Assessing the Impacts of Road Capacity Improvements on Project Communities: A Case Study of the National Highway 1 (N1-Highway) Accra, Ghana

by

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ABSTRACT

The evaluation of road transportation projects has always been undertaken based on engineering and economic criteria. Road transportation projects are selected based on their significant impacts on key performance measures such as safety and travel time. In recent years, emphasis has been placed on the social and economic impacts of road transportation projects and how they affect members of society rather than the users of roads (Transportation Research Board, 2011). The provision of appropriate and effective road facilities is of the utmost importance in order to achieve well-functioning roads in terms of safety, capacity, user comfort, and minimizing environmental impacts. However, these road projects sometimes have social, economic, and spatial effects that adversely impact project communities (Transportation Research Board, 2011). This is significantly important in developing countries where these effects are deemed to be secondary or even tertiary (Markovich & Lucas, 2011).

This qualitative study adopts a grounded theory approach to gain a good understanding of the social, economic, and spatial impacts of road improvement on project communities. This approach was designed to encourage the researcher's persistent interaction with the collected data while remaining constantly involved with the emerging analysis. A qualitative approach was adopted to allow respondents to freely express their views in a variety of ways, rather than using a quantitative approach that could confine the responses of participants or pose self-presentation biases (Chatterton et al., 2009; Whitmarsh, 2009).

Through the process of open coding, axial coding, and constant comparison, this study revealed several themes (codes), the majority of which were consistent with issues

found in the existing literature. The study revealed that the highway improvement has brought benefits such as reduced traffic congestion, increased travel speeds, and improvement to the aesthetic nature of project communities. However, the study further revealed some adverse social, economic, and spatial impacts on project communities. Based on the study, these adverse impacts emerged in the post-construction phase. The study revealed that had these adverse social, economic, and spatial impacts been given the required attention during the planning process, most of these could have been reduced, avoided, or mitigated.

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DEDICATION

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General Introduction and Background

Besides playing the role of thoroughfares for motor vehicles, urban streets also serve as public spaces. Urban streets are places where people walk, shop, and meet to engage in diverse social and recreational activities. Many see these as activities that make urban living entertaining (Dumbaugh & Gattis, 2005). Streets of European and American cities in the 19th century were no better than those of ancient Rome, although outside observers recognized dirt and overcrowding as the major problems. In describing the streets of Manchester, Engels (1950) indicated that the streets were filled with heaps of refuse, garbage, filth, and overwhelming stench. Rudofsky (1969) described the streets of Boston and New York in a similar fashion. Traffic and noise were not considered much of a problem during this era. In the 20th century, streets were described as clean and well-paved. However, the paving of streets was believed to have led to the intrusion of motor vehicles into cities. Motor vehicles and their by-products have gradually and relentlessly invaded the streets of cities (Appleyard, Gerson, & Lintell, 1981).

The negative effects of traffic and the role of streets have been a matter of debate in modern planning since the beginning of the 20th century. For instance, one of the objectives of the Garden City movement was to make streets safer through cul-de-sacs, residential squares, and neighborhood units, with safe pedestrian pathways to schools. Also, architects tried to distance their buildings from the street by placing them at right angles to develop quiet green spaces. However, these approaches underestimated the traffic problem. The majority of the people in existing cities continued to live along streets, increases in car ownership resulted in more traffic than ever predicted, and

parking lots and roads replaced safe green spaces (Appleyard, Gerson, & Lintell, 1981).

On the other hand, Jane Jacobs criticized modern housing and planning (1961). Jacobs praised the complexities and diversity of the old city and advocated for the return of life to the street. Jacobs believed that the safest place in the city was the urban street: with residents' eyes always on the street, criminals could easily be identified. In contrast, in the parks and anonymous grounds of modern residential developments, no one took it upon themselves to look out for others. Jane Jacobs' ideal urban environment was one depicted by the intensive street life in her Greenwich Village neighborhood. Although she did not worry much about traffic in her neighborhood, she developed a critical idea about traffic. Jacobs indicated that as traffic increased to fill newly provided highway space, traffic congestion could lead to its own attrition. This is a concept that intuitively looks possible, but depends on the elasticity of demand for driving (Jacobs, 1961).

A report on livable streets in England, "Traffic in Towns," published by Great Britain's Ministry of Transport in 1963, drew the British government's attention to traffic problems. The publication documented the effects of traffic and greatly emphasized solutions. It introduced the concept of zoning cities into environmental areas, where the environment would be an overarching concern. As a result, a great number of cities developed plans for these environmental areas. However, in subsequent years, the focus of British transportation planning was on the need for channeling traffic along major highways in order to create the environmental areas (Appleyard, Gerson, & Lintell, 1981).

Empirical sociology gave some level of attention to the street block strictly as a sociological phenomenon. The core interest had been the role played by "face-to-face

neighboring" in the social fabric of urban residents. The discussion had focused on the role of proximity in neighboring, a characteristic found to be significant in an early study by Festinger, Schachter, and Black (1950). In a number of papers that emphasized the dominance of social homogeneity in neighborly relations, Gans (1968) challenged the role of proximity in neighboring. Gans criticized Jane Jacobs for engaging in the "fallacy of environmental determinism" (1968) when she argued that the design of housing and streets could in itself bring diversity to urban street life.

Fried and Gleicher (1961) and Suttles (1968) described the nature of street life in slum and working-class streets of Boston and Chicago. A study by Brower (1977) in Baltimore established that more recreation takes place on streets than in the parks. These descriptions depicted the importance of street life in lower-income neighborhoods and detailed the interrelation of private and public territory, with the street as the mediator between the general community and the private world of the family. Brower (1977) discussed traffic and other environmental nuisances, while Suttles (1968) described the role of major commercial streets of slums in Chicago. Environmental concerns surfaced through studies that looked at overall residential satisfaction. A broad range of characteristics was reported, including the house itself, privacy, neighbors' upkeep, appearance, social status, suitability for children, and well-paved streets. For some strange reason, traffic did not emerge in these studies as an important issue. This was attributed to the fact that many surveys had concentrated on suburban environments or new housing projects, where traffic was planned to be of slow speed and low volume. Another possibility relates to how research results were coded. One study coded traffic under the heading "street activity"; in another, all the characteristics of a house's

"external setting" deemed to be an important factor in residential choice were grouped under one category (Michelson, 1977). The 1973 U.S. Housing Survey suggested the dimensions of the problem. The survey revealed that 45.8% (over 30 million people) reported "street noise" as an undesirable characteristic of their neighborhood, while 29% reported "heavy traffic." Fewer respondents complained of characteristics such as inadequate lighting, the need for street repairs, crime, and trash (Appleyard, Gerson, & Lintell, 1981).

As a result, traffic was seen more as a widespread problem than crime, although crime captured the media headlines. In inner cities, the U.S. Housing Survey revealed that 34% complained about heavy traffic, 51% about street noise, and 22% about street crime. The most distressing issue was a large number of children injured or killed by traffic. In a study of over 2,000 pedestrian accidents in 13 U.S. cities, Snyder and Knoblauch (1971) found that 50% of all accidents involved children under the age of 15 years. Nationally, the U.S. recorded that 2,180 children under the age of 15 were killed as pedestrians in 1975 (National Safety Council, 1975). Globally, other countries reported similar findings. A random survey in Tokyo reported that "traffic hazard," experienced by 25% of the survey sample, was the most common neighborhood problem (Appleyard, Gerson, & Lintell, 1981). In a nationwide sample of 5,600 people in the United Kingdom, 64% reported being bothered to some extent by traffic (Appleyard, Gerson, & Lintell, 1981). A quarter of the British sample reported being awakened in the morning by traffic noise. At the Twelfth International Study Week in Traffic Engineering and Safety in 1974, it was reported that 84% of children under 10 years in Britain were injured within 800 meters of their home, and 70% of all accidents in the Netherlands involving children

under six occurred on streets carrying fewer than 3,000 cars daily.

In Japan and Europe, narrower discontinuous street systems had highlighted congestion, noise, and air pollution. In U.S. cities, wide continuous gridiron street systems had allowed traffic to infiltrate neighborhoods indiscriminately (Appleyard, Gerson, & Lintell, 1981). The infiltration of highways into urban areas caused an uproar in many U.S. cities. These highways cut through, around, and between cities across the nation. The construction of these highways forced about one million people out of their homes to provide land needed for rights-of-way. Additionally, many businesses were forced to relocate or found the values of their locations affected by the new pattern of vehicular transportation (Goodman, 1971).

Outside the U.S., efforts to manage the negative effects of traffic were in advanced stages. In April 1975, countries participating in the Organization for Economic Cooperation and Development (OECD) held a conference in Paris entitled "Better Towns with Less Traffic." The conference signified a change of heart in transportation planning—a change believed to have been advocated for by small groups living in neighborhoods that straddle transportation routes. At the conference, case studies were presented from places such as Bologna, Singapore, Uppsala, Nottingham, Munich, Besançon, and Nagoya, which were then pioneering new ways of making more livable cities (Appleyard, Gerson, & Lintell, 1981).

In protecting streets, cities across the world adopted traffic control devices that were able to solve the problems on streets easily and cheaply with signs, street bumps, or temporary barriers. Inasmuch as urban problems took huge amounts of money and effort to solve, traffic control was simple and yielded immediate results. However, the side

effects of traffic change were complex. Motorists were likely to become resentful, a proportion of the street's residents might be surprised and unhappy at the change, businesses might be apprehensive about likely threats to their sales, and emergency services were likely to view any traffic constraint as a problem. Also, those on the streets that gained traffic as a result of the change were likely to stand against schemes. Secondary impacts could lead to the invasion of an area by higher income groups or to stabilization of middle-income residents in an area of lower-income intrusion. Land values and uses were also dramatically affected. Even in situations where a traffic change resulted in the greatest good for a greater number of people, there was the likelihood of opposition strong enough to force changes or abandonment (Appleyard, Gerson, & Lintell, 1981).

Globally, citizens became increasingly active in opposing traffic, and this was usually catalyzed by accidents involving children. The majority of the protests were against increased traffic and were mild and political. Active street and neighborhood organizations in many cities demanded control of traffic through their neighborhoods. Planning agencies and public works departments in many places installed devices often individually designed to meet specific street problems. Additionally, many cities developed more comprehensive traffic management schemes (Appleyard, Gerson, & Lintell, 1981).

The preceding discussions have indicated that the protection and creation of livable streets involve more than just increasing the comfort or safety of urban living. It must also be acknowledged that streets have other functions. As a place where most children grow up, the street has been seen as a crucial mediator between the home and the

outside world, where children learn to confront strangers and environments on their own. Streets should be receptive and reasonably safe environments that children can explore, manipulate, and use as a setting for all kinds of activities. Streets have personal and social meanings for adults and the elderly as well. Social relations that take place on the street, its potential neighborliness and street life, are treasured aspects of urban life (Appleyard, Gerson, & Lintell, 1981). However, connecting cities across the globe with highways has resulted in the physical destruction and division of many low-income communities, as well as the financial devastation of these communities (Walker, 2016).

Problem Statement

The role of transportation in economic, social, and physical development has always been of importance to politicians, academicians, planners, and investors. In both developed and developing countries transportation is considered a major factor in the development process. The relationship between transportation and development is complex, and this relationship varies both in space and over time (Giuliano, 2004). The availability of effective transportation encourages varying forms of development and also creates opportunities for development. The absence of transportation, however, inhibits the exchange of goods, services, ideas, and information, which further negatively impacts development (Hoyle, 1988).

Transportation problems that confront poor, developing countries are significantly different from those experienced by wealthy, developed countries. Most of the transportation planning problems in developing countries have been exacerbated by the influx of people into urban areas (Cervero, 2013). The World Bank (2013) indicated that by the year 2030, two-thirds of the world's population will move into cities, with the

majority of this change happening in developing countries. The rapid rate of urbanization experienced globally, especially in developing nations, means that more people will end up living and working in urban cities (World Bank, 2013). Additionally, more people and goods will be making more trips over long distances. The movement of people, goods, and information within these urbanized areas are critical and fundamental components of societies. As these urbanized societies modernize, the movement of people and goods is likely to increase, along with a shift toward motorized forms of transportation (Poumanyvong, Kaneko, & Dhakal, 2012).

Motorization in cities of developing nations is increasing, and city-dwellers place a great amount of importance on this. Motorization has transformed cities in developing nations, and the economic and social benefits are significant (Sharma, Jain, & Singh, 2011; Sperling & Clausen, 2004). Motorization provides cities with a high level of access to goods, services, and activities, granting residents a great amount of freedom to move. The acquisition of motorized transport, especially vehicles in developing nations, signifies economic growth and an improvement in one's status (Sharma, Jain, & Singh, 2011; Sperling & Clausen, 2004). However, the acquisition of personal vehicles in most developing nations also imposes a number of economic, social, and environmental costs on their economies. Increased motorization means greater energy use, air and noise pollution, neighborhood fragmentation resulting from new and expanded expressways, as well as increased accidents (Sperling & Clausen, 2004).

The increase in the acquisition of personal motorized vehicles in developing nations places an enormous amount of stress on the finances of such nations. Increased motorization is also likely to cause heavy traffic congestion that places pressure on the

existing road infrastructure (Kutzbach, 2009; Sperling & Clausen, 2004). In mitigating the congestion problem, policymakers in developing nations usually resort to building new roads or improving existing ones. However, these strategies have both positive and negative impacts on project communities and users of the transportation system. In this study, *road capacity improvements* are defined as the conversion of a two-lane undivided highway into a divided multilane controlled-access highway.

The evaluation of road transportation projects has always been undertaken based on engineering and economic criteria. Road transportation projects are selected mostly based on their significant impacts on key performance measures such as safety and travel time. In recent years, emphasis has been placed on the social and economic impacts of road transportation projects, and how it affects members of society rather than the users of roads alone (Forkenbrock and Benshoff, 2001). The provision of appropriate and effective road facilities is of the utmost importance for achieving well-functioning roads in terms of road safety, capacity, road user comfort, and minimized environmental impact. However, these road projects sometimes have social, economic, and spatial effects that adversely impact project communities (Transportation Research Board, 2011). This is significantly important in developing countries where these negative effects are deemed secondary or even tertiary (Markovich & Lucas, 2011).

In developing countries, road transportation plays a very important role in economic growth. In Ghana, for instance, the Ministry of Roads and Highways (2010) indicated that road transportation accounts for about 95% of passenger and freight traffic, and about 97% of the passenger miles traveled in the country. The majority of urban transportation in Ghana occurs by road and is provided by taxis, minibuses (*trotro*), and

state and private bus services. On average, road traffic densities are low in Ghana except in large urban cities such as Accra (the national capital), Tema, Kumasi (the second most populous city), and Takoradi. The extensive use of road transportation compared to other forms of transportation, along with the poor maintenance of existing roads, has led to the premature deterioration of roads, congestion in urban areas, and an increase in traffic accidents. Some of the most congested roads connecting urban cities in Ghana are trunk roads that include high-speed express roadways with high volumes of national, trans-national, and local traffic. However, some of these trunk roads lack the required operational capacity, rendering the transport network in the Accra metropolis inefficient, and frequently resulting in traffic congestion (Millennium Challenge Corporation, 2012; Densu, Salifu, & Attafuah, 2014).

In reducing road traffic congestion, the Government of Ghana (GoG) adopted a policy decision to convert some congested trunk roads into multilane controlled-access highways. One of these roads is the 14.1-kilometer two-lane undivided section of the N1-Highway between the Tetteh Quarshie Interchange and the Mallam Junction road corridor in the Accra Metropolis. This road is not only a regional thoroughfare on the Trans-West African Coastal Highway, but it is also an economic and trade lifeline that traverses more than 500 kilometers of Ghana's coast (Densu, Salifu, & Attafuah, 2014). It connects Ghana's international airport and the two deep-water sea freight ports in Tema and Takoradi to key agricultural production zones (Millennium Challenge Corporation, 2012). Whereas this road corridor has seen little development since 1960, vehicular traffic has exponentially grown, accommodating about 30,000 vehicles daily (Densu, Salifu, & Attafuah, 2014).

In order to eliminate the long travel times, increased transportation, and vehicle operating costs on the Tetteh Quarshie Interchange-Mallam Junction road corridor, the Government of Ghana (GoG), with support from the United States government's Millennium Challenge Corporation (under the Transport Project of the Millennium Challenge Account Ghana Program), received funding to upgrade the 14.1-kilometer section between the Tetteh Quarshie Interchange and the Mallam Junction of the N-1 highway to a six-lane divided thoroughfare (Millennium Challenge Corporation, 2012). The improvement of the road has enhanced mobility and reduced road traffic congestion drastically; however, new challenges have emerged in the form of negative social, economic, and spatial impacts on project communities.

Changes in transportation systems have the potential to affect the safety of a community's residents as they go about their daily lives. Transportation system changes could result in increased traffic or changes in traffic patterns that could transform a pedestrian-friendly environment into one in which residents are at greater risk of injury. This usually presents a safety problem for all road users (Forkenbrock & Benshoff, 2001). According to Densu, Salifu, and Attafuah (2014), the N1-Highway improvement has resulted in increased vehicular traffic and higher travel speeds. To gauge the attitudes of road users in accessing the upgraded highway, these authors conducted spot speed studies that revealed the presence speeding, running red lights, and jaywalking. The spot speed studies were also conducted to evaluate motorists' compliance with posted speed limits. The study revealed that most motorists drive at speeds above the statutory speed limit as a result of the highway upgrade. Findings from this same study revealed that speeding on the N1-Highway has resulted in vehicular crashes, as well as accidents

involving motorcyclists, bicyclists, and pedestrians (Densu, Salifu, & Attafuah, 2014). This is consistent with the fact that while driving higher speeds, failure to anticipate oncoming hazards and vehicle handling errors increase (Howard & McInerney, 2010).

A report in *The Herald* (2013) revealed that the National Road Safety Commission recorded 500 vehicular crashes with 200 fatalities on the N1-Highway over a span of 17 months. Statistics from the National Road Safety Commission (2012) indicated that 339 road traffic crashes, 248 injuries, 43 fatalities, and 93 pedestrian knockdowns occurred within a year of the official opening of the highway on February 15, 2012. This indicates an increase in road traffic crashes resulting from the highway expansion. Most of the vehicles involved in crashes on the N1-Highway are commercial vehicles, although schoolchildren were among the pedestrian fatalities (Yeboah, 2013).

According to Densu, Salifu, and Attafuah (2014), a variety of factors are responsible for the speeding and the resulting crashes. These factors include improved highway condition, adequate road space due to the highway expansion, and poor road safety standards (*The Herald,* 2013). The authors further indicate that some commercial vehicle operators take advantage of the additional highway space to speed, hoping to reduce round-trip travel time and maximize daily profit; the profit margin of a typical commercial vehicle operator in Ghana is dependent on the number of daily round trips they are able to take.

Crossing the highway as a pedestrian is another problem posed by the highway expansion. Although footbridges exist, pedestrians have an aversion to using them, since they are located over two kilometers apart and are far from most traffic-generating locations (Densu, Salifu, & Attafuah, 2014). The authors further revealed that more than

one in five pedestrians will risk their lives crossing the expanded highway at undesignated crossing locations. This exposes pedestrians to traffic crashes and partly accounts for the frequent pedestrian fatalities on the highway. In addition, the noncompliance of motorists in observing traffic lights, as indicated by Densu, Salifu, and Attafuah (2014), also places other road users, such as pedestrians who do use the traffic lights to access the highway, in danger.

Another major traffic safety problem on the N1-Highway is the lack of directional and informational signs to guide drivers on the highway. In heading towards the Mallam Interchange, drivers are confronted with three different lanes without prior information or direction. Drivers are then forced to determine which lane to use at a fast-moving pace. This causes confusion for drivers, and if not immediately addressed could lead to an increase in road traffic crashes on the highway. This may not be a problem for daily users of the road, but it is certainly a major problem for new users (Amegashie, 2012; Salih, 2013).

