

**Examining the Impacts of Road Construction on Quality of Life:
A Case Study of the Bertil Harding Highway Widening Project in The Gambia**

by

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Abstract

Good road network plays a significant role in national development as it facilitates transportation, communication and, movement of goods & services. In view of this, the Government of The Gambia secured funds from the Saudi Fund for Development to upgrade the road infrastructure from Airport Junction to Sting Corner. This development is aimed at easing travel between the Airport and the Capital city of Banjul. This thesis is geared towards investigating the perceived quality of life of individuals affected by the social impacts of the road construction phase. The employed mixed methods research revealed that, despite mitigation measures implemented, among the impacts, traffic congestion, particulate matter pollution, interruption to basic utility services and economic losses have the most effect on overall quality of life.

Keywords: Transportation infrastructure development; social impact assessment; road construction; Bertil Harding highway; Air pollution

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List of Acronyms

AfDB	African Development Bank
BADEA	Arab Bank for Economic Development in Africa
BHH	Bertil Harding Highway
BHHP	Bertil Harding Highway Project
EIA	Environment Impact Assessment
ESIA	Environmental and Social Impact Assessment
GBA	Grater Banjul Area
GG	Gambia(n) Government/ Government of The Gambia
IFC	International Finance Cooperation
IMF	International Monetary Fund
KND	Kombo North District
MOTWI	Ministry of Transport, Works and Infrastructure
NEMA	National Environment Management Act
NRA	National Roads Authority
OIC	Organisation of Islamic Cooperation
OICRE	Organisation of Islamic Cooperation Road Expansion
OIC Gambia	The Gambia, Organisation of Islamic Cooperation Secretariat
PM	Particulate Matter (Pollution)
QoL	Quality of Life
SIA	Social Impact Assessment
UN	United Nations
UNOPS	United Nations Office for Project Services
WHO	World Health Organisation
WHOQOL -100	World Health Organisation Quality of Life – 100 Questionnaire
WHOQOL -BREF	World Health Organisation Quality of Life Brief Version

1. Introduction

This thesis discusses how the impacts of road infrastructure projects during the construction phase affect the quality of life of people within the construction site. The research is based on the ongoing road expansion project in The Gambia with a particular focus on the Bertil Harding Highway (BHH) construction zone within the Kombo North District area. This section of the paper begins by introducing the background of transport infrastructure in The Gambia and giving a geographical description of the focus area. The paper will use OICRE and Bertil Harding Highway project (BHHP) interchangeably.

1.1. Transport Infrastructure in The Gambia

Adequate transportation infrastructure is vital for economic growth and urban development. However, the construction phase of these infrastructures can incur economic losses and social costs (Riley-Powell et al., 2018). To address this, social impact assessments (SIA) are conducted during the planning phase to comprehensively evaluate and manage the positive and negative impacts of large-scale projects (Shukla & Jani, 2018). Yet, understanding the impacts on quality of life (QoL) for affected individuals remains challenging until the project is underway.

In low-income countries, particularly in the Global South, subpar urban transport infrastructure remains a significant obstacle to economic growth and national development (Agénor, 2010). The road transport system in The Gambia consists of a primary network of 818.53 km inter-urban trunk roads, of which 649 kms are paved, 303 kms of secondary roads mainly gravel surfaced. 37 km of urban roads are confined mainly to the Banjul Capital, 150km primary/secondary roads are within the Greater Banjul Metropolitan Area, and 2,556 kms of feeder roads in rural areas are made of gravel and/or earth (AfDB, 2013).

The Greater Banjul Metropolitan Area (GBA), occupying 490sq km, is the most densely populated region in The Gambia (UNOPS, 2022). Kombo North district (KND) is one of the most economically active districts within the GBA. In 2001, the Government of the Gambia (GG), with funding from Kuwaiti Fund and the Arab Fund for Economic Development in Africa, constructed a 168km long highway section as part of the Kombo coastal Roads Project (AfDB, 2013), leading to rapid urbanisation and economic activities in the region.

The population concentration in the GBA has resulted in traffic congestion and stress on the urban transport system, which fails to meet mobility requirements (MoTWI & NRA, 2015). Recognizing these challenges, The Gambia National Development Strategy (2015-2021) prioritized investment in road infrastructure rehabilitation and maintenance, along with the establishment of a hierarchical road system, to enhance efficiency and mitigate congestion (GG, 2018). However, the urban road network remains in poor condition due to insufficient resources and the absence of a hierarchical road system (MoTWI & NRA, 2015). To address this, the Organisation of Islamic Cooperation (OIC) approved funding for the expansion of The Gambia's road network. They currently support the ongoing road expansion project (OIC Gambia, 2022).

In subsequent sections, this paper first provides background on the OIC and transport infrastructures in The Gambia. Secondly is the review of literature on theories and concepts on which the conceptual framework is anchored including Quality of Life (QoL), Social Impact Assessment (SIA), Environmental Social Impact Assessment (ESIA) and Particulate Matter (PM) pollution. This is followed by the methodology and results. In the discussion and conclusion section, principal effects of road infrastructure projects on socio-spatial landscapes and their impact on quality of life in the Kombo North area are summarized.

1.2. Background of Project

The Organization of Islamic Cooperation (OIC), established in 1969, is an international organization consisting of 57 Muslim-majority member states. In 2018, it was decided that The Gambia would host the 14th OIC summit in 2019. The summit is a biennial event where leaders of member states gather to discuss issues of mutual concern and to formulate policies and strategies aimed at promoting interests of the Muslim world (OIC, 2023). However, after consultations with the OIC and other stakeholders, the 2019 Gambia summit was postponed to 2022 due to logistical challenges including inadequate transportation infrastructure (OIC, 2018).

In tandem, negotiations were had for funding of large-scale infrastructure projects that aim to ensure The Gambia is prepared to host the Summit and the Gambia OIC Secretariat was established to oversee implementation. This includes: the Sir Dawda Kairaba Conference centre, construction of a 22km road dubbed the OIC road expansion project (OICRE); 5-star hotel named Radisson Blu Banjul; and a VVIP Airport Lounge at the Banjul International Airport (OIC Gambia, 2023).

The road expansion project, which is being implemented by the National Roads Authority (NRA) of The Gambia, includes the construction of a dual carriageway from Airport to Banjul Capital city, and the rehabilitation of several existing roads in the Greater Banjul Metropolitan Area (OIC Gambia, 2023) (Figures 1 & 2). Funded by the Saudi Fund for Development with 50 million Dollars (Bojang, 2021), the new developments (Figures 3 & 4) are expected to improve transport connectivity, reduce travel time, and enhance economic activity (IMF, 2021).

The Gambia | Brikama - Kombo North - St Marie | BASEMAP
District basemap - Health Facilities

