Analysis of Environmental and Social Impacts of Ota - Idiroko Proposed Road Rehabilitation, Ogun State, Nigeria

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Abstract

Environmental and social impacts (ESI) are major concerns of the government and decision makers to ensure the safety of people and environment. Employing ESI Assessment (ESIA) tool in evaluating possible impacts of a project solidifies its implementation. It is against this background that this study aimed at examining the environmental and social impacts of Ota-Idiroko proposed road rehabilitation on the residents and their environment before, during and after the rehabilitation with a view of suggesting measures to mitigate the negative impacts. Methodologically, the study was restricted to a radius of 0.5km off Ota-Idiroko road at the five selected zones comprises of 2,963 households which represent the total population size and 340 as sample size, by using Yamane's table calibration. Data on socio-economic, environment and transport characteristics were collected through the use of well-structured questionnaires which were administered among the 340 categorised respondents that were sampled using a purposive sampling technique. Descriptive, cross tabulation and checklist analytical tools were employed to analyse the retrieved data. Impact Mean Value (IMV) of project impacts was measured using 24 variables before the survey analysis on a 5-point Likert scale at pre-construction, construction and post-construction phases. Findings revealed that out of the 24 listed impacts, 19 were considered negatives (need to be mitigated), while only 5 were considered less significant. The ANOVA generated result shows that with f=1.66833 and P= 0.19608, there are statistically significant effect of the impacts on the environment and residents' social wellbeing. The study recommends strong government commitment to ESIA of road development, more robust stakeholders' engagement for the formulation of strategies and measures to address the adverse impacts of road development.

Keywords: environment, environmental impacts, road rehabilitation, socio-economic impacts, Ota-Idiroko road, Ogun State.

1. Introduction

Road rehabilitation does not just happen, they are demanded because they are needed for improved quality of life and wellbeing of the citizens. The implication of this is that infrastructural projects, no matter who the proponents are, whether private or public sector, are set up to meet certain demands or objectives (Kadiri & Salau, 2004). Road rehabilitation as a capital development activity, is the act of repairing portions of an existing pavement to reset the deterioration process by

removing and replacing the wearing course in a pavement provides new wearing course material on which the deterioration process begins anew (ITS, 2000).

Road as a way in road transportation plays an essential role in the economic and social development of our societies. It provides access to jobs, housing, services and recreation, and opens up peripheral and isolated regions (Armstrong, Davison, de Vos Malan, Gleeson & Godfrey, 2015). This massive expansion (or rehabilitation) in road infrastructure provision can be attributed to governments' set vision to make public, economic and social services physically more accessible to all the people in the rural and urban areas around the world (Arethun & Bhatta, 2012).

At political scene, transport sector is considered as an essential component of community development by impacting on physical, socioeconomic development and the welfare of people. The provision of transport facilities and services is often taken as campaign issue and politicians are often quick to promise its improvements (Oyesiku, 2021). Traffic management and transportation is the first pillar of the THEMES Agenda of the administration of Mr. Babajide Olusola Sanwo-Olu, the Governor of Lagos State. The Ogun State Governor, Prince Dapo Abiodun has made the construction and rehabilitation of roads one of his cardinal foci of the infrastructure which the "I" represent in his I.S.E.Y.A Agenda.

Also, in Oyo State, Engr. Seyi Makinde had coined out a Four-Point Service Agenda of his government, which include provision of a safe and secure environment which will eventually expand the economy and improve the standard and quality of living. It is also demonstrated by the President Muhammad Buhari administration's policy through the Federal Ministry of Transportation, embarked on massive construction and rehabilitation of roads and others infrastructures, all geared towards building a modern and efficient transportation system (Oyesiku, 2021).

This study is stimulated to addresses the environmental and social effects of the proposed road rehabilitation on the host communities. This rehabilitation according to Thisday Newspaper (2021) was declared by Mr. Babatunde Fashola, Former Minister of Works and Housing, under the federal government's tax credit scheme arrangement with Globacom (a major telecommunication service provider in Nigeria).

2.0 The Study Area

Ota-Idiroko Road had been abandoned despite its position as one of the federal routes in Nigeria. The road links Nigeria to other neighbouring West African Countries like Republic of Benin, Togo, Ghana, Cote d'Ivoire among others. Also, it gives direct access to important institutions located in the town among which include Covenant University, Bells University of Technology, All-Over Central Polytechnic and the headquarter of Winners Chapel. The corridor as an international road; functions for local travels, international travels, industrial good movement and religious traffic.

