVERVIEW OF LABOR LEGISLATION: TERMS AND CONDITIONS

This section sets out the ***key aspects*** of national and local labor legislation with regards to term and conditions of work (e.g national minimum wage law, local content laws etc) , and how

such legislation applies to different categories of workers identified in Section 1. The overview focuses on legislation which relates to the items set out in ESS 2, paragraph 11 (i.e. wages, deductions and benefits).

Section 4: BRIEF OVERVIEW OF LABOR LEGISLATION: OCCUPATIONAL HEALTH AND SAFETY

This section sets out the ***key aspects*** of the national labor legislation with regards to occupational health and safety, and how national legislation applies to the different categories of workers identified in Section 1.

Section 5: RESPONSIBLE STAFF

This section identifies the functions and/or individuals within the project responsible for (as relevant):

- engagement and management of project workers
- engagement and management of contractors/subcontractors
- occupational health and safety (OHS)
- training of workers
- addressing worker grievances

In some cases, this section will identify functions and/or individuals from contractors or subcontractors, particularly in projects where project workers are employed by third parties.

Section 5: POLICIES AND PROCEDURES

This section sets out information on OHS, reporting and monitoring and other general project policies. Where relevant, it identifies applicable national legislation.

Where significant safety risks have been identified as part of Section 2, this section outlines how these will be addressed. Where the risk of forced labor has been identified, this section outlines how these will be addressed. Where risks of child labor have been identified, these are addressed in Section 7.Where the Borrower has stand-alone policies or procedures, these can be referenced or annexed to the LMP, together with any other supporting documentation.

Section 6: AGE OF EMPLOYMENT

This section sets out details regarding:

- The minimum age for employment on the project
- The process that will be followed to verify the age of project workers
- The procedure that will be followed if underage workers are found working on the project
- The procedure for conducting risk assessments for workers aged between the minimum age and 18

Section 7: TERMS AND CONDITIONS

This section sets out details regarding:

- Specific wages, hours and other provisions that apply to the project
- Maximum number of hours that can be worked on the project
- Any collective agreements that apply to the project. When relevant, provide a list of agreements and describe key features and provisions
- Other specific terms and conditions

Section 8: GRIEVANCE MECHANISM

This section sets out details of the grievance mechanism that will be provided for direct and contracted workers, and describes the way in which these workers will be made aware of the mechanism. Where community workers are engaged in the project, details of the grievance mechanism for these workers is set out in chapter on GRM (chapter 10 of this ESIA).

Section 9: CONTRACTOR MANAGEMENT

This section sets out details regarding:

- The selection process for contractors (or sub-contractors)
- The contractual provisions that will put in place relating to contractors for the management of labor issues, including occupational health and safety.
- The procedure for managing and monitoring the performance of contractors.

Section 10: COMMUNITY WORKERS

Where community workers will be involved in the project, this section sets out details of the terms and conditions of work, and identifies measures to check that community labor is provided on a voluntary basis. It also provides details of the type of agreements that are required and how they will be documented. This section sets out details of the grievance mechanism for community workers and the roles and responsibilities for monitoring such workers.

Section 11: PRIMARY SUPPLY WORKERS

Where a significant risk of child or forced labor or serious safety issues in relation to primary suppliers has been identified, this section sets out the procedure for monitoring and reporting on primary supply workers.

Section 12: Summary, Conclusions and Recommendations of the LMP

Annex 7 GBV Consultation and Attendance lists

Gender Based Violence (GBV) Field Report and Attendance List

Interactive sessions were held on Gender Based Violence (GBV) with women in various communities between March- May, 2021 within the following dates; 15th March, 17th March, 18th March, 28th April, 29th April, 30th April, 1st May, 2021. The meetings were held in local dialect (**Yoruba)** and English to aid comprehension among participants in the following communities, and summary of women consultation includes;

1.1 ADEBORUWA PALACE, IGBOGBO

It was gathered that women in this area were involved in farming and trading. There is a level of awareness in the community about Gender based violence. This includes a billboard dedicated to this close to the palace, and a shirt worn by the secretary to the Kabiyesi depicting toll free points to report sexual abuse and GBV as shown in Figure 1.1. The shirt shows it is sponsored by "Abiodun Ariori Golden Foundation" in collaboration with Lagos State Domestic & Sexual Violence Response Team (DSVRT) with the wordings "Igbogbo says No to Rape, Child Abuse and Domestic Violence".

The women explained that no incidents of rape or pregnancy have been reported so far. However, in the community a lot of people are still unaware of the channels/ process for reporting incase an incident occurs. Suggestions for improvement include;

- A Grievance Redress mechanism (include CDA, health representative etc) should be designed for this project in this community which can be strengthened/ adopted after the project.
- Primary health care centres should be equipped with Rape minimum kit to cater for GBV survivors if there is an incident.
- Increase awareness among residents in the community about GBV and toll free lines for reporting to discourage shame/ stigma and promote attitude to speak up in such incidents.

Figure 1.1: Showing billboard and shirt worn by Secretary to Kabiyesi depicting GBV

Figure 1.2 Picture of Women Consultation at Adeboruwa palace, Igbogbo Ikorudu

1.2 AIYETORO, IKORODU

Aiyetoro is a fishing community and most women are engaged in fishing activities. Disputes are usually resolved between themselves as they live a communal lifestyle with close knit ties. This community lack access to basic amenities including; clean water, electricity, bad Roads etc. It is advised that; a formal GBV/ GRM response process is set up, Health centre should be provided within the community incase of emergencies, and Basic amenities for this community should be reviewed by the government and provided.

Figure 1.3: Showing consultations at Ayetoro, Ikorodu

Figure 1.4: Livelihood of a woman in Ayetoro community, Ikorodu (crayfish trading after fishing)

1.3 Magodo CDA, Itokin Ikorodu

The meeting started by introduction of consultants, introduction of project. Information gathered from GBV consultations was; female residents are involved in trading, entrepreneurship, etc and there has been No cases of rape, sexual abuse or GBV in the community. It is advised that; a primary health center should be provided within the community to cater for health needs of community members. A rape minimum kit should also be provided in the clinics/ hospitals. Women requested for basic amenities in the community. In order of preference, these include; Water, electricity, health center, security, etc. A grievance redress mechanism or mediation channel should be set up and toll free numbers.

1.4 Shared Divine Estate, Ikorodu

Most women in this community are traders, food vendors, stay home mums, and a few civil servants. When there are projects in the community, some women usually go to some construction sites to sell provision/ food, but children aren't involved in such activities/ street hawking. No incidents on rape, violence/ abuse in the community. However, only a few arguments concerning owed by labourers in the past, but these are usually resolved within both affected parties or referred to the CDA chairman for resolution. It is believed that the project would expose

residents to insecurity challenges. Hence, some women advised that barricades should separate the community from the construction site, Promote enlightenment in the community etc. A process for complaints in case of an incident was suggested which includes; asking the individual to narrate exactly what happened. This narrative should be repeated to ensure credibility of information source, after which medical help should be seeked immediately before social redress, court, or law enforcement agency etc.It is also advised that; Sex education/ enlightenment should be taught to girls by parents or in school. Children should be encouraged to speak up by developing friendly relationship with them. Formal security guards/ law enforcement agency should be provided within community

Figure 1.5: Consultation at Shared Divine estate, Ikorodu

1.5 Isheri Kabiyesi palace

This area is located at Isheri area, towards Lagos-Ibadan Expressway. It is a mixed residential and commercial area as some shops/ stalls (e.g food vendors, petty traders etc) were seen as well as residential buildings. The Road to the palace is an earth Road filled with potholes and mud.

The palace is usually headed by the Kabiyesi who is the traditional ruler but passed away and the throne is now temporarily headed by a female as acting Kabiyesi who is the daughter of the past king. In this area, women are allowed to make decisions and hold positions in the community. Whenever the king dies, they install the daughter pending the coronation of a new king. This was seen as the acting Kabiyesi, who is well respected and honoured is the daughter of the late king. The major source of income/ livelihood is petty trading.

Consultation with women group in Kabiyesi Palace, Isheri.

1.6 Okeira Kekere, Addo Road

This is a mixed area (residential and commercial activities) with GPS coordinates: 31N 0564357, UTM 0717716 and it is close to Okeira central mosque, Ajah. There is a proposed interchange in this area according to the project design. The residents of the community complained about security threats in

the area, however most complaints about security and gender risks are usually reported to the Baale in the community. Figure 2 shows women consultation at Okeira- Kekere community.

Consultation with women at Okeira kekere community, Ajah

1.7 Tippers garage, Oke-ira nla Jetty, Ajah

This is where the jetty is located and people can easily connect the island to the mainland (via water). Boats carry passengers from Ajah to Aiyetoro/ Bayekun, Ikorodu and vice versa. Residents in this area are involved in fishing and women were observed drying/ smoking fish for preservation purposes before sales.

Consultation with women and livelihood of residents (fishing/ preservation of fish) in Okeira Nla Jetty area.

1.8 Alade Egbeyemi, Idiroko, Ikorodu (1/4/2021)

This area is located in Ikorodu, near Idiroko bustop, Ikorodu. Most of the streets in this area have been adversely affected by erosion. Residents in this area are involved in trading, entrepreneurship, while

some others are civil servants. Women in this community are allowed to work and express their opinions. Details of findings on gender issues are presented in table 1.

Women Consultation at Alade Egbeyemi, Idiroko, Ikorodu

1.9 Surulere Ikorodu North (1/5/21)

This is mainly a residential area with a few shops/ stalls where some residents are involved in petty trading. Most residents in the area are civil servants and they own their homes. Residents raised concerns about the resettlement plans and the start date of the project. However, they were reassured that it would be a transparent and participatory process and resettlement would be done prior to commencement of the project.

Women Consultation at Surulere, Ikorodu

Details on responses to FGD questions in the communities visited are presented in Tables 1 and 2.

Table 1: Responses to Questions during Focus Group Discussions (I)

	AREAS VISITED			
Questions	**Adeboruwa Palace, Igbogbo (15/03/2021)**	**Aiyetoro, Ikorodu (15/03/2021)**	**Magodo CDA, Itokin Ikorodu (16/03/2021)**	**Shared Divine Estate, Ikorodu (18/03/2021)**
Source of Livelihood	Women in this area are involved in farming and trading.	Fishing is the major source of income in this area. This can be attributed to the area's proximity to water	Most female residents are involved in trading, entrepreneurship endeavors.	Women in this community are usually traders, food vendors, stay home mums, and a few civil servants.
Do women work during project?	Women and Children hawk and sell to laborers on civil works	Community has not experienced major project however they do get to sell their product to project workers.	Women work and also sell their product to project workers	Women work and also sell their product to project workers
Who makes decisions? Are women involved?	Women are involved in decisions and they're carried along during projects.	Women are involved in decision making and they participated during consultation. .	Women participate in decision making	Decision making isn't gender-bias. Women are involved in decision making process.
Security	Security issues in this area are resolved by Police. The Police station is located in Agbeleye/ Oreyo Road	There is no police station in the community and no security personnels in the area.	It was gathered that there is no police station within the community.	There is no formal security, only informal security guards e.g Hausa men (aboki).
Do site workers harass little girls/ women/ date them?	No	No	No	None
How do you report workers who misbehave?	They can be reported to Baale, Chiefs, or Police.	Issues are resolved within themselves and family heads..	When disagreement occurs in the community, it is usually resolved to the chairman, but there has been no complain/ conflict about harassment.	Issues can be reported to the CDA Chairman.
Is there hospital/ maternity home around? What's the distance?	The Community has a Primary Health Centre (PHC)- Igbogbo PHC, and Macaulay Maternity home.	There are no health facilities in the area, hence residents have to walk long distances to access medical care.	There is private hospital near the community, but no government hospital is within the community.	Private hospital is located within the community.
If there's an incident, how is it reported? (e.g Domestic violence/ GBV)	Family issues/ conflict between couples are usually resolved traditionally through Baale (at suburbs)--Council of Chiefs (in towns) and if unresolved, it is referred to the Palace for resolution. There is also a Civic	Disputes are usually resolved between themselves as they live a communal lifestyle with close knit ties.	No cases of rape, sexual abuse or GBV in the community, it is usually a calm community. However, it can be perceived that these cases may be existent but usually not reported.	No incidents on rape, violence/ abuse in the community. However, only a few arguments concerning owed by labourers in the past, but these are usually resolved within both affected parties or referred to the CDA chairman for resolution

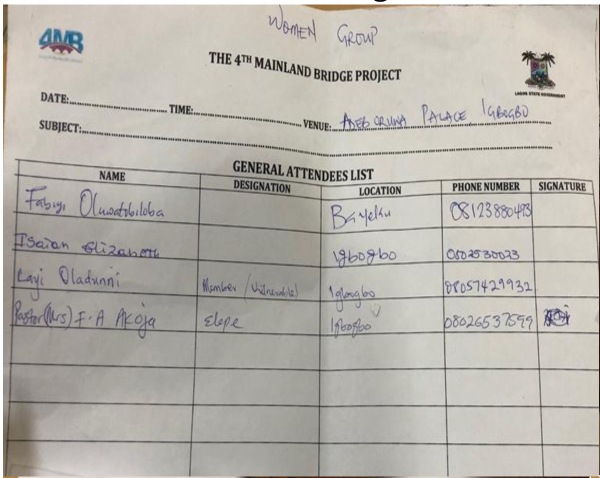
	mediation center and law enforcement (The Police located in Agbeleye/ Oreyo Road).			
Reporting structure	Family- Baale- Chiefs- Kabieyesi/ Police	Baale and community Elders. Communal disputes are usually settled fast.	Community leaders -Police	Family- CDA Chairman – Police
Community Needs	The community needs for their healthcare facility to be well equipped	This community lacks access to basic amenities including; clean water, electricity, bad Roads and healthcare facility etc.	**School:** students have to walk a distance to the public schools and this may be a potential risk during construction activities. Needs include: Water, electricity, health center, security,	Public Healthcare facility.
Thought on 4th mainland bridge project	It's a good Project, as long as the adverse effects are minimal	It would be a good project		It's a good project and will ease challenges of transportation.

Table 2: Responses to Questions during Focus Group Discussions (II)

	Areas visited				
	Isheri Kabiyesi palace (28/04/2021)	**Okeira Kekere (29/04/2021)**	**Okeira Nla jetty (30/04/2021)**	**Alade Egbeyemi, Idiroko , Ikorodu North (1/5/2021)**	**Surulere Ikorodu North (1/5/2021)**
Source of Livelihood	Women in this area are involved in trading, and some food vendors were also observed.	Trading is the major source of livelihood in this area	Sources of income include; Fishing, trading etc	Residents are involved in trading, entrepreneurship, and some are civil servants	Most residents are civil servants, retirees, etc. Only a few are traders etc
Do women work during project?	Women carry blocks or sell food in construction sites.	Women can be involved in the supply of construction materials	No major projects so far in this area.	No major projects so far in the project area.	Women are usually not interested in working on construction sites, as most people are busy/ working.
Who makes decisions? Are women involved?	Women participate in decision making.	Yes, women are involved in decision making	Women are involved in decision making	Yes, women are involved in decision making	Women are involved in decision making
Security	Security issues in this area are resolved by Vigilante, OPC, Police etc	There are security threats in the area, as residents complained of cultists stealing at night and fights in the area. However, most	This is a peaceful area and residents live communally. There are family ties/ a close knit relationship. If there are security threats in	Whenever there are security threats, landlords use flutes to create awareness and security in the area come out if there	No security threats in the area.

		incidents are reported to the Baale	neighboring communities, youths/ Vigilante resident in this community would protect residents.	are threats in the community.	
Do site workers harass little girls/ women/ date them?	No	No	No	None experienced so far.	Nothing like this.
How do you report workers who misbehave?	They can be reported to Chiefs.	Issues with workers are reported to the traditional ruler (Baale).	Issues are resolved by the family head and Baale.	Workers who misbehave can be reported to the Chairman of community	Issues can be reported to family heads.
Is there hospital/ maternity home around? What's the distance?	No maternity home in the community and the hospital is far.	There is a school in the community called Model College, Badore. Health centers are located in Owode and Badore. It is not far from the community.	There's no hospital around the community	Private hospital is located within the community.	There is none in the community. Only Erunwen public health center which is far and there is no medical doctor.
If there's an incident, how is it reported? (e.g Domestic violence/ GBV)	It is settled within family, or taken to the Kabiyesi.	Reported to the Family, if unresolved, reported to Baale and then to the police station.	No incident so far. However, if it occurs, the child can report to parents.	No incident but child can report to parents and they report to the chairman, then police	No incidents so far.
Reporting structure	Family- Kabiyesi	Baale- Police	No incident has occurred, hence no structure.	Family- Chairman – Police	Family
Community Needs	General Hospital, secondary school, market and Bridge		Hospital and school, no water.	Road and school. School is far	Road, drainage, school, health center
Thought on 4th mainland bridge project	Good Project	It would be good	It's a good project but residents don't want to be relocated as most of them have been residing in the area for more than 25years	Good project.	Resettlement should be completed before project starts because most residents are civil servants who have laboured for several years to get a land in this area. Hence, they should be compensated adequately with lands.

ATTENDANCE C: Meeting Attendance



WOMEN GROUP

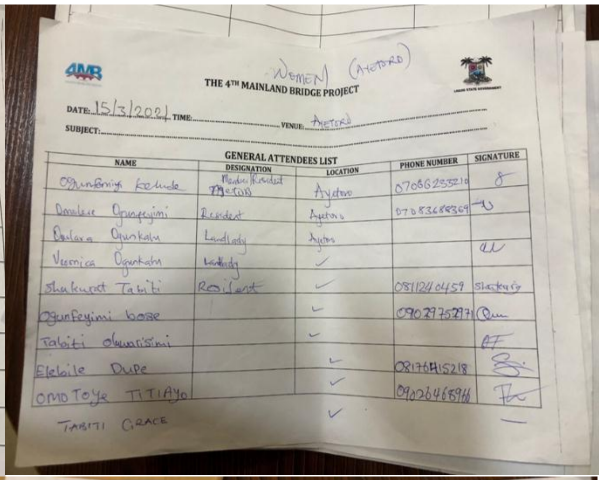
THE 4TH MAINLAND BRIDGE PROJECT

DATE: TIME: VENUE: Adeb Oruwa Palace Igbogbo

SUBJECT:

GENERAL ATTENDEES LIST

NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
Fabiyi Oluwatobiloba		Bayeku	08123880493	
Isaiah Elizabeth		Igbogbo	0802530023	
Laji Oladunni	Member (Vulnerable)	Igbogbo	08057429932	
Pastor (Mrs) F. A. Akoja	Elepe	Igbogbo	08026537599	



WOMEN (AYETORO)

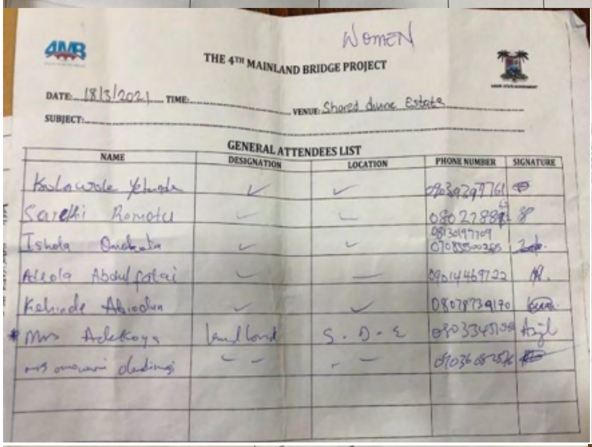
THE 4TH MAINLAND BRIDGE PROJECT

DATE: 15/3/2021 TIME: VENUE: Ayetoro

SUBJECT:

GENERAL ATTENDEES LIST

NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
Ogunfeniyi Kehinde	Member (Resident Ayetoro)	Ayetoro	07086253210	
Damilare Ogunfeyimi	Resident	Ayetoro	07083688369	
Bolara Ogunkoya	Landlady	Ayetoro		
Veronica Ogunkoya	Landlady	✓		
Shukurat Titiloye	Resident	✓	08112440459	
Ogunfeyimi Bose		✓	09029752971	
Tabiti Oluwatosin		✓		
Elebile Dupe		✓	08176415218	
Omotoye Titilayo		✓	09026468966	
Tabiti Grace		✓		



WOMEN

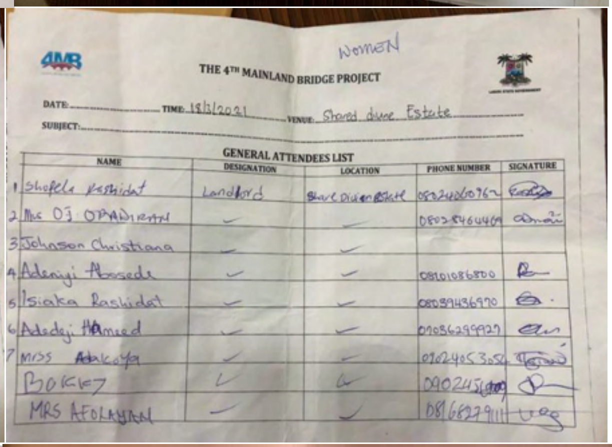
THE 4TH MAINLAND BRIDGE PROJECT

DATE: 18/3/2021 TIME: VENUE: Shared dune Estate

SUBJECT:

GENERAL ATTENDEES LIST

NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
Kolawole Yetunde	✓	✓	08034297161	
Saidi Romoke	—	—	08027288	
Ishola Omobola	✓	✓	08130917109 / 07085500365	
Alaola Abdul Rafiat	—	—	08014469722	
Kehinde Abiodun	✓	✓	08078739170	
Mrs Adekoya	Landlord	S. D. E	08033451504	
Mrs Omowumi Oladimeji	—	—	09036082576	



WOMEN

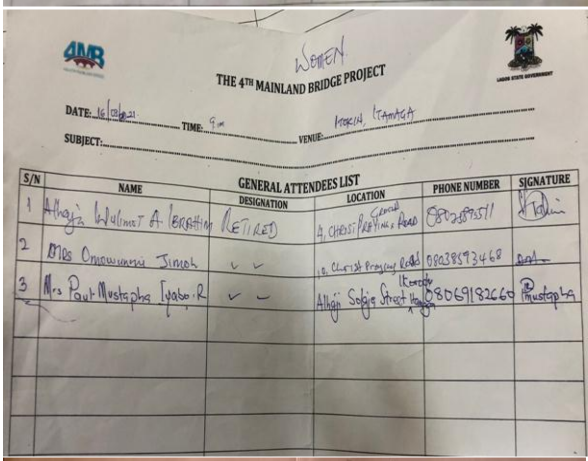
THE 4TH MAINLAND BRIDGE PROJECT

DATE: TIME: 18/3/2021 VENUE: Shared dune Estate

SUBJECT:

GENERAL ATTENDEES LIST

NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
1 Shofele Rashidat	Landlord	Share dune Estate	08024060767	
2 Mrs OJ Oyadiran	—	—	08034460469	
3 Johnson Christiana	—	—		
4 Adeniyi Abosede	—	—	08101086800	
5 Isiaka Rashidat	—	—	08039436970	
6 Adedeji Hameed	—	—	07056299927	
7 Miss Adekoya	—	—	07024053056	
Bokey	—	—	09024510	
Mrs Afolayan	—	—	08168279111	



WOMEN

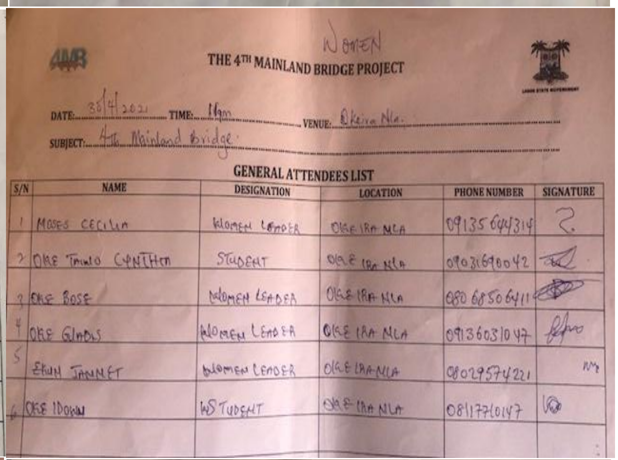
THE 4TH MAINLAND BRIDGE PROJECT

DATE: 16/03/21 TIME: 9am VENUE: Ikosi, Itamaga

SUBJECT:

GENERAL ATTENDEES LIST

S/N	NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
1	Alhaja Waliyat A. Ibrahim	Retired	4, Christ Praying Road	08022893511	
2	Mrs Omowunmi Jimoh	✓ ✓	10, Christ Praying Road	08038973468	
3	Mrs Pout Mustapha Iyabo R	✓ —	Alhaji Sofiyu Street Ikorodu	08069182669	Mustapha



WOMEN

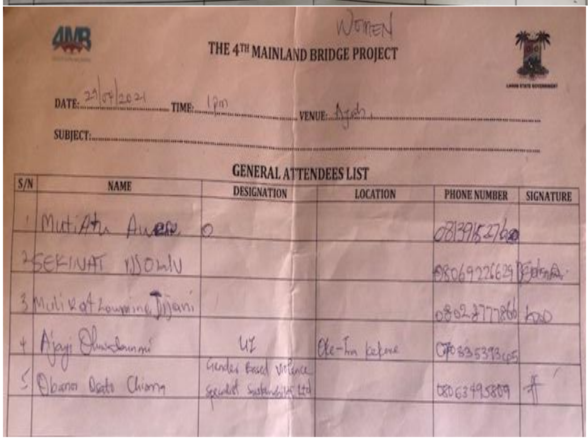
THE 4TH MAINLAND BRIDGE PROJECT

DATE: 23/4/2021 TIME: 11am VENUE: Okeira Nla

SUBJECT: 4th Mainland Bridge

GENERAL ATTENDEES LIST

S/N	NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
1	Moses Cecilia	Women Leader	Oke Ira Nla	09135694314	
2	Oke Tawo Cynthia	Student	Oke Ira Nla	09031690042	
3	Oke Bose	Women Leader	Oke Ira Nla	08068506411	
4	Oke Gladys	Women Leader	Oke Ira Nla	09136031047	
5	Etuh Janet	Women Leader	Oke Ira Nla	08029574221	
6	Oke Idowu	Student	Oke Ira Nla	08117710147	



WOMEN

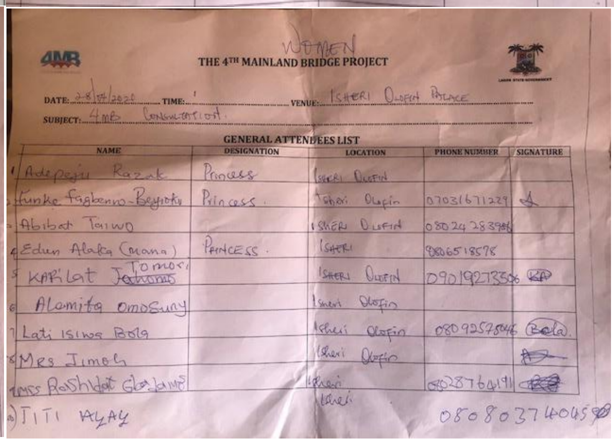
THE 4TH MAINLAND BRIDGE PROJECT

DATE: 27/04/2021 TIME: 1pm VENUE: Ajah

SUBJECT:

GENERAL ATTENDEES LIST

S/N	NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
1	Mutiatu Awere			08139162760	
2	Sekinat Isola			08069226629	
3	Mulikat Lawani Dijani			08023778860	
4	Ajayi Oluwadamilare	UI	Ole-Iwa Lekki	07083539305	
5	Obono Daita Chioma	Gender Based Violence Specialist Sustainability Ltd		08063495809	



WOMEN

THE 4TH MAINLAND BRIDGE PROJECT

DATE: 28/05/2021 TIME: VENUE: Isheri Olofin Palace

SUBJECT: 4MB Consultation

GENERAL ATTENDEES LIST

NAME	DESIGNATION	LOCATION	PHONE NUMBER	SIGNATURE
1 Adepeju Razak	Princess	Isheri Olofin		
Funke Fagbemi-Bayode	Princess	Isheri Olofin	07031671227	
Abibat Taiwo		Isheri Olofin	08024283986	
4 Edun Alaka (Mama)	Princess	Isheri	08065718578	
5 Karimat Tomori		Isheri Olofin	09019273356	
6 Alamita Omosuny		Isheri Olofin		
7 Lati Isiwo Bola		Isheri Olofin	08092257846	
8 Mrs Jimoh		Isheri Olofin		
Mrs Rashidat Gbolahan		Isheri	08028760191	
10 Titi Ajayi			08080374045	

Annex 8 Code of Conduct on Preventing Gender Based Violence and Violence Against Children

Company Code of Conduct

The company is committed to creating and maintaining an environment in which gender based violence (GBV) and violence against children (VAC) have no place, and where they will not be tolerated by any employee, associate, or representative of the company. Therefore, in order to ensure that all those engaged in the project are aware of this commitment, and in order to prevent, be aware of, and respond to any allegations of GBV and VAC, the company commits to the following core principles and minimum standards of behavior that will apply to all company employees, associates, and representatives including sub-contractors, without exception:

1. The company—and therefore all employees, associates, and representatives—commit to treating women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status. Acts of GBV and VAC are in violation of this commitment.
2. Demeaning, threatening, harassing, abusive, culturally inappropriate, or sexually provocative language and behavior are prohibited among all company employees, associates, and its representatives.
3. Acts of GBV or VAC constitute gross misconduct and are therefore grounds for sanctions, which may include penalties and/or termination of employment. All forms of GBV and VAC, including grooming are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or at worker's homes.
4. In addition to company sanctions, legal prosecution of those who commit acts of GBV or VAC will be pursued if appropriate.
5. Sexual contact or activity with children under 18—including through digital media—is prohibited. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.
6. Sexual favors—for instance, making promises or favorable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior are prohibited.
7. Unless there is full consent[6] by all parties involved in the sexual act, sexual interactions between the company's employees (at any level) and members of the communities surrounding the work place are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" within the scope of this Code.
8. All employees, including volunteers and sub-contractors are highly encouraged to report suspected or actual acts of GBV and/or VAC by a fellow worker, whether in the same company or not. Reports must be made in accordance with GBV and VAC Allegation Procedures.
9. Managers are required to report suspected or actual acts of GBV and/or VAC as they have a responsibility to uphold company commitments and hold their direct reports responsible.

To ensure that the above principles are implemented effectively the company commits to ensuring that:

[6] **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even in the event that national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

10. All managers sign the 'Manager's Code of Conduct' detailing their responsibilities for implementing the company's commitments and enforcing the responsibilities in the 'Individual Code of Conduct'.
11. All employees sign the project's 'Individual Code of Conduct' confirming their agreement not to engage in activities resulting in GBV or VAC.
12. Displaying the Company and Individual Codes of Conduct prominently and in clear view at workers' camps, offices, and in in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
13. Ensure that posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
14. An appropriate person is nominated as the company's 'Focal Point' for addressing GBV and VAC issues, including representing the company on the GBV and VAC Compliance Team (GCCT) which is comprised of representatives from the client, contractor(s), the supervision consultant, and local service provider(s).
15. Ensuring that an effective Action Plan is developed in consultation with the GCCT which includes as a minimum:
    a. **GBV and VAC Allegation Procedure** to report GBV and VAC issues through the project Grievance Redress Mechanism (GRM);
    b. **Accountability Measures** to protect confidentiality of all involved; and,
    c. **Response Protocol** applicable to GBV and VAC survivors and perpetrators.
16. That the company effectively implements the Action Plan, providing feedback to the GCCT for improvements and updates as appropriate.
17. All employees attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments and the project's GBV and VAC Codes of Conduct.
18. All employees attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the project's GBV and VAC Code of Conduct.

I do hereby acknowledge that I have read the foregoing Company Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to prevent and respond to GBV and VAC. I understand that any action inconsistent with this Company Code of Conduct or failure to take action mandated by this Company Code of Conduct may result in disciplinary action.

Company name: _____
Signature: _____
Printed Name: _____
Title: _____
Date: _____

MANAGER'S CODE OF CONDUCT ON PREVENTING GENDER BASED VIOLENCE AND VIOLENCE AGAINST CHILDREN

Managers at all levels have particular responsibilities to uphold the company's commitment to preventing and addressing GBV and VAC. This means that managers have an acute responsibility to create and maintain an environment that prevents GBV and VAC. Managers need to support and promote the implementation of the Company Code of Conduct. To that end, managers must adhere this Manager's Code of Conduct and also sign the Individual Code of Conduct. This commits them to supporting and developing systems that facilitate the implementation of the Action Plan and maintain a GBV-free and VAC-free environment at the workplace and in the local community. These responsibilities include but are not limited to:

Implementation

1. To ensure maximum effectiveness of the Company and Individual Codes of Conduct:
    a. Prominently displaying the Company and Individual Codes of Conduct in clear view at workers' camps, offices, and in in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
    b. Ensuring all posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
2. Verbally and in writing explain the Company and Individual Codes of Conduct to all staff.
3. Ensure that:
    a. All direct reports sign the 'Individual Code of Conduct', including acknowledgment that they have read and agree with the Code of Conduct.
    b. Staff lists and signed copies of the Individual Code of Conduct are provided to the GCCT and the client.
    c. Participate in training and ensure that staff also participate as outlined below.
    d. Staff are familiar with the Grievance Redress Mechanism (GRM) and that they can use it to anonymously report concerns of GBV or VAC incidents.
    e. Staff are encouraged to report suspected or actual GBV or VAC through the GRM by raising awareness about GBV and VAC issues, emphasizing the staff's responsibility to the Company and the country hosting their employment, and emphasizing the respect for confidentiality.
4. In compliance with applicable laws and to the best of your abilities, prevent perpetrators of sexual exploitation and abuse from being hired, re-hired or deployed. Use background and criminal reference checks for all employees.
5. Ensure that when engaging in partnership, sub-contractor or similar agreements, these agreements:
    a. Incorporate the GBV and VAC Codes of Conduct as an attachment.
    b. Include the appropriate language requiring such contracting entities and individuals, and their employees and volunteers, to comply with the Individual Codes of Conduct.
    c. Expressly state that the failure of those entities or individuals, as appropriate, to take preventive measures against GBV and VAC, to investigate allegations thereof, or to take corrective actions when GBV or VAC has occurred, shall constitute grounds for sanctions and penalties in accordance with the Individual Codes of Conduct.
6. Provide support and resources to the GCCT to create and disseminate internal sensitization initiatives through the awareness-raising strategy under the Action Plan.
7. Ensure that any GBV or VAC issue warranting police action is reported to the client and the World Bank immediately.

Training

8. All managers are required to attend an induction manager training course prior to commencing work on site to ensure that they are familiar with their roles and responsibilities in upholding the GBV and VAC Codes of Conduct. This training will be separate from the induction training course required of all employees and will provide managers with the necessary understanding and technical support needed to begin to develop the Action Plan for addressing GBV and VAC issues.
9. Ensure that time is provided during work hours and that staff attend the mandatory project facilitated induction training on GBV and VAC required of all employees prior to commencing work on site.
10. Ensure that staff attend the monthly mandatory refresher training course required of all employees to combat increased risk of GBV and VAC during civil works.
11. Managers are required to attend and assist with the project facilitated monthly training courses for all employees. Managers will be required to introduce the trainings and announce the self-evaluations.
12. Collect satisfaction surveys to evaluate training experiences and provide advice on improving the effectiveness of training.

Response

13. Managers will be required to provide input to the GBV and VAC Allegation Procedures and Response Protocol developed by the GCCT as part of the final cleared Action Plan.
14. Once adopted by the Company, managers will uphold the Accountability Measures set forth in the Action Plan to maintain the confidentiality of all employees who report or (allegedly) perpetrate incidences of GBV and VAC (unless a breach of confidentiality is required to protect persons or property from serious harm or where required by law).
15. If a manager develops concerns or suspicions regarding any form of GBV or VAC by one of his/her direct reports, or by an employee working for another contractor on the same work site, s/he is required to report the case using the GRM.
16. Once a sanction has been determined, the relevant manager(s) is/are expected to be personally responsible for ensuring that the measure is effectively enforced, within a maximum timeframe of 14 days from the date on which the decision to sanction was made.
17. Managers failing to report or comply with such provision can in turn be subject to disciplinary measures, to be determined and enacted by the company's CEO, Managing Director or equivalent highest-ranking manager. Those measures may include:
    a. Informal warning.
    b. Formal warning.
    c. Additional Training.
    d. Loss of up to one week's salary.
    e. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
    f. Termination of employment.
18. Ultimately, failure to effectively respond to GBV and VAC cases on the work site by the company's managers or CEO may provide grounds for legal actions by authorities.

I do hereby acknowledge that I have read the foregoing Manager's Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and VAC. I understand that any action inconsistent with this Manager's Code of Conduct or failure to take action mandated by this Manager's Code of Conduct may result in disciplinary action.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

INDIVIDUAL CODE OF CONDUCT ON PREVENTING GENDER BASED VIOLENCE AND VIOLENCE AGAINST CHILDREN

I, _____, acknowledge that preventing gender-based violence (GBV) and violence against children (VAC) is important. The company considers that GBV or VAC activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of GBV or VAC are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit GBV or VAC may be pursued if appropriate.

I agree that while working on the project I will:

- Consent to police background check.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behaviour towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not participate in sexual contact or activity with children—including grooming, or contact through digital media. Mistaken belief regarding the age of a child is not a defence. Consent from the child is also not a defense or excuse.
- Not engage in sexual favors—for instance, making promises or favorable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior.
- Unless there is the full consent[7] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" within the scope of this Code.
- Attend and actively partake in training courses related to HIV/AIDS, GBV and VAC as requested by my employer.
- Consider reporting through the GRM or to my manager any suspected or actual GBV or VAC by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18:

- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home, unless they are at immediate risk of injury or in physical danger.
- Not sleep close to unsupervised children unless absolutely necessary, in which case I must obtain my supervisor's permission, and ensure that another adult is present if possible.
- Use any computers, mobile phones, or video and digital cameras appropriately, and never to exploit or harass children or to access child pornography through any medium (see also "Use of children's images for work related purposes" below).
- Refrain from physical punishment or discipline of children.
- Refrain from hiring children for domestic or other labor which is inappropriate given their age or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.
- Comply with all relevant local legislation, including labor laws in relation to child labor.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

[7]**Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even in the event that national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Sanctions

I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Loss of up to one week's salary.
- Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
- Termination of employment.
- Report to the police if warranted.

I understand that it is my responsibility to avoid actions or behaviors that could be construed as GBV or VAC or breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to GBV and VAC. I understand that any action inconsistent with this Individual Code of Conduct or failure to take action mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

Annex 9 COVID-19 Checklist for Employers and Employees

Know the Symptoms of COVID-19

- Coughing, fever, shortness of breath, and difficulty breathing.

- Early symptoms may include chills, body aches, sore throat, headache, diarrhea, nausea/vomiting, and runny nose. If you develop a fever and symptoms of respiratory illness, DO NOT GO TO WORK and call your supervisor and health-care provider immediately. Do the same thing if you come into close contact with someone showing these symptoms.

Employer Responsibilities

- Develop a COVID-19 Exposure Action Plan.
- Conduct safety meetings (toolbox talks) by phone if possible. If not, instruct employees to maintain 6-feet between each other. The foreman/supervisor will track attendance verbally rather than having employees sign an attendance sheet.
- Access to the job site and work trailer will be limited to only those necessary for the work.
- All visitors will be pre-screened to ensure they are not exhibiting symptoms.
- Employees, contractors, and visitors will be asked to leave the jobsite and return home if they are showing symptoms.
- Provide hand sanitizer and maintain Safety Data Sheets of all disinfectants used on site.
- Provide protective equipment (PPE) to any employees assigned cleaning/disinfecting tasks.

Employee Responsibilities

- Become familiar with the Exposure Action Plan and follow all elements of the Plan.
- Practice good hygiene: wash hands with soap and water for at least 20 seconds. If these are not available, use alcohol-based hand rub with at least 60% alcohol. Avoid touching your face, eyes, food, etc. with unwashed hands.

Cleaning/Disinfecting Job Sites and Other Protective Measures

- Clean and disinfect frequently used tools and equipment on a regular basis. This includes other elements of the jobsite where possible. Employees should regularly do the same in their assigned work areas.
- Clean shared spaces such as trailers and break/lunchrooms at least once per day.
- Disinfect shared surfaces (door handles, machinery controls, etc.) on a regular basis.
- Avoid sharing tools with co-workers. If not, disinfect before and after each use.
- Arrange for any portable job site toilets be cleaned by the leasing company at least twice per week and disinfected on the inside.
- Trash collected from the jobsite must be changed frequently by someone wearing gloves.

Personal Protective Equipment and Alternate Work Practice Controls

- Provide and wear the proper PPE.
- Keep the dust down by using engineering and work practice controls, specifically through the use of water delivery and dust collection systems.

COVID-19 Toolbox Talk

What is COVID-19?

The novel coronavirus, COVID-19 is one of seven types of known human coronaviruses. COVID- 19, like the MERS and SARS coronaviruses, likely evolved from a virus previously found in animals. The

remaining known coronaviruses cause a significant percentage of colds in adults and children, and these are not a serious threat for otherwise healthy adults.
Patients with confirmed COVID-19 infection have reportedly had mild to severe respiratory illness with symptoms such as fever, cough, and shortness of breath.
According to the U.S. Department of Health and Human Services/Centers for Disease Control and Prevention ("CDC"), Chinese authorities identified an outbreak caused by a novel—or new—coronavirus. The virus can cause mild to severe respiratory illness. The outbreak began in Wuhan, Hubei Province, China, and has spread to a growing number of other countries—including the United States.

How is COVID-19 Spread?

COVID-19, like other viruses, can spread between people. Infected people can spread COVID-19 through their respiratory secretions, especially when they cough or sneeze. According to the CDC, spread from person-to-person is most likely among close contacts (about 6 feet). Person-to-person spread is thought to occur mainly *via* respiratory droplets produced when an infected person coughs or sneezes, like influenza and other respiratory pathogens. These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs. It is currently unclear if a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes.

In assessing potential hazards, employers should consider whether their workers may encounter someone infected with COVID-19 in the course of their duties. Employers should also determine if workers could be exposed to environments (e.g., worksites) or materials (e.g., laboratory samples, waste) contaminated with the virus.

Depending on the work setting, employers may also rely on identification of sick individuals who have signs, symptoms, and/or a history of travel to COVID-19-affected areas that indicate potential infection with the virus, in order to help identify exposure risks for workers and implement appropriate control measures.

There is much more to learn about the transmissibility, severity, and other features associated with COVID-19, and investigations are ongoing.

COVID-19 Prevention and Work Practice Controls:

Worker Responsibilities

- Frequently wash your hands with soap and water for at least 20 seconds. When soap and running water are unavailable, use an alcohol-based hand rub with at least 60% alcohol. Always wash hands that are visibly soiled.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
- Avoid touching your eyes, nose, or mouth with unwashed hands.
- Avoid close contact with people who are sick.
- Employees who have symptoms (i.e., fever, cough, or shortness of breath) should notify their supervisor and stay home—DO NOT GO TO WORK.
- Sick employees should follow NCDC-recommended steps. Employees should not return to work until the criteria to discontinue home isolation are met, in consultation with healthcare providers and state and local health departments.

General Job Site / Office Practices

- Clean AND disinfect frequently touched objects and surfaces such as workstations, keyboards, telephones, handrails, and doorknobs. Dirty surfaces can be cleaned with soap and water prior to disinfection.
- Avoid using other employees' phones, desks, offices, or other work tools and equipment, when possible. If necessary, clean and disinfect them before and after use.
- Clean and disinfect frequently used tools and equipment on a regular basis.
    - This includes other elements of the jobsite where possible.
        - Employees should regularly do the same in their assigned work areas.

- Clean shared spaces such as trailers and break/lunchrooms at least once per day.
- Disinfect shared surfaces (door handles, machinery controls, etc.) on a regular basis.
- Avoid sharing tools with co-workers if it can be avoided. If not, disinfect before and after each use.
- Arrange for any portable job site toilets to be cleaned by the leasing company at least twice per week and disinfected on the inside.
- Any trash collected from the jobsite must be changed frequently by someone wearing gloves.
- In addition to regular PPE for workers engaged in various tasks (fall protection, hard hats, hearing protection), employers will also provide:
    - Gloves: Gloves should be worn at all times while on-site. The type of glove worn should be appropriate to the task. If gloves are not typically required for the task, then any type of glove is acceptable, including latex gloves. Gloves should not be shared if at all possible.
    - Eye protection: Eye protection should be worn at all times while on-site.

Annex 10 The Lagos 4th Mainland Bridge Air Quality Study Report

Executive Summary

This is the report of atmospheric conditions assessment carried out on the proposed 38 km 4th Mainland Bridge, Lagos State, Nigeria in support of its Environmental and Social Impact Assessment (ESIA) study. On-line monitors were used to carry out *insitu* monitoring of all the investigated parameters.

In the area, climate is characterized by the dry and wet seasons though it rains in every month of the year with mean monthly rainfall of 104.4 – 288.4 mm. Its monthly relative humidity is 77 - 87% with air temperatures of about 22.5 – 33.7 °C. The atmospheric pressure is 1015 – 1020 mbar while the cloud cover is 6.7 – 6.9 Oktas with 51.2 – 165.7 hrs monthly sunshine periods. Its surface wind speed is 0.5 – 7.7 m/s with occasional calmness and southwest prevailing direction. All the measured microclimatic parameters during the study agreed with these climatic data.

Though nine (9) gaseous pollutants were monitored, CH_4 was not detected. While VOCs were 0.01 – 0.26 ppm in the dry season, they were 0.02 – 0.12 ppm in the wet season. In the dry season, CO concentrations were 1.0 – 12.30 ppm but 0.60 – 10.20 in the wet season with SO_2 levels of 0.02 – 0.14 ppm and 0.02 – 0.04 ppm in the dry and wet seasons respectively. Both NO and NO_2 were 0.02 – 0.25 ppm and 0.01 – 0.06 ppm respectively in the dry season but 0.01 – 0.08 ppm and 0.02 – 0.15 ppm in the wet season. The dry season NH_3 was 0.03 – 1.40 ppm but 0.01 – 0.09 ppm in the wet season while H_2S was 0.20 ppm and 0.01 – 0.08 ppm in the dry and wet seasons respectively. Both the dry and wet seasons O_3 were respectively 0.02 – 0.10 ppm and 0.01 – 0.04 ppm. While the 1-hour averaging period $PM_{2.5}$ was 3.6 – 49.5 μg/m^3 in the dry season, it was 2.3 – 131.5 μg/m^3 in the wet season. The dry season PM_{10} was 49.0 – 636.6 μg/m^3 but 17.0 – 2133.6 μg/m^3 in the wet season. In the dry season TSP was 55.8 – 874.7 μg/m^3 and 19.5 – 2725.9 μg/m^3 in the wet season.

Since 1-hour averaging period ambient air quality standards' breaches were in 2 - 4% of the sampling locations and 24-hour averaging period ambient air quality standards' breaches were recorded in 2 – 16% of the locations, the proposed project area can described as un-degraded airshed using the World Bank classification. Therefore the airshed can be described as having excellent carrying capacity for construction and operation activities of the proposed 38 km 4th Mainland Bridge.

In the proposed project area, the minimum ambient noise levels were 28.6 – 65.2 dB(A) in the dry season but 28.6 – 65.8 dB(A) in the wet season. The maximum ambient noise levels in the dry season were 34.9 – 79.4 dB(A) but 34.9 – 85.2 dB(A) in the wet season with background levels of 28.8 – 66.2 dB(A) and 28.8 – 67.1 dB(A) in the dry and wet seasons respectively. The wet season's ambient noise levels were higher than that of the dry season in about 60% of the sampling locations.

Being by-products of fuel combustion, CO, SO_2, NO and NO_2 sources along the corridor in the proposed project area include fossil fuel burning, cooking appliances, biomass burning and refuse handling via open burning in commercial places. Commercial activities, vehicles and electric power generators are the major sources of noise identified during the study.

1. Preamble

Dry and wet seasons ambient air quality, noise and microclimatic parameters monitoring carried out in and around the proposed 4th Mainland Bridge site in Lagos, Nigeria in support of its Environmental and Social Impact Assessment (ESIA) are presented in this report. While the dry season sampling took place between Sunday 21st and Saturday 27th February, 2021 the wet season sampling was between Sunday 16th May and Saturday 22nd May 2021. Sampling took place at fifty (50) monitoring stations (Table 1.1) along the proposed corridor (Figure 1.1). The study was led by Prof. J.A. Sonibare of the Environmental Engineering Research Laboratory, Department of Chemical Engineering, Obafemi Awolowo

University, Ile-Ife. He was supported by Dr. A.J. Adesanmi and Mr. A.J. Adewale who is a PhD student in the laboratory.

2. Sampling Strategy and Methodology

Meteorological parameters, air pollutants and ambient noise levels were monitored using relevant on-line monitors (Plate 1). While the EXTECH 45170 Weather Tracker was used for meteorological parameters, Met one AEROCET 531S particle Mass/ Particle counter was used for particulates. Aeroqual Series 200 and the WolfPackTM Modular Area Monitors were used for gaseous pollutants while the EXTECH Instruments, US Model 407750 sound meter was deployed for ambient noise levels. Air quality present status in the project area was assessed using their measured concentrations and the standards. The airshed was classified using the World Bank classification method. The detailed sampling methodology is reported in Appendix A.

3. Observed Conditions of the Investigated Airshed

The field observations as recorded during the study are herein reported. Also included are the results analyses on the measured microclimatic parameters, air quality parameters and noise. These were then combined with other relevant information from the literature and past studies on the study area to describe its atmospheric conditions. They are herein presented.

3.1. Climate and Meteorology

This study considered climatic conditions in the proposed project area over a period of 30 years (1991 – 2020) as obtained from the Nigerian Meteorological Agency (NIMET, 2021). The climate is characterized by dry and wet conditions associated with movement of the Inter-Tropical Convergence Zone (ITCZ) north and south of the equator. This ITCZ appears as a band of clouds that circle the globe near the equator. The northeast winds prevail producing the dry-season when it is to the south of the equator but southwest wind prevails bringing rainfall and the wet season whenever it moves into the northern Hemisphere.

Rainfall: As presented in Table 3.1, the proposed project area experiences rain every month of the year. Its rainy season (April – October) mean monthly rainfall levels are 104.4 – 288.4 mm with the minimum in August and maximum in June. In the dry season, mean monthly rainfall levels are 12.7 – 81.5 mm with the minimum and maximum in January and March respectively. The mean monthly numbers of rainy days are 8 – 16 days during the raining season but 1 – 5 days per month in the dry season.

Relative Humidity: The mean monthly Relative Humidity in the area is 77 - 87% with the minimum in February and the maximum between June and September (Table 3.1). During the dry season fieldwork, the measured relative humidity levels were 17.8 – 94.6% but 62.2 – 98.6% in the wet season which agree with the climatic data as presented in Table 3.2.

Air Temperature: Air temperature in Lagos hosting the proposed project is 22.5 – 33.7 °C (Table 3.1) with the minimum in August (the rainy season) and the maximum in February (peak of the dry season). These agree with the measured air temperature of 24.2 – 35.1 ºC obtained during the dry season fieldwork and 21.6 – 31.1 °C recorded during the wet season fieldwork (Table 3.2).