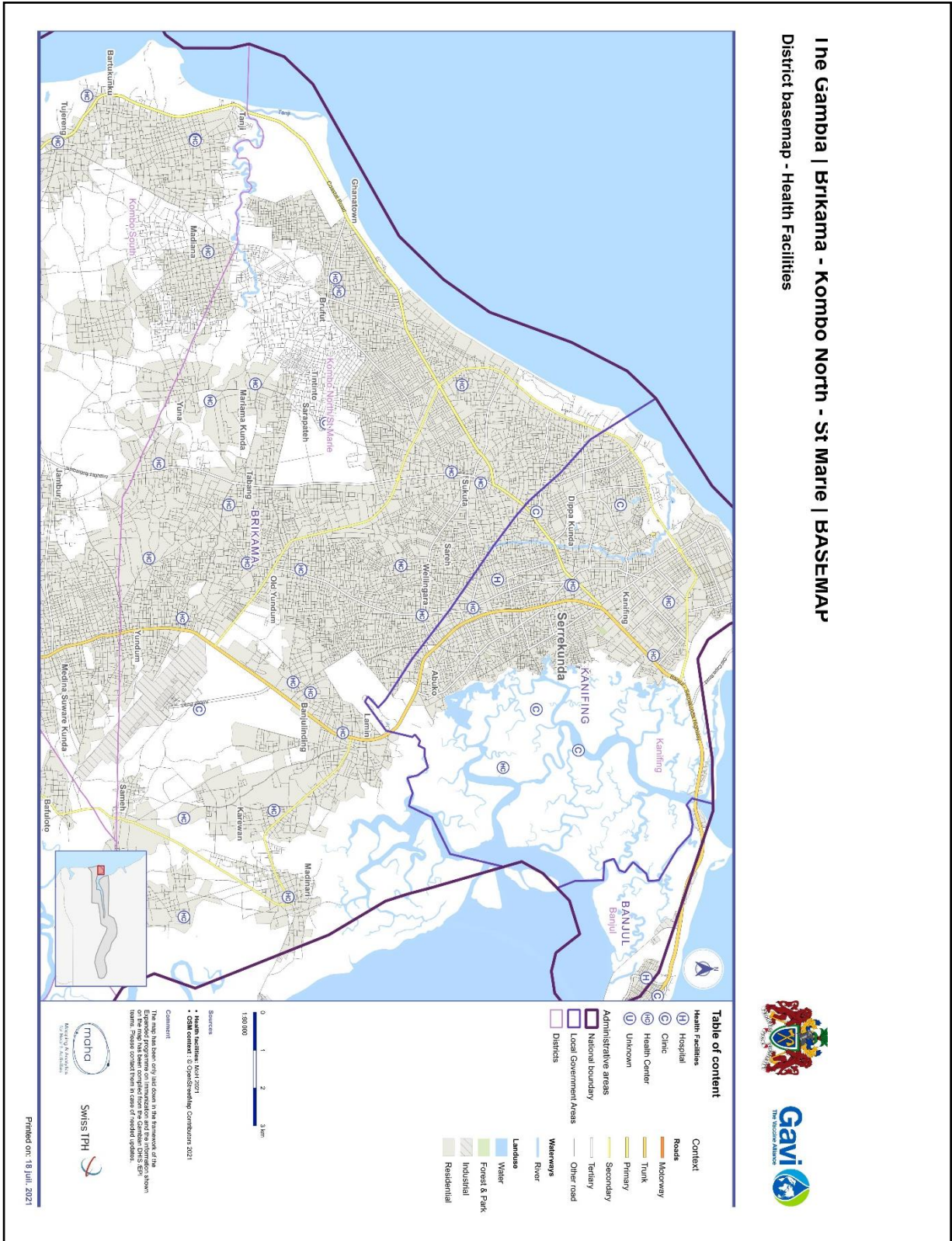


Figure 1: Location of Kombo North Area (Bertil Harding Highway)

Source: Maha, 2021

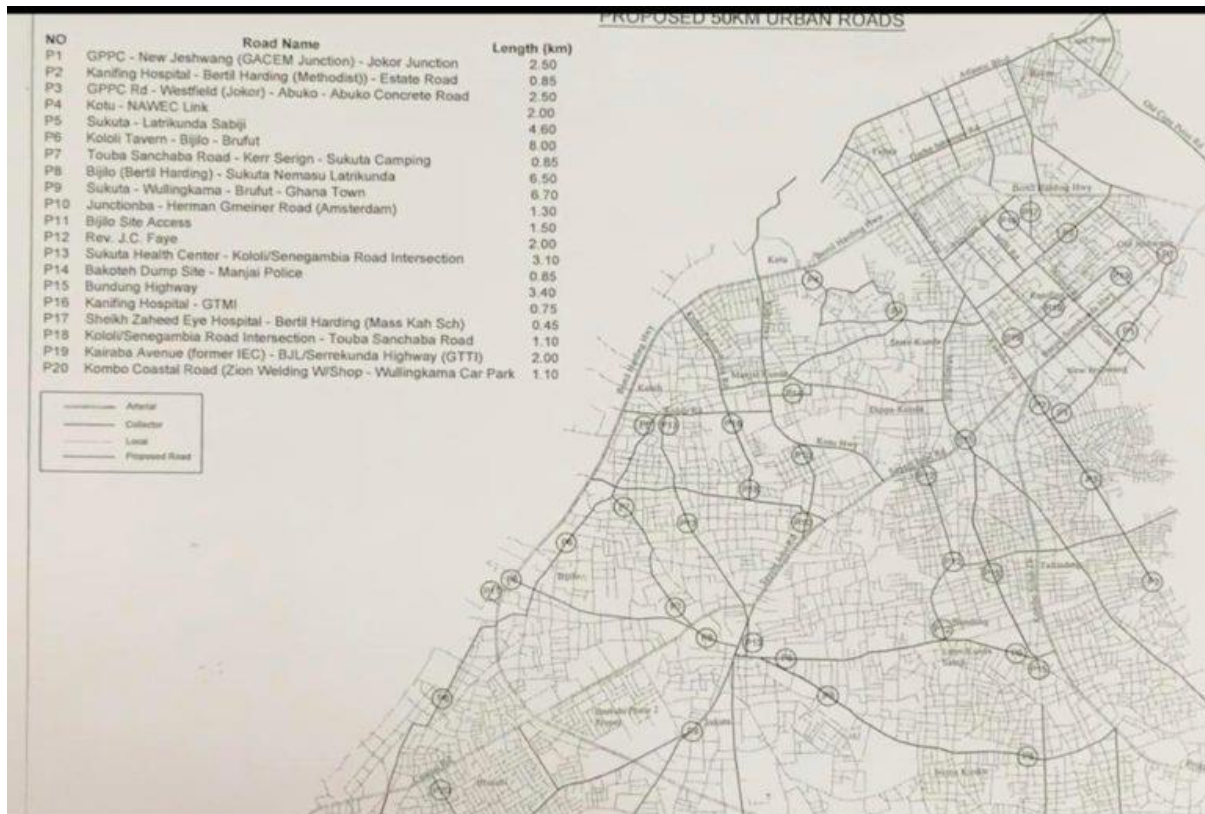


Figure 2: Map showing proposed roads to be constructed ahead of the OIC summit in The Gambia, Source: FatuNetwork, 2020.



Figure3 & 4: Prototype of proposed transport infrastructure being constructed along the BHH as part of the OIC road expansion project Source: MOTWI, 2020

In 2020, OICGambia announced it had, in collaboration with the Ministry of Transport, Works and Infrastructure (MOTWI) and the National Roads Authority, finalised recruitment of consultants for the design and supervision of the 50Km Urban Roads Project, (Camara, 2020).

“Under this contract, PACE & GAMECS, which is a joint venture between Saudi Arabian and Gambian engineering consultancy firms, will provide detailed designs, pre-tender, and pre-contract services for a period of 7 months. Additionally, the team will supervise, manage, and monitor the execution of the 14 months road construction project. The Joint Venture partnership shows the commitment to promoting local

content in all the OIC Related projects in order to create employment and build local capacity,” OIC Gambia said in a statement (Gainako, 2020).

In a speech, the Minister of Finance and Economic Affairs, on behalf of the Minister of Transport, Works and Infrastructure hailed the project as a significant milestone for the country. He made mention of the need and benefits of robust road infrastructure and highlighted the importance of the Bertil Harding Highway as a main transport link in the Gambia road network (The Point, 2021).

“We have seen the need for the upgrading of roads to improve traffic circulation and congestion.

With works expected to be completed within a period of 16 months, the road will significantly ease the burden of movement in the country.

It will further boost commerce and improve the urban outlook for this country once completed. The new and improved Bertil Harding Highway will also improve The Gambia's tourism infrastructure, while mitigating against the wear and tear of our motor vehicles.” – Minister of Finance and Economic Affairs, The Gambia (The Point, 2021)

While the project has been praised for its potential benefits, there is a need to examine how impacts from the construction phase has altered quality of life of affected persons.

1.3. Problem Statement (Research Gap Identification)

Road construction is among the most prevalent method of altering the natural landscape, disrupting socio-spatial relations, and leading to social inequalities (Oviedo Hernandez & Dávila, 2016). These disruptions can adversely affect QoL in communities, as argued by Wiedenhoft (1996).

Whilst studies have explored the broader economic benefits of road infrastructure development (Khanani et al., 2021), there is limited understanding of how these projects impact the quality of life of those affected, particularly in terms of socio-spatial impacts. The need to evaluate the social implications of large-scale infrastructure projects on local communities has garnered increasing attention (Barikayeva et al., 2018), yet there is a noticeable gap on the perceptions and experiences of the KND communities during the road construction phase.