Ota, the study area is characterized with high population density due to its closeness to Lagos State and its being part of the Lagos metropolitan area. Besides, the proximity of Ota to the Nigeria-Benin border had encouraged influx of Economic Community of West African States (ECOWAS) citizens (Ogunseye and Kadiri, 2017). The population of Ota for year 2015 was 1,520,921 as calculated using the compound growth rate equation (Ufoegbune *et al*., 2016). The projected population for year 2021 using same procedure is 9,415,718.

The 64km road rehabilitation is proposed to starts from Sango under bridge

and span through Ota, Iju, Atan, Owode-Yewa, Ajilete, Oke-Odan, Ihunbo to Idiroko the border town to Republic of Benin. This study is limited to a segment of the road within Ota area covering a distance of 11.61km from Sango under bridge and terminates at Iju River. Five nodes along the corridor were used for the study. These nodes or zones are Sango under bridge, Oju-Ore roundabout, Obasanjo Junction, Iyana-Iyesi Junction and Winners Junction. The study was limited to a radius of 0.5km at each identified node.

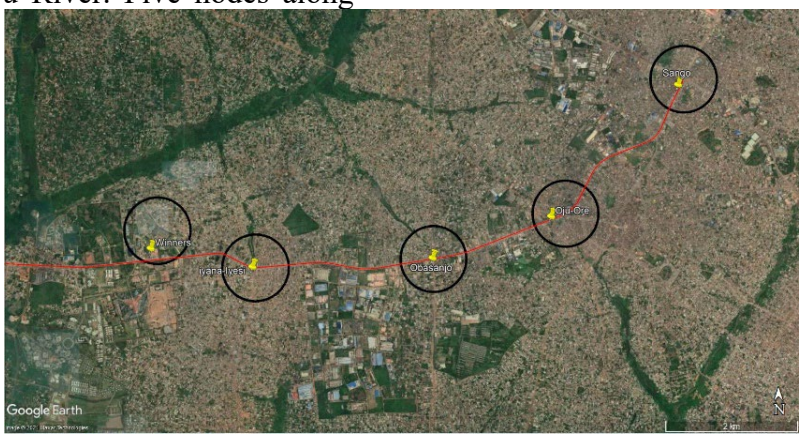

Figure 1.1: Location of the Study Area along with the Selected Nodes
Source: Google Map (2023)

3.0 Conceptual Framework and Literature Review

3.1 Operational Synthesis of Conceptual Framework

The concept of realms of environmental impact (Mackenzie Valley Environmental Impact Review Board, 2007) reveals how these impacts affect people who have based their life and economies on their environment. The expected output of the study is to formulate environmental management plan on the expected impacts. The systems concept (Shaw, 1993) study the significant of road within the framework of transport system along with its impact both direct and indirect (through the other two components of transport system) will not only hamper the sustainability and effectiveness of the environment but will also render serious havoc on the residents and their community at large which is the focus of this study.

Relationship of dependent and independent variables (Nerhagen, Forsstedt & Edvardsson, 2018) as a concept presents both the dependent and independent variables for the study. The dependent variables upon which the EMP will be formulated include noise pollution, air pollution, vibration, road terminal, traffic congestion, vehicular/pedestrian conflict, urban aesthetics, access to community amenities and services – school; health facilities; shopping and recreation facilities; displacement of residents, demolition of building, unemployment, higher rental value, unstable income, reduction in sales revenues and closure of roads. The independent variable are social risk and environmental risk.

The infrastructure development concept (Eva, 2014) shows the benefits and positive impacts associated with road rehabilitation which are often underestimated with respect to their negative impacts. These are free flow of traffic, employment generation, higher rental value, good road network, aesthetic environment, reduce cost of vehicle maintenance, reduced cost of public transportation, increased business opportunities for small and medium -scale traders, increased regional trade, increased security, reduced risk of accidents and emergence of new towns and markets.

3.2 Literature Review

Environment encompasses social, economic or physical activities, which shows the interplay of forces which affect man positively or negatively (Uchegbu, 2002). Fast increasing in urbanization and urban population growth rate in Nigeria where efforts are concentrated in the development of cities through the rehabilitation of existing facilities such as roads as greatly affects the environment and social wellbeing of the residents. Therefore, seeing the environment and resident wellbeing being affected by these actions in any way is a matter of concern.

i. Environmental Impacts of Road Rehabilitation

Any road project whether construction, upgrade or rehabilitation will definitely have an impact either positive or negate or both on the environment upon which the infrastructure is provided on. According to Audain (2014), the effects of the physical presence of the road since the construction requires direct utilization of land, possibly for environmental practices such as farming. Rivers and streams can be diverted during road construction which will probably affect the aquatic animals, wildlife populations and endangered plant species according to the U.S. Humane Society and the Urban Wildlife Research Centre.