The N1-Highway also cuts through built-up communities whose activities and accessibility needs conflict with the road design (Densu, Salifu, & Attafuah, 2014). The road corridor runs through settlements spread along both sides of the road, and people cross from one side of the road to the other to access their daily needs. This accessibility offers residents the ease of reaching employment locations, retail and service outlets, and recreational opportunities, and it is vital to the health of project communities (Hanson & Giuliano, 2004). Additionally, accessibility in this situation is central to the measure of the quality of life within neighborhoods adjacent the N1-Highway (Scott, 2000). In the case of the N1-Highway, accessibility is dependent on road crossing facilities, as crossing

the multilane highway is one of the most important but also dangerous activities undertaken by pedestrians daily. Although the completion of the 14.1-kilometer section between the Tetteh Quarshie Interchange and the Mallam Junction of the N1-Highway has enhanced mobility and reduced road traffic congestion drastically, it has negatively impacted pedestrian accessibility (Densu, Salifu, & Attafuah, 2014).

Poor pedestrian accessibility on the highway has been attributed to poor road safety design standards (*The Herald*, 2013). The entire 14.1-kilometer upgraded section of the N1-Highway has only six footbridges that are placed at locations with minimal pedestrian activities and average more than two kilometers apart. It is however not surprising to see pedestrians jump over guardrails that separate the highway instead of walking long distances to access these footbridges. It is clear that pedestrians are willing to risk their lives daily by jumping over guardrails to access facilities and services on each side of the highway (Amegashie, 2012). The highway upgrade has also altered the daily lives of residents and communities along the highway through the relocation and isolation of community facilities and services; residents are regularly forced to cross the highway to access these facilities and services. This has resulted in pedestrians crossing the six-lane highway at undesignated locations, which usually expose them to great risk.

Also, footbridges on the road were designed without any regard for the disabled, children, or senior citizens. The design of footbridges that do not accommodate the needs of disabled individuals shows a clear disregard for the Ghana Disability Act (Amegashie, 2012; Salih, 2013). In order to gain daily access to facilities and services within communities abutting the highway, people with disabilities go through the daily hassle of traveling long distances while also finding assistance in order to access the footbridges.

This problem was so severe that the Ghana Federation of Disabled Organizations (GFD) threatened a lawsuit against the Millennium Development Authority (MiDA) (Global Accessibility Network, 2012). The GFD labeled the complaint as a deliberate disregard of their needs in the design and construction of the N1-Highway.

The poor accessibility challenge that has emerged as a result of the N1-Highway upgrade has also presented an economic problem for local businesses. After the upgrade, some local roads that previously provided access and connected residents on both sides of the highway to local businesses, social services, and facilities have been completely cut off. This in addition to the inadequate provisions for pedestrian crossing has caused some local businesses to lose a significant number of their local base clientele or go out of operation altogether (Amegashie, 2012). The combination of poor access and inadequate footbridges now forces business owners to travel long distances to access their business premises. In the same vein, residents are forced to travel long distances to access closer or preferred business locations, and in some cases residents are practically forced to access businesses elsewhere (Amegashie, 2012).

Amegashie (2012) stated that the construction of the N1-Highway is estimated to have led to the loss of businesses, jobs, job opportunities, and livelihoods, as well as a reduction in the local tax base. The access people have to businesses adjacent to the N1-Highway is very important for residents both economically and socially (Amegashie, 2012). However, now residents are often unable to get to their preferred destinations due to inadequate or lack of accessibility, preventing them from accessing higher-order services and thereby limiting the opportunity to improve their quality of life (Vandenbulcke, Steenberghen, & Thomas, 2009).

One of the major social problems presented by the N1-Highway upgrade is the isolation of some portions of adjacent communities and the effect on community cohesion. According to Amegashie (2012), the relocation of businesses and residents, along with the disruption of public utilities, has presented some social challenges to communities adjacent to the highway. Meetings held with community members revealed that the highway expansion had broken up families and disrupted social cohesion within communities adjacent to the highway (Amegashie, 2012). Even though community members have accepted that there are many means of maintaining contacts with people who have moved out as a result of the highway upgrade, they also noted that it will now take extra effort to arrange and meet these individuals, or these individuals might never be seen again, further deteriorating social interaction.

The long-distance between the footbridges located on the highway has presented a crossing challenge, as pedestrians sometimes have to walk over a kilometer to use footbridges to access needed facilities and services the local population relies on. This is because the highway expansion has resulted in the relocation of community facilities and services, therefore impairing access to them. In some of the worst cases these community facilities and services have been removed altogether. Some of the facilities and services affected include churches, schools, playgrounds, and other social service facilities (Amegashie, 2012). Besides providing critical services, these facilities contribute to higher levels of community cohesion and play vital roles in determining the degree of cohesion, social interaction, and overall quality of life in communities adjacent to the highway (Flint & Robinson, 2008). However, the difficulty in residents' ability to access some of these relocated community-based facilities and services has physically isolated

portions of abutting communities and their local residents. This isolation problem has dwindled cohesion in portions of communities along the N1-Highway. Residents greatly impacted by the isolation problem are mainly children, seniors, and the disabled (Amegashie, 2012).

All of the problems discussed so far can be partially attributed to the overemphasis placed on the operational aspect of the N1-Highway, whilst neglecting its social, economic, spatial, and cultural dimensions. This supports Vandenbulcke et al.'s (2009) argument that importance be placed on a community's quality of life rather than the road infrastructure alone. The identified problems can also be directly attributed to poor planning. Proper planning can help planners recognize the fact that road projects can alter the environment surrounding the road, affecting different facets of lifestyles, travel patterns, and social and economic activities (World Bank, 1997). Understanding and planning for the management of both positive and negative impacts of road improvement projects is an important aspect of transportation planning (World Bank, 1997). As a result, there is a need to assess how the design, planning, and implementation of the N1-Highway have contributed to the anticipated and unanticipated adverse impacts.

Purpose of Research

The purpose of this qualitative study is to gain a good understanding of the impacts (benefits and costs) of a highway upgrade on project communities. In discussing the impacts, the study will focus mainly on the adverse social, economic, and spatial effects of the upgrade. The study will undertake an objective assessment of the N1-Highway project to identify its intended and unintended benefits. The study will also explore the adverse social, economic, and spatial impacts of the N1-Highway upgrade to

help determine how many of these were anticipated and unanticipated. It will also help determine if any of the unanticipated adverse impacts were overlooked if any. The study will identify ways of avoiding, mitigating or reducing the adverse impacts on project communities in the future. Based on the study findings, recommendations will be made to address identified problem areas.

Research Questions

This study seeks to address the following questions:

i. What are the general benefits of the highway upgrade?
ii. What are the adverse social, economic, and spatial impacts of the highway upgrade?
iii. Were the adverse impacts overlooked, and to what extent were they overlooked?
iv. How can these adverse impacts be avoided or mitigated?
v. What lessons can be learned to improve similar projects in the future?

Significance of Research

Road projects are generally intended to improve economic and social welfare. Increased road capacity can reduce travel times and lower the cost of travel for both freight and passenger vehicles while improving access to markets, jobs, education, and health services. For all the positive aspects of road projects, there are significant negative impacts on nearby communities (World Bank, 1997). People and properties in the direct path of road works may be affected in a major way. People may also be indirectly affected by projects through the disruption of their livelihood, loss of accustomed travel paths and links within the community, and injury from traffic accidents. New roads may induce development in previously undeveloped areas, sometimes significantly affecting

the social lifestyle and economic activity patterns of communities (World Bank, 1997).

International bodies such as the World Bank have indicated that much can be done to avoid, mitigate, or compensate for the negative socioeconomic impacts of a road project. However, it is important to identify potential issues early in the road planning process and to make provisions to avoid or mitigate these effects. Failure to identify these potential impacts may result in delays and cost increases later on in the project's development and may also cause road agencies to adopt solutions that compromise social and economic activities. Poor management of these potential impacts can produce negative public perception of road projects (World Bank, 1997). Against this background, it is therefore not enough to evaluate road projects primarily on the potential positive economic or engineering criteria. Rather, adverse social, economic, and spatial impacts that emerge as a result of road projects should be discussed as part of the evaluation process. The impact of these effects could be substantial, and considering them is essential to a community's quality of life (Transportation Research Board, 2011).

Chapter 2

Literature Review

Introduction

The vitality of communities is often dependent on the ease of social and economic interactions. Roads play a very important role in the sustainability of these interactions. However, building new roads or upgrading existing ones sometimes produces results that heavily disrupt local interactions and eventually outweigh the benefits of road improvements (World Bank, 1997). The adverse effects arising from the construction or upgrade of roads can be directly attributed to poor planning. However, when road construction or upgrades are properly planned, they greatly benefit the surrounding communities by contributing to lower transportation costs and providing better access to markets, goods, jobs, and services such as health care and education. Additionally, proper planning enables us to recognize the fact that road projects can alter the environment surrounding the road, affecting different facets of lifestyles and travel patterns as well as economic and social activities. Understanding and planning for the management of these impacts is an important aspect of dealing with transportation planning problems associated with road improvement projects (World Bank, 1997).

In the context of the developing world, multilateral lending agencies such as the World Bank and the European Union require borrower countries to undertake impact assessments. These measures are intended to ensure that funded infrastructural projects yield significant favorable impacts on the lives of people in those countries in terms of socio-cultural, economic, institutional, historical, and political effects (World Bank, 2003). The aim is to predict the likely environmental, social, and economic consequences

of a project before it begins and to approve, adjust, or reject it accordingly (Becker & Vanclay, 2003). The goal is to use these impact assessments to gauge, moderate, and mitigate the impacts of planned interventions (Esteves, Franks, & Vanclay, 2012). However, infrastructure developments such as road projects are sometimes likely to yield unintended effects that adversely impact project communities (Transportation Research Board, 2011).

Impacts on project communities are considered externalities or impacts outside of the intentional costs of a transportation project and outside of the intentional direct benefits to users of the transportation system (Transportation Economic Committee, 2016). Impacts on project communities are usually grouped with economic development impacts under the broader category of social and economic impacts. However, the effects of projects on these two areas are mostly examined separately because impacts on project communities are typically localized and focus more on the everyday lives of people in adjacent communities. These can be important to consider when transportation decision-makers are weighing the positive, negative, and distributional effects of proposed projects. However, due to the qualitative and subjective nature of community impacts, they are typically considered part of the environmental impact assessment process rather than monetary measures in cost-benefit analysis (Transportation Economic Committee, 2016).

The Transportation Research Board (2011) indicated that the evaluation of road transportation projects has always been undertaken based on engineering and economic criteria. Project selection is mostly based on their significant impacts on key performance measures such as safety and travel time. In recent years, emphasis has been placed on the

social and economic impacts of road transportation projects and how they affect members of society rather than the users of roads (Transportation Research Board, 2011). The social and economic effects of road transportation projects are measured because their impacts could be substantial and are essential to a community's quality of life. The provision of appropriate and effective road facilities is of the utmost importance in order to achieve well-functioning roads in terms of road safety, capacity, road user comfort, and minimized environmental impacts.

However, these road projects sometimes have social and economic effects that adversely impact project communities (Transportation Research Board, 2011). As part of this study, the literature review discusses the benefits of road improvement projects while also placing emphasis on the adverse impacts of such projects. The review examines the adverse impacts of projects in North America, Latin America, Southeast Asia, and Africa, and identifies case studies and highlights their associated adverse social, economic, and spatial impacts.

Discussion on General Benefits of Road Capacity Improvement

Introduction

The benefits of transportation investments are the direct, positive effects of a project. Thus, benefits are the desirable things directly obtained from investing in a project. For instance, investment in a road project may improve transportation by reducing the number or severity of crashes, eliminating long delays during peak hours, or reducing circuitry of travel. Transportation projects can have various impacts on a community's economic development objectives such as productivity, employment, business activity, property values, investments, and tax revenue. Generally, transportation

projects that improve overall accessibility (i.e., they improve businesses' ability to provide goods and services, and increase people's ability to access education, employment, and services) and reduce transportation costs (including travel time, vehicle operating costs, road and parking facility costs, and accident and pollution damage costs) tend to increase economic productivity and development (World Bank, 2016).

Savings in travel time

The attributes of time make it unexchangeable, hence in the strict sense time cannot be purchased, sold, or bartered. As a result, time has no intrinsic value, and therefore the term *value of time* actually means the value of goods, services, or some utility that can be produced within a time interval. When a trip is made in less time than before, the reduction in time is considered time saved, even though the difference in time was not really saved but was used to perform another activity. This is the conceptual basis upon which transportation analysts consider reductions in travel time to be a saving and proceed to measure its benefits in terms of amount of time saved and the value of each unit of time saved (Sinha & Labi, 2007). The value of travel time is the cost of time spent on transport. This includes costs to businesses of the time employees and vehicles spend on travel, as well as costs to consumers of personal time spent on travel. The value of travel time savings refers to benefits from reduced travel time costs. Travel time savings are the principal benefit assigned to urban transport projects (Cervero, 2011).

Improvements made to a transportation system are usually expected to result in increased travel speed or decreased waiting or transfer times, which finally leads to a reduction in travel time. Savings associated with reduced travel time typically constitute the largest component of transportation user benefits (Sinha and Labi, 2007). Congestion

relief projects are justified mainly by the reduction in travel time they will bring about. Travel time savings can lead to reductions in vehicle operating costs. Mackie, Jara-Diaz, and Fowkes (2001) indicated that travel time savings captured 80% of the quantified benefits for transportation cost-benefit analysis in the United Kingdom. In Lima, Peru, the evaluation of proposed busway improvements indicated that travel time savings represented 75% of the project's total estimated benefits (World Bank, Latin American and the Caribbean Region, 2003). World Bank studies also use travel time savings as the main measure of economic benefits (Cervero, 2011). In 2003, a conference of European Ministers of Transport in Paris concluded that "the valuation standards of time requirements for transport and time savings as a consequence of transport policies are often decisive for the acceptance or rejection of transport policies and transport infrastructure investment projects" (UNESC, 2004).

Vehicle operating costs savings

Vehicle costs are seen as direct expenses that comprise the costs of vehicle ownership (fixed) and vehicle operation (variable). Vehicle operating costs vary with vehicle use and are expressed in cents per mile traveled by a vehicle. For a majority of transportation modes, vehicle-operating costs include energy use, tires, maintenance, repairs, and mileage-dependent depreciation. On the other hand, fixed vehicle costs are those that are mainly independent of vehicle use and are generally unaffected by transportation improvements. Examples of this are insurance costs, time-dependent depreciation, financing, and storage. Such costs are usually eliminated from the vehicle operating costs impact evaluation of projects (Sinha & Labi, 2007).

Vehicle operating costs savings are economic benefits, and the initial beneficiaries are vehicle owners. Vehicle operating costs savings or benefits of a transportation improvement or intervention usually refers to the reduction in vehicle operating costs compared to an existing situation or a base case alternative (Sinha & Labi, 2007). Vehicle operating costs also refer to costs that vary with vehicle usage, including fuel, tires, maintenance, repairs, and mileage-dependent depreciation costs (Booz-Allen & Hamilton, 1999). In general sense, traveling at a consistent speed will use less fuel and depreciate a vehicle less quickly (Thompson, Rosenbaum, & Hall, 2008). When transportation improvements are made, the cost of operating vehicles along a particular facility or set of facilities can change. Vehicle operating costs can change either because the number of miles driven changes, as in the case of a shorter bypass or a reduction in circuitry or diversion of trips, or because of changes in the number of stops or speed-cycle changes (Minnesota Department of Transportation, 2017).

Safety benefits

The basic unit for measuring transportation safety is a crash. Sinha and Labi (2007) define a crash as "a collision involving at least one moving transportation vehicle and another vehicle or object." Crashes can also involve a noncollision off the transportation path, like a vehicle rollover. Transportation planning decisions often affect crash risks. The cost-benefit analysis helps identify the most cost-effective projects and evaluate decisions that involve trade-offs between safety and other planning objectives, such as travel speed and vehicle costs (Transportation Economics Committee, 2015). Safety benefits are some of the principal benefits that can result from road transportation improvements. Benefits occur when the number or severity of crashes on a facility or a

set of facilities is reduced because of the transportation improvement (Minnesota Department of Transportation, 2017). Road transportation projects generally have a direct or indirect safety component that reduces the rate or severity of crashes. As such, safety enhancement is considered a key aspect of user benefits associated with physical or policy changes in a transportation system (Sinha & Labi, 2007). For instance, lane width has an influence on safety, especially at certain key road locations. Vehicles typically use more of the travel lane on bends than on straight road sections, and head-on crashes can happen on bends when drivers accidentally (or intentionally) "cut the corner." Widening the lanes on a bend can reduce the risk of head-on crashes by giving drivers more room to get around the bend without crossing into the opposing lane. Similarly, widening turn lanes can improve safety, especially for larger vehicles. Also, widening traffic lanes on straight sections of multilane roads can reduce sideswipe crashes (Cervero, 2011; Minnesota Department of Transportation, 2017).

Enhanced accessibility

One of the major benefits of roadway capacity expansion and transport services is enhancing access to places where travelers want to go. Accessibility as a benefit of transport investment promotes a balanced approach to long-range urban planning. It gives attention to alternatives to capital investment strategies for reducing traffic congestion and mitigating environmental problems, such as promoting efficient resource use and conserving land use arrangements. This is because accessibility is a product of mobility and proximity, enhanced by either increasing the speed of getting between two points (mobility) or by bringing two points closer together (proximity). Since accessibility is a product of both travel time and the geographic location of urban activities, it captures not

only the temporal but the spatial dimension of travel as well (Cervero, 2011). Thus, accessibility measures give legitimacy to land use initiatives and urban management tools in addition to supply-side, mobility enhancing measures. Focusing on accessibility improvements reflects the derived nature of travel demand and puts the focus on promoting interaction (e.g., trade and social interaction) rather than movement. Some argue that most people want to minimize travel time so that more time can be spent at the destination. Making cities more accessible versus mobile prompts a theoretical shift in planning, elevating land use management and information technologies as genuine tools for managing traffic flow and mitigating traffic congestion (Cervero, 2011).

Adverse Impacts of Road Capacity Improvement

Adverse economic impacts

Generally, economic impacts resulting from transportation projects are captured in the public or private sector as net losses or gains. Economically, the impacts of highway improvements can be classified in terms of direct, indirect, and induced impacts. The direct impacts are the ones that produce immediate measurable changes, whilst the indirect impacts are those that produce some measurable net change in economic activity over a period of time within a community and can be attributed to the highway improvements. On the other hand, induced impacts happen as a result of direct and indirect impacts of new employment and income resulting from successive rounds of spending. Embedded in these economic impacts are problems that arise as a result of highway improvements (Forkenbrock & Benshoff, 2001).

The direct impacts of transportation projects lead to both relocation and barrier effects (Sinha & Labi, 2007). For instance, the acquisition of rights-of-way for new or

expanding roads requires additional relocation of houses, businesses, and community facilities. The loss of a family home and real estate, leaving a familiar neighborhood, or the physical, emotional, and financial stresses of moving can be overwhelming for both families and individuals. Businesses that suffer the effects of relocation mainly include grocery shops, banks, and shopping centers, as well as community facilities that include schools, churches, and recreation areas (Sinha & Labi, 2007). When a road project results in the relocation of a significant number of businesses and community facilities, residents are forced to seek services and employment outside their communities. This results in increased commutes to access the services offered by the relocated facilities (Sinha & Labi, 2007). As households are relocated, community facilities undergo reduced demand or enrollment, decreased operational cost-effectiveness, and possible closure. The population groups that are most vulnerable and sensitive to relocation impacts are the elderly, low-income families, long-time residents and homeowners, handicapped persons, and minority ethnic group members. Relocation is also disruptive for residents with school-aged children, especially if they have to transfer to new schools (Sinha & Labi, 2007).

Another economic problem associated with relocation is the lack of available and suitable housing for dislocated persons. With regard to business relocation, there is the issue of inadequate land available for businesses to relocate and continue to be economically viable (Caltrans, 1997). Large-scale transportation expansion projects usually result in the displacement of businesses that rely on highway traffic for patronage. In cases where these businesses are unable to find suitable locations along busy roadways or are not able to attract customers to stay operational, they fail. In most instances, the

business clientele is easily absorbed by similar businesses in the immediate surrounding area (Sinha & Labi, 2007).

When businesses relocate to other areas in the community and do not experience loss of viability, the unemployment impacts are temporary. Conversely, relocation of businesses to areas outside of a community can lead to unemployment and the subsequent loss of multiplier effects (Sinha & Labi, 2007). Even when businesses relocate to other areas within the community, some workers may not be willing to travel or relocate to the new location, resulting in businesses losing employees. Local businesses with longtime loyal clientele may have to re-establish contact with their customer base when they relocate to new areas (Sinha & Labi, 2007).