Therefore, this study aims to fill this research gap by examining the association between the implementation phase of road infrastructure projects and quality of life of the affected individuals, using the case study of the OICRE project in The Gambia. By capturing the voices and experiences of KND communities, this research will provide valuable insights on how to better evaluate the social impacts of large-scale transport projects on local communities.

1.4. Case Study Area and Purpose of Research

This thesis aims to highlight the relationship between QoL and, social costs and impacts on socio-spatial relations from road construction in KND. The significance of the study lies in its potential to contribute to the broader body of research on the complex relationship between transportation infrastructure and QoL. By examining the specific case of the Bertil Harding Highway construction in KND, this study can provide insights into the ways in which transportation infrastructure can impact quality of life in The Gambia and contribute to effective mitigation measures to enhance the well-being of individuals within construction zones.

The paper will focus on the construction of the 22km Bertil Harding Road network connecting Sting Corner to Airport Road via Traffic Lights (Figure 5) which has drawn concern over its environmental and social impacts. Grey literature and reports by an independent YouTuber who follows the progress of the BHHP, called Nice Gambia (2023), indicates major disruptions to the physical environment and social costs. These include the destruction of habitats, disruption of traditional ways of life, demolition of properties along the Kombo Coastal Road that fall within the area earmarked for the project and traffic disruption (Eye Africa TV, 2018).

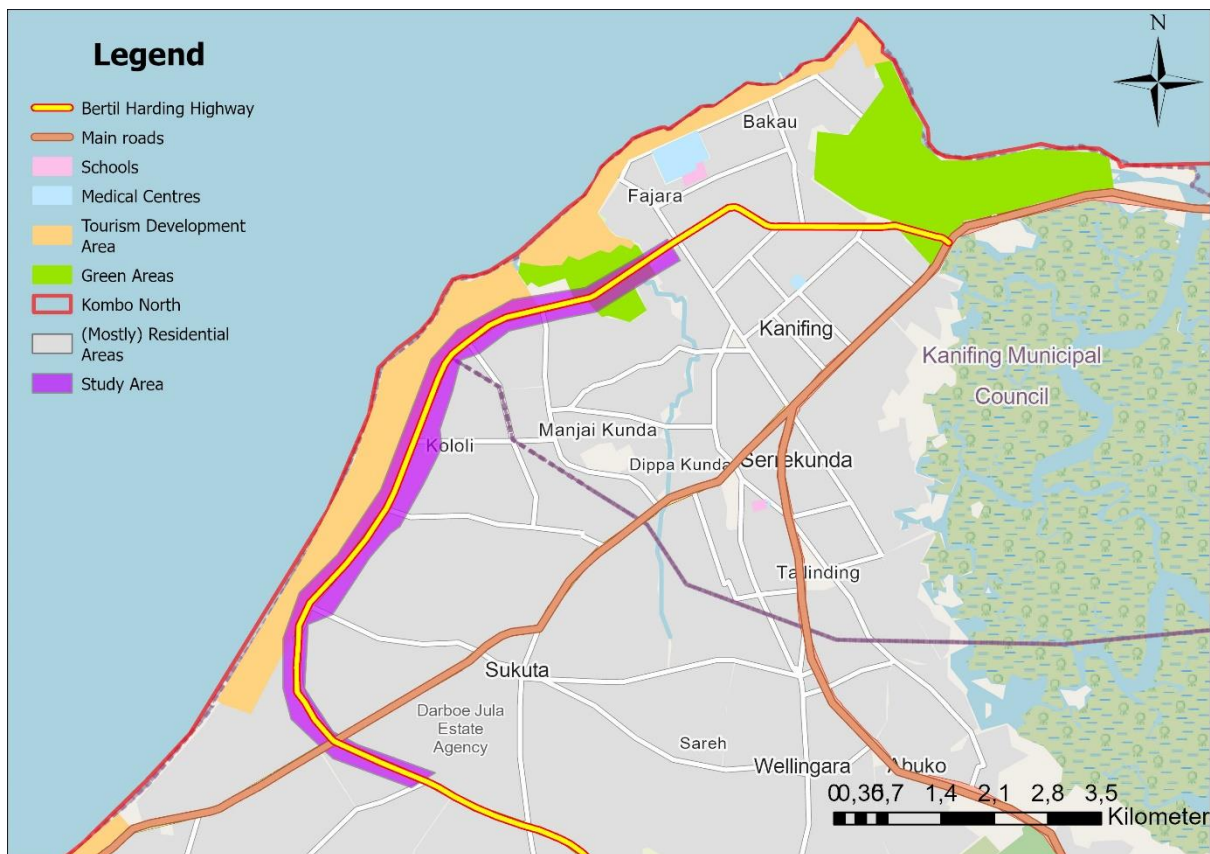


Figure 5: Map showing Bertil Harding Highway and the study area
Source: Jobarteh, 2023

1.5. Research Objectives

This paper objectives are:

- Assess what individuals in the study area have identified as the main social and economic impacts of the road construction phase that affect quality of life
- Examine the perceptions and experiences of the affected communities during the construction of the Bertil Harding Highway to understand the socio-spatial changes and disruptions caused by the project
- Investigate the effectiveness of social impact assessments in identifying and mitigating the negative effects of large-scale road infrastructure projects, and propose strategies for enhancing the assessment process to better address community needs

1.6. Research Questions

To do this, the main research question is as follows:

How has quality of life in the Kombo North Area of The Gambia been affected by the Bertil Harding Highway project?

To answer the research question, the sub-questions are defined as follows:

1. How has the OICRE project impacted the spatial environment and natural resources in surrounding communities? (Secondary data analysis)
2. What are the socio-spatial impacts of the OICRE project on the quality of life of communities along the road network? (Primary data analysis)
3. What measures have policy makers, planners and relevant stakeholders taken to mitigate identified social impacts of the road expansion project in The Gambia? (desk research/ grey literature)

2. Theoretical Framework

2.1 Transportation Infrastructure Development

Infrastructure development plays a crucial role in the progress of developing countries (Khanani et al., 2020). It has been acknowledged by the World Bank (Luo, 2018) that infrastructure development yields significant positive effects on economic growth, poverty reduction, and social advancement. The Gambia's OICRE project exemplifies such an endeavour, aiming to enhance transportation and infrastructure nationwide. The project's anticipated outcomes include improved access to essential services like healthcare and education, as well as enhanced connectivity among different regions, positively impacting the quality of life for Gambians (NRA et al., 2021).

Nevertheless, infrastructure development projects can also impose adverse environmental and social consequences (Margorinova & Trojanova, 2019). Construction activities, for instance, can lead to soil erosion, deforestation, biodiversity loss, and air pollution, resulting in long-term negative environmental impacts (Barikayeva et al., 2018). Furthermore, large-scale

infrastructure projects may cause social and economic displacement, cultural heritage loss, livelihood disruptions, and alterations in land use patterns (Bina & Hawkesworth, 2017).

Hanna et al. (2016) conducted a study on cultural implications of a hydroelectric dam project in Brazil, emphasizing the importance of considering culture in development projects that impact communities. The article underscores culture as a fundamental aspect of community identity and advocates for culturally appropriate impact assessments and project development frameworks.

From a critical perspective, the article argues for collaborative impact assessments with affected communities to identify culturally significant tangible and intangible assets. Tangible assets encompass physical structures like buildings and monuments, while intangible assets encompass practices, beliefs and values. The article emphasizes the need to prioritize significant cultural assets during the assessment process and involve communities in defining culturally appropriate mitigation measures.

2.2 Social Impact Assessment

Kreissel et al (2015) provide a broader perspective on impact assessments and their social implications. Discussing the concept of societal impact assessment, they argue that impact assessments should be conducted in a participatory manner, with the involvement of all stakeholders, including affected communities, civil society organizations, and government agencies. Kreissel et al., (2015) emphasizes the need for transparency and accountability in the assessment process to ensure that the interests of all stakeholders are considered. This stance of the importance of stakeholder participation in the assessment process, is echoed by Esteves et al (2011). They recommend that stakeholder participation should be a continuous process throughout the cycle, from planning and design to implementation and evaluation. This allows for ongoing feedback and adjustment and helps to ensure that the needs and concerns of stakeholders are addressed at every stage.