Among the indirect impacts closely related to the construction process and often pose a more serious risk to the environment include issues such as land erosion and pollution from construction raw materials, which has knock-on effects on earth surface quality. Another one is deforestation when roads are cut into forest areas to support easy logging transport and settler migration (Audain, 2014). Some others include dust and smoke from construction activities which may cause harm to the health of construction workers and residents, the noise and vibration from heavy-duty construction vehicles, vehicles emit a variety of pollutants like carbon dioxide and carbon monoxide, all of which may have serious cumulative effects on workers and residents alike.

In addition, the environment, turned to construction site during the road rehabilitation, are likely to be vulnerable to flooding and waterlogging due to the alteration of the gradient of the land during construction activities, especially in the rainy season. Also, different categories of wastes ranging from domestic or food wastes, sanitary waste and oil waste will typically be generated around the project area.

The economic and social development of any country is significantly dependent on efficient road transport infrastructure which facilitates delivery of agricultural produce, merchandise and commodities to markets as well as easy access to basic services (health, schools, water, trading centres, and administrative offices etc.) by the people. The benefits from efficient road transport are felt at all levels of the society, directly or indirectly, such as to include improved national economy, social income, wealth and job creation, health care, public transport and general service delivery (Eva, 2014). Improvement of all these areas is desirable for the current national aspirations including inter-sectoral growth collaborations (Perkins, 2011).

ii. Socioeconomic Impacts of Road Rehabilitation

The implementation of road rehabilitation project will improve the pavement condition of the road, extend the carriage way thereby led to reductions in travel times, the elimination of traffic congestion, reduction in accident rate and improved driving comfort. According to the Project Completion Report (PCR), indirect effects were realized in the form of employment creation at the implementation stage, revitalization of economic activity along the roads, and stimulation of the tourist industry, housing development, and so forth. Its positive impact on health include increase in the access to health services both in emergencies and for

primary care. The possible impacts (negative) cover a range of important public health interests which may include physical activity and obesity, mental health, air quality and cardio-respiratory health, social exclusion and inequalities, and environmental impacts related to fuel emissions and climate change (Thomson, Jepson, Hurley & Douglas, 2008). Also included are the issues of accident occurrence due to over speeding, increase in the spread of diseases due to air and noise pollution, (WHO, 2009).

A higher risk of social exclusion of vulnerable groups due to road rehabilitation is envisaged by Khayesi (2020). The Nigerian transport sector is highly motorized giving no chance for NMT to triumph. Displacement or discomfort to residents and other road users whose houses were demolished as testified to by Ogun State Government, the Commissioner for Works and Infrastructure, Arc. Olamilekan Adegbite (Vanguard, November 7, 2013).

The indirect impact of road rehabilitation as showcased by Daigle (2010) work through the dynamic developmental externalities generated through the forward and the backward linkages. This may reflect through change in the land use pattern, location of industries, advancement of trading and other auxiliary services, effects on income, output, employment, land rent and land price among others. The entire regional or national economy lying beyond this neighbourhood should also benefit from the development in terms of the opportunities derived from increased resources (Weisbrod & Weisbrod, 1997).

4.0 Research Methodology

The study uses quantitative and qualitative methods to source data from residents, business operators, institutional establishments and transport operators in the study area with the aid of structured questionnaire. This method was used by Budiyati, Wahyu and Gleave (2014); Alade (2020) for the study of social and economic impacts of national road improvement in Kabupaten Dompu, Nusa, Tenggara Barat, Indonesia and the environmental and socio-economic impacts of Ojodu-Berger Road upgrade, Lagos, Nigeria respectively. The questionnaire for this study consists two basic sections.

The study area was divided into five nodes or zones– Sango round-about, Oju-Ore round-about, Obasanjo junction, Iyana-Iyesi junction and Winners' junction. This is the spatial framework upon which the data was collected and Google map was used to establish the boundary and coverage of each zone. The study was limited to a radius of 0.5km at each identified node as used by Alade (2020) for the study of environmental and socio-economic impacts of Ojodu-Berger Road upgrade, Lagos, Nigeria.