Road improvement projects are believed to have substantial impacts on businesses such as a severe decrease in patronage that can cause businesses to fail (Harvey, 1996; Sinha & Labi, 2007). The growth of urban cities in Africa as a result of people moving into urban areas in search of jobs greatly impacts land and the built-up environment (Ajayi et al., 2013). In their 2013 study, Ajayi et al. indicate that in most African countries, this is evident in the illegal occupation of both private and public lands and the erection of illegal structures on available open spaces in urban cities. In such a context, the expansion of roads could result in businesses losing land to right-of-way (ROW) and the subsequent displacement of both formal and informal businesses. According to Buffington and Wildenthal (1993), upgrading and widening highways in Texas raised concerns about businesses losing shoulder and private parking space for their customers or having to relocate because of losing too much land to ROW. The likely economic impact on local government agencies or other taxing authorities relates to changes in

property or sales tax revenue. Sales taxes are collected by a government institution based on gross sales receipts of businesses in a jurisdiction. Consequently, the amount of sales tax collected will change as business activities change. Therefore, an increase in the displacement or relocation of businesses will drastically affect the property tax base of the local government. This will, however, affect local governments' funding sources and development (Florida Department of Transportation, 2000).

The impact of road improvement on property values is usually seen as indirect (or secondary) and long term. These impacts can be traced to increased noise, vibration, air pollution, and poor aesthetic (Harvey, 1996). Property value depends on the desirability of a property with regards to its aesthetic qualities, safety, accessibility, and other additional factors both objective and subjective in nature. A change in any of the foregoing factors can positively or adversely affect the value of a property, and a transportation project can either enhance or decrease this value. On the adverse side, a road improvement project that causes noise, increased vibration, air pollution, or a less aesthetically pleasing neighborhood can reduce property values within the neighborhood. It must be indicated that the extent of changes in property values is a function of the distance between the transportation project and the property as well as the changes brought about by the presence of that project within the neighborhood (Florida Department of Transportation, 2000).

In urban areas, both business and social activities are often found in built-up areas and near busy intersections, where traffic congestion is already heaviest. As traffic flow increases, so do conflicts between local activities and the efficiency and safety of traffic functions of the road. Further conflicts and safety concerns arise when road improvement

plans call for widening the road and reducing encroachment and access. Road planners need to recognize that some of these activities may play an important part in the social and economic life of the community. Economic impacts could include the loss of businesses and customers, induced capital investment, and high opportunity cost losses. Project communities sometimes meet these changes with fierce resistance (World Bank, 1997).

Adverse social impacts

In comparison to other types of transportation system impacts, social and cultural impact assessment is a relatively inexact science because social environments differ from place to place, and the impacts depend on the manner of social change interpretation, the level of anticipation, and resilience of the affected population (Sinha & Labi, 2007). The social impacts of transport and their distributional effects across various segments of society have traditionally been viewed as secondary or even tertiary concerns relative to economic and environmental impacts (Markovich & Lucas, 2011).

Geurs et al. (2008) define social impacts as changes in transport sources that might positively or negatively influence the preferences, well-being, behavior, or perception of individuals, groups, social categories, and society in general. The Federal Highway Administration (FHWA, 1982) defines social impacts as the destruction or disruption of human-made resources, social values, community cohesion, and availability of public facilities and services; displacement of people, businesses, and farms; and disruption of desirable community and regional growth. According to Parkhurst and Shergold (2009), the definitions of social impacts in literature have identified some level of overlap between social, economic, and environmental impacts. Other scholars have

noted these overlaps, necessitating the need for social impacts to be recognized as distinct from economic and environmental impacts.

Adverse impacts on social capital, indigenous people, cultural heritage and health of local people. The impact of transportation projects and policies may sometimes cause undesirable impacts on the social capital of an area in three major ways, namely direct (relocation effects, barrier effects, and integrative features), indirect, and cumulative. In regards to the direct impacts (relocation effects) of transportation projects, the acquisition of ROW for new or expanding facilities requires additional relocation of houses, businesses, and community facilities. Relocations dismantle the social fabric and destroy social interaction in communities or neighborhoods by removing the formal and informal social networks established by residents for physical or psychological support (Sinha & Labi, 2007; Transportation Economics Committee, 2015).

Regarding barrier effects, Sinha and Labi (2007) indicate that the widening or extension of roads affects the structure, function, and social pattern of the surrounding neighborhoods because roads can cause separation of households, businesses, and community facilities, or reduce access between such entities. The authors further indicate that after a road project is implemented, it can be difficult or impossible to access social facilities by foot or bicycle, and vehicle trips to such facilities may take more time. In this instance, transportation facilities can constitute a physical or psychological barrier that is difficult to cross, particularly for the elderly, young children, and other residents who travel on foot or by bicycle. This barrier effect may lead to the isolation of community facilities, services, and institutions (Sinha & Labi, 2007).

The World Bank (2003) indicates that new settlers that arrive in communities as a result of road transportation projects may face difficulties in social adjustment in the new area. Conversely, an influx of new settlers can significantly change the demographics of small rural communities served by new transportation facilities, which can lead to loss of community identity and erosion of traditional value systems and lifestyles. World Bank experience suggests that tribal societies in developing countries, particularly those fully or partially isolated from outside influences are sensitive mainly to the influx of new settlers and other external intrusions brought about by road transportation projects (World Bank, 2003). Indirect impacts arise not from the physical presence of transportation facilities but from its increased usage due to travel generated or induced. The increased traffic can lead to psychological impediments that reduce the extent of social interaction in the community (Sinha & Labi, 2007).

The impacts of road transportation projects are very prominent in areas occupied by indigenous people. The cultural, social, political, and economic integrity that characterizes indigenous people renders their lives extremely vulnerable to disruptions from outside. A road planned to cross an area inhabited by indigenous people or to open up that same area will usually have significant effects on their lives. Although roads create opportunities, they can easily push indigenous people into an artificially accelerated development stream which could be too fast for their population. This could negatively impact social cohesion, produce physiological effects on individuals, and negatively impact individual perceptions of self-worth (World Bank, 1997).

For most traditional people, land is considered sacred and is a significant part of the people's lifestyle and livelihood. In such settings, the flora and fauna are considered

beings and form a part of their environment. Thus, the very definition of self is bound up with the land, and its flora and fauna, in a way completely foreign to outside economists, planners, developers, and settlers. Roads can easily disrupt this sense of identity. By opening up areas settled by indigenous or traditional people to development and settlement by other people, road development initiates a process that involves not just a loss of ecological balance between people and the land, but the loss of the peoples' traditional sense of identity (World Bank, 1997).

Construction crews and new settlers bring with them a serious health and social problems including diseases, alcohol abuse, and unemployment. These problems can destabilize traditional lifestyles and can also take a heavy toll on relatively isolated indigenous people. The physical and cultural stresses placed upon indigenous people by road development can lead to major disruptions to their culture. While these pressures may not be caused by roads alone, the road is generally a major instrument of any externally initiated development project (World Bank, 1997).

Cultural significance is a concept used in estimating the value of a site. This includes aesthetic, scientific, social, or economic value and the concept of amenity value. Cultural heritage is legally protected in almost every country. The Convention Concerning the Protection of the World Cultural and Natural Heritage of 1972 became the foundation for national and other legislation since it requires signatories to adopt general policies, establish appropriate organizations and services, and develop legal, scientific, and financial measures for the protection and conservation of cultural and natural heritage. In most developing countries, engineers and developers are granted unregulated access to cultural heritage sites. This could lead to the damage of quarries

and the creation of borrow sites. Such damage could affect historic, scientific, social, and amenity values, and could also negatively impact cultural monuments and archaeological sites (World Bank, 1997).

Road projects have serious negative consequences for the health of local residents. By encouraging direct contact between previously disparate areas, the construction of new roads provides the ideal medium for the transmission of disease both between humans and from plants and animals to humans. Road construction is also likely to cause some level of air or water pollution, endangering the health of residents close to the new development. Disease transmission is facilitated by the migration of people who accompany road projects. Construction work crews, along with their relatives and dependents that follow them, can potentially bring a multitude of possible communicable diseases with them. Also, the temporary camp setups by construction crews are often characterized by standing water and poor waste management practices; this provides the ideal conditions for disease to infect and multiply among the local population. On the other hand, it is possible that diseases endemic to the project area will be contracted by the construction crew and then transmitted to the population near the next work site (World Bank, 1997).

Adverse impacts on road safety. Generally, transportation projects have a direct or indirect safety component that reduces the rate or severity of crashes. As such, safety enhancement is considered a key aspect of user benefits associated with physical or policy changes in a transportation system (Sinha & Labi, 2007). Changes in transportation systems have the probability of affecting the safety of individual residents of a community as they go about their daily lives (Forkenbrock & Benshoff, 2001).

Transportation system changes could result in increased vehicular traffic or changes in traffic patterns that could alter a pedestrian-friendly environment into one where residents are at a greater risk of injury. This usually presents a safety problem for all road users (Forkenbrock & Benshoff, 2001). Safety is an issue that must be addressed since road crashes result in deaths, injuries, and damage to property. Road safety is major public health problem and a significant cost to the economy in many parts of the world (World Bank, 1997).

Globally, road traffic safety is a critical health and social issue. Road traffic injuries are a leading public health problem, resulting in over 1.2 million deaths annually (Toroyan & Peden, 2009). Averagely, it is estimated that road traffic accidents cost up to 1% of a country's Gross Domestic Product (GDP) (World Health Organization, 2008). Sub-Saharan Africa has the highest road traffic accident death rate in terms of fatalities per registered vehicle as compared to any other region in the world (World Health Organization, 2008). The economic cost of road traffic crashes, which is borne by individuals, insurance companies, and the government, consists of loss of market productivity and workplace costs; intangible costs include physical and emotional pain, suffering, and loss of life (Sinha & Labi, 2007).

Adverse spatial impacts

Adverse impacts on accessibility. Road transportation projects such as highway improvements may substantially improve the accessibility of some locations while reducing the accessibility of others (Forkenbrock & Benshoff, 2001; Harvey, 1996). Accessibility as a cumulative measure is a function of proximity, connectivity, and mobility, and is very important in transportation planning (Handy, 2002). Based on the

bid rent theory, locations that have improved accessibility have comparatively high land values (Forkenbrock & Benshoff, 2001; Harvey, 1996). Also, when accessibility to a location is significantly improved through road upgrades, changes in land use are frequent and inevitable. It can then be concluded that certain transportation projects are likely to negatively change the relative accessibility of numerous land parcels and lead to changes in land-use patterns and urban forms that are inevitable (Forkenbrock & Benshoff, 2001; Harvey, 1996). For instance, Buffington and Wildenthal (1993) conclude that the value of abutting properties decreased during construction of highway widening projects in Texas. However, after the completion of the highway project the value of these properties immediately increased, surpassing the values before and during construction (Buffington & Wildenthal, 1993).

Adverse impacts on land use, land acquisition, and gentrification. The provision of transportation infrastructure impacts the intensity and distribution of land use patterns in an area by altering its level of accessibility, which is reflected in both the price and intensity of the developments in the area. The mechanism of transportation impacts on land use may be direct or indirect. For instance, a highway project in an area may involve direct appropriation of land and consequently may alter accessibility to that land. Also, that same project may have indirect impacts if land development that follows the highway project has impacts on land use types, patterns, or distribution in outlying areas even though the highway does not pass through those areas (Sinha & Labi, 2007).

Investment in transportation infrastructure, such as the construction of new highways, has the potential to alter the spatial layout of land development by increasing the accessibility of land through the introduction of new access or improvement of

existing access, enhancing the mobility of land users, lowering transportation costs, and encouraging land development of various types. Changes in land use generate activities that create a demand for travel. Increased travel, in turn, generates the need for new transportation facilities, which increase accessibility and attractiveness of further development. This cycle usually continues until it is halted by natural limitations or policies (Sinha & Labi, 2007).

Residential development tends to be a function of economic growth and housing market variables such as employment, population growth, income changes, and changes in the inventory of available housing (Perera, 1990). The reduction in housing inventory as a result of ROW acquisition can lead to relocation or replacement of housing needs. Notwithstanding, improvements made to highways can affect residential development by inducing the construction of new housing units. In a region impacted by a highway, access to lower-cost land located further from existing development and buyers' perception of increased access can make residential development highly attractive (Perera, 1990). In areas dominated by less intensive land uses, this shift in relative value can result in dramatic land-use changes (Carey, 2001).

It is believed that the method of constructing a highway sometimes influences how land is used. Buffington, Chui, and Memmott (1985) note that a highway does not reach optimal efficiency in carrying traffic until all lanes and service roads are constructed. Potentially, the process of construction can be costly in the short-term because traffic diversion and increases in travel time will disrupt the flow of customers to affected businesses. The expansion of the ROW along a specific corridor could lead to the displacement of business establishments in the corridor, redistribution of jobs and

services, and the loss of land available for future commercial development (Carey, 2001). These impacts could result in temporary losses to firms in the project community, or even to firms farther from the corridor if the ROW or construction activity creates a barrier to access (Perera, 1990).

Road development often requires the procurement of privately owned land. This land has to be acquired by the government from its current owners. While it is sometimes possible to negotiate a price for the voluntary sale of a property, governments often have to use their rights to compulsory acquisition of properties for public projects. By its nature, expropriation causes economic loss, as well as social and psychological disruption for the affected individuals and their families. Naturally, the greater the number of people involved, the greater the disruption and loss. A government's right to expropriate carries with it a responsibility to ensure that those affected do not bear an unfair share of the costs of a project which will bring benefits to others.

The economic impacts of expropriation may include the loss of houses or businesses, or the loss of business income, either temporarily or permanently. The social and psychological impacts and associated costs are more complex, and they are often much more devastating. Neighborhoods can be disrupted and, in the worst instances, broken up completely by large construction projects. Local residents who meet on a daily basis and who provide support to each other may be left deprived when separated by physical barriers or long travel distances. There are also social and psychological costs associated with disruptions to businesses. Business owners may find their established clientele cut off from their shops or experience changes in business practices they neither anticipate nor appreciate (World Bank, 1997).

These kinds of social and economic changes often find personal expression in a variety of physical or psychological disorders. The manifestation of these impacts is heavily influenced by the linear nature of road projects, and in the case of road upgrading, by the existence of what may be a sizeable but often well-established ROW. Road projects typically cut across communities, as opposed to affecting the entire community equally; run through many governmental jurisdictions; and, in the case of upgrading projects, tend to displace a disproportionately large number of encroachers who have occupied government-owned ROW.

Many road projects consist of some stretches of new highway along with the upgrading of link roads to nearby communities. Without good planning, there is the danger that people occupying these link roads may be subjected to major increases in traffic generated by the highway to which the link roads connect. The presence of squatters on the ROW poses specific challenges. There are many reasons why the poor, the homeless, and those pursuing informal economic activities encroach upon the publicly-owned ROW and, in many cases, the existing road surface. In such cases, road projects are likely to displace these persons whose presence signifies their need for government attention (World Bank, 1997).

Gentrification is a term sometimes applied to situations in which the value of land in a particular area is increased by infrastructural improvements, leading to higher rental values, a turnover in occupancy, and a replacement of lower-income tenants and residents by those who can afford the higher rents. This is a distributional issue, in that, overall, development projects such as roads can harm some segments of the community (World Bank, 1997). In light of all the impacts related to highway construction, researchers still

agree that highways can increase the level of commercial activity in the impact region. It is important to note that this increase is not necessarily a net gain to society, as industries may simply relocate from other regions to be closer to the highway. However, the development process does represent a change in land use, both in the highway project environment and in other remote locations. This is because relocation may spur alternate uses of land vacated by property owners seeking greater access to transportation and markets closer to the highway (Carey, 2001). A study by Gamble and Thomas (1978) revealed that the decentralization of retail establishment districts and the rise of suburban shopping centers are evidence of the impact highways have on land uses across impact and non-impact areas.

Adverse impacts on the road network and traditional modes of transport. Urban road traffic congestion is a growing problem and continues to hurt economies and reduce quality of life globally. Road traffic congestion robs families of time with each other and sometimes dictates where people live and work. It is estimated globally that families waste billions of dollars in time and fuel while sitting in traffic (Hartgen & Fields, 2006). Additionally, businesses and their customers bear enormous costs associated with traffic-related logistic problems, delivery problems, delivery delays, poor transportation reliability, and fewer potential employees within commuting distances (Hartgen & Fields, 2006).

From the preceding paragraph, it is clear that the impact of inadequate transportation networks is enormous to global economies. Planners, engineers, and other professionals have traditionally responded to the problem of inadequate transportation networks by expanding roadway vehicle capacity. Road capacity expansion ranges from

the construction of new roads, the addition of lanes to existing roadways, and the upgrade of existing highways to controlled-access freeways (Handy & Boarnet, 2014). A major concern of the highway expansion approach is its ability to lead to additional vehicle travel. Using the basic economic principles of supply and demand, the addition of capacity decreases travel time and, as a result lowers, the price of driving. This, however, drives prices down and increases the quantity of driving. The increase in vehicle miles traveled (VMT) that occurs as a result of increase in road capacity is known as *induced travel*. The occurrence of induced travel reduces the effectiveness of road capacity expansion (Handy & Boarnet, 2014).

Increased highway capacity sometimes leads to increased VMT in the short term if people shift from other modes of transit to driving, if drivers make longer trips by choosing longer routes and distant destinations, or if drivers make more frequent trips (Gorham, 2009; Litman, 2010; Noland & Lem, 2002). Long-term effects of increased highway capacity can occur if households and businesses move to more distant locations or if development patterns become more spread out as a result of capacity increases. Also, capacity expansion may also result in increases in commercial traffic as well as passenger travel (Duranton & Turner, 2011).

Changes that accompany road transportation projects can disrupt traditional modes of transport. Measures that impede road crossings, control bus-stopping points and restrict parking of informal public transport vehicles near busy markets and intersections may reduce the attractiveness of these options. The barrier effect of new or widened roads can increase travel time and distances for short local trips, especially affecting access by foot, bicycle, and other nonmotorized transport. These potential changes need

to be assessed alongside the benefits of improved access and transport services provided by an improved road (World Bank, 1997).

Highway improvement is typically associated with a broad range of economic, social, environmental, and spatial benefits. Generally, these impacts tend to be positive, as the benefits of increased efficiency associated with road transportation cost savings accrue to a wide range of highway users and nonusers alike. However, highway improvement can impose costs both in the short run and long run. So far, this discussion has identified many adverse social, economic, and spatial impacts resulting from highway improvement. The adverse economic impacts identified were loss of businesses and employment, along with the resulting negative impact on the tax base of a local economy based on highway improvement projects. The social impacts identified were impacts on social capital, indigenous people, cultural heritage, the health of the local residents, and road traffic safety. The adverse spatial impacts were mainly identified as impacts on land use, land acquisition, gentrification, road networks, and traditional transport modes. The adverse impacts of highway improvement and their distributional effects across various segments of society are mostly seen as secondary or tertiary relative to the benefits. This study, therefore, looks to emphasize the adverse social, economic, and spatial impacts of road transportation projects and how they affect residents of project communities.

Adverse Impacts of Road Capacity Improvement Projects around the Globe

Road projects are generally meant to improve economic and social welfare. Notwithstanding, road projects sometimes have significant negative impacts on nearby communities (World Bank, 1997). In her book *The Death and Life of Great American Cities*, Jane Jacobs challenged the construction of urban highways. Jacobs commented on

the effects of highways on communities, arguing that "highways eviscerate cities" (1961). Jacobs highlighted some of the adverse effects of highways such as displaced and split communities, environmental degradation, and land use impacts (Jacobs, 1961). This section of the literature discusses the adverse social, economic, and spatial impacts of highway projects in North America, Latin America, Southeast Asia, and Sub-Saharan Africa.

Adverse impacts in the developed world - United States

The late 1950s and well into the 1960s saw the construction of urban expressways and the subsequent massive family dislocation and housing destruction in the United States. State highway engineers and consultants working with local civic elites determined the interstate routes into central cities. The destruction of blighted houses in central cities was one of the main goals of highway builders. By the mid-1950s, after a decade and half of heavy black migration into urban areas, most of those inner-city areas targeted by highway builders were mainly African American. As a result, most American cities were confronted with serious community disruption and racial controversy as interstate expressways tore through urban neighborhoods and leveled broad areas of inner-city housing (Mohl, 2002).