In the context of large-scale infrastructure projects like expansion of roads in GBA, understanding and addressing social impacts becomes crucial. This study examines the limitations of traditional Social Impact Assessments (SIAs) and argues for their inclusion of broader social aspects. SIAs often focus on measurable impacts such as job creation or improved access to services, which may be politically convenient indicators (Amour, 1990). However, Vanclay (2002) contends that SIAs should encompass social aspects like exposure to environmental hazards, impacts on physical safety, access to resources, and economic and personal disadvantages experienced by individuals. Armour (1990) highlights the underestimation of social impacts in many SIA studies, as exemplified by the oversight of property loss. In The Gambia, Environmental Social Impact Assessments (ESIA) are used as an alternative to traditional SIAs to identify potential problems and opportunities associated with activities.

2.3 Environmental Social Impact Assessment

“An Environmental Social Impact Assessment (ESIA) is a systematic identification through interdisciplinary lenses of a project’s development likely impacts and their significance” (NRA et al., 2021). In essence, an ESIA can be juxtaposed with an SIA. However, in 1994, The Gambia’s National Environment Management Act was passed to address matters of environmental protection and socio-economic development, and in 1999, environmental impact assessments (EIA) became a requirement for development projects and activities that could have significant impacts on the environment (Kakonge, 2006). In addition to an EIA, large scale projects were also required to produce an SIA.

However, in 2014 the NEMA requirement was updated (GG, 2014). Instead of producing two separate documents with possible overlapping results, major projects, such as the BHHP, are now required to conduct an ESIA to assess the potential environmental and social impacts in the sites and areas selected for the project (NRA et al., 2021).

In 2021, an ESIA was conducted, and the report acknowledges that although some impacts are known, their direct and indirect implications remain a mystery until the commencement of the project (NRA et al., 2021). Some of the potential impacts during construction phase and mitigation measures highlighted in the report are listed in Table 1.

*Table 1: Potential impact sources and receivers with impact description and significance
Source: NRA et al., 2021*

Time	Impact source	Impact category	Impact receiver	Impact description	Impact status	Impact significance
Construction	Road clearing: freeing and cleaning	Flora	Environment	Tree clearing/ loss of vegetation cover	Negative	-1
		Agriculture	Livelihood	Horticulture & floriculture activities relocation	Negative	-1
		Infrastructure	Population	Residence and business relocation or removal within road right of way	Negative	-2
	Site base installation including stockpiling area of material	Soil and Water	Environment	Compaction, erosion, contamination from leakage or inappropriate waste disposal	Negative	-1
	Quarrying: opening and exploitation	Landscape & soil	Environment	Access roads and illegal mining Soil erosion		
	Laterite road foundation and grading	Atmosphere	Population	Increase in the quantity of solids in suspension in the air (dust emissions)	Negative	-1
	Earthworks and road grading	Infrastructure	Population	Infrastructure damage and service interruption	Negative	-1
	Heavy machinery works & material transportation	Health & Safety	Population	Noise and vibration, accidents, fumes and noxious gazes	Negative	-1
	Access routes and diversions	Road safety	Population	Increased traffic, over speeding & accidents	Negative	-2
	Labour units	Health & Safety Socio-economic	Workers/Pop	occupational accidents, STI's transmission	Negative	-1
Population			Income generation and skill enhancement	Positive	+2	
	Natural rainwater flow	Infrastructure	Population	Flooding and soil erosion	Negative	-1
Operation	Income generation	Socio-economic	Population	Employment	Positive	+2
	Communication & access	Socio-economic	Population	Increased mobility and access	Positive	+2
	Traffic: petroleum fumes and particulate matter	Atmosphere	Pop/Env	Air pollution and related health issues	Negative	-1
	Road Safety	Safety	Population	Vehicle accidents: excess speed, etc.	Negative	-2
		Safety	Population	Hindered mobility of pedestrians		
	Livestock and wildlife crossing	Biological	Pop/ Fauna	Collisions and biodiversity loss	Negative	-1
	Transportation & Trade facilitation	Infrastructure	Population	Fluidity of transport of goods and people	Positive	+2
Urban landscape	Infrastructure	Population	Increased land value and up lifting of urban outlook	Positive	+2	
Workshop	Disposal of excess materials, rubble, and other debris	Infrastructure	Environment	Solid waste generation may cause visual, water and soil pollution	Negative	-1
	Garage activities & fuel storage	Bio-physical: soil & water	Environment	Used oil, petrol leakage causes soil and water pollution. Can also be a source of fire and explosion	Negative	-1

In addition to the potential negative impacts during the construction phase, the ESIA (NRA et al., 2021) also stipulated the anticipated positive impacts on the wellbeing of affected communities once the projected was completed. These include ease of communication and accessibility, and reduced transport cost and potential boost in economic activity.

2.4 Particulate Matter Pollution

Particulate matter pollution is a major environmental concern related to road construction (Reid et al., 2013). PM refers to small solid or liquid particles in the air, like dust, that can enter the lungs and cause health issues (Anderson et al., 2012). PM pollution is typically measured as PM_{2.5}, representing particles with a diameter of 2.5 micrometres or smaller (Reid et al., 2013)

Research indicates that road construction activities can substantially elevate PM pollution in nearby regions (Khanani et al., 2021). According to Reid et al., (2013), PM is generated during construction processes such as drilling, excavation, and rock and soil crushing. Vehicle traffic associated with construction, including trucks and heavy equipment, can also contribute to PM generation.

Exposure to PM pollution is associated with various adverse health effects, including respiratory and cardiovascular diseases (Anderson et al., 2012). These health impacts significantly affect QoL, as individuals residing in areas with high PM pollution levels may experience reduced physical and mental wellbeing (Reid et al., 2013).

2.5 Quality of Life

The concept of quality of life (QoL) is central to understanding the impact of development projects on the well-being of communities. Within QoL literature, it is widely acknowledged that QoL is a complex concept that involves various dimensions, including physical, mental and social functioning as well as overall well-being (Schalock et al., 2000). In the context of this study, QoL can be defined as the degree to which individuals or communities are able to meet their basic needs and experience a sense of well-being in different aspects of life, such as health, education, social relationships, and living conditions (MackeFnzie et al., 2016). The OICRE project in the Greater Banjul Area of The Gambia has the potential to affect the quality of life of the residents of the Kombo North Area in several ways. This study will focus on how the externalities of the BHH road construction has affected how well an individual functions in daily life and their perceived well-being. The externalities include, dust, traffic congestion, disrupted water and electricity lines (connections), property damage etc (NRA et al., 2021).

3 Conceptual model

3.1 Assumptions

The conceptual model depicts the key factors that may influence the impact of the OIC road expansion project on the quality of life of Gambians. The model comprises three main components: the road expansion project, the environment, and the community (Figure 7). These components are interconnected, and changes in one component can affect the others.

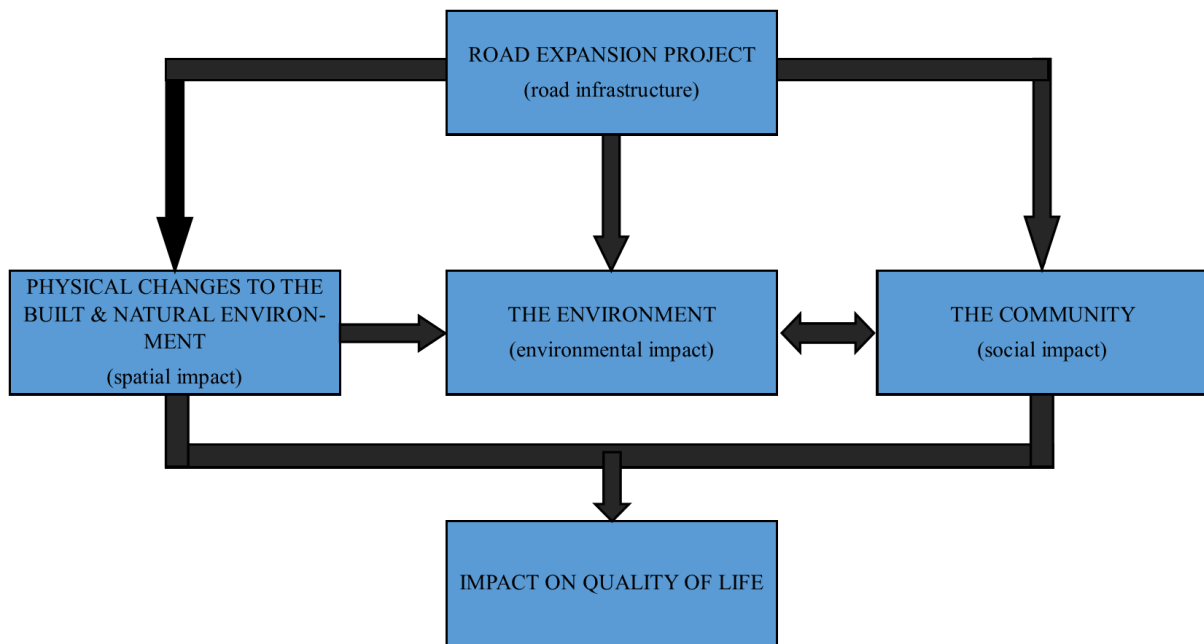


Figure 7: Conceptual model Source: Jobarteh, 2023 based on theoretical framework.