Having determined the spatial frame for this study, convenient sampling technique was adopted in determining the sample size for this study as surveys and questionnaire administration were carried out based on the availability and readiness of respondents for interview. This involved the compilation and counting of buildings in each node or zone. Analysing urban issues on the basis of this spatial unit is advantageous because each zone exhibits certain consistent features in terms of location, the types, structures and layout of housing, housing conditions and occupancy ratio which reflect social, economic and cultural attributes of residents (Ogunkan, 2017). This technique was used due to the unplanned nature of the area and a dearth of information highlighting the actual number of people per respondent category (Alade, 2020). For ease of sampling and representativeness, the study recognized four stakeholders namely residents, business operators, institutions (schools,

government agencies, mosques and churches) and transport operators.

Working with this background and the fact that households were the unit of analysis, the total number of houses in the nodes were considered. Therefore, the total number of houses in the nodes were captured and counted using Google earth image at 2021 Maxar Technologies by zooming on the selected node to reveal the clearer imagery for counting. To avoid the problem of double counting, the hard copy of the imagery was printed out where the counted houses were marked accordingly. With the assumption that there is, at least, one household in each house, the results show that the zones have 2,963 households (Table 4.1).

Following Taro Yemane sample size table as cited in Glenn (2003) and using a confidence level of 95% and a confidence interval of ±5% of the total sample, 340 respondents were selected across the five nodes for the study as shown on Table 2.

Table 4.1: Nodes Sample Size using Yamane Sample Size Table

Nodes	Number of Buildings	Sample Size
Sango	768	88
Oju-Ore	630	72
Obasanjo	475	55
Iyana-Iyesi	759	87
Winners	331	38
Total	**2,963**	**340**

Source: Authors' field survey, 2023

A convenient selection of 340 respondents from the four stakeholders was adopted, comprising of 60%, 25%, 10% and 5% for residents, business operators, transport operators and institutions respectively as adapted from the Ogun State of Nigeria Gazette (2010). This includes 202 residents, 86 business owners, 34 transport operators and 18 institution owners (Table 4.2).

Table 4.2: Sample Size of the Stakeholders

Sample Zones	Residents (60%)	Business Operators (25%)	Transport Operators (10%)	Institutions (5%)	Total Sample Size
Sango	52	22	9	5	88
Oju-Ore	43	18	7	4	72
Obasanjo	33	14	5	3	55
Iyana-Iyesi	52	22	9	4	87
Winners	22	10	4	2	38
Total	**202**	**86**	**34**	**18**	**340**

Source: Authors' field survey, 2023

4.1 Methods of Data Analysis

The analysis was done using descriptive statistics such as percentage, means, average, frequency counts and cross tabulation were used to analyse socio-economic characteristics of respondents. The socio-economic characteristics of the respondents was cross-tabulated with the nodes with chi-square specification to determine the development pattern and demographic characteristics of host communities along the corridor. Other data such as the anticipated environmental and social impacts of the project on host communities was also analysed using descriptive statistics.

In order to facilitate the process of impact assessment, a tabular checklist was

developed to highlight the major impacts in the project area. Rating of identified environmental impacts of the proposed development was done using 5-point Likert scale to quantitatively evaluate these impacts to aid proper decision making. The rating is carried out based on the following considerations.

Twenty-four environmental and socio-economic variables as identified in the literature (Alade, 2020; Coleman, 2016; Alimi, Ayedun & Oni, 2014; Aigbe, Ogundele & Aliu, 2012; Lacono and Levinson, 2009; and Akee, 2006) were measured on a 5-point Likert scale to establish the Impact Mean Value (IMV) of the proposed road rehabilitation at the pre-construction, construction and post-construction stages based on respondents' perception. The 5-point scale of 1– 5 is presented as follow: 1 = Highly Adverse, 2 = Adverse, 3 = Moderate, 4 = Beneficial, 5 = Highly Beneficial). The description of the mean scores as demonstrated by Balansag, Natividad, & Evangelista (2017) is given as: 1.00 – 1.79 = insignificant impact; 1.80 – 2.59 = less impact; 2.60 – 3.39 = moderate impact; 3.40 – 4.19 = severe impact; and 4.20 – 5.00 = most severe impact.

5.0 Findings and Discussion

The anticipated environmental and socioeconomic impacts of the road rehabilitation had been compiled in checklist format as derived from the literature. The stakeholder's perception of the impacts is sought as tested in the questionnaire at the pre-construction, construction and post-construction phase and the effectiveness of mitigating strategies against adverse impacts of the road rehabilitation.