Table 1.1: Sampling Locations for Meteorology, Air Quality and Noise along the Proposed Project Site

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
1.	SP1	6.54048	3.5632	Ayetoro community	Monday 22-02-2021	13:36 – 14:36	Monday 17-05-2021	12:45 – 13:45
2.	SP2	6.54058	3.5641	Ayetoro extension		14:54 – 15:54		13:52 – 14:52
3.	SP3 (Control)	6.53972	3.5611	Ijede 2		16:01 – 17:01		15:11 – 16:11
4.	SP4 (Control)	6.54283	3.55646	Omolade street		17:21 – 18:21		16:20 – 17:20
5.	SP5 (Control)	6.55022	3.55389	Bayeku community		18:28 – 19:28		17:31 – 18:31
6.	SP6	6.5916	3.55388	Ijede road	Tuesday 23-02-2021	08:45 – 09:45		18:40 – 19:10
7.	SP7	6.58848	3.5553	Prosperity estate, Olumo igbogbo		09:53 – 10:53		19:18 – 19:48
8.	SP8	6.58562	3.55543	Igbogbo 2, Ikorodu		11:27 – 12:27		19:53 – 20:23
9.	SP9	6.58145	3.55472	Igbogbo 2, Ikorodu		12:43 – 13:43		20:31 – 21:01
10.	SP10 (Control)	6.58227	3.55257	Close to Lady Vet Poultry, Ikorodu		13:59 – 14:59	Tuesday 18-05-2021	06:58 – 07:58
11.	SP11	6.57953	3.55648	Iree 1		15:11 – 16:11		08:15 – 09:15
12.	SP12	6.5693	3.56028	Igbogbo/ Iree 2		16:33 – 17:33		09:26 – 10:26
13.	SP13 (Control)	6.55478	3.559	Bayeeku/Igbogbo		17:49 – 18:49		10:50 – 11:50
14.	SP14 (Control)	6.55699	3.54771	Igbogbo 2, Ikorodu		18:58 – 19:58		12:14 – 13:14
15.	SP15	6.58524	3.55999	Igbogbo 2, Ikorodu	Wednesday 24-02-2021	07:41 – 08:41		13:45 – 14:45
16.	SP16	6.57752	3.56106	Close to Lanre Akinade Avenue, Ire 1, Igbogbo, Ikorodu		08:54 – 09:54		15:04 – 16:04
17.	SP17 (Control)	6.59381	3.55905	Igbogbo 2, Ikorodu		10:17 – 11:17		16:22 – 17:22

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
18.	SP18	6.60245	3.55242	Close to Akintayo Eribake St, Ikorodu		11:49 – 12:49		17:38 – 18:38
19.	SP19	6.61128	3.55089	Erikorodu, Ikorodu		13:17 – 14:17		18:56 – 19:56
20.	SP20	6.62388	3.54154	Igbogbo 2, Ikorodu		14:33 – 15:33		20:14 – 21:14
21.	SP21	6.62962	3.53251	Ita Maga		15:52 – 16:52		06:01 – 07:01
22.	SP22	6.63544	3.5242	LASPOTECH		17:13 – 18:13		07:24 – 08:24
23.	SP23	6.64005	3.51451	Opp sawmill okegbegun, Ikorodu		18:26 – 19:26		08:36 – 09:36
24.	SP24	6.64297	3.50972	Olu Balogun Street, Ikorodu		19:35 – 20:35		09:50 – 10:50
25.	SP25	6.64989	3.49723	Olu Balogun Street, Ikorodu		07:22 – 08:22	Wednesday 19-05-2021	11:01 – 12:01
26.	SP26	6.6568	3.49188	Socam church, Fomah St, Ikorodu		08:51 – 09:51		12:20 – 13:20
27.	SP27	6.65917	3.48452	Itokin Road, Nipco Station, Lagos		10:16 – 11:16		13:33 – 14:33
28.	SP28	6.66127	3.47142	Ipakodo, Ikorodu		11:35 – 12:35		14:42 – 15:42
29.	SP29	6.6591	3.46843	Ipakodo, Ikorodu	Thursday 25-02-2021	12:56 – 13:56		15:53 – 16:53
30.	SP30	6.65126	3.45779	Ipakodo, Ikorodu		14:13 – 15:13		17:13: 18:13
31.	SP31	6.64082	3.43156	Channels TV Ave, Lagos		15:24 – 16:24		18:25 – 19:25
32.	SP32	6.64057	3.42267	Channels TV Ave, Lagos		16:38 – 17:38	Thursday 20-05-2021	06:48 – 07:48
33.	SP33	6.64043	3.4148	Channels TV Ave, Lagos		17:47 – 18:47		08:01 – 09:01
34.	SP34	6.64026	3.40422	Isheri Olofin, Lagos		18:59 – 19:59		09:14 – 10:14
35.	SP35	6.64588	3.39958	Opposite Lonex Garden		20:04 – 21:04		10:36 – 11:36

S/No.	Sampling Code	Coordinates		Designation	Dry Season Sampling Period		Wet Season Sampling Period	
		Latitude	Longitude		Date	Time (Hours)	Date	Time (Hours)
36.	SP36	6.651542	3.393166	Isheri Oke	Friday 26-02-2021	06:04 – 07:19		11:49 – 12:49
37.	SP37 (Control)	6.656883	3.401004	Isheri Oke		07:24 – 07:39		13:04 – 14:04
38.	SP38 (Control)	6.646938	3.380085	Ojodu Berger		07:42 – 07:57		14:16 – 15:16
39.	SP39	6.48971	3.57972	Ibeju, Eti-Osa, Lekki		08:15 – 08:30		15:47 – 16:47
40.	SP40 (Control)	6.491655	3.585961	2 Bello Olopo St, Lambasa, Lekki		08:34 – 09:34		16:02 – 17:02
41.	SP41	6.48932	3.57835	Lagos Lagoon		09:43 – 10:43		17:16 – 18:16
42.	SP42	6.47812	3.58157	12 Aguleri Dr, Aja, Lagos		10:52 – 11:52		18:34 – 19:34
43.	SP43	6.469844	3.585353	End of Abraham Adesanya bridge		12:00 – 13:00		19:47 – 20:47
44.	SP44	6.46381	3.58533	OgonboRoad		13:10 – 14:10	Friday 21-05-2021	06:34 – 07:34
45.	SP45 (Control)	6.47361	3.59933	Lekki - Epe Expy, Eti-Osa, Lagos		14:19 – 15:19		07:50 – 08:50
46.	SP46 (Control)	6.47609	3.58408	Eti-Osa, Lagos		15:40 – 16:40		09:13 – 10:13
47.	SP47	6.5363	3.55132	Bayeiku Ferry Terminal		16:48 – 17:48		10:28 – 11:28
48.	SP48 (Control)	6.57057	3.57191	Igbe ogunro central mosque		18:00 – 19:00		11:40 – 12:40
49.	SP49	6.5319	3.55314	Lagos Lagoon		19:04 – 20:04		13:04 – 14:04
50.	SP50	6.49982	3.57014	Lagos Lagoon		20:10 – 21:10		14:20 – 15:20

Fig. 1.1: Monitored Stations during the Fieldwork

(a) Dry Season – February 2021

(b) Wet Season – May 2021

Plate 1: Typical Atmospheric Environment Fieldwork Monitoring during the Study

Atmospheric Pressure: The mean atmospheric pressure from the climatic data is 1015 – 1020 mbar with the minimum and maximum in January and June respectively (Table 3.1). During the fieldwork, atmospheric pressure was measured to be 1007.1 – 1019.4 mbar in the dry season but 1011.1 – 1013.6 mbar in the wet season (Table 3.2). These are also within the climatic data.

Cloud cover: In the project area, cloud cover is generally high throughout the year with very little variations. It is higher in May and October and lowest in June and July with average of 6.7 – 6.9 Oktas (Table 3.1), indicating overcast sky with blue patches.

Wind Speed and Direction: Surface wind speed is 0.5 – 7.7 m/s with an average of 3.6 m/s (Table 3.3) and prevailing southwest direction (Figure 3.1). The measured wind speed of 0.8 – 1.7 m/s during the dry season fieldwork with northeast prevailing direction and 3.1 – 3.9 m/s with south-southwest prevailing direction in the wet season (Figure 3.2) also agree with the climatic data.

Sunshine Pattern: The annual sunshine period in the study area is about 1500 hours with monthly period of 51.2 – 165.7 hrs (Figure 3.3). It receives the minimum period in July - September but the maximum in December - January. The short period in July could be due to the greater cloudiness and rainfall characteristic of the period. Conversely, the higher December sunshine period is due to the prevalent clear skies accompanying the ITCZ movement in its northward migration.

Table 3.1: Climatic Parameters on the Study Area (NIMET, 2021)

Month	Air Temp (° C)		Rainfall (mm)			Number of Rain Days			Relative Humidity (%)			Pressure (mbar)			Cloud Cover (Oktas)		
	T_{min}	T_{max}	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Jan	23.1	32.6	0.0	53.4	12.7	0	4	2	41	90	78	1009	1031	1015	5.4	7.1	6.7
Feb	24.2	33.7	0.0	188.5	38.7	0	6	2	58	86	77	1009	1032	1017	5.4	7.3	6.7
Mar	24.7	33.2	5.8	308.1	81.5	0	12	5	74	85	79	1005	1033	1016	3.8	7.0	6.7
Apr	24.4	32.5	26.4	336.3	135.8	1	17	9	76	84	80	1008	1033	1016	4.6	7.0	6.7
May	23.7	31.2	88.6	353.8	196.3	3	22	12	79	88	83	1010	1032	1018	6.1	7.0	6.8
Jun	23.1	29.7	69.5	619.5	288.4	2	23	16	84	90	87	1011	1031	1020	5.9	7.1	6.8
Jul	22.7	28.5	18.5	567	194.5	1	25	13	77	90	87	1012	1031	1018	6.4	7.3	6.9
Aug	22.5	28.4	3.9	419.1	104.4	2	16	8	81	89	86	1008	1031	1018	6.3	7.1	6.9
Sep	22.7	29.3	22.9	436.6	185.2	3	24	13	83	90	87	1011	1032	1018	6.2	7.3	6.9
Oct	23.0	30.5	37.3	342.7	155.4	1	22	11	81	88	85	1010	1033	1019	6.3	7.0	6.8
Nov	23.5	31.9	1.2	240.6	78.6	0	11	4	74	86	82	1010	1033	1018	6.1	7.0	6.7
Dec	23.1	32.5	0.0	87.7	25.4	0	6	1	65	88	81	1010	1032	1018	3.9	7.0	6.7

Table 3.2: Field Measured Meteorological Parameters in the Proposed Project Area during this Study

Season	Level	Air Temperature (°C)	Relative Humidity (%)	Atmospheric Pressure (mbar)	Wind	
					Speed	Direction
Dry	Minimum	24.2	17.8	1007.1	0.8	SW
	Maximum	35.1	94.6	1019.4	1.7	NE
	Mean	29.1	76.2	1011.5	1.2	NE
Wet	Minimum	21.6	62.2	1011.1	3.1	SW
	Maximum	31.1	98.6	1013.6	3.9	SSW
	Mean	27.3	88.8	1012.2	3.4	SSW

Table 3.3: Monthly Wind Speed Variation in the Study Area (NIMET, 2021)

Month	Wind Speed (m/s)		
	Minimum	Maximum	Mean
January	0.1	5.7	3.0
February	0.1	6.2	4.0
March	1.5	7.2	4.5
April	0.5	7.2	4.0
May	0.1	6.7	3.9
June	0.1	6.7	3.4
July	0.1	7.7	3.8
August	0.1	7.7	4.2
September	0.1	7.7	3.8
October	0.1	5.7	3.0
November	0.1	5.7	2.7
December	0.1	6.7	2.9

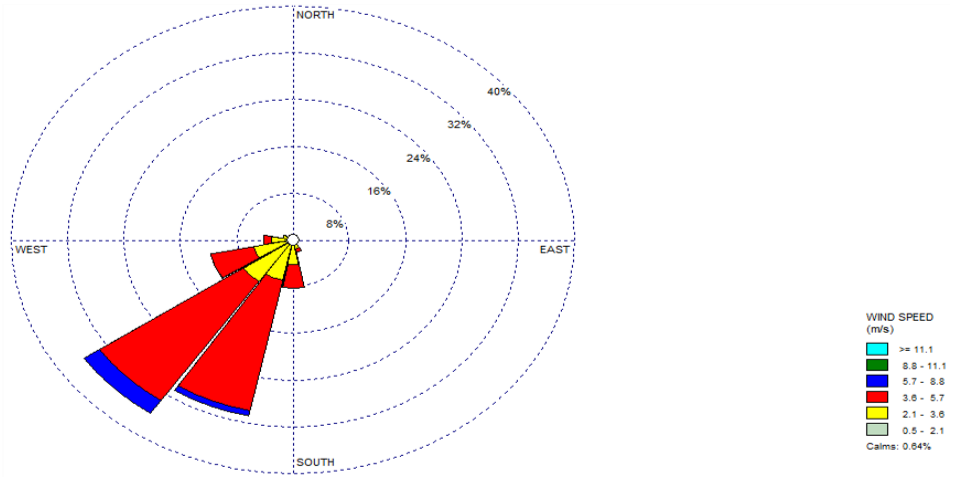
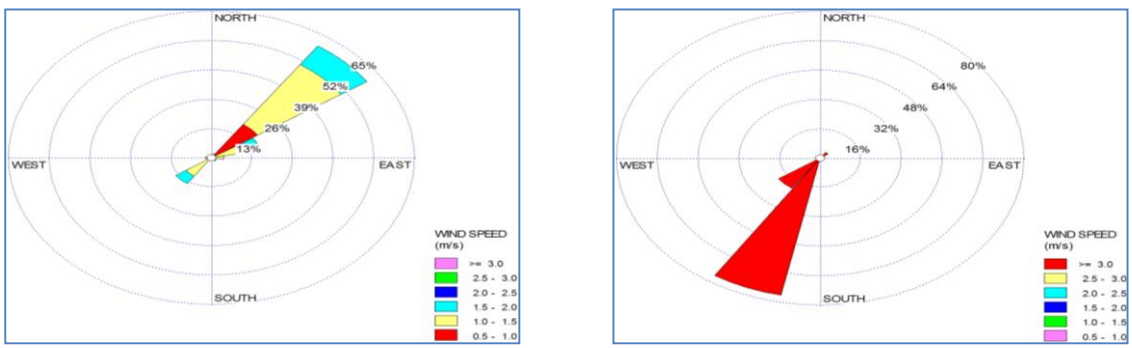


Fig. 3.1: Windrose of the Proposed Project Area (NIMET, 2021)



(a) Dry Season *(b) Wet Season*

Fig. 3.2: Observed Windrose in the Project Area during the Fieldwork

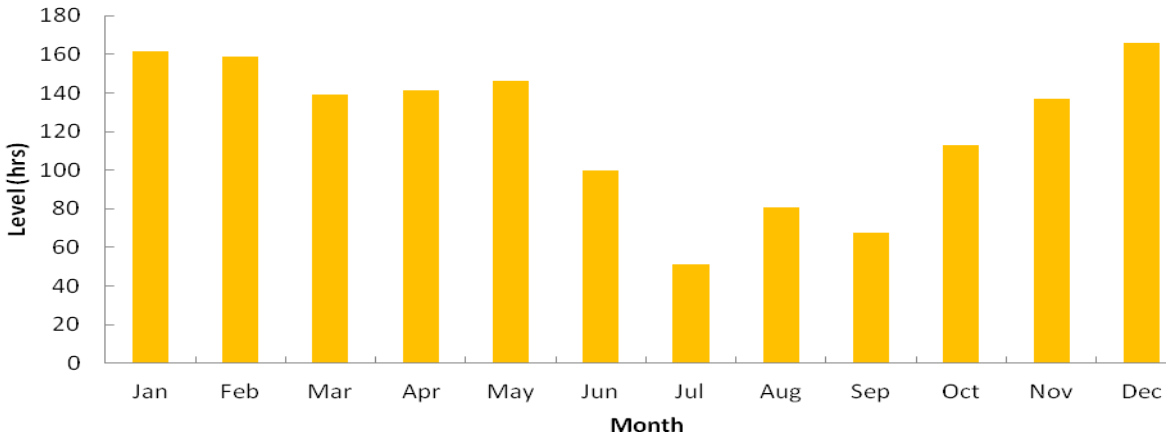


Fig. 3.3: Sunshine Pattern in the Study Area (NIMET, 2021)

3.2. Air Quality

Presented in Table 3.4 are the 1-hour averaging period concentrations of the nine gaseous pollutants monitored during the study. Though nine (9) gaseous pollutants were monitored, CH_4 was not detected in any of the sampling locations. While VOCs were 0.01 – 0.26 ppm in the dry season, they were 0.02 – 0.12 ppm in the wet season. In the dry season, CO concentrations were 1.0 – 12.30 ppm but 0.60 – 10.20 in the wet season with SO_2 levels of 0.02 – 0.14 ppm and 0.02 – 0.04 ppm in the dry and wet seasons respectively. Both NO and NO_2 were 0.02 – 0.25 ppm and 0.01 – 0.06 ppm respectively in the dry season but 0.01 – 0.08 ppm and 0.02 – 0.15 ppm in the wet season. The dry season measured NH_3 was 0.03 – 1.40 ppm but 0.01 – 0.09 ppm in the wet season while H_2S was 0.20 ppm and 0.01 – 0.08 ppm in the dry and wet seasons respectively. Both the dry and wet seasons measured O_3 concentrations were respectively 0.02 – 0.10 ppm and 0.01 – 0.04 ppm.

As summarized in Table 3.5, the 24-hour averaging period equivalents of the measured VOCs are 0.01 – 0.13 ppm in the dry season but 0.01 – 0.06 ppm in the wet season. While the 24-hour averaging period equivalents of the measured CO was 0.51 – 6.31 ppm, it is 0.31 – 5.23 ppm in the wet season with the measured SO_2 becoming 0.01 – 0.07 ppm and 0.01 – 0.02 ppm in the dry and wet seasons respectively. Dry and wet seasons measured NO become 0.01 – 0.013 ppm and 0.01 – 0.04 ppm respectively while NO_2 is 0.01 – 0.03 ppm in the dry season but 0.01 – 0.08 ppm in the wet season. The 24-hour equivalent of the measured NH_3 in the dry season is 0.02 – 0.72 ppm but 0.01 – 0.05 ppm in the wet season while the measured H_2S becomes 0.10 ppm in the dry season and 0.01 – 0.04 ppm in the wet season. The daily equivalents of the measured O_3 in the dry and wet seasons are 0.01 – 0.05 ppm and 0.01 – 0.02 ppm respectively.

Particulates were detected in all the sampling locations as presented in Table 3.6. While the 1-hour averaging period measured $PM_{2.5}$ concentration was 3.6 – 49.5 $\mu g/m^3$ in the dry season, it was 2.3 – 131.5 $\mu g/m^3$ in the wet season. The dry season measured PM_{10} was 49.0 – 636.6 $\mu g/m^3$ but 17.0 – 2133.6 $\mu g/m^3$ in the wet season. In the dry season TSP was 55.8 – 874.7 $\mu g/m^3$ and 19.5 – 2725.9 $\mu g/m^3$ in the wet season.

The 24-hour averaging period equivalents of the measured $PM_{2.5}$ is 1.8 – 25.4 $\mu g/m^3$ in the dry season but 25.4 $\mu g/m^3$ in the wet season (Table 3.7). While the 24-hour equivalent of the measured PM_{10} is 25.1 – 326.6 $\mu g/m^3$ in the dry season it is 8.7 – 1094.6 $\mu g/m^3$ in the wet season. In the dry and wet seasons, the TSP equivalents are 28.6 – 448.8 $\mu g/m^3$ and 10.0 – 1398.5 $\mu g/m^3$ respectively.

As presented in Figure 3.4, the monitored gaseous pollutants were detected in 2 - 58% of the sampling locations in the study area during the dry season but in 8 - 22% of the locations in the wet season. However, CH_4 was not detected in any of the locations in the two seasons while particulates were

detected in all during the study. Detection of air pollutants in more of the sampling locations in the dry season than in the wet season could be attributed to "rain washout" effect associated with the wet season. This effect reduces the concentrations of air pollutants in the atmosphere.

During the study, particulates concentrations were higher in the dry season than wet season in most sampling locations (Figure 3.5). Similarly gaseous concentrations in the dry season were higher in more sampling locations than in the wet season except for NH_3 and H_2S as presented in Figure 3.5. Lower concentrations of some gases in the dry season than the wet season could also be attributed to more of the sampling locations in the dry season than in the wet season could be attributed to "rain washout" effect associated with the wet season as earlier observed. Higher NH_3 and H_2S in the wet season than the dry season could be attributed to decomposition of nitrogen and sulphide-containing vegetation in the wet season than in the dry season. This induces emissions of NH_3 and H_2S into the atmosphere.

As reported in Table 3.4, the FMEnv's 1-hour 0.10 ppm limit of ambient SO_2 and the WBG 1-hour 0.11 ppm limit of ambient NO were breached once each in the dry season while all the other detected gaseous pollutants were within their respective limits in all the sampling locations. In the wet season, none of the 1-hour averaging period limits was breached by the monitored gaseous pollutants. While the 0.01 ppm 24-hour FMEnv's limit for SO_2 was breached times in the dry season, the limit was breached in five times in the wet seasons (Figure 3.5). Also, 0.04 ppm 24-hour limit for NO was breached three times in the dry season but once during the wet season. While the 0.28 ppm 24-hour limit of NH_3 and 0.01 ppm 24-hour limit for H_2S were breached once each in the dry season, H_2S limit was breached five times during the wet season.

The 1-hour TSP limit of 600 $\mu g/m^3$ FMEnv limit was breached twice in the dry season but six times during the wet season (Table 3.6). While the $PM_{2.5}$ limit of 25 $\mu g/m^3$ was breached once in the dry season, it was breached five times in the wet season (Figure 3.6). Also PM_{10} limit of 80 $\mu g/m^3$ was breached fifteen times in the dry season but twelve times in the wet season. The TSP limit of 250 $\mu g/m^3$ was breached twice and seven times in the dry and wet seasons respectively.

Being by-products of fuel combustion, CO, SO_2, NO and NO_2 sources along the corridor in the proposed project area include fossil fuel burning in electric power generators, cooking appliances (e.g. gas cooker and kerosene stove), biomass burning cooking appliances (e.g. firewood and charcoal stoves) and refuse handling via open burning in commercial places. However their main source is vehicular emission as a result of the fuel combustion. These air pollutants have health implications and adverse effects on the environment. Their present levels indicate some levels of degradation in the airshed of the proposed project site due to some of the identified sources.

Though not conventional air pollutants, VOCs are toxics emitted as gases and may include a variety of chemicals, some of which may have short- and long-term adverse health effects. Their release depends on the products handled in the environment. If a by-product of combustion of fuels, VOCs sources along proposed 4th Mainland Bridge corridor may include fuel evaporation in vehicles and filling stations. Others may include insecticides, air freshener, cooking gas, paints and lacquers, and furnishings. Their health effects are eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system. If good vehicle maintenance habit is encouraged along the bridge in the life of the proposed project, the VOCs levels can be accommodated by the host airshed. Ground level O_3 is formed in the atmosphere by chemical reactions between NOx and VOCs in the presence of sunlight. Fuel evaporation identified as source of VOCs and vehicular emissions identified as source of NO_X may be responsible for the detected O_3 during this study. Breathing O_3 in the ambient environment may trigger health challenges in some classes of people. The presence of H_2S and NH_3 in the area could be attributed to decomposition of sulphide and nitrogen vegetation aided by the presence of moisture in the atmosphere especially in the wet season. Atmospheric particles are dispersed materials that may include solid, oil, and water droplets, among others. In the study area, detected

particulates could be from dust re-suspension, vehicular emissions and domestic/commercial activities involving combustion.

3.3. Investigated Airshed Classification

Since 1-hour averaging period ambient air quality standards' breaches were in 2 - 4% of the sampling locations and 24-hour averaging period ambient air quality standards' breaches were recorded in 2 – 16% of the locations, the proposed project area can described as un-degraded airshed using the World Bank classification. Therefore the airshed can be described as having excellent carrying capacity for construction and operation activities of the proposed 38 km 4th Mainland Bridge.

3.4. Ambient Noise Measurements

In the proposed project area, the minimum ambient noise levels were 28.6 – 65.2 dB(A) in the dry season but 28.6 – 65.8 dB(A) in the wet season (Table 3.8). The measured maximum ambient noise levels in the dry season were 34.9 – 79.4 dB(A) but 34.9 – 85.2 dB(A) in the wet season with background noise levels of 28.8 – 66.2 dB(A) and 28.8 – 67.1 dB(A) in the dry and wet seasons respectively. As presented in Figure 3.7, the wet seasons ambient noise levels were higher than that of the dry season in about 60% of the sampling locations.

While the minimum ambient noise levels in the area were within the 70 dB(A) industrial area ambient noise limit in all the sampling locations in the two seasons, the maximum noise levels breached this limit in 8% and 12% of the sampling locations in the dry and wet seasons respectively (Table 3.8). However the background noise levels of the area were also within this limit in all the sampling locations both in the dry and wet seasons. The 55 dB(A) World Bank day-time ambient noise limit was breached in 12% of the sampling locations in the dry season but in 18% of the locations in the wet season while the maximum noise levels breached this limit in 26% and 42% of the sampling locations in the dry and wet seasons respectively. The background noise levels of the area breached this day-time limit in 14% of the sampling locations in the dry season but in 18% of the locations in the wet season. Commercial activities, vehicles and electric power generators are the major sources of noise identified during the study.

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Table 3.4: Mean Measured 1-Hour Gaseous Pollutants during the Study in and around the Proposed Project Site

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP1	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.06	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.06	0.04
SP2	0.0	0.0	0.0	1.0	0.04	0.02	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP3	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP4	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.01	0.0	0.0	0.02	0.0
SP5	0.03	0.0	3.7	0.0	0.02	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP9	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
SP10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP12	0.02	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP13	0.03	0.0	2.1	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.08	0.0	0.0	0.0	0.0
SP14	0.01	0.0	2.3	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP18	0.02	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.06	0.0
SP19	0.0	0.0	1.2	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.15	0.0	0.0	0.04	0.0	0.0	0.09	0.02
SP20	0.0	0.0	2.0	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.17	0.0	0.20	0.0	0.0	0.0	0.0	0.0
SP21	0.21	0.0	12.3	4.4	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.09	0.0	0.0	0.0	0.0	0.10	0.0
SP22	0.20	0.0	8.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP23	0.0	0.0	2.1	0.0	0.07	0.0	0.0	0.0	0.0	0.0	0.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP24	0.15	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP29	0.18	0.0	4.0	3.2	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.02
SP30	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.01	0.0	0.0	0.0	0.0
SP31	0.0	0.0	2.8	0.0	0.14	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP32	0.05	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0
SP33	0.0	0.0	1.1	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP34	0.12	0.0	2.5	1.0	0.0	0.03	0.0	0.02	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.0

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP35	0.0	0.0	1.7	1.5	0.07	0.04	0.0	0.02	0.0	0.06	0.0	0.06	0.0	0.02	0.0	0.0	0.0	0.0
SP36	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.02	0.0
SP37	0.0	0.0	8.0	0.0	0.0	0.0	0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP38	0.13	0.04	6.0	1.4	0.0	0.0	0.02	0.08	0.01	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.04	0.01
SP39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP43	0.19	0.0	12.2	0.9	0.0	0.03	0.03	0.03	0.01	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0
SP44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP45	0.16	0.0	7.4	4.3	0.0	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP46	0.0	0.12	1.3	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.04	0.0	0.0	0.04	0.0
SP47	0.10	0.0	1.1	1.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.04	0.0	0.05	0.0	0.0	0.02	0.02
SP48	0.0	0.05	1.0	0.0	0.0	0.0	0.0	0.01	0.0	0.02	0.0	0.04	0.0	0.01	0.0	0.0	0.0	0.0
SP49	0.26	0.02	1.8	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SP50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean	**0.12**	**0.06**	**3.64**	**2.68**	**0.06**	**0.03**	**0.07**	**0.03**	**0.02**	**0.06**	**0.29**	**0.04**	**0.20**	**0.03**	**0.0**	**0.0**	**0.06**	**0.02**

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SD	**0.08**	**0.04**	**3.13**	**2.85**	**0.04**	**0.01**	**0.08**	**0.03**	**0.02**	**0.05**	**0.42**	**0.02**	**0.0**	**0.02**	**0.0**	**0.0**	**0.03**	**0.01**
FMEnv Limit	-		20.0 (0)	20.0 (0)	0.10 (1)	0.10 (0)	-	-	-	-	-	-	-	-	-	-	-	-
WBG Limit	-		-	-	-		0.11 (0)	-	-	-	-	-	-	-	-	-	-	-

Frequency of limit exceedance in parenthesis

Table 3.5: Extrapolated 24-Hour Equivalents of the Measured Gaseous Pollutants during the Study in and around the Proposed Project Site

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP1	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.02
SP2	0.00	0.00	0.00	0.51	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP3	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP4	0.00	0.00	1.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.01	0.00
SP5	0.02	0.00	1.90	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP9	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
SP10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP12	0.01	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP13	0.02	0.00	1.08	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04	0.00	0.00	0.00	0.00
SP14	0.01	0.00	1.18	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP18	0.01	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.03	0.00
SP19	0.00	0.00	0.62	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.02	0.00	0.00	0.05	0.01
SP20	0.00	0.00	1.03	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.09	0.00	0.10	0.00	0.00	0.00	0.00	0.00
SP21	0.11	0.00	6.31	2.26	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.00
SP22	0.10	0.00	4.10	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP23	0.00	0.00	1.08	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP24	0.08	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP29	0.09	0.00	2.05	1.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01
SP30	0.00	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
SP31	0.00	0.00	1.44	0.00	0.07	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP32	0.03	0.00	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
SP33	0.00	0.00	0.56	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP34	0.06	0.00	1.28	0.51	0.00	0.02	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SP35	0.00	0.00	0.87	0.77	0.04	0.02	0.00	0.01	0.00	0.03	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00
SP36	0.00	0.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.00
SP37	0.00	0.00	4.10	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP38	0.07	0.02	3.08	0.72	0.00	0.00	0.01	0.04	0.01	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.02	0.01
SP39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP43	0.10	0.00	6.26	0.46	0.00	0.02	0.02	0.02	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
SP44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP45	0.08	0.00	3.80	2.21	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP46	0.00	0.06	0.67	5.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.02	0.00
SP47	0.05	0.00	0.56	0.51	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00	0.03	0.00	0.00	0.01	0.01
SP48	0.00	0.03	0.51	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00
SP49	0.13	0.01	0.92	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SP50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean	**0.06**	**0.03**	**1.87**	**1.38**	**0.03**	**0.01**	**0.04**	**0.02**	**0.01**	**0.03**	**0.15**	**0.02**	**0.10**	**0.02**	**0.0**	**0.0**	**0.03**	**0.01**

Monitoring Station	Concentrations (ppm)																	
	VOCs		CO		SO_2		NO		NO_2		NH_3		H_2S		CH_4		O_3	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
SD	**0.04**	**0.02**	**1.61**	**1.46**	**0.02**	**0.00**	**0.04**	**0.01**	**0.01**	**0.02**	**0.22**	**0.01**	**0.0**	**0.01**	**0.0**	**0.0**	**0.02**	**0.01**
FMEnv Limit			**10 (0)**	**10 (0)**	**0.01 (10)**	**0.01 (5)**	**0.04 (3)**	**0.04 (1)**	**0.04 (0)**	**0.04 (1)**	**0.28 (1)**	**0.28 (0)**	**0.01 (1)**	**0.01 (5)**	**-**	**-**	**0.10 (0)**	**0.10 (0)**

Frequency of limit exceedance in parenthesis

Table 3.6: Mean Measured 1-Hour Suspended Particulates Matter during the Study

Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	32.8	6.1	217.6	18.0	241.1	21.0
SP2	33.2	9.4	222.7	35.5	246.9	61.4
SP3	31.9	7.5	233.5	35.2	260.5	76.5
SP4	19.2	7.8	162.8	33.5	252.0	47.0
SP5	23.4	7.0	136.8	35.8	149.3	48.2
SP6	38.9	4.7	636.6	40.6	874.7	67.1
SP7	25.1	7.1	177.2	23.9	198.4	25.1
SP8	25.6	5.7	162.4	22.8	178.8	27.1
SP9	27.5	5.4	172.7	28.3	191.4	32.6
SP10	25.1	4.9	90.0	17.0	97.8	19.5
SP11	28.0	4.8	83.2	18.4	96.4	23.4
SP12	22.6	5.2	73.4	23.5	77.9	24.1
SP13	25.1	5.4	160.2	23.7	183.4	26.8
SP14	25.2	5.0	135.9	23.6	146.7	35.9
SP15	20.2	6.1	119.1	27.6	130.7	28.9
SP16	21.1	5.3	144.6	77.4	172.7	106.4
SP17	21.5	8.8	134.6	79.6	148.4	121.5
SP18	22.4	5.3	136.8	22.9	154.2	26.6
SP19	3.6	7.4	49.0	54.7	65.1	67.6
SP20	21.1	4.3	146.9	37.5	164.8	47.4
SP21	22.6	5.2	142.8	48.6	164.9	83.1
SP22	21.7	15.1	109.0	123.9	119.9	167.0
SP23	25.0	15.7	168.1	113.0	208.4	160.0
SP24	20.8	5.9	135.3	245.6	153.0	521.1
SP25	20.7	7.0	117.5	111.9	135.6	143.9
SP26	18.9	9.7	113.3	74.0	127.6	91.2
SP27	18.4	48.2	124.2	2133.6	149.6	2725.9
SP28	49.5	17.6	268.8	307.5	321.5	434.4
SP29	18.4	11.9	130.9	63.5	151.2	73.9
SP30	17.7	9.3	114.1	38.8	135.0	54.8
SP31	17.8	15.5	101.2	52.9	111.8	63.4

Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP32	17.7	12.3	74.3	41.6	77.4	47.2
SP33	18.5	131.5	95.9	231.5	108.0	262.3
SP34	19.1	20.2	92.9	106.3	102.3	129.3
SP35	18.2	34.9	99.2	288.7	111.2	347.3
SP36	18.7	20.3	97.3	181.5	106.9	267.1
SP37	26.5	44.9	167.3	515.7	189.1	650.7
SP38	25.6	49.3	162.4	122.7	178.8	147.3
SP39	17.6	9.8	54.2	77.0	55.8	91.7
SP40	15.3	3.8	54.3	140.8	57.4	225.5
SP41	18.6	12.1	67.9	318.2	72.7	425.5
SP42	26.0	2.3	93.0	469.2	104.6	600.5
SP43	14.1	16.7	527.0	80.9	710.0	130.9
SP44	13.1	20.0	65.9	63.2	82.9	86.0
SP45	15.4	-	155.4	-	204.7	-
SP46	13.9	-	66.5	-	76.7	-
SP47	23.0	103.9	100.3	676.3	104.3	765.0
SP48	20.8	94.5	135.3	566.7	153.0	638.2
SP49	18.9	125.6	113.3	886.0	127.6	992.0
SP50	25.1	-	177.2	-	198.4	-
Mean	**22.2**	**21.0**	**146.4**	**186.4**	**172.6**	**239.6**
SD	**7.0**	**31.0**	**102.1**	**347.2**	**140.9**	**434.4**
FMEnv Limit					**600 (2)**	**600 (6)**
WBG Limit	**-**	**-**	**-**	**-**	**-**	**-**

Frequency of limit exceedance in parenthesis

Table 3.7: Extrapolated 24-Hour Equivalents of the Measured Suspended Particulates

Monitoring Station	Concentration (µg/m^3)					
	$PM_{2.5}$		PM_{10}		TSP	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	16.8	3.1	111.6	9.2	123.7	10.8
SP2	17.0	4.8	114.3	18.2	126.7	31.5
SP3	16.4	3.8	119.8	18.1	133.6	39.2
SP4	9.9	4.0	83.5	17.2	129.3	24.1
SP5	12.0	3.6	70.2	18.4	76.6	24.7
SP6	20.0	2.4	326.6	20.8	448.8	34.4
SP7	12.9	3.6	90.9	12.3	101.8	12.9
SP8	13.1	2.9	83.3	11.7	91.7	13.9
SP9	14.1	2.8	88.6	14.5	98.2	16.7
SP10	12.9	2.5	46.2	8.7	50.2	10.0
SP11	14.4	2.5	42.7	9.4	49.5	12.0
SP12	11.6	2.7	37.7	12.1	40.0	12.4
SP13	12.9	2.8	82.2	12.2	94.1	13.7
SP14	12.9	2.6	69.7	12.1	75.3	18.4
SP15	10.4	3.1	61.1	14.2	67.1	14.8
SP16	10.8	2.7	74.2	39.7	88.6	54.6
SP17	11.0	4.5	69.1	40.8	76.1	62.3
SP18	11.5	2.7	70.2	11.7	79.1	13.6
SP19	1.8	3.8	25.1	28.1	33.4	34.7
SP20	10.8	2.2	75.4	19.2	84.5	24.3
SP21	11.6	2.7	73.3	24.9	84.6	42.6
SP22	11.1	7.7	55.9	63.6	61.5	85.7
SP23	12.8	8.1	86.2	58.0	106.9	82.1
SP24	10.7	3.0	69.4	126.0	78.5	267.3
SP25	10.6	3.6	60.3	57.4	69.6	73.8
SP26	9.7	5.0	58.1	38.0	65.5	46.8
SP27	9.4	24.7	63.7	1094.6	76.8	1398.5
SP28	25.4	9.0	137.9	157.8	164.9	222.9
SP29	9.4	6.1	67.2	32.6	77.6	37.9
SP30	9.1	4.8	58.5	19.9	69.3	28.1
SP31	9.1	8.0	51.9	27.1	57.4	32.5
SP32	9.1	6.3	38.1	21.3	39.7	24.2
SP33	9.5	67.5	49.2	118.8	55.4	134.6
SP34	9.8	10.4	47.7	54.5	52.5	66.3
SP35	9.3	17.9	50.9	148.1	57.1	178.2
SP36	9.6	10.4	49.9	93.1	54.8	137.0
SP37	13.6	23.0	85.8	264.6	97.0	333.8
SP38	13.1	25.3	83.3	63.0	91.7	75.6
SP39	9.0	5.0	27.8	39.5	28.6	47.0
SP40	7.8	1.9	27.9	72.2	29.4	115.7
SP41	9.5	6.2	34.8	163.3	37.3	218.3
SP42	13.3	1.2	47.7	240.7	53.7	308.1
SP43	7.2	8.6	270.4	41.5	364.3	67.2
SP44	6.7	10.3	33.8	32.4	42.5	44.1
SP45	7.9	-	79.7	-	105.0	-
SP46	7.1	-	34.1	-	39.4	-
SP47	11.8	53.3	51.5	347.0	53.5	392.5
SP48	10.7	48.5	69.4	290.7	78.5	327.4
SP49	9.7	64.4	58.1	454.6	65.5	508.9
SP50	12.9	-	90.9	-	101.8	-
Mean	**11.4**	**10.8**	**75.1**	**95.6**	**88.6**	**122.9**
SD	**3.6**	**15.9**	**52.4**	**178.1**	**72.3**	**222.9**
FMEnv Limit	**-**	**-**	**-**	**-**	**250 (2)**	**250 (7)**
WBG Limit	**25 (1)**	**25 (5)**	**80 (15)**	**80 (12)**	**-**	**-**

Frequency of limit exceedance in parenthesis

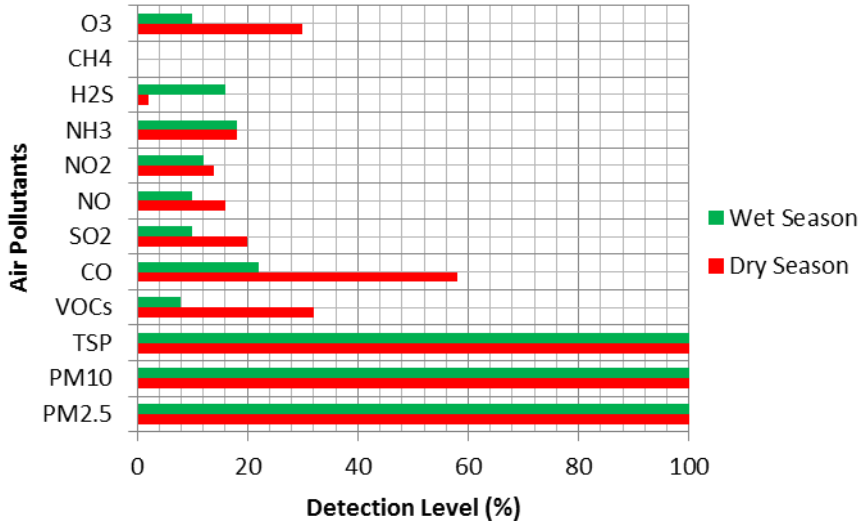

Fig. 3.4: Air Pollutants Presence in the Proposed Project Area during the Study

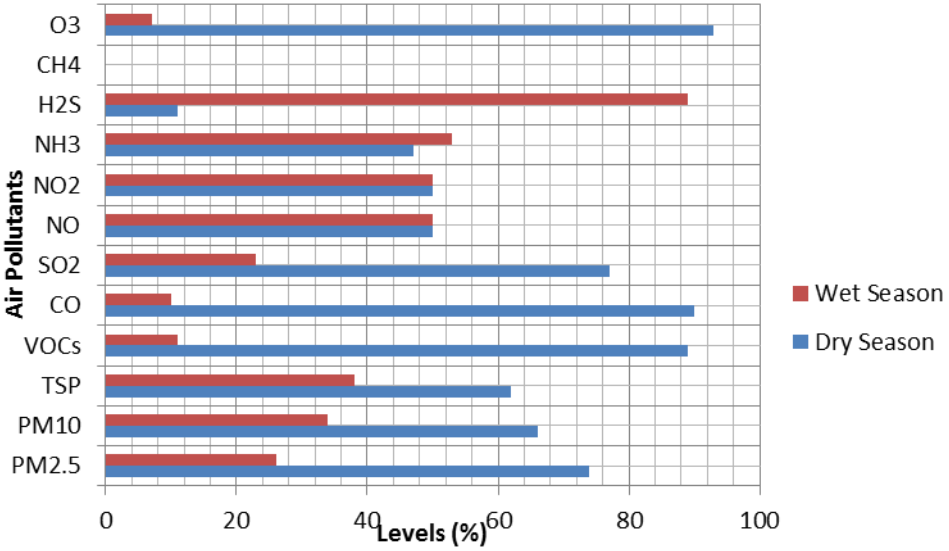

Fig. 3.5: Air Pollutants Detection Levels in the Proposed Project Area during the Study

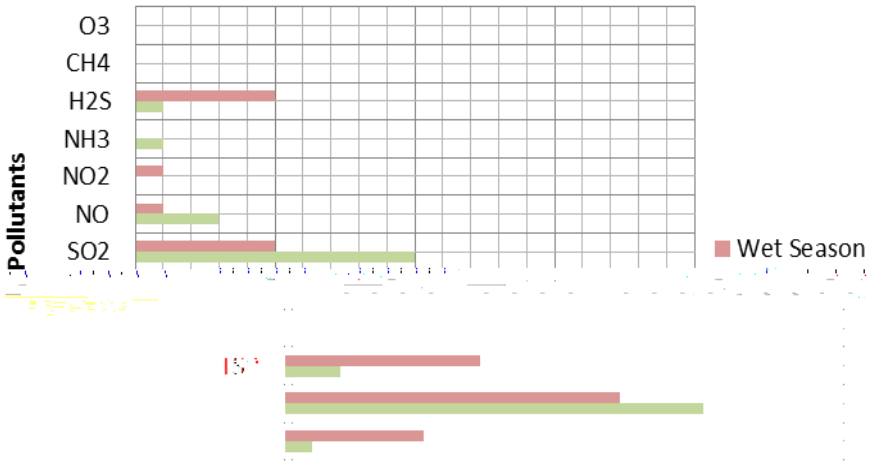

Fig. 3.6: Frequency of 24-Hour Limit Exceedance by Air Pollutants during the Study

Table 3.8: Measured Ambient Noise Levels in the Area during the Study

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP1	34.4	34.7	46.1	40.8	36.49	34.8
SP2	36.1	35.5	49.9	40.3	36.9	35.8
SP3	31.9	35.4	38.7	40.3	32.3	35.5
SP4	33.1	35.1	47.7	41.3	34.4	35.2
SP5	33.3	35.1	49.7	37.8	33.5	35.1
SP6	41.6	35.9	63.0	55.9	42.8	36.1
SP7	35.0	34.9	40.7	47.0	35.1	34.9
SP8	30.5	35.5	40.7	56.1	31.1	35.7
SP9	30.9	35.2	39.9	39.4	31.9	35.2
SP10	32.6	37.1	38.7	43.8	33.0	37.2
SP11	44.8	37.0	47.9	46.4	45.3	37.4
SP12	28.6	38.5	34.9	58.7	28.8	40.5
SP13	30.0	43.1	41.1	55.1	32.1	43.9
SP14	34.7	42.4	49.3	58.7	35.4	42.9
SP15	42.6	37.4	45.1	53.4	42.9	39.7

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP16	42.5	44.7	62.0	47.7	45.8	45.4
SP17	32.3	38.1	39.0	50.5	32.6	39.5
SP18	39.0	39.5	43.1	49.0	39.4	40.8
SP19	30.2	59.8	40.8	82.2	30.3	61.2
SP20	32.8	43.8	39.3	54.7	33.9	44.1
SP21	53.4	44.1	69.2	66.5	56.4	46.8
SP22	41.1	53.6	51.4	58.7	42.1	54.3
SP23	56.9	37.4	64.1	52.4	57.5	39.1
SP24	37.2	45.2	47.0	53.6	38.1	45.5
SP25	49.9	40.2	54.8	52.6	50.3	41.7
SP26	33.7	29.7	46.1	48.8	34.6	33.7
SP27	34.6	57.0	42.7	71.2	35.2	56.0
SP28	42.4	40.9	49.4	53.2	43.7	41.2
SP29	39.6	39.9	53.3	46.0	42.5	40.4
SP30	38.9	29.7	49.5	46.2	40.8	30.7
SP31	34.8	30.5	47.7	46.9	35.1	37.4
SP32	30.3	44.1	37.8	69.4	31.1	44.1
SP33	33.6	37.7	38.3	52.3	34.1	37.8
SP34	36.5	48.4	44.8	64.5	37.1	49.3
SP35	50.8	64.7	62.5	85.2	51.7	65.2
SP36	53.4	60.4	58.4	69.5	53.9	60.8
SP37	63.7	35.1	74.0	41.3	64.6	35.2
SP38	60.3	51.4	73.1	66.9	63.9	53.3
SP39	42.6	49.9	45.1	58.8	42.9	50.9
SP40	52.3	44.2	62.7	63.2	52.5	47.8
SP41	34.6	65.8	42.7	77.0	35.0	67.1
SP42	42.4	60.3	47.3	71.8	42.6	62.3

Sampling Station	Levels, dB(A)					
	Minimum (L_{Min})		Maximum (L_{Max})		Background (L_{90})	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
SP43	65.2	40.1	79.3	49.1	66.2	40.8
SP44	49.4	56.1	59.2	63.1	51.3	56.6
SP45	60.3	56.1	68.9	63.1	61.4	56.6
SP46	36.9	30.0	46.2	41.1	38.3	32.1
SP47	30.0	62.1	41.1	74.0	32.1	63.7
SP48	62.1	28.6	79.4	34.9	63.7	28.8
SP49	28.6	34.0	34.9	40.3	28.8	35.1
SP50	34.0	-	40.3	-	35.1	-
Industrial Area Limit	70 (0)	70 (0)	70 (4)	70 (6)	70 (0)	70 (0)
Residential Area Limit	55 (6)	55 (9)	55 (13)	55 (21)	55 (7)	55 (9)

Frequency of limit exceedance in parenthesis

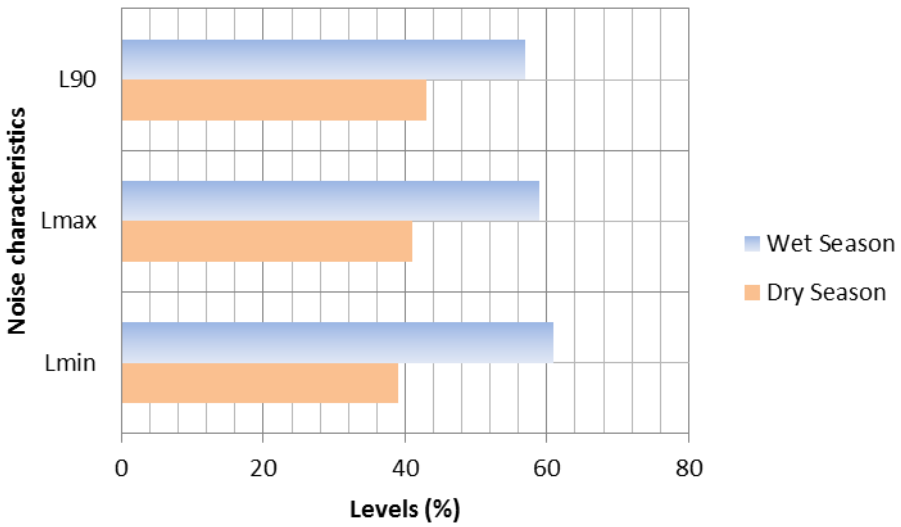

Fig. 3.8: Seasonal Trend of Ambient Noise Levels in the Area during the Study

APPENDIX FOR AIR QUALITY

A1. Scope of Work and Field Methodology

Nine gaseous pollutants monitored during the study were ammonia (NH_3), carbon monoxide (CO), hydrogen sulphide (H_2S), nitric oxide (NO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), methane (CH_4) and volatile organic compounds (VOCs). The ambient air was also analysed for particulates with diameter less than 2.5 microns ($PM_{2.5}$), 10 microns (PM_{10}) and Total Suspended Particles (TSP). Also measured were ambient noise levels and meteorological parameters.

A1.1 Meteorological Parameters

The EXTECH 45170 Environmental Meter was used for measurements of some meteorological parameters during the fieldwork. This is a multi-function environmental monitoring instrument used to measure major environmental conditions including air temperature, relative humidity, wind speed, and light intensity.

A1.2 Air Sampling for Particulate Matter

Particulate matter (PM) was measured with AEROCET 531S Particle Mass/ Particle Count Monitor, an equipment from Met One Instruments. It is handheld, battery operated and completely portable unit measuring five mass ranges of TSP: PM_1, $PM_{2.5}$, PM_4, PM_7, PM_{10}, and TSP with a concentration range of 0 – 1000 µg/m^3 and 0 – 3000000 particle cubic foot (and resolution of 0.1 µg/m^3). The PM Monitor samples at a flow rate of 2.83 l/min. To measure, the monitor is placed at 1 m above the ground level, switched on in the environment of interest and the measured concentration read directly on the screen after particle capturing. The respirable fractions of the total particulates were the focus of this measurement.

A1.3 Air Sampling for Gaseous Pollutants

Oxides of nitrogen (NO and NO_2), sulphur dioxide (SO_2) carbon monoxide (CO), Volatile organic compounds (VOCs), hydrogen sulphide (H_2S), ammonia (NH_3), ozone (O_3) and methane (CH_4) were measured with the *insitu* Aeroqual Series 200 and the WolfPackTM Modular Area Monitors. The Aeroqual monitor has facility from which concentration for the last 5 minutes can be determined. For measurement, the monitor is placed at 1 m above ground level and switched. The measured concentration is then displayed. Ammonia (NH_3) was measured with sensor ENG-1808140-005 having detection range of 0 – 100 ppm and 0.1 ppm resolution while NO and NO_2 were measured with sensor ENW-2402150-009 having a detection range 0 – 1 ppm and 0.001 ppm resolution. Aeroqual Head sensor ESO-2502155-007 was used to monitor SO_2 and EHS/EHS2 for H_2S with both having detection limit of 0 – 10 ppm. Their resolution is 0.01 ppm. Both VOCs and CO were monitored with sensors VM-2305142-025 and ECN-2811140-015 respectively. While VOCs sensor has a detection limit of 0 – 25 ppm, CO sensor's limit is 0 – 100 ppm with both having a resolution of 0.1 ppm.