The road expansion project component includes the areas the new roads are being constructed, diversions and changes that may result in increased traffic and particulate matter pollution. It may also lead to the displacement of some communities and the fragmentation of natural habitats.



Figure 8: Aerial view of the new BHH being constructed, the diversion routes and the surroundings Source: Nice Gambia on YouTube

The environment component includes the natural and built environment surrounding the road network. This component may be affected by the road expansion project through demolition of

structures, and increased traffic and pollution, leading to a decline in air and water quality, as well as negative impacts on natural habitats (Margorínová & Trojanová, 2019).

The community component includes the people living along the road network and the social and economic activities that take place in the area. The road expansion project may impact the community by changing their mobility patterns, access to markets, health and safety, and overall quality of life (Riley-Powell et al., 2018).

The arrows in the conceptual model represent the potential causal relationships between the components. For example, the road expansion project may impact the environment, which in turn may affect the community. Similarly, changes in the community may influence the environment and the success of the road expansion project.

3.2 Hypotheses

Based on the theoretical framework and established conceptual model (Figure 7), the hypotheses have been formulated as follows:

- The road construction has altered the physical landscape which has significant social and environmental impacts including changes to the landscape, increased pollution, traffic patterns, and accessibility.
- There is a relationship between the social and environmental impacts during the construction of the new roads and perceived quality of life.
- The road construction has created business opportunities along the road network which has improved the quality of life of people.

4 Methodology and Identification Strategy (anthropological data collection)

This study uses a mixed methods approach (Figure 9). For the qualitative analysis, primary data was collected in two phases. The first phase of research consisted of in-depth interviews, brief interviews and participatory conversations. The main objective of this qualitative work was to ensure that individuals had the opportunity to identify the main impacts from the BHH road construction that they perceived affected their quality of life.

Secondary data was collected through YouTube videos documenting the OICRE project and review of grey literature to inform the research about the generalised impacts of road construction of the people and the environment.

How has quality of life in the Kombo North Area of The Gambia been affected by the Bertil Harding Highway project?

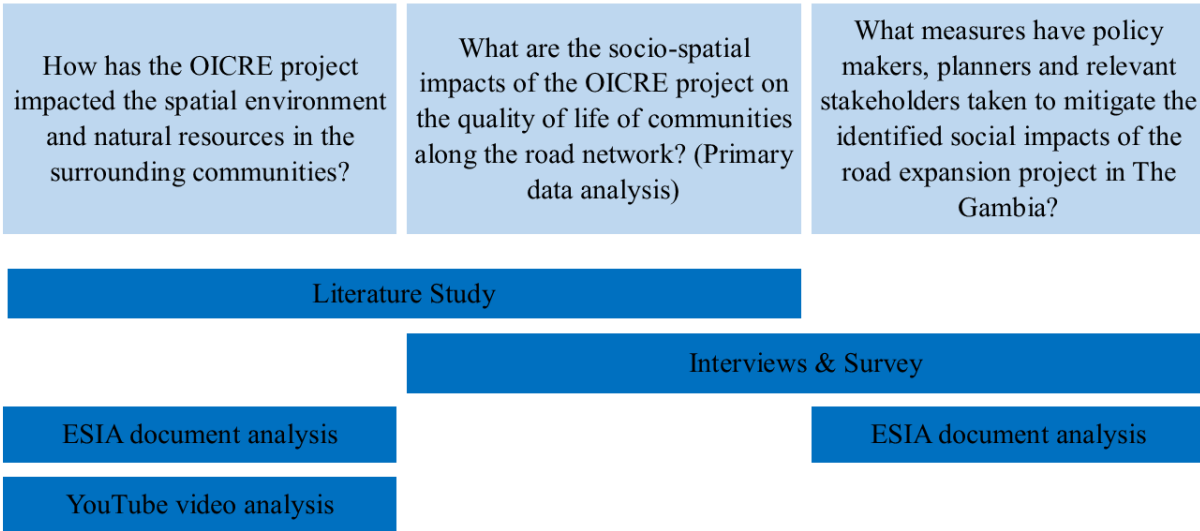


Figure 9: Research design

4.1 Qualitative Data

Data was collected using in-depth semi-structured interviews. Interviewees were selected based on geographic proximity to the BHH and contrasting social and economic characteristic. Participatory conversations were used to supplement interviews, allowing for non-leading and open discussions (Swain & King, 2022). Brief interviews were conducted with a random sample of traders and commercial drivers along the road network to address literacy challenges.

Primary data collection took place from April-May 2023 involving brief and in-depth interviews, and two participatory conversations. The interviews and conversations sought the perspectives of residents living along the highway, government officials, commuters, public transport drivers, business-persons and road infrastructure experts (Table 2).

Table 2: Overview of the selected interviewees Source: Jobarteh, 2023

Interviewee number	Description of the interviewee	Role/ Position in relation to the project	How was interview held
1	Civil servant	Affected person	Phone call
2	Civil servant	Affected person	Phone call
3	Former Foreign Affairs Minister (Gambian politician and diplomat)	Has background knowledge about the project	Phone call
4	YouTuber that has been following the road construction	Affected person/ Spectator	Phone call
5	Working student	Affected person	Phone call
6	Engineer	Affected person	Phone call

Interviewee number	Description of the interviewee	Role/ Position in relation to the project	How was interview held
7	Tourist Taxi Driver	Affected person	In-person
8	Tradeswoman	Affected person	In-person
9	Credit seller	Affected person	In-person
10	Coconut salesman	Affected person	In-person
11	Fruit seller	Affected person	In-person
12	Gardener	Affected person	In-person

The secondary data sources were aerial images/ satellite imagery of KND (sourced from google maps 2023), 2021 Land use and boundary data of communities (from UNOPS Banjul story map on Arcgis) and stills from Nice Gambia (2023) YouTube channel. The aerial images were used to get a bird's eye visualisation of the spatial changes at two moments; before and after the start of the road construction.

4.2 Quantitative Data (Survey)

To supplement and generalize findings from the qualitative analysis, a survey was developed to collect specific information pertaining to the main impacts of road construction that affect quality of life of individuals within the study area. The survey was conducted among a sample size of 50 respondents to minimize sampling error and ensure sufficient statistical power. Inspiration for the questionnaire was drawn from the main impacts identified in the interviews, the contents of the ESIA conducted by NRA et al. (2021), and an adapted version of the World Health Organization Quality of Life-BREF (WHOQOL-BREF) (WHO, 2004). The WHOQOL-BREF is a shortened version of the WHOQOL-100, which is a comprehensive questionnaire that assesses QoL across physical health, psychological wellbeing, social relationships, and environmental aspects

Study population

Commuters who use the BHH were selected as the target population for the study as they represent a segment of the population directly affected by the BHH road construction making their experiences crucial in assessing the impacts on QoL. A target of 50 respondents was established to minimize sampling error and ensure sufficient statistical power. A random sampling method was employed to select participants with an identification question within the survey used to validate if they were users of the highway.

Bivariate test of association – Fishers exact test was used to analyse that data. The outcome variable, QoL, was recoded from five categories to three: “Very positively” and “positively” were combined as “positively”, “not affected” remain untouched and “Very negatively” and “negatively” were combined as “negatively”, resulting in three categories.