In Miami, Florida, state highway builders purposely routed Interstate-95 directly through the inner city black community of Overtown. An abandoned railroad corridor that served as an alternative was rejected, as highway planners thought it would be better to run the highway through Overtown to provide room for future expansion of the central business district. This had been the vision of elite local businesses since the 1930s. Before the construction of the expressway, both black and white press questioned where

the blacks dislocated by the project would be relocated. The question was never answered, and when the downtown phase of the expressway was completed in the mid-1960s, it ripped through the center of Overtown, destroying a huge number of houses as well as the city's main business district, the commercial and cultural heart of black Miami. One of the expressway interchanges destroyed 20 square blocks of densely settled land and destroyed the housing of about 10,000 people. At the end of the 1960s, the City of Overtown had turned into an urban wasteland dominated by concrete expressways (Wilbur Smith and Associates, 1956; Miami Herald, 1957; Watt, 1959; Mohl, 1993).

In New Orleans, there was a long resistance against an eight-lane elevated expressway along the Mississippi River and through the edges of the city's historic French Quarter. The Riverfront Expressway originated in a 1946 plan developed for New Orleans by Robert Moses. This project was part of an inner-city beltway that the Bureau of Public Roads had incorporated into its interstate planning. After years of strong opposition and dispute, historic preservationists succeeded in fighting off the Riverfront Expressway plan. While white New Orleans residents with vested interests were successful in resisting the highway, nearby mid-city black communities were not as successful. Highway builders there had destroyed a broad area along North Claiborne Avenue in central New Orleans for Interstate-10. At the core of an old and stable black Creole community with a long stretch of beautiful oak trees, North Claiborne served a variety of community functions such as picnics, festivals, and parades. Before residents could organize any protest, the highway builders rammed an elevated expressway through the neighborhood. By the 1970s, I-10 in New Orleans was built through the black community, destroying most of the neighborhood (Vieux Carre Courier, 1965).

The expressway experience was similar in places like Camden, New Jersey. In the 1960s, Interstate-95 was rammed through low-income neighborhoods. In 1968, the Department of Housing and Urban Development directed a task force to Camden to study the impact of highway building and urban renewal. The impact study revealed that minorities made up 85% of the families displaced by the North-South Freeway, and about 1,093 families out of the total 1,298 families were displaced (Mohl, 2002). Between 1963 and 1967, about 3,000 low-income housing units were destroyed in Camden, but only about 100 new low-income housing units were built within this period, resulting in a huge housing deficit (Mohl, 2002).

Adverse impacts in the developing world - Southeast Asia

Close to what was practiced in the United States, many countries in Southeast Asia between the 1950s and 1960s started building their own highways. In China and India, urban highway construction had been dramatic. Both countries built new highways and surfaced existing roads at a fast pace, although in India the pace was a bit slower due to complexities in land acquisition processes. These highways carried significant amounts of traffic and contributed to economic development. However, they blighted massive sections of cities, threatened historic urban neighborhoods, dislocated people, disconnected neighborhoods, concentrated air pollution in highly populated areas, and threatened people's health, among other adverse effects (Bocarejo, LeCompte, & Zhou, 2012).

Knapen (2001) reported that roads have an impact on the landscape of diseases. The author indicated that after the construction of the Trans-Papua Highway, diseases skyrocketed in the city in which this occurred. Roads change the prevalence of diseases

and the direction in which contagious diseases spread. In the 19th century, the creation of roads in Kalimantan (Indonesia) worsened the incidence of malaria. Sexually transmitted diseases, such as AIDS, can also be linked to road construction. It is believed that truck drivers and construction workers are likely vectors of these diseases. On the same highway, the rate of deadly traffic crashes increased, exceeding rates in Western countries (World Bank, 1997).

The shift from rivers to roads as avenues of transportation is common knowledge, but the impact of this shift on the urban space is less known. In Semarang (Indonesia), all urban functions were formerly concentrated along the Semarang River, but after the construction of the Grote Postweg (Great Post Road), many functions moved into or parallel to the road, or close to other side roads that had emerged as a result of the Grote Postweg. The town of Demak (Indonesia) was not oriented toward the river, but rather toward the central square, where its palace constituted a cosmic center. The road, lined with shops, cut the central square into two halves and reduced the palace's cosmic power (Asian Development Bank, 1999).

Palembang (Indonesia) used to have an elongated spatial form, spreading along both banks of the Musi River. After the development of a road network, the city grew inland, and this process was hastened by the construction of the first bridge spanning the river. Small streams emptying into the Musi were reclaimed and paved as roads. The vernacular "limas" houses in Indonesia used to face the river and rivulets; however, after the construction of the road, new houses were turned to face the road (Taal, 2003). Bangkok also made the changeover from water to road transport. When the King moved his palace and simultaneously constructed a road lined with palaces, temples, and public

buildings, the sacred urban cosmology changed to a modern capital city (Evers & Korff, 2000).

In India, the widening of the Kalka-Shimla Highway resulted in the large-scale demolition of shops that were within and outside the ROW. The demolition resulted in the destruction of 2,500 small and medium-size commercial units. It was estimated that about 50% of the small businesses destroyed did not have the capacity to reestablish. This ruined the livelihood of most of the households involved, and in cases where these units served as shelters, those involved lost their housing. Some of the commercial units along the highway were popular small restaurants that attracted lots of tourists and boarding school students. However, the demolition affected most of these iconic establishments. While most of these small eateries and shops were demolished, others similar to them were cut off from tourists after the widening of the Kalka-Shimla Highway (Dogra, 2017).

Adverse impacts in the developing world - Latin America

Many developing areas in Latin America have been locations for large-scale infrastructure projects (Tizón & Gadea, 2002). These projects have been driven by the idea of regional economic integration in order to facilitate national competitiveness in globalizing markets. New roads and infrastructure upgrades are important for regional development; however, this infrastructure can bring negative social and ecological impacts (Forman et al., 2003; Trombulak and Frissell, 2000). Highway projects in Brazil during the 1960s led to the widespread deforestation, land degradation, violent conflicts over natural resources, and limited rural livelihood options, which usually led to rural-

urban migration and the reproduction of poverty in urban areas (Goodland & Irwin, 1975; Mahar, 1989).

In Brazil, the Trans-Amazonian Highway in the state of Pará opened a large area of forest to colonization in the 1970s (Smith, 1982); however, state abandonment in the 1980s hindered the ability of colonists to secure sustainable livelihoods (Nascimento & Drummond, 2003). Land ownership turnover and rising crop prices attracted new colonists in the 1980s, resulting in expanded deforestation (Nascimento & Drummond, 2003). While some prospered for a period, decreases in prices and increased pest attacks threatened colonists' well-being, prompting many to adopt cattle ranching, which also stimulated expanded deforestation (Veiga & Tourrand, 2004). The paving of the BR-364 highway (Polonoroeste Project) through the state of Rondonia with World Bank funds resulted in a great influx of migrants from southern Brazil, leading to disorganized land settlement, widespread deforestation, invasion of indigenous lands, disordered small-scale mining that polluted rivers with mercury, and predatory timber extraction that degraded forests (Browder & Godfrey, 1997).

In the Bolivian lowlands, investment in the highway from the highlands to Santa Cruz encouraged rapid migration and urban growth (Stearman, 1985). As Bolivia embarked on structural adjustment reforms in the 1980s and 1990s to improve international competitiveness, soybean and ranching operations thrived in Santa Cruz (Pacheco, 1998). As a result, deforestation prevailed along roads in Santa Cruz (Mertens et al., 2004). In Ecuador, investments in road infrastructure from the highlands to the eastern lowlands stimulated rapid migration into the Oriente (Rudel, 1983; Uquillas, 1984; Wunder, 2000). As in other areas, new or improved roads generated new economic

opportunities for many impoverished families in the densely settled highlands. Colonists in the lowlands experienced varying degrees of success in farming; however, the emergence of narcotics trafficking in the Ecuadorian lowlands greatly complicated the situation (Rossi, 1996). New roads in the northern Peruvian Amazon raised concerns about social and environmental impacts as well (Mäki, Kalliola, & Vuorinen, 2001).

The paving of the Interoceanic Highway was to facilitate links between the Atlantic ports in southern Brazil and the Pacific ports in Peru, opening the southwestern Amazon to global markets. The building of the road was expected to reduce the distance between Acre (Brazil) and the nearest ocean port from 4,000 km to 1,500 km. The Interoceanic Highway represented the challenge of reconciling conservation and development goals. It was estimated that about 30 indigenous groups were located along the highway, as well as rubber tappers, Brazil nut collectors, and traditional riverside dwellers (Pro-Inversión, 2005; Tizón & Gadea, 2002). An official estimate suggested that six million people would be integrated by the highway on the Peruvian side, or 20% of the national population (MTC, 2005). It was also estimated that 30 million people fell within the area of influence of the highway in Peru, Brazil, and Bolivia (Brown et al., 2002). As a result of the highway, some social problems emerged in Madre de Dios and Pando. These problems included limited agricultural credit, land conflicts, and weak social organization.

Credit became an issue as landholders sought to invest in products for markets that would become accessible with the paved highway. Land tenure was problematic in Pando (and elsewhere in Bolivia) due to the lack of secure titles and disputes between private logging concessions, peasants, and indigenous communities. While loggers and

traditional Brazil nut concessionaires were seen by many participants as having special privileges, entrepreneurs were hesitant to plan or invest due to tenure insecurity. In Peru, the problem was not the lack of titles, rather, it was overlapping land uses such as timber and Brazil nut concessions, agriculture, and mining. Government zoning efforts there were still incipient and ineffective (Mendoza et al., 2007).

In Acre, residents complained frequently of social problems such as drug trafficking and violence that had increased after the pavement of the Interoceanic Highway. There were also complaints about rural-to-urban migration due to the sale of land along the road to outsiders. Migrants moved to the capital city, to small towns, or further along the road to still-forested areas, a pattern seen in other frontier road corridors in the Amazon. Additionally, there were complaints that rural land sales and rural out-migration were leading to greater unemployment in urban areas (Mendoza et al., 2007). In Pando, it was estimated that rural underemployment was the cause of seasonal rural-urban migration when Brazil nut collection and agricultural activities were not competing for workers in rural areas. Stakeholders in Pando associated seasonal unemployment with alcoholism, family problems, moral breakdowns, violence, and poverty. There were also complaints about the rapid increase in land prices. With land values increasing about seven times since the paving of the Interoceanic Highway, local residents were unable to acquire land. The multiple social problems linked to rural change, migration and the shared lack of educational opportunities indicated the social difficulties faced by communities when dealing with the impacts of road paving (Mendoza et al., 2007).

Adverse Impacts in the Developing World - Sub-Saharan Africa

Sub-Saharan Africa's transport infrastructure is limited compared to other developing regions. Road density is less than a third of roads in South Asia, and only a quarter of the network is paved (Bricendo-Garmendia & Foster, 2010), compared to 60% in India (Government of India, 2016) and two thirds in China (World Bank, 2015). The road network in most developing countries is sparse, both measured per square kilometer and per inhabitant, compared to that of developed countries (Thagesen, 1996). As indicated by Calderón and Servén (2010), in most dimensions of infrastructure performance, Sub-Saharan Africa ranks last among all developing regions. Unfortunately, little is known about the history of transportation infrastructure in Africa, even though it represents a significant investment (Jedwab & Storeygard, 2017). Transportation accounted for 14% of World Bank lending and 22% of African Development Bank disbursements between 2012 and 2015 (World Bank, 2016; African Development Bank, 2012-2015).

In many of these countries, the most important interurban trunk roads linking the provincial capitals are in place, while the network of secondary and access roads in rural areas is far from fully developed. Often the existing roads are in a poor state of repair as a result of inadequate maintenance (Thagesen, 1996). The current extent and condition of the road network in developing countries is a result of the historical development and economic situation of these countries. In most developing countries the backbone of the existing transport infrastructure in terms of harbors, major railway lines, and trunk roads was established during the colonial era. The purpose of this infrastructure was to transport raw materials from mining areas, plantations, and agricultural estates to the

coast for shipment to Europe (Njoh, 2008; Thagesen, 1996). At independence, most of these countries, notably in Africa, inherited a disintegrated transport network with roads and railways leading from harbors to the interior of these countries. These networks were inadequate for the development of independent economies integrating all regions of these countries.

In West Africa, four major phases of road provision and transportation service development were identified by Porter (2008). First, there is a colonial phase where the emphasis was on accessing major export producing areas. Secondly, a post-independence phase (1960s to 1980s) where newly independent governments began to shape their own road transportation policies. Third, a structural adjustment phase from the mid-1980s, which influenced conditions for well over a decade. External interventions in this phase from the International Monetary Fund (IMF) and the World Bank brought increasing influence to bear on local policies and conditions. Finally, a new phase of more positive change in the 21st century attracting new donors and investors into infrastructure investment and the transport services sector (Porter, 2008).

Just as the rest of the continent, basic transport infrastructure investment during the colonial era in West Africa was primarily focused on opening up the region for political and economic exploitation. This had tremendous implications not only for the movement of goods and services but also for the levels of development in the various regions through which major lines of communication run or are ignored (Porter, 2012). Post-independence saw significant investments by respective governments, international aid, and financing agencies in rehabilitating existing and constructing new trunk roads. The focus on trunk roads was related to the prevailing development strategy of that

period, the single-factor strategy or modernization strategy, which aimed at rapid growth through industrial development. The International Development Agency (IDA) during the 1960s spent 30% of its total investments in developing countries on transport infrastructure, notably trunk roads. For instance, the length of the networks of highways in Kenya was expanded from about 1,000 km in 1960 to about 3,000 km in 1970 (Thagesen, 1996).

Globally, few countries experienced their first highways in the 1920s and 1930s. However, highways in Sub-Saharan Africa were a postwar phenomenon. With the exception of the far south, there were barely any tarred roads outside the towns until after the Second World War (Wrigley, 1986). Even in South Africa, there were only about 2,000 km of highways in 1940 (Perkins, 2003; Perkins, Johann, & Luiz, 2005). Jedwab and Storeygard (2017) indicated that the first restricted-access highways in Africa were constructed in 1972, and by 2012 they were limited to 3,400 km, 87% of which were in Nigeria and South Africa. Paved roads tripled between 1961 and 1984, and leveled off in the mid-1980s. The earliest paved roads in Africa appeared in Ghana in 1924, followed by Nigeria in 1930, Zimbabwe in 1933, South Africa in 1938, and Kenya in 1945 (Jedwab & Storeygard, 2017).

Inadequate provision of transport infrastructure and services provides a basis for explaining the incidence of poverty across various African communities in both urban and rural areas. Across the African continent, it has been established that inadequate transportation facilities and services, as well as the limitations imposed on the mobility and accessibility of people to markets, hospitals, and water sources, have significant implications on deepening poverty levels. In this regard, there has always been a need for

African countries to develop important policy measures to resolve existing travel and transport problems. The importance of transportation infrastructure to African countries cannot be overemphasized, as efficient transportation infrastructure facilities act as catalysts for development (Olomola, 2003).

In many African countries, the permanent occupancy of open spaces of publicly owned ROW commonly invites encroachment of local community activities onto the roadside, footpaths, bus stops, and sometimes the road surface itself. These activities take many forms, including the selling of goods from individual kiosks or more expansive markets; small businesses such as cafés and vehicle repair shops; uncontrolled stops by buses, taxis, and informal public transport; and unregulated parking, often associated with business activities. Additionally, there are other social activities associated with the roadside. In both rural and urban areas, and at the entrance of towns and villages, the roadside provides a social venue. People assemble along the roads to talk, smoke, drink, or watch traffic (Ajayi et al., 2013).

The sustainability of urban areas has to do with the ease of commuting within the various axes and this depends on the level of the road network within the city. Development projects such as roads are intended to modify social and natural environments in order to create or enhance the economic well-being and livelihood as well as other benefits that are valued by society. This purpose is sometimes defeated by unanticipated or unintended negative social or environmental impacts that reduce desired benefits or in some cases threaten the sustainability of projects. The social and economic benefits provided by highway projects include all-weather reliability, reduced transportation costs, increased access to markets for local produce and products, access to

new employment centers, employment of local workers on the project itself, better access to health care and other social services, and strengthening of local economies.

However, these highways (road) projects can produce negative impacts alongside these benefits (Ajayi et al., 2013). The impacts of road improvement, rehabilitation, and maintenance can be significant on natural resources and systems, as well as social and cultural environments. In African countries, the transport sector is seen as a significant source of employment. These employment benefits are likely to be both direct and indirect, with associated changes in income and livelihoods for those employed. It is anticipated that the skill-base of the local labor pool will be strengthened, thereby enhancing prospects for future employment. At the same time, road construction and maintenance activities may affect social and economic conditions by creating more difficult trading conditions, thus having a negative effect on livelihoods. For instance, road construction and maintenance activities have sometimes resulted in the generation of noise, dust, and material stockpiles which discourage trading in project vicinities. Sometimes these road construction and maintenance activities lead to traders relocating nearby or leaving the neighborhood altogether. Although numbers may be small, effects could significantly increase individuals' vulnerability to poverty. Also, local trading at certain locations is impacted due to the presence of a local workforce (Cracknell, 2000).

In some instances, the economic impacts of road expansion in Africa have resulted in the loss of businesses and customers, induced need for capital investment, and high opportunity cost losses (Ajayi et al., 2013). A study on the impact of the expansion of the Arakale road in Akure, Nigeria, revealed that the loss of customers due to the demolition of business premises, accompanied by inaccessible roads to new makeshift

shops, had resulted in the reduction of profit. The study indicated that although the government had compensated displaced traders, it was seen as inadequate compared to the loss and inconveniences incurred. The study recommended the provision of accessible and affordable shopping complexes for traders and the speedy completion of the road project to reduce the hindrance to customers in reaching the business area (Ajayi et al., 2013).

Again in Nigeria, Porter (1997) found that after intense paved road construction, off-road communities became more isolated and social inequality increased. Porter further indicated that off-road markets were dying, and this was especially harmful to small growers with restricted mobility; women and the elderly were more likely to fall into this category. In times of economic contraction, when vehicle operators want to save on spare parts, transport services are restricted to the best-maintained roads and even more of the roadside communities become isolated. When people migrate to roadside communities, off-road communities become less viable locations for clinics and schools. A World Bank report sums up the social problems as follows: the bypassed community, the community split by a road, culture shock, reduced convenience of traditional modes of transport, resettlement of people making way for road construction, the introduction of new diseases and alcohol abuse to indigenous peoples, loss of traditional sense of identity, violation of traditionally exercised land rights, damage to cultural heritage, and impact on the aesthetics of landscape (World Bank, 1997).

Highway improvements are typically associated with a broad range of economic, social, and spatial benefits. Generally, these impacts tend to be positive, as the benefits of increased efficiency associated with road transportation cost savings accrue to a wide

range of highway users and nonusers alike. However, highway improvement can impose adverse impacts both in the short and long term. The foregoing literature has identified adverse impacts resulting from highway improvements or construction around the world. In the context of developing countries, economic factors primarily dominate policy decisions, with negative social and spatial factors usually overlooked (Pro-Inversión, 2005; Tizón & Gadea, 2002). Consequently, there is a need for this study to assess the adverse social, economic, and spatial impacts of highway improvements on project communities.

Case Studies

Introduction

The review of case studies helped the researcher to compare literature on the adverse impacts of highway capacity expansion on both the local and regional environment. Case studies provided the researcher with a platform to identify how the adverse impacts have been assessed and analyzed globally. It also provided an in-depth understanding of the different approaches and methodologies that have been used in the case studies, as well as the quality of the results they yielded. This review involved three case studies, two from Kenya (Africa) and one from India (Southeast Asia). The review of case studies looked at the background of each project and its adverse impacts.