A1.4 Noise Measurements

Noise measurements were taken with a digital, battery-powered, sound pressure level meter (EXTEC Instruments, US Model 407730). It has both A and C weighting and 0.1 dB resolution with fast/slow responses. The meter is also equipped with a build-in calibration check (94 dB), tripod mount, and analogue DC/AC conditioned outputs of 10mV/dB and utilized a 0.49 " (12.3 mm) condenser microphone. To measure the noise levels at any of the sampling locations, the sound level meter was placed at a distance of at least 3 m from any barrier or other sound reflecting sources and at about 1.2 – 1.5 m above ground level. Measurements were taken by setting the sound level meter to the "A" weighting network.

These methods are as recommended by the Federal Ministry of Environment (FEPA, 1991).

A2 Ambient Air Quality and Noise Assessment Study Approach

The present air quality status and airshed classification according to the World Bank Guidelines were determined using the national and World Bank standards (Table A1). The measured noise levels were also compared with the permissible noise levels of the Federal Ministry of Environment (Table A2) and that of the World Bank (Table A3).

Table A1: Ambient Air Quality Standards Considered in the Study

Air Pollutant	Time Average	Limit (µg/m3)	
		FMEnv	World Bank
NH_3	24-hr	0.28 ppm	-
CO	24-hr	11,400 (10 ppm)	-
SO_2	1-hr	260 (0.1 ppm)	-
	24-hr	26 (0.01 ppm)	20
NO_X	1-hr	-	200
	24-hr	75 – 113 (0.04 – 0.06 ppm)	-
H_2S	24-hr	0.008	
Ozone	24-hr	0.1 ppm	
VOCs	24-hr	160	-
$PM_{2.5}$	24-hr	-	25
PM_{10}	24-hr	-	80
TSP	24-hr	250	-

Table A2: Nigeria's Standard Noise Levels (FEPA, 1991)

Duration per Day, hour	Permissible Exposure Limit, dB (A)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Table A3: Maximum Allowable Log Equivalent (hourly measurements), in dB (A)*

Receptor	Day-time (7:00 – 22:00)	Night-time (22:00 – 7:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

*(World Bank, 1999)

Annex 11 The Lagos 4th Mainland Bridge Air Emission Dispersion Modelling

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ACRONYMS AND ABBREVIATIONS

ADT	-	Average Daily Traffic
FMEnv	-	Federal Ministry of Environment
CO	-	carbon monoxide
NO_X	-	oxides of nitrogen
SO_2	-	sulphur dioxide
PM_{10}	-	particulate matter less than 10.0 microns in diameter
AGO	-	Automotive Gas Oil (Diesel)
SE	–	Southeast
E	–	East
SW	–	South West
N	–	North
NE	–	Northeast
NW	–	Northwest
MW	–	Megawatts
TSP	–	Total suspended particulates
WBG	–	World Bank Group
WHO	–	World Health Organization

EXECUTIVE SUMMARY

This is the report of an independent air emission dispersion modelling carried out on the proposed 4th Mainland Bridge, Lagos State, Nigeria to determine its impact on airshed. Emission inventory was conducted to identify the sources of air pollutants in the facility. Air pollutants including Carbon Monoxide (CO), Oxides of Nitrogen (NO_X), Sulphur Dioxide (SO_2), Volatile Organic Compounds (VOCs) and Suspended Particulate Matter (SPM) associated with the identified sources were quantified and fed into the ISC-AERMOD View dispersion modelling tool. Four traffic flow scenarios were investigated for a comprehensive air quality impact assessment.

The major sources of air emissions on the proposed Bridge in its operation phase are vehicles including cars, buses/suvs and trucks. Four average daily traffic flow of 41500 vehicles/day, 45500 vehicles/day, 49500 vehicles/day and 53500 vehicles/day are anticipated on the bridge. The maximum 1-hour averaging period CO ground level concentrations from vehicular emissions on the proposed Bridge is 3.06 – 20.41% of the 30,000 µg/m^3 limit while their maximum 24-hour concentrations are 0.75 – 4.99% of the 11,400 µg/m^3 limit. While the maximum 1-hour SO_2 is 4.73 – 6.08% of its 260 µg/m^3 limit, their maximum 24-hour levels are 4.38 – 5.65% of the 26 µg/m^3 limit. The maximum 1-hour NO_X is 1.14 – 6.9 folds of the WBG 200 µg/m^3 limit with the maximum 24-hour concentrations being 18.76 – 112.57% of the FMEnv 113 µg/m^3 limit and the maximum annual concentrations being 10.0 – 68.0% of its WBG 40 µg/m^3 limit. The maximum 1-hour SPM is 1.7 – 2.2% of its FMEnv 600 µg/m^3 limit with the maximum 24-hour concentrations that are 0.36 – 0.49% of its FMEnv 250 µg/m^3 limit and maximum annual concentrations level that is 1.0 – 1.4% of its WBG 20 µg/m^3 limit. Their maximum 24-hour VOCs are 11.94 – 47.13% of its FMEnv 160 µg/m^3 limit. Though the maximum ground level concentrations of CO, SO_2, SPM and VOCs associated with vehicular emissions in operation phase of the bridge are within respective limits, NO_X breaches its respective 1-hour and 24-hour FMEnv and WBG limits. It is observed that the improved free flow of traffic in the study area accompanying the proposed bridge will assist to achieve reduced air pollutants

To maintain the predicted maximum concentrations of ground level air pollutants from the proposed project, it is recommended that adequate traffic management is put in place to ensure that average 60 km/hr speed investigated is sustained.

CHAPTER ONE

INTRODUCTION

1.1 Preamble

The Lagos State Government in conjunction with a consortium comprising of Visible Asset Limited, Advanced Engineering Consultants, Julius Berger Nigeria Plc, Hi-tech Construction Limited, J.P. Morgan, Eldorado Nigeria Limited, Nigerian Westminster Dredging and Marine, Africa Finance Corporation (AFC) and Access Bank has agreed to construct the 4th Mainland Bridge. The bridge is designed to cover a distance of 38 km and to be constructed under a Build, Operate and Transfer (BOT) concession and the state's public-private partnership programme for a period of 40 years. In support of Environmental and Social Impact Assessment (ESIA) study of the proposed bridge, a vehicular emissions dispersion modelling study commissioned by Sustainabiliti Nig. Ltd. Alausa - Ikeja, Lagos State, Nigeria was carried out by *Engr. Jacob Ademola* ***Sonibare***. He is a Professor of Chemical Engineering, Air Quality Expert, Noise Specialist and Life Cycle Analyst with the Environmental Engineering Research Laboratory, Department of Chemical Engineering, Obafemi Awolowo University, Ile-Ife, Nigeria.

The proposed project is a 38 km bridge with alignment passing through Lekki, Langbasa and Baiyeiku towns along the shoreline of the Lagos Lagoon estuaries, further running through Igbogbo River Basin and crossing the Lagos Lagoon estuaries to Itamaga Area in Ikorodu (Figure 1.1). It will also cross through the Itoikin Road and the Ikorodu – Sagamu Road to connect Isawo inward Lagos Ibadan Expressway at Ojodu Berger axis. It is a 2 x 4 lane carriageway cross-sectional road with permission for BRT Lane and future road contraction expected to become the second longest Bridge in Africa, featuring 3 toll plazas, 9 interchanges, 4.5 km Lagoon Bridge and Rest and Service Areas. This proposed bridge designed to be a two-level bridge, is subdivided into three sections including Island Section, Lagoon Section and Mainland Section. The upper level will function as a means for vehicular traffic while the lower level will stimulate and accommodate pedestrian, social, commercial and cultural interactions. It starts at the Abraham Adesanya Roundabout in Lekki where a "free flow" interchange will be constructed as well as some traffic flow alterations to the existing Lekki – Epe Expressway to maintain traffic movements during construction. Its intention is to strengthen the current radial commuting connections towards Lagos urban core and the establishment of transversal connections that will serve both long distance traffic (avoiding the metropolitan traffic) and also other connections within the Megacity not Lagos bound. It allows for the first time "direct access" from the large suburb of Ikorodu to the Island and the Lekki Free Trade Zone area.

Though many sources of air pollution are anticipated in the course of rendering its designed services, the major sources identified and considered in this study are vehicles plying the bridge. Construction activities may be an issue but this study is limited to operation only.

1.2 Purpose and Objectives

This study is carried out to identify the air quality impacts of criteria air pollutants emissions from the proposed 4th Mainland Bridge in its area of influence. The specific objectives are to:

i. identify vehicular traffic characteristics anticipated on proposed 4th Mainland bridge;
ii. estimate air emission associated with vehicular traffic characteristics identified in (i);
iii. predict ground level concentrations of air pollutants associated with the emissions;
iv. determine impacts of the predicted ground level air pollutants on ambient air quality at receptors along the proposed 4th Mainland Bridge

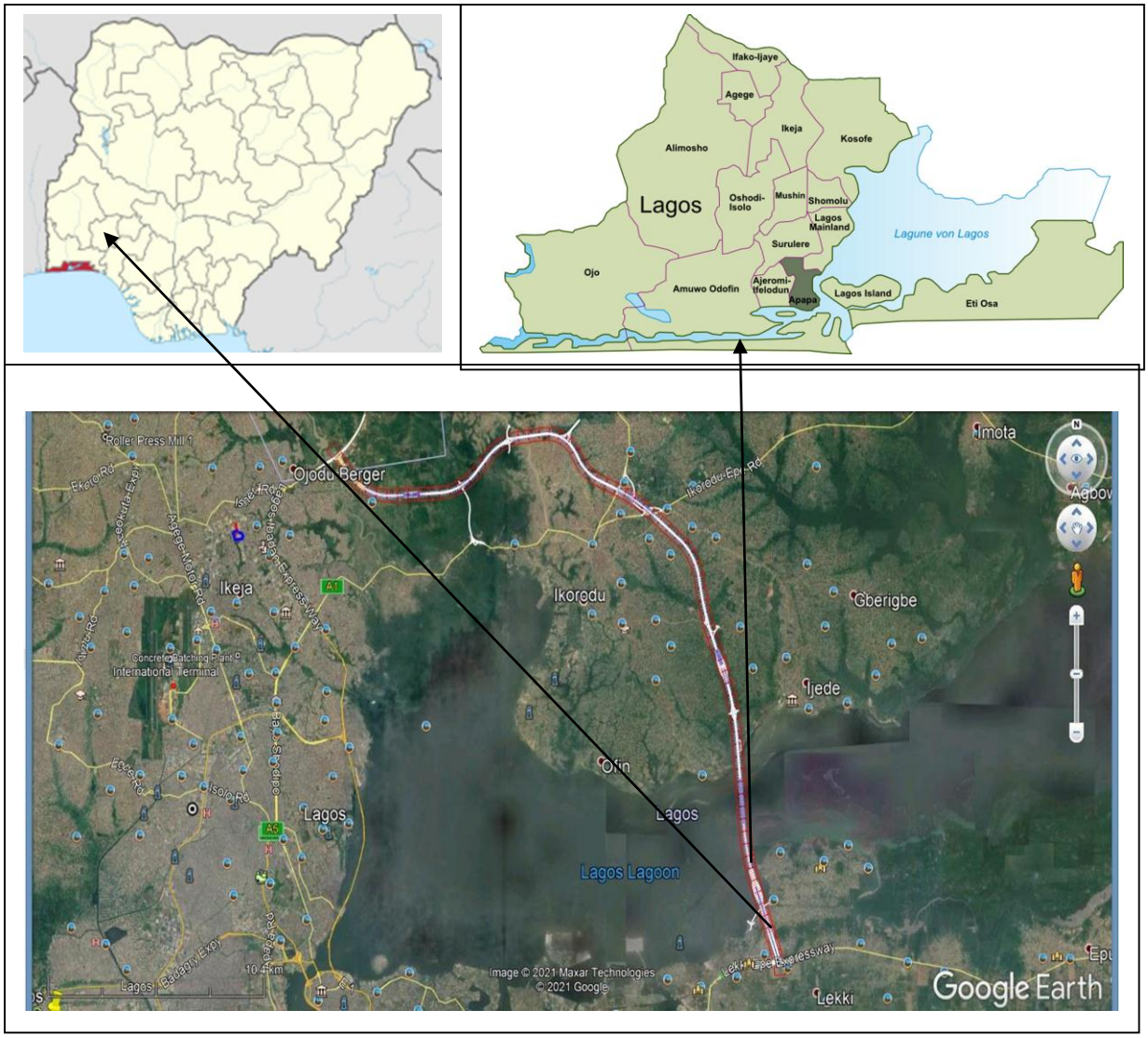

Fig. 1.1: The Proposed 4th Mainland Bridge Coverage Area

1.3 Legal, Regulatory and Administrative Framework

This air emission dispersion modelling has been conducted in accordance with relevant laws, guidelines, standards and conventions:

1.3.1 National Ambient Air Quality Standards (NAAQS), Nigeria

Nigeria has ambient air quality standards which recognize that emissions from industries and other sources including health care facilities like the proposed project may have impact on ambient air quality. For this reason, it prescribes guidelines for safe levels of air pollutants tolerable to humans, aquatic organisms and vegetation. Objective of the standards is to ensure that atmospheric environment in the country in the industrial or residential areas is not loaded with air pollutants at beyond tolerable level. These standards are documented in Table 3.4 of the National Guidelines and Standards for Industrial Effluents, Gaseous Emissions, and Hazardous Wastes Management in Nigeria (FEPA, 1991).

1.3.2 National Environmental (Air Quality Control) Regulations, 2013

In 2007 the National Environmental Standards and Regulations Enforcement Agency (NESREA) was established via the National Environmental Standards and Regulations

Enforcement Agency (Establishment) Act, 2007 (NESREA, 2007). Among its functions, is setting specifications and standards to protect and enhance the quality of Nigeria's air resources, to promote public health or welfare and the natural development and productive capacity of the nations' human, animal, marine or plant life including. In 2013, the Agency released its National Environmental (Air Quality Control) Regulations (NESREA, 2013) through which it intends to further manage the country's ambient air quality, among others.

1.3.3 World Bank Group Environment, Health and Safety (EHS) Guidelines for Toll Roads: Air Emissions and Ambient Air Quality

The World Bank Group in its EHS Guidelines (World Bank, 2007) indicated that Projects with significant sources of air emissions, and potential for significant impacts on ambient air quality, should prevent or minimize the impacts. This should be by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards. National legislated standards, or in their absence, WHO Air Quality Guidelines or other internationally recognized sources are to be applied. Several approaches required for control of air emissions from projects with significant sources and potential for significant impacts to ambient air quality are clearly indicated.

The standards used in this study to assess the anticipated air pollutants associated with operation of the proposed 4th Mainland Bridge project are summarized in *Table 1.1.*

Table 1.1: Considered Ambient Air Quality Standards

Air Pollutant	Time Average	Limit (µg/m^3)	
		FMEnv[a]	WBG[b]
CO	1-hour	30,000	-
	24-hour	11,400 (10 ppm)	-
SO_2	1-hour	260 (0.1 ppm)	-
	24-hour	26 (0.01 ppm)	20
NO_X	1-hour	-	200
	24-hour	75 – 113 (0.04 – 0.06 ppm)	-
	Annual	-	40
SPM	1-hour	600	-
	24-hour	250	50 (PM_{10})
	Annual	-	20 (PM_{10})
VOCs	24-hour	160	-

Source: [a]FEPA (1991); [b]World Bank (2016)

CHAPTER TWO

EMISSION SOURCES

Emissions from activities of the proposed 4th Mainland Bridge development and its operation with significant sources of criteria air pollutants were considered. Though its identified phases with potential sources of emissions include the construction and operation, the operation phase is the focus of this study. In this phase, the identified major sources of air emissions are vehicles (line sources) while the identified emissions are those resulting from combustion activities. The air pollutants modelled for ground level concentrations therefore include: carbon monoxide (CO), sulphur dioxide (SO_2), oxides of nitrogen (NO_X), suspended particulate matter (SPM) and volatile organic compounds (VOCs). The total number of vehicles involved in this operation phase of the project was obtained from the initial traffic study carried out in the project area. Emission rates and exhaust vent stack parameters (height, diameter, exhaust temperature, and exit velocity) used as model input parameters were obtained from project proponent.

During the operation phase, the vehicle types identified as major sources of air pollutants include: cars, buses & SUVs and Trucks (Table 2.1). Emissions from these sources were estimated using Emission Factors. Other assumptions include: cars, Buses and SUVs, run on gasoline while trucks run on automotive gas oil (diesel). Emission calculations also assumed that vehicles continuously drive along the bridge (Table 2.2).

Table 2.1: Average Daily Traffic Flow (Emission Sources) on the Proposed Bridge

Vehicle Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Cars	23489	25753	28017	30281
Buses & SUVs	4698	5151	5603	6056
Trucks	13313	14596	15880	17163

Obtained from Lagos State Ministry of Works and Infrastructure (2020)

Table 2.2: Calculated Vehicular Emission Rates by Vehicle Types on 4th Mainland Bridge

Parameters	Emission Rates (g/s)			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Gasoline passenger cars				
NO_X	0.0102	0.0111	0.0121	0.0131
VOCs	0.0245	0.0268	0.0292	0.0315
CO	0.2107	0.2310	0.2513	0.2717
SO_2	0.0005	0.0006	0.0006	0.0007
SPM	0.0005	0.0005	0.0005	0.0006
Gasoline Buses/SUVs				
NO_X	0.0027	0.0029	0.0032	0.0034
VOCs	0.0056	0.0061	0.0067	0.0072

CO	0.0334	0.0366	0.0398	0.0430
SO_2	0.0001	0.0001	0.0001	0.0001
SPM	0.0001	0.0001	0.0001	0.0001
Diesel Trucks				
NO_X	0.0267	0.0293	0.0319	0.0344
VOCs	0.0052	0.0057	0.0062	0.0067
CO	0.0231	0.0253	0.0275	0.0297
SO_2	0.0003	0.0003	0.0004	0.0004
SPM	0.0003	0.0003	0.0003	0.0003

Anticipated Daily Traffic Flow was combined with Emission Factors from EAA (2009)

CHAPTER THREE

EMISSION MODELLING PROTOCOL

The ISC-AERMOD View used for the investigation is a user-friendly interface for four U.S. EPA air dispersion models: ISCST3, ISC-PRIME, AERMOD and MET developed for Microsoft Windows. It uses pathways that compose the runstream file as the basis for its functional organization. Its version 8.2.0 with serial number AER00005543 licensed to Dr. Jacob Ademola Sonibare of Environmental Engineering Research Laboratory, Department of Chemical Engineering, Obafemi Awolowo University, Ile-Ife, Nigeria was used. The model has a wide range of options for modelling air quality impacts of pollution sources where source emission rates can be treated as constant throughout the modelling period or varied by month, season, hour-of-day, or other optional periods of variation. It is capable of handling multiple sources, including point, volume, area and open pit source types. Line sources may also be modelled as a string of volume sources or as elongated area sources. Vehicular emissions being the major air pollutants identified in this study are treated as line emission that they are.

Several source groups may be specified in a single run, with the source contributions combined for each group. Also there is provision for the choice of study area's terrain, i.e., calculation can be made for either simple terrain or complex terrain or for both during dispersion determination. In the latter case, the model will select the higher of the simple and complex terrain calculations on an hour-by-hour, source-by-source and receptor-by-receptor basis for receptors in intermediate terrain, i.e., terrain between release and plume height. Similarly, there is provision for the use of either rural or urban dispersion parameters, depending on the characteristics of the source location. The typical output from the model are: summaries of high values by receptor for each averaging period and source group combination; summaries of overall maximum values for each averaging period and source group combination; and tables of concurrent values summarized by receptor for each averaging period and source group combination for. The proposed 4th Mainland Bridge site is an urban area and this was so indicated during the modelling.

The identified line emission sources with all the parameters listed in Table 2.1 - were considered as input parameters into the modelling while Table 1.1 was used to investigate their impacts on ambient air quality.

3.1 Emission Sources Input Scenarios

Four different vehicular emission scenarios were used to investigate anticipated impacts of the proposed bridge on ambient air quality. ***Scenario 1*** investigates traffic air emissions impact using the scenario 1 anticipated Average Daily Traffic volume on the bridge (Lagos State Ministry of Works and Infrastructure, 2020) while ***Scenario 2*** considers emissions from its scenario 2 traffic flow. Both scenario 3 and scenario 4 modelled vehicular emissions from its anticipated scenario 3 and scenario 4 vehicular flows. The four scenarios assumed continuous movement of vehicles along the bridge in the investigated condition.

3.2 Receptors Locations

Considered in this modelling study as receptor to the air pollutants in the vehicular emissions anticipated around the proposed project were the environment within 500 m to the left and right sides along the axis of the proposed bridge site (*Figure 1.3*). This allows the study to

cover the important receptors within the proposed Project area without compromising quality of the data prediction provided by the model.

3.3 Meteorological Data

An essential requirement of the ISC-AERMOD air dispersion modelling for accurate results is the meteorological information. The surface and upper air observations were compiled using meteorological data from the Lakes Environmental meteorological observations (Met Data Order # MET 134283) and the project acquired surface meteorological data on site. These have winds with prevalence for a south-westerly direction *(Figure 3.1*).

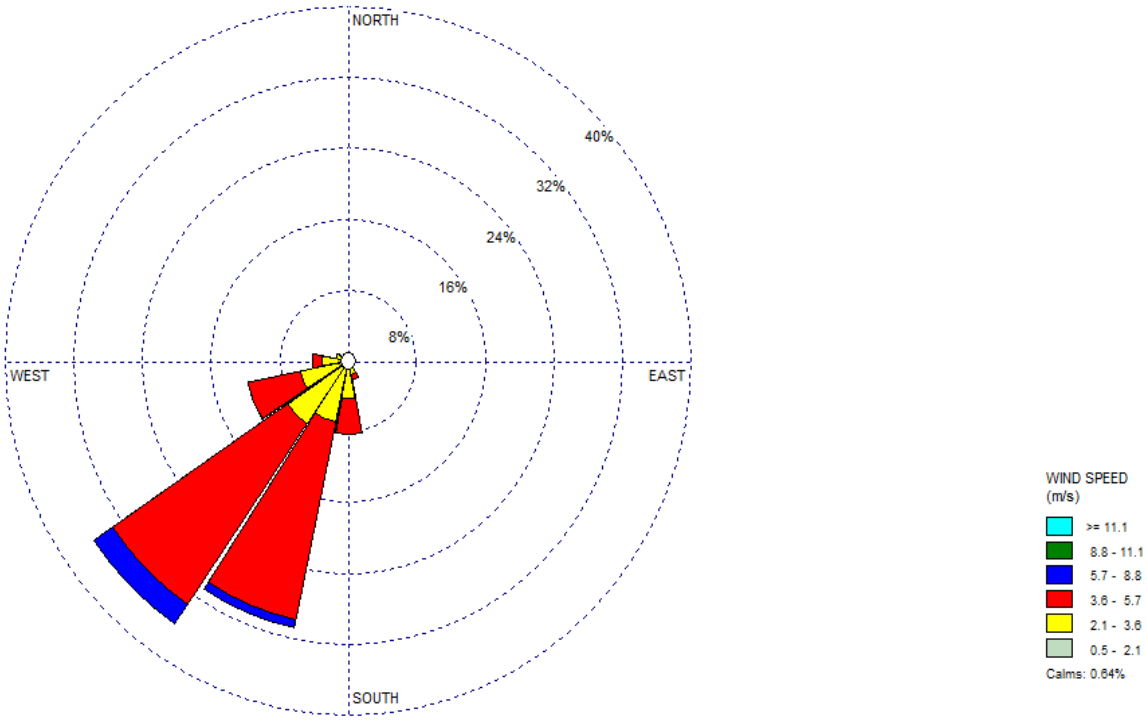

Fig. 3.1: Windrose of the Area Generated from the Wind Data used in the Study

3.4 Land Surface Characteristics Data

The ISC-AERMOD View uses several parameters to represent certain features that affect complex dispersion processes to accomplish its calculations. Information is also sought about the nearby terrain and surface features that induce turbulence in addition to hourly surface and upper air meteorological data. These include roughness length which represents the height of trees or other obstructions to wind flow. In this study, the necessary parameters were selected based on the nature of the area and its closeness to the Lagoon and the Atlantic Ocean.

CHAPTER FOUR

MODELLING RESULTS

The predicted ground level concentrations of associated air pollutant with the anticipated vehicular emissions on the proposed 4th Mainland Bridge as obtained in the dispersion modelling are presented in this section. However, these are guided by the available ambient air quality standards of both the Federal Ministry of Environment (FMEnv) and the World Bank Group (WBG) reported in Table 1.1.

4.1 Ground Level Concentrations Associated with Traffic on the Proposed Bridge

From scenario 1 anticipated number of cars on the bridge, 1-hr CO is 47.5 – 4750.1 µg/m^3 (Figure 4.1) but 37.6 – 3759.2 µg/m^3 from the Buses/SUVs (Figure 4.2) and 9.2 – 917.3 µg/m^3 from the Trucks (Figure 4.3). Its 24-hr CO is 4.4 – 441.0 µg/m^3 from cars (Figure 4.4) but 3.5 – 349.0 µg/m^3 from Buses/SUVs (Figure 4.5) and 0.9 – 85.2 µg/m^3 from Trucks (Figure 4.6). The 1-hr SO_2 is 0.1 – 12.3 µg/m^3 from the three types of vehicles investigated (Figure 4.7 – 4.9) but 0.01 – 1.14 µg/m^3 as 24-hour levels (Figure 4.10 – 4.12). Their 1-hr NO_X are 2.3 – 228.8 µg/m^3 (Figure 4.13), 3.0 – 300.3 (Figure 4.14) and 10.6 – 1062.4 µg/m^3 (Figure 4.15) from cars, Buses/SUVs and Trucks respectively with respective 24-hr levels of 0.2 – 21.2 µg/m^3 (Figure 4.16), 0.3 – 27.9 µg/m^3 (Figure 4.17) and 1.0 – 98.6 µg/m^3 (Figure 4.18) and annual levels of 0.05 – 4.00 µg/m^3 (Figure 4.19), 0.06 – 5.97 µg/m^3 (Figure 4.20) and 0.20 – 21.1 µg/m^3 (Figure 4.21). The 1-hr SPM is 0.1 – 10.2 µg/m^3 from the three vehicle types (Figure 4.22 – Figure 4.24) but 0.01 – 0.90 µg/m^3 as 24-hour averaging period concentrations (Figure 4.25 – Figure 4.27) with annual levels of 0.0 – 0.30 µg/m^3 (Figure 4.28 – Figure 4.30). From this scenario 1 vehicular emissions on the bridge, 24-hour VOCs from cars is 0.5 – 51.2 µg/m^3 (Figure 4.31) but 0.6 – 58.5 µg/m^3 from the buses/suvs and (Figure 4.32) and 0.2 – 19.1 µg/m^3 (Figure 4.33) from trucks.

Scenario 2 cars traffic on the bridge is characterized with 1-hour CO levels of 52.1 – 5208.0 µg/m^3 (Figure 4.34) but 41.2 – 4121.6 µg/m^3 from Buses/SUVs (Figure 4.35) and 10.1 – 1005.8 from Trucks (Figure 4.36) with 24-hour levels of 4.8 – 483.5 µg/m^3 (Figure 4.37), 3.8 – 382.6 µg/m^3 (Figure 4.38) and 0.9 – 93.4 µg/m^3 (Figure 4.39) from the cars, buses/suvs and trucks respectively. While the 1-hour SO_2 is 0.1 – 12.3 µg/m^3 from cars (Figure 4.40) with 0.1 – 13.4 µg/m^3 from Buses/SUVs and Trucks (Figure 4.41 and Figure 4.42), its 24-hour levels are 0.01 – 1.14 µg/m^3 (Figure 4.43), 0.01 – 1.25 µg/m^3 (Figure 4.44 and Figure 4.45) from cars, buses/suvs and trucks respectively. The scenario 2 vehicles 1-hour NO_X is 2.5 – 250.9 from cars (Figure 4.46) but 3.3 – 329.9 µg/m^3 from Buses/SUVs (Figure 4.47) and 11.6 – 1164.8 µg/m^3 from trucks (Figure 4.48) with 24-hour levels of 0.2 – 23.3 µg/m^3 from cars (Figure 4.49), 0.3 – 30.6 µg/m^3 from buses/suvs (Figure 4.50) and 1.1 – 108.1 µg/m^3 from trucks (Figure 4.51) and annual levels of 0.05 – 4.0 µg/m^3 (Figure 4.52), 0.07 – 6.55 µg/m^3 (Figure 4.53) and 0.20 – 23.20 µg/m^3 from the trucks (Figure 4.54). While its anticipated 1-hour SPM from the investigated vehicles is 0.1 – 11.2 µg/m^3 (Figure 4.55 – Figure 4.57) with 24-hour concentrations of 0.01 – 1.04 (Figure 4.58 – Figure 4.60) and annual levels of 0.0 – 0.20 µg/m^3 (Figure 4.61 – 4.63), its 24-hour VOCs is 0.6 – 56.1 µg/m^3 from cars (Figure 4.64) with 0.6 – 64.2 µg/m^3 from buses/suvs (Figure 4.65) and 0.2 – 20.9 µg/m^3 from trucks (Figure 4.66)

The investigated scenario 3 anticipated traffic volume produces 1-hour CO levels of 56.7 – 5665.9 µg/m^3 from the cars (Figure 4.67) but 44.8 – 4484.0 µg/m^3 from buses/suvs (Figure 4.68) and 10.9 – 1094.2 µg/m^3 from trucks (Figure 4.69) with 24-hour levels of 5.3 – 526.0 µg/m^3 (Figure 4.70), 4.2 – 416.3 µg/m^3 (Figure 4.71) and 1.0 – 101.6 µg/m^3 (Figure 4.72) from cars, buses/suvs and trucks respectively. While its 1-hour SO_2 is 0.1 – 14.6 µg/m^3 from the three investigated vehicle types (Figure 4.73 – 4.75), its 24-hour SO_2 is 0.01 – 1.25 µg/m^3 from

cars (Figure 4.76) but 0.01 – 1.36 µg/m^3 from buses/suvs and trucks (Figure 4.77 and Figure 4.78). This scenario 3's 1-hour NO_X is 2.7 – 272.9 µg/m^3 from cars (Figure 4.79) but 3.6 – 358.2 from buses/suvs (Figure 4.80) and 12.7 – 1267.2 µg/m^3 from trucks (Figure 4.81) with 24-hour levels of 0.3 – 25.3 µg/m^3 (Figure 4.82), 0.3 – 33.3 µg/m^3 (Figure 4.83) and 1.2 – 117.6 µg/m^3 (Figure 4.84) from cars, buses/suvs and trucks respectively and annual levels of 0.05 – 5.43 µg/m^3 from cars (Figure 4.85), 0.07 – 7.12 µg/m^3 from buses/suvs (Figure 4.86) and 0.3 – 25.2 µg/m^3 (Figure 4.87). Its 1-hour SPM is 0.1 – 12.2 µg/m^3 (Figure 4.88 – Figure 4.90) with 24-hour levels of 0.01 – 1.13 µg/m^3 (Figure 4.91 – Figure 4.93) and annual levels of 0.0 – 0.24 µg/m^3 (Figure 4.94 – Figure 4.96) from cars, buses/suvs and trucks with 24-hour VOCs levels of 0.6 – 61.1 µg/m^3 from cars (Figure 4.97) but 0.7 – 89.8 µg/m^3 from buses/suvs (Figure 4.98) and 0.2 – 22.7 µg/m^3 from trucks (Figure 4.99).

Scenario 4 that investigated air emissions from the highest traffic volume anticipated on the bridge provided 1-hour ground level CO of 61.2 – 6123.8 µg/m^3 from cars (Figure 4.100) but 48.5 – 4846.3 µg/m^3 from buses/suv (Figure 4.101) and 11.8 – 1182.6 µg/m^3 from trucks (Figure 4.102) with 24-hour levels of 5.7 – 568.5 µg/m^3 (Figure 4.103), 4.5 – 449.9 µg/m^3 (Figure 4.104) and 0.9 – 85.2 µg/m^3 (Figure 4.105) from cars, buses/suv and trucks respectively. While its 1-hour SO_2 is 0.2 – 15.8 µg/m^3 from all the vehicle types (Figure 4.106 – Figure 4.108), its 24-hour level is 0.01 – 1.47 µg/m^3 from the vehicles (Figure 4.109 – Figure 4.111). Its 1-hour NO_X from cars is 2.9 – 295.6 µg/m^3 (Figure 4.112) with 3.9 – 387.2 µg/m^3 from buses/suv (Figure 4.113) and 13.7 – 1369.6 µg/m^3 from trucks (Figure 4.114) while the 24-hour levels are 0.3 – 27.4 µg/m^3 (Figure 4.115), 0.4 – 35.9 µg/m^3 (Figure 4.116) and 1.3 – 127.2 µg/m^3 (Figure 4.117) from cars, buses/suv and trucks respectively with respective annual levels of 0.06 – 5.87 µg/m^3 (Figure 4.118), 0.08 – 7.70 µg/m^3 (Figure 4.119) and 0.3 – 27.2 µg/m^3 (Figure 4.120). As presented in Figure 4.121 - 4.123, the 1-hour averaging period SPM concentrations from each of the investigated vehicle types in this scenario is 0.1 – 13.2 µg/m^3 with 24-hour levels of 0.01 – 1.22 µg/m^3 (Figure 4.124 – Figure 4.126) and annual levels of 0.0 – 0.20 µg/m^3 (Figure 4.127 – Figure 4.129). The anticipated 24-hour VOCs from cars in this scenario is 0.7 – 66.0 µg/m^3 (Figure 4.130) but 0.8 – 75.4 µg/m^3 from buses/suvs (Figure 4.131) and 0.2 – 24.6 µg/m^3 (Figure 4.132).

4.2 Impacts of the Proposed Bridge Traffic on Ambient Air Quality

As presented in Table 4.1, the maximum 1-hour averaging period CO ground level concentrations from vehicular emissions on the proposed 4th Mainland Bridge is 3.06 – 20.41% of the 30,000 µg/m^3 limit while their maximum 24-hour averaging period concentrations are 0.75 – 4.99% of the 11,400 µg/m^3 limit.

While the maximum 1-hour averaging period SO_2 concentrations are 4.73 – 6.08% of its 260 µg/m^3 limit (Table 4.2), their maximum 24-hour averaging period SO_2 concentrations are 4.38 – 5.65% of the 26 µg/m^3 limit.

Summarized in Table 4.3 are the maximum ground level concentrations of NO_X associated with vehicular emissions on the bridge. Its maximum 1-hour concentrations are 1.14 – 6.9 folds of the WBG 200 µg/m^3 limit with the maximum 24-hour concentrations being 18.76 – 112.57% of the FMEnv 113 µg/m^3 limit and maximum annual concentrations of 10.0 – 68.0% of its WBG 40 µg/m^3 limit.

The maximum 1-hour averaging period SPM concentrations are 1.7 – 2.2% of its FMEnv 600 µg/m^3 limit with the maximum 24-hour concentrations that are 0.36 – 0.49% of its FMEnv 250 µg/m^3 limit and maximum annual concentrations level of 1.0 – 1.4% of its WBG 20 µg/m^3 limit (Table 4.4). Their maximum 24-hour averaging period ground level VOCs are 11.94 – 47.13% of its FMEnv 160 µg/m^3 limit (Table 4.5).