Descriptive statistics for each of the variables were reported by number and percentage (Table 3). Due to the small sample size (n=47), bivariate analyses through Fishers exact tests were conducted on the predictor variables to examine their significance with QoL at the p=0.05 level (Table 5). Table 5 also includes results of variables where differences between sub-categories are not significant.

4.3 Data Analysis

Data were analysed concurrently employing qualitative and spatial tools to arrive at a comprehensive understanding of the impacts the road construction has on the wellbeing of affected communities. The qualitative data were coded and analysed using ATLAS.ti software to understand the effects that have emerged due to the project (Appendix B). The spatial data analysis was done in ArcGIS to visualise (map) the focus area of this study as identified through image interpretation, interviews and YouTube videos. Survey data were entered and managed in Microsoft Excel and further analysed using SPSS Statistical software.

Table 3: Methods of data collection

Source: Penda Jobarteh, 2023

Methods of (primary) data collection	Amount
In-depth interviews	6
Brief interviews	6
Participatory conversation	2
Questionnaire (Survey)	47

4.4 Limitations

Geographical barriers were the biggest limitations of the study. To overcome this physical limitation, digital tools were employed to gather data from participants who were based in Gambia. All interviews were conducted remotely through phone calls rather than video conferencing to avoid connection issues. Another unintended consequence of the physical distance was the inability to interact directly with the local vendors and other affected persons. To mitigate these limitations, a collaborator – a journalist by profession – contributed to the study by conducting the brief street interviews. The survey and questionnaire administered to the participants were designed and developed by me. Moreover, a triangulation method using the results from the brief interviews combined with the in-depth interviews help strengthen the validity and reliability of the study findings.

The limitation of the questionnaire design was the use of categorical data to capture travel time before and during the road project, restricting “before vs after” comparisons.

Lastly, although the official language of Gambia is English, not all participants are fluent in English thus, the language barrier should be considered a limitation. As a result, some interviews were conducted in Wolof and some nuances may have been lost during the transcribing and translation process.

4.5 Ethical Considerations and Expected Outcomes

To ensure the protection of participants’ rights and to maintain integrity of the research, ethical considerations were carefully addressed throughout the data collection and analysis phase. Prior to conducting the interviews’, informed consent was obtained from all participants. They were provided with an explanation of the study and their rights as participants. Participants identities and personal information are kept strictly confidential with all identifying information removed or stored securely. Confidentiality was maintained throughout the research process including the dissemination of findings.

The outcomes of this research will provide insights into how the OIC road expansion project has impacted the quality of life of people along the Bertil Harding Highway construction zone

in the Kombo North area. The research will contribute to the body of knowledge on infrastructure development in developing countries by providing evidence-based data on the socio-spatial and environmental impacts of the project and its management strategies.

5 Findings (Results)

Literature has shown that good road infrastructure can have beneficial spill over effects such as infrastructure development, increase in trade and other economic benefits (NRA et al., 2021). As explained by government officials (The Point, 2021), and as the interviews corroborated, there is a hope for improved transport infrastructure, faster travel times and economic development with project completion.

5.1 Qualitative analysis

Figure 10 illustrates the coding scheme derived from an analysis of the interviews in ATLAS.ti. The analysis of the interviews is based on the emerging themes.

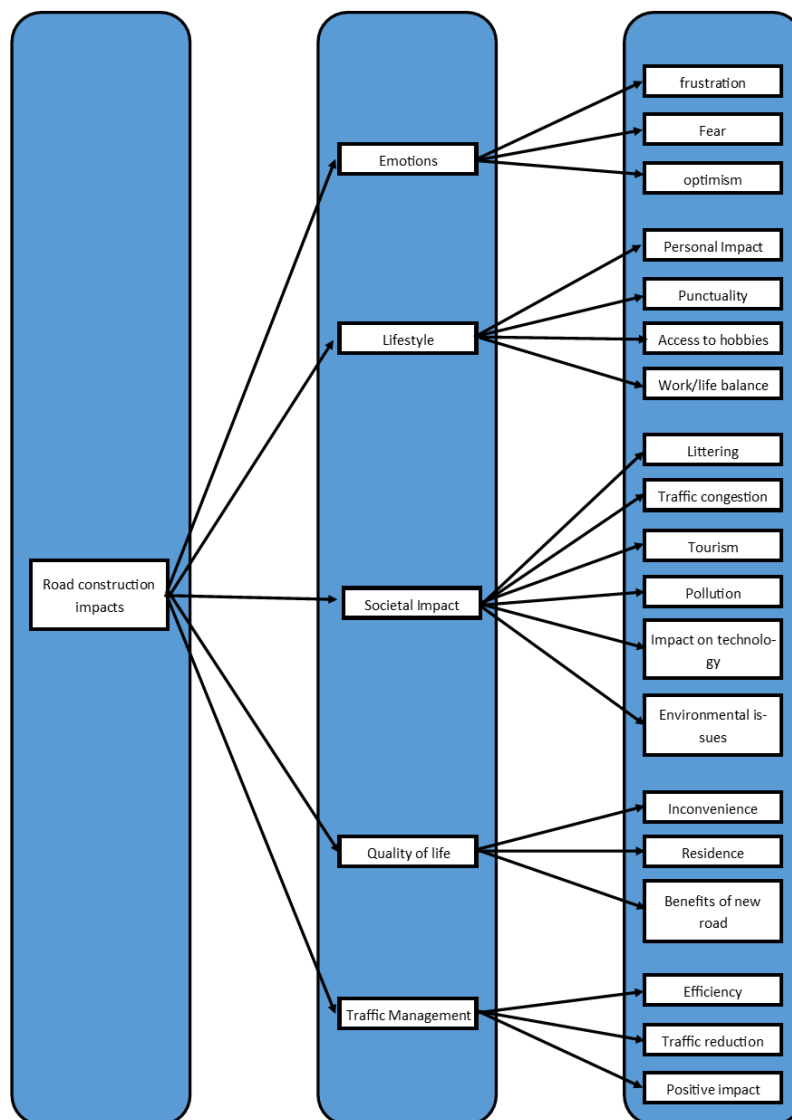


Figure 10: Coding scheme

5.1.1 Social Impact

The interviews exposed a trend in the social impacts of the road construction project. Complementary to previous findings (Ihuoma et al., 2020; NRA et al., 2021), all interviewees emphasized dust pollution as the biggest social impact. As interviewee 3 pointed out, *They've patched up side roads for people to take and, what the side roads had done is to make driving difficult because they're very bumpy. But worst of all is the dust pollution, there's a lot of dust.* However, interviewees such as interviewee 8 mentioned that the workers attempt to reduce this impact by showering the roads with water to mitigate the impacts. So far, this has been an unsuccessful mitigation measure.

Our merchandise gets very dusty because we are next to the road, when the construction vehicles and trucks are (off)loading sand and when they are working there is a lot of dust which gets generated. But they also sometimes sprinkle water on the ground to reduce the dust that rises which, when wet, helps a little bit. As they work, the sprinkle water to reduce the dust.

Dust inhalation can lead to health implications for people like the child of interviewee 13, *when I took her to the hospital they said that she is allergic to dust. So it makes her, you see at night when she is trying to sleep she can't breathe. She wheezes, people purchase and use dust masks. I have to buy a mask every, every, a packet of masks, every few weeks because if not, I end up getting a flu all the time (Interviewee 5).* The by-product of this act however is littering, *the filth, the dirt (Interviewee 5).*

5.1.2 Quality of Life

Street vendors (Figure 17) acknowledged positive economic impacts due to increased visibility and prolonged exposure to potential customers during the traffic congestion on diversion routes. However, road users perceived a decrease in quality of life due to the negative spill over effects of the route diversion during the road construction. One main issue mentioned by all the interviewees was the increase in traffic congestion. A tourist taxi driver and a civil servant complained about damages to their vehicles and corresponding maintenance costs.

... But the impact it has on the negative aspect is the, the negligence the contractor or I don't know how contract is. But to my own understanding, the road that people are using right now must be made properly first before they will even start maintaining the highway. But by looking at it, there is no consideration done for that. And a lot of vehicles have problems, mechanical problem, especially me, I have been maintenance in my vehicle constantly. ...