5.1 Pre-construction Stage of the Road Rehabilitation

The pre-construction stage represents the baseline for the study. The analysis presented in Table 5.1 represents the prevailing environmental and socio-economic situation of the project area at the pre-construction phase. The Impact Mean Value (IMV) established from the 24 variables indicate 22 parameters were significant as they have various degree of impact on both the environment and stakeholders socioeconomic ranging from less impact (7), moderate impact (11) and severe impact (4). Only 2 parameters (encroachment on pedestrian facilities and poor sanitation) are insignificant. In order of significance, seven most significant parameters as they have IMV above 3.00 include reduction in sales (3.69), access to community amenities and services (3.58), noise pollution (3.50), traffic congestion (3.47), vehicle maintenance (3.16), closure of road (3.01) and disruption of water supply (3.00). Other parameters are significant with less and moderate impacts.

The results suggest that before the road project, the neighbourhood had always experienced adverse environmental conditions such as noise pollution, high levels of traffic congestion and closure of road while at the socioeconomics, high cost of vehicle maintenance, reduction in sales, access to community amenities and services and disruption of water supply are experienced before the road project. The results on the environmental and socio-economic situation at the pre-construction of the road project reveal that environmental situations were generally poor.

Table 5.1: Pre-construction Environmental and Socio-economic Parameters

Criteria	Impacts' Significance Ratings (n=340)					IMV	Interpretation
	1	2	3	4	5		
ENVIRONMENTAL PARAMETER							
Noise pollution	187	75	63	0	15	3.50	Severe impact
Air pollution (dust)	88	150	93	0	9	2.09	Less impact

Vibration	20	40	280	0	0	2.76	Moderate impact
Flooding	12	135	157	0	36	2.74	Moderate impact
Traffic congestion	175	84	36	30	15	3.47	Severe impact
Road accident/Traffic crashes	153	104	83	0	0	2.79	Moderate impact
Poor road terminal	105	123	110	0	2	2.03	Less impact
Poor road condition	132	39	96	51	22	2.39	Less impact
Vehicular/pedestrian conflict	54	132	61	39	54	2.73	Moderate impact
Encroachment on pedestrian facilities	157	133	50	0	0	1.69	Insignificant impact
Impaired urban aesthetics	72	147	55	57	9	2.36	Less impact
Poor sanitation	205	46	89	0	0	1.66	Insignificant impact
Closure of road	24	139	47	70	60	3.01	Moderate impact
SOCIOECONOMICS PARAMETER							
Crime/insecurity	39	109	105	57	30	2.79	Moderate impact
Demolition of building	72	141	82	45	0	2.29	Less impact
Displacement of business	51	45	166	63	15	2.84	Moderate impact
Access to community amenities and services	189	24	70	21	36	3.58	Severe impact
Disruption of power supply	100	87	87	45	21	2.41	Less impact
Disruption of water supply	51	50	140	45	54	3.00	Moderate impact
Closure of roads	47	84	75	59	75	3.09	Moderate impact
Vehicle maintenance	18	109	76	74	63	3.16	Moderate impact
Reduction in sales	15	30	81	133	81	3.69	Severe impact
Employment opportunity	62	143	49	41	45	2.60	Moderate impact
Rental value	62	93	146	24	15	2.52	Less impact

Source: Authors' field survey, 2023

5.2 Construction Stage of the Road Rehabilitation

Implementation of the project will attract men, machinery and materials that are needed to execute the works. The labour force required may include a variety of skilled, semi-skilled and unskilled professionals in the construction industry. Machinery needed would include concrete, bulldozers, mixers, caterpillars, excavators, tippers, trucks, welding machines, etc. The use of these machineries and manpower could generate some measures of disturbance in the community. The anticipated impacts to be generated by the execution of this project are analysed in Table 5.2.

The table reveals that 8 (four environmental and four socio-economic) of these parameters have IMV higher than 3.0 and 4 of them have severe significant. In order of significance, the eight most significant parameters include air pollution (dust) (3.89), noise pollution (3.81), vibration (3.69), employment opportunity (3.36), vehicle maintenance (3.14), closure of roads (3.04) and disruption of water supply (3.03). While fourteen parameters are moderate or less significant including poor road condition (2.92), rental value (2.80), reduction in sales (2.77), vehicular/pedestrian conflict (2.73), road accident/traffic crashes (2.71), displacement of business (2.49), crime/insecurity (2.43), disruption of power supply (2.41), poor road terminal (2.41), access to community amenities and services (2.31), impaired urban aesthetics (2.27), encroachment on pedestrian facilities (2.26), traffic congestion (2.18) and demolition of building (2.18). Only flooding and poor sanitation are not significant to the environment during the construction stage.