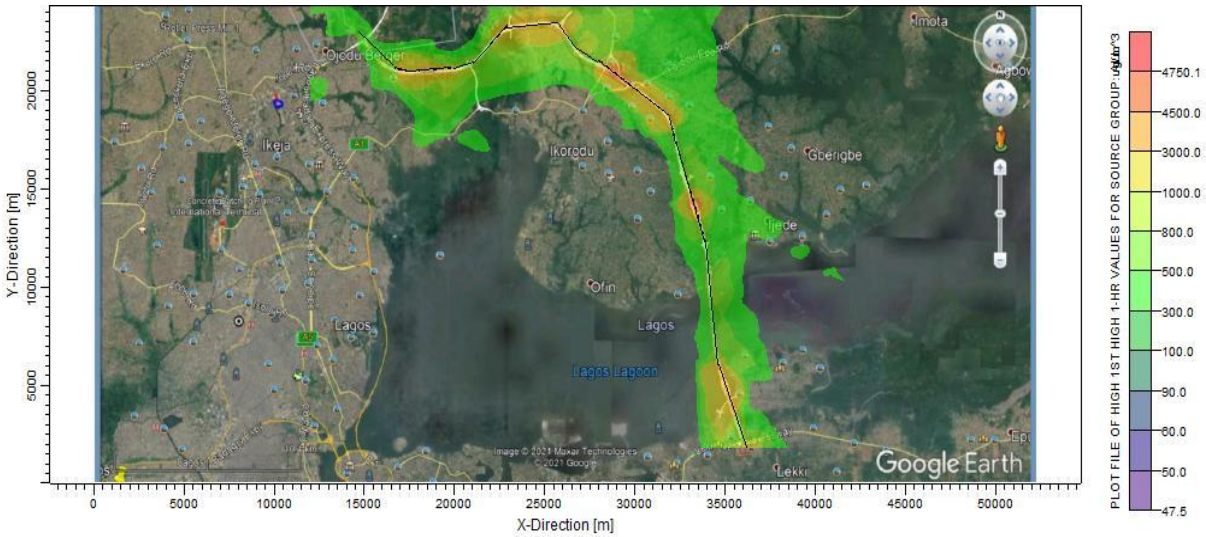

Fig. 4.1: Isopleth of 1-hour Ground Level CO from Scenario 1 Cars

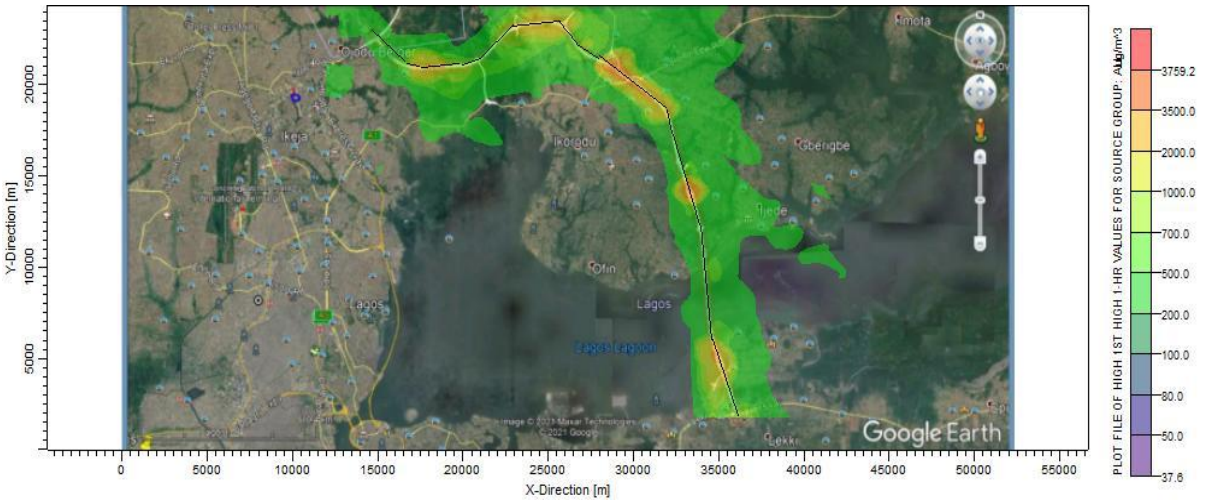

Fig. 4.2: Isopleth of 1-hour Ground Level CO from Scenario 1 Buses/SUVs

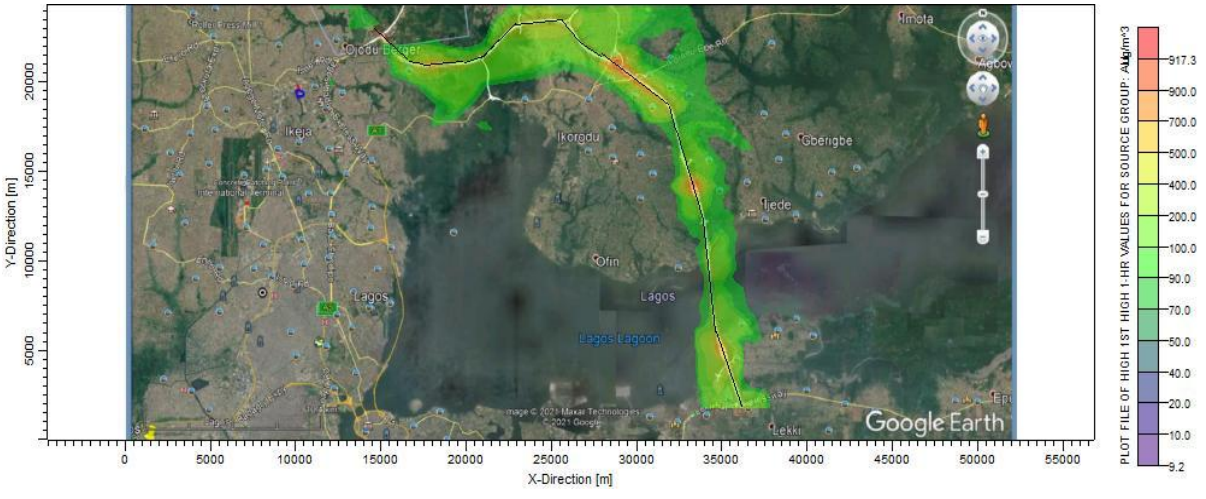

Fig. 4.3: Isopleth of 1-hour Ground Level CO from Scenario 1 Trucks

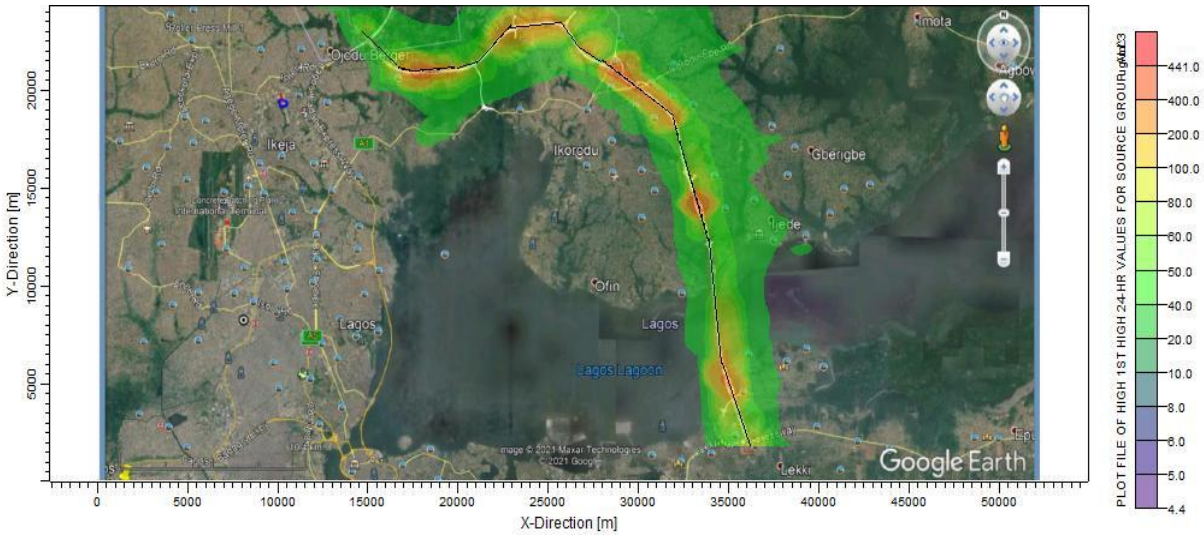

Fig. 4.4: Isopleth of 24-hour Ground Level CO from Scenario 1 Cars

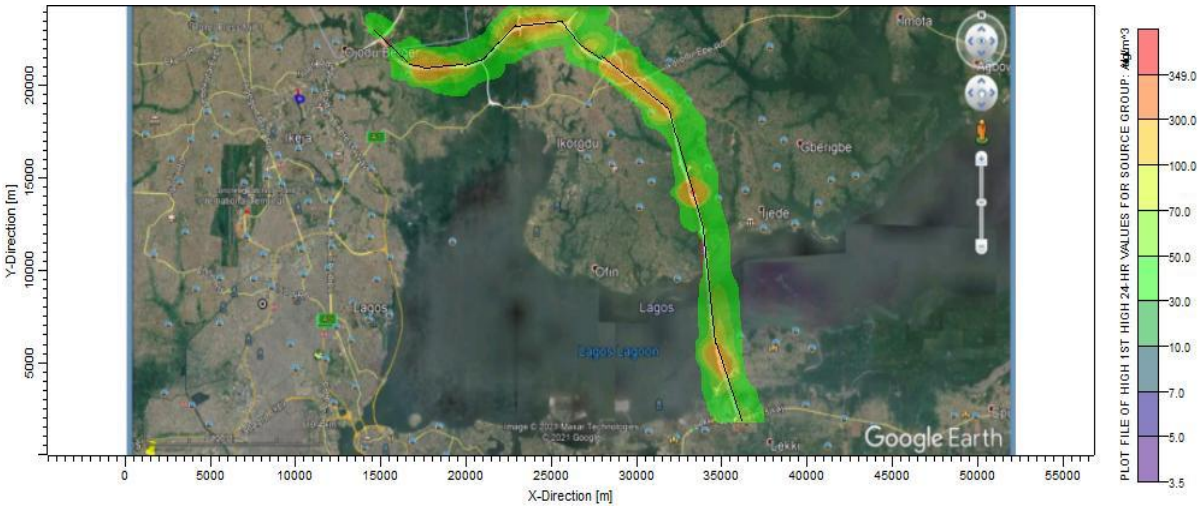

Fig. 4.5: Isopleth of 24-hour Ground Level CO from Scenario 1 Buses/SUVs

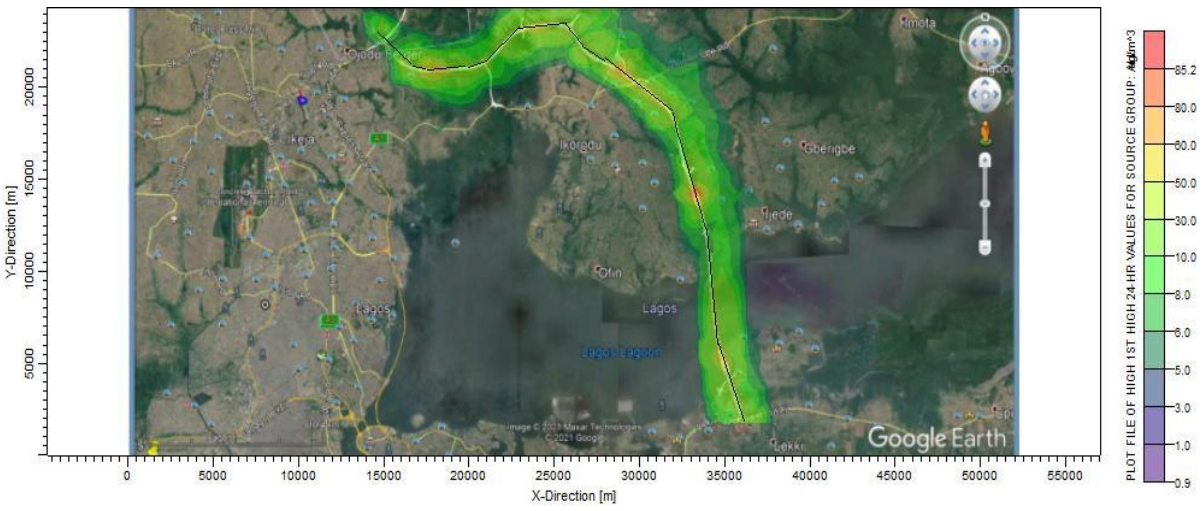

Fig. 4.6: Isopleth of 24-hour Ground Level CO from Scenario 1 Trucks

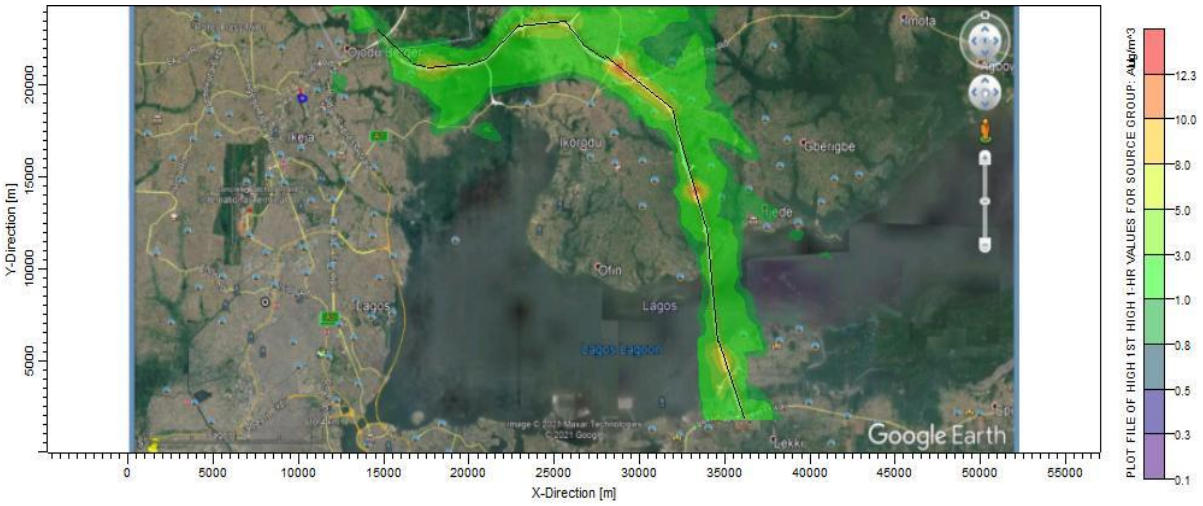

Fig. 4.7: Isopleth of 1-hour Ground Level SO_2 from Scenario 1 Cars

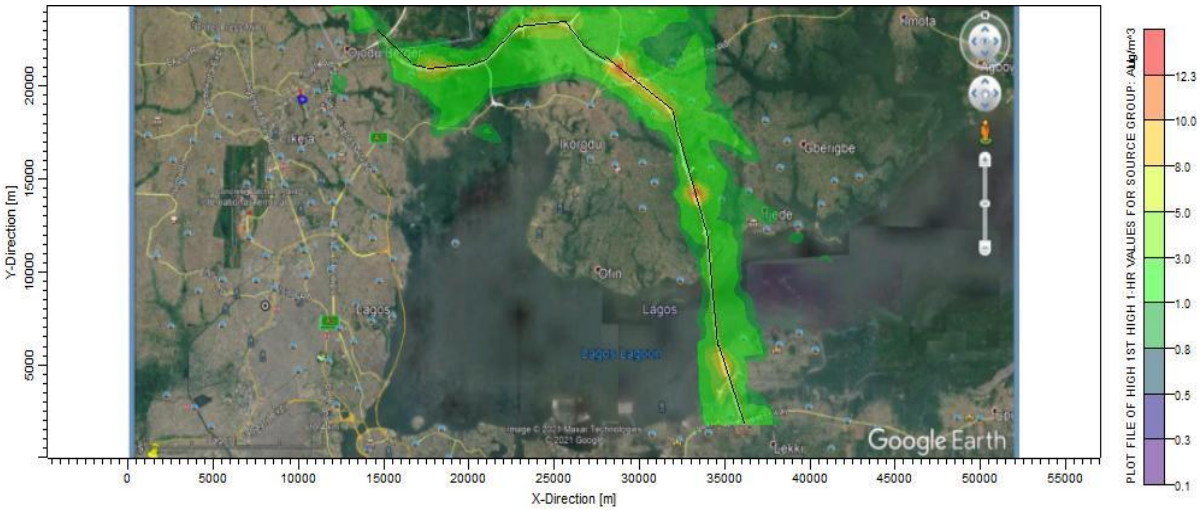

Fig. 4.8: Isopleth of 1-hour Ground Level SO_2 from Scenario 1 Buses/SUVs

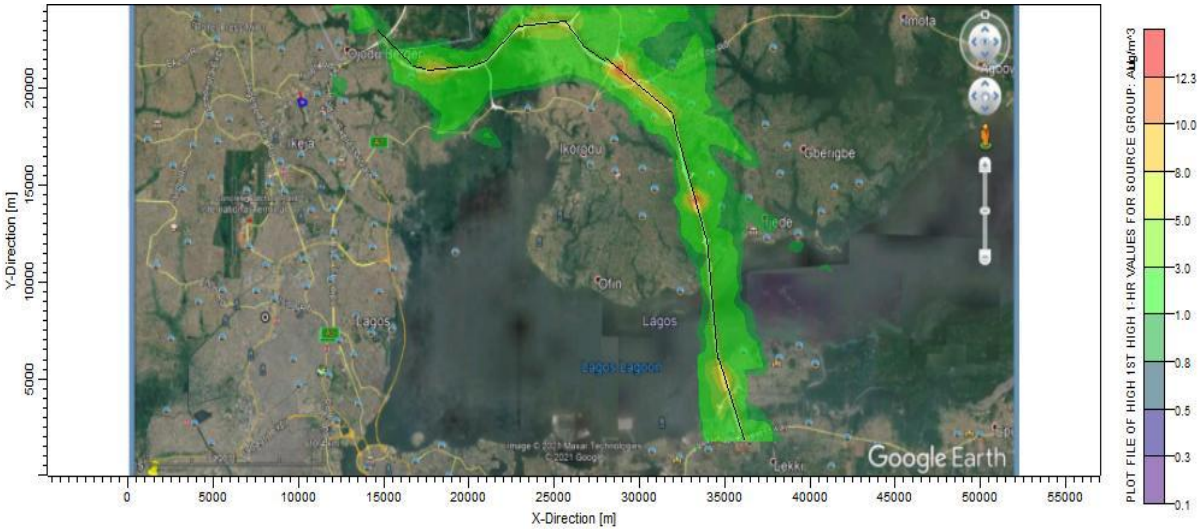

Fig. 4.9: Isopleth of 1-hour Ground Level SO_2 from Scenario 1 Trucks

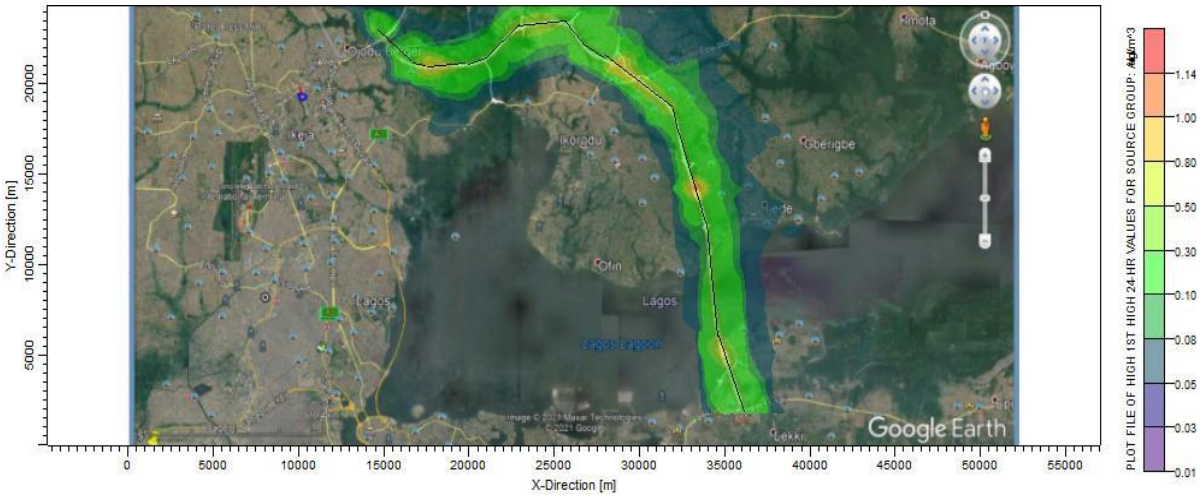

Fig. 4.10: Isopleth of 24-hour Ground Level SO_2 from Scenario 1 Cars

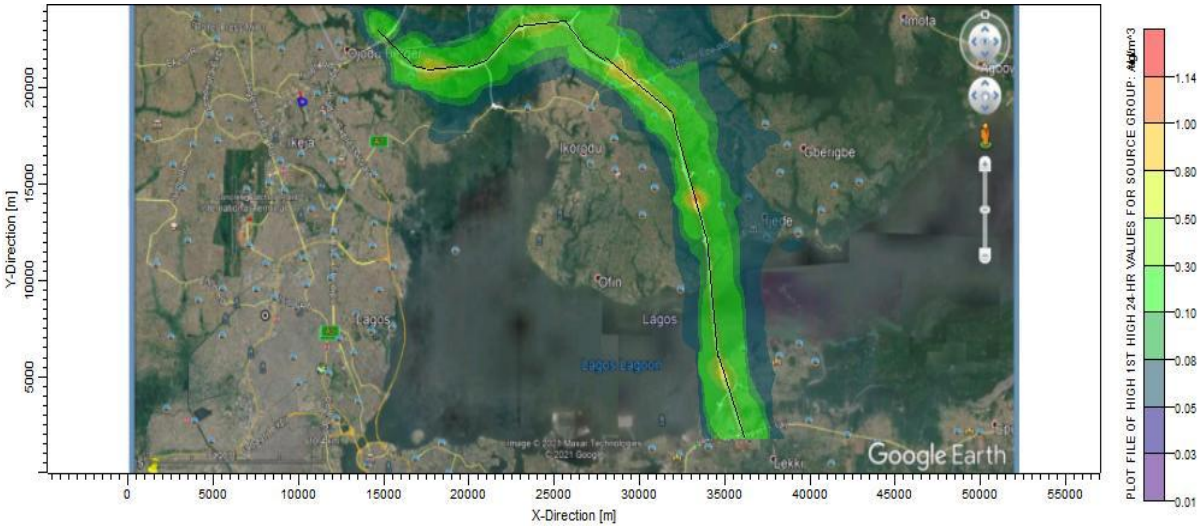

Fig. 4.11: Isopleth of 24-hour Ground Level SO_2 from Scenario 1 Buses/SUVs

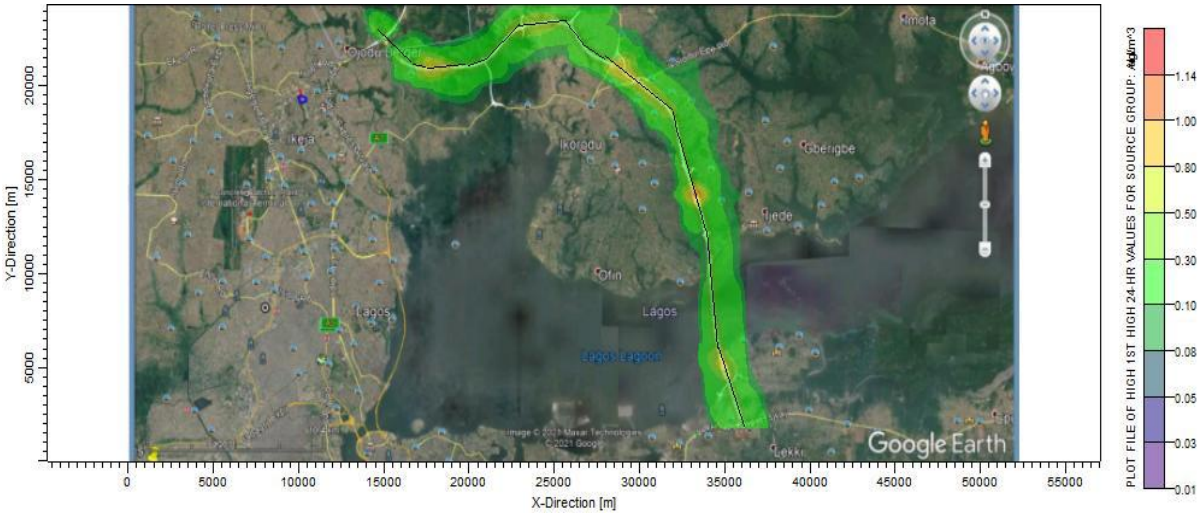

Fig. 4.12: Isopleth of 24-hour Ground Level SO_2 from Scenario 1 Trucks

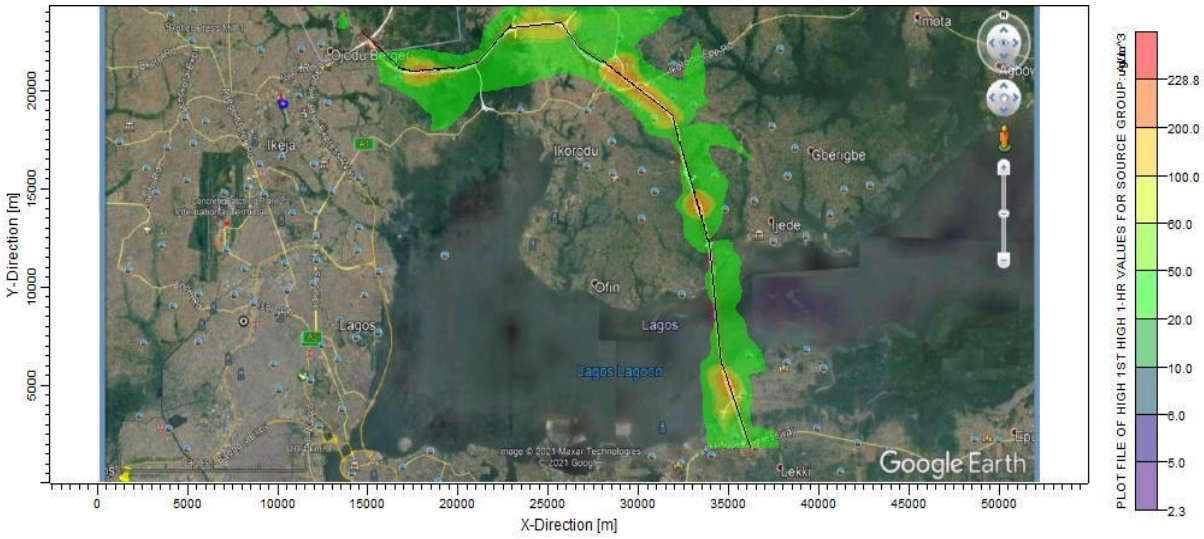

Fig. 4.13: Isopleth of 1-hour Ground Level NO_X from Scenario 1 Cars

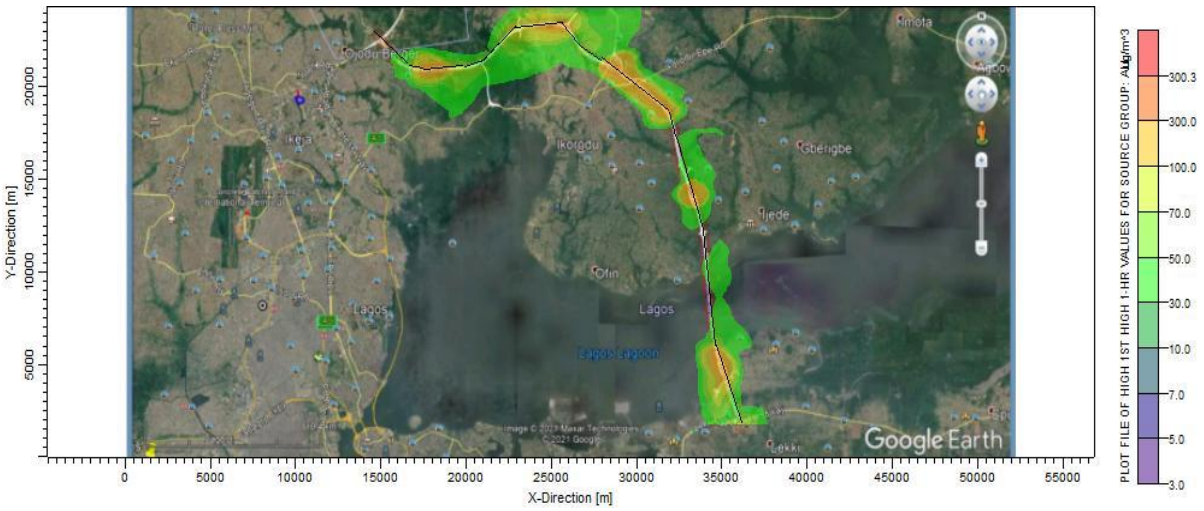

Fig. 4.14: Isopleth of 1-hour Ground Level NO_X from Scenario 1 Buses/SUVs

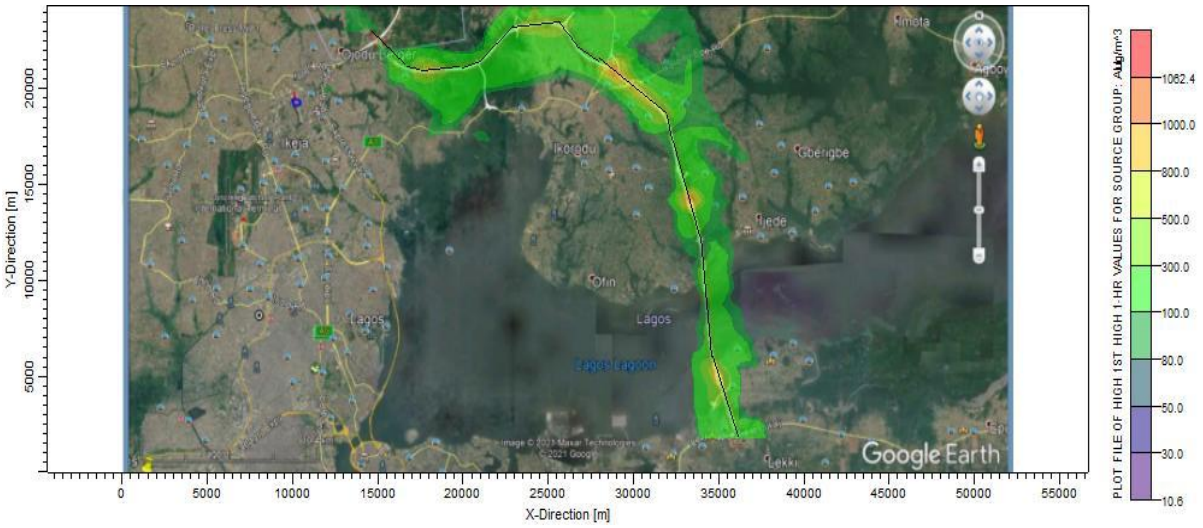

Fig. 4.15: Isopleth of 1-hour Ground Level NO_X from Scenario 1 Trucks

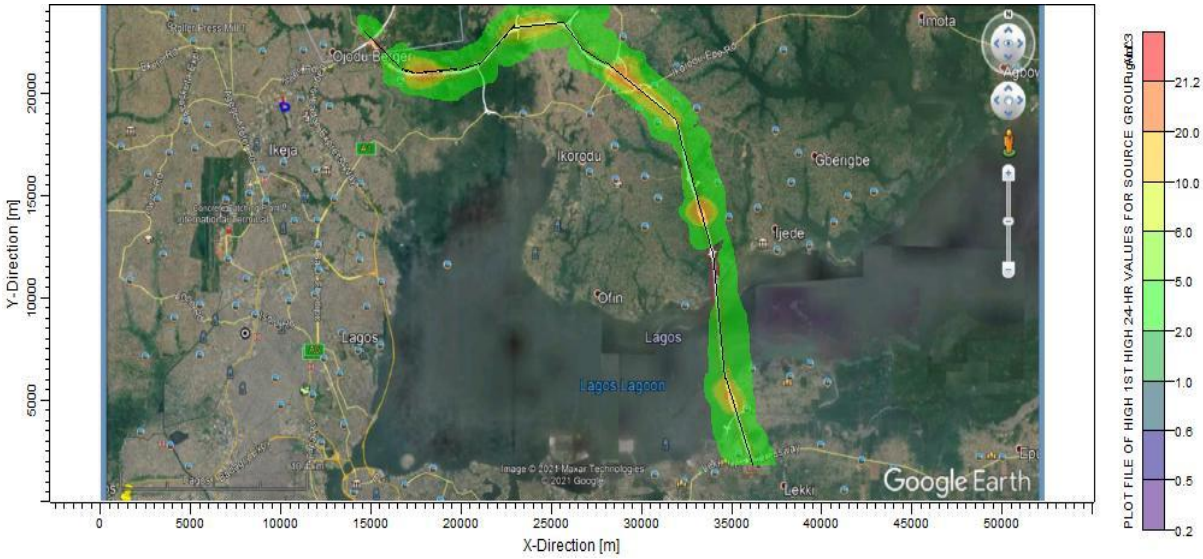

Fig. 4.16: Isopleth of 24-hour Ground Level NO_X from Scenario 1 Cars

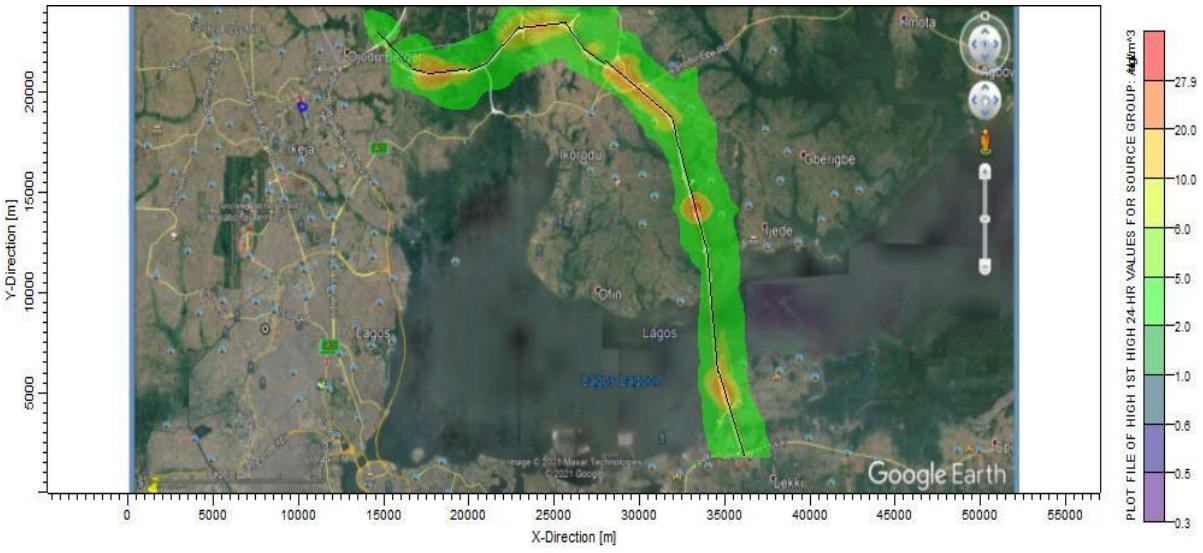

Fig. 4.17: Isopleth of 24-hour Ground Level NO_X from Scenario 1 Buses/SUVs

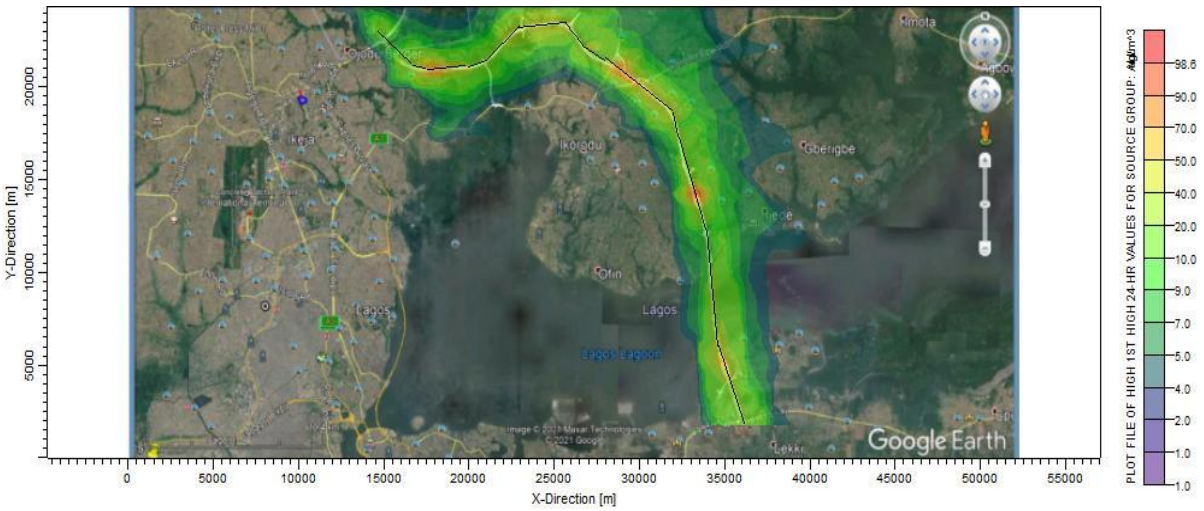

Fig. 4.18: Isopleth of 24-hour Ground Level NO_X from Scenario 1 Trucks

Fig. 4.19: Isopleth of Annual Ground Level NO_X from Scenario 1 Cars

Fig. 4.20: Isopleth of Annual Ground Level NO_X from Scenario 1 Buses/SUVs

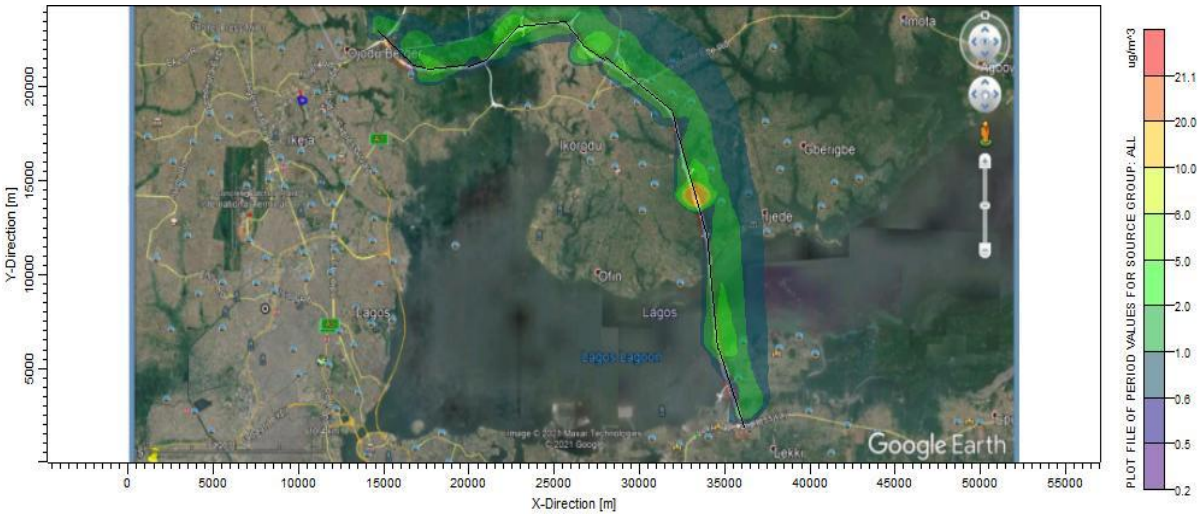

Fig. 4.21: Isopleth of Annual Ground Level NO_X from Scenario 1 Trucks

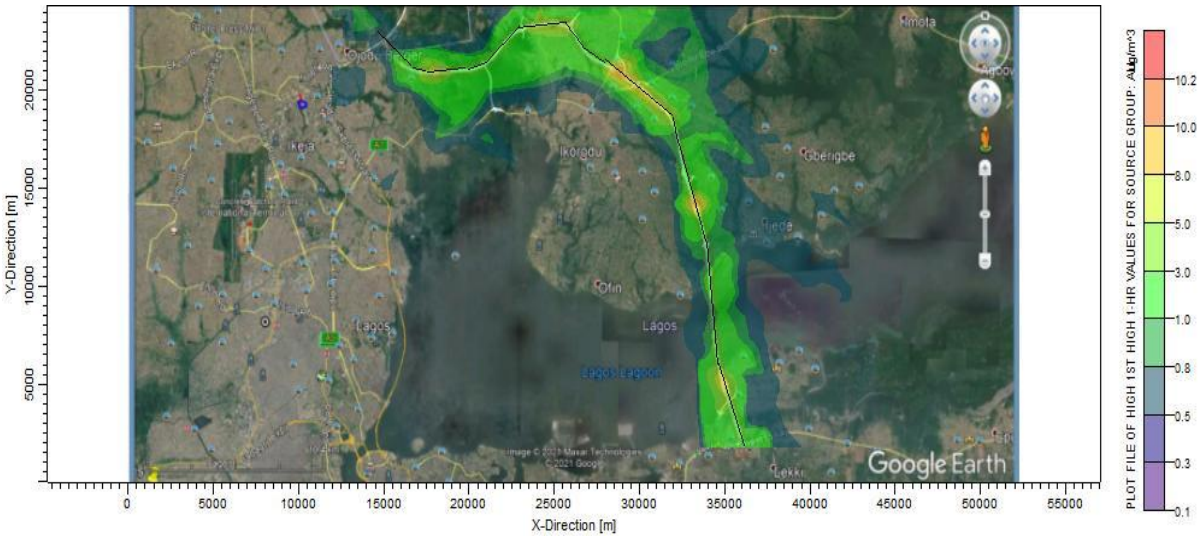

Fig. 4.22: Isopleth of 1-Hour Ground Level SPM from Scenario 1 Cars

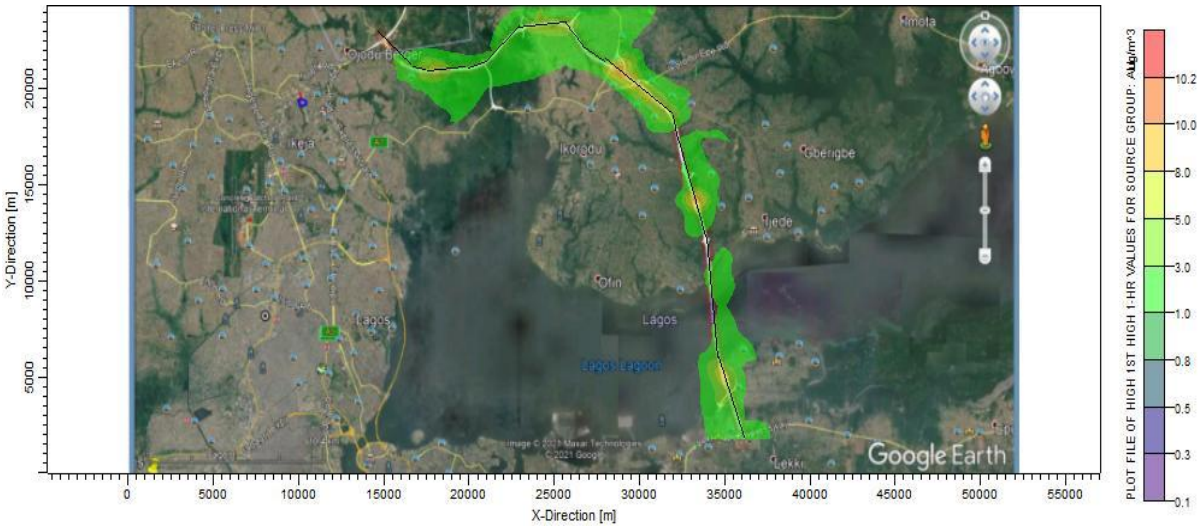

Fig. 4.23: Isopleth of 1-Hour Ground Level SPM from Scenario 1 Buses/SUVs

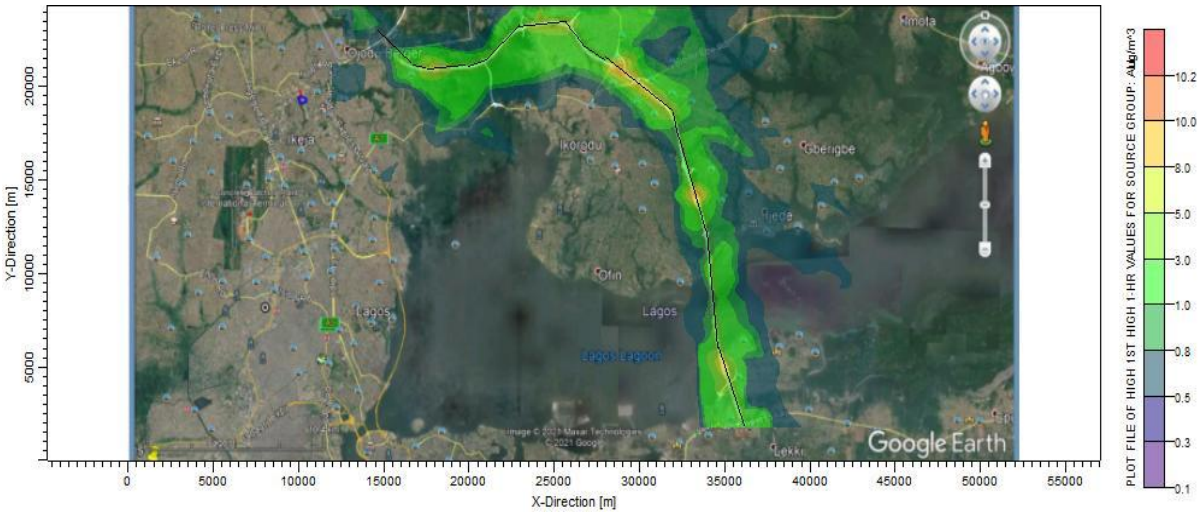

Fig. 4.24: Isopleth of 1-Hour Ground Level SPM from Scenario 1 Trucks

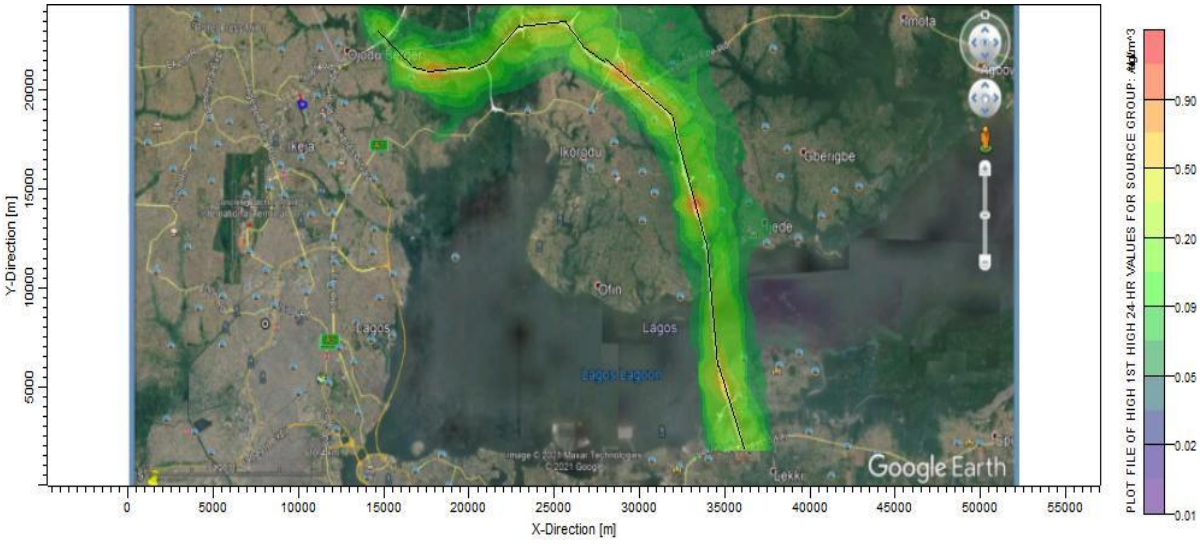

Fig. 4.25: Isopleth of 24-Hour Ground Level SPM from Scenario 1 Cars

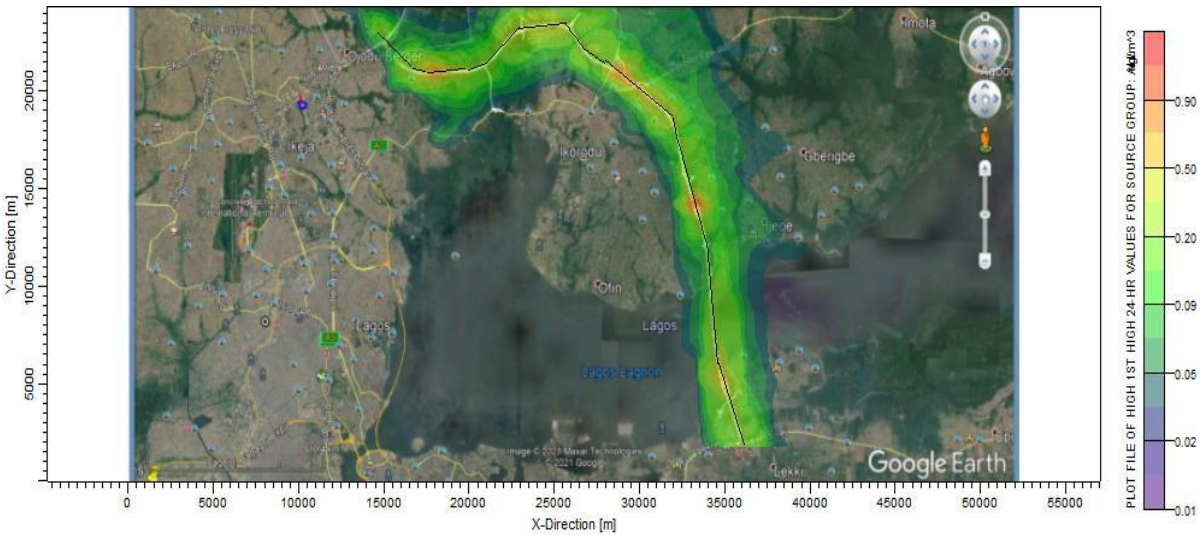

Fig. 4.26: Isopleth of 24-Hour Ground Level SPM from Scenario 1 Buses/SUVs

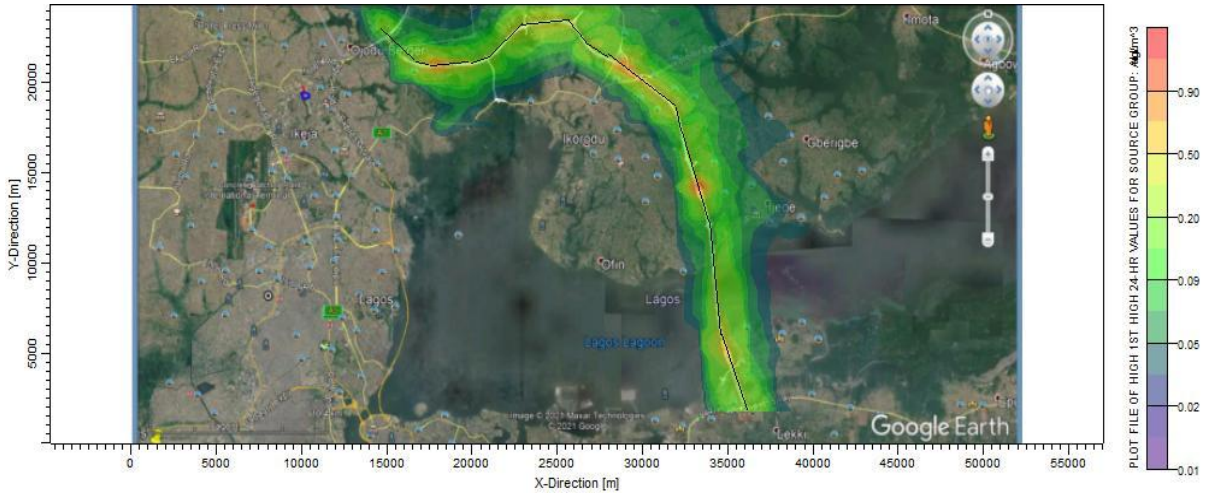

Fig. 4.27: Isopleth of 24-Hour Ground Level SPM from Scenario 1 Trucks

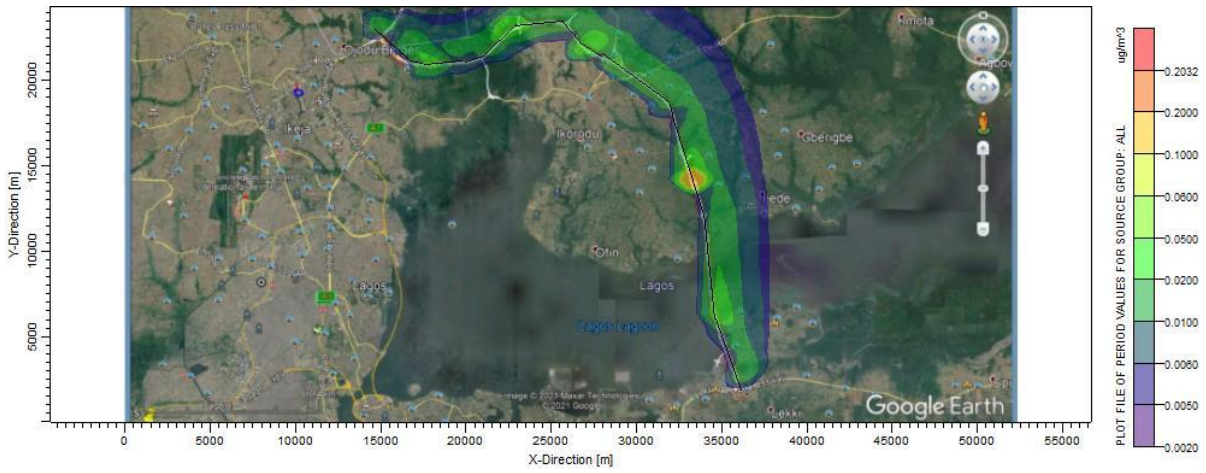

Fig. 4.28: Isopleth of Annual Ground Level SPM from Scenario 1 Cars

Fig. 4.29: Isopleth of Annual Ground Level SPM from Scenario 1 Buses/SUVs

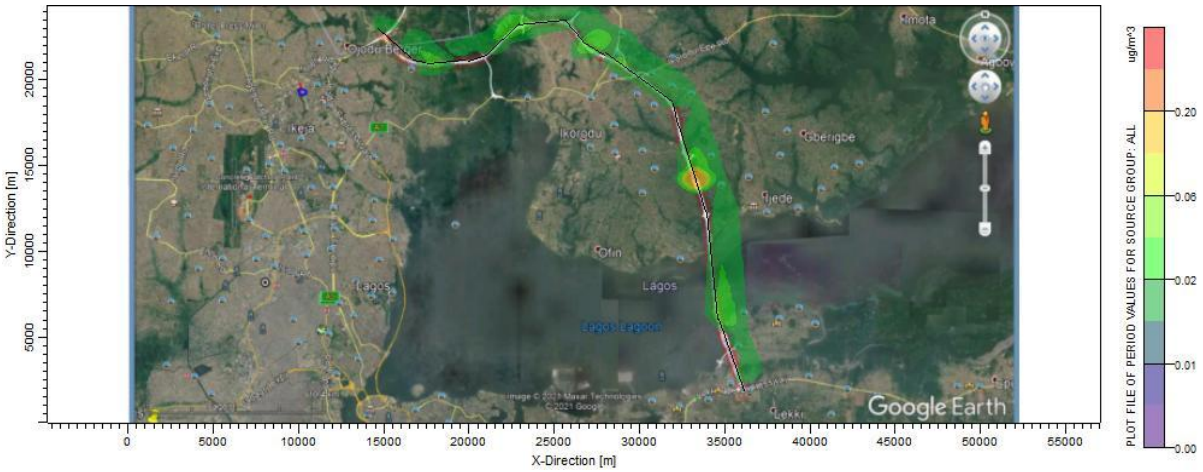

Fig. 4.30: Isopleth of Annual Ground Level SPM from Scenario 1 Trucks

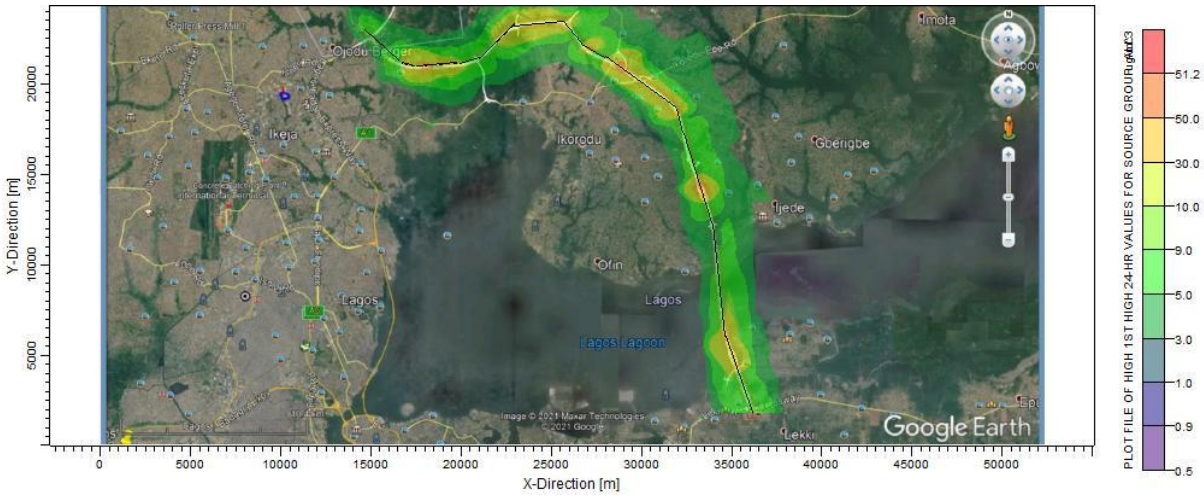

Fig. 4.31: Isopleth of 24-Hour Ground Level VOCs from Scenario 1 Cars

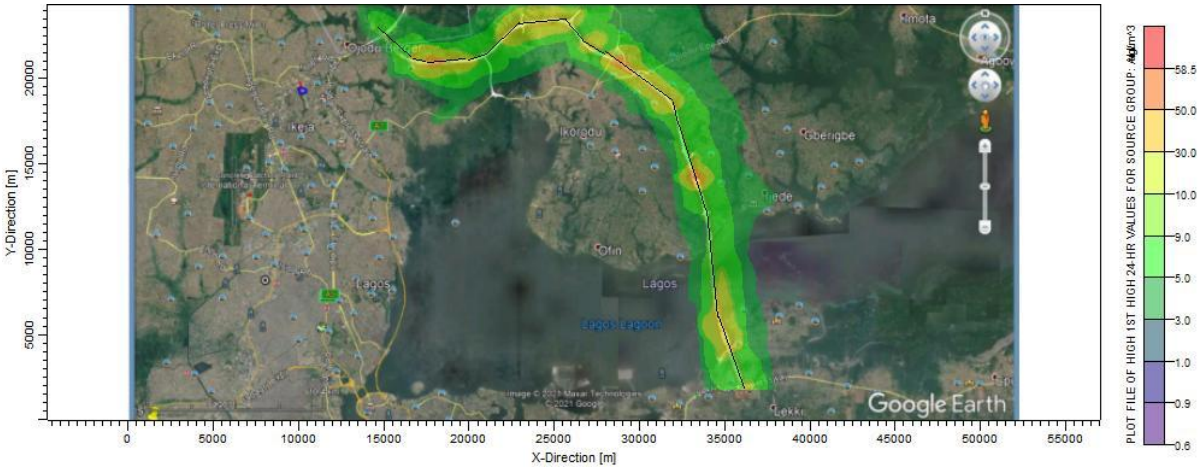

Fig. 4.32: Isopleth of 24-Hour Ground Level VOCs from Scenario 1 Buses/SUVs

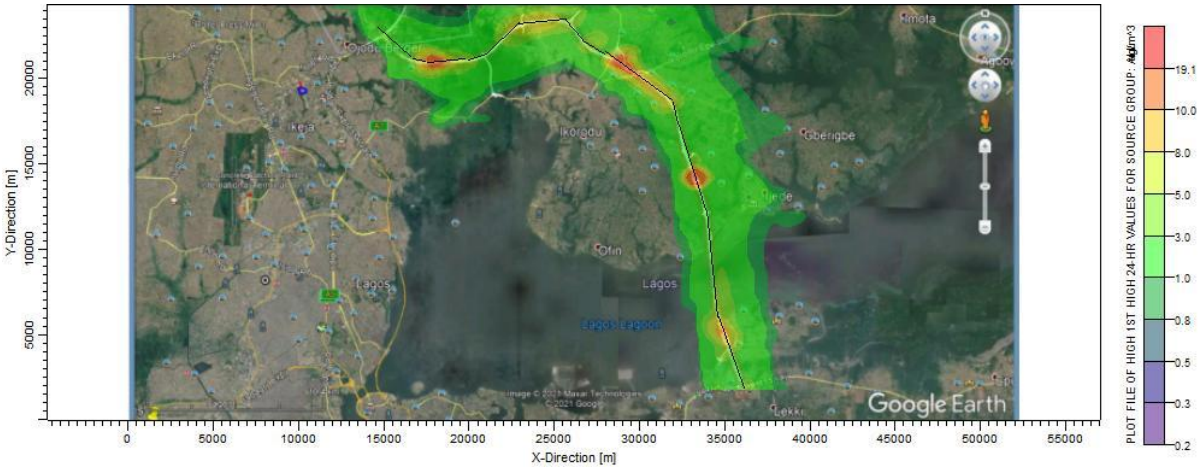

Fig. 4.33: Isopleth of 24-Hour Ground Level VOCs from Scenario 1 Trucks

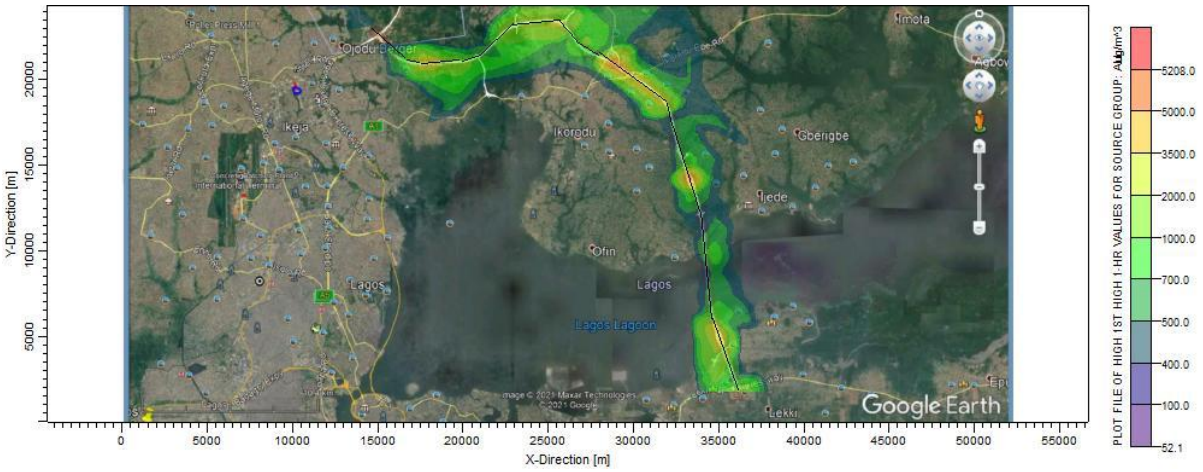

Fig. 4.34: Isopleth of 1-hour Ground Level CO from Scenario 2 Cars

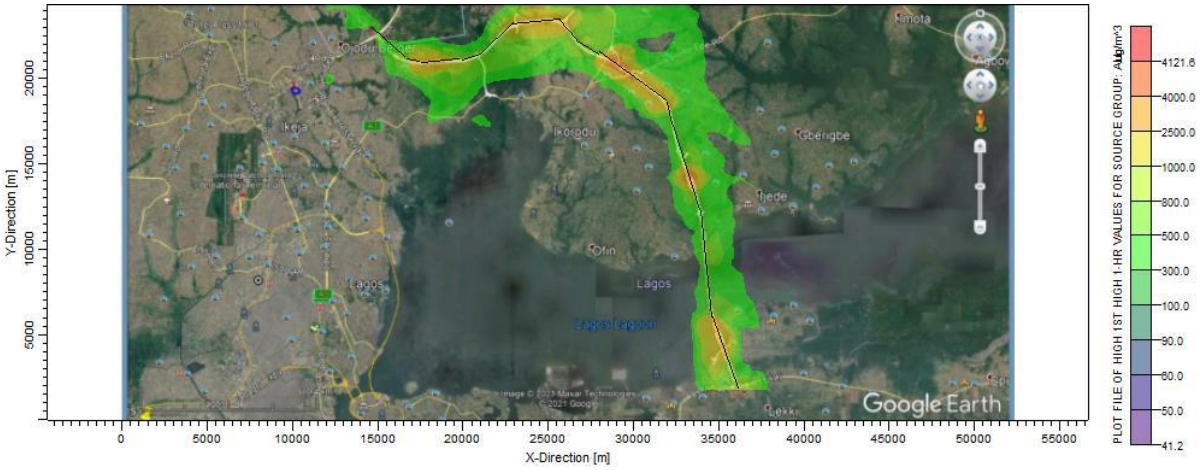

Fig. 4.35: Isopleth of 1-hour Ground Level CO from Scenario 2 Buses/SUVs

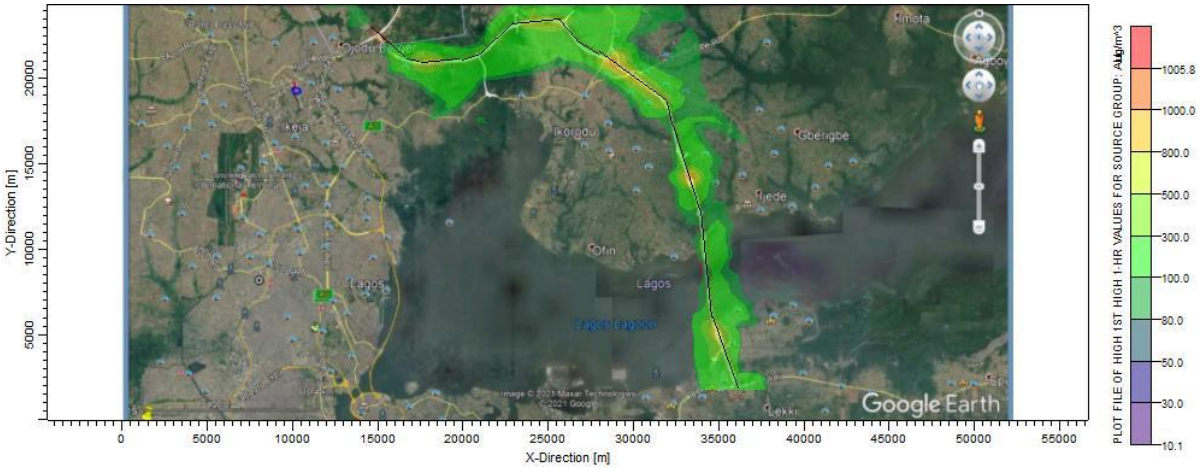

Fig. 4.36: Isopleth of 1-hour Ground Level CO from Scenario 2 Trucks

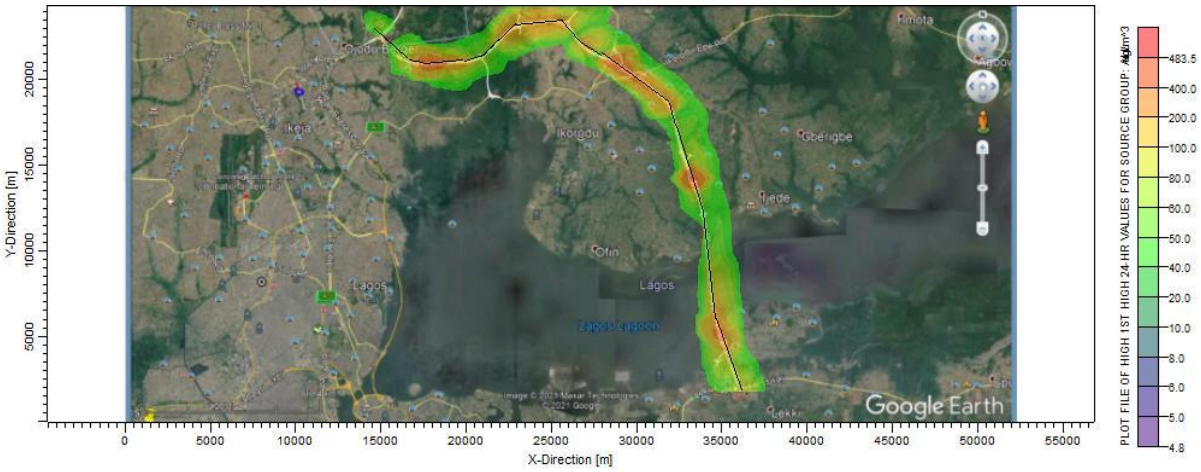

Fig. 4.37: Isopleth of 24-hour Ground Level CO from Scenario 2 Cars

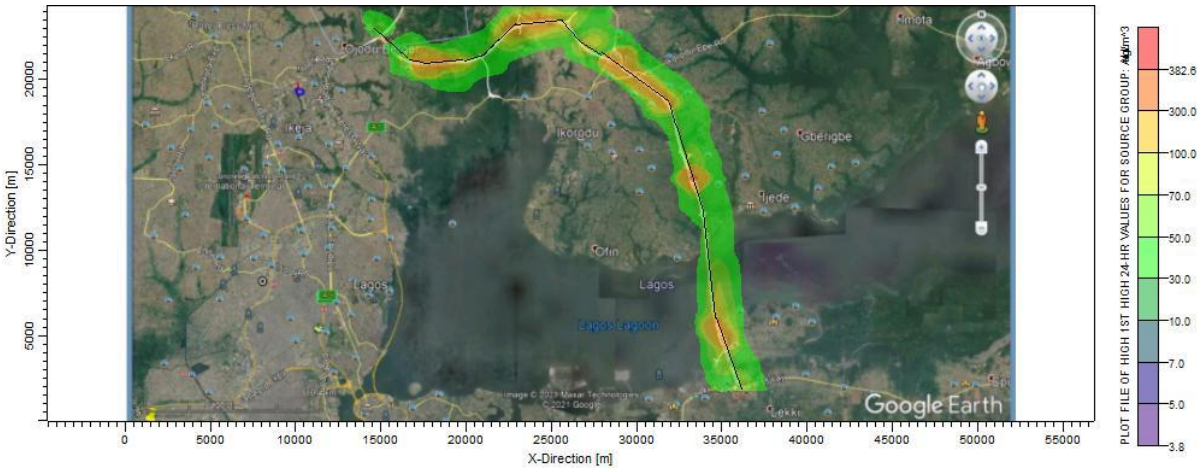

Fig. 4.38: Isopleth of 24-hour Ground Level CO from Scenario 2 Buses/SUVs

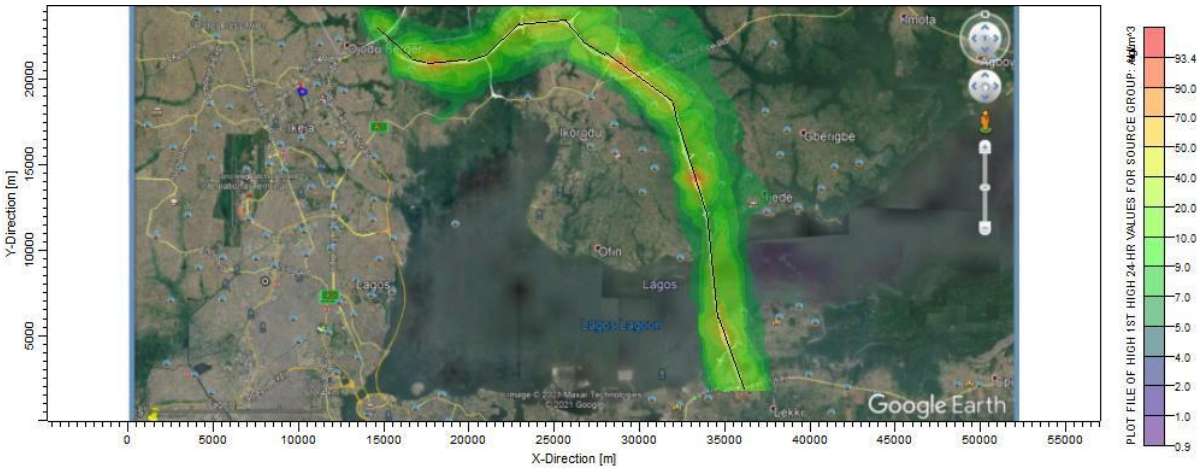

Fig. 4.39: Isopleth of 24-hour Ground Level CO from Scenario 2 Trucks

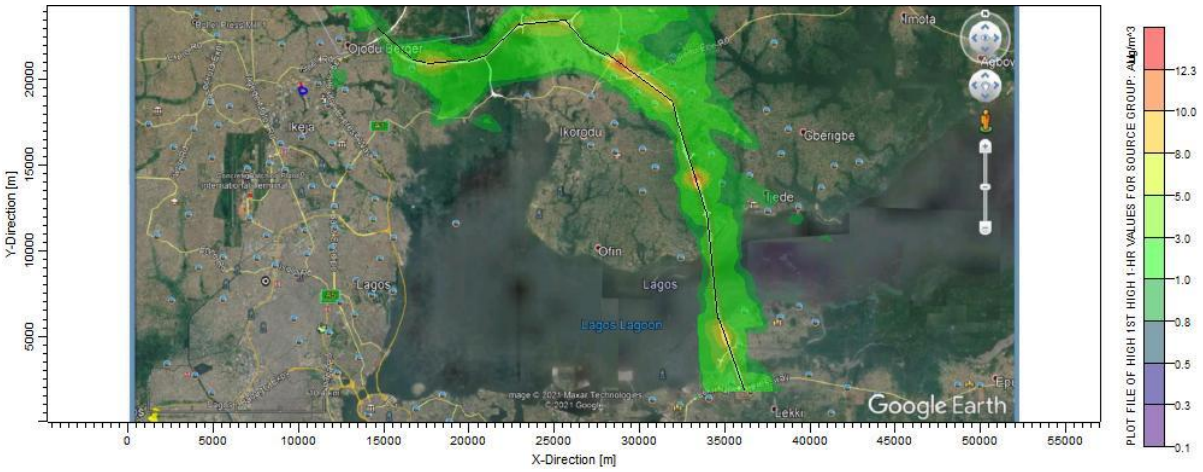