Thika Highway Project – Kenya

Project background. The Nairobi-Thika Highway improvement project was seen as one of Kenya's first large transportation infrastructure projects. Funding for the project came as loans from the African Development Bank and the Chinese Government. The road improvement included an upgrade of the existing four lanes to eight lanes, as well as

the provision of bicycle tracks and footpaths (KARA and CSUD, 2012). The Nairobi-Thika road corridor is an international trunk road that lies in the northeast of the Nairobi Metropolitan Region and runs through Nairobi City Center to Thika District. It is an important metropolitan, regional, and international transit link that also connects Nairobi City with Ethiopia, and carries about 60,000 vehicles daily (KARA and CSUD, 2012). The Nairobi-Thika road corridor is one of the country's most used roads and is a primary artery that serves various satellite towns and economic centers. It also provides some Kenyans who live on the outskirts of Nairobi with access to employment, education, and other high-order services in the core of Nairobi, Westlands, and Parklands (KARA and CSUD, 2012).

However, users of the Nairobi-Thika road corridor were confronted with problems, including heavy congestion, high road traffic crashes, high road traffic fatality rates, and dilapidated infrastructure (KARA and CSUD, 2012). All these preceding problems were just a part of the broader urban transportation problems that confronted the Nairobi Metropolitan Region. The overall urban transportation problems in the Nairobi Metropolitan Region were attributed to rapid urbanization, inadequate transportation infrastructure, poor maintenance, and poor transport policies. All this was believed to have contributed to the inability of the Kenyan Government to address the travel needs of public transit users, pedestrians, and cyclists. The increase in the rates of traffic and travel demand for both motorized and nonmotorized road users in addition to poor road conditions was believed to have affected mobility and accessibility needs; this resulted in poor road safety conditions in the Nairobi Metropolitan Region (KARA and CSUD, 2012).

In its early stages, the Nairobi-Thika Highway improvement project was met with lots of excitement and praise. However, some neighboring residents and road users who had their lives impacted by the road improvement project raised complaints about their noninvolvement in most discussions about the project. In response, the Kenya Alliance for Resident Association (KARA) and the Center for Sustainable Urban Development (CSUD) at the Earth Institute at Columbia University in Kenya collaborated to investigate issues that were developing about the Nairobi-Thika Highway improvement project. This was, however, part of a broader multidisciplinary research consortium with the University of Nairobi's Department of Geography and Environmental Studies, and the Jomo Kenyatta University of Agriculture and Technology's Highway, Geotechnical, and Transportation Division. The objective of KARA and CSUD's investigation was to listen to the concerns and complaints of road users and residents impacted by the project. This investigation was to complement the broader consortium research of examining road designs, land use, and environmental impacts of the Nairobi-Thika road improvement project (KARA and CSUD, 2012).

As part of the investigations, KARA and CSUD conducted focus group discussions, stakeholder meetings, and public forums to grant the public a chance to voice their views and concerns on project planning and implementation, socioeconomic impact of the road project on residents and road users, and issues of local planning and land use in relation to the road improvement project. These investigations revealed that participants appreciated the long-term benefits of the project, but there were immediate concerns that bothered them about the adverse effects of the road improvement implementation on the daily routines of businesses and residents. A summary of the

social and economic concerns raised by residents and businesses as a result of the road improvement project is discussed below.

Social impacts. Investigations revealed that during the construction of the Nairobi-Thika Highway improvement project, road traffic crashes became frequent, specifically in densely populated parts of the highway, such as the Githurai area. This was attributed to inadequate information and signage on the road. The investigations revealed specifically that diversion information was inadequate, thus causing a safety risk as some motorists frequently found themselves on the wrong side of the road. Also, the lack of knowledge on the part of both motorists and pedestrians about how to use the highway was identified as a major contributor to the frequent road traffic crashes (KARA and CSUD, 2012).

People with disabilities such as the blind and those using wheelchairs were not taken into consideration in the design and implementation of the project. This made it difficult for the disabled to cross from one side of the highway to the other since they had challenges in using the footbridges and could not cross the highway without the risk of being knocked down by speeding motorists.

Concerns were also raised about the inadequate number of footbridges along the highway. Since the footbridges were spread wide apart, pedestrians were often tempted to cross the highway without using them. Due to the high speed of vehicles on the highway, pedestrians risked their lives anytime they attempted to cross the road in this manner (KARA and CSUD, 2012).

Economic impacts. Property value along the highway increased as a result of the road improvement project, and people scrambled for lands adjacent to the Nairobi-Thika

Highway. However, this profited property owners and not renters. Given the rent increases, some tenants who were unable to pay the high prices were forced to move out. The area also experienced a loss of businesses due to the lack of access, diversion, and the demolition of businesses on the road reserve (KARA and CSUD, 2012). Participants involved in the investigation processes raised the issue of compensation for those whose properties had been demolished or whose access roads to their properties had been blocked or diverted. However, the Ministry of Roads and the Kenya National Highways Authority (KeNHA) categorically stated that the government had no provision for compensation. The use and movement of heavy machinery during the construction of the Nairobi-Thika Highway was believed to have caused vibration and also weakened the foundations of some buildings adjacent the highway. Additionally, noise and air pollution from the construction adversely impacted property values along the highway (KARA and CSUD, 2012).

Nairobi Outer Ring Road Improvement Project

Project background. Nairobi had experienced traffic congestion on most of its roads, and different agencies carried out studies to find solutions to the congestion problem. In light of this, the Kenyan Government through the Kenya Urban Roads Authority (KURA) decided to upgrade the Outer Ring Road. This was seen as an effort to remove the bottleneck and enhance traffic flow. The improvement was also to increase traffic movement linkages with major road corridors like the Nairobi-Thika Highway and the Nairobi-Mombasa Highway (African Development Bank, 2013).

The Outer Ring Road corridor was highly built up with residential areas, medium and high commercial activities, and low-level industrial activities. The total length of the

proposed road corridor was 13 kilometers, consisting of two-lane carriageways and heavy traffic. The project road had a low level of service with travel speeds ranging from 12 to 15 kilometers per hour (African Development Bank, 2013). The project also involved large-scale road construction in a densely populated urban setting. The purpose of the project was to improve traffic flow into Nairobi by converting the 13-kilometer Outer Ring Road to a dual carriageway and upgrade existing intersections to six grade-separated intersections and two underpasses, together with integrated nonmotorized transport facilities for the entire road length. Also included were 10 footbridges to facilitate safe pedestrian crossing, street lighting, roadside drains, road furniture, and markings (African Development Bank, 2013). The upgrade of the Outer Ring Road was expected to generate both positive and negative impacts. Below is a summary of some of the adverse impacts as listed in the Environmental and Social Impact Assessment Report, 2013.

Social impacts. The project road and intersection construction generated traffic problems which made traffic flow through the construction site difficult. Increased traffic volume and activities during construction caused road traffic crashes for both pedestrians and vehicles. Also, noise and vibration were a major part of the construction due to the heavy machinery involved. The increased noise and vibrations caused agitation, impaired communication, and weakened foundations of existing buildings. Generally, the key impacts included traffic delays and disruption of traffic flow on a road corridor that carried annual daily traffic of more than 20,000 vehicles; the disruption of public utilities such as water supply, sewage, and electricity; the risk of road traffic crashes and construction accidents; and the generation of noise, dust, and vibrations (African

Development Bank, 2013). Public utilities such as water, sewage systems, and power lines that run close to the road were disrupted during construction. This made services unavailable to residents for a long period of time (African Development Bank, 2013).

Economic impacts. Some of the major economic problems associated with the road project were the loss of business to 445 informal traders (street hawkers and petty traders) who had temporary shelters along the project road corridor, as well as the loss of 177 properties within the construction corridor (African Development Bank, 2013). The 177 properties were acquired to make room for the road improvement project. These properties were the total number of parcels that had title deeds, including those that had encroached on the land reserved for the road improvement. The property acquisition displaced some residences and businesses, which resulted in the loss of jobs and job opportunities. Overall, the proposed project resulted in the loss of productive assets specifically for groups such as women, some urban poor, and vulnerable groups along the project road (African Development Bank, 2013).

Western Transport Corridor, India

Project background. The Western Transport Corridor, consisting of National Highway 8 (NH 8) and National Highway 4 (NH 4) and connecting Delhi, Mumbai, Bangalore, and Chennai, is one of the busiest corridors in India. The section between Bangalore and Mumbai on NH 4 had a high traffic volume. Constructing an efficient, continuous transport linkage throughout the Western Transport Corridor was expected to have a significant impact on overall economic growth and also allow benefits from economic growth to spread to poorer areas (Asian Development Bank, 1999). The Western Transport Corridor Project aimed to advance policy reforms in India to create an

environment that would enable the sustainable development of national highway systems, with substantial participation of the private sector. The project was designed to remove capacity constraints on a critical section of the project highway; enhance road safety by introducing design features that would reduce traffic crashes and minimize negative impacts of road construction for people within the project area; enhance corporate finance capability of the National Highways Authority India (NHAI) to facilitate its eventual transition to an efficiently managed autonomous entity; and finally, to increase private sector participation in the development, operation, and maintenance of the national highway system (Asian Development Bank, 1999). The project included the upgrading of the existing two-lane single carriage to a four-lane highway on the Tumkur-Haveri section (about 259 km) of NH 4 in the state of Karnataka. The project was expected to generate land acquisition and resettlement activities (Asian Development Bank, 1999).

Social impacts. The project required the acquisition of 1,601 acres of land, of which 1,341 acres were agricultural, 173 nonagricultural, and the remaining 87 government land. The land acquisition was projected to affect an estimated 18,906 persons. However, because of the strip acquisition, impacts were not expected to be significant. The acquisition of 541 privately owned structures affected 541 families or 3,246 persons. No relocation sites were required since all affected households opted to self-relocate. Additionally, 1,860 persons without titles in 310 families were affected by the acquisition of 310 structures. A total of 27 government-owned structures were acquired, including social infrastructures such as schools, clinics, and government offices (Asian Development Bank, 1999).

Economic impacts. On the economic side, 44 shops were relocated under the project. These were mainly owned by displaced non-titled affected persons who had been operating shops along the highway for at least 18 years and had proof of "panchayat" license and record of stay. Based on interviews conducted with affected persons, the 44 shop owners had organized themselves into the Sri Maruthi Squatters Association (SMSA) and were able to acquire land for relocation and license for operation (Asian Development Bank, 1999).

Summary

These case studies reveal that the impact of each transportation project is different and is largely based on the environment in which the project occurs. After reviewing case studies around the globe, it is clear that road transportation projects have negative impacts, and there is a need to pay close attention to how these may affect project communities. The lack of mitigation planning and the exclusion of civil society during road construction planning usually contributes to the failure to identify adverse impacts. Road transportation projects in the developing world are mostly evaluated based on positive economic criteria; in this way, roads are constructed by sacrificing the adverse economic, social, and spatial impacts of project communities. These case studies also show that adverse impacts can be mitigated or minimized if the construction processes involve transparent planning and implementation process.

Chapter 3

Project Description and Assessment

Introduction

In August 2006, the Millennium Challenge Corporation (MCC) signed a five-year, approximately $547 million Compact with the Government of Ghana (GoG). The Millennium Challenge Account (MCA) was viewed as an opportunity to address fundamental structural problems in the local economy, as well as to help improve the economic, political, and social stability of the subregion. Ghana's principal economic goal was to improve the standard of living for its citizens and to achieve middle-income status within a decade, driven by private sector growth. The Compact program was intended to advance these goals by enhancing economic growth through poverty reduction (Resettlement Action Plan Report, 2008).

The Compact identified three key objectives to advance the overarching goal of poverty reduction via economic growth. The objectives were stated as follows:

- To increase productivity and business skills of small and medium-sized farmers, and their employees, via activities described within the "Agricultural Development Project."
- To reduce transportation costs between target production centers and national, regional, and global markets via activities described within the "Transportation Development Project."
- To improve critical social services by providing additional water supply, sanitation, and education facilities in selected districts through activities described

within the “Rural Services Development Project” (Resettlement Action Plan Report, 2008).

The Transportation Development Project included funds for upgrades to sections of the N1-Highway. The N1-Highway between Tetteh Quarshie Interchange and Mallam Junction (TQM) serves as an outer ring road of Accra, and it broadly forms a boundary between the metropolitan areas of Accra and the outer administrative areas. The highway is under the jurisdiction of the Ghana Highway Authority (GHA) (Inception Report, 2008).

Project Description

The Millennium Challenge Account program in Ghana coincided with the nation’s long-term goal of transforming the nation into a middle-income economy. Regional integration was deemed significant in achieving this goal. As a result, it was imperative that infrastructure such as the Tetteh Quarshie Interchange to Mallam Junction road (part of the Trans-West African Coastal Highway) be upgraded to the standard of an international highway. The main objective of the project was to upgrade the 14.1-kilometer highway to reduce congestion and fix the bottleneck in accessing the Kotoka International Airport in Accra and the two seaports in Tema and Takoradi, respectively. This was to support the expansion of Ghana’s export-directed horticulture base.

Increased transportation and vehicle operating costs for agricultural and other sectors, as well as long travel times, had placed significant constraints on the growth of Ghana’s economy. While plans for the road’s expansion slowly evolved since the mid-1960s, Accra built up rapidly around the old road corridor. Accommodating about 30,000 vehicles per day, this stretch of the N1-Highway was a two-lane undivided road, often

congested and lacking the operational capacity required to serve high volumes of national, transnational, and local traffic. The completed highway now consists of a six-lane divided thoroughfare with six footbridges, streetlights, drainage, bus stops, sidewalks, and traffic lights at all major intersections. In order to ensure the long-term success of the project, construction was preceded by an environmental impact assessment and the creation of environmental management and resettlement action plans (Millennium Challenge Corporation, 2012).

Policy, Legal, and Administrative Framework

In Ghana, there are a number of policies, laws, and regulations concerned with the development and the environment in general. Under Ghana's environmental laws, an Environmental Impact Assessment (EIA) is mandatory for 17 types of activities classified as environmentally critical and requires an environmental permit (EP). The construction of roads and highways is one of such activities, hence an EIA and an EP were mandatory for the N1-Highway upgrade project (Millennium Development Authority, 2008). The purpose of these laws and regulations in environmental management include the following: to disclose to the public reasons for agency approvals of projects with significant environmental effects; to foster interagency coordination in the review of projects; to prevent environmental damage by requiring implementation of feasible alternative or mitigation measures; and to enhance public participation in the EIA permitting process. This section of the study reviews policy, legal, and regulatory frameworks that were consulted as a result of the nature of the N1-Highway project.

Policy Frameworks

Ghana government's environmental policy. The ultimate aim of the National Environmental Policy of Ghana is to improve the surroundings, living conditions, and quality of life for all citizens, both present and future. The policy seeks to ensure reconciliation between economic development and natural resource conservation and to make the high-quality environment a key element supporting the country's economic and social development (Millennium Development Authority, 2012). Specifically, the National Environmental Policy seeks to maintain ecosystems and ecological processes essential for the functioning of the biosphere; ensure sound management of natural resources and the environment; adequately protect humans, animals, and plants and their biological communities and habitats against harmful impacts and destructive practices; promote preservation of biological diversity; guide development in accordance with quality requirements to prevent, reduce, and eliminate pollution and nuisances; integrate environmental considerations in sectoral, structural, and socioeconomic planning at the national, regional, district, and local levels; and finally, to seek common solutions to environmental problems in West Africa, Africa, and the world at large (Report on Final Environmental Impact Assessment and Environmental Management Plan, 2008).

Environmental protection in Ghana is guided by the preventive approach, that is, with the recognition that socioeconomic development must be undertaken in a way to avoid the creation of environmental problems. This is reflected in the Environmental Policy of Ghana formulated in the National Environmental Action Plan (NEAP) of 1993. The NEAP defines a set of policies and other actions that make Ghana's development strategy environmentally sustainable. The policy seeks reconciliation between economic

planning and environmental resource development with the view of achieving sustainable national development. Public participation in the environmental decision-making process is a vital component of government policy (Report on Environmental Impact Assessment and Environmental Management Plan, 2008).

Road sector policy and administrative framework. The Government of Ghana's (GoG) transport policy provides for continued improvements to Ghana's rural and urban road networks. This objective is met through an integrated, efficient, cost-effective, and sustainable transportation system responsive to the needs of society, supportive of growth and poverty reduction, and capable of establishing and maintaining Ghana as a transportation hub of West Africa (Report on Environmental Impact Assessment and Environmental Management Plan, 2008). The Ministry of Transportation (MoT) is responsible for formulating policies and overall strategies on roads and vehicular transport. The Ghana Highway Authority (GHA), Department of Feeder Roads (DFR), and Department of Urban Roads (DUR) are the organizations under MoT that carry out actual implementation of road policies. The N1-Highway project falls within the jurisdiction of the GHA. Specifically, the Road Sector Policy seeks to achieve sustainable improvements in the performance of trunk, feeder, and urban roads, and road transportation services in all regions of Ghana; strengthen the capabilities for management and implementation in the road sector; and establish management systems that will ensure the upgrading and preservation of an improved road system and the use thereof in an environmentally, socially, and financially sustainable fashion (Report on Environmental Impact Assessment and Environmental Management Plan, 2008).

Legal and Regulatory Frameworks

The major relevant and important policy, legal, and regulatory frameworks that guided the Environmental Impact Assessment study on the N1-Highway project include the following:

Constitution (1992). The implementation of the N1-Highway project involved the acquisition of ROW by the government through the Ghana Highway Authority whereby some private properties were affected. Since the constitution provided for the protection of property rights and natural resources, all affected properties and natural resources along the N1-Highway were appropriately identified, properly valued, and adequately paid compensation as outlined in clause 20 of the constitution.

Environmental and social management framework (ESMF) and resettlement policy framework (RFP) 2007. The ESMF and RPF served as guidelines for the Transport Sector Development Program (TSDP) with a focus on road sector projects. The purpose was to provide corporate environmental, social, and resettlement safeguard policy frameworks, institutional arrangements, and capacity available to identify and mitigate potential safeguard issues. These documents were relevant to the N1-Highway project because they represent statements of policy, guiding principles, and procedures, as well as environmental and social safeguard instruments of reference for the road sector projects agreeable to all stakeholders, such as the Environmental Protection Agency (EPA), the World Bank, the Ministry of Transportation, and other implementing agencies.

Transport sector environmental assessment guidelines. The objective of the transport sector environmental assessment guidelines was to assist project authorities and consultants in the planning and preparation of Environmental Impact Assessments to

ensure systematic, consistent, and comprehensive coverage for the impact assessment of the various transport modes, including roads. These guidelines were not intended to be exhaustive or a reference for the very detailed or specific problems that occur in assessing the environmental impact of transport projects; rather, they were meant to complement professional judgment and the experience of competent consultants such as planners, engineers, financial institutions, and policymakers, among others.

Environmental assessment (EA) regulations LI 1652, 1999 and (amendment) LI 1703, 2002. These regulations were enacted to provide guidance and ensure adequate consideration of biodiversity and related sensitive resources for EIA in Ghana. The EA regulations combine both environmental assessment and environmental management systems. The N1-Highway project falls under schedules of undertakings that require registration and securing of environmental permits (Schedule 1) from the EPA through the EA system. The others include Schedule 2 (EIA mandatory undertakings) and Schedule 5 (relevant undertakings located in environmentally sensitive areas).

Environmental Protection Agency Act 490, 1994. The Act grants the agency enforcement and standards-setting powers to ensure compliance with standards and guidelines. The EPA is also mandated to ensure compliance with the Ghana EA requirements and procedures for proposed as well as existing undertakings. The EPA is therefore vested with the power to determine what constitutes an adverse effect on the environment or serious threat to public health and to require an EA, EMP, or annual environmental report on the N1-Highway project. The agency was also responsible for advising the government on all matters related to the environment, monitoring sound

ecological balance, and coordinating environmental activities, education, and research. The Act also specified requirements for the production of an EIA for various proposed works.

Criminal code (Act 29) Section 296-297, 1960. This Act sought to prevent the accumulation and exposure of filth and refuse, and to prohibit activities which may endanger public health or cause damage to lands, crops, cattle, or goods. Any project activities that pose a danger to health and safety are infringing on this law. The implementation of the N1-Highway resulted in dust, noise, vibration pollution, waste generation, and the creation of borrow pits, all of which adversely impacted public health. In accordance with the criminal code, mitigation measures were proposed to help avoid, reduce, or eliminate negative impacts where necessary, as well as to help enhance positive ones.

Water resources commission act 522 (1996). This Act provides for the preparation of comprehensive plans for the regulation, utilization, conservation, development, and improvement of water resources and develops a policy framework for water resources management in the country. It also grants the right to exploit water resources. As part of implementation, the N1-Highway project was expected to impact the Odaw stream and wetlands near the Mallam Junction section of the highway. As a result, there was a need to apply the relevant provisions of Act 522 (1996).