This suggests that the road project has significant environmental and socio-economic impacts in the construction

phase. Specifically, socio-economic impacts in the form of business displacement, unemployment (job loss), increased rental value and high cost of vehicle maintenance were noticeable. It is normal to have environmental and socioeconomic impacts from road projects of this nature.

Table 5.2: Construction Stage Environmental and Socio-economic Parameters

Criteria	Impacts' Significance Ratings (n=340)					IMV	Interpretation
	1	2	3	4	5		
ENVIRONMENTAL PARAMETER							
Noise pollution	163	105	53	11	8	**3.81**	Severe impact
Air pollution (dust)	119	139	82	0	0	**3.89**	Severe impact
Vibration	168	110	62	0	0	**3.69**	Severe impact
Flooding	126	197	17	0	0	1.68	Insignificant impact
Traffic congestion	84	174	36	29	17	2.18	Less impact
Road accident/Traffic crashes	43	14	283	0	0	2.71	Moderate impact
Poor road terminal	103	61	110	64	2	2.41	Less impact
Poor road condition	28	112	90	78	32	2.92	Moderate impact
Vehicular/pedestrian conflict	54	132	61	39	54	2.73	Moderate impact
Encroachment on pedestrian facilities	60	133	147	0	0	2.26	Less impact
Impaired urban aesthetics	80	147	55	57	1	2.27	Less impact
Poor sanitation	205	46	89	0	0	1.66	Insignificant impact
Closure of road	24	139	47	70	60	**3.01**	Moderate impact
SOCIOECONOMICS PARAMETER							
Crime/insecurity	98	116	39	57	30	2.43	Less impact
Demolition of building	92	141	62	45	0	2.18	Less impact
Displacement of business	91	45	166	23	15	2.49	Moderate impact
Access to community amenities and services	70	189	24	21	36	2.31	Less impact
Disruption of power supply	100	87	87	45	21	2.41	Less impact
Disruption of water supply	21	35	240	0	44	3.03	Moderate impact
Closure of roads	49	82	75	75	59	**3.04**	Moderate impact
Vehicle maintenance	18	109	92	50	71	**3.14**	Moderate impact
Reduction in sales	115	35	81	33	76	2.77	Moderate impact
Employment opportunity	62	23	49	141	65	**3.36**	Severe impact
Rental value	67	93	39	124	17	2.80	Moderate impact

Source: Authors' field survey, 2023

5.3 Post-Construction Stage

The third level of assessing the impact of the proposed project is when the facility is put in use. The main goal of the project will be fully bear to play and felt by the stakeholders. The analysis presented in Table 5.3 represents the prevailing environmental and socio-economic situation of the project area at the post-construction phase.

The table shows 10 (four environmental and six socio-economic) of these parameters have IMV higher than 3.0 with one most severe significant and 5 of severe significant. In order of significance, the ten most significant parameters include encroachment on pedestrian facilities (4.20), rental value (3.91), closure of roads (3.78), vehicle maintenance (3.72), employment opportunity (3.50), access to community amenities and services (3.38), vibration (3.15), displacement of business (3.13) and noise pollution (3.05). Parameters with moderate or less significant impact are impaired urban aesthetics (2.91), reduction in sales (2.77), air pollution (2.69), disruption of power supply (2.69), vehicular/pedestrian conflict (2.59), disruption of water supply (2.59), crime/insecurity (2.44), flooding (2.24), poor sanitation (2.28), poor road terminal (2.21), traffic congestion (2.18), demolition of building (2.18), road accident/traffic crashes (2.04) and poor road condition (1.89).

