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ENVIRONMENTAL IMPACT ASSESSMENT ON PROPOSED DUALISATION OF IJEGUN-IJEGEMO TO ABULE-ADO ROAD NETWORK, LAGOS STATE, NIGERIA

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Abstract.
The Lagos State Government plans to construct a 19 km road network connecting Abule Ado to Ijegun-Ijegemo Alape canoe side. This initiative aims to alleviate traffic congestion along LASU/Iba road and address growing access needs in the area. An Environmental Impact Assessment (EIA) has been completed to assess the project's potential environmental and social effects, including strategies to mitigate negative impacts and enhance positive ones. Field surveys identified and documented environmental impacts, while consultations involved various stakeholders such as local authorities and affected individuals. The EIA adheres to Nigerian Government regulations and guidelines from the Federal Ministry of Environment and NESREA. The proposed route will traverse Abule Ado (Latitude 06.45789, Longitude 03.25520), Alape/Arandun (Longitude 06.50612, Latitude 03.20202), and Befun (Longitude 06.50686, Latitude 03.22934), reaching Ijegun Ijeododo (Longitude 06.50695, Latitude 03.27605). The project, located in the Ojo Local Government Area of Lagos, Nigeria, is designed to significantly improve local infrastructure and traffic flow.
This work describes the issues that have been identified so far through the public participation process and one-on-one consultations with affected landowners by specialists on the project team. Similarly, mitigation measures will be proposed to reduce negative impacts and enhance positive impacts. The findings of the specialists will also be used to develop an Environmental Management Plan (EMP) that will guide the construction and operation of the proposed road project. The EMP will include a monitoring program to assess performance.

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Introduction. Project Description and Location

a. The intended road project cuts across Abule-Ado at Latitude 06.45789, Longitude 03.25520, and at an elevation of 25-28.5 Ft.

b. Alape/Arandun at Longitude 06.50612, Latitude E 03.20202, and an elevation of 18.5ft-9.5ft.

c. Befun at Longitude N 06.50686, Latitude 03.22934, and an elevation of 27.7ft.

Ijegun Ijeododo at Longitude 06.50695 and Latitude 03.27605, with an elevation of 22.3ft.

The total stretch of land that the proposed road will cover is 19KM, and the project is located in Ojo local Government area of Lagos, Nigeria.

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Project Impacts: Lagos' economy is highly dependent on a good road network to facilitate the movement of goods and services. Therefore, its inadequacy can be a serious constraint to local, state, and national development.

The development of this road would be a confidence reassurance measure to improve the movement of commuters and goods along the corridor.

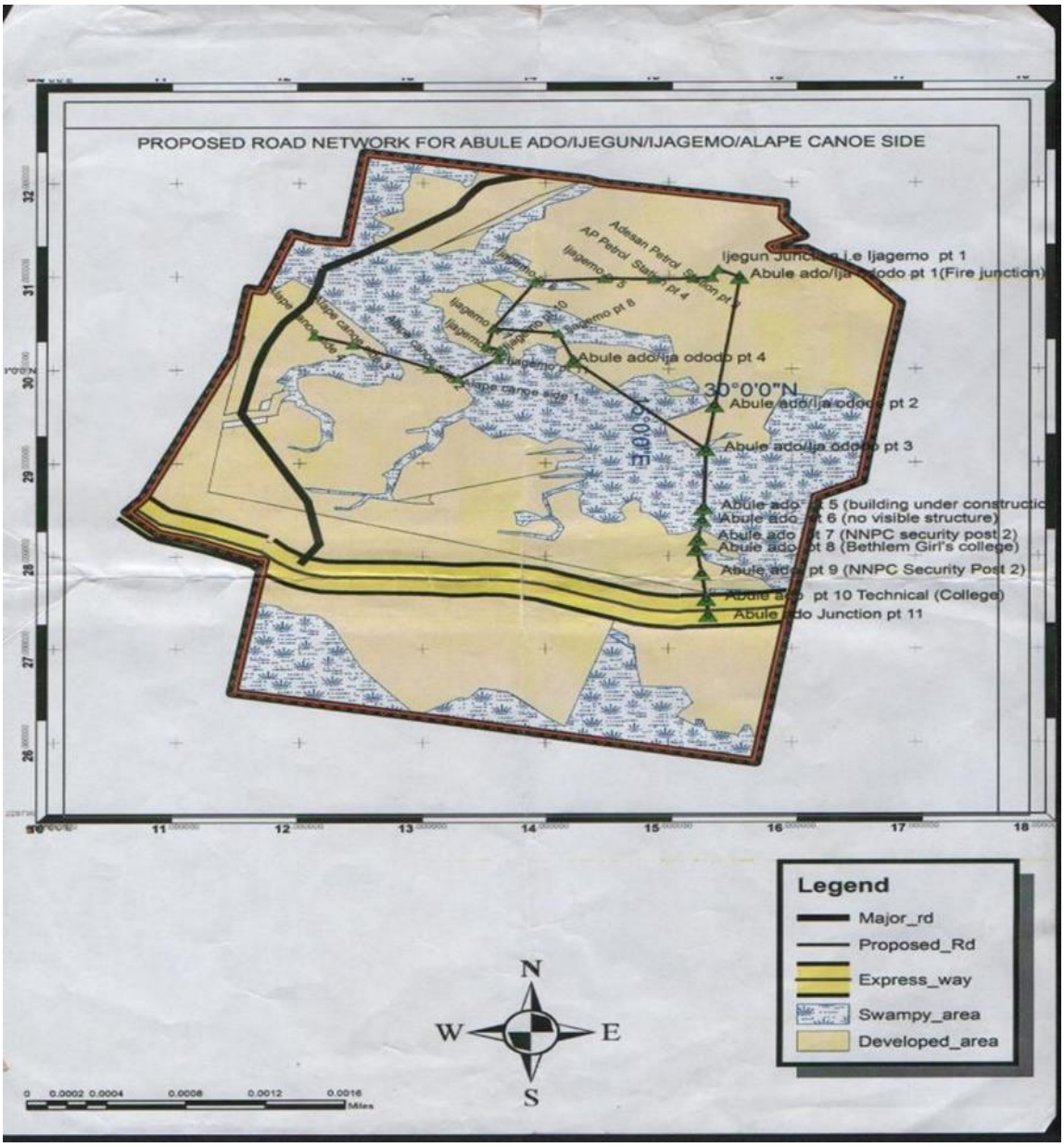

Fig. 1. Overview map of the area
Рис. 1. Обзорная карта района

Climate/Methodology: The project area is associated with high temperatures ranging from (24-28°C). Rainfall in the project area is generally high, and the project area has calm weather with wind speeds ranging between 0.6 m/s to 5.7 m/s. The project area has excellent ambient air quality, with all the measured pollutant indicators being below FMEN regulatory limits. The ambient air concentrations measured for S02, CO, NH3 are 0.00 ppm and 0.03 ppm for $N0_2$, while methane (CH_4) ranges between 11.00 ppm and 11.80 ppm. The concentration of Hydrogen Sulphide (H_2S) was also not detectable.

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Noise: The daytime ambient noise levels measured at different locations within and outside the study area ranged from values of 35.9 to 72.5 decibels-acoustic dB(A). In some areas, all the ambient noise levels recorded were below the Ministry of Environment's permissible limits of 85.0 dB(A).

Geomorphology, Geology, and Hydrogeology

The geology underlying the proposed road construction is composed of swampy basement complex rocks and thick forest in-between Abulo Ado and Ijegun Ijeododo, as well as Iba and Ijeagamo. The sub- surface layers, which are strongly dependent on the solid geology, vary from clay to sandy clayey sand and basement bedrock beneath the segment. The pH level of water bodies ranged between 4.73 and 8.20, turbidity between 5 and 55 Nephelometric Turbidity Unit (NTU), indicating clear and turbid waters. The values were partially above the Nigeria Industrial standard (NIS) for drinking water, apart from the tap water at Abule Ado and underground water at Alape with Avenue/Iba area, in which the parameters are within the WHO and NIS limit. All other ones are above the limit electrical conductivity, which is a measure of the ionic richness of the water bodies, ranged between 61.8 and 758μcm/s. These values are typical of freshwater bodies. The project area is blessed with potable underground water, apart from Abule Ado with tap water of pH 4.73.

Also, there is a high level of dissolved oxygen (DO=2.4 and 6.5 ppm). The concentration of heavy metals in the waters, especially pollution indicators Hg, Cr, Ag, Pb, Ni, and V, are very low or below detectable limits, i.e., NIS, WHO & FMENV limits.

Ecology: Planktons: Sixty-eight taxa of phytoplankton belonging to three divisions, namely bacillariophyta or Chatom, cyanoplyta or blue-green algae, and chlophyta or green algae, were identified during the studies. The diatoms comprised the bulk of the flora with 51.5%, followed by chlorophyta with 33.8%, cyano plyta constituted 14.7%. The blue-greens occurred in a few sampling stations.

Fish and Fisheries: A fish study was conducted on fishes obtained from rivers along the proposed rehabilitation routes and through interviews and literature. Generally, there were more fish during the wet season compared to the dry season. The fishing gears commonly used include cast nets, set nets, drift nets, gill nets, and hook online, as well as fish fence. Fishing activities are carried out mostly in the early mornings and evenings, usually by migrant fishermen and a few indigenes.

Biological (Flora and Fauna): It is accepted that emissions majorly affect the plants and animals' species and this result in the movement of animals from the discomforting source; while plants will have to respond physiologically to pollution by damaging their tissues and sometime even kill them.

In the operation phase, the effects on floral will be basically from NO_2 emissions. NO_2 emissions were found to be causing discoloration in plant leaves. The loss of carotene and reduction of chlorophyll are the major response from plant exposed to NO_2 emissions.

Eco Systems: Impacts of road construction on the ecosystem will be high since there will be

1. Removal or interference with prey of predatory animals.
2. Waste water discharge to receiving bodies.
3. Significant siltation from run-off altering aquatic and more flora and fauna population.
4. Noise disrupting breeding behavior or use of breeding grounds, resulting in shifts in population dynamics and removal of predatory animals resulting in the population decrease

Community Health Status:

The common ailments reported are malaria, typhoid fever, coughs, and waterborne diseases, e.g. diarrhea, cholera, and guinea worm. Health facilities prevalent in the project area include patent medicine stores and local herbal dispensaries.

Terms of Reference/Scope of Work

The Terms of Reference for the study given are highlighted:

1. Description and qualification of the effects of the project on natural resources and the human environment, as well as atmospheric pollution from construction activities.
2. Assessment of vegetation loss and agricultural land.
3. Assessment of the areas and land use of particular values, including residential and agricultural land, nature conservation areas, forests, and other important national resources, cultural, historical, archaeological, and grave sites, population of flora and fauna, and the encroachment of flora and fauna on such construction activities and works.

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4. Assessment of indirect impact on agriculture and forestry, particularly the utilization of firewood and water resources.

5. Assessment of impacts due to construction and maintenance, especially the pollution of ground and surface water and drainage.

6. Assessment of effects on land resources.

7. Assessment of hydrological effects.

8. Assessment of all social issues, including legal implications, for example, compensation for involuntary displacement, agricultural land loss, housing, grazing land, etc.

9. Assessment of effects on wildlife.

10. Assessment of the impact on tourism on the project.

The study is divided into four major components as follows:

1. Hydrological, water quality, and fisheries aspects.
2. Agriculture, soil quality, and wildlife aspects.
3. Waste management and human health.
4. Socio-economic and cultural aspects.

Consultation

Several consultations were conducted at the various sites with stakeholders, including leaders' social groups and youth leaders of each community. The socio-economic benefits were appreciated, as well as the possible reduction in accident rates.

Conclusion

Eventually, the EIA shows that there are none of the significant potential impacts identified that cannot be adequately managed and mitigated. An environmental management plan is required for effective mitigation of the potential impacts following the conduct.

Map of the proposed road project

Environmental Impact Assessment for Road Project Background

Like people, most organizations are heavily dependent on roads to distribute their goods and to carry their executives and salespeople. Yet, though once seen as the engine of progress, roads are facing increasing critics in the world. Impact due to construction of roads includes the noise and dust from construction, the use of non-renewable aggregates, the loss of natural habitats and green space, and an increase in traffic (with all its impacts). The best practice is to undertake an Environmental Impact Assessment (EIA) before the road is designed.

Environmental Impact Assessment (EIA) is defined as the process of examining the environmental effects of the development from consideration of the environmental aspects at the design stage, through to the preparation of an Environmental Impacts Statement, evaluation of the Environmental Impact Studies (EIS) by a competent authority, and subsequent decision as to whether the development should be permitted to proceed, also encompassing public response to that decision. The EIA methodology promotes practical and dynamic processes of environmental protection that allow significant adverse impacts to be avoided or mitigated throughout the entire planning and design process. Road planning and design is an iterative process where planning and design evolve in response to environmental and other considerations. This ensures that environmental considerations become an integral part of the overall route corridor selection and road scheme planning and design process.

Anticipated Impacts Due to Road Construction Project: This construction is bound to encroach on precious ecology. The proposed routing of the road project encroaches upon precious ecological resources, including forests and swamps. This also disturbs the natural habitats of many creatures and animals living in the encroached lane. Ecological disturbance is likely to occur. The construction activities will drive some wildlife away from their habitats, particularly migratory birds. The Construction will last for quite a long time (1-3 years) and many migratory birds within about 500 m of the proposed roads will leave their currently roosting feeding places and move away. During road construction, the vegetation on the acquired land will be destroyed, and the local ecosystem will change. In addition, the destruction and fragmentation effect of the road construction may diminish the habitats for some animal species, so there may not be enough roosting places for them to survive. During

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operation, the traffic noise, traffic lights at night, and vehicle emissions will cause some adverse impacts on the wildlife around the road.

Adverse Impacts on Historical/Cultural Monuments: The nearby structures to the road construction will be adversely affected due to the pollution and environmental disturbances created by the project. During the construction phase, a huge amount of carbon dioxide (CO_2) and carbon monoxide (CO) gases are going to be released into the atmosphere. The gas poses a threat to ancient monuments as they are made up of lime which reacts with these gases in the presence of water/moisture.

Impairment of Fisheries/Aquatic Ecology and Other Beneficial Water Use: The water bodies like lakes, ponds, or rivers which are close to the highway site get affected by the construction activity. The workers and staff living near to the Road Project Construction site use the water from these water bodies and in turn pollute them causing harm to aquatic ecology. The rainwater may wash away the chemicals and other hazardous products to the water body affecting its oxygen content. This will lead to the impairment of fisheries.

Table1: Checklist for Environmental Parameters for Highway Projects

Таблица 1: Контрольный список экологических параметров для проектов строительства автомагистралей

Actions Affecting Resources and Values	Damage to Environment	Recommended Feasible Protection Measures	No Significant Effect	Significant Effect	Major
Encroachment on precious ecology	Loss to precious ecology	Careful planning to minimize and offset losses		Yes	
Importance of fisheries/aquatic ecology of other beneficial uses	Important downstream beneficial water uses	Careful planning to minimize and offset losses		Yes	
Erosion and siltation	Excessive soil erosion and important of dam stream	Careful resurfacing or relocating of exposed area			Yes
Environmental aesthetics	Water quality loss of scenic values	Careful planning to minimize and offset		Yes	
Noise and vibrations	Nuisances to travelers and neighbors	Losses careful planning to minimize and offset losses		Yes	
Air pollution hazard	Nuisance to travelers and workers	Control of motor vehicle emission		Yes	
Highway run off pollution	Loss of ecology	Careful planning to minimize and offset losses	Yes		
Highway spills of hazardous material	Serious health/safety hazards travelers and neighbors	Careful planning and important emergency clean up		Yes	

Water Quality: The project will involve the construction of small and long bridges, which will be built with hollow piers and deep foundations with bored piles. The pile drilling operation will generate a great amount of spoil water and surface runoff from highways may contain sufficient petroleum drops plus spilled materials (including toxic and hazardous materials) which can adversely affect aquatic ecology and environmental aesthetics. The project will also disrupt some existing irrigation systems,

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particularly in the plain areas where the road will be constructed on filled up embankments. This fragmentation will also affect the existing flood relief channels and natural drainage of the area.

Land Acquisition: This results in the loss of agricultural products due to farm land decrease. Extra land is needed during the construction period for temporary use (construction camp sites, staging areas, access roads, borrow and spoil sites etc). Some buildings will be demolished and wire poles will be removed, so small enterprises may be displaced.

Environmental Examination Report: The following checklist is used to analyze the severity of the project on different environmental parameters like ecological disturbance, aquatic ecology, etc. The effect on the environment is rated according to the severity of impact, i.e., small, moderate, major. Based on the prepared checklist, the report is prepared to analyze the impact on the environment.

Project Benefits

There are tangible benefits, some of which are listed below:

- Reduce the operating cost of transportation by improving the quality of the road.
- Reduce journey time by minimizing congestion on major roads within the Ojo/Badagry axis and Isheri/Isolo axis.
- Improve drainage and raise road levels. Provide route options to achieve better traffic distribution.
- Minimize annual road maintenance costs.
- Minimize the environmental impact from road improvement works.

Project Life Cycle

The project will go through conceptual/design stages in which the outputs of the Environmental Impact Assessment (EIA) will be used to improve the final design for sustainable development. During the construction and operational phases, any negative environmental impacts identified in this EIA and documented in the Environmental Management Plan will be addressed. At the end of the project's lifespan, a decommissioning plan will be developed.

Description of the Proposed Road

Project cut across Ijegun-Ije Ododo-Abule Ado in Ojo local government area of Lagos State, Nigeria. The proposed road will provide a direct link for commuters operating between Ijegun/Ikotun with Lagos Badagry expressway without having to pass through the dreaded traffic congestion along LASU-Iba road.

Type of Project

Dual carriageway/New 4-lane divided highway road construction linking Ijegun with Abule Ado/Lagos Badagry expressway. Design Standard. The project is in line with the Federal Ministry of Works and British standards for the design of Bridges and drainage structures. The design of the road is to complement other roads in existence such as Ikotun-Ijegun-Jakande-Estate-Isolo-road, Pipeline, and Abule-Ado.

Planned Project Activities

The project activities include those during the pre-construction phase like setting up servitudes and site camps before construction, Construction and operational phases of the proposed road project in which each activity has potential impacts on the environment.

Pre-Construction Phase

Surveying: All sections of the proposed road have been surveyed in detail.

Search and Rescue: Any species of flora of high conservation status within these servitudes is expected to be removed by the environmental site officer and stored for transplantation.

Clearing and Grubbing: The removal of all vegetation and topsoil in preparation of stable foundations for new construction works as well as along proposed access routes and in areas set aside for construction camps.

Topsoil Stripping: Topsoil within the servitudes will be stripped and stockpiled or removed.

Access Road Construction: This will involve the construction of the various roads required to access the construction areas, construction camps, and other surface infrastructure sites.

Transport of Materials to Site Road: Materials sourced outside of the study area will be transported to the servitude by road. The existing Lasu-Iba secondary road and farm roads will be utilized as a means of delivering these materials to the site, with potential impacts on the transport infrastructure and road

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users in the region. Establishment of Construction Camps: Construction of temporary camps: These will be established by the contractor and involve clearing of the vegetation, fencing of camps, and construction of houses, workshops, store-rooms, and vehicle parking areas.

The camp is expected to be electrified and provided with potable water. The exact number and location of these camps have not been determined yet. An Environmental Management Plan (EMP) will be compiled as part of the EIA which will describe parameters such as the following.

1. The contractor will provide a plan detailing the layout of site facilities, such as chemical toilets, areas for stockpiles for concrete materials. This will comprise side-restrained triangular bin-type structures. Bund walls will be constructed with high-quality materials and low dust-generating characteristics will be used.
2. Hazardous waste such as bitumen, tar, oils, etc will be disposed of at an approved disposal site as well as a landfill site. Special care will be taken to avoid spillage of tar products such as tar prime or pre-coating fluid to prevent water-soluble phenols from entering the ground or contacting underground water. All hazardous materials i.e bitumen binders will be stored in a secured, appointed area that is fenced and has restricted entry. Suitable containers will be used for storage of bituminous products.
3. Fuel and gas will be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. Fuel storage will generally occur in the workshop areas of the site camps, which are generally fenced and paved bund walls will be built around an impermeable wall stream. A mobile tanker will be used to refuel vehicles on site.
4. Domestic waste will be collected in drums and removed to the nearest municipal waste site for disposal.
5. Suitable washing facilities and sanitary arrangements at site offices, workshops, and construction sites will be provided. Sanitary facilities for the site camps will comprise either pre-fabricated septic tanks or stands.

Establishment of Crusher Plants

During the detailed assessment stage, the Design Consultants identified the possible need for a crusher plant to crush rock, obtained from road cuttings to be used for the construction of pavement layers. The inclusion of crusher plants will form part of each contractor's financial proposal during the tender stage. The responsibility for the establishment and operation of the crusher plants will be that of the contractor, who will be required to follow the environmental and mining guidelines and regulations.

Earthworks: Clearing of vegetation: Vegetation along the route will be cleared and grubbed.

Cuttings: Cuttings will be intimated using bulldozers and backhoes to remove the soft material.

Blasting: Drilling and blasting will occur where rock is encountered that cannot be ripped. These activities will be strictly controlled. The appointed contractor is responsible for property protection.

Road Construction: Road construction activities such as earth works, the construction pavement layers, surface drainage structures and bridge structures and ancillary works are foreseen for this project. The construction work will be carried out in accordance with the Federal Ministry of Works Standard & Specifications for road and bridge works.

Site Removal and Rehabilitation: Site removal encompasses the removal of all building materials, temporary structures and any other waste material generated during construction. All such material must be removed from site and disposed of appropriately once construction is completed. The following will be removed from site where necessary infrastructure such as storage structures, accommodation structures and workshops may be left on site for the benefit of the natives concerned.

- Storage structures.
- All construction material, including concrete slabs.
- Accommodation structures.
- Workshop structures.
- Waste material generated by the work force and during construction.
- Extra construction material not used or needed on site.
- Stripped vegetation
- Stock piled topsoil
- Rock and other material generated during construction e.g. during blasting and excavations which cannot be utilized on site.

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Technical Process Followed During the Scoping Phase (EIA)

This chapter outlines the broad technical and public participation processes followed during this environmental assessment.

The EIA is part of the feasibility study of the proposed road project. The findings of the EIA will also assist the Engineering Design team in taking into consideration potential environmental impacts. During the scoping phase the technical assessment focuses on identifying issues of concern. These will be taken into consideration during the impact assessment phase. The following has been carried out.

1. A review of the proposed project and available information by the Consultant.
2. Meeting with the consultant/Design Engineers.
3. A biophysical assessment of the route by Technical Specialists.
4. A draft scoping report and summary report given to the consultant has to be distributed to the stake holders.

Biophysical Assessment

The biophysical assessment covered the entire route and was a key component in the identification of technical issues. The route was divided into five sections commencing at Ijegun Ijedododo and ending at Abule Ado along Badagry express way. The assessments consist of:

1. Walking the uncultivated areas of the proposed road project and identifying all floras in order to establish the condition of vegetation and ascertain sensitive areas such as wet lands, rivers, and streams.
2. Identifying any restricted access areas to provide land owners with alternatives.
3. Recording all possible fauna and flora observed during the site visits in order to compile species checklists. Also Photographing and collection examples of unidentifiable plant species for positive identification at a later stage during the report written.

The sensitivity of each of the five sections of the route was assessed as follows:

Areas of High Sensitivity

1. Abule Ado grass land: Undisturbed veld, dominated by climax grasses such as Themedia trandra.
2. Wetland areas (including stream courses) characterized by features such as seepage slopes, sedges, bird life and heavy soils. These areas carry out important water conservation functions.
3. Unique/isolated habitats; these may include isolated koppies and cliffs, which may provide habitats for fauna and flora in disturbed landscapes.
4. Inhabited areas (homesteads), which may be intruded upon by the proposed road.
5. Potential mineral extraction areas.
6. High agricultural potential areas such as areas with good soils.
7. Economically viable production areas, where the proposed road's sub division of fields would result in the areas becoming uneconomical.

Areas of Low Sensitivity

Disturbed grass land and old cultivated lands; veld which has been heavily grazed or previously cultivated and which generally shows a change in species composition. The species composition mix includes grasses such as evagrosits, chloromelas, and lynodan dactylon, amongst stand of the original themeda triancha

1.Road side verges: grass land in the road reserve that has been disturbed by previous road construction and is degraded. This is characteristics by plant species such as pridens pilosa, priden Formosa, tagetes minutia, and varias thatching grass species.

2. Cultivate pastures. Cultivated areas specifically for grazing purposes. These are characterized by stands of Evagrostis curvala and Cynodon dactylon.

3. Fallow lands: Previously cultivated but not presently under cultivation Public Participation Process Followed During the Scoping Exercise

These include provision of sufficient and transparent information on regular basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantage people, especially woman and the youth.

Objective of Public Participation Process

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The public participation process is designed to provide sufficient, accessible and objective information to interested and affected parties (I & APS) or stake holders to assist them to participate.

During the Scoping Phase they are expected to:

1. Raise issues of concern and suggestions for enhanced benefits.
2. Verify that their issues have been captured

During: The Impact Assessment Phase, They Should:

Verify that their issues have been considered by technical investigations and Comment on the findings of the EIA.

The public participation process and approximate scheduling are summarized below:

1. Local Government Authority.
2. Agriculture including local land areas.
3. Industry mining and commerce in the areas.
4. Labour unions and the unemployed.

Local grouping in the vicinity, including mosques groups, church groups, women's groups, schools, voluntary associations and others.

Announcing the Opportunity to Participate

The opportunity for stakeholder to participate in the EIA was announced as follows

1. Several hundred copies of a booklet page Background Information Document (BID) were distributed to stakeholders in the areas. The document, outlined the proposed project, and environmental assessment, and listed potential issues of concern. These documents were also left in various public places such as local government secretariats and council offices.
2. More than 100 stakeholders received a letter of invitation to comment.
3. More than 200 telephone calls were made to stakeholders in the areas to advise them of the opportunity to comment. And to arrange meetings.

Description of Receiving Environment Physical Characteristics:

Climate: Rainfall in the area varies between 650 and 750mm per annum. The average is 719mm. Most rainfalls in the rainy season months between October and March are heavy falls commonly associated with thunder storms.

The average wind direction is North (N) to North -East (NE) while monthly temperature varies between 240C and 330C while the average temperature is 27.250C.

Hydrogeology Geology:

The predominant geology within the project area is that of the sandy loamy soil group with minor intrusions of granophyte, felsites and pyroclasts. The area is also intended with dolomite.

The geology of the proposed 19km road between Abule Ado, Ijegun Ijeododo, and Ijegun Ijagemo Alape/Befun station is under lane by rocks of super group comprising mainly dolente with mud rock and sand stone of the Ecca group occasionally occurring in places.

Soils: The physicochemical properties of the soils revealed that the soil is slightly basic with pH range between 8.14-8.64 in the surface and lower depth of about 5m with Electrical Conductivity of (123.0 – 488/µs/cm) and Total Organic Matter (TOC) ranging from (0.11-0.31%). The content of available anions and cations are moderate and within the NESREA specification. e.g. Exchangeable Cation, Nitrate Sulphite e.tc. The Mn^{2t} and Fe^{2t} ions contents were very high while zinc and chromium (Zn^{2+} & Cr^{3+}) which were minor elements had relatively low concentration. The other assayed heavy metals occurred in trace amounts and below recommended limits by NIS and FMEV set standard as indicated in Tables 2 and 3 below.

Air Quality: The ambient air concentrations of carbon monoxide (CO), nitrogen dioxide (NO2), hydrogen sulfide (H2S), oxygen (O2), ammonia (NH3), noise level, and suspended particulate matter (SPM) were measured using a sound level meter with model No. 2308i and a GPS map plotting receiver moiety detector for gases. A handheld laser particle counter with model 3887 was also used. The results obtained indicate that the environment is not polluted, except for a recorded NO2 level of 0.03 at the Ijegun Ijedodo axis, which accounts for the yellowish color of vegetation in the area. Methane emissions ranging between 11.0% and 11.79% were also detected from the swampy area. A summary of the findings of ambient air quality measurements taken for the project area is presented in Table 4 below.

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Table 2. Physico-chemical parameters of soil samples
Таблица 2. Физико-химические параметры образцов почвы

Parameters	Ijegun Ododo	Abule Ado	Abule Ado 5ft	B3 Top	6T Top Canoe Side
pH	8.14	8.64	8.40	8.49	8.40
Conductivity (μScm^{-1})	234.0	488.0	205.0	281.0	123.0
TOC (%)	0.21	0.31	0.22	0.14	0.11
THC (mg/kg)	ND	ND	ND	ND	ND
Oil & Grease (mg/kg)	ND	ND	ND	ND	ND
SO42- (mg/kg)	160.0	140.0	80.0	40.0	36.70
PO43- (mg/kg)	66.0	57.50	69.0	36.0	22.40
Temperature (°C)	27.1	27.1	27.0	27.2	27.0
NO3- (mg/kg)	52.70	32.40	40.20	33.20	23.40
Cl^- (mg/kg)	800.0	612.0	400.0	350.0	270.0
Exchangeable cations (mq/100g)					
Na^+	3.48	3.12	1.74	1.44	1.56
Ca2+	6.70	4.42	2.44	3.50	2.67
K+	1.62	1.14	0.96	1.66	1.57
Mg2+	3.33	2.72	1.67	2.20	1.66

**ND = Not Detected*

Table 3: Metals of soil samples
Таблица 3: Металлы в образцах почвы

Parameters	Ijegun Ododo	Abule Ado T	Abule Ado 5m	B3 Top	6T Top canoe side
Fe (mg/kg)	2.25	2.14	4.46	3.10	3.98
Zn (mg/kg)	0.28	0.39	0.28	0.44	0.32
Pb (mg/kg)	0.03	ND	ND	0.04	ND
Mn (mg/kg)	0.24	0.26	0.28	0.22	0.32
Cu (mg/kg)	0.18	0.17	0.13	0.11	0.20
Cr (mg/kg)	0.22	0.05	0.05	0.01	0.04
Ni (mg/kg)	0.23	0.04	0.01	0.03	0.02
Hg (mg/kg)	ND	ND	ND	ND	ND
As (mg/kg)	ND	ND	ND	ND	ND
V (mg/kg)	ND	ND	ND	ND	ND

**ND = Not Detected.*

Table 4: Air quality characteristics of the project area
Таблица 4: Характеристики качества воздуха в районе реализации проекта

Sampling point	CO (ppm)	NO (ppm)	H_2S (ppm)	O_2 (ppm)	NH_3 (ppm)	Noise level (dB)A	CH_4	SPM
Ijegun Ijedodo	0.00	0.03	0.00	20.10	0.00	57.00	11%	5.7×10^7 m²
Ijegun Ijagemo	0.00	0.0	0.00	20.20	0.00	53.50	11%	5.0×10^7 m²
Befun	0.00	0.0	0.00	20.70	0.00	35.90	11.5%	5.5×10^7 m²
Alape/ Arandun	0.00	0.0	0.00	20.20	0.00	60.00	11.5%	4.7×10^7 m²
Abule/Ado	0.00	0.0	0.00	20.90	0.00	72.50	11.79	5.0×10^7 m²

Water Quality: The water temperature during sampling varied between 28-80°C and 32.6°C. The conductivity of water, which is a reflection of the low total dissolved solids content, varied between 100 ppm and 518 ppm (Befun and Abule Ado water). The poor ionic contents of the water samples were probably responsible for the low conductivity.

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As expected, the dissolved oxygen (DO) content of surface water was higher than that of boreholes and bore wells of the samples, respectively, because of the high rate of turbulence and atmospheric dissolution at the air-water interface.

The levels of the biogenic cations and those of some heavy metals in the water samples collected along the proposed road project axis, i.e. Magnesium (Mg^{2+}), ranged between 0.01 ppm and 0.09 ppm. In the water sample collected from most locations, measurements taken for the project area are presented in tables 5, 6, 7, 8, and 9 below:

Table 5: Physicochemical and microbiological analysis of water samples
Таблица 5: Физико-химический и микробиологический анализ проб воды

Locations	pH	Turbidity	Alkalinity	Hardness	Chloride
TAA	4.73	0.1 NTU	58 ppm	50 ppm	0.22 ppm
RAA	7.8	20.0 NTU	155 ppm	106 ppm	0.16 ppm
WAA	7.46	4.0 NTU	309 ppm	144 ppm	0.36 ppm
SJD	6.7	42 NTU	220 ppm	210 ppm	0.06 ppm
WIID	6.9	3.0 NTU	95 ppm	180 ppm	0.03 ppm
WIIG	8.2	2.8 NTU	156 ppm	149 ppm	0.56 ppm
SIIG	7.7	30.0 NTU	150 ppm	115 ppm	0.08 ppm
RIIG	8.2	25 NTU	154 ppm	80 ppm	0.1 ppm
RIIG	7.5	30 NTU	106 ppm	128 ppm	0.05 ppm
WCS/A	6.8	2.0 NTU	75 ppm	200 ppm	0.03 ppm
SCS/A	7.0	18 NTU	130 ppm	320 ppm	0.04 ppm
RCS/A	6.9	28 NTU	106 ppm	154 ppm	0.03 ppm
RWB	7.4	60 NTU	106 ppm	154 ppm	0.09 ppm
WWB	7.9	0.5 NTU	59 ppm	50 ppm	0.26 ppm
SWB	7.2	4.5 NTU	45 ppm	160 ppm	0.07 ppm

**ND =Not Detected*

Table 6: Physicochemical and microbiological analysis of water samples (continued)
Таблица 6: Физико-химический и микробиологический анализ проб воды, продолжение

Locations	Sulphate	Nitrate	Dissolved Oxygen	Total Dissolved solid	Chromium
TAA	ND	0.2 ppm	4 ppm	307 ppm	ND
RAA	45 ppm	1.5 ppm	5.0 ppm	22.0 ppm	ND
WAA	16 ppm	ND	2.0 ppm	418 ppm	ND
SIID	6.0 ppm	4.0 ppm	3.5 ppm	8.9 ppm	ND
WIID	48.0 ppm	ND	2.5 ppm	41.0 ppm	ND
WIIG	56.0 ppm	1.25 ppm	2.0 ppm	787 ppm	ND
SIIG	52.0 ppm	80.0 ppm	4.5 ppm	118 ppm	ND
RIIG1	21.0 ppm	0.16 ppm	0.12 ppm	224 ppm	ND
RIIG2	57.0 ppm	58.0 ppm	3.2 ppm	77.8 ppm	ND
WCS/A	5.00 ppm	0.01 ppm	1.4 ppm	38.0 ppm	ND
SCS/A	55.0 ppm	1.70 ppm	4.2 ppm	39.0 ppm	ND
RCS/A	5.0 ppm	0.3 ppm	2.2 ppm	475.0 ppm	ND
RWB	ND	0.05 ppm	1.9 ppm	123 ppm	ND
WWB	31.0 ppm	7.0 ppm	2.0 ppm	366 ppm	ND
SWB	3.5 ppm	7.1 ppm	4.0 ppm	100 ppm	ND

**ND =Not Detected*

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Table 7: Physicochemical and microbiological analysis of water samples (continued)
Таблица 7: Физико-химический и микробиологический анализ проб воды, продолжение

Locations	Arsenic	Lead	Nickel	Cadmium	Phenolic
TAA	0.00 ppm	ND	ND	0.04 ppm	0.19 ppm
RAA	0.031 ppm	0.014 ppm	0.04 ppm	0.05 ppm	0.12 ppm
WAA	0.39 ppm	ND	ND	0.02 ppm	0.59 ppm
SIID	0.011 ppm	0.005 ppm	0.05 ppm	0.01 ppm	0.022 ppm
WIID	0.29 ppm	ND	ND	0.02 ppm	0.145 ppm
WIIG	0.08 ppm	0.67 ppm	0.67 ppm	0.01 ppm	0.406 ppm
SIIG	ND	0.27 ppm	0.19 ppm	0.19 ppm	ND
RIIG	0.03 ppm	0.07 ppm	0.07 ppm	0.14 ppm	ND
RIIG	ND	0.15 ppm	0.15 ppm	0.23 ppm	ND
WCS/A	0.21 ppm	0.04 ppm	0.04 ppm	0.11 ppm	ND
SCS/A	ND	0.21 ppm	0.04 ppm	0.02 ppm	ND
RCS/A	ND	0.09 ppm	0.05 ppm	0.01 ppm	ND
RWB	0.007 ppm	0.08 ppm	0.06 ppm	0.03 ppm	ND
WWB	0.04 ppm	0.04 ppm	0.06 ppm	0.27 ppm	ND
SWB	0.01 ppm	0.02 ppm	0.04 ppm	0.15 ppm	ND

ND =Not Detected

Table 8: Physicochemical and microbiological analysis of water samples (continued)
Таблица 8: Физико-химический и микробиологический анализ проб воды, продолжение

Locations	Total iron	Copper	Carbonate	Calcium	Magnesium
TAA	ND	0.21 ppm	110 ppm	0.02 ppm	0.3 ppm
RAA	ND	0.015 ppm	204 ppm	0.31 ppm	0.02 ppm
WAA	ND	0.20 ppm	315 ppm	0.21 ppm	0.05 ppm
SIID	ND	0.05 ppm	406 ppm	0.31 ppm	0.02 ppm
WIID	ND	0.142 ppm	303 ppm	0.21 ppm	0.04 ppm
WIIG	ND	0.13 ppm	98.0 ppm	0.20 ppm	0.03 ppm
SIIG	ND	0.03 ppm	68.0 ppm	0.15 ppm	0.06 ppm
RIIG	ND	0.7 ppm	32.0 ppm	0.04 ppm	0.02 ppm
RIIG	ND	0.02 ppm	30.0 ppm	0.02 ppm	0.05 ppm
WCS/A	ND	0.01 ppm	67.0 ppm	0.16 ppm	0.04 ppm
SCS/A	ND	0.04 ppm	26.0 ppm	0.19 ppm	0.09 ppm
RCS/A	ND	0.02 ppm	23.0 ppm	0.16 ppm	0.07 ppm
RWB	ND	0.03 ppm	21.0 ppm	0.02 ppm	0.03 ppm
WWB	ND	0.03 ppm	41.0 ppm	0.30 ppm	0.03 ppm
SWB	ND	0.07 ppm	70.0 ppm	0.08 ppm	0.01 ppm

ND =Not Detected

Fauna and Flora

A large proportion of the original grassland cover in the area has been lost through agricultural development. Good areas of natural veld are dominated by Mangifera indica (mango), Alchornea spp (Christians bush), Raphia hooken (Rafia), Elaeis gaineers (oil palm), Alstoma boonei (alstonia), manihot esculenta (cassava), and Chrmolaena odorata (Awolowo/Akintola). In some parts of the road project, small wetlands occur. The condition of the plant counties in these areas varies. Nevertheless, these moist

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plant counties continue to play a valuable role in the local ecology, acting as a buffer between the dry scope counties and the water course and slowing the loss of water from the system.

There are a number of old lands and fallow lands within the footprint of the new road. These previously disturbed areas are dominated by opportunistic weeds and grasses. In areas of good quality veld, there is considerable evidence of small mammals' activities, and at certain times of the year, vulnerable species of birds including blue crane, bald Ibis, and blue korhaa may be found in the area.

Table 9: Physicochemical and microbiological analysis of water samples (continued)
Таблица 9: Физико-химический и микробиологический анализ проб воды, продолжение

Locations	Manganese	Sodium	Aluminum	MPN	Odour
TAA	0.02 ppm	ND	0.02 ppm	1800 cfu	Unobjectionable
RAA	ND	ND	ND	440 cfu	Objectionable
WAA	ND	ND	ND	73 cfu	Unobjectionable
SIID	ND	ND	ND	11 cfu	Objectionable
WIID	ND	ND	ND	92 cfu	Unobjectionable
WIIG	ND	ND	ND	180 cfu	Unobjectionable
SIIG	ND	ND	ND	320 cfu	Objectionable
RIIG	ND	ND	ND	110 cfu	Objectionable
RIIG	ND	ND	ND	32 cfu	Objectionable
WCS/A	ND	ND	ND	400 cfu	Unobjectionable
SCS/A	ND	ND	ND	210 cfu	Objectionable
RCS/A	ND	ND	ND	200 cfu	Objectionable
RWB	ND	ND	ND	120 cfu	Objectionable
WWB	ND	ND	ND	140 cfu	Unobjectionable
SWB	ND	ND	ND	150 cfu	Objectionable

ND =Not Detected

Table 10: Metals of plant samples
Таблица 10: Металлы в образцах растений

Parameters	K1	K2	K3	K4
Fe (mg/kg)	2.73	3.78	3.90	3.51
Zn (mg/kg)	0.70	0.56	0.59	0.49
Pb (mg/kg)	ND	0.03	ND	ND
Mn (mg/kg)	0.24	0.29	0.37	0.24
Cu (mg/kg)	0.23	0.23	0.13	0.18
Cr (mg/kg)	0.01	0.02	ND	0.03
Ni (mg/kg)	0.03	0.01	0.05	0.22
Hg (mg/kg)	ND	ND	ND	ND
As (mg/kg)	ND	ND	ND	ND
V (mg/kg)	ND	ND	ND	ND

ND =Not Detected

Waste Management

The waste stream encountered in the project area comprises both biodegradable and non-biodegradable products. The biodegradable waste includes domestic waste, vegetable matter, food remnants, electronic waste, demolition waste, and other assorted organic materials. Waste is also generated by craftsmen engaged in various trades. The non-biodegradable waste includes plastics, glass, scraps, and scraps of vehicles that are involved in accidents due to the unavailability of good roads.

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Socio Economic Issues

Most farmsteads along the route, particularly the stretch between Abule Ado and Ijegun Ijeododo, are isolated, making them vulnerable to criminal activities, especially after dark. The security of people is particularly important when considering road development.

Soil, Agriculture and Wildlife Aspects

Introduction

Nigeria's efforts since independence in 1960 have been to develop the road sector to overcome human and material loss on our highways. These efforts, demonstrated by numbers of policies, programs, and projects, were intensified in the seventies and early eighties, and more vigorously in the last six years of this administration, owing to the worsening performance of our road sector.

Road development will continue to play a vital role now and in the future for the development of Nigeria, much more so as the country strives for the development of the rural area and agricultural production. Environmental issues, though not pursued to any significant extent in the past, have not been overlooked by road development, especially the dualisation of roads. The very recent focus on environmental impact assessment of road development projects is indeed a welcome departure from the previous practice of neglect, which has given rise to serious ecological problems such as erosion, siltation, and diseases in many of the existing road projects. The need to pay attention to the study of the ecological consequences of road development activity is to avert costly disasters. The establishment of new projects must be based on "preventive planning" as a way of avoiding undesired consequences. Preventive planning involves the incorporation into a plan of all foreseeable consequences - environmental, economic, and social - of development activity. This section, therefore, deals with the soil, agriculture, and wildlife aspects of impact assessment.

Scope of the study

The broad objectives of the study are to:

(i) Identify the present and potential environmental risks and problems that are associated or are likely to be associated with the proposed road dualisation project.

(ii)Articulate actions or controls to prevent or eradicate them; and

(iii) Draw up plans for monitoring further environmental changes contingent upon the operation and maintenance of the road project.

Methodology

Soil, Agriculture, and Wildlife Aspect

Three approaches were adopted in the field study, namely:

(i) Interview with farmers and communities in the area under investigation using questionnaires;

(ii)Discussions with corporate agricultural agencies operating in the general area; and

(iii) Direct field investigations of the effects of the road dualisation on the resources of the area, including soils, water, animals, plants, and people. Interviews with farmers and communities were conducted in selected villages.

(iv) Field investigations included the documentation of land use types and spatial relationships, observations of erosion, flooding, or waterlogging conditions in fields proximate to the villages visited and elsewhere in selected sample areas. Observation, with sampling, of surface water conditions within areas, investigating salt pollution (e.g. salinization, sodicity, eutrophication, etc.) in soil and surface water arising from the emission of gases from vehicles or road users.

Wildlife Aspect

Questionnaires were administered to individuals and communities in villages visited. Among the individuals interviewed were farmers who frequently set traps for games. The professional hunters were difficult to come by in the area since 98% of the communities visited are either businessmen or fishermen. Included also were people that rear livestock at home. In addition to the use of questionnaires, field observations of wildlife species, including mammalian fauna and avifauna species in general, and granivorous and rodent pests in particular, were carried out in selected representative ecological zones in the project area. The stratified sampling technique was adopted for the observations. The species of livestock grazing habits, ectoparasites, and diseases were investigated by the rapid rural appraisal method. The forest reserves in the area were visited, and records were made regarding their nature, wildlife sanctuary capacity, present and potential impacts of irrigation on them.

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Impact and consequences on Soils

Soil, as a primary medium for biological and human activities, is an important component of the natural environment. Soil protection in relation to road development deserves considerable attention.

Type of impact

(i) Erosion: When natural conditions are modified by the construction of a road, it marks the start of a race between the appearance of erosion and the growth of vegetation. Distribution during construction can upset the balance between stabilizing factors, such as vegetation, and others which seek to destabilize, such as running water. Slope stability can be upset by the creation of road cuts or embankments.

(ii)Loss of Productive Soil: The most immediate and obvious effect of road development on soil is the elimination of the productive capacity of the soil covered by roads. Unfortunately, the best sites for road development also tend to be ideal for agriculture. The narrow, linear character of roads makes the impacts of loss of land seems minimal, but when the width of the right-of-way is multiplied by its length, the removal of productive soil from the local economy can have socio-economic implications as well as habitat implications for flora and fauna. Soil productivity can also be reduced as a result of compaction with heavy machinery during construction.

(III) Contamination of soil: Soil contamination can arise from daily traffic operation on very busy roads. Metals such as chromium, lead, and zinc remain in the soil for hundreds of years. Pollutants settling in road- side soil can impair the growth of vegetation and the workings of soil organism thereby increasing the likelihood of erosion

(1V) Cumulative Impacts: Cumulative impacts involving soil damage many affect many aspects of the environment. Development of a road could encourage bush fires and deforestation, which in turn, could lead to erosion of bare slopes, re-channeling of rivers and streams and possibly minor landslides.

Prevention of Impacts: The likelihood of serious environmental impacts on soil as a result of dualisation of road projects can be reduced by:

1. Minimizing the area of ground clearance
2. Avoiding sensitive alignments, such as those, which include steep hillsides.
3. Avoiding previously contaminated sites.
4. Avoiding the creation of cut slopes and embankments which are of an angle greater than the natural angle of repose for the local soil type.
5. Balancing filling and cutting requirements through route choice, so as to avoid the Production of excess spoil material and reduce the need for borrow pits.
6. Replanting distorted areas immediately after disturbance has stopped, not after Construction has been completed.

Impact mitigating measures

There are measures designed to reduce to the risk of damaging the soil and to fit the project into its environment with minimal adverse effects.

Simple measures: (Replanting)

Replanting cleared areas and slopes is the most effective action to be taken in reducing erosion and stability problems. It should be undertaken as early as possible during the construction process, before erosion becomes too advanced. To be most effective, it should be done immediately after the disturbance takes place. Vegetation should be selected to serve a specific engineering function. Engineering functions of vegetation includes its abilities to

(i) Catch and retain material moving over the surface,

(ii)Map out the surface against erosion and abrasion by intercepting raindrops

(iii) Support the slope by propping from the base through the root and releasing it to the air by transpiration

(iv) Facilitate infiltration of water through the soil profile, thereby reducing the proportion of water flowing over the soil surface.

Complementary to this, the drainage should be improved and the impact on flora and fauna could be considered in the larger context of biodiversity conservation. Biodiversity refers to the wealth of species and ecosystem in a given area and of genetic information within populations. Areas of high biodiversity are prized as store houses of genetic material, which form the basis of untold numbers and

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quantities of foods, drugs and other useful products. At the ecosystem level, biodiversity provides flexibility for adaptation to changing condition. Road development has perhaps its most serious effects on aquatic ecosystems. Erosion from poorly constructed and rehabilitated sites can lead to downstream siltation, and running spawning beds for fish. Constriction of flows at water crossing can make the current too fast for some species. Alternation of foods cycles, tidal flows, and water levels can upset trophic dynamics by affecting the life cycle of plankton and have corresponding effects on the rest of the food chain. Roads may serve as barriers to movement of some aquatic species, especially where culverts are used. The issue of blockage or restriction of fish migration is extremely important and need to be assessed for each relevant project.

Interruption of Biogeochemical Cycle:

The flowing of nutrients and materials is a major determinant in ecosystem structure and function, and road development can easily disrupt it through alteration of flows of surface and ground water, removal of biomass, and relocation of top soil .Also, human activity can be a major source of nutrients (sewage, animal dung and eroded topsoil), which provided they are allowed to get into the surface water, can raise turbidity, and biological oxygen demand(BOD) of the water to the point where certain aquatic species simply cannot survive.

The potential impacts that alternation of the biogeochemical cycle may have on an ecosystem can be very roughly estimated once the nature of the alteration has been established, based on data on soil erodibility, soil fertility and anticipation human activity, among other things. An understanding of energy flow in the nutrient regime and energy flow of the affected ecosystem is essential.

Accessibility:

Roads increase contact between human and the natural environment, which in most cases leads to ecosystem modification. Penetration of previously unmodified areas makes them available for a host of human activities of varying effect, from recreation, forest and mineral exploitation to colonization. Upgrading of existing roads generally facilitates an increase in the like hood of impacts.

Ecological Disequilibrium: The important of new plant and animal species along the right – way can upset the dynamic balance, which exist in ecosystems. Native species face competition for resource from new arrivals, and predator- prey relationship can be altered, often to the detriment of the native species. Non- native species can gain a competitive advantage because of a black of natural controls and become dominant.

The result is usually a simplified ecosystem which is more vulnerable to further impacts. In some cases, road development may actually alter the ecological equilibrium in a positive way by providing for the creation of new ecotones. Which tend to be relatively biodiversity. This will only apply if the total area of the existing system is relatively large compared to the newly created ecotone. Also, the potentially positive effect will often be negated by the impacts discussed above.

Contamination of the Biota:

The presence of motor vehicles introduces the potential for contamination of the soil, air, and water adjacent to the road and in the case of the surface water, well beyond the immediate surroundings. Chronic contamination can become a serious problem for animal species, especially those at the top of food chain, because of bioaccumulation of pollutants.

Fires: Increases in human activity are often associated with more frequent incidents of fires, which can obviously have sudden, severe, and wide range of impacts.

Transmission of disease: Roads are effective vectors for the spread of diseases, which can have marked impacts on populations of plant and animal species. Carriers of diseases both flora and fauna, can gain easy access to wilderness areas along new road corridors. Transportation of livestock and plant products, such as firewood, animal feed, and fruit, may also aid in spreading disease.

Prevention of Impacts: When planning new roads or changes in width or alignment, sensitive natural environments should be identified early in the planning process so that alternative routes and designs may be considered. Wherever possible, road developments should be located more than one kilometer away from sensitive areas to avoid severe impact on flora and fauna. Water crossings should be minimized, and buffer zones of undisturbed vegetation should be left between roads and watercourses. Groundwater recharge areas should not be constructed through national parks or other

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protecting areas. Advantage should be taken of opportunities to twin new road corridors with previously established transport rights-of-ways, such as railway lines.

Impacts mitigation measure:

Re-engineering road cross-section can be modified to reduce the impact on the environment, for example by using narrower width, lower vertical alignments, smaller cuts and fills, flatter side slopes, and less clearing of existing vegetation. Narrower rights-of-way and lower vertical alignment may make crossing easier for animals that finds roads a physical or psychological barrier. Also, providing longer sight lines for drivers can reduce collisions with animals by allowing more reaction time.

Planting: Planting in road rights-of-way and adjacent areas can help to support local flora and fauna. In some cases, planting may provide additional habitats and migration routes for local animals, while also guarding against erosion. Border plant species may need to be chosen for resistance to wind or fire in some areas. Planting should be done wherever possible with native species, which are likely to require little maintenance and may prove beneficial in maintaining ecosystem. integrity. In cases where non-native species are deemed essential, careful monitoring should be planned, to ensure that they do not compete too successfully with native species and spread uncontrollably.

Animal Crossings: Animal crossings can be used to assist the migration of animals. At important crossing points, animal tunnels or bridges have sometimes been used to reduce collision rates, especially for protected or endangered species. Tunnels are sometimes combined with culverts or other hydraulic structures. These measures are expensive and used only at a few locations where they are both justified (by the importance of the animal population and the crossing route) and affordable (relative to the cost of the project and the funds available). In forested areas, especially tropical ones reducing the width of vegetation clearance in selected in areas may allow trees to touch over the roadway, providing a means of crossing for canopy dwellers.

Fencing: Fencing or plant barriers can reduce the risk of collisions between animals and vehicles. In some cases, semi-permeable fencing is used, which excludes species that are more likely to be involved in collisions while letting less problematic species through. Fences may interfere with the migratory patterns of animals or may simply shift the points where migratory patterns conflict with traffic patterns along the route. Fencing may also in some cases, interfere in predator-prey relationships, allowing predators to gain significant advantage because prey escape routes are restricted.

Water Crossing:

Aquatic ecosystems are particularly sensitive to road development, and there are a number of ways in which the impacts can be lessened. Standing water can be bridged instead of filled stream re-channeling should be avoided as much as possible, but where it must be done, efforts should be made to recreate lost channel diversity. Careful attention should be paid to erosion control techniques near watercourses. Culvert crossings should be designed with the needs of migratory aquatic species in mind. Baffles might be installed to show the flow enough to set below the level of the streambed. Pre-development streambed gradients should be maintained wherever possible.

Traffic Control Measures: Reduction of the speed limit may reduce the rate of collisions between vehicles and animals. Some jurisdictions apply lower speed limits, particularly at night and in areas of frequent animal crossings. Signs warning motorists of presence of animals in places in places where animal corridors cross the road may also help to reduce collisions. Roadside reflectors may be used to scare animals away from the roadway when vehicles approach at night.

Crops and Agricultural productivity

Crop pests and diseases: Organisms which attack and injure crop plants or animals exist in nature at a characteristic level of abundance. How frequently this level of abundance is exceeded depends on how frequently man’s activity per unit area of investment has compelled over simplification of the ecosystem through crop monoculture, growing carefully selected varieties, suppression of weed competitors, soil fertility and conservation and soil water management.

The incidence of pests and diseases are crop related. Therefore, the knowledge of the crops in the project area is a necessary prelude to the discussion of pests and diseases. In the project area, the major crop grown is millet, rice, groundnut and beans. 90% of the communities visited complained of lack of farm land to grow crops. Most of the farmers around the project area are tenants and the land leased to them by their landlords was used for their crops. In Alape canoe side, the farmers (about 70% of the

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whole farmers interviewed) grow arable crops and also engaged in fishing. The rainfed crops grown included maize, rice, yam, beans and cassava. All these crops were cultivated on farms of less than 2ha. Inter-cropping was prevalent, in the area. Overall, approximately 90% of the farmers sampled planted local crops. Few farmers claimed to have used improved varieties.

Insect pests and diseases

Crop in the fields are examined at the different area were at various phonological growth stages. Table 11 lists the insect pests and diseases observed on crops in the surveyed area.

Table 11: Common Insects and diseases attacking Crops in the project Area

Таблица 11: Распространенные насекомые и болезни, поражающие сельскохозяйственные культуры в районе реализации проекта

Pests	Crop attacked	Plant part attacked
Insects		
Miliarpha separatelia	Rice	Tiller
Sesamia calamistis	Maize, Rice	Stem, Ear
Ciacadulina spp	Maize	Leaves
Poophilus spp	Maize	Leaves
Zonocerus Varieqatus	Maize	Leaves
Termites	All cereal crops	Roots
Other Arthropods		
Centipede Miters	Maize Vegetables	Seedling, Root and Stem Leaves
Vertebrate Pests		
Birds Rodents	All cereal crops All crops (tree & cereal)	Seedlings and grains Seedlings, Stem, Leaves & grains

Security and Safety: This is a crucial aspect of the process, where there is a need to construct access ramps or pedestrian bridges over the highway. Access roads should be able to accommodate heavy vehicles and be designed to facilitate the turning of such vehicles. The authority responsible for maintaining the access roads should also be identified. This will improve transportation infrastructure and provide financial benefits to stakeholders, as well as support the development of industries dependent on electric energy from dam streams. It will also create employment opportunities.

Conclusion and Recommendations

The Environmental Impact Assessment (EIA) was conducted during the project preparation phase to comply with legal requirements and identify, evaluate, and mitigate the significant potential impacts of the development project on the environment. An Environment Management Plan (EMP) has also been developed as a guide to ensure environmental sustainability during and after the execution of various project activities.

The road development will reduce transportation costs, decrease travel time, and greatly improve transport infrastructure and access to marketplaces, which will significantly benefit the poor. Additionally, the construction and operation of the project will create numerous direct and indirect employment opportunities for the local economy.

The adverse impacts caused by the road construction will be avoided or reduced to significant levels through appropriate mitigation and compensation measures. These measures include reforestation and landscape programs along the project alignments to compensate for the loss of green fields, implementation of environmental programs during construction to mitigate impacts such as noise, dust, and silt runoff, and the establishment of environmental emergency teams to minimize the impacts of motor vehicle accidents involving hazardous materials.

The overall impacts on the biophysical environment associated with the project development are either not significant or can be managed within reasonable and acceptable limits by implementing all identified mitigation measures outlined in this project. Water quality will also be monitored during construction and operation.

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Conflicts of Interest

The authors declare no conflict of interest.
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ОЦЕНКА ВОЗДЕЙСТВИЯ НА ОКРУЖАЮЩУЮ СРЕДУ ПРЕДЛАГАЕМОЙ ДУАЛИЗАЦИИ ДОРОЖНОЙ СЕТИ ИДЖЕГУН-ИДЖЕГЕМО – АБУЛЕ-АДО, ШТАТ ЛАГОС, НИГЕРИЯ

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Аннотация.
Правительство штата Лагос планирует построить 19 км дороги, соединяющей Абуле-Адо с Иджегуном-Иджегемо Алапе. Эта инициатива призвана уменьшить транспортные заторы вдоль дороги LASU/Iba и удовлетворить растущие потребности в доступе в этот район. Была проведена оценка воздействия на окружающую среду (ОВОС) для определения потенциальных экологических и социальных последствий проекта, включая стратегии по смягчению негативных и усилению позитивных воздействий. В ходе полевых исследований было выявлено и задокументировано воздействие на окружающую среду, а в консультациях приняли участие различные заинтересованные стороны, такие как местные власти и затронутые лица. ОВОС соответствует нормативным документам правительства Нигерии и руководящим принципам Федерального министерства охраны окружающей среды и NESREA. Предлагаемый маршрут пройдет через Абуле-Адо (широта 06.45789, долгота 03.25520), Алапе/Арандун (долгота 06.50612, широта 03.20202) и Бефун (долгота 06.50686, широта 03.22934) и достигнет Иджегун-Иджеододо (долгота 06.50695, широта 03.27605). Проект, расположенный в районе Оджо (Ojo Local Government Area) города Лагос, Нигерия, призван значительно улучшить местную инфраструктуру и транспортный поток.
В данной работе описываются проблемы, выявленные к настоящему времени в процессе участия общественности и индивидуальных консультаций с затронутыми землевладельцами специалистами проектной группы. Кроме того, предложены меры по снижению негативного и усилению позитивного воздействия. Получены выводы специалистов, которые также будут использованы для разработки Плана управления окружающей средой (ПУОС). ПУОС будет регулировать строительство и эксплуатацию предлагаемого дорожного проекта, а также включать программу мониторинга для оценки эффективности.

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