Wild animals preservation act 43, 1961 (amended by PNDCL 55, 1983). The Wild Animals Preservation Act sets restrictions on hunting vertebrate animals and makes it possible to create reserves within which hunting, capturing, or killing any bird or animal is prohibited without special authorization. The act is relevant to the N1-Highway project in that the Achimota Forest abuts the project road corridor, and there have been

plans to relocate the Accra Zoo into the Achimota Forest. There was, therefore, the need to incorporate in the design appropriate and adequate mitigation measures to reduce or eliminate negative effects on the animals.

Wildlife reserve regulations (LI 710) 1971. This regulation provides for the creation of wildlife reserves and the prohibition of water pollution with reserves. This is particularly relevant where the road passes through or close to a game reserve. As already indicated, there were plans to relocate animals from the Accra Zoo to the Achimota Forest.

Local government act 462, 1994. The Local Government Act 462, 1994 enjoins the district assemblies to be responsible for the development, improvement, and maintenance of human settlements and the environment at the district and local levels. As part of the N1-Highway project, the district assemblies were responsible for the management and maintenance of the access roads within their respective jurisdictions.

Land Acquisition Legislation

The process of land acquisition by the Government of Ghana for public utility purposes is regulated by a series of statutory documents, including the Administration of Lands (Amendment) Decree (1979), the State Lands Act (1963), the Administration of Lands Act (1962), and the State Property and Contracts Act (1960). In Ghana, these acts make it possible for the government to acquire private and ancestral lands for public utility purposes. They also provide a framework of reference for compensation and/or replacement of affected land and describe the recourse available in the event of a challenge. In designing the N1-Highway, deliberate attempts were made to minimize the destruction of properties. However, in cases where it became necessary to demolish or destroy a property, cash compensation was paid under the Lands Act 186 (1963), Section

6 (1). The provision of the Act was further supported by clause 20 of the 1992 Constitution, which provided for prompt and adequate compensation for any land or property taken for public purposes.

Town and country planning cap 84, 1951. Preparation of district layout plans and the protection and preservation of amenities and public services such as drainage, roads, sewage, and water supply fall under the preserve of Cap 84. The N1-Highway upgrade traversed through the Accra Metropolitan and Ga District Assemblies respectively. The Town and Country Planning Cap 84 was relevant in determining the layout of the adjoining properties lining the road corridor, and also helped identify land use that was critical or sensitive in environmental areas.

Millennium challenge corporation (MCC) environmental guidelines. The MCC guidelines were aimed at establishing a process for the review of environmental and social impacts to ensure that projects undertaken as part of programs funded under MCC compacts with eligible countries were environmentally sound, were designed to operate in compliance with applicable regulatory requirements, and, as required by the legislation establishing MCC, were not likely to cause significant environmental, health, or safety hazards. The policies reflected in the guidelines were based on sound sustainable development project design principles and international best practices in the environmental field, including guidelines of the International Association for Impact Assessment, United States of America Government development assistance and financial entities, and multilateral development banks.

World Bank Requirements (Safeguard Policies)

The World Bank's Operational Policies (OP) include guidance on environmental assessment requirements. The safeguard policies are lumped into environmental, rural development, social development, and international law. Relevant for consideration as guidelines for the N1-Highway upgrade project was Involuntary Resettlement (OP/BP4.12), Forestry (OP/BP4.36), and Management of Cultural Property (OP/BP 11.03). The policy on involuntary resettlement was intended to assist people displaced by development projects, in order not to impoverish any affected people within the project's area of influence. Based on the policy, an action plan that at least restored their standard of living must be instituted,in cases where resettlement was inevitable or loss of assets and impacts on livelihood occurred. The policy also calls for the consultation of impacted people and host communities for a successful resettlement process and implementation of any action plan in order to incorporate appropriate choices.

The aim of the forestry policy was to enhance the environmental and social contribution of forested areas and address the need to reduce deforestation. The protection of forest-related impacts of all investment operations was a concern covered by the policy, which requires that the sector and other relevant stakeholders be consulted as appropriate about operations affecting critical forest and conservation areas.

The management of cultural property policy is premised on the need to investigate and take inventory of cultural resources likely to be affected. Based on the policy, mitigation measures are provided in cases of adverse impacts on physical resources. Mitigation measures are undertaken in conjunction with appropriate authorities, organizations, and institutions that must be consulted and involved in the management of

the cultural property. The World Bank does not support development actions likely to significantly damage nonreplicable cultural property, and only assists projects sited or designed to prevent such damage.

The World Bank safeguard policies were adopted for consideration in the N1-Highway upgrade's environmental impact assessment because it provided guidance on appropriate impact assessments.

Anticipated Impacts

The identification of potential impacts was considered from two separate aspects. First, the consultants analyzed the N1-Highway upgrade from construction aspects, where they looked at similar projects in Africa and compared the actual and potential impacts. Secondly, specific concerns of the local communities were studied through consultations. To identify impacts, perceptions of benefits that individuals, families, communities, and the nation as a whole were expected to derive from the road project were analyzed. Additionally, analysts considered how the positive impacts could be enhanced, and also how the possible adverse effects could be managed or mitigated. As a result, the discussions of the anticipated impacts of the road project were separated into positive and negative.

Positive impacts. Some of the direct and indirect positive impacts that stakeholders were expected to enjoy from the project included: ease of traffic flow; better transport services; increase in public transport services; economic growth; and increased property values. Immediate and long-term positive impacts that were identified included: a decrease in road traffic accident rates; creation of employment opportunities; and better road infrastructure. The sum total of all these effects was expected to produce a reduction in

road traffic congestion, increased accessibility, and a general improvement in the country's transportation system. Generally, it was estimated that if the road was regularly maintained and road safety campaigns were improved, it would enhance the positive impacts expected and yield more benefits to communities.

It was expected that the project would accelerate the government's program for regional integration and the associated socio-economic benefits to the West African subregion. The project was expected to provide the missing link between two newly constructed sections: the Kaneshie-Mallam and Accra-Tema Motorway. The project was expected to positively affect the regional economy, as accessibility and commercial activities would be enhanced, thereby facilitating regional economic integration.

Public transportation and shuttle services were expected to increase, as drivers who avoided the current route would find it more attractive when upgraded. Increased availability of transport services would help foster social cohesion by improving people's access to businesses and each other. Based on consultations with residents and business owners, many business owners opted to move their businesses out of the area. However, those who chose to remain might attract more customers than before and flourish. Others were of the opinion that once the project was completed, there would be a population increase and economic activities would boom in project communities. As a result, the value of properties along the road was expected to increase, and most of the properties along the road were converted into stores and offices.

Most community members believed that the project would resolve the conflict between vehicles and pedestrians. Fresh pavement, pedestrian crossings, and other traffic management schemes would help reduce crashes. Also, motorist navigation along the

expanded and improved road would be safer and easier. The improved road was expected to have reduced wear and tear on vehicles. Thus, the improved roads would be devoid of potholes and corrugated sections, making driving smooth. This was expected to reduce the number of times that vehicle parts such as suspensions and brakes would need replacement. Cumulatively, the project was expected to reduce traffic congestion, increase accessibility, and improve the general transportation system of Accra. This would, in turn, facilitate economic activities, especially the transportation of agricultural produce to the ports. Table 1 below summarizes the anticipated positive impacts and the recommended enhancement measures.

Table 1

Positive Impacts and Enhancement Measures

Positive impacts	Enhancement measures
• Better road infrastructure • Ease of traffic flow • Better transport services and an increase in public shuttle services • Booming economic activities • Increase in property values	• Regular maintenance of road and road infrastructure ✓ ✓ ✓ ✓
• A decrease in vehicular crashes	• Stepping up road safety campaigns
• Beautification and reduction of crimes in project communities	• Provision and maintenance of street lights

Source: Report on Environmental Impact Assessment and Environmental Management Plan, 2008

Negative impacts. Some adverse impacts of the project were also identified. Notable among the direct and indirect negative impacts were demolition of properties, displacements of people and businesses, and loss of income. In the long term, as a result of the loss of businesses, the government was expected to lose revenue that would have been

collected from these businesses. It was anticipated that a total of 375 structures (83 permanent, 210 temporary, and 82 fence walls), were located within the ROW. These were going to be completely demolished, leading to the loss of residential accommodation and business premises. It was anticipated that the dislocation of people who were expected to lose their accommodation as a result of the project would induce some disturbances, such as finding temporary shelter, packing, and transporting belongings. It was expected that if people relocated to faraway places, social ties and networks built over a long period may be broken and new ties would have to be fostered in host communities.

One of the most anticipated adverse impacts of the project was the expected loss of business sites and short- to long-term loss of incomes. Almost all identifiable business groups within the project communities complained of the likely loss of their businesses and jobs, causing a reduction in income and, consequently, an impact on family upkeep. With the expected demolition of businesses and suspension of their activities, business owners indicated that without either resettlement or enough compensation to re-establish their businesses, the only alternative was to lay off employees and apprentices. Shown below in Table 2 is a summary of the anticipated negative impacts and their mitigation measures.

Table 2

Anticipated Negative Impacts and Mitigation Measures

Negative impacts	Mitigation measures
• Demolition of properties • Displacement and relocation of people and businesses • Loss of jobs and termination of apprenticeship • Loss of customers and goodwill established	• Resettlement and payment of adequate cash compensations • Encourage affected people to enroll in national youth employment programs
• Overspeeding	• Stepping up road safety campaigns

Source: Report on Environmental Impact Assessment and Environmental Management Plan, 2008.

Assessment of the N1-Highway

Six years after the official inauguration of the N1-Highway, there has not been any official evaluation or assessment of the highway to measure or assess its impact. However, individual researchers have undertaken several studies to assess various components of the N1-Highway. Also, individuals have taken to other platforms such as newspapers and the Internet to share their perspectives on the N1-Highway. This section of the research tries to review the unofficial assessments conducted by private researchers and individuals.

A spot speed study conducted by Densu, Salifu, and Attafuah (2014) to evaluate motorists' compliance with speed limits on the N1-Highway revealed that motorists were speeding on the rehabilitated highway. The study revealed that the improved road condition, combined with relatively adequate road space, may encourage commercial drivers to speed to reduce round trip time, as the profit margin of a typical commercial vehicle operator in Ghana is primarily reliant on the number of round trips made daily. In the same vein, other motorists were taking advantage of decreased traffic congestion to engage in excessive speeds during their daily activities. This assertion was supported by

Ankrah (2017) in an online newspaper article, which indicated that high-level discussions had been concluded with all road agencies responsible for enhancing road safety by introducing speed control measures. Findings from these articles have revealed that the highway is speed-oriented, and road authorities agree with this assertion. As a result, road authorities have agreed to introduce speed control measures. Densu, Salifu, and Attafuah (2014) also call for sustained driver education and enforcement programs.

A study by Noora et al. (2016) observed 1,856 pedestrians crossing the N1-Highway. Findings from the study revealed that about 25% of the pedestrians that cross the highway daily did not use approved routes. This finding was supported in a study conducted by Densu, Salifu, and Attafuah (2014), which indicated that 1 in 5 pedestrians risked their lives accessing the highway facility using the unmarked crossing. Additionally, online articles by Edwards (2013) and Gabor (2018) both revealed that pedestrians risk their lives by crossing the highway at unauthorized points. All of these studies attributed the poor pedestrian behavior to inadequate footbridges located too far apart. Considering the fact that pedestrians will have to walk long distances to access footbridges, they are likely to explore alternative routes that represent shorter walking distances to enable them to cross the highway at peril of their lives. Edwards (2013) indicated in her article that the highway had drawn protests from a number of groups, including the Association of Private University Students, whose members cross the road daily to attend classes.

Densu, Salifu, and Attafuah (2014), as well as Gabor (2016), indicated that the N1-Highway does not make provisions for people with special needs. This group of pedestrians must cross the road at either the pelican crossings, which drivers ignore, or

use pedestrian footbridges, which are not disability friendly. According to Gabor (2016), the director of communications of the National Road Safety Commission admitted that the major problems of the highway have to do with "safety audit concerns." Since 2012, the Commission has engaged stakeholders to mitigate these problems.

An article authored by Mensah (2014) and published in *The Herald* newspaper indicated that commercial drivers in the Accra metropolis have complained about the lack of road signs on the N1-Highway; many drivers even described driving at night on the N1-Highway as a death trap. According to the article, the branch chairman of the Kaneshie-Tema station of the Ghana Private Road Transport Union (GPRTU) had made complaints to the Ghana Highway Authority about the lack of road signs, but nothing had been done.

It is evident from the preceding issues that much remains to be done regarding the safe use of the N1-Highway. Authors such as Densu, Salifu, and Attafuah (2014), Gabor (2016) and Mensah (2014) have made recommendations to provide grade-separated facilities, such as highly secured disability-friendly pedestrian subways at appropriate locations along the highway to separate pedestrian movement entirely from vehicular traffic. Additionally, they have recommended the erection of footbridges at traffic-generating sites to enhance accessibility and encourage their use. According to the authors, this should be complemented with pedestrian information and educational campaigns on the safe use of the N1-Highway.

Chapter 4

Approach and Methodology

This qualitative study adopts a grounded theory approach to gain an understanding of the adverse impacts of highway upgrades on project communities. In g*rounded theory* method, a theory or theories becomes the "endpoint" of a study (Creswell, 2009, p. 63). Grounded theory method is a systematic, inductive, and comparative approach for conducting research for the purpose of constructing theory (Charmaz, 2006; Charmaz and Henwood, 2007). This method is designed to encourage researchers' persistent interaction with the collected data while remaining constantly involved with the emerging analysis. Grounded theory method builds empirical checks into the analytic process and leads researchers to examine all possible theoretical explanations for their empirical findings. The process of moving back and forth between the data and emerging analysis makes the collected data progressively more focused and the analysis successively more theoretical (Bryant and Charmaz, 2007). Sbaraini et al. (2011) indicate that there are significant fundamental components relevant to the creation of grounded theory research; the authors highlight these components as openness, coding, memo writing, theoretical sampling, and theoretical saturation.

Openness

Grounded theory studies commence with open questions, and researchers presume they may know little about the meanings that drive the actions of their participants (Sbaraini et al., 2011). In grounded theory studies, researchers do not begin with preconceived ideas or existing theories and then force them on data for the purpose of verifying them or rearranging them into a corrected grounded theory (Glaser, 1992).

Researchers undertaking grounded theory studies are usually familiar with the research topic and setting; however, it is important to set aside previous knowledge of the subject and allow the data to tell the story (Bryant and Charmaz, 2007; Glaser, 1992). One of the important things about grounded theory method is that it avoids assumptions. It can be used successfully in different fields, more so because it is a general methodology (Glaser, 1992). Considering that most research aimed at evaluating the impact of transportation infrastructure is quantitative in nature, utilizing an open-ended approach by interviewing people and groups impacted by road transportation projects might prove beneficial for further understanding this concept.

Coding and Comparing

In grounded theory, coding is intended to "delineate concepts to stand for interpreted meaning of data" (Corbin and Strauss, 2015, p. 220). Through coding, the conceptual abstraction of data and its reintegration as theory happen. In grounded theory, there are two types of coding, namely, substantive and theoretical coding. In *substantive coding*, the researcher works with the data directly, fracturing and analyzing the data. The initial phase of this is done through open coding for the emergence of a core category and related concepts, and subsequently through theoretical sampling and selective coding of data to theoretically saturate the core and related concepts (Bryant and Charmaz, 2007). Theoretical saturation is achieved through constant comparison of incidents in the data to elicit the properties and dimensions of each category (*theoretical coding*). The constant comparison of incidents continues until no new properties or dimensions emerge from the continued coding and comparison (Bryant and Charmaz, 2007).

Memo Writing

Memo writing is a way for the researcher to keep written records of the analysis. Memo writing begins with the first analytic session and continues throughout the research process. It starts as a rudimentary representation of thought and grows in complexity, density, clarity, and accuracy as the research progresses. Writing memos enable the researcher to keep a record of changes and progress in the analysis (Corbin and Strauss, 2015). In the context of this study, the researcher took notes throughout to enable him organize thinking about how the data fits together, and also help in the articulation and emerging links between codes. Once links between codes were established, memo writing was used to help the researcher conceptualize the data to promote emerging themes and theories (Glaser and Strauss, 1967).

Theoretical Sampling

This is a method of data collection based on concepts derived from data. The objective of *theoretical sampling* is to collect data from places, people, and events that will maximize opportunities to develop concepts in terms of their properties and dimensions, uncover variations and identify relationships between concepts (Corbin and Strauss, 2015). In comparison with other methods, theoretical sampling method's approach to data collection is open and flexible. This approach allows analysts to follow the lead of the research and direct data collection to those areas that will best serve the developing theory (Corbin and Strauss, 2015). Given the limited literature on the impacts of road improvement on project communities in Sub-Saharan Africa, theoretical sampling is important because emerging themes from the data collected will help the researcher's

direct effort to collect more data on the new areas. Theoretical sampling may not be required if the data collection does not provide any new emerging themes.

Theoretical Saturation

This refers to the point at which gathering more data about a theoretical category reveals no new properties nor yields any further theoretical insights about an emerging grounded theory (Corbin and Strauss, 2015). This point is determined by the discovery that additional interviews are yielding little new information, and more interviews would be a waste of time (Schutt, 2004). In the context of the current study, saturation occurred when no new information was heard from participants. When the researcher was not able to create any new codes for the data collected, and the data already collected was considered substantial enough to create a new theoretical framework, data collection stopped (Bryant and Charmaz, 2007).

Participants and Setting

In order to explore and gain a good understanding of the social, economic, and spatial impacts of road improvement on project communities, a wholly qualitative approach was adopted. A qualitative approach would allow respondents to freely express their views in a variety of ways rather than using a quantitative approach that could confine the responses of participants or pose self-presentation biases (Chatterton et al., 2009; Whitmarsh, 2009).

Focus group discussions (FGDs) were used to allow participants to respond to each other's comments, helping to generate new concepts while placing their comments within a wider social practice. Participants for the focus group discussions were recruited through word of mouth from various community-based organizations (CBOs). Prior to

the focus group discussions, leaders of these CBOs were initially contacted and informed about the research. With the group leaders, the researcher then arranged the time and location for the focus group discussion. On the arranged date, the researcher met these groups at the set time and location. On the day of the focus group discussions, the researcher took the participants through the Institutional Review Board (IRB) protocol and informed them about their consent for participating in the research. This practice was also done for both the household and institutional surveys. The focus group discussion with the opinion leaders at Akweteyman was held at the chief's palace, while that of the Presbyterian Church youth group was held on church premises. The rest of the focus group discussions were held at the premises of the selected CBOs. Six focus group discussions were held with 58 local residents who were 18 years or older and spoke English or any of the local Ghanaian dialects. As indicated in Table 3 below, the six groups interviewed were furniture makers at Dzorwulu; heavy-duty construction equipment operators at Aboful; the youth branch of the Presbyterian Church of Ghana at Apenkwa; opinion leaders at Akweteyman; hairdressers at Darkuman; and cosmetic sellers at Kwashieman. A maximum of twelve participants was allowed per session. As indicated by Stewart and Shamdasani (1990), more than 12 participants will make things difficult for the researcher to manage and will also prevent all individuals from participating. The process was carried out with semistructured questionnaires and was audio recorded.

Table 3

Focus Group Discussion

Community	Groups Interviewed	Number of People Present
Dzorwulu	Furniture Makers	12
Aboful	Heavy Duty Construction Equipment Operators	12
Apenkwa	Presbyterian Church of Ghana - Youth Branch	7
Akweteyman	Opinion Leaders	12
Darkuman	Hairdressing Group	8
Kwashieman	Cosmetic Sellers Group	7
Total	**-**	**58**

Source: Field Study, 2015

Sixty-five participants for the household survey were randomly selected from Dzorwulu (8), Aboful (10), Apenkwa (8), Akweteyman (8), Darkuman (8), Kwashieman (8), Awoshie (8) and Mallam (7). See Table 4 below for details. In the context of this study, a household was defined as a group of people living in the same dwelling space and who acknowledge the authority of a man or woman who is the head of the household (Beaman and Dillon, 2011). The target population for the survey in each household was males and females ages 18 years and above. The household surveys were carried out with semi-structured household questionnaires and were audio-recorded.

Table 4

Household Survey

Community	Number of Households Interviewed
Dzorwulu	8
Aboful	10
Apenkwa	8
Akweteyman	8
Darkuman	8
Kwashieman	8
Awoshie	8
Mallam	7
Total	**65**

Source: Field Study, 2015

Participants for the institutional surveys were professionals such as planners, engineers, surveyors, project managers, and consultants. These professionals were interviewed with semistructured questionnaires and were selected from the institutions indicated in Table 5 below.

Table 5

Institutions and Consultants Interviewed

#	Institutions and Consultants
1	Ghana Highway Authority
2	Road Safety Division of the Ghana Highway Authority
3	Millennium Development Authority
4	Town and Country Planning Department
5	Ghana Lands Commission
6	Land Valuation Board
7	Environmental Protection Agency
8	Consultants hired by – • Ghana Water Company • Ghana Telecom • Electricity Company of Ghana

Source: Field Study, 2015

Procedure

The study started with a drive on the entire 14.1 kilometers of the N1-Highway, where the researcher observed the location of footbridges, the distance between the footbridges, major land uses, accessibility to land uses, pedestrian activities, provision of pedestrian facilities, and speed management. The drive also served as an opportunity for the researcher to familiarize himself with communities along the highway (impacted communities). The drive was done on two different weekdays, one during the day and the second at night.

For the focus group discussion, the researcher made contact with the senior reverend of the Apenkwa Presbyterian Church. This was to seek permission to talk to

some of the church members who resided in Apenkwa and surrounding communities. Based on the reverend's suggestion, the researcher scheduled an evening meeting with the youth branch of the Presbyterian Church to conduct the focus group discussion. The reverend also introduced the researcher to the local chief of Akweteyman who agreed to talk to his opinion leaders and help organize them for the focus group discussion. Two days after contacting the local chief, he organized 11 of the opinion leaders at his palace for the focus group discussion. With the help of the chief and the reverend minister, the researcher was able to identify and contact four additional community-based organizations for the focus group discussions. Besides the focus group discussion with the Presbyterian Church, which was done in the evening, the other five were conducted during the day. All six focus group discussions were conducted during the week and lasted from 45 to 60 minutes. After each focus group discussion, all participants were thanked for their time and willingness to participate. It must be re-stated that all participants were provided with a consent form approved by the Institutional Review Board of the University of Texas at Arlington.

Data Sources

Primary Data

Primary data was gathered through the use of semistructured questionnaires to conduct formal interviews and direct observations. The primary data was obtained through interviewing households in communities along the N1-Highway; interviewing key institutions involved in the planning, design, and implementation of N1-Highway upgrade; and conducting focus group discussions with community-based organizations (CBOs). The questionnaires guided data collection, but consistent with grounded theory

methodology, there were no a priori hypotheses (Bryant and Charmaz, 2007; Corbin and Strauss, 2015).

The household survey and focus group questionnaires consisted of open-ended questions that encouraged residents to discuss their involvement in the planning, design, and implementation of the highway upgrade; the social, economic, and spatial impacts of the highway upgrade on local residents; and their suggestions for mitigating negative impacts of the highway. The institutional questionnaires also consisted of open-ended questions on the involvement of institutions in the planning, design, and implementation of the highway project, the anticipated impacts as compared to the unanticipated, and how the negative consequences of the unanticipated impacts could be mitigated. As stated earlier, all of these questions guided the data collection process, however, as the study progressed some of these questions were modified and others added when it became necessary. Samples of all the questionnaires used have been attached as Appendix A.

Secondary Data

To fully appreciate the impacts of the highway upgrade on project communities, it was important to understand the perspective of other scholars. In that direction, this study adopted a three-tier approach in reviewing the literature relevant to the study. This study reviewed literature on the global phenomenon of highway upgrade and its impact on project communities. First, the literature review focused on the adverse social, economic, and spatial impacts of highway upgrades in both developed and developing countries. This looked at adverse impacts of highway upgrade in North America (United States), which represented the developed world, as well as the adverse impacts in Latin America,

Southeast Asia, and Africa, which represented the developing world. Secondly, the literature review looked at case studies and how they relate to the current study. The case studies provided the researcher with a platform to identify how these impacts have been assessed and analyzed by other scholars around the globe. The literature review helped the researcher to identify the appropriate theories within which other scholars have discussed the topic. As part of the secondary data source, many technical reports on the N1-Highway project were reviewed. These included main report on the final resettlement plan, inception report for consultancy services, monthly progress reports, road safety audit report, as well as the environmental impact assessment and environmental management plan report. With all this background information serving as knowledge for the researcher, and not allowing this knowledge to influence the outcome of the primary data collected, the researcher began to break down the data and allowed themes and categories to emerge based on the responses of participants.

Data Analysis

Data analysis for the study corresponded with grounded theory methods described by Glaser and Strauss (1967), Bryant and Charmaz (2007), and Corbin and Strauss (2015). Interviews were transcribed verbatim and the raw data were examined and coded in phases. The initial phase termed as open coding in the grounded theory method involved analyzing the transcripts line by line to create as many codes as required to accurately reflect the content in the transcripts. The data at this stage was broken down, labeled, and fit into as many categories as appropriate (Bryant and Charmaz, 2007; Corbin and Strauss, 2015). Open coding is the initial step of theoretical analysis that pertains to the initial discovery of categories and their properties (Glaser, 1992).

The next phase of the data analysis defined as axial coding involved reviewing the open codes and grouping them together into higher-order categories based on parallels and theoretical connections across the transcripts. During this phase the researcher attempted to establish properties that link specific codes together (Glaser and Strauss, 1967). The final phase termed selective coding, involved grouping and narrowing the axial codes into highly conceptualized categories or themes (Glaser and Strauss, 1967). Categories emerged through constant comparison, an important characteristic of grounded theory. This involved identifying codes in the data and constantly comparing them to previously identified codes, thereby revealing patterns in the data and allowing new categories to emerge where statements do not fit any of the currently identified categories (Corbin and Strauss, 2015).

Parallel to the coding process was the constant writing of memos about ideas on themes and relationships between codes. As a key characteristic of grounded theory, the memos served as the write-up of ideas as they emerge, while coding for categories, their properties and their theoretical codes (Glaser, 1992). Once saturation was reached, the analysis was written up by integrating individual substantive codes with high order codes, guided by memos, into a grounded theory.

Chapter 5

Results and Discussion

Introduction

The purpose of this qualitative study was to gain a good understanding of the impacts (benefits and costs) of the N1-Highway upgrade on project communities. In discussing the impacts, the study focused on the adverse social, economic, and spatial impacts of the highway upgrade. Specifically, the study focused on the general benefits of the N1-Highway upgrade; identified the adverse social, economic, and spatial impacts of the highway upgrade; and assessed if professionals had overlooked the adverse impacts of the highway upgrade. Additionally, the study looked to determine how the adverse impacts could be reduced, avoided, or mitigated in future projects, and also identify lessons that could be learned to improve similar projects in the future. In finding answers to the objectives of the study as proposed by grounded theory, the researcher took the data collected through three stages, namely open coding, axial coding, and selective coding. Findings from the coding stages are presented in this section of the study.

Because the sample was purposeful, the analysis cannot be generalized to a larger population, nor should it be considered exhaustive. Notwithstanding, the results and discussion which follow can help researchers better understand the adverse social, economic, and spatial impacts of the N1-Highway upgrade on project communities.

Results

The initial open coding phase involved analyzing interview transcripts line by line to create as many codes as required to accurately reflect the content of the transcripts. In order to gain a general sense of what residents deemed as benefits of the N1-Highway upgrade, the researcher used semistructured questionnaires to pose open-ended questions during focus group discussions and household surveys. This included 65 households and 58 participants at six different focus group discussions. Results from the open coding provided terms and phrases used by respondents to describe the benefits of the N1-Highway improvement project. The nine codes that emerged from the open coding phase are listed in Figure 1 below.

Analyzing the nine codes generated at the open coding phase completed the axial coding phase. Through constant comparison, a defining characteristic of grounded theory, the nine codes were placed in higher-order codes to help better understand the general benefits of the N1-Highway upgrade. The constant comparison enabled the researcher to compare previously identified codes, thereby revealing patterns in the data and allowing new categories to emerge where statements did not fit any of the identified codes (Glaser, 1992). Through constant comparison, a point was reached where the data kept revealing previously determined codes. In grounded theory this is known as the *point of saturation,* indicating the end of new emerging codes. Parallel to the coding process was the constant writing of memos to help capture the interrelationship of codes. Three codes emerged from the axial coding phase to help the researcher identify what the respondents believed were the benefits of the N1-Highway project. These codes were identified as reduced congestion, increased travel speed, and beautification (aesthetic improvement).

The final coding phase was selective coding, and this involved integrating the codes established in the axial coding stage to create a storyline that explains the interrelationship of the codes. As indicated earlier, one of the objectives of this study was to identify the benefits of the N1-Highway upgrade. All the respondents from the household surveys (65) and eight focus group discussions identified reduced congestion, reduced travel time, and beautification (aesthetic improvement) as benefits resulting from the N1-Highway project. The storyline created during the selective coding was based on the three codes created in the axial coding phase. These codes were viewed as a connected network of factors to help explain how respondents see the benefits of the highway project.

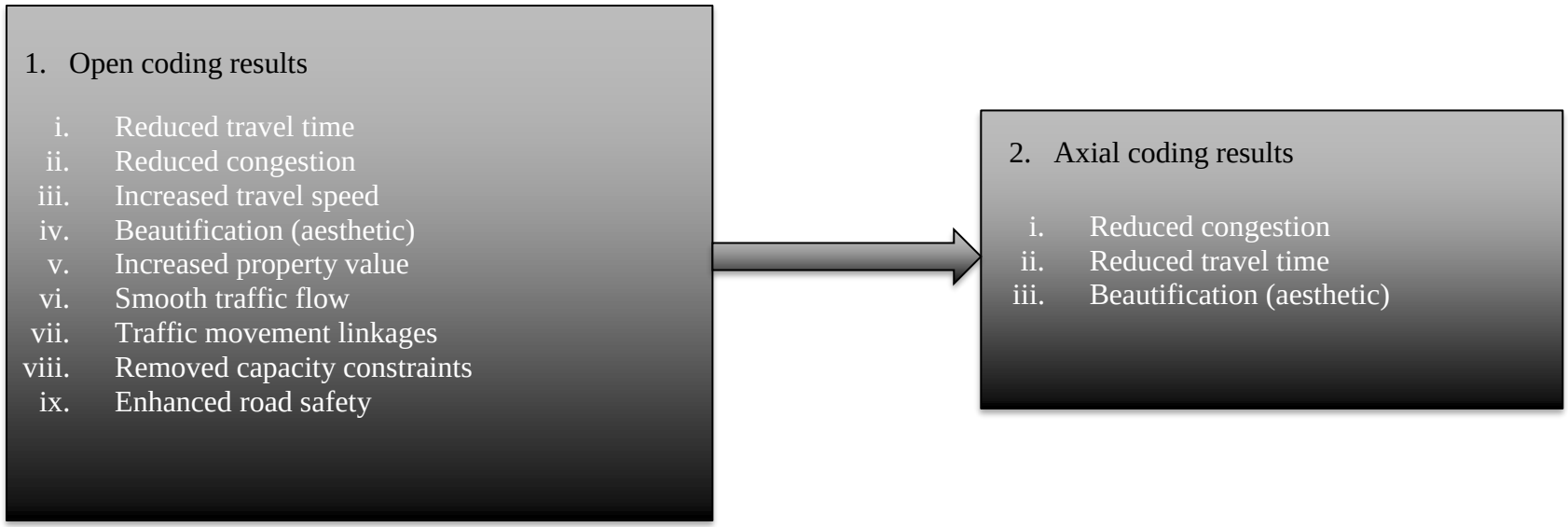

Figure 1. Open and axial coding results on benefits of N1 highway improvement project.

In determining what the study data identified as the adverse social, economic, and spatial impacts of the N1-Highway project; the researcher commenced the open coding phase by analyzing the transcripts from the household surveys, focus group discussions, and institutional surveys. The open coding phase was to create broader codes that represented the content of the data collected. Analyzing transcripts from statutory institutions and residents was a good way of identifying how the parties perceived what the adverse impacts of the highway project were. Results from the open coding phase generated 17 terms and phrases used by statutory institutions and residents in describing the adverse impacts of the N1-Highway project. The terms and phrases generated in the open coding phase are indicated in Figure 2.

Through axial coding, the 17 terms and phrases were analyzed and placed in higher-order codes. This was done by constantly comparing previously identified codes, thereby revealing patterns in the data and allowing new categories to emerge where statements did not fit any of the currently identified codes. Parallel to this process was the constant writing of memos to enable the researcher to capture the interrelationship between codes. These codes were further placed under broader themes (economic, social, and spatial) as have been discussed in existing literature. This was done to determine how literature had categorized the themes and also to see how these codes were consistent with or deviated from existing literature. Through constant comparison, a point of saturation was reached where the data kept revealing the same codes and patterns. Five codes emerged from the axial coding process. These emergent codes highlighted what the statutory institutions, households, and different focus groups interviewed deemed as the adverse social, economic, and spatial impacts (see Figure 2 below).

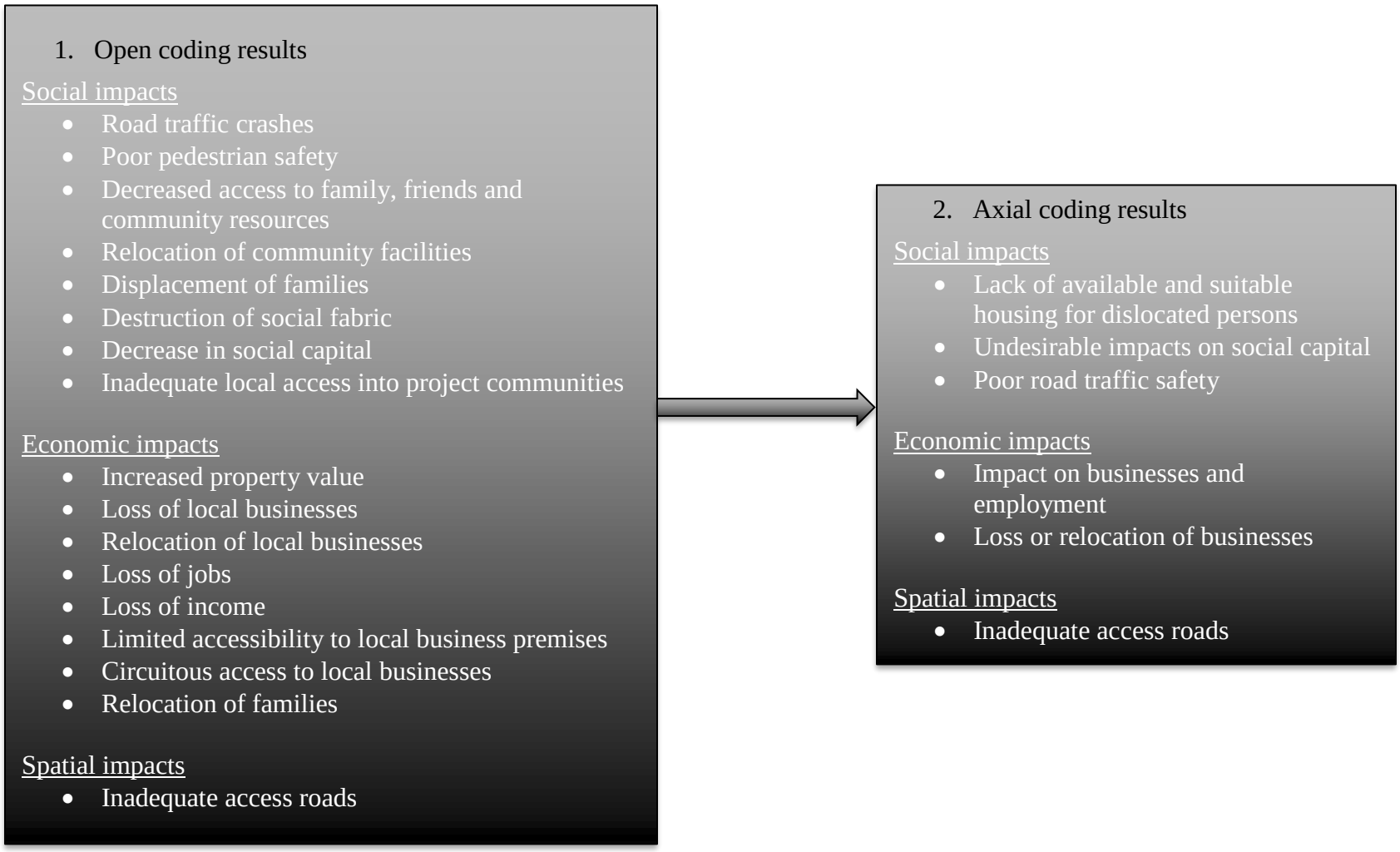

Figure 2. Open and axial coding results on adverse social, economic and spatial impacts.

In determining if the adverse impacts of the N1-Highway project were overlooked, the study looked at issues that required more attention from statutory agencies, resulting in them having to spend more time on these issues to the neglect of others. Determining if the adverse impacts were overlooked included looking at how issues that required more time and attention impacted the ability of statutory agencies to satisfactorily address adverse impacts. During the initial open coding phase, the researcher analyzed interview transcripts to create codes that reflected what respondents (experts and residents) deemed as potential adverse impacts and how important these impacts were estimated to be. Results from the open coding phase revealed that respondents paid close attention to five major issues, namely compensation, mobility, funding, and time (as shown in Figure 3 below).

Analyzing the five themes generated at the open coding phase completed the axial coding process. Through constant comparison, the five codes were placed in higher-order themes to enable the researcher to understand how much significance was attached to these issues through the planning, designing, and implementation process. Constant comparison was done to help the researcher compare previously identified codes and reveal patterns in the data. Parallel to the coding process was the writing of memos to capture the interrelationship of codes. Through constant comparison, the data reached a point of saturation where no new codes emerged. The axial coding phase ended with the four themes (compensation, mobility, funding, and time) that had emerged at the open coding phase. These were codes statutory agencies spent most of their time trying to address.

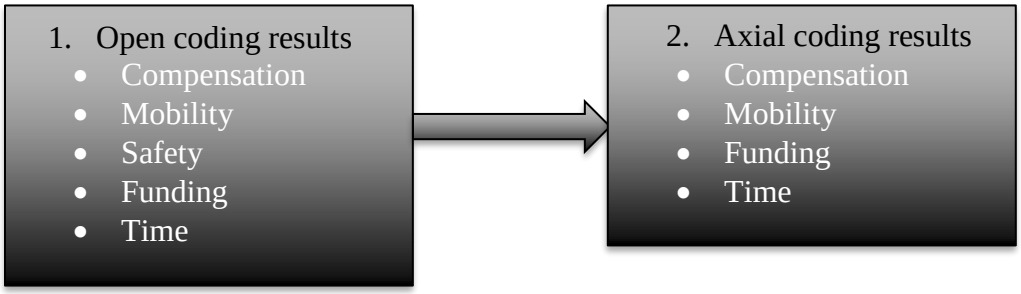

Figure 3. Open and axial coding results on extent to which adverse impacts were overlooked.

In identifying how the social, economic, and spatial adverse impacts of the N1-Highway project could have been avoided or mitigated, the researcher posed questions to professionals at the institutional level as well as to residents in project communities. The data obtained from this process was taken through open coding, where interview transcripts were analyzed. The objective here was to create codes that would reflect the content of the transcripts. The three main codes (phrases) that emerged from the open coding phase are listed in Figure 4 as follows: public involvement (participation), social impact assessment, and education. These three codes (phrases) were analyzed to complete the axial coding. The analysis ended with the same three codes (phrases) listed in Figure 4 below.

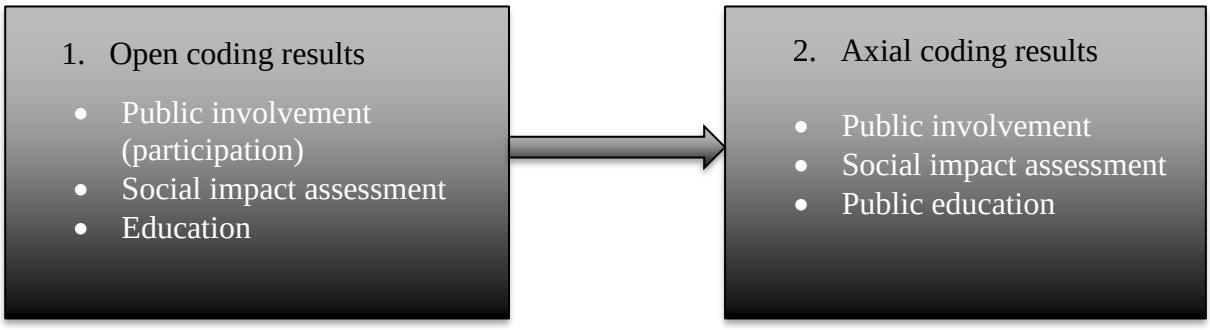

Figure 4. Open and axial coding on how adverse impacts could be mitigated or avoided.

Regarding what could be learned from the N1-Highway project and used to improve similar projects in the future, the professionals and residents interviewed identified some lessons. Going through the interview transcripts, the open coding process identified 10 themes or phrases, shown in Figure 5 below. Analyzing the 10 codes completed the axial coding phase. Through constant comparison, the 10 codes were placed in higher-order codes to help better understand the lessons identified. Constant comparison was done to enable the researcher to compare previously identified codes, thereby revealing patterns in the data and allowing new categories to emerge where statements did not fit any of the identified codes (Glaser, 1992). Through constant comparison, a saturation point was reached where the data kept revealing previously determined codes, indicating the end of new emerging codes. Parallel to the coding process was the constant writing of memos to help capture the interrelationship of codes. Four codes emerged from the axial coding phase to help the researcher identify what the respondents believed were lessons that could be learned to ensure future projects do not suffer a similar fate. These codes were captured as allotting reasonable time for road project completion, not underestimating road safety, improved communication and coordination among statutory stakeholders, and funding.

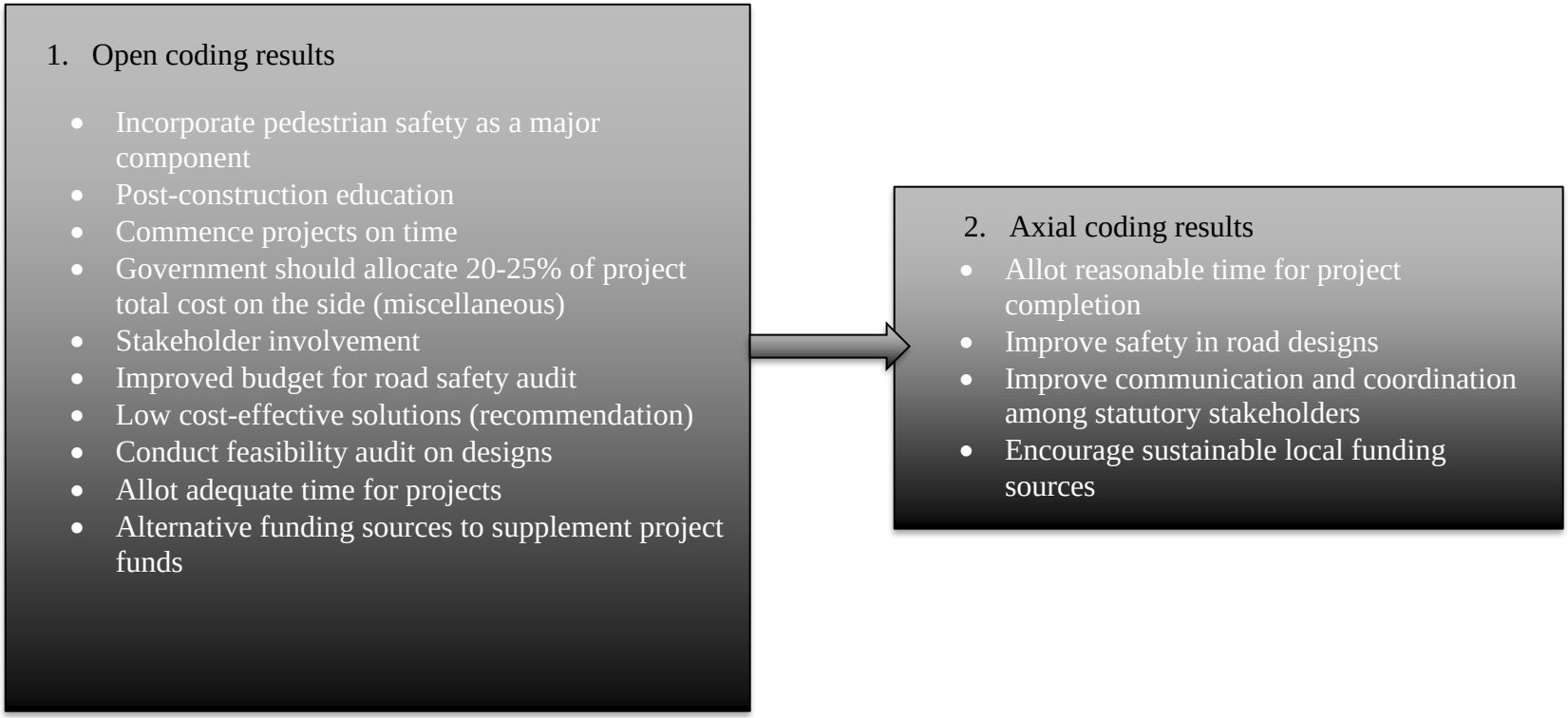

Figure 5. Open and axial coding on lessons learned from N-1 highway project.

Discussion

For each of the research questions posed by the study, different themes (codes) or phrases emerged. This section of the study discusses all the emergent themes based on the study's research questions. Additionally, the section identifies how the reviewed literature deviated or stayed consistent with the emergent themes. In discussing the benefits of the N1-Highway project based on responses from surveys conducted, the study identified reduced congestion, increased travel speed, and beautification as the main benefits.

General benefits of the N1-Highway project

All the respondents interviewed agreed that the N1-Highway upgrade has drastically reduced traffic congestion. Respondents indicated that prior to the highway upgrade, it took them about three hours to travel the 14.1-kilometer section of the N1-Highway during the morning and evening peak periods of the day. This is because the former road corridor only had one lane in each direction and was always congested during the morning and evening peak hours. This meant vehicles traveled at a significantly slower speed. However, after the highway upgrade, drivers are able to cover that same distance in 15 minutes. As indicated by one of the respondents,

> The N1 highway project is part of the national route 1, and because of its peculiar nature, there has been the need to open it up. The 14.1-kilometer project corridor took users about three hours to travel. The bottleneck definitely had to be addressed. After the highway improvement travel time has reduced to fifteen minutes. The idea was to move people as fast as possible in east-west and north-south directions. (September 6, 2015).

The reduction in traffic congestion has been attributed to increased travel speeds, resulting in decreased travel time on the N1-Highway. This is supported by Mackie et al. (2001), who indicated that congestion relief projects are justified by the reduction in

travel time they bring about. Additionally, savings in travel time can also lead to a reduction in vehicle operating costs.

Considering the fact that the highway connects major agricultural production zones to an international airport and two sea freight ports, removing the congestion problem was vital to the agricultural zone and other sectors of Ghana's economy. In removing the congestion challenge, it is estimated that trade activities between the West African countries connected by the N1-Highway will improve and enhance economic growth. Thus, interregional and international trade will be improved for all the connected countries through the free movements of agricultural products. It is important to indicate that measuring these effects is challenging because the impacts are so dispersed and facts difficult to identify (Rangarajan et al., 2017). This assertion is supported by Donaldson (2018) who analyzed data on rail networks from India. His work revealed that rail networks reduced trade costs and interregional price gaps increased interregional and international trade, and improved income levels (Donaldson, 2018).

Hoyle and Knowles (1992) and Passonneau (1996) have indicated that roads and traffic reduce the beauty of the natural environment, causing urban blight. However, in the case of the N1-Highway improvement project, respondents strongly disagree with this assertion. Respondents indicated that aesthetically highway improvement has added some beauty to the project communities. According to respondents, the construction of pedestrian sidewalks as part of the N1-Highway has helped address erosion and air pollution (dust) problems in some parts of the project communities.

Respondents stated that prior to the highway improvement the immediate surroundings of the existing road (before the upgrade) were not paved (dirt) and some of these areas had erosion problems. With the road receiving over 30,000 vehicles daily, the atmosphere over the majority of project communities was always polluted with dust. However, adding lanes to the N1-Highway resulted in a greater part of the immediate road surroundings being taken up for highway expansion. These areas were subsequently covered with paved roads, and this has resolved the air pollution (dust) and erosion problems. The foregoing is consistent with a study conducted by the Transportation Research Board (2002). According to the study, transportation investments can improve the visual appearance of neighborhoods, and aesthetics and function should be inherent in the design of new or rehabilitated infrastructure.

Summary. In discussing the benefits of the N1-Highway, it is clear that the highway improvements have contributed significantly to the reduction of traffic congestion. This is attributed to increased travel speeds along the wider road. The N1-Highway upgrade is believed to have improved the aesthetic features of the project environment. The study revealed that issues such as erosion and dust pollution have been resolved as a result of highway improvement. The highway expansion has improved connection between agricultural production zones and airport and seaports in Accra, Tema, and Takoradi. This is believed to have enhanced economic development. All these findings from the study have been consistent with the literature review.

Adverse Social, Economic, and Spatial impacts

Based on responses received from focus group participants, households (local residents), and professionals that were directly involved in undertaking the project, the adverse impacts identified were categorized as social, economic, and spatial. The adverse social impacts were identified as the lack of available and suitable housing for dislocated persons, undesirable impacts on social capital, and poor road traffic safety. The adverse economic effects were listed as impacts on businesses and employment, including loss or relocation of businesses. The only adverse spatial impact identified was inadequate access roads.

Social impacts

Lack of available and suitable housing for dislocated persons

The lack of available and suitable housing for dislocated persons was identified as one of the project's major adverse social impacts. Respondents indicated that due to the heavily built character of the project environment, the demolition of structures in the ROW impacted both residential and commercial structures. In some instances, engineers had to reduce the ROW from the original 90 meters to 70 meters just to limit the number of structures that would be demolished. Notwithstanding, some structures still had to be destroyed, resulting in the dislocation of many local residents. Even though owners or occupants of these demolished structures were paid compensation, the majority could not find suitable and affordable places within the project communities to rent. One local resident said the following regarding renting in the project communities:

> The house I used to live in has been demolished and I can't seem to find a place to rent around here. I have a little money, but the rent these landlords are requesting is too high for me. Rent in Accra is expensive, but I know I will find a place outside this area. I just don't know how safe this area will

be. (September 7, 2015).

This finding is consistent with a study conducted by Lekovich, Rouwendal, and Marwijk (2015). The study revealed that improved accessibility positively impacts the price of housing in nearby municipalities. However, intense noise pollution and traffic intensity levels have the opposite effect on prices. The study further revealed that combining the total effects of all externalities, the impact of highway development on the price of housing is generally positive. This impact is noticeable even before the project is completed as a result of anticipation.

Undesirable impacts on social capital

Data from the focus group and household surveys revealed that the highway upgrade has had some adverse impacts on social activities. The study revealed that improved N1-Highway has prevented many local senior residents from attending and participating in local church activities. These were activities senior residents used as an opportunity meet friends and socialize. For instance, Akweteyman residents who attend the Presbyterian Church located in Apenkwa are not able to attend weekday activities. Additionally, some parents have refused to allow their children to cross the road for church activities on Sundays. The church has had to rent a bus to convene its members from one side of the highway to the other on Sundays. This has added to the church's expenditure and has also resulted in a decrease in church attendance during weekday activities. This is as a result of the risk, distance, and time involved in crossing the expanded highway. For someone in Akweteyman, it would take about 30 minutes to get to and across the nearest footbridge located at Flat-Top. A round trip from Akweteyman to Apenkwa now takes about 60 minutes. This was a journey that previously took about

seven minutes prior to highway expansion.

Public schools in Apenkwa have experienced similar problems. The only public primary and junior high schools for families in Akweteyman and some parts of Achimota are located in Apenkwa. This means that many kids used to cross the road on a daily basis to access their schools. The expansion of the N1-Highway now poses a physical barrier and a threat to the lives of schoolchildren. Data from the study revealed that inadequate footbridges are the source of this problem. The inadequate footbridges cause schoolchildren to either walk long distances to use a footbridge or attempt to cross the expanded highway at undesignated locations, exposing students to risk.

The expansion of the N1-Highway has also led to the destruction of a cemetery in Apenkwa. Impacted families can no longer identify the exact location where dead relatives were buried. Respondents stated that the destruction of the cemetery has adversely impacted the traditional and cultural life of the people of Apenkwa. Respondents indicated that mourning the dead is a cultural and traditional belief most families uphold. However, the destruction of the cemetery has taken the "mourning rites" away. Families in Apenkwa would now have to bury dead relatives in farther locations such as Achimota, Osu, Atomic, or Kwabenya. Respondents further indicated that because families in project communities are forced to bury dead relatives in farther locations, surviving family members could no longer visit the cemetery as frequently to mourn the dead.

The study revealed that the expansion of the N1-Highway has limited the ability and frequency with which families living on opposite sides of the highway can visit and socialize with each other. There are several people who have been involved in road

crashes in their attempt to cross the highway to visit other family members. Some of these victims have died or suffered major injuries. As indicated by one respondent:

> I know of about five families whose relatives have been involved in road traffic crashes just because they were trying to cross the highway to go visit their relatives. (September 7, 2015)

According to the study, some families have had their relatives relocated to entirely different neighborhoods. Relocation of this nature can destroy the social fabric and social interaction amongst families and friends by removing relationships that have been established over a long period. Based on the data from the study, most of the relocated families complained of inadequate financial compensation.

These findings have been consistent with available literature. According to Sinha and Labi (2007) as well as the Transportation Economic Committee (2015), the acquisition of ROW for new transportation infrastructure usually requires relocation of houses, businesses, and community facilities. For individuals who are impacted, the thought of leaving a familiar neighborhood along with the physical, emotional, and financial stresses of relocating can be overwhelming. Furthermore, relocation dismantles social fabric and can destroy social interaction in communities. Relocations remove both formal and informal social networks established by residents for physical or psychological support.

Sinha and Labi (2007) indicated that the expansion of roads affects the structure, function, and social pattern of the surrounding neighborhoods. This is because road expansion sometimes causes separation of households, businesses, and community facilities, and in some cases reduces access between such entities. The authors emphasized that after the implementation of a road expansion project, it would be

difficult or impossible to access social facilities by foot or bicycle, and vehicle trips to such facilities may take more time (Sinha & Labi, 2007). In this instance, transportation facilities can constitute a physical or psychological barrier that is difficult to cross, particularly for the elderly, young children, and other residents who travel on foot or by bicycle.

Poor road traffic safety

The qualitative data from this study revealed that the rate of road traffic crashes had increased since the N1-Highway expansion. Respondents attributed the increase in crashes to factors such as inadequate footbridges, poor placement of footbridges, lack of local involvement in the placement of footbridges, lack of directional and informational signs, higher travel speeds, and inadequate public education. Respondents indicated that there are inadequate footbridges and these footbridges were constructed at locations with little human activities. For instance, the majority of the children in Akweteyman attend schools located in Apenkwa. These children cross the N1-Highway daily from Akweteyman to the Apenkwa end to attend school. However, the closest footbridge for residents and schoolchildren is located over a kilometer and a half away at Aboful. Respondents indicated that locating a footbridge in Aboful is useless because the location has very little foot traffic. As a result of the footbridge's distance from higher-activity locations, schoolchildren and pedestrians, in general, are forced to cross the highway at undesignated locations, sometimes causing crashes. Respondents believe that placing a footbridge connecting Akweteyman and Apenkwa would have been better for schoolchildren and pedestrians in general. As indicated by a respondent who is a teacher:

> Some parents are so scared of vehicles killing their children that they do not want their kids to go across the highway to attend school. (September 8, 2015).

Respondents believe that additional footbridges placed at the appropriate locations would encourage pedestrians to use them, hence preventing pedestrians from risking their lives to cross the highway at undesignated locations. This finding is consistent with findings from a study conducted by Densu et al. (2014), which revealed that 1 in 5 pedestrians risked their lives in crossing an expanded highway in Ghana.

Respondents indicated that highway improvement has resulted in increased travel speeds (reduced travel time). The highway expansion has somehow encouraged both private and commercial vehicle operators to speed, resulting in more crashes. As stated by one respondent:

> Those that saw the N1-Highway as an extension of the Tema motorway extension so they could speed up, lost sight of the fact that the road goes through centers of population. Some drivers do about 120 kilometers per hour on the highway. It was like a brand new attraction and everybody wanted to check how fast their cars can move. As a result, road traffic crashes catapulted. (September 12, 2015).

According to Gallen et al. (2014), speed is cited as a primary factor in the cause of one-third of road traffic crashes and impacts the severity of road traffic crashes. A study done in Ghana by the Building and Road Research Institute in 2011 revealed that excessive traffic speeds accounted for 26% of road fatalities in the year 2010. In their study, Howard and McInerney (2010) found that at higher speeds, the effects of failing to anticipate oncoming hazards in good time and of vehicle handling errors are greater. In identifying additional factors responsible for speeding and road traffic accidents, Densu et al. (2014) cite adequate road space from highway expansion as a key contributory factor. The authors indicated that some commercial vehicle operators take advantage of the additional highway expansion space to speed and reduce round trip travel, hoping to

maximize profit.

Other potential contributing factors to the road safety situation on the N1-Highway are the lack of directional and informational signs, as well as inadequate public education. Respondents indicated that the N1-Highway lacks directional and informational signs for road users, especially drivers. Respondents stated that N1-Highway is one of the major and most complicated highways in Ghana, and it is difficult for most drivers to navigate. There is, therefore, the need to provide adequate information and directions to enable road users to navigate the highway without any uncertainties. The N1-Highway has a speed limit that ranges from 80 to 100 kilometers per hour. At that speed, any uncertainty on the part of drivers could result in a crash.

Respondents also stated that there was not adequate public education on how to use the highway. As a result, some road users still find the highway challenging to navigate. Although there was some education presented on national television, respondents stated it was not enough. Respondents, therefore, call for continuous education campaigns on how drivers and pedestrians should use the road. Respondents believe this will serve as good information to the public and will help improve the safety situation.

According to Forkenbrock & Benshoff (2001), changes in a transportation system are likely to affect the safety of residents as they undertake their daily activities. Any change in a transportation system has the possibility of increasing vehicular traffic or changing traffic patterns, which could change a pedestrian-friendly environment into one where residents are at greater risk. Generally, findings from the road safety section conform to information available in the existing literature.

Economic impacts

The expansion of the N1-Highway has impacted project communities in diverse ways economically. This includes its impact on businesses and employment, as well as the loss or relocation of businesses. Respondents indicated that Lapaz was a major business center, and most of these businesses fell within the ROW. As a result of the highway expansion, many had to relocate. This led to the dispersion of many of the businesses at Lapaz, whose owners had developed strong relationships with each other, as well as with local clients. For instance, one respondent who operated a currency exchange business (Forex Bureau) indicated that he had clients from both sides of the highway before the expansion. The respondent also indicated that before the highway expansion, there were some external clients who would mostly park by the side of the highway and go into the Forex Bureau to conduct business. However, the expansion of the highway now prevents clients from crossing the street in this way. The respondent indicated that previously, both local and external clients were easily to cross the street to access this business. Now with the highway's expansion, this task has become dangerous, cumbersome, circuitous, and tiring to undertake. This is evident in the quote below:

> An elderly client who had arrived from Europe was killed by vehicle a while he was trying to cross the highway to come into the currency exchange store to conduct business. (September 5, 2015).

Just as in the case of the Forex Bureau, local businesses such as local restaurants and markets are facing similar challenges. The research data revealed that other local and external clients are reluctant to travel (walk or drive) longer distances from one side of the road to the other to access local restaurants and markets. The majority of the local residents are not willing to patronize businesses because of the risk involved in having to

cross the highway.

Because of these inconveniences, many businesses have had to relocate. Respondents indicated that most of these new locations were difficult to access both on foot and by vehicle. According to respondents, it was difficult for vehicles on the expanded highway