Fig. 4.40: Isopleth of 1-hour Ground Level SO_2 from Scenario 2 Cars

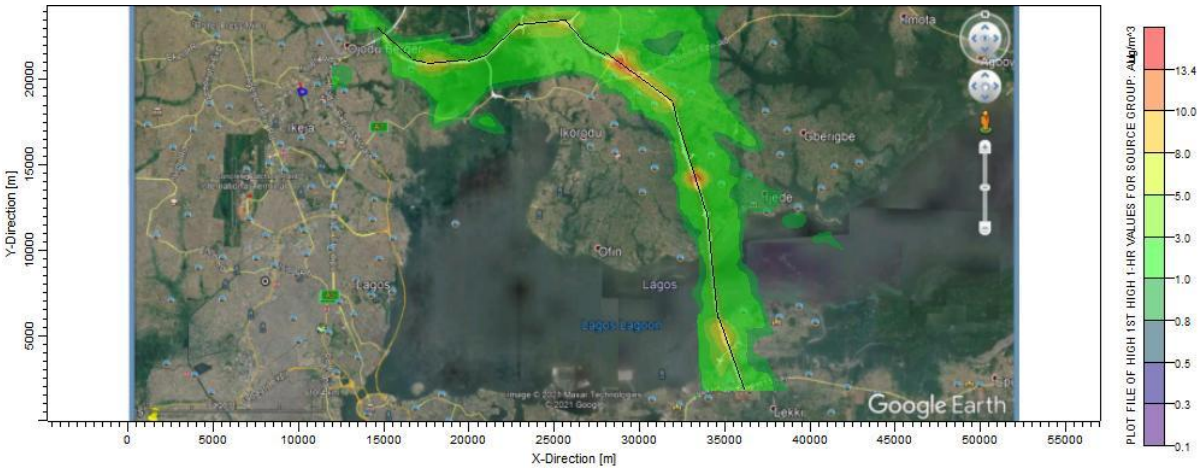

Fig. 4.41: Isopleth of 1-hour Ground Level SO_2 from Scenario 2 Buses/SUVs

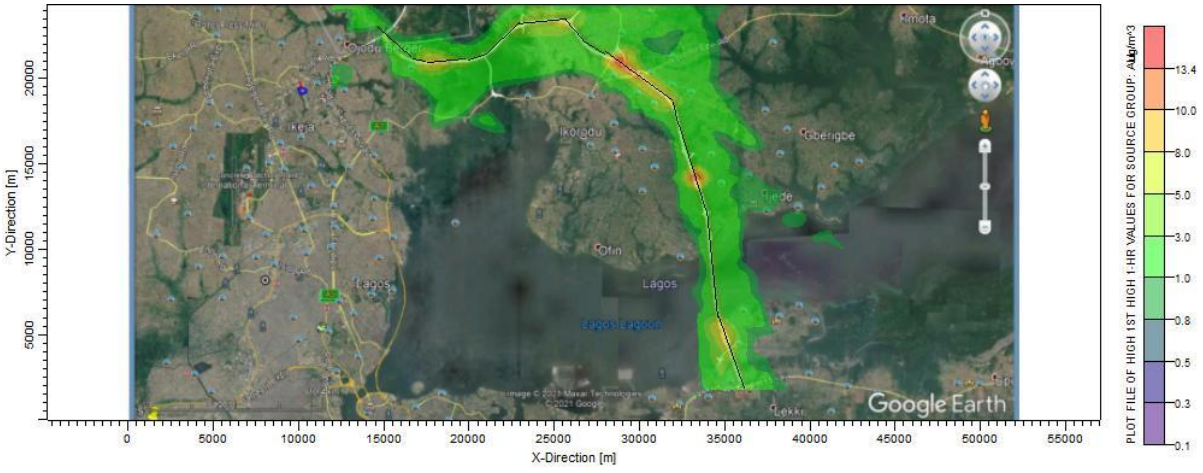

Fig. 4.42: Isopleth of 1-hour Ground Level SO_2 from Scenario 2 Trucks

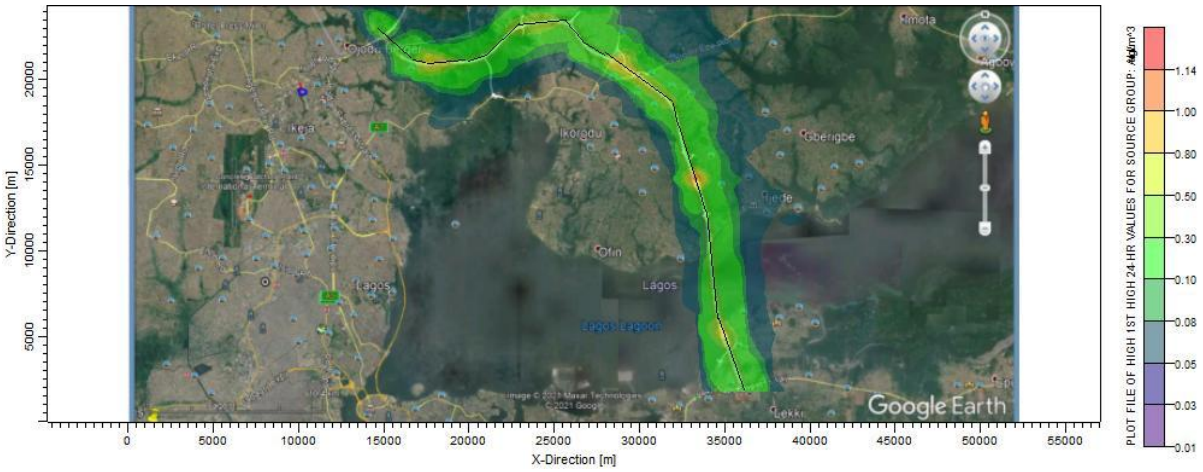

Fig. 4.43: Isopleth of 24-hour Ground Level SO_2 from Scenario 2 Cars

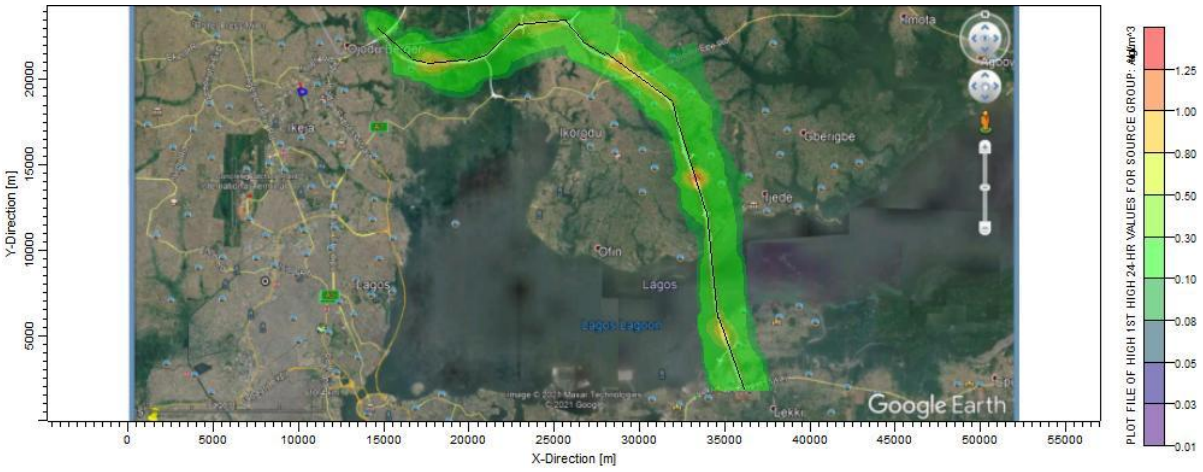

Fig. 4.44: Isopleth of 24-hour Ground Level SO_2 from Scenario 2 Buses/SUVs

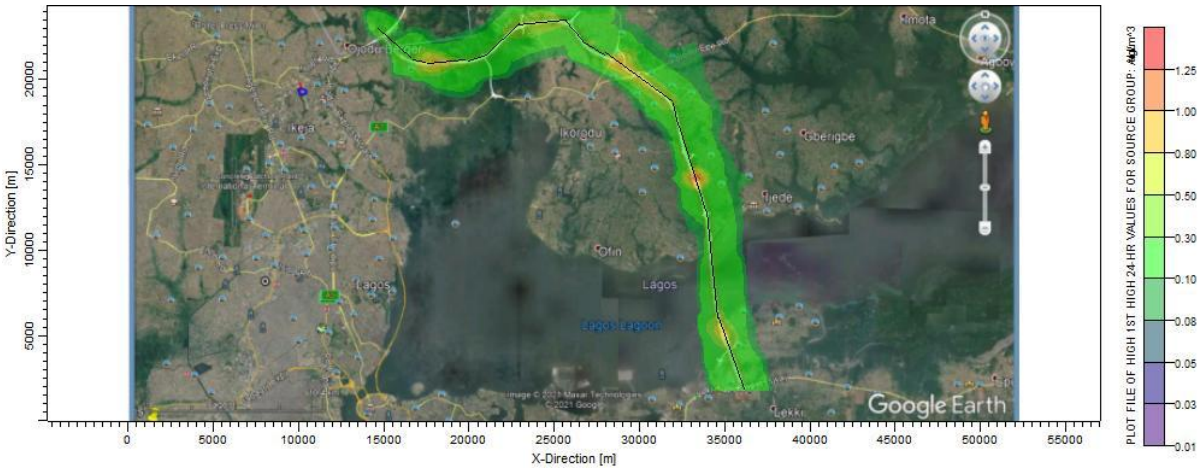

Fig. 4.45: Isopleth of 24-hour Ground Level SO_2 from Scenario 2 Trucks

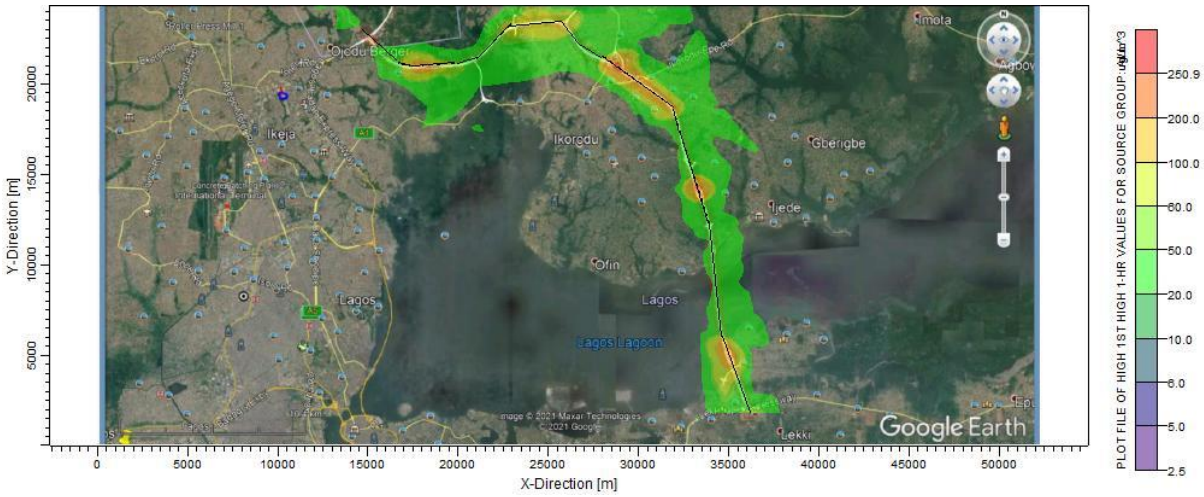

Fig. 4.46: Isopleth of 1-hour Ground Level NO_X from Scenario 2 Cars

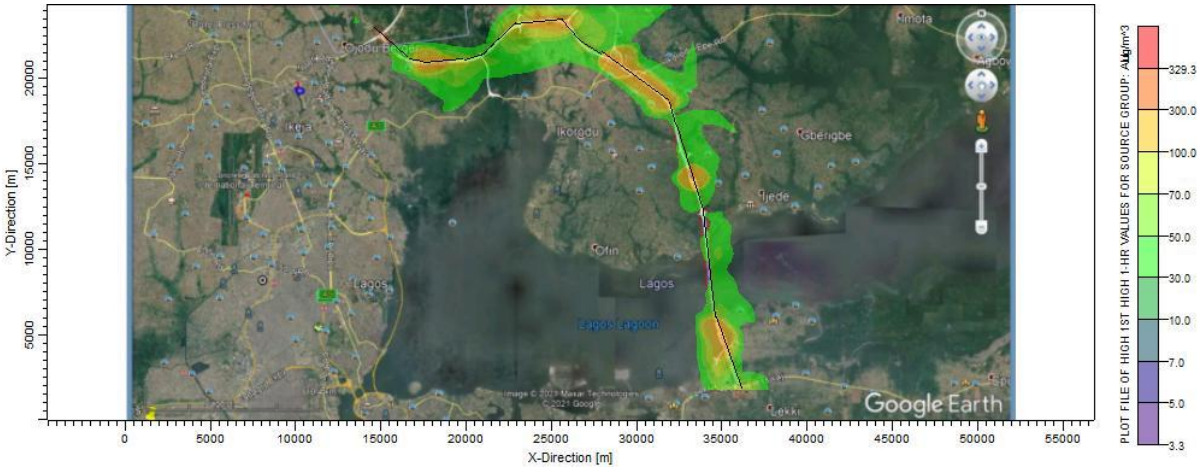

Fig. 4.47: Isopleth of 1-hour Ground Level NO_X from Scenario 2 Buses/SUVs

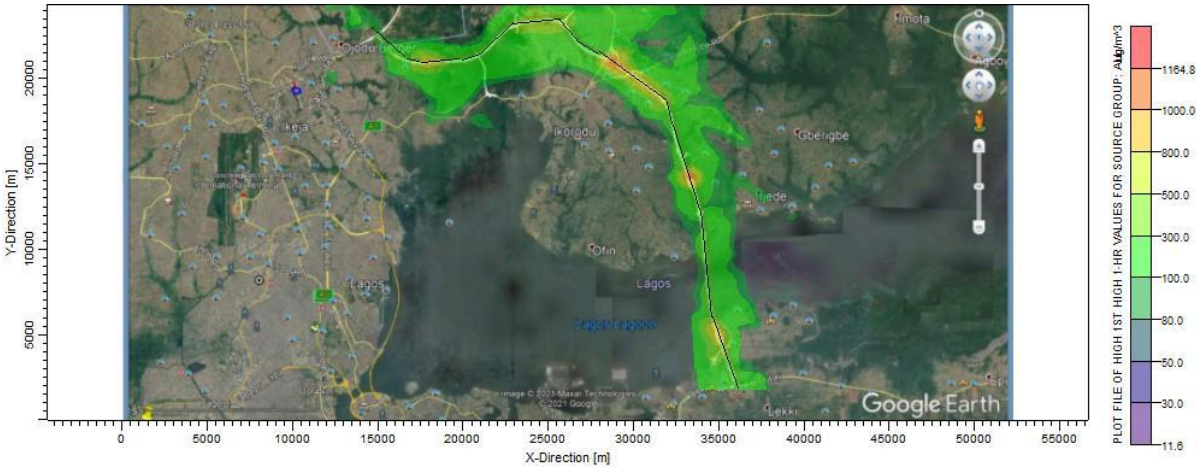

Fig. 4.48: Isopleth of 1-hour Ground Level NO_X from Scenario 2 Trucks

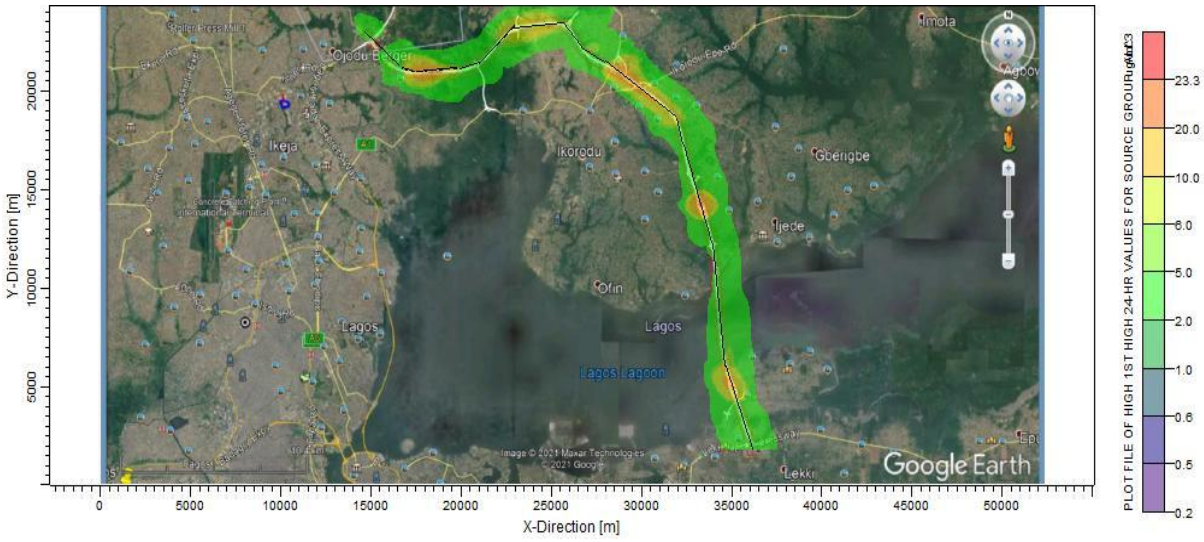

Fig. 4.49: Isopleth of 24-hour Ground Level NO_X from Scenario 2 Cars

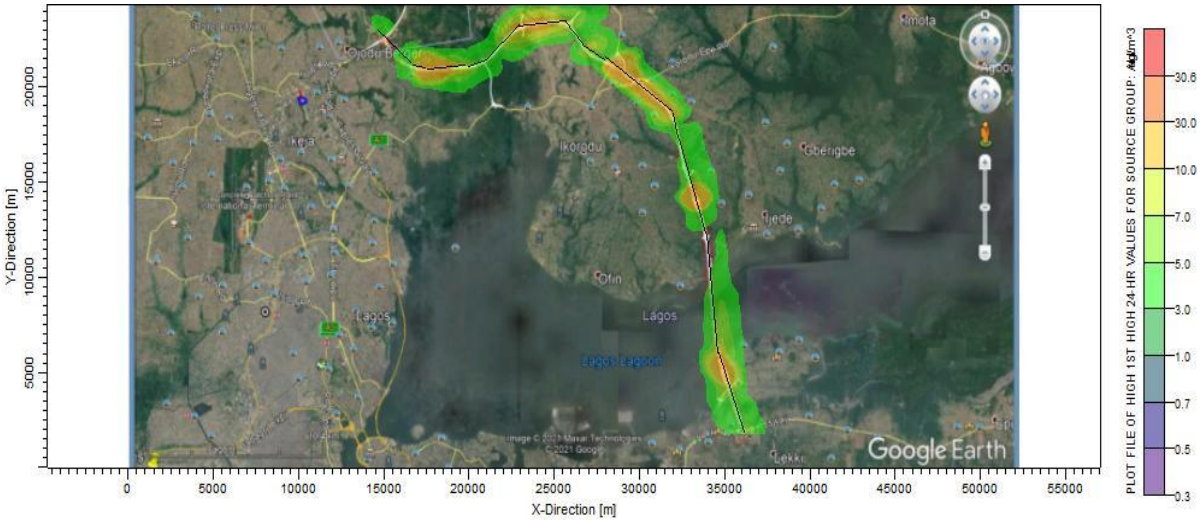

Fig. 4.50: Isopleth of 24-hour Ground Level NO_X from Scenario 2 Buses/SUVs

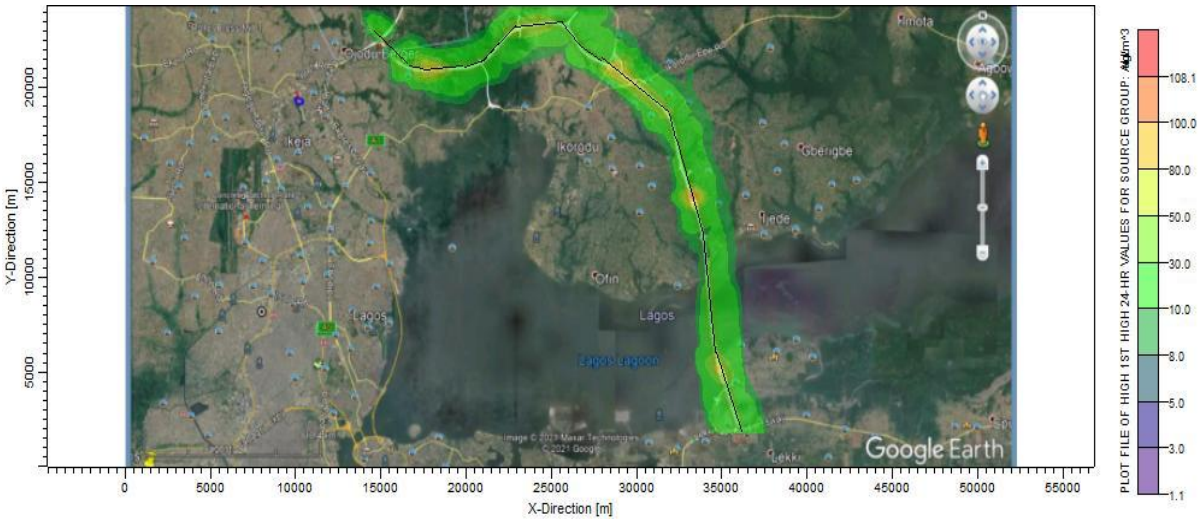

Fig. 4.51: Isopleth of 24-hour Ground Level NO_X from Scenario 2 Trucks

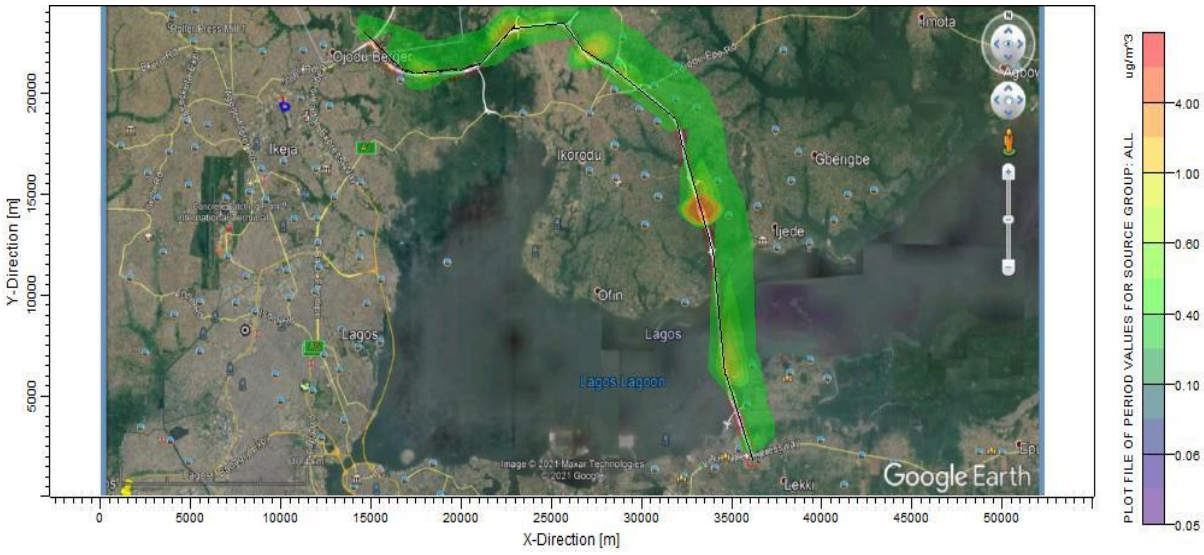

Fig. 4.52: Isopleth of Annual Ground Level NO_X from Scenario 2 Cars

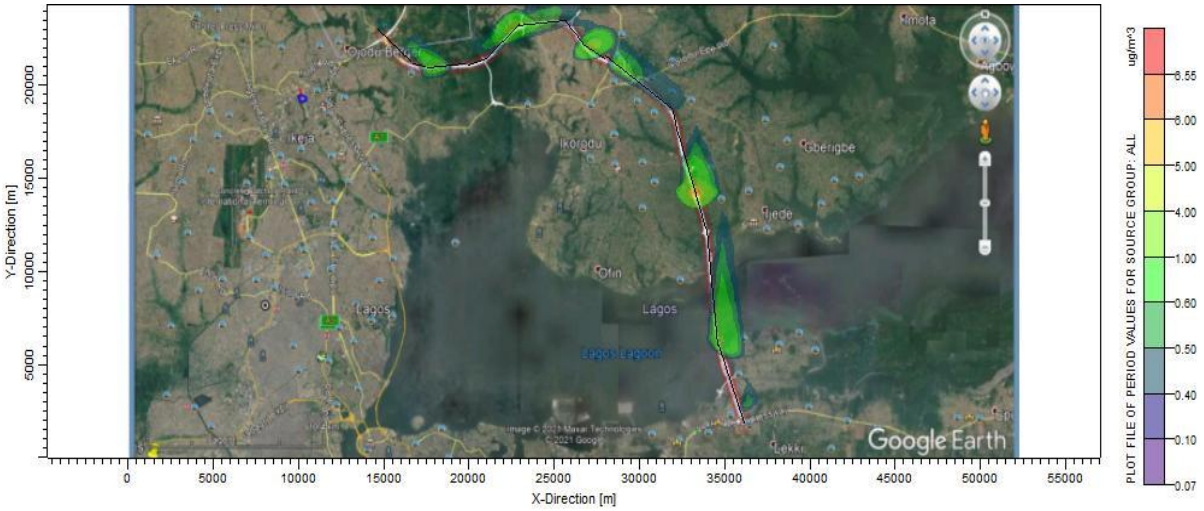

Fig. 4.53: Isopleth of Annual Ground Level NO_X from Scenario 2 Buses/SUVs

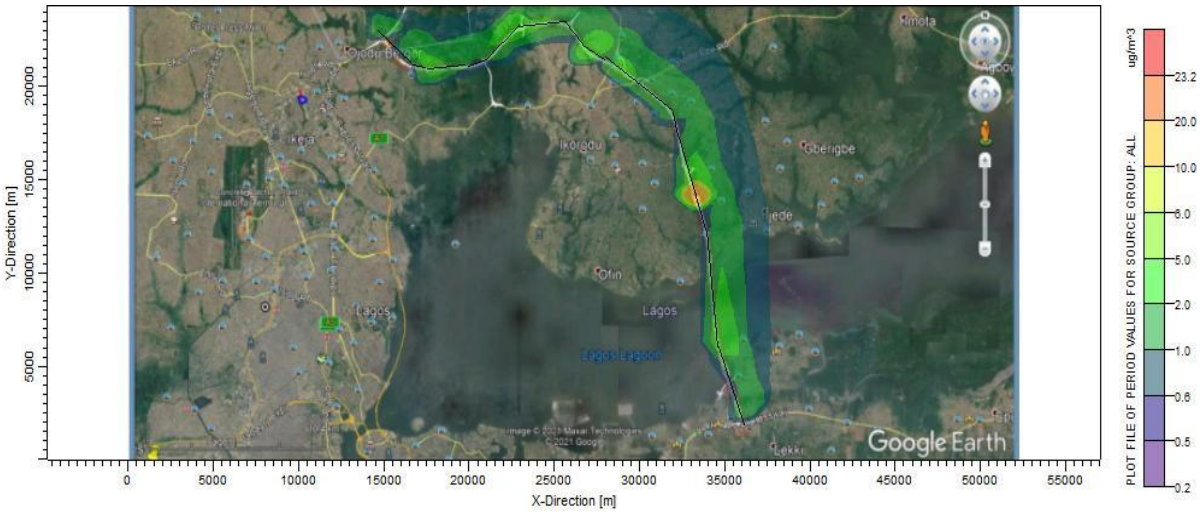

Fig. 4.54: Isopleth of Annual Ground Level NO_X from Scenario 2 Trucks

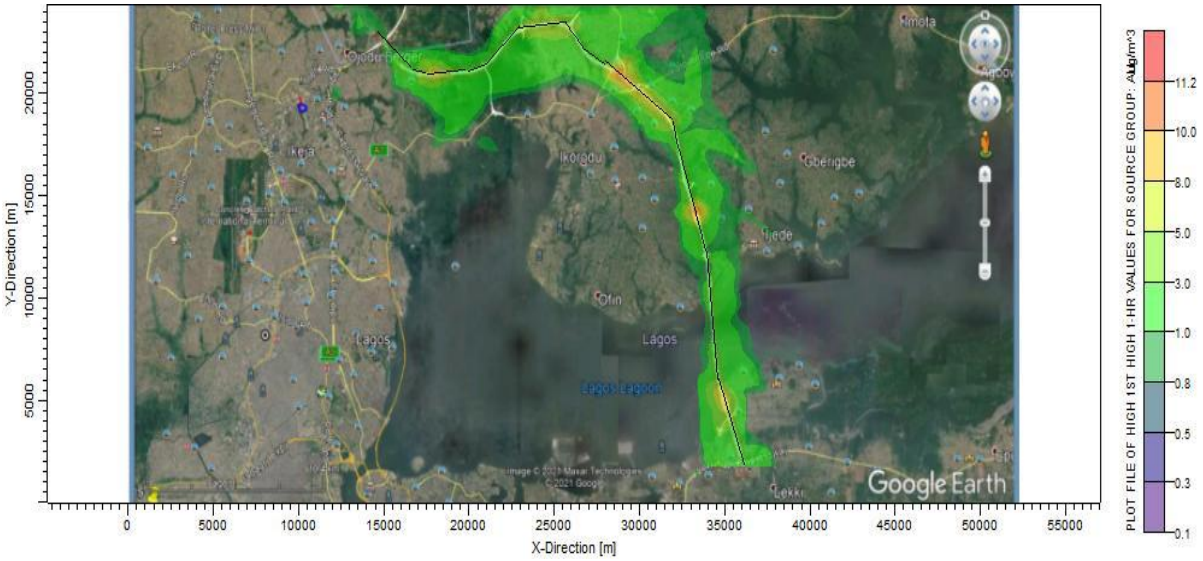

Fig. 4.55: Isopleth of 1-Hour Ground Level SPM from Scenario 2 Cars

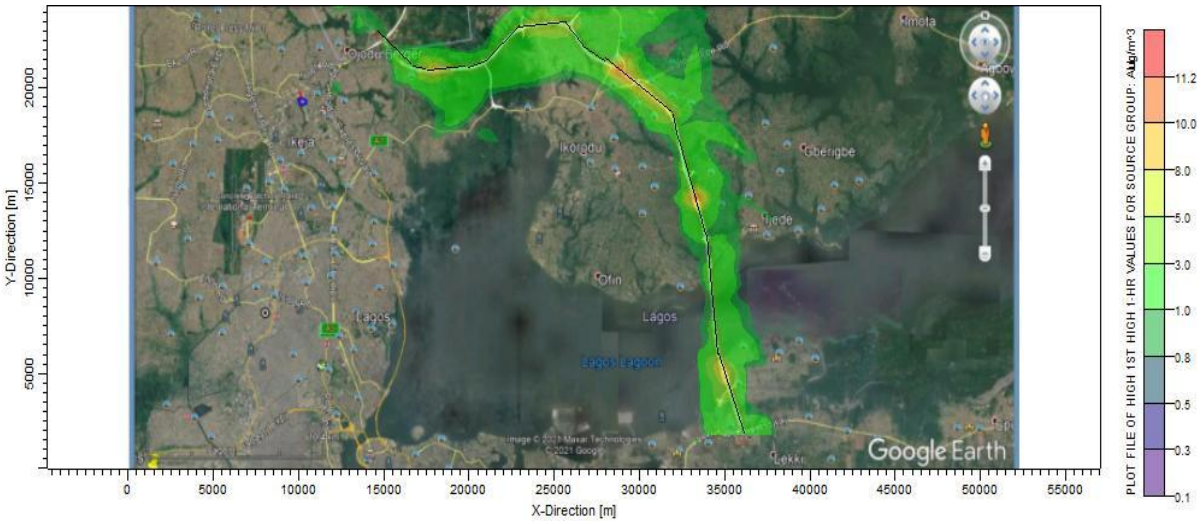

Fig. 4.56: Isopleth of 1-Hour Ground Level SPM from Scenario 2 Buses/SUVs

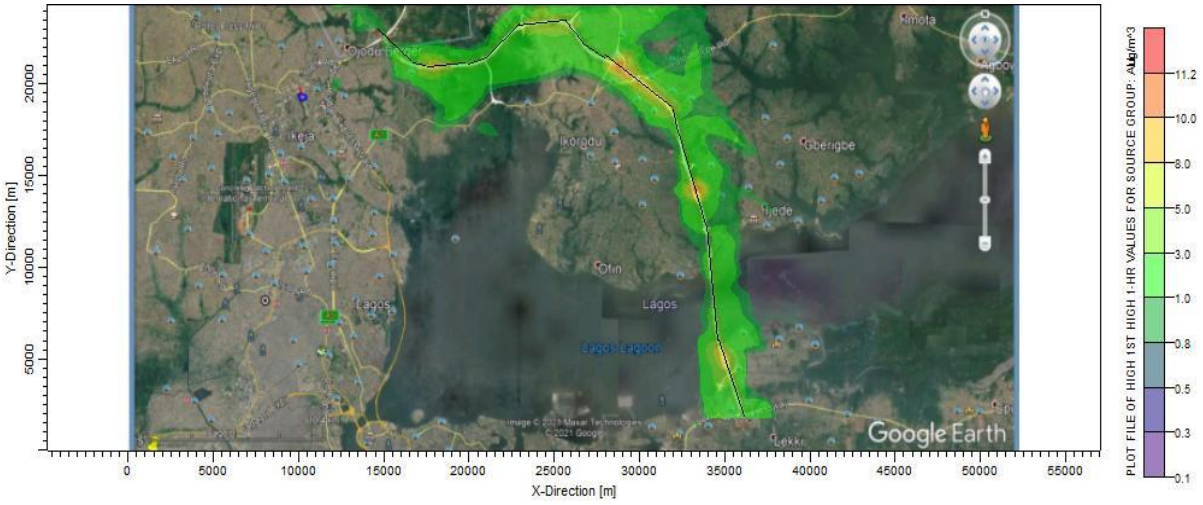

Fig. 4.57: Isopleth of 1-Hour Ground Level SPM from Scenario 2 Trucks

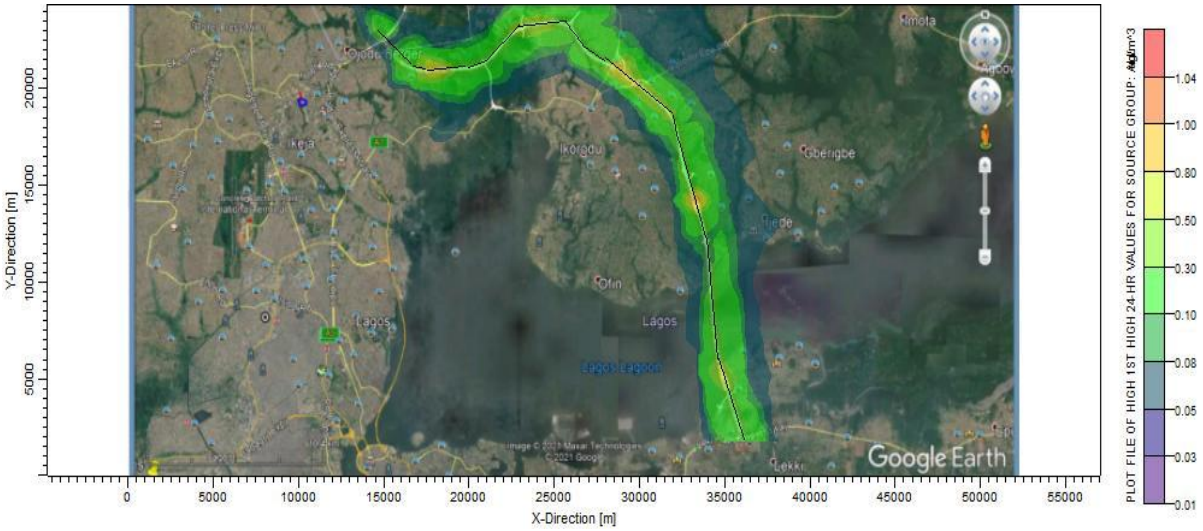

Fig. 4.58: Isopleth of 24-Hour Ground Level SPM from Scenario 2 Cars

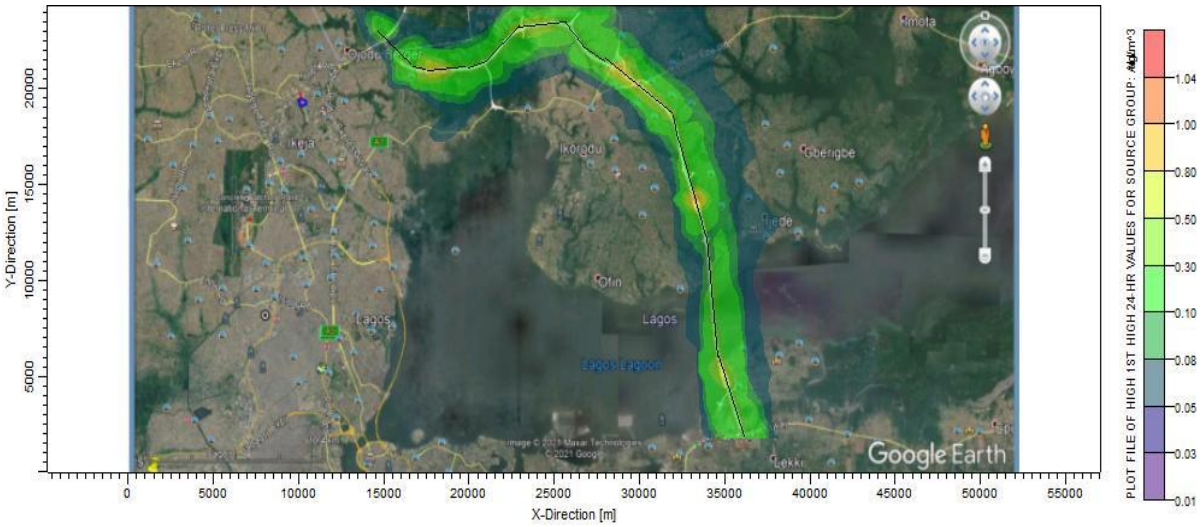

Fig. 4.59: Isopleth of 24-Hour Ground Level SPM from Scenario 2 Buses/SUVs

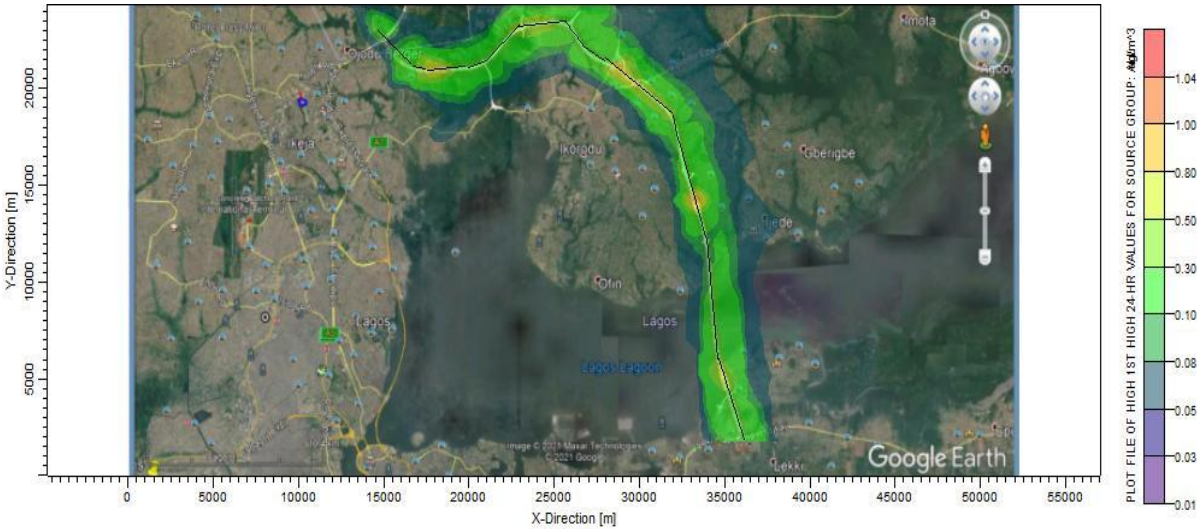

Fig. 4.60: Isopleth of 24-Hour Ground Level SPM from Scenario 2 Trucks

Fig. 4.61: Isopleth of Annual Ground Level SPM from Scenario 2 Cars

Fig. 4.62: Isopleth of Annual Ground Level SPM from Scenario 2 Buses/SUVs

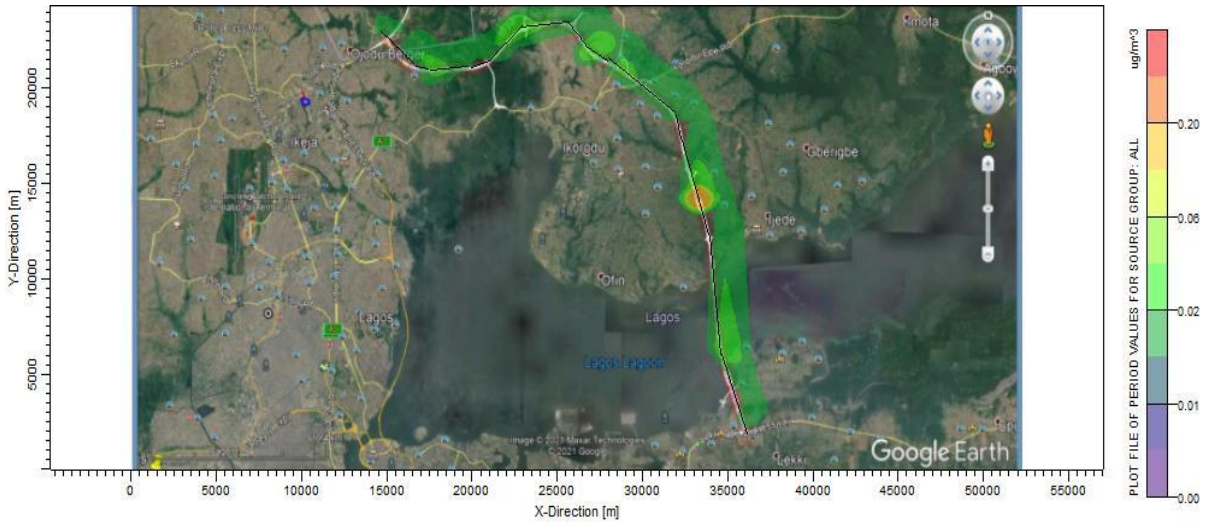

Fig. 4.63: Isopleth of Annual Ground Level SPM from Scenario 2 Trucks

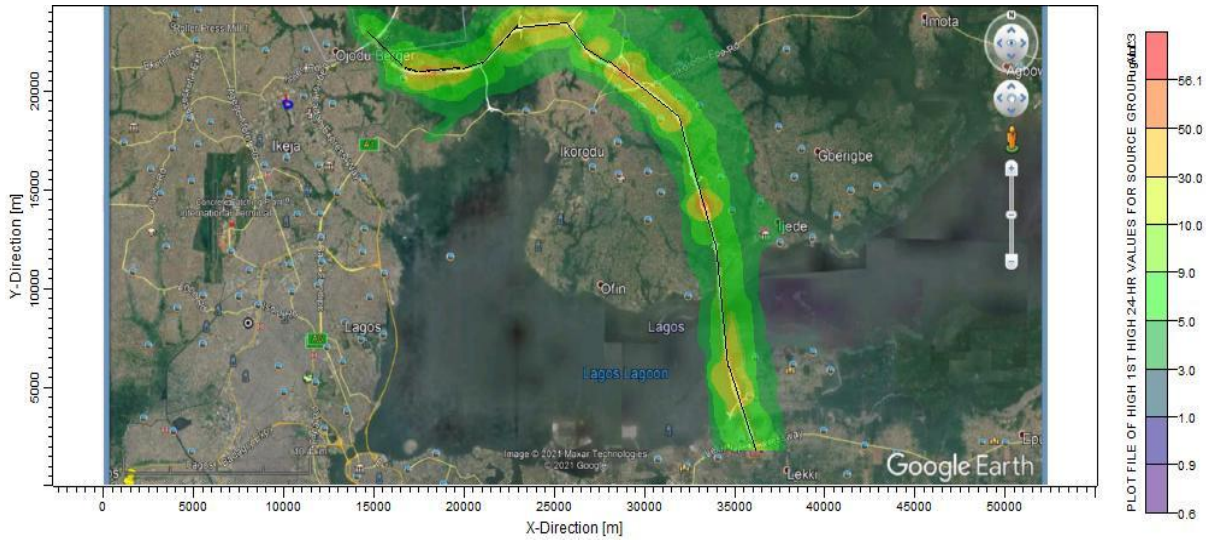

Fig. 4.64: Isopleth of 24-Hour Ground Level VOCs from Scenario 2 Cars

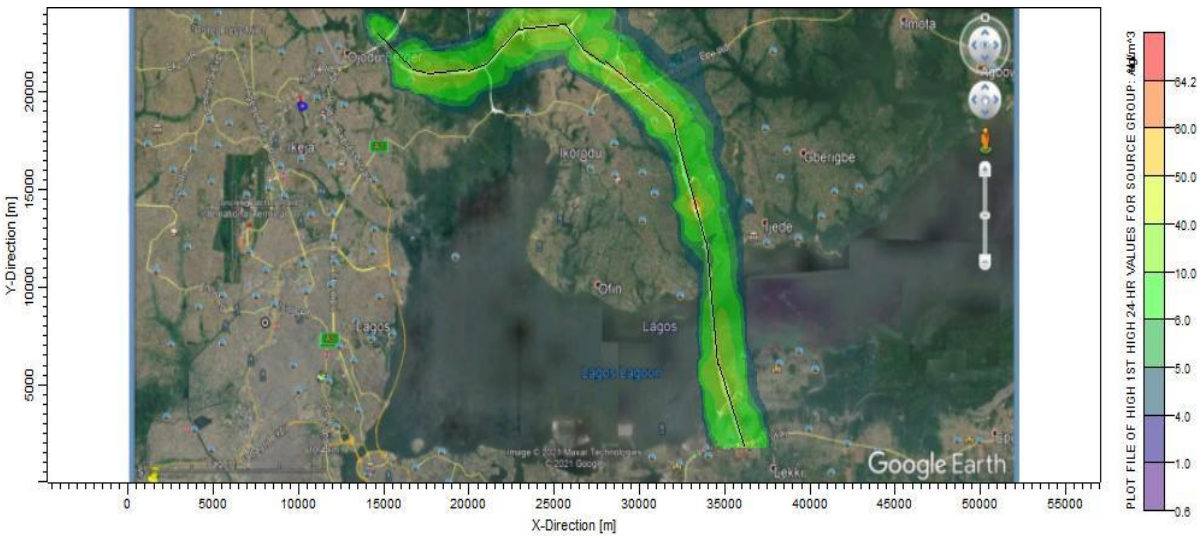

Fig. 4.65: Isopleth of 24-Hour Ground Level VOCs from Scenario 2 Buses/SUVs

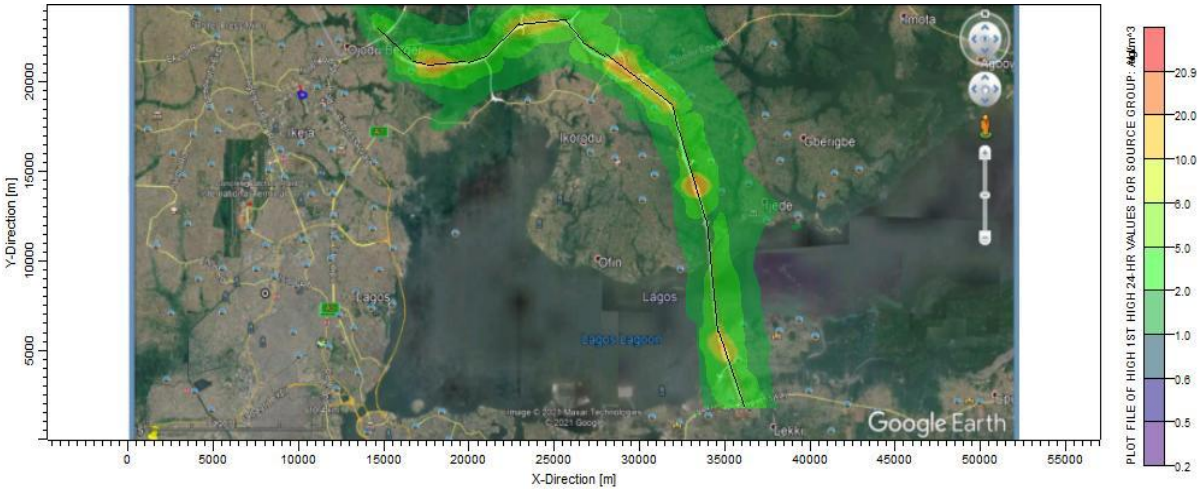

Fig. 4.66: Isopleth of 24-Hour Ground Level VOCs from Scenario 2 Trucks

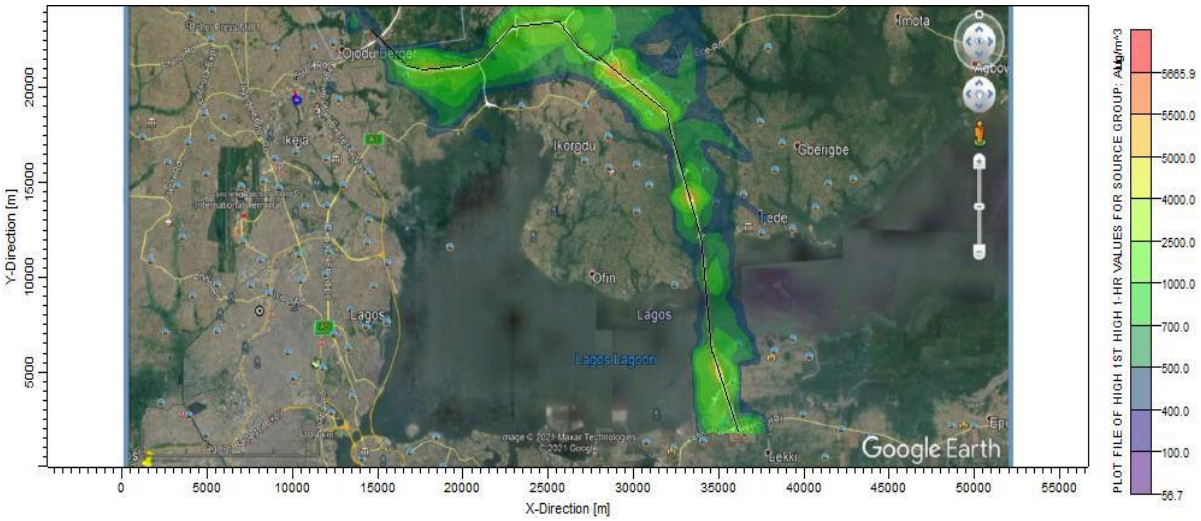

Fig. 4.67: Isopleth of 1-hour Ground Level CO from Scenario 3 Cars

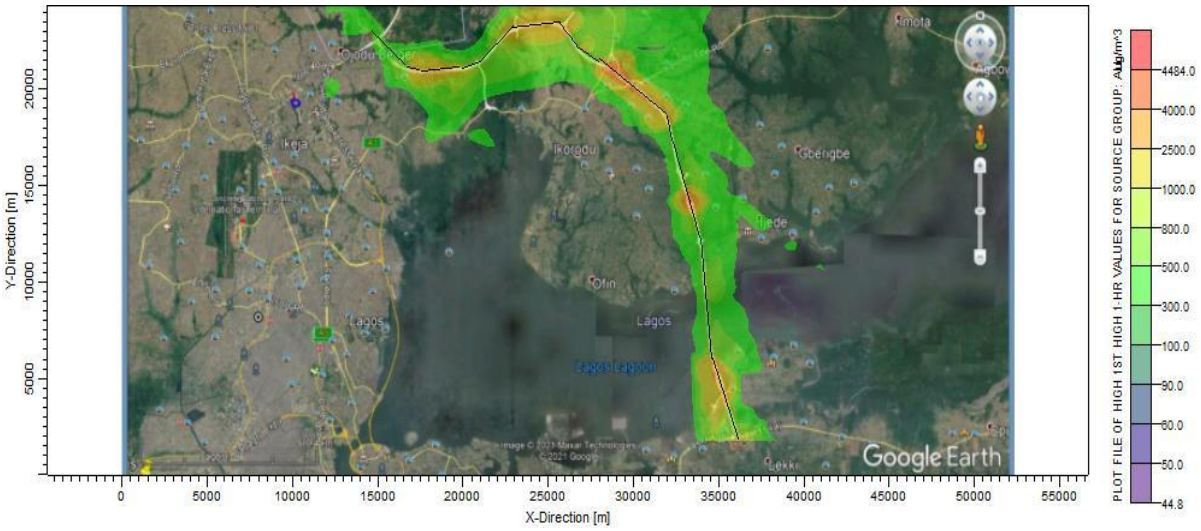

Fig. 4.68: Isopleth of 1-hour Ground Level CO from Scenario 3 Buses/SUVs

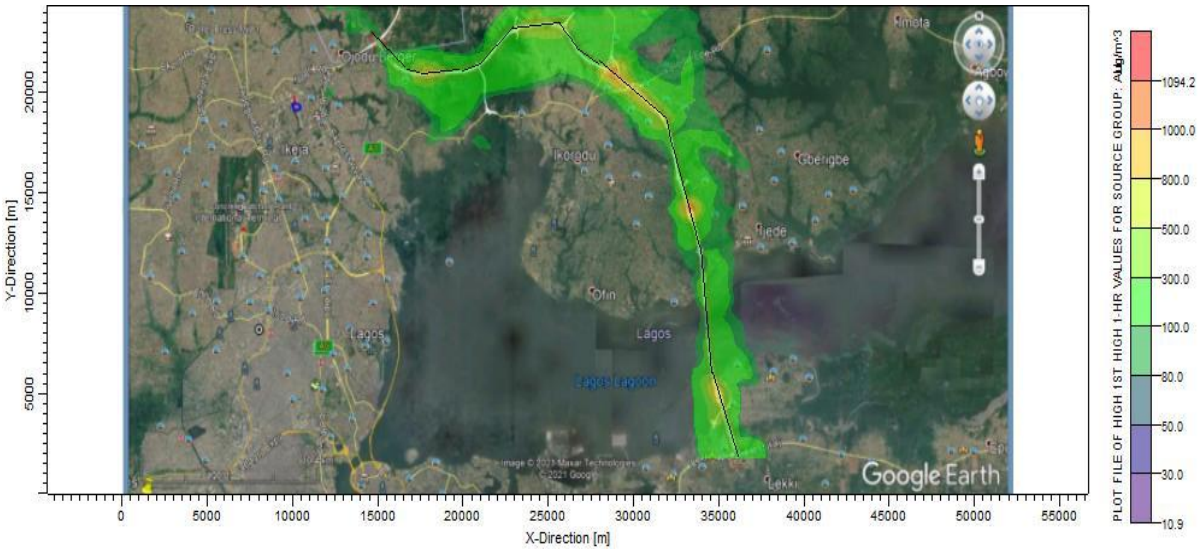

Fig. 4.69: Isopleth of 1-hour Ground Level CO from Scenario 3 Trucks

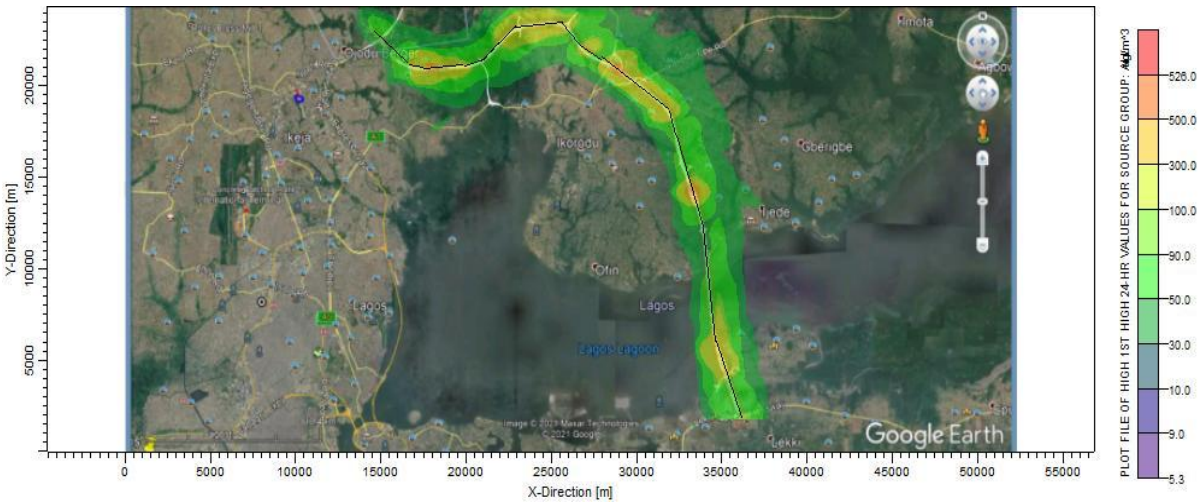

Fig. 4.70: Isopleth of 24-hour Ground Level CO from Scenario 3 Cars

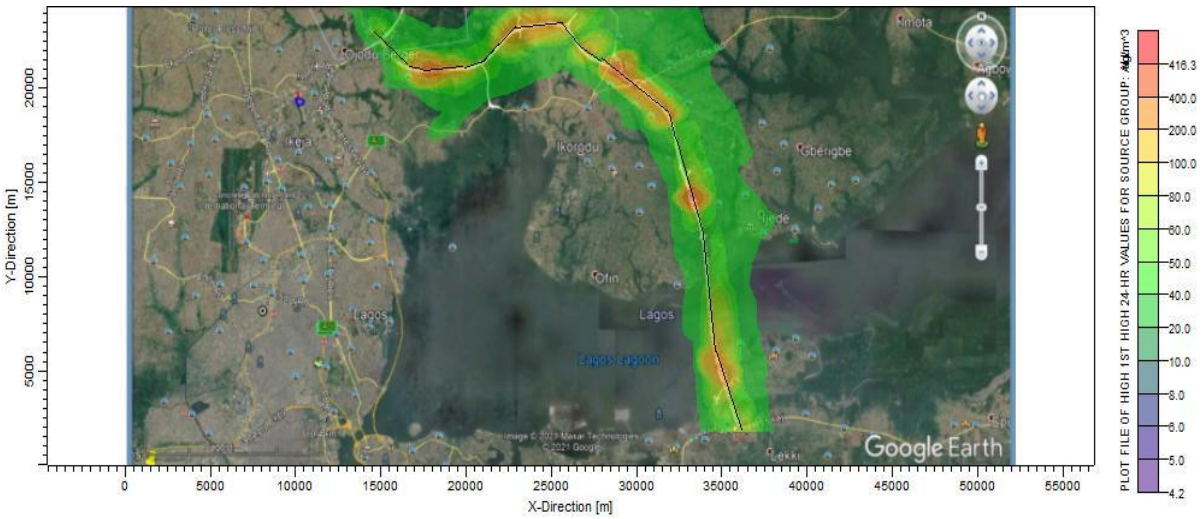

Fig. 4.71: Isopleth of 24-hour Ground Level CO from Scenario 3 Buses/SUVs

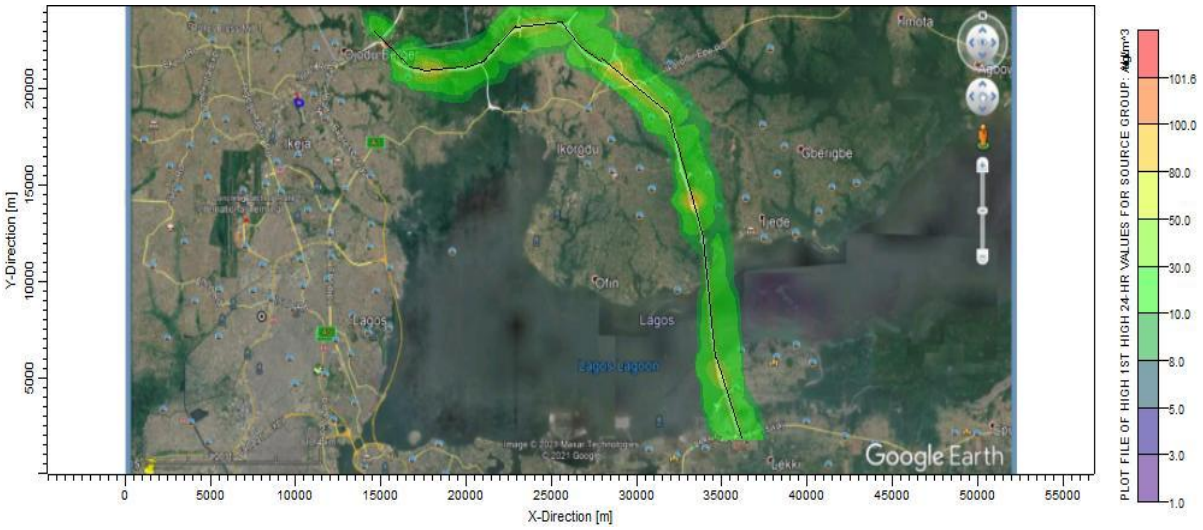

Fig. 4.72: Isopleth of 24-hour Ground Level CO from Scenario 3 Trucks

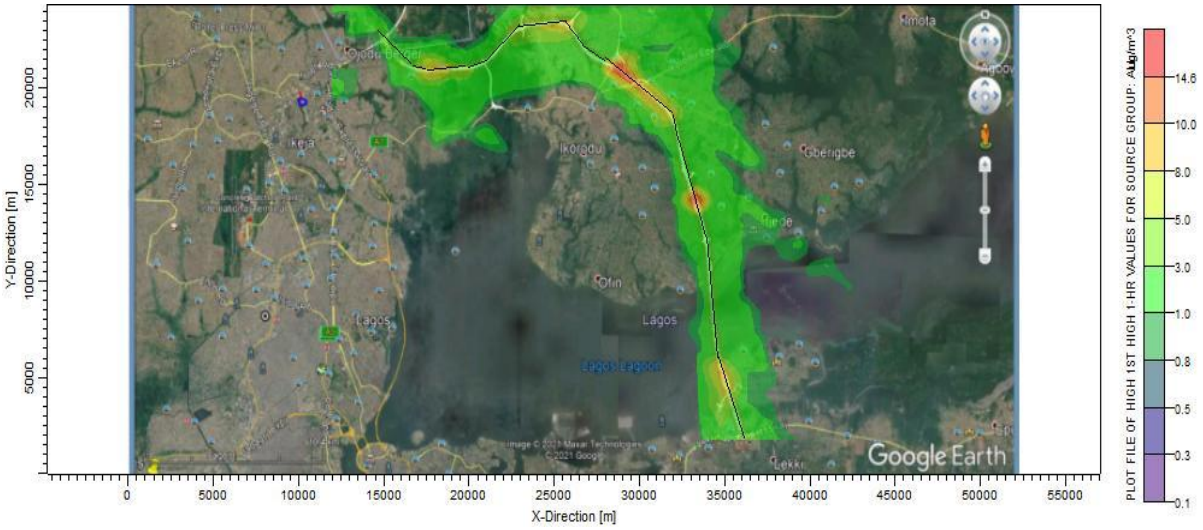

Fig. 4.73: Isopleth of 1-hour Ground Level SO_2 from Scenario 3 Cars

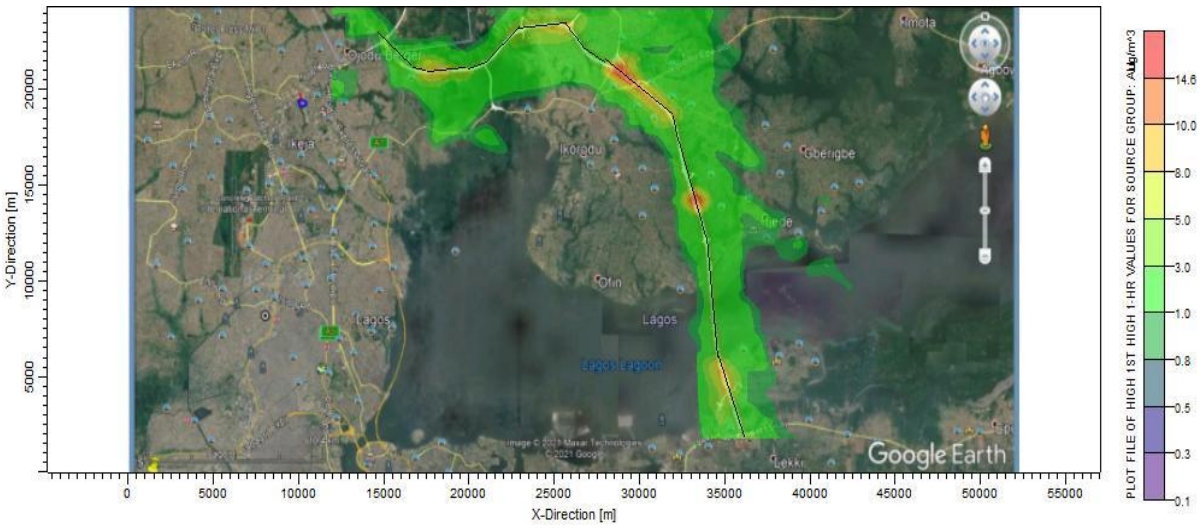

Fig. 4.74: Isopleth of 1-hour Ground Level SO_2 from Scenario 3 Buses/SUVs

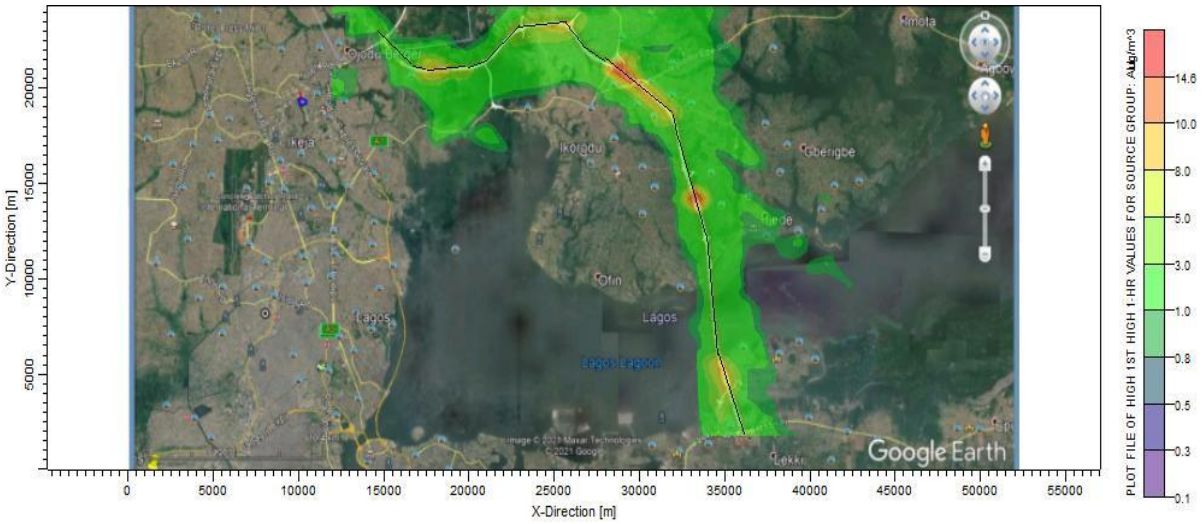

Fig. 4.75: Isopleth of 1-hour Ground Level SO_2 from Scenario 3 Trucks

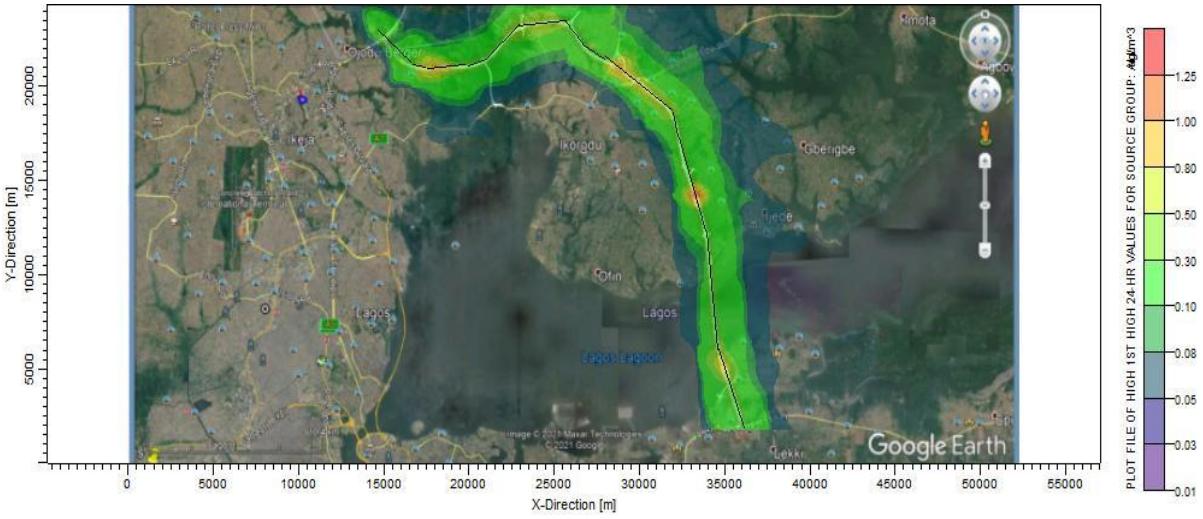

Fig. 4.76: Isopleth of 24-hour Ground Level SO_2 from Scenario 3 Cars

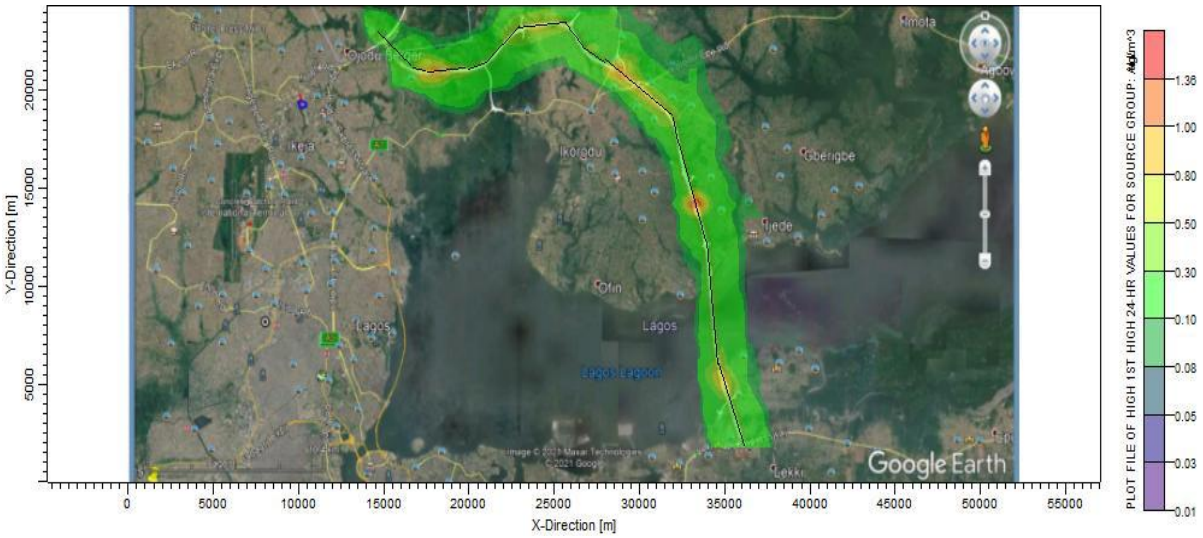

Fig. 4.77: Isopleth of 24-hour Ground Level SO_2 from Scenario 3 Buses/SUVs

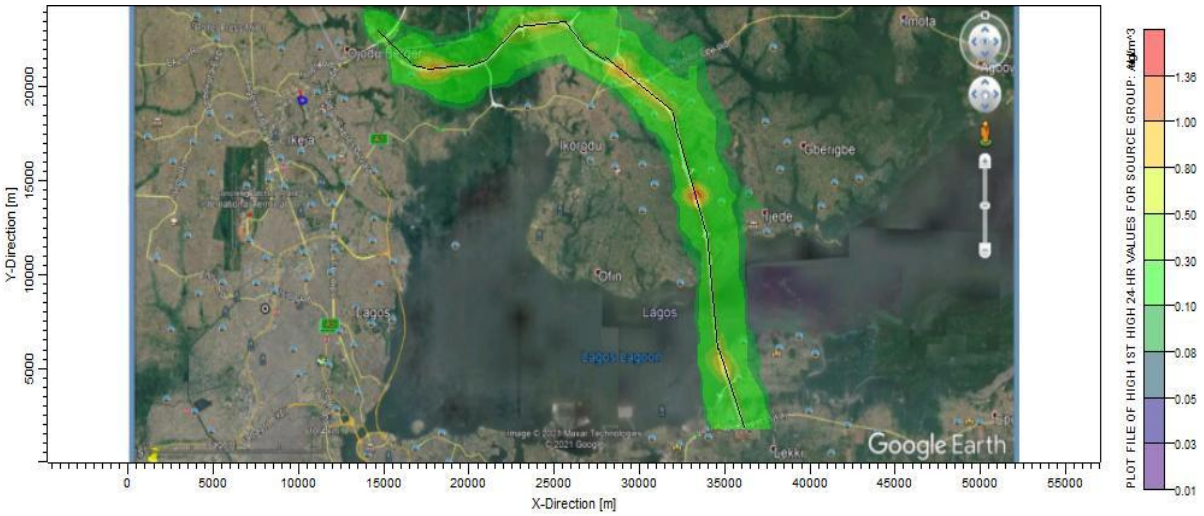

Fig. 4.78: Isopleth of 24-hour Ground Level SO_2 from Scenario 3 Trucks