Table 5.3: Post-Construction Environmental and Socio-economic Parameters

Criteria	Impacts' Significance Ratings					IMV	Interpretation
	1	2	3	4	5		
ENVIRONMENTAL PARAMETER							
Noise pollution	0	107	161	20	52	**3.05**	Moderate impact
Air pollution (dust)	48	105	105	68	14	2.69	Moderate impact
Vibration	15	45	178	79	23	**3.15**	Moderate impact
Flooding	66	144	113	17	0	2.24	Less impact
Traffic congestion	74	91	51	102	22	2.73	Moderate impact
Road accident/Traffic crashes	79	181	71	7	2	2.04	Less impact
Poor road terminal	91	102	136	8	3	2.21	Less impact
Poor road condition	102	201	20	6	11	1.89	Less impact
Vehicular/pedestrian conflict	68	34	212	20	6	2.59	Less impact
Encroachment on pedestrian facilities	3	17	28	153	139	**4.20**	Most severe impact
Impaired urban aesthetics	51	74	119	45	51	2.91	Moderate impact
Poor sanitation	65	184	43	28	20	2.28	Less impact
Closure of road	25	11	73	169	62	**3.68**	Severe impact
SOCIOECONOMICS PARAMETER							
Crime/insecurity	68	133	79	43	17	2.44	Less impact
Demolition of building	28	142	133	0	37	2.64	Moderate impact
Displacement of business	9	93	147	48	43	**3.13**	Moderate impact
Access to community amenities and services	25	23	167	48	77	**3.38**	Moderate impact
Disruption of power supply	37	93	167	43	0	2.64	Moderate impact
Disruption of water supply	31	91	139	76	3	2.79	Moderate impact
Closure of roads	8	17	113	108	94	**3.78**	Severe impact
Vehicle maintenance	3	14	144	93	86	**3.72**	Severe impact
Reduction in sales	40	71	164	57	8	2.77	Moderate impact
Employment opportunity	6	76	105	48	105	**3.50**	Severe impact
Rental value	0	45	82	74	139	**3.91**	Severe impact

Source: Authors' field survey, 2023

5.4 Impact Mean Value (IMV) of Parameters

For a better comparison of the pre-construction, construction and post-construction impacts, the IMV of significant impact parameters in the three phases of the projects are presented in Table 5.4. The table reveals that all parameters were significant to the community at post construction stage unlike that of pre-construction and construction stages where 2 parameters each were not significant (encroachment on pedestrian facilities, poor sanitation at both stages and flooding). Closure of road and vehicle maintenance are severe across the three stages (3.09 and 3.16; 3.04 and 3.14; 3.78 and 3.72), noise pollution severe at both pre and post construction stages (3.50 and 3.05), vibration severe at both construction and post-construction stages (3.89 and 3.15), traffic congestion severe only at pre-construction stage (3.47), access to community amenities and services severe at both pre and post-construction stage (3.58 and 3.38), employment opportunity (3.36 and 3.50) severe both at construction and post-construction stages.

Encroachment on pedestrian facilities (4.20) is the most severe of all parameters followed by rental value (3.91), vibration (3.89), closure of road (3.78), vehicle maintenance (3.72), reduction in sales and air pollutions (3.69), access to community amenities and services (3.58), noise pollution and employment opportunity (3.50) and traffic congestion (3.47).

Table 5.4: IMV of Parameters in the Three Project Phases

Criteria	Project Phases IMV

	Pre-construction	Construction	Post-construction
ENVIRONMENTAL PARAMETER			
Noise pollution	**3.50**	1.81	**3.05**
Air pollution (dust)	2.09	**3.69**	2.69
Vibration	2.76	**3.89**	**3.15**
Flooding	2.74	1.68	2.24
Traffic congestion	**3.47**	2.18	2.73
Road accident/Traffic crashes	2.79	2.71	2.04
Poor road terminal	2.03	2.41	2.21
Poor road condition	2.39	2.92	1.89
Vehicular/pedestrian conflict	2.73	2.73	2.59
Encroachment on pedestrian facilities	1.69	2.26	**4.20**
Impaired urban aesthetics	2.36	2.27	2.91
Poor sanitation	1.66	1.66	2.28
Closure of road	**3.01**	**3.01**	**3.68**
SOCIOECONOMICS PARAMETER			
Crime/insecurity	2.79	2.43	2.44
Demolition of building	2.29	2.18	2.64
Displacement of business	2.84	2.49	**3.13**
Access to community amenities and services	**3.58**	2.31	**3.38**
Disruption of power supply	2.41	2.41	2.64
Disruption of water supply	**3.00**	**3.03**	2.79
Closure of roads	**3.09**	**3.04**	**3.78**
Vehicle maintenance	**3.16**	**3.14**	**3.72**
Reduction in sales	**3.69**	2.77	2.77
Employment opportunity	2.60	**3.36**	**3.50**
Rental value	2.52	2.80	**3.91**

Source: Authors' field survey, 2023

Table 5.5: ANOVA Test of the Impact Mean Value (IMV)

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	24	65.19	2.71625	0.30442
Column 2	24	63.18	2.6325	0.3292
Column 3	24	70.36	2.93167	0.39436

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.14335	2	0.57168	1.66833	0.19608	3.12964
Within Groups	23.6437	69	0.34266			
Total	24.7871	71				

Source: Authors' field survey, 2023

The descriptive analysis shows that the observed mean values of the impacts are difference across the three phases of the road rehabilitation. It is important, however, to test how significant are the observed differences. The result of ANOVA as shown in Table 5.5 shows that

with f-value of 1.66833 and the corresponding p-value of P=0.19608, the proposed road rehabilitation will significantly affect the existing environmental condition of the study area and the social wellbeing of residents. This implication is that though, there were observed differences in parameters mean values along the phases, the majority of observed differences are statistically significant. The result of the ANOVA notwithstanding, there is no denying the fact that the observed impacts of the proposed road rehabilitation is an important factor that affect the existing environmental condition and social wellbeing of residents of the study area.