Figure 11: Street vendors lined along the construction barrier. Source: Nice Gambia, YouTube, 2023.

In addition, as predicted in the ESIA, telecommunications was also affected. Interviewee 3 explained that *when the construction started, there was a lot of digging. And cables. Cables got cut, cable cables, telecommunications cables got cut. And sometimes we will go for days without internet.* Basic amenities were also impacted which had ripple effects on QoL. As interviewee 5 said *it has impacted us in this area of water and basic amenities like electricity as well. There is always power outage and if you ask, they'll tell you the road construction. And then the internet as well is sometimes not available. So, and you have a flu all the time.*

5.1.3 Lifestyle

Another recurring impact was an increase in travel time regardless of distance. For the different interviews this has impacted them in different ways. For example, the business owner arrives late at home after a long day at work, the working student no longer has an active social life, and one resident's family relation is strained because they are unable to visit family members as much as they used to.

Property damage, service disruption and communication glitches were also mentioned. In the preparatory phase of the project, structures that encroached into the forty-meter buffer zone of the road were earmarked for demolition. It is difficult to ascertain the level of blame the victims can shoulder for their properties falling within the buffer zone considering a building permit had to have been issued before any structured can be erected on a site. As Interviewee 12 lamented, *it is true we did not purchase this land but the land is here for the children of the country. If the government needs the site, then they should not just say we should not use it and banish us but they can give us compensation so that we are encouraged.* This sentiment mirrors IFC's Guidance Note 5 (2012) which states that residents without land title should be entitled to compensation. This is should especially be the case in developing countries like The Gambia where many disadvantaged groups do not have land titles. None-the-less, the affected people

were alerted of the demolition by the relevant governmental body almost a year before the demolition took place. Interviewee 1 confirmed this:

Right now, I think the negative outweighs the positive... the road constructions are taking longer than intended. ...it was scheduled to only last for one year...

5.1.4 Traffic Management & changes to physical environment

Similar to the findings of Zoker et al., (2022), the road construction had substantial effects on vehicular traffic, and disturbance from the road material itself and the traffic of the diverted route.

They damaged the only good road that we had. They are working backwards. They should have fixed the feeder roads first because the main road, though narrow, was still in good condition. Now we have bad feeder roads, and no main road. I think they did this for their own political agenda but we the people are the ones struggling. I can't even visit my mother that often because she lives in Brusubi and getting to her takes hours when it normally used to take no more than 20 mins during off-peak hours.

The spatial dynamics which have emerged in the studied area of the OICRE project due to the road construction include damage to existing infrastructure, change in the landscape and natural areas such as the Kotu stream which has become heavily polluted, vegetation has been removed which has exposed the bare ground to erosion and much of the built environment has been altered (Figure 17 – Figure 18).



Figure 12: Birds eye view imagery showing the new road being constructed, the diversion route and the construction machinery. Source: Nice Gambia, YouTube, 2023.



Figure 13: Image showing the current condition of the Bertil Harding Highway, and the diversion route (right side of photo). Source, Nice Gambia, YouTube, 2023.

5.1.5 Emotion

Despite the negatives, interestingly most interviewees have an optimistic and supportive outlook on the project once it has been completed.

Oh, the road once complete everyone will be happy. Yes, it is true that the Gambia is a small nation but the roads are very narrow. But this one, once completed everyone will be happy. Traffic jam will be drastically reduced because the widening of the road will make everyone happy. The cars will be going and coming, and I think traffic accidents will also reduce because since the new road will be wide and not narrow, people will be able to avoid accidents in the traffic. - (Translated from Wolof)

5.2 Quantitative analysis

This section presents the results of the data collected through the survey.

Table 4: Descriptive statistics of study population and survey responses

Source: Jobarteh, 2023

VARIABLE	(n)	PROPORTION (%)
Gender		
Male	32	68.1
Female	15	31.9
Age bracket		
18-24	4	8.5
25-30	8	17.0
31-40	14	29.8
41-50	5	10.6
51-60	6	12.8
60+	10	21.3
Daily Use of Bertil Harding Highway		
Yes	38	80.9
No	9	19.1
Aware of construction prior to starting		
No knowledge	3	6.4
Less than 3 months prior to start	4	8.5
Less than 6 months	3	6.4
Between 6 months to 1 year	5	10.6
Over a year	32	68.1
Extent to which construction affected leisure activities		
1 (Least affected)	2	4.3
2	4	8.5
3	14	29.8
4	8	17.0
5 (Highly affected)	19	40.4
Quality of Life prior to construction		
1 (Very poor)	1	2.1
2	2	4.3

3	18	38.3
4	16	34.0
5 (Very good)	10	21.3
Quality of Life after the construction began		
1 (Very poor)	2	4.3
2	7	14.9
3	11	23.4
4	12	25.5
5 (Very good)	15	31.9
Travel time prior to construction (minutes)		
15-30 mins	15	39.5
30-45 mins	14	36.8
45mins-1hr	5	13.2
>1hr	4	10.5
Travel time during the construction		
15 mins or less	3	6.4
15-30 mins	2	4.3
30-45 mins	11	23.4
45mins-1hr	10	21.3
>1hr	21	44.7
Affected by dust		
Very Positively	2	4.3
Positively	3	6.4
It has not affected me at all	1	2.1
Negatively	16	34.0
Very negatively	25	53.2
How much has the road construction affected your QOL		
Very Positively	1	2.1
Positively	1	2.1
It has not affected me at all	17	36.2

Negatively	13	27.7
Very negatively	15	31.9
Overall satisfaction with changes to physical environment from road construction		
1 (Very dissatisfied)	16	34.0
2	6	12.8
3	17	36.2
4	4	8.5
5 (Highly Satisfied)	4	8.5

Table 1 presents the descriptive statistics of the study population and the survey respondents. Overall, 47 participants responded to the questionnaire. Majority of participants were male (68%) and middle-aged; 31-40 years-old (30%). 81% used the BHH daily, compared to 19 percent who did not use the BH highway daily. Almost 80 percent of respondents were aware of the road construction at least 6 months before road works commenced. The questionnaire explored participants use of the highway, satisfaction (or lack thereof) and contributions or disruptions to their movements. When asked about Quality of life before and after construction, 21 percent responded ‘very good’ compared to 31.9 percent respectively; 6 percent responded ‘poor’ or ‘very poor’ compared to 19.2 percent who reported their quality of life was ‘poor’ or ‘very poor’ after road works began. Responses related to travel time revealed that majority of participants spent 15-45 minutes (76%) travelling to their respective work sites or schools before construction compared to 10 percent who travelled 15-45 minutes during construction. In contrast, majority of participants travelled more than an hour (45 percent) during BHH road works. Outside of work and school, majority of respondents’ leisure activities were highly affected (40%) by the ongoing construction and accompanying dust pollution (87%). Almost half (47%) of respondents expressed their dissatisfaction toward the new highway; 34 percent were ‘very dissatisfied’ and 13 percent were ‘dissatisfied’.

Results from the bivariate analysis (Table 5) shows that the only variable significantly associated with QOL is dust pollution ($p < 0.01$). Other variables assessed: sex, age, overall satisfaction, daily use of BHH, impact on leisure activities, travel time before and during construction were not significantly associated with quality of life.

Table 5: Bivariate analysis of QOL and study variables using Fishers exact test
Source: Jobarteh, 2023

	OUTCOME
	QOL during road construction
<i>Fischer's exact test p-value</i>	
Sex	0.19
Age	0.75
Overall satisfaction with changes to physical environment from road construction	0.37
Daily use of BHH	0.81
Extent to which construction affected leisure activities	0.36
Travel time prior to construction	0.96
Travel time during the construction	0.74
Affected by dust	<0.01***

Table 6 depicts the results from the bivariate analysis between QOL and dust pollution. Majority (45%) of participants who reported that the dust pollution affected them ‘very negativley’ reported a poor quality of life.

Table 6: Bivariate analysis between QOL and dust pollution
Source: Jobarteh, 2023

	How road construction affected QOL (%)		
	Poor	Neutral	Positively
Not affected	2.13	0	0
Negatively	8.5	23.4	2.1
Positvely	4.3	2.1	0
Very negatively	44.7	6.4	2.1
Very positively	0	4.3	0

Interestingly, 68.1% of the respondents were aware of the project over a year before construction began which corroborates works in the theoretical framework above and ESIA

(NRA et al., 2021) that community engagement about project was done before works commenced (Figure 14).