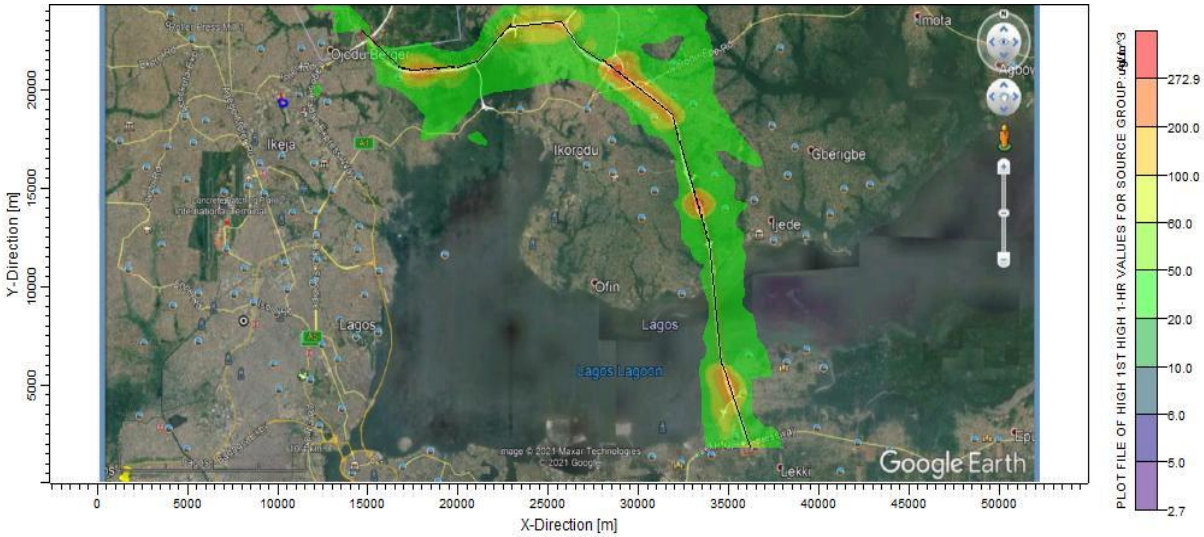

Fig. 4.79: Isopleth of 1-hour Ground Level NO_X from Scenario 3 Cars

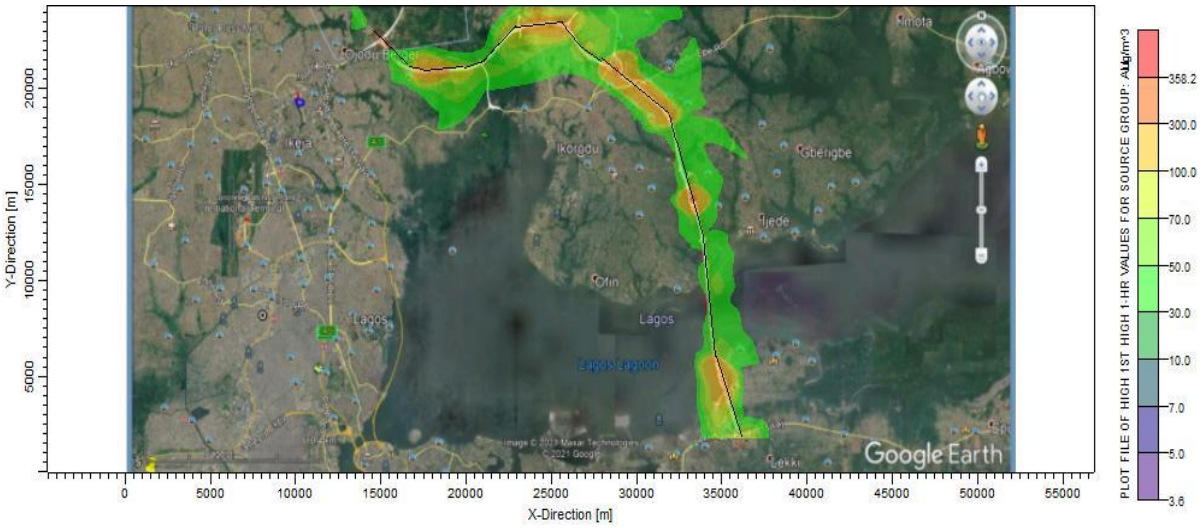

Fig. 4.80: Isopleth of 1-hour Ground Level NO_X from Scenario 3 Buses/SUVs

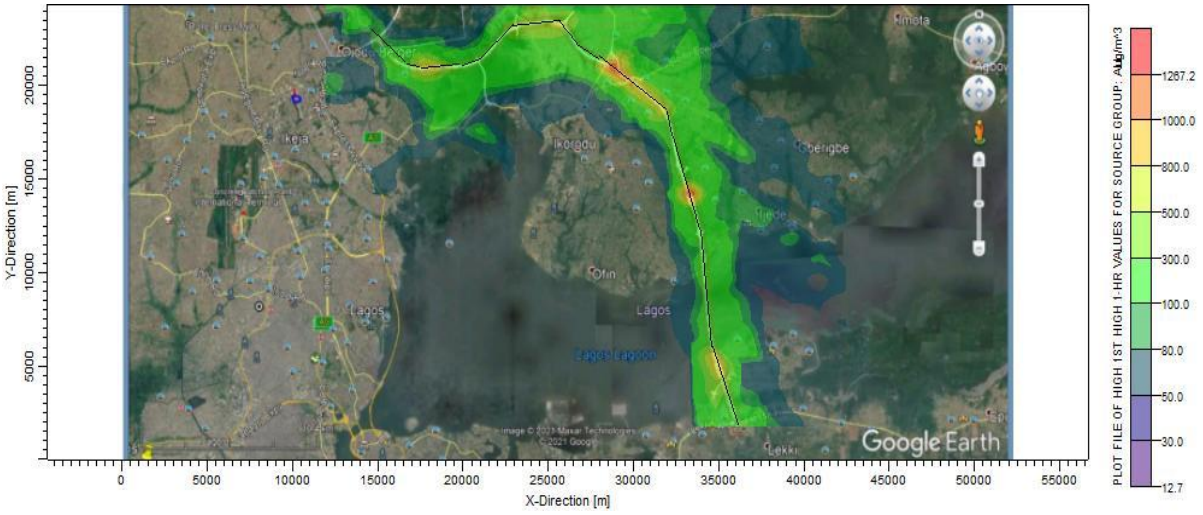

Fig. 4.81: Isopleth of 1-hour Ground Level NO_X from Scenario 3 Trucks

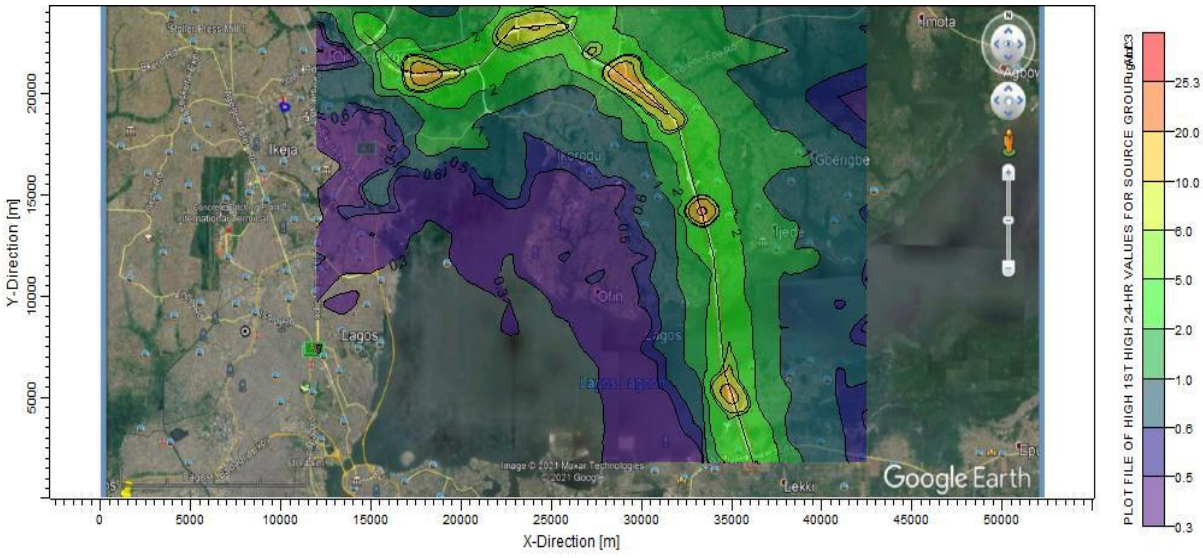

Fig. 4.82: Isopleth of 24-hour Ground Level NO_X from Scenario 3 Cars

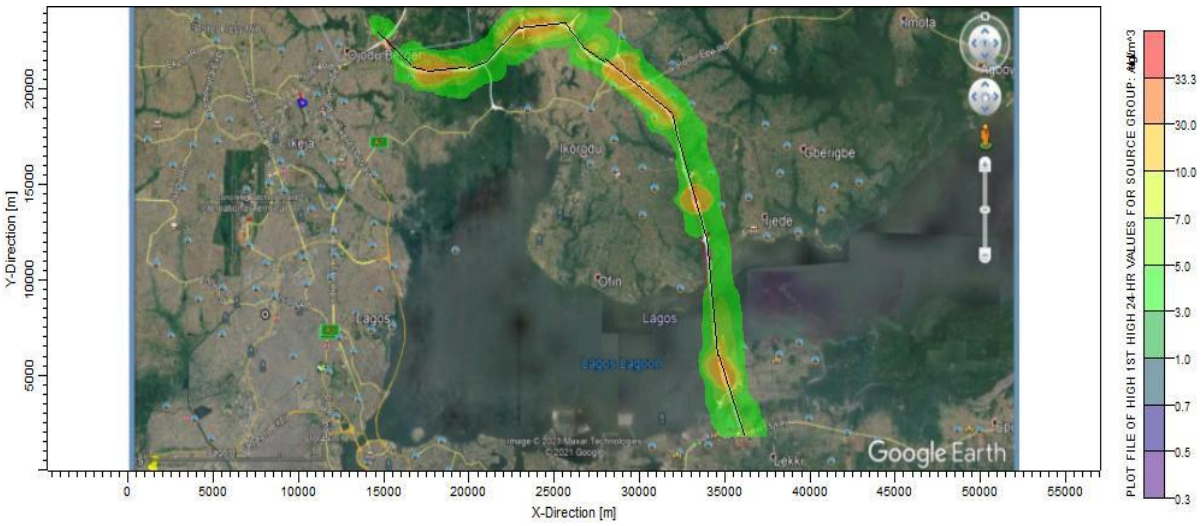

Fig. 4.83: Isopleth of 24-hour Ground Level NO_X from Scenario 3 Buses/SUVs

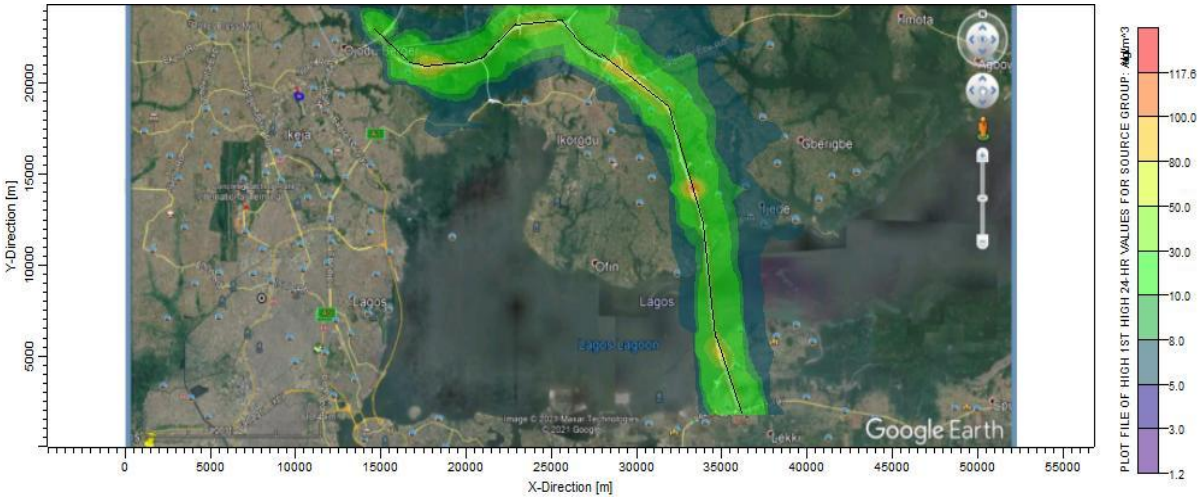

Fig. 4.84: Isopleth of 24-hour Ground Level NO_X from Scenario 3 Trucks

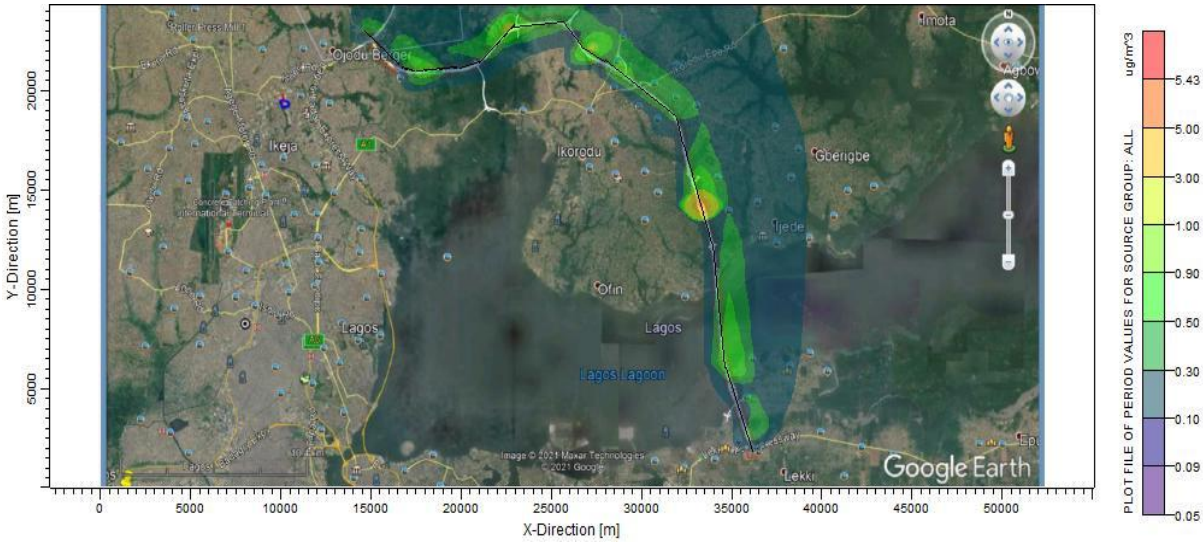

Fig. 4.85: Isopleth of Annual Ground Level NO_X from Scenario 3 Cars

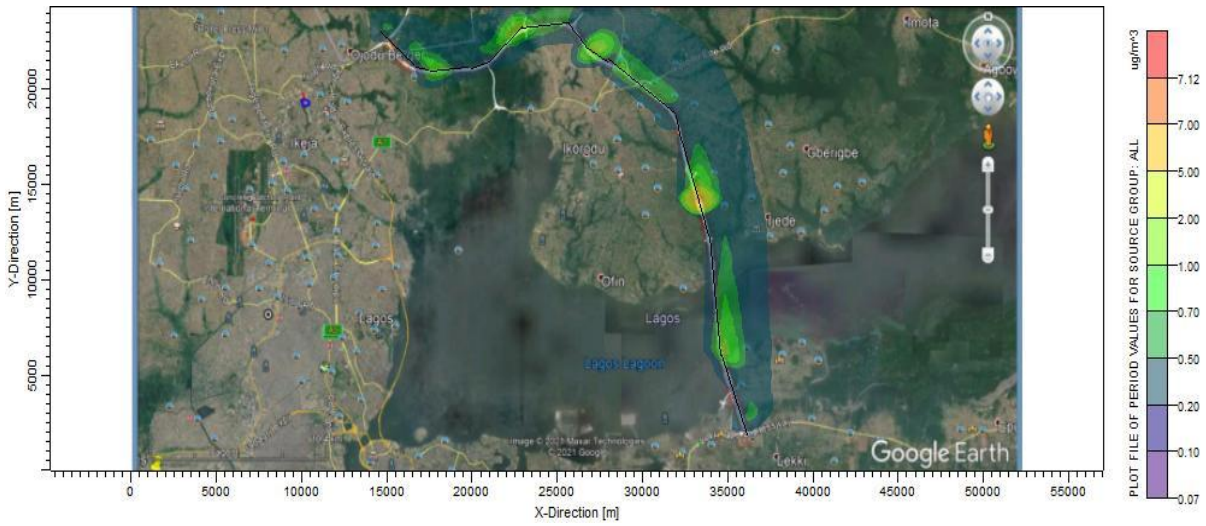

Fig. 4.86: Isopleth of Annual Ground Level NO_X from Scenario 3 Buses/SUVs

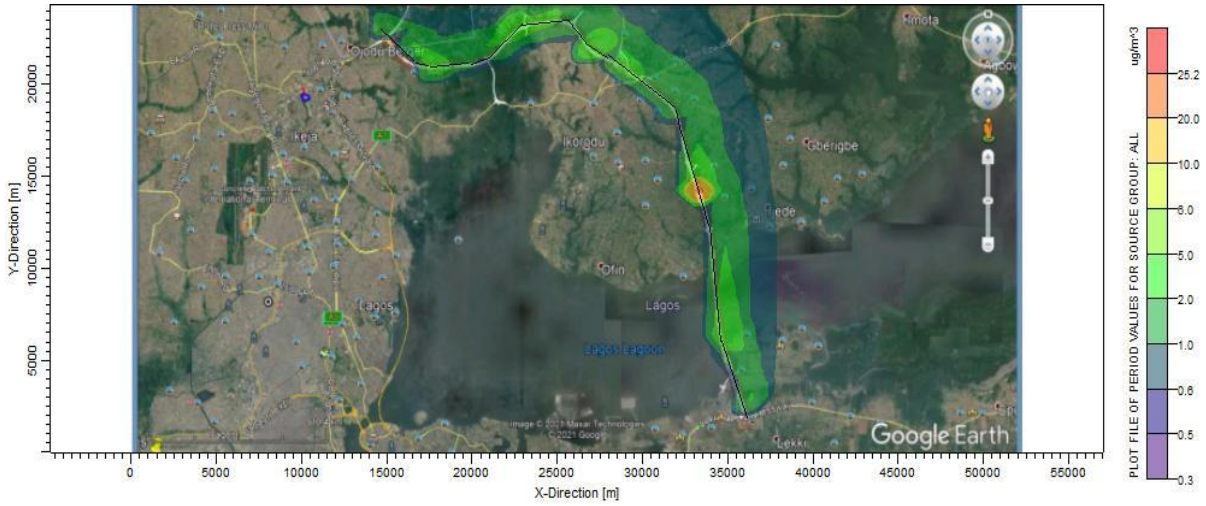

Fig. 4.87: Isopleth of Annual Ground Level NO_X from Scenario 3 Trucks

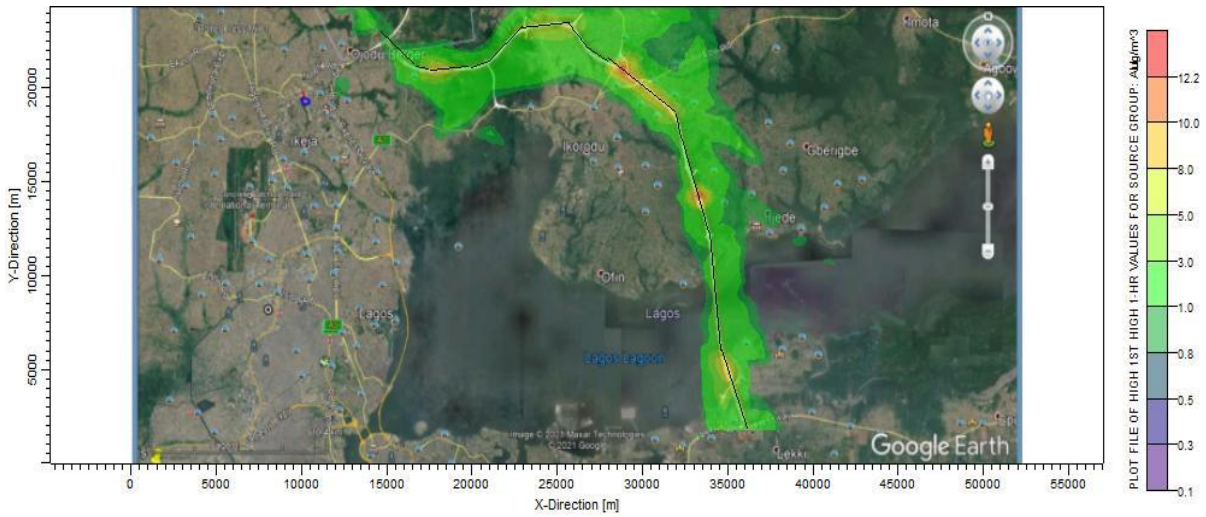

Fig. 4.88: Isopleth of 1-Hour Ground Level SPM from Scenario 3 Cars

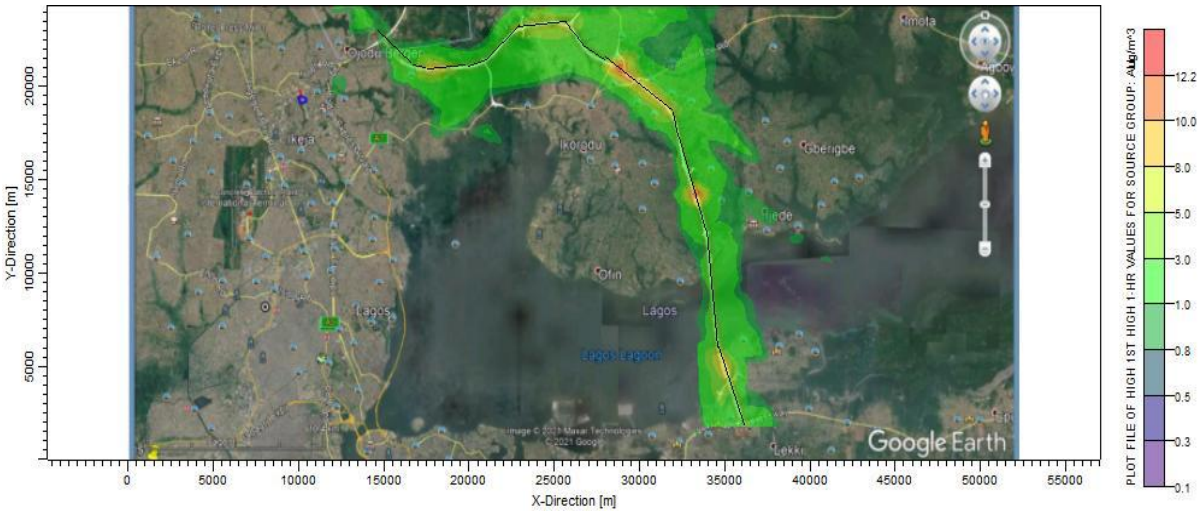

Fig. 4.89: Isopleth of 1-Hour Ground Level SPM from Scenario 3 Buses/SUVs

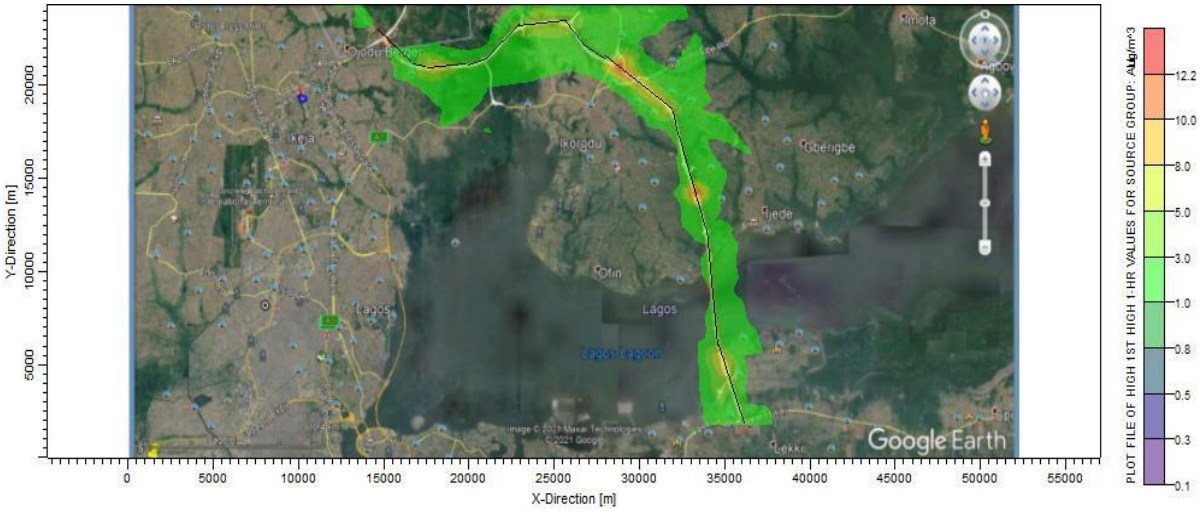

Fig. 4.90: Isopleth of 1-Hour Ground Level SPM from Scenario 3 Trucks

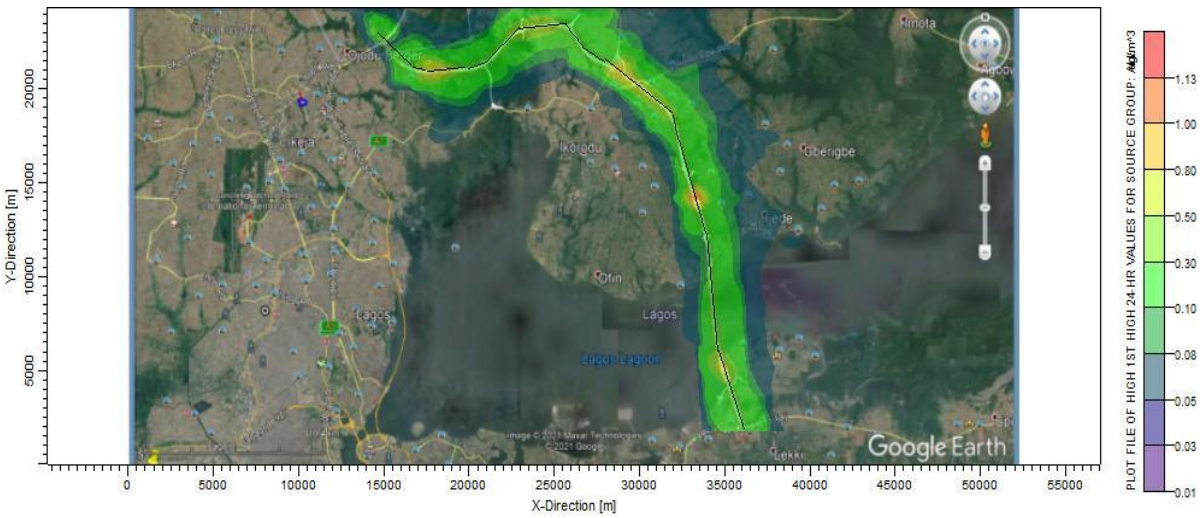

Fig. 4.91: Isopleth of 24-Hour Ground Level SPM from Scenario 3 Cars

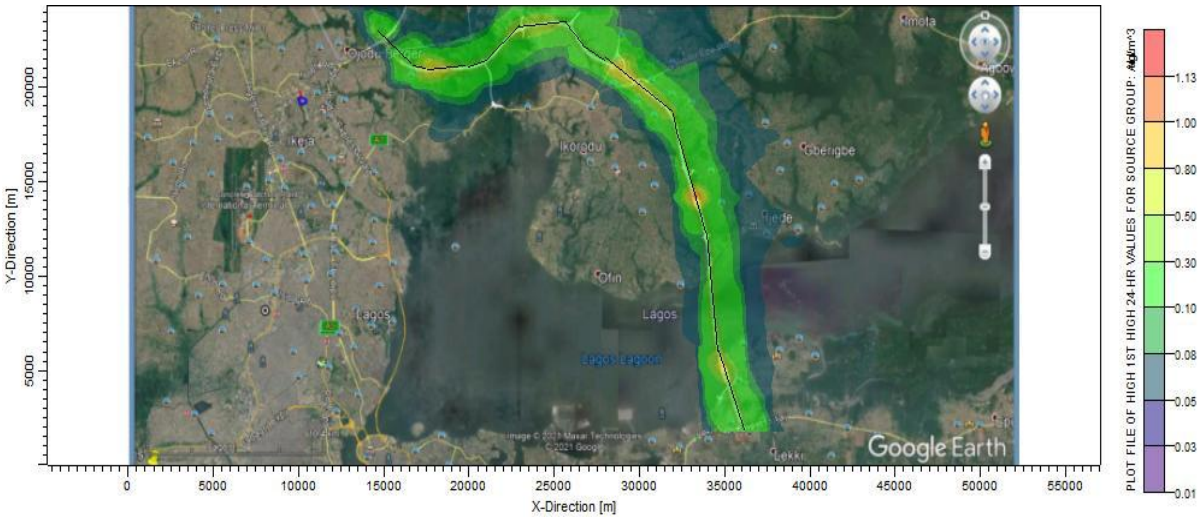

Fig. 4.92 Isopleth of 24-Hour Ground Level SPM from Scenario 3 Buses/SUVs

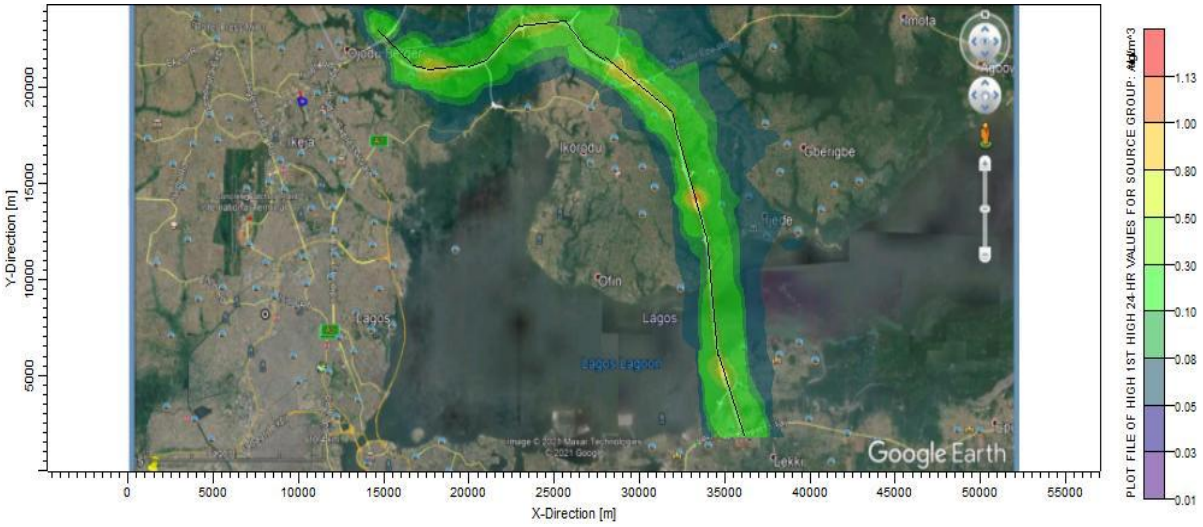

Fig. 4.93: Isopleth of 24-Hour Ground Level SPM from Scenario 3 Trucks

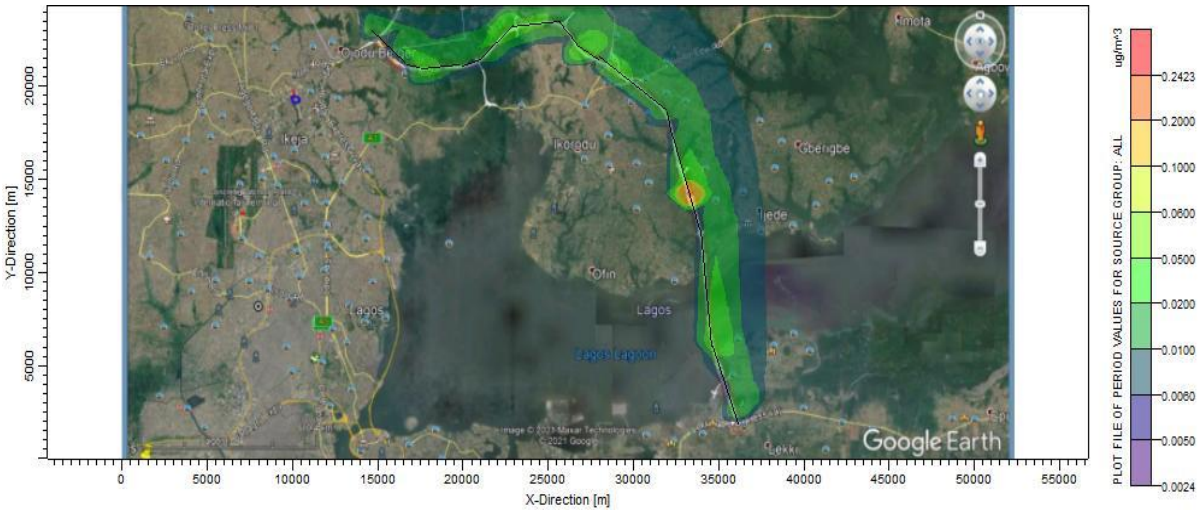

Fig. 4.94: Isopleth of Annual Ground Level SPM from Scenario 3 Cars

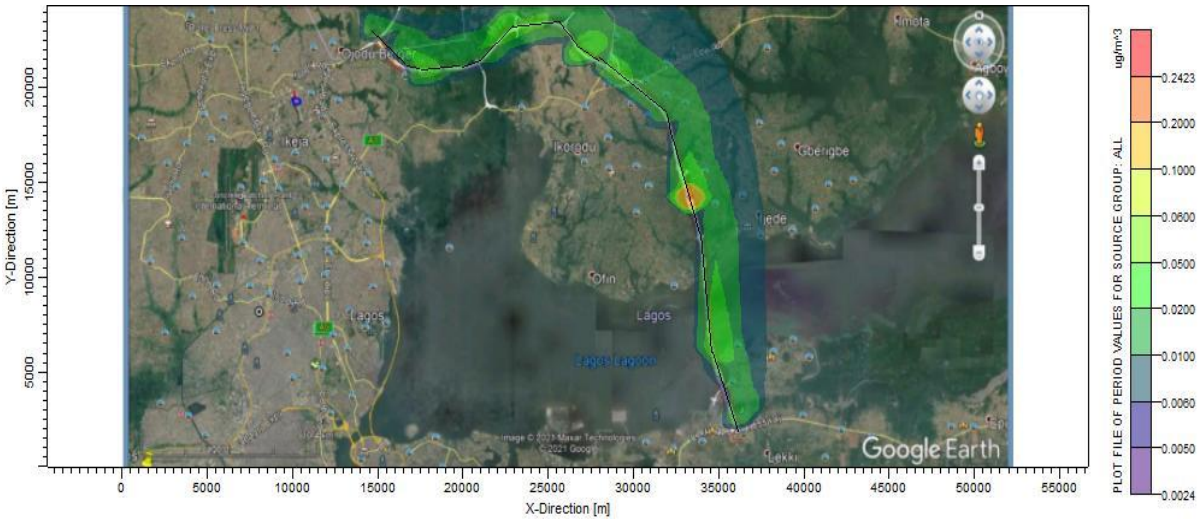

Fig. 4.95: Isopleth of Annual Ground Level SPM from Scenario 3 Buses/SUVs

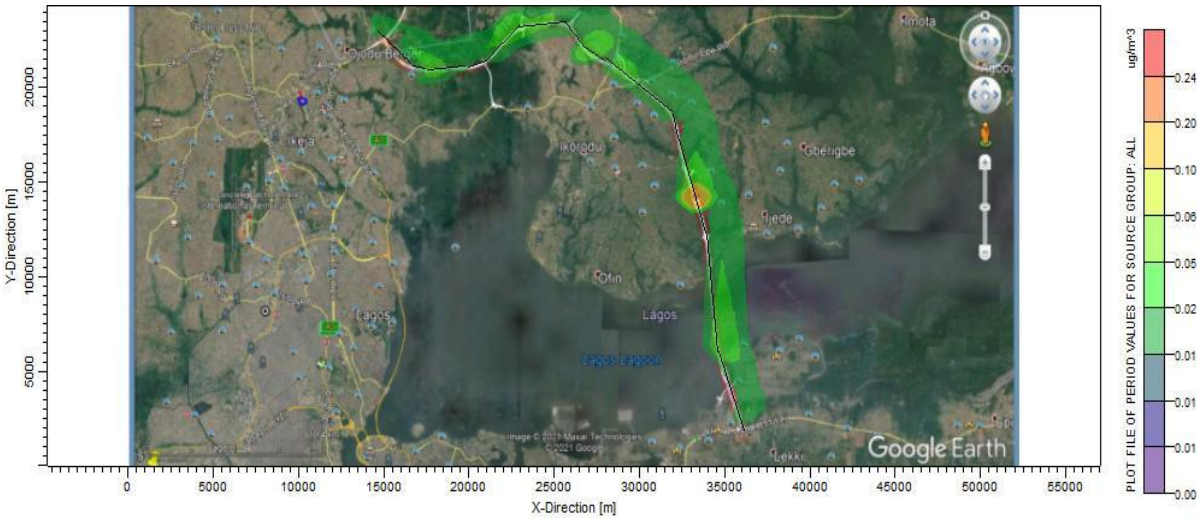

Fig. 4.96: Isopleth of Annual Ground Level SPM from Scenario 3 Trucks

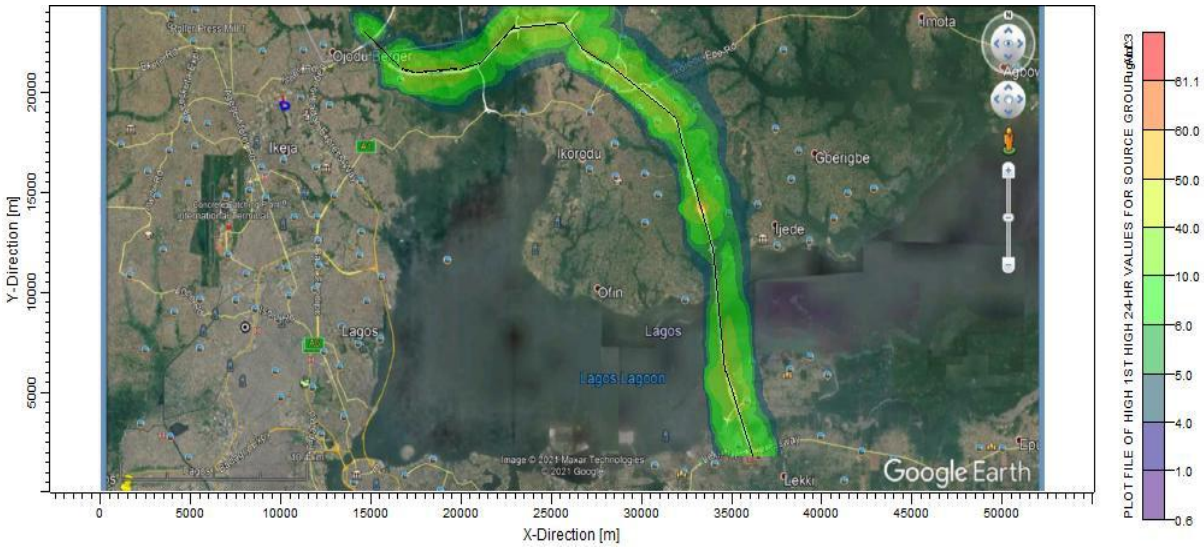

Fig. 4.97: Isopleth of 24-Hour Ground Level VOCs from Scenario 3 Cars

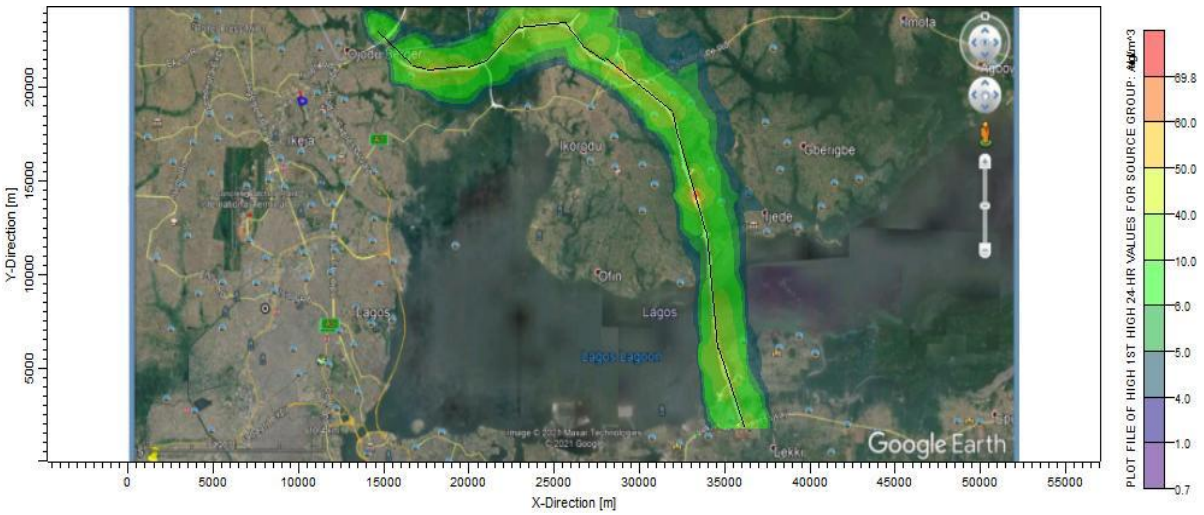

Fig. 4.98: Isopleth of 24-Hour Ground Level VOCs from Scenario 3 Buses/SUVs

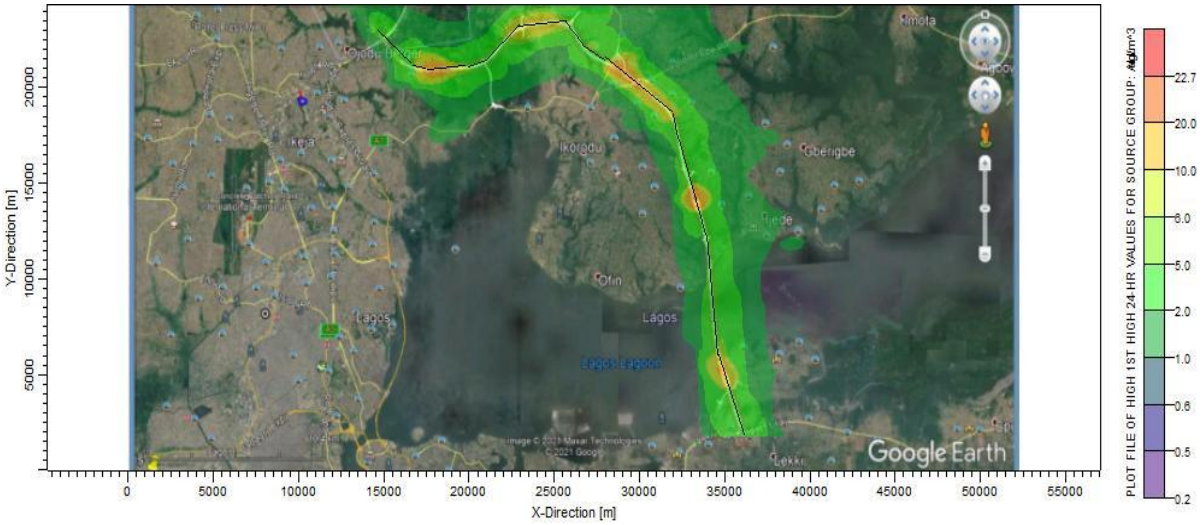

Fig. 4.99: Isopleth of 24-Hour Ground Level VOCs from Scenario 3 Trucks

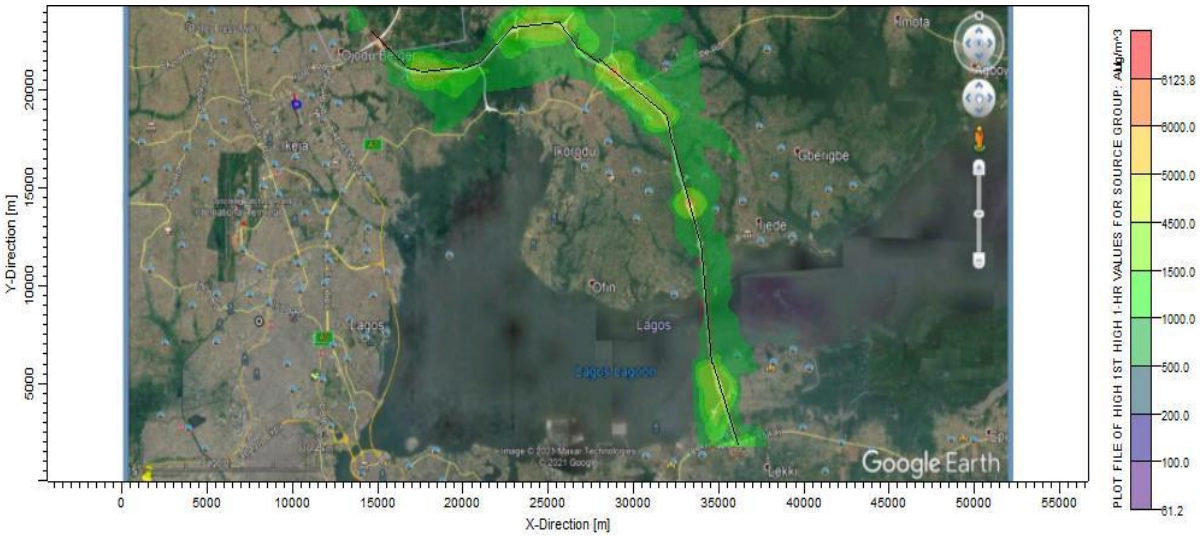

Fig. 4.100: Isopleth of 1-hour Ground Level CO from Scenario 4 Cars

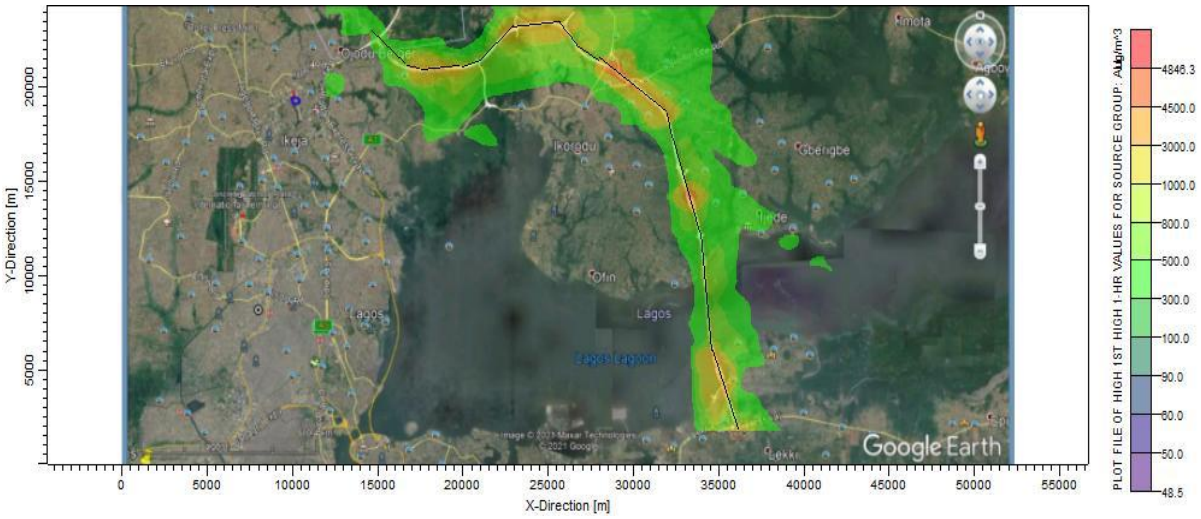

Fig. 4.101: Isopleth of 1-hour Ground Level CO from Scenario 4 Buses/SUVs

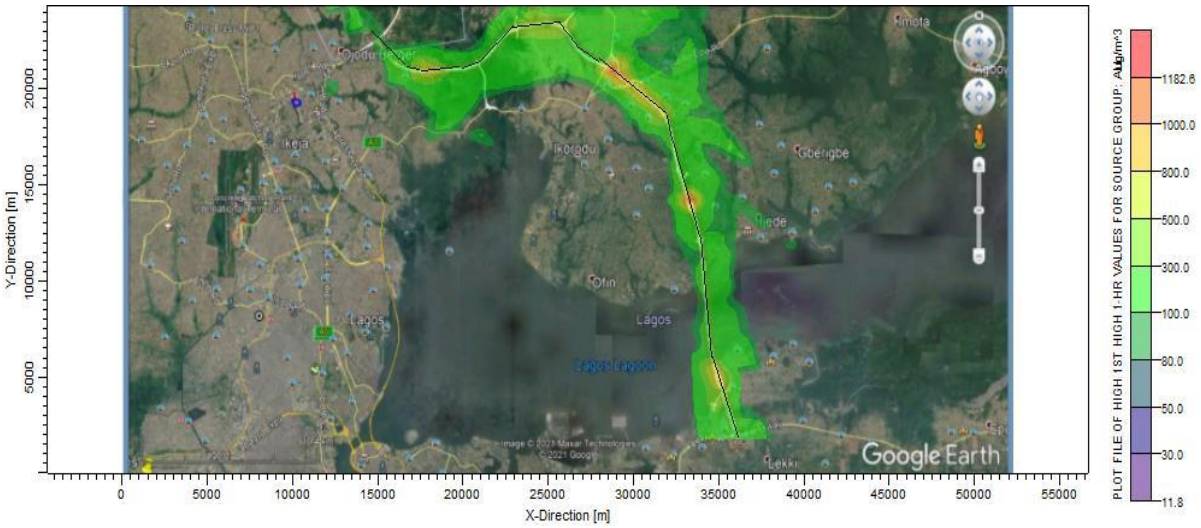

Fig. 4.102: Isopleth of 1-hour Ground Level CO from Scenario 4 Trucks

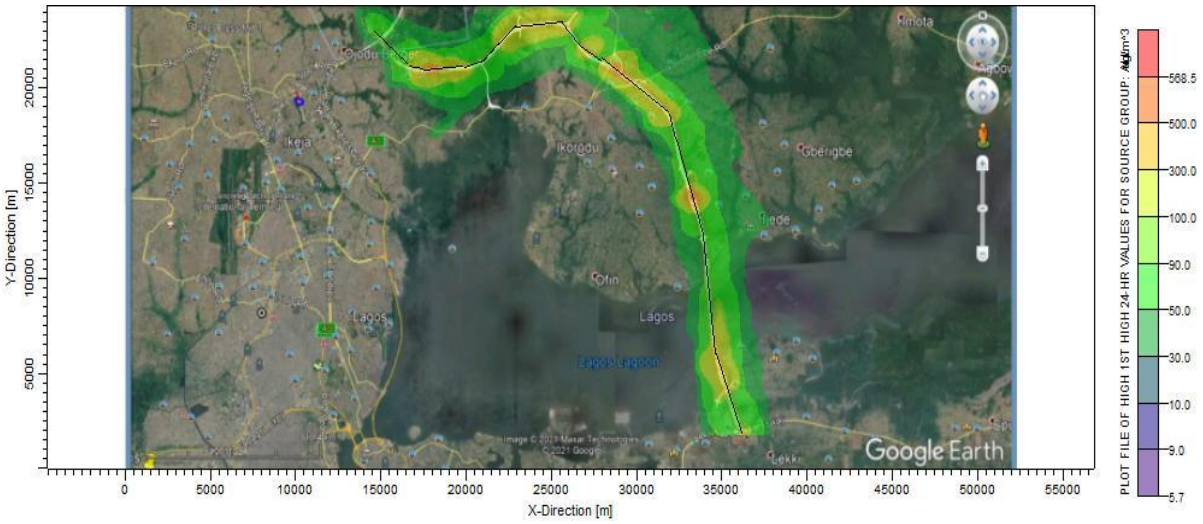

Fig. 4.103: Isopleth of 24-hour Ground Level CO from Scenario 4 Cars

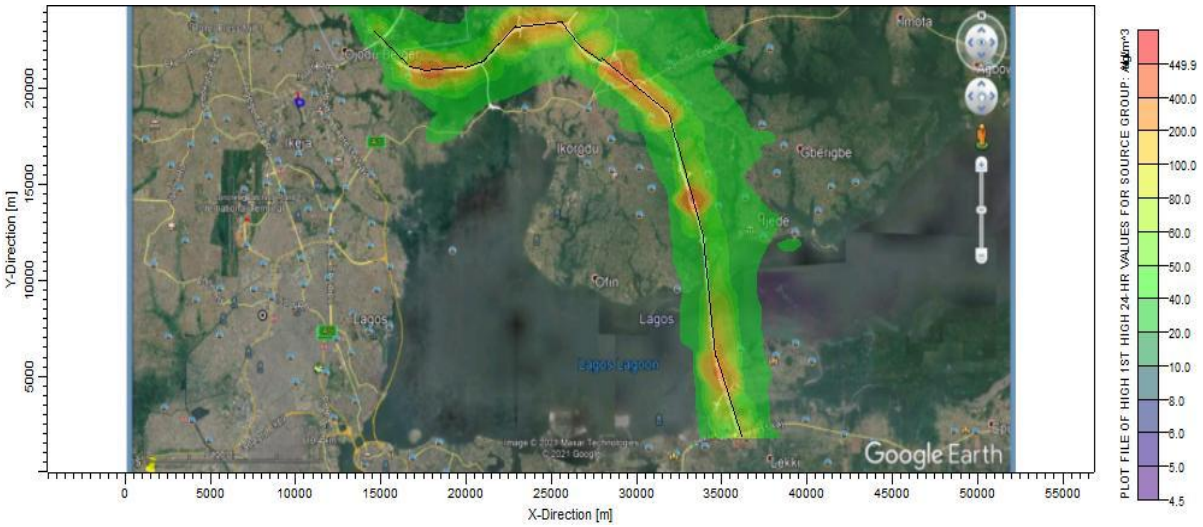

Fig. 4.104: Isopleth of 24-hour Ground Level CO from Scenario 4 Buses/SUVs

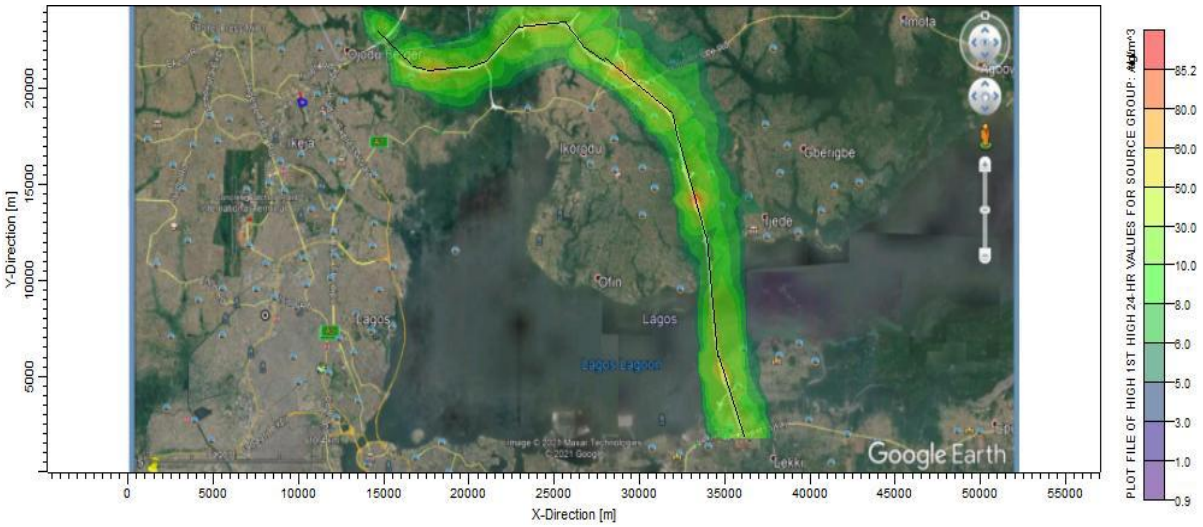

Fig. 4.105: Isopleth of 24-hour Ground Level CO from Scenario 4 Trucks

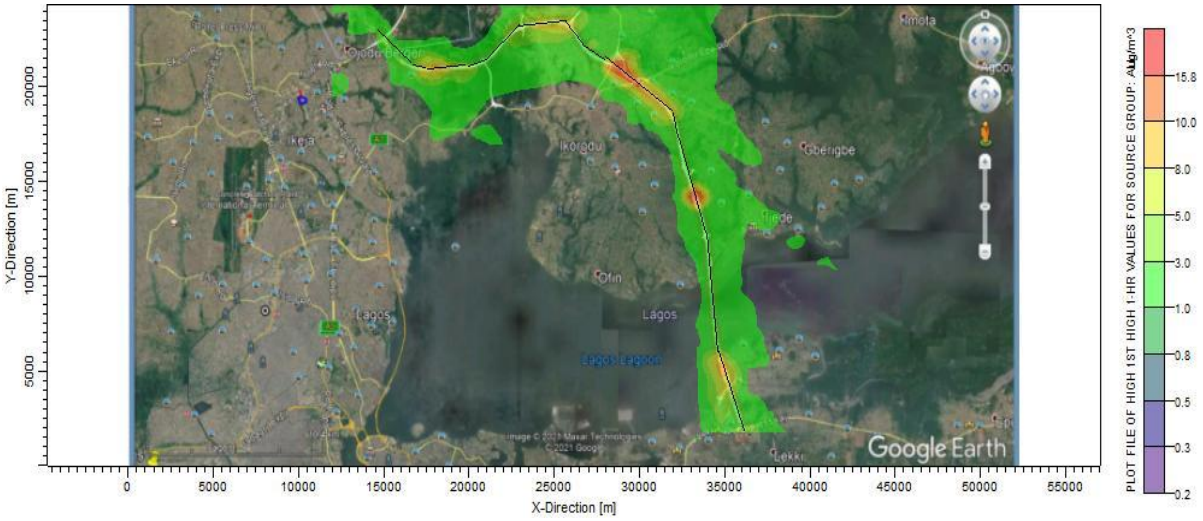

Fig. 4.106: Isopleth of 1-hour Ground Level SO_2 from Scenario 4 Cars

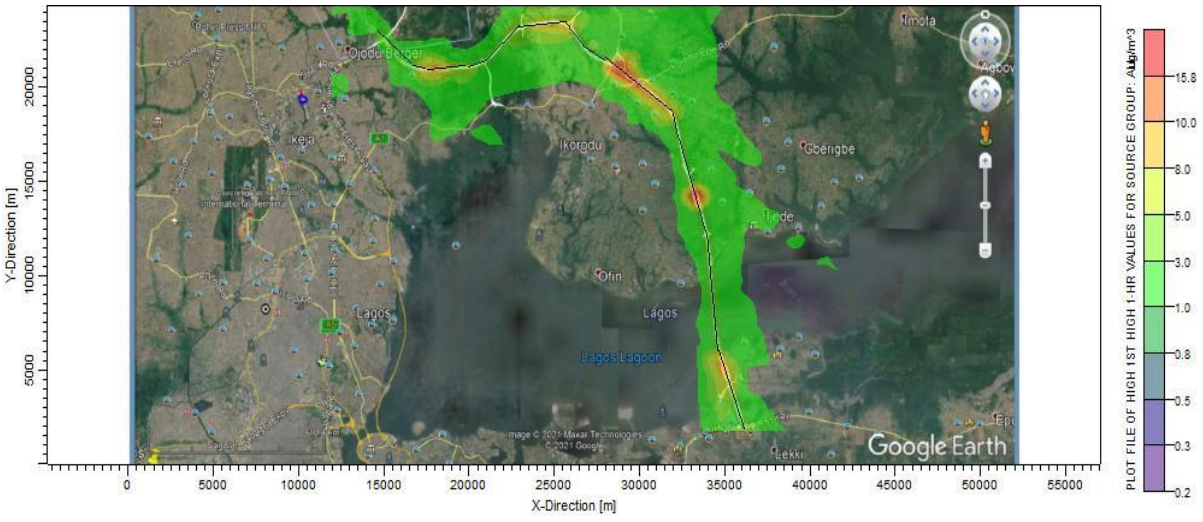

Fig. 4.107: Isopleth of 1-hour Ground Level SO_2 from Scenario 4 Buses/SUVs

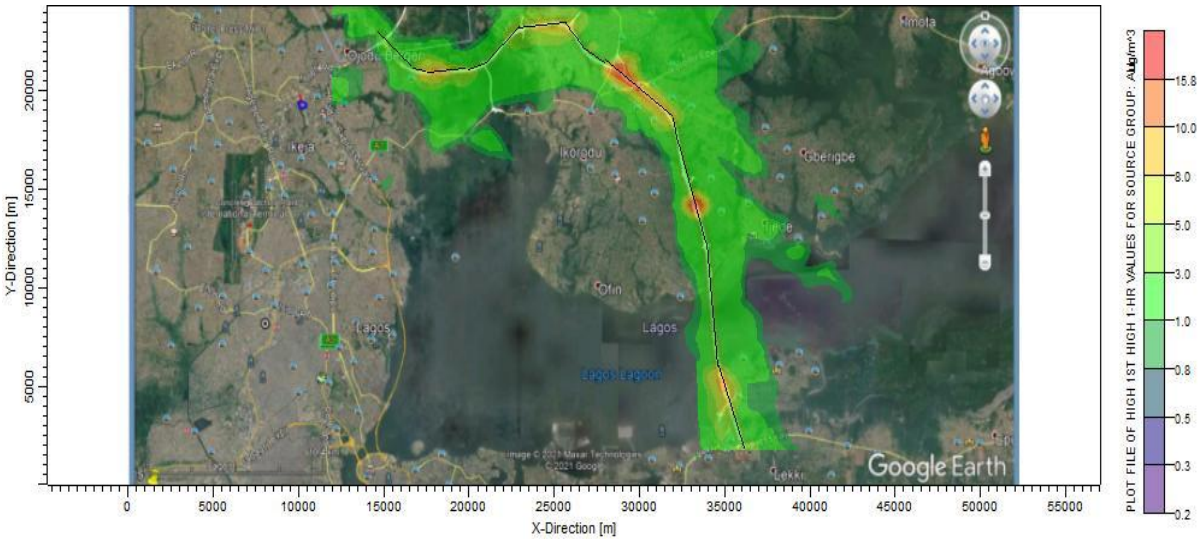

Fig. 4.108: Isopleth of 1-hour Ground Level SO_2 from Scenario 4 Trucks

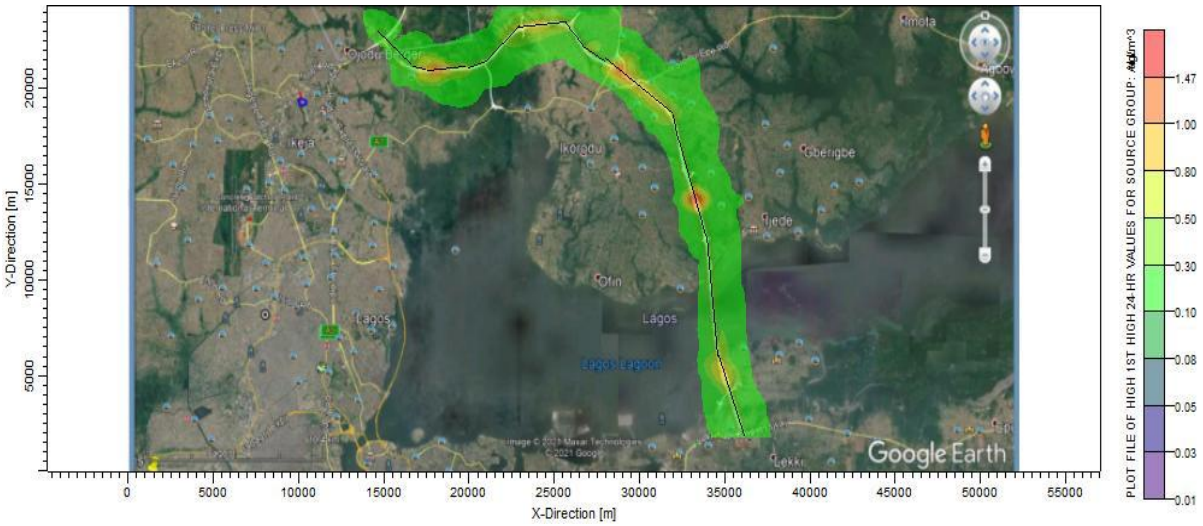

Fig. 4.109: Isopleth of 24-hour Ground Level SO_2 from Scenario 4 Cars

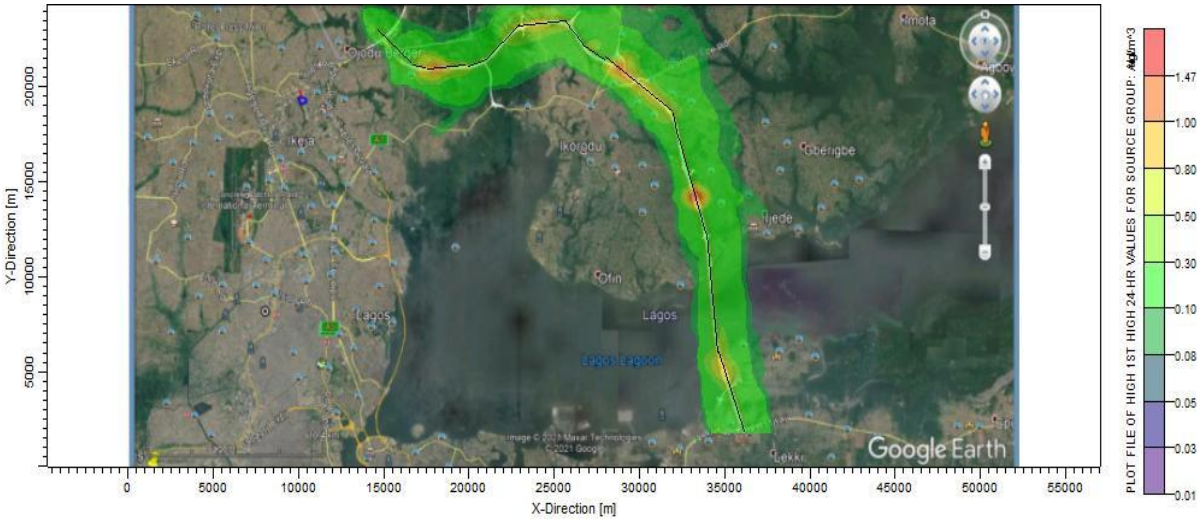

Fig. 4.110: Isopleth of 24-hour Ground Level SO_2 from Scenario 4 Buses/SUVs

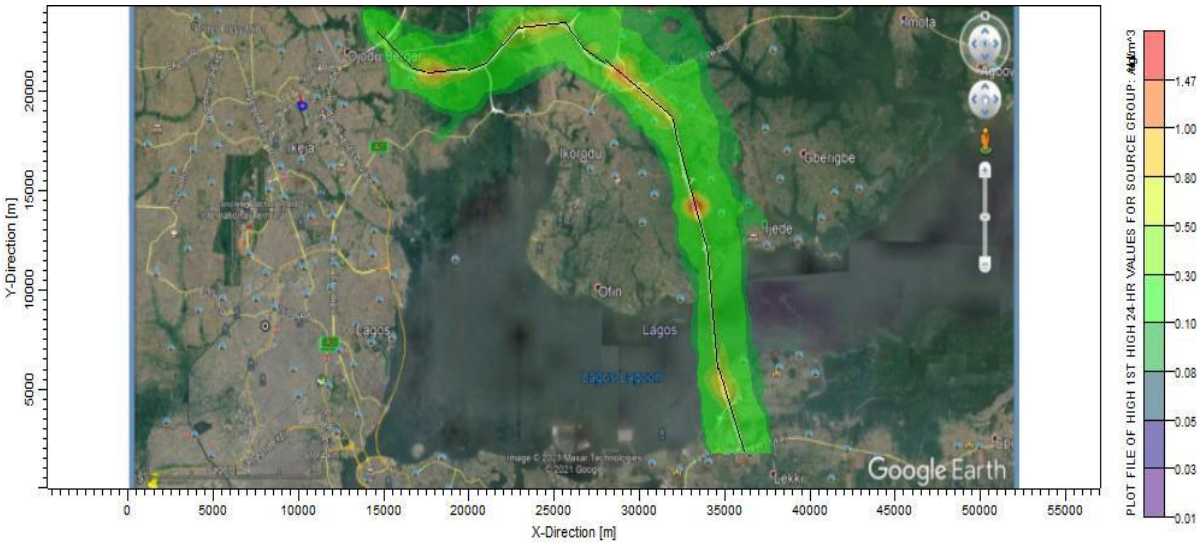

Fig. 4.111: Isopleth of 24-hour Ground Level SO_2 from Scenario 4 Trucks

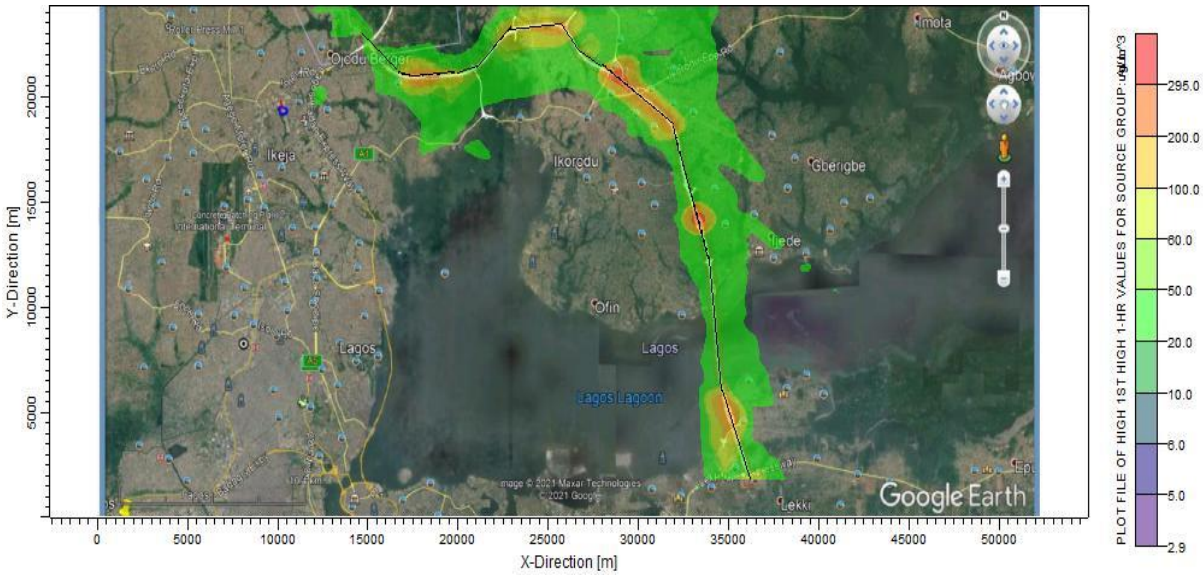

Fig. 4.112: Isopleth of 1-hour Ground Level NO_X from Scenario 4 Cars

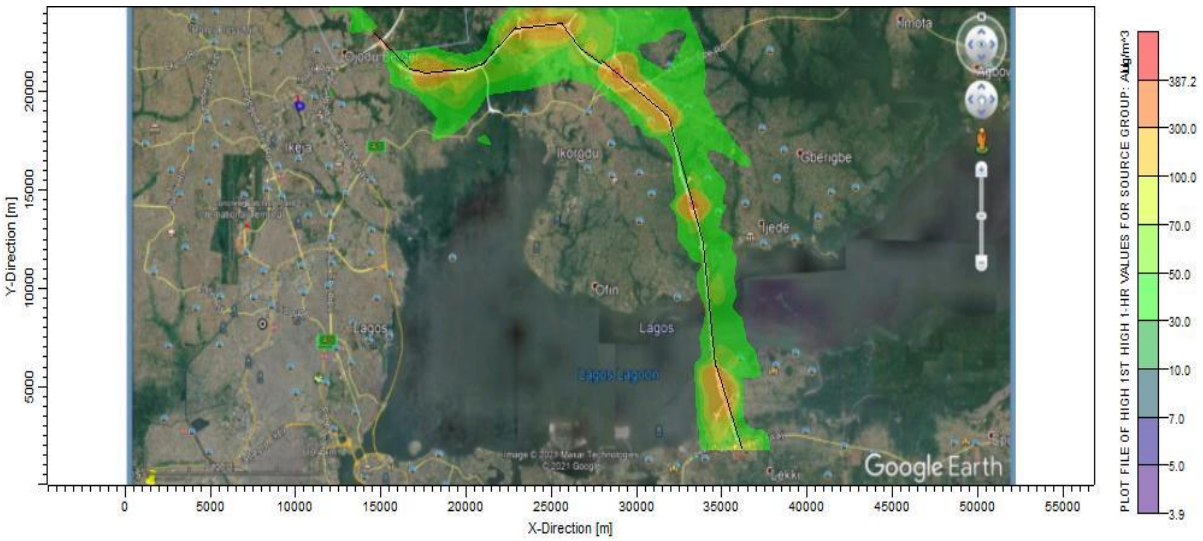

Fig. 4.113: Isopleth of 1-hour Ground Level NO_X from Scenario 4 Buses/SUVs

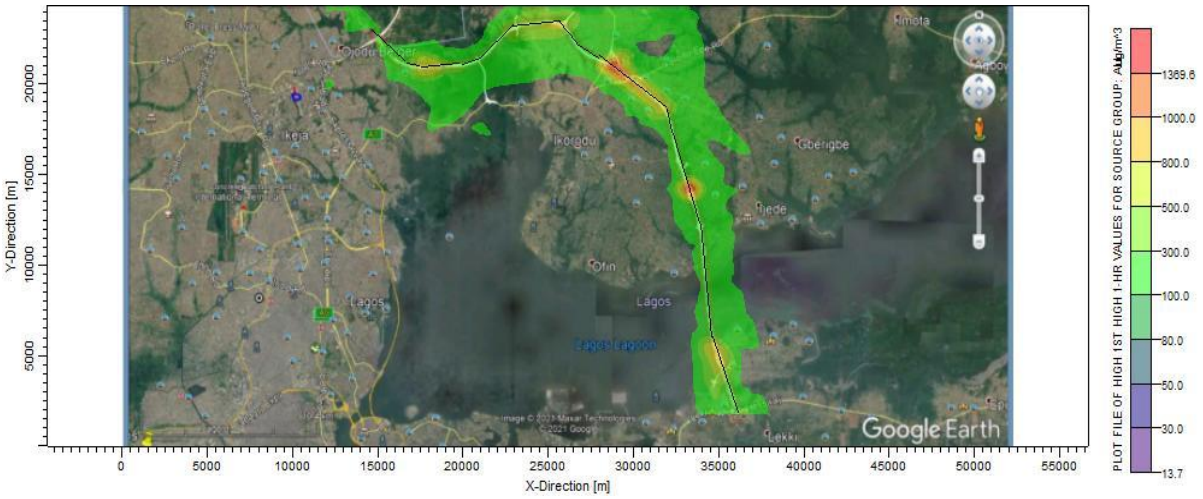

Fig. 4.114: Isopleth of 1-hour Ground Level NO_X from Scenario 4 Trucks

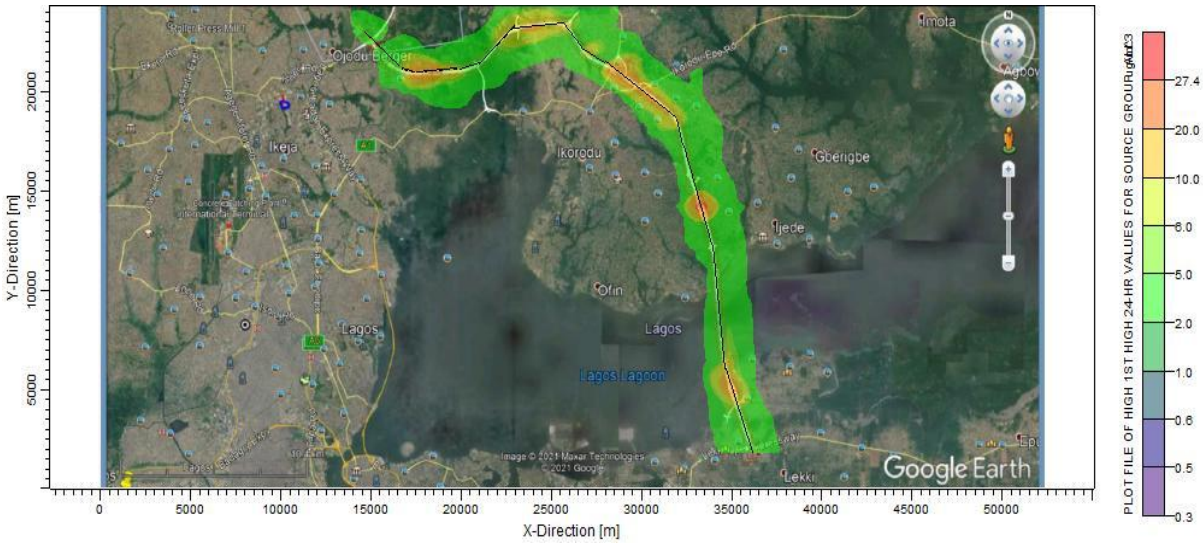

Fig. 4.115: Isopleth of 24-hour Ground Level NO_X from Scenario 4 Cars

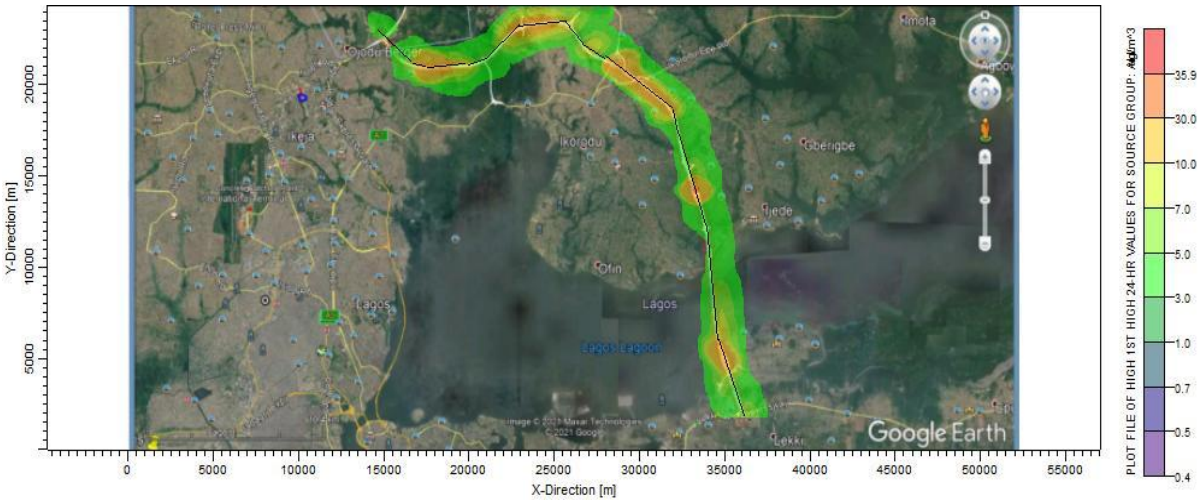