6.0 Impact Mitigating Measures

This section proffers mitigating measures to be adopted in managing the adverse impacts of the road rehabilitation. Of the 24 listed impacts, 19 of them were considered as negative impacts, which need to be mitigated. Disruption of power supply, disruption of water supply, vehicle maintenance, employment opportunity was among the impacts considered less significant.

The primary measure to mitigate these impacts as presented in Table 8 include but not limited to the avoidance of the use of noise-making equipment, dust making materials, vibration generating equipment for noise and air pollutions and vibration. Adoption of different road management and safety measures for traffic congestion, traffic crashes, closure of road, crime and sanitation. Provision of necessary amenities, facilities and services for road terminal, vehicular/pedestrian conflict, encroachment on pedestrian's facilities and closure of road. Adequate compensation and engagement with owners of affected building and business and regulation on rental value.

Table 6.1: Impact Mitigating Measures

Project impact	Mitigating Measures
Noise pollution	Avoidance of use of noise-making equipment
	Elimination of unnecessary public audios
Air pollution	Avoidance of use of dust-making materials
	Regular road wetting
Vibration	Avoidance of use of vibration generating equipment
Flooding	Construction of proper drainage system and channels
	Regular/frequent drainage clearing
Traffic congestion	Traffic diversion and use of traffic officials
	Provision of alternative routes/roads
Road accident/Traffic crashes	Placement of safety and traffic signs
	Deployment of traffic and road safety personnel
	Enforcement of speed limit and other safety measures
Poor road terminal	Proper definition of terminals
	Delineation of boundaries and layout
	Provision of lighting, toilet and other amenities
Poor road condition	Quality road construction and use of quality materials
Vehicular/pedestrian conflict	Construction of sidewalks/erection of barricade to prevent commuters from crossing highway
Encroachment on pedestrian facilities	Barricading and preventing commuters from crossing the highway
Impaired urban aesthetics	Urban design application to the construction of the pedestrian bridge, terminals and roads
Poor sanitation	Constant site cleaning and prevention of dumping on the road side
Closure of road	Provision of alternative routes
	Diversion of traffic and mass media announcement to that effect
Crime/insecurity	Deployment of the police and other security agencies
	internal vigilance
Demolition of building	Adequate compensation
	Consultation with stakeholders
Displacement of business	Compensation/consultation with stakeholders
Access to community amenities and services	Quality road networks
	Provision of alternative routes
Reduction in sales	Adequate consideration of the market people
Rental value	Regulation and guidance on rental issues

Source: Authors' field survey, 2023

7.0 Conclusion and Recommendations

This study has shown that the proposed rehabilitation of Ota-Idiroko Road is a must due to its crucial importance and usefulness and should be done in earnest without any further delay. It is clear from this study that some adverse impacts of the road rehabilitation could be adequately mitigated to pave way for rehabilitation without stress. Among the negative impacts include noise and air pollution, traffic congestion, vehicular/pedestrian conflict, impaired urban aesthetics, difficult access to places, displacement of business, building demolition, unemployment, higher rental value, reduction in sales revenues, cost of vehicle maintenance, cost of transport fare and closure of road. The positive impacts revolve around continuous increase in business opportunities, improvement of movement of people and goods, increased employment opportunities and unfettered access to places.

Based on the study objectives and findings, it is recommended that when the road is completed, government should ensure proper means of monitoring and maintaining the road and its infrastructures for durability and protection against any destructive activities. Again, private sector should be encouraged to participate in the provision, management and maintenance of transport infrastructure with continuous and assured managerial autonomy.

For researchers, this study will provide a useful insight into further discussions on the road especially when it is completed and fully in use. It will arouse the interest of researchers in urban planning particularly along the environmental and social impact analysis and transportation. Also, creating awareness among the host communities on the project and its potential impacts is an important contribution of this study. In the final analysis, if the recommendations made in this study are given considerations, the efficiency and sustainability of the road will be enhanced.

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