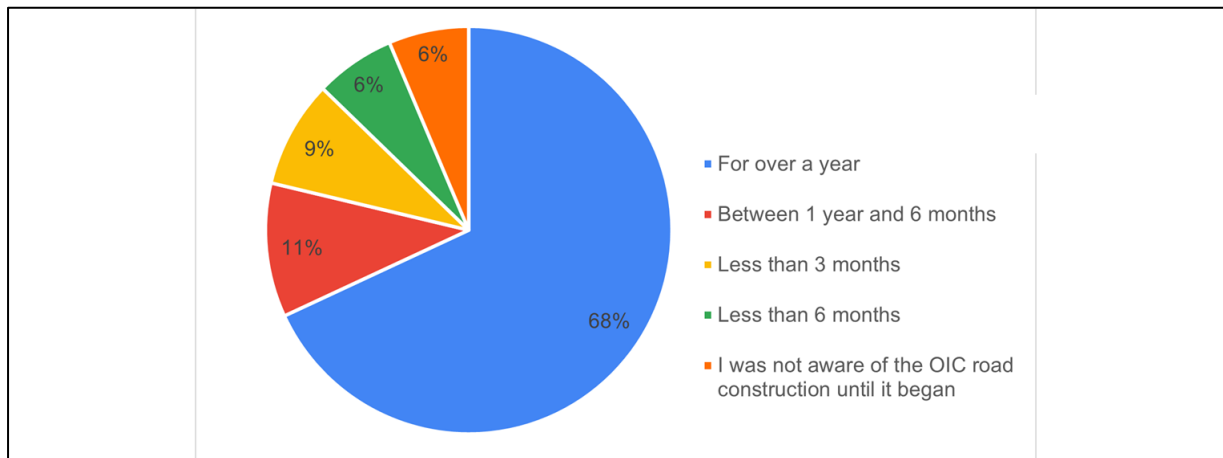


Figure 14: Visualisation of answers to the Question – How long did you know about the OIC road construction before it began?

As prior studies and BHH ESIA (NRA et al., 2021) have identified, travel time is a major impact of road construction. Commuters perceived negative change in accessibility because of the BHH road construction as shown by average travel time before and during the construction phase (Figure 15 & 16). Most of the interviews agreed with the experiences of the respondents about travel time with an interviewee stating that.

“Furthermore, as a commercial driver, a trip from here to the airport takes 45 minutes now instead of the usual 10 minutes. That has affected me.” - Interviewee 7

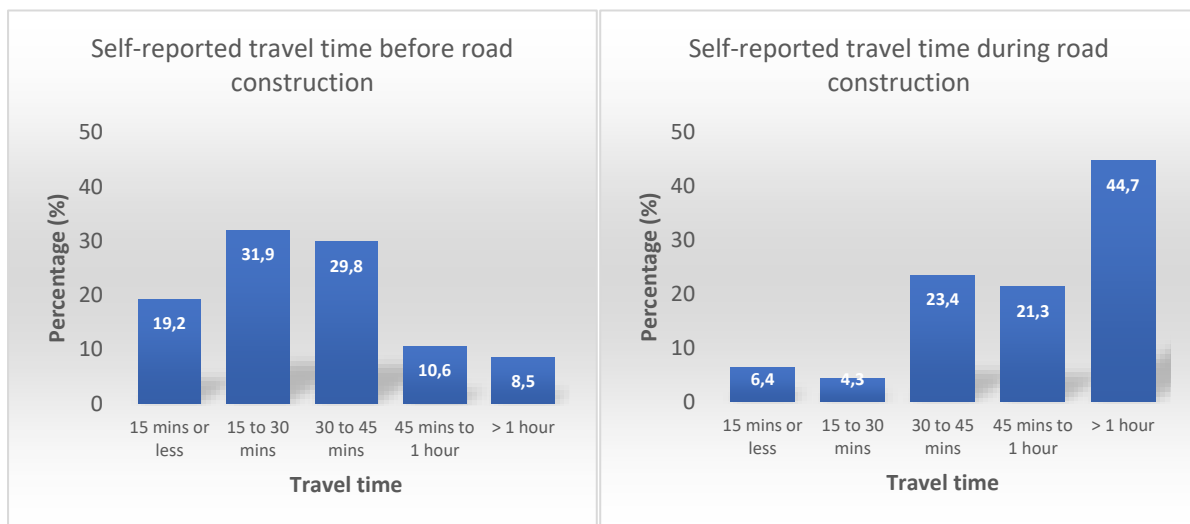


Figure 15 & 16: Percentage comparison of average travel time of commuters before and during the road construction phase

When travel time was assessed (Figure 14 and 15), results showed that the average travel time before construction was 15 to 30 minutes (32%). However, once the road project began the average travel time was more than one hour (45%).

Only 9 percent of respondents travelled for more than an hour before construction compared to 45 percent during road works. Similarly, 51 percent of road users reported a short travel time (less than 30 minutes) before road construction, this decreased to 11 percent during road construction. Although the study cannot conclude that individual travel time was different before and during construction work, results from the Fischer's exact test ($p=0.05$) suggests that there is an association between the travel time before and after the road construction.

6 Discussion & Conclusion

This section discusses the insights from study findings as per the objectives of the research and the conceptual framework in relation to earlier studies on impacts of road construction, and quality of life.

The results suggest that people in the construction zone of the BHH in The Gambia link their quality of life not only to health and income, but also mobility and social relations. A range of impacts of the road construction on QoL were identified and generally, the mixed method data analysis shows three emerging themes which are validated with the conceptual model (Figure 7). These are summarized in Table 8. They include both positive and negative impacts. Overall, however, affected people felt that the (potential) positive impacts and mitigation measures were outweighed and maybe even overshadowed by disruptions to life from dust, traffic congestion, interruption to basic amenities and change in social relationships. Despite this, they mostly remain optimistic of the benefits that the new road infrastructure will bring.

Based on the results, 68.1% of the respondents were aware of the project over a year before construction began which collaborates works in the theoretical framework above and ESIA (NRA et al., 2021) that community engagement was done before works commenced

As prior studies and BHH ESIA (NRA et al., 2021) have identified, travel time is a major impact of road construction. Commuters perceived negative change in accessibility because of the BHH road construction shown by average travel time before and during construction (Figure 14 & 15), which is identical to interview findings.

Table 8: Overview of the positive and negative impacts of the road construction that have affected quality of life. Source: Penda Jobarteh, 2023

Major Dimensions	Expected positive impacts of the road (once it is completed)	Negative impacts of the road during the (current) construction phase
Social	Improved social interaction within own community and other communities because it will be faster/ easier to reach places	<p>Increase in traffic accidents and damage to vehicles</p> <p>Increase in travel time due to traffic congestion</p> <p>Loss of land, property and livelihoods during the clearing of the 40m buffer zone</p> <p>Health implications due to dust</p> <p>Interruption of basic services</p>
Spatial	<p>Improved accessibility</p> <p>More aesthetically pleasing infrastructure</p>	<p>Displacement of people who were located in the 40m buffer zone</p> <p>Damage to flora and fauna</p>
Economic	Reduced travel time and travel cost which will improve the connection to other communities and improve business activity	Disruption of business, loss of customers and income

In conclusion, this study investigated and provides insight on the impact of the OICRE project’s construction phase on the quality of life of people in KND. It provides empirical findings and conclusions by incorporating the social impacts of the infrastructure project on people along the BHH into the analysis. Similar to previous studies, this research reveals both positive and negative effects of road infrastructure projects. In KND, completion of the road project is expected to bring improvements such as enhanced accessibility, reduced travel time, and economic growth. However, the affected individuals experience primary negative impacts during the construction phase, including traffic congestion, increased motor vehicle accidents, and particulate matter pollution from work zones. Results highlight implementation of risk management strategies for example sprinkling water for dust control. Study limitations include its case study design and further research can focus on determining if the findings are applicable to other communities and projects. Additionally, data is cross-sectional, suggesting that results may change at later stages. Although the study acknowledges the importance of political and ecological dimensions, they were not assessed and should be explored for future research.

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