Fig. 4.116: Isopleth of 24-hour Ground Level NO_X from Scenario 4 Buses/SUVs

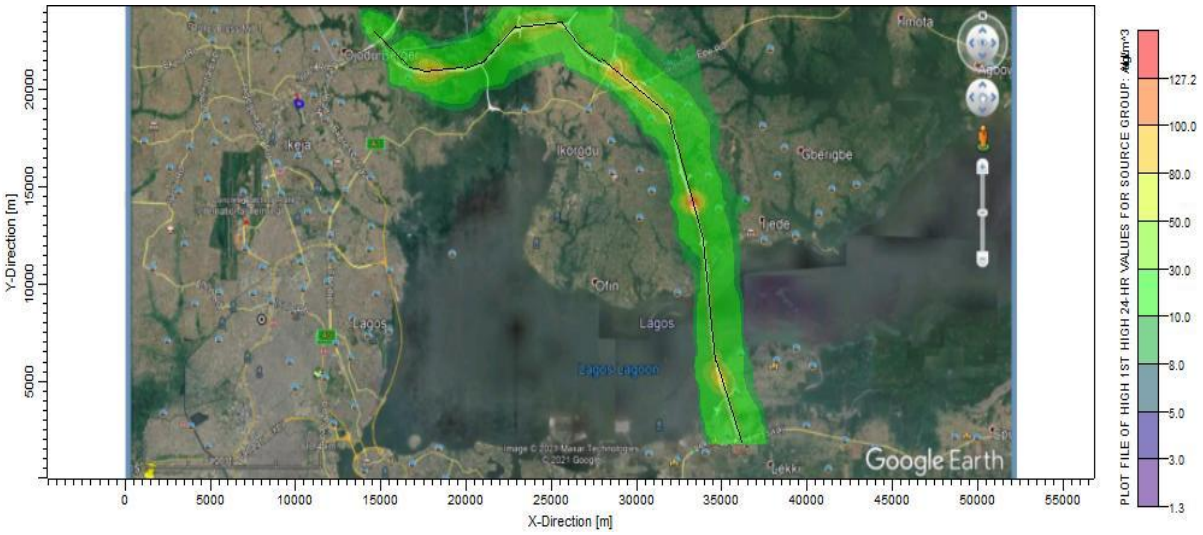

Fig. 4.117: Isopleth of 24-hour Ground Level NO_X from Scenario 4 Trucks

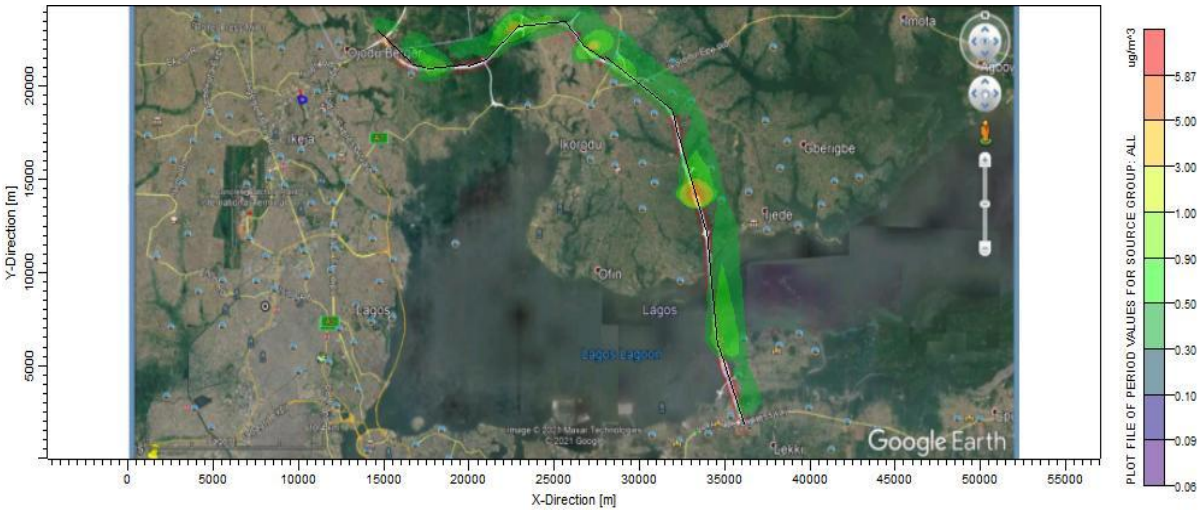

Fig. 4.118: Isopleth of Annual Ground Level NO_X from Scenario 4 Cars

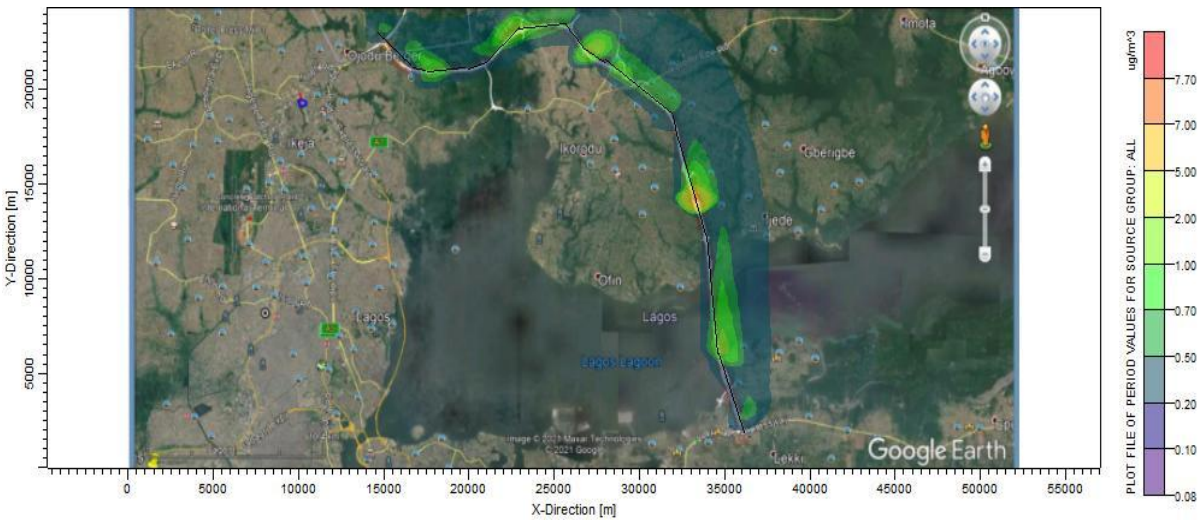

Fig. 4.119: Isopleth of Annual Ground Level NO_X from Scenario 4 Buses/SUVs

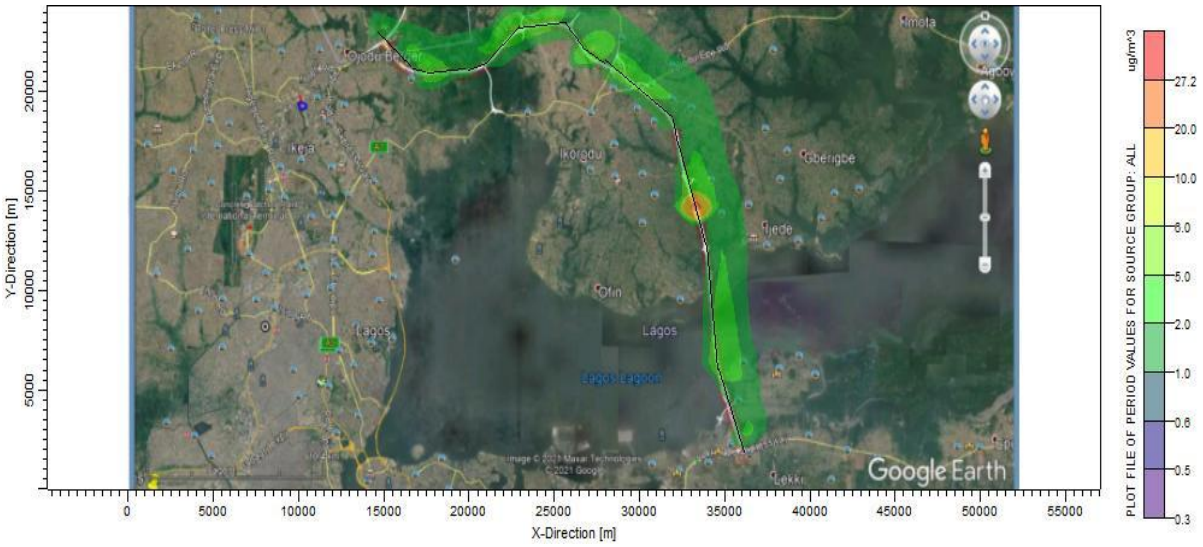

Fig. 4.120: Isopleth of Annual Ground Level NO_X from Scenario 4 Trucks

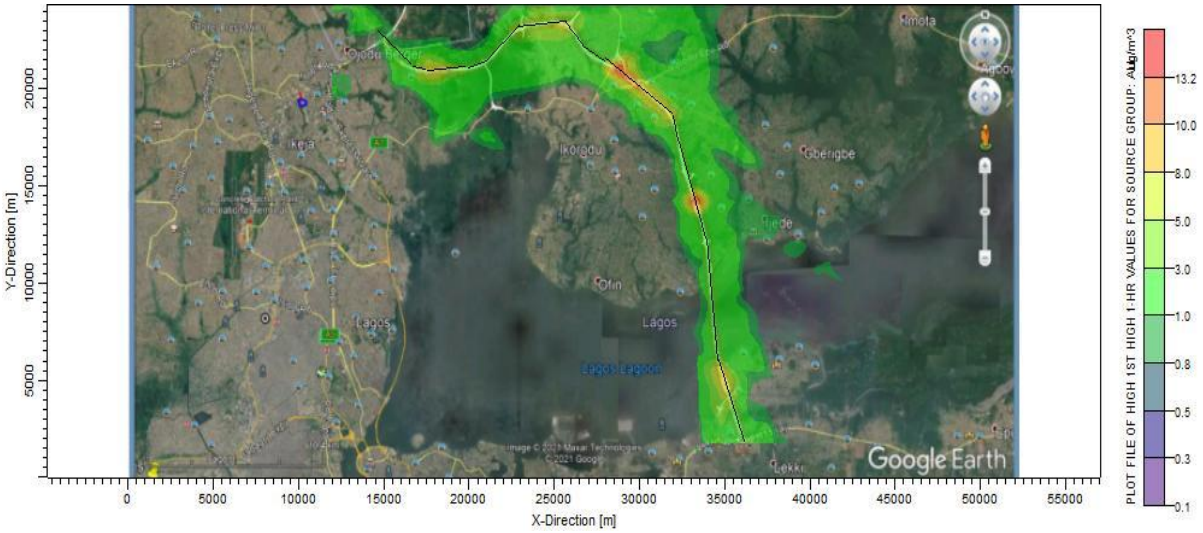

Fig. 4.121: Isopleth of 1-Hour Ground Level SPM from Scenario 4 Cars

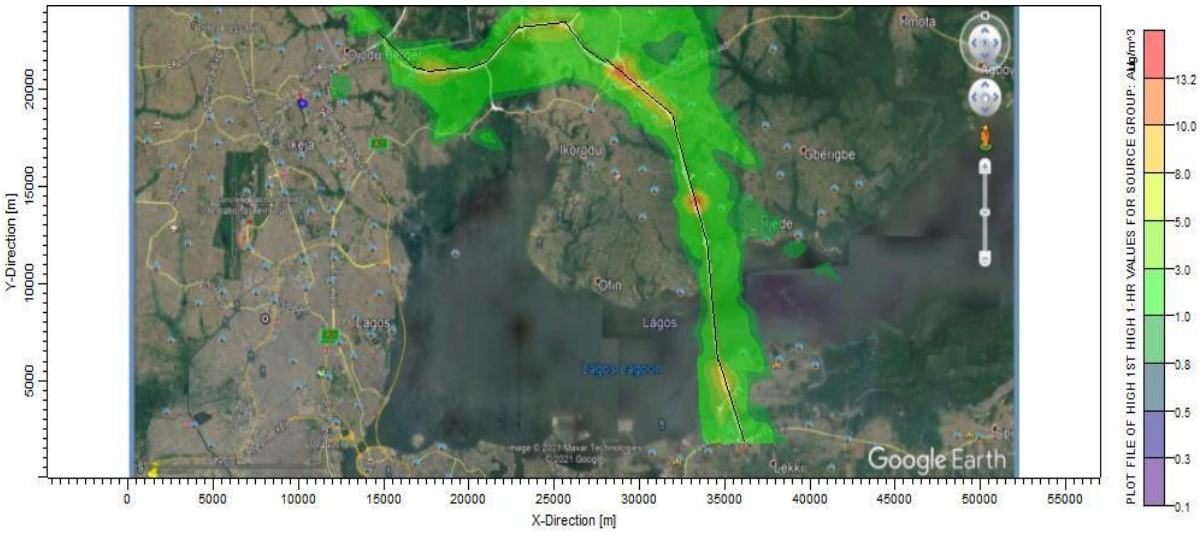

Fig. 4.122: Isopleth of 1-Hour Ground Level SPM from Scenario 4 Buses/SUVs

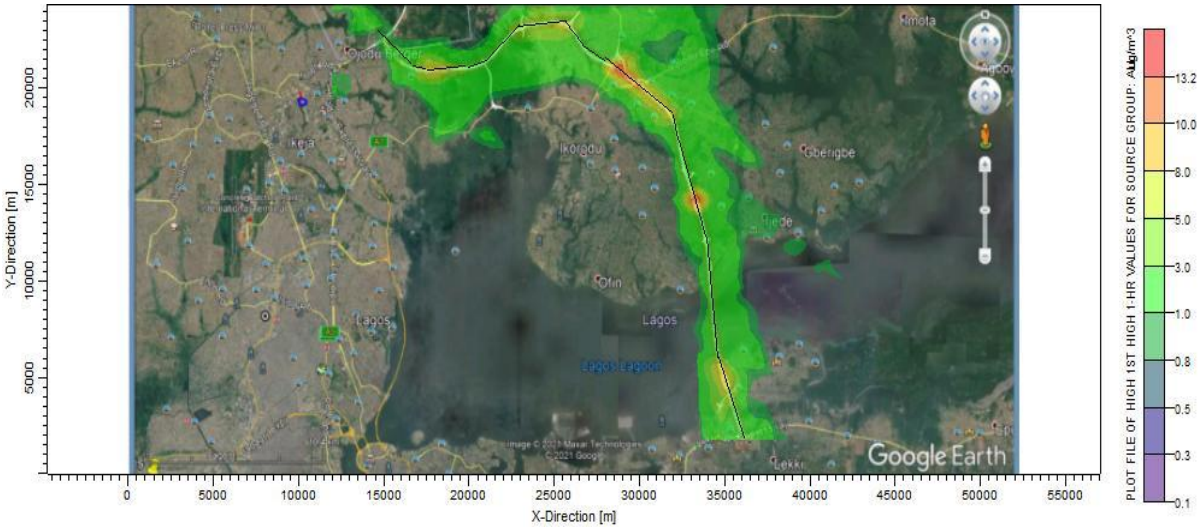

Fig. 4.123: Isopleth of 1-Hour Ground Level SPM from Scenario 4 Trucks

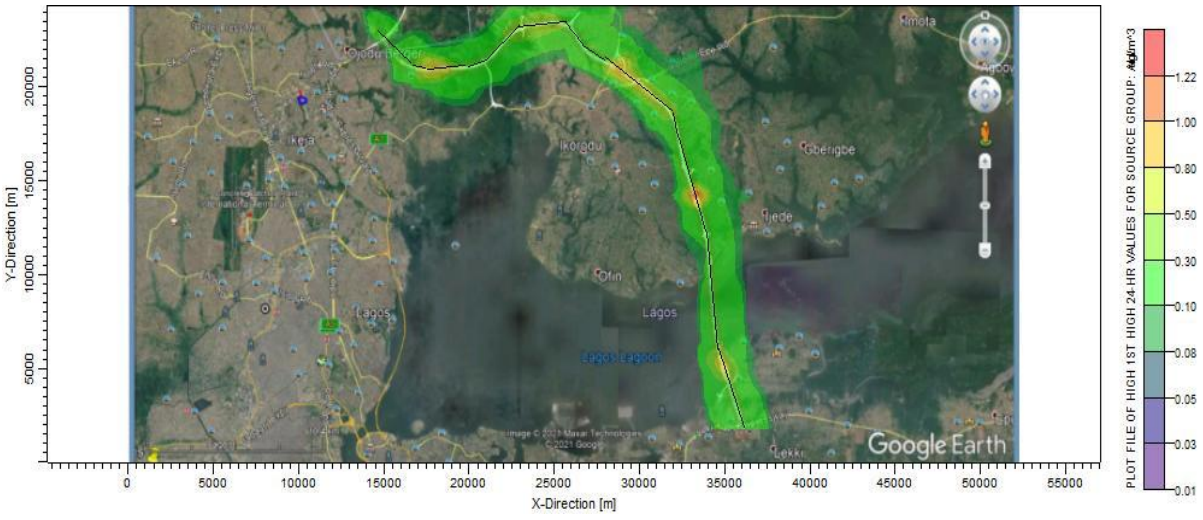

Fig. 4.124: Isopleth of 24-Hour Ground Level SPM from Scenario 4 Cars

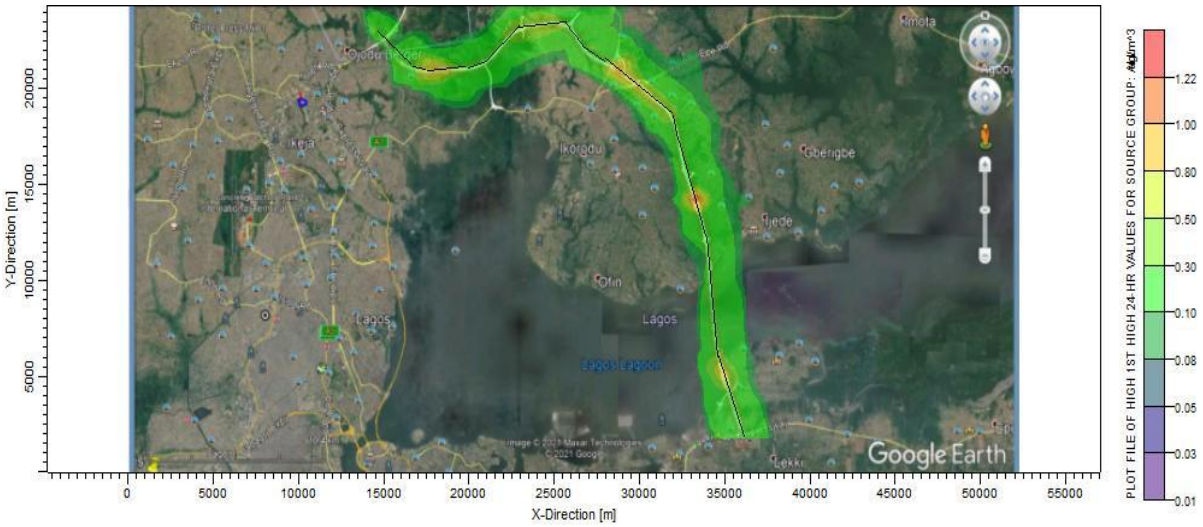

Fig. 4.125: Isopleth of 24-Hour Ground Level SPM from Scenario 4 Buses/SUVs

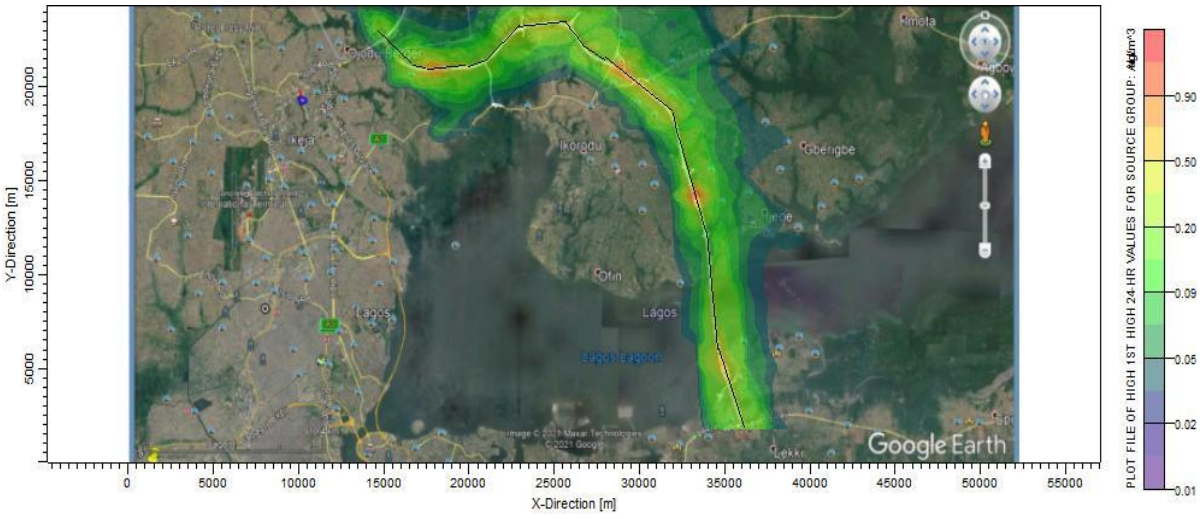

Fig. 4.126: Isopleth of 24-Hour Ground Level SPM from Scenario 4 Trucks

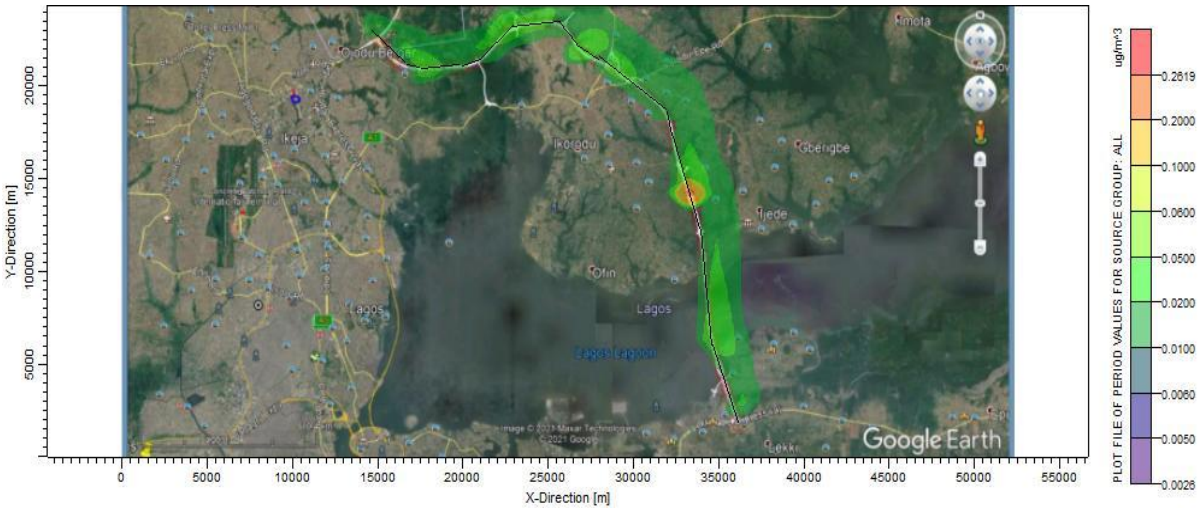

Fig. 4.127: Isopleth of Annual Ground Level SPM from Scenario 4 Cars

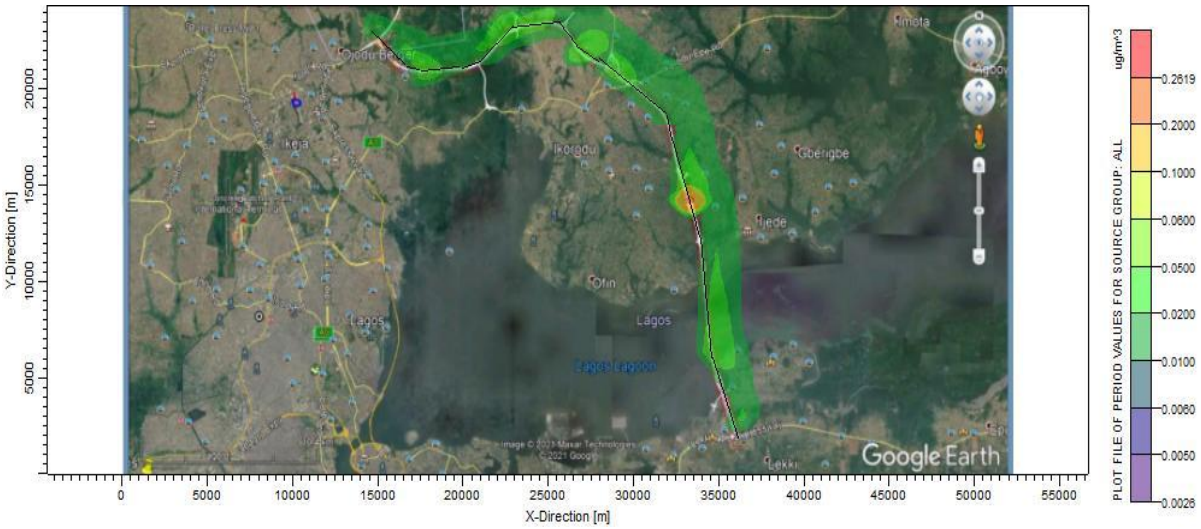

Fig. 4.128: Isopleth of Annual Ground Level SPM from Scenario 4 Buses/SUVs

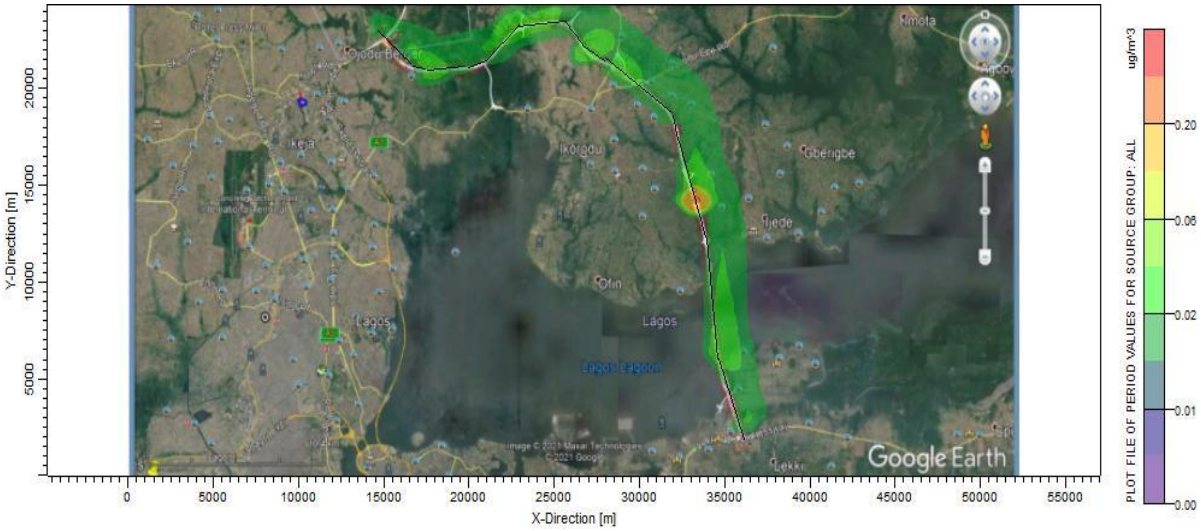

Fig. 4.129: Isopleth of Annual Ground Level SPM from Scenario 4 Trucks

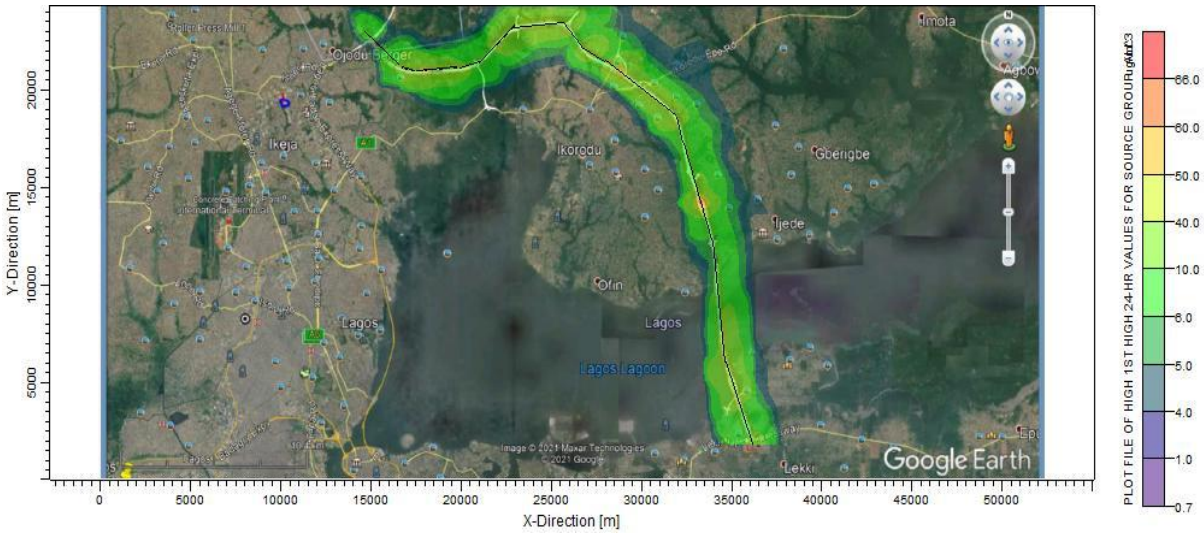

Fig. 4.130: Isopleth of 24-Hour Ground Level VOCs from Scenario 4 Cars

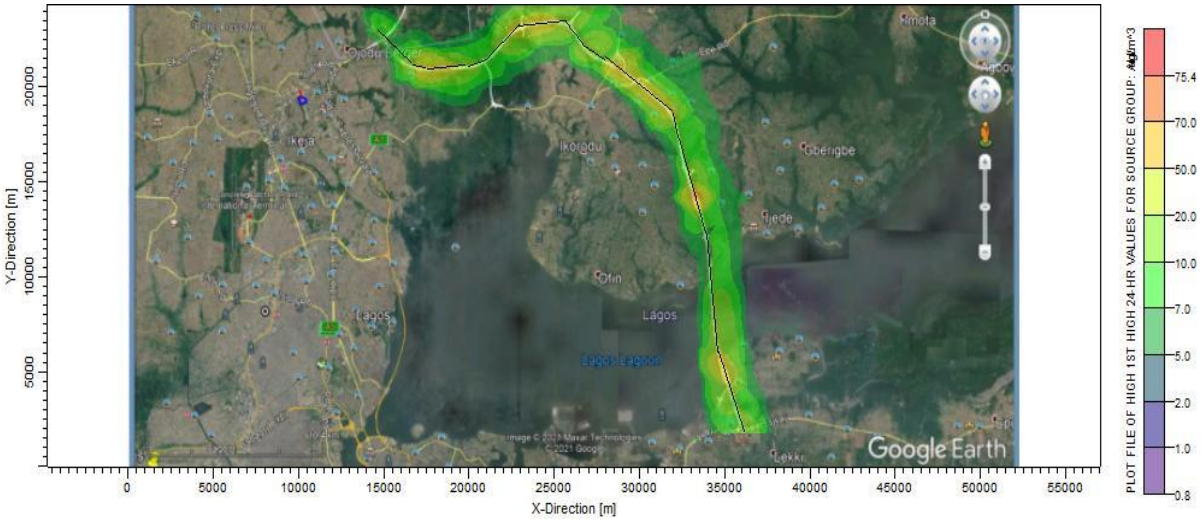

Fig. 4.131: Isopleth of 24-Hour Ground Level VOCs from Scenario 4 Buses/SUVs

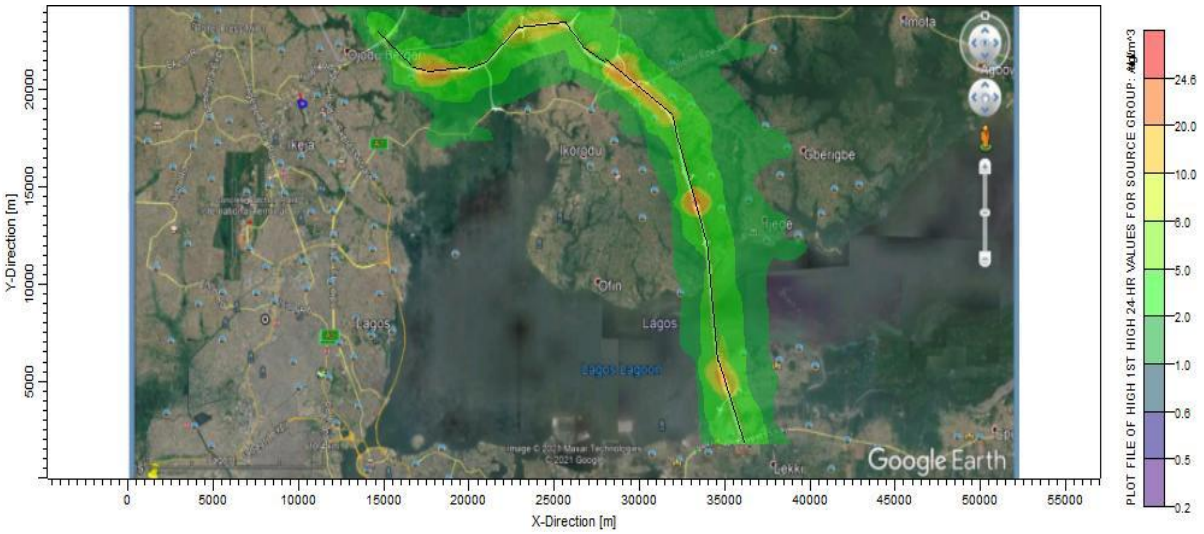

Fig. 4.132: Isopleth of 24-Hour Ground Level VOCs from Scenario 4 Trucks

Table 4.1: Maximum Ground Level CO Associated with 4th Mainland Bridge Traffic

Averaging Period	Scenario	Concentration (μg/m³)*	% of Limit	
			FMEnv	WBG
1-Hour	*Scenario 1 Cars*	4750.1	15.83	-
	Scenario 1 Buses/SUVs	3759.2	12.53	-
	Scenario 1 Trucks	917.3	3.06	-
	Scenario 2 Cars	5208.0	17.36	-
	Scenario 2 Buses/SUVs	4121.6	13.74	-
	Scenario 2 Trucks	1005.8	3.35	-
	Scenario 3 Cars	5665.9	18.89	-
	Scenario 3 Buses/SUVs	4484.0	14.95	-
	Scenario 3 Trucks	1094.2	3.65	-
	Scenario 4 Cars	6123.8	20.41	-
	Scenario 4 Buses/SUVs	4846.3	16.15	-
	Scenario 4 Trucks	1182.6	3.94	-
24-Hour	*Scenario 1 Cars*	441.0	3.87	-
	Scenario 1 Buses/SUVs	349.0	3.06	-
	Scenario 1 Trucks	85.2	0.75	-
	Scenario 2 Cars	483.5	4.24	-
	Scenario 2 Buses/SUVs	382.6	3.36	-
	Scenario 2 Trucks	93.4	0.82	-
	Scenario 3 Cars	526.0	4.61	-
	Scenario 3 Buses/SUVs	416.3	3.65	-
	Scenario 3 Trucks	101.6	0.89	-
	Scenario 4 Cars	568.5	4.99	-
	Scenario 4 Buses/SUVs	449.9	3.95	-
	Scenario 4 Trucks	85.2	0.75	-

Table 4.2: Maximum Ground Level SO_2 Associated with 4th Mainland Bridge Traffic

Averaging Period	Scenario	Concentration (μg/m³)*	% of Limit	
			FMEnv	WBG
1-Hour	*Scenario 1 Cars*	12.3	4.73	-
	Scenario 1 Buses/SUVs	12.3	4.73	-
	Scenario 1 Trucks	12.3	4.73	-
	Scenario 2 Cars	12.3	4.73	-
	Scenario 2 Buses/SUVs	13.4	5.15	-
	Scenario 2 Trucks	13.4	5.15	-
	Scenario 3 Cars	14.6	5.62	-
	Scenario 3 Buses/SUVs	14.6	5.62	-
	Scenario 3 Trucks	14.6	5.62	-
	Scenario 4 Cars	15.8	6.08	-
	Scenario 4 Buses/SUVs	15.8	6.08	-
	Scenario 4 Trucks	15.8	6.08	-
24-Hour	*Scenario 1 Cars*	1.14	4.38	-
	Scenario 1 Buses/SUVs	1.14	4.38	-
	Scenario 1 Trucks	1.14	4.38	-
	Scenario 2 Cars	1.14	4.38	-
	Scenario 2 Buses/SUVs	1.25	4.81	-
	Scenario 2 Trucks	1.25	4.81	-
	Scenario 3 Cars	1.25	4.81	-

	Scenario 3 Buses/SUVs	1.36	5.23	-
	Scenario 3 Trucks	1.36	5.23	-
	Scenario 4 Cars	1.47	5.65	-
	Scenario 4 Buses/SUVs	1.47	5.65	-
	Scenario 4 Trucks	1.47	5.65	-

Table 4.3: Maximum Ground Level NO_X Associated with 4th Mainland Bridge Traffic

Averaging Period	Scenario	Concentration (μg/m³)*	% of Limit	
			FMEnv	WBG
1-Hour	*Scenario 1 Cars*	228.8	-	114.40
	Scenario 1 Buses/SUVs	300.3	-	150.15
	Scenario 1 Trucks	1062.4	-	531.20
	Scenario 2 Cars	250.9	-	125.45
	Scenario 2 Buses/SUVs	329.3	-	164.65
	Scenario 2 Trucks	1164.8	-	582.40
	Scenario 3 Cars	272.9	-	136.45
	Scenario 3 Buses/SUVs	358.2	-	179.10
	Scenario 3 Trucks	1267.2	-	633.60
	Scenario 4 Cars	295.0	-	147.50
	Scenario 4 Buses/SUVs	387.2	-	193.60
	Scenario 4 Trucks	1389.6	-	694.80
24-Hour	*Scenario 1 Cars*	21.2	18.76	-
	Scenario 1 Buses/SUVs	27.9	24.69	-
	Scenario 1 Trucks	98.6	87.26	-
	Scenario 2 Cars	23.3	20.62	-
	Scenario 2 Buses/SUVs	30.6	27.08	-
	Scenario 2 Trucks	108.1	95.66	-
	Scenario 3 Cars	25.3	22.39	-
	Scenario 3 Buses/SUVs	33.3	29.47	-
	Scenario 3 Trucks	117.6	104.07	-
	Scenario 4 Cars	27.4	24.25	-
	Scenario 4 Buses/SUVs	35.9	31.77	-
	Scenario 4 Trucks	127.2	112.57	-
Annual	*Scenario 1 Cars*	4.0	-	10.00
	Scenario 1 Buses/SUVs	5.97	-	14.93
	Scenario 1 Trucks	21.1	-	52.75
	Scenario 2 Cars	4.0	-	10.00
	Scenario 2 Buses/SUVs	6.55	-	16.38
	Scenario 2 Trucks	23.2	-	58.00
	Scenario 3 Cars	5.43	-	13.58
	Scenario 3 Buses/SUVs	7.12	-	17.80
	Scenario 3 Trucks	25.2	-	63.00
	Scenario 4 Cars	5.87	-	14.68
	Scenario 4 Buses/SUVs	7.70	-	19.25
	Scenario 4 Trucks	27.20	-	68.00

Table 4.4: Maximum Ground Level SPM Associated with 4th Mainland Bridge Traffic

Averaging Period	Scenario	Concentration (μg/m³)*	% of Limit	
			FMEnv	WBG
1-Hour	*Scenario 1 Cars*	10.2	1.70	-
	Scenario 1 Buses/SUVs	10.2	1.70	-
	Scenario 1 Trucks	10.2	1.70	-
	Scenario 2 Cars	11.2	1.87	-
	Scenario 2 Buses/SUVs	11.2	1.87	-
	Scenario 2 Trucks	11.2	1.87	-
	Scenario 3 Cars	12.2	2.03	-
	Scenario 3 Buses/SUVs	12.2	2.03	-
	Scenario 3 Trucks	12.2	2.03	-
	Scenario 4 Cars	13.2	2.20	-
	Scenario 4 Buses/SUVs	13.2	2.20	-
	Scenario 4 Trucks	13.2	2.20	-
24-Hour	*Scenario 1 Cars*	0.90	0.36	-
	Scenario 1 Buses/SUVs	0.90	0.36	-
	Scenario 1 Trucks	0.90	0.36	-
	Scenario 2 Cars	1.04	0.42	-
	Scenario 2 Buses/SUVs	1.04	0.42	-
	Scenario 2 Trucks	1.04	0.42	-
	Scenario 3 Cars	1.13	0.45	-
	Scenario 3 Buses/SUVs	1.13	0.45	-
	Scenario 3 Trucks	1.13	0.45	-
	Scenario 4 Cars	1.22	0.49	-
	Scenario 4 Buses/SUVs	1.22	0.49	-
	Scenario 4 Trucks	1.22	0.49	-
Annual	*Scenario 1 Cars*	0.20	-	1.00
	Scenario 1 Buses/SUVs	0.20	-	1.00
	Scenario 1 Trucks	0.20	-	1.00
	Scenario 2 Cars	0.20	-	1.00
	Scenario 2 Buses/SUVs	0.20	-	1.00
	Scenario 2 Trucks	0.20	-	1.00
	Scenario 3 Cars	0.24	-	1.20
	Scenario 3 Buses/SUVs	0.24	-	1.20
	Scenario 3 Trucks	0.24	-	1.20
	Scenario 4 Cars	0.26	-	1.30
	Scenario 4 Buses/SUVs	0.26	-	1.30
	Scenario 4 Trucks	0.26	-	1.30

Table 4.5: Maximum Ground Level VOCs Associated with 4th Mainland Bridge Traffic

Averaging Period	Scenario	Concentration (μg/m³)*	% of Limit	
			FMEnv	WBG
24-Hour	*Scenario 1 Cars*	51.2	32.00	-
	Scenario 1 Buses/SUVs	58.5	36.56	-
	Scenario 1 Trucks	19.1	11.94	-
	Scenario 2 Cars	56.1	35.06	-

	Scenario 2 Buses/SUVs	64.2	40.13	-
	Scenario 2 Trucks	20.9	13.06	-
	Scenario 3 Cars	61.1	38.19	-
	Scenario 3 Buses/SUVs	69.8	43.63	-
	Scenario 3 Trucks	22.7	14.19	-
	Scenario 4 Cars	66.0	41.25	-
	Scenario 4 Buses/SUVs	75.4	47.13	-
	Scenario 4 Trucks	24.6	15.38	-

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

An air emission dispersion modelling study has been carried out on the proposed 4th Mainland Bridge, Lagos Nigeria to determine its impacts on the proposed host airshed. The findings have assisted to arrive at some levels of conclusion and recommendations that can assist operation of the project in a sustainable manner, especially as it concerns the airshed.

5.1 Conclusion

It can be concluded that:

i. the major sources of air emissions on the proposed 4th Mainland Bridge in its operation phase are vehicles including cars, buseses/suvs and trucks;
ii. four average daily traffic flow of 41500 vehicles/day, 45500 vehicles/day, 49500 vehicles/day and 53500 vehicles/day are anticipated on the bridge;
iii. the maximum ground level concentrations of CO, SO_2, SPM and VOCs associated with vehicular emissions in the operation phase of the proposed bridge are within their respective limits;
iv. the NO_X concentration from vehicular emissions in the proposed project breach its respective 1-hour and 24-hour averaging periods FMEnv and WBG limits; and
v. improved free flow of traffic in the study area accompanying the proposed bridge will assist to achieve reduced air pollutants

5.2 Recommendations

To maintain the predicted maximum concentrations of ground level air pollutants from the proposed project it is recommended that adequate traffic management is put in place to ensure that average 60 km/hr speed investigated is sustained. This will ensure that traffic gridlocks are minimized on the bridge thus eliminating its associated air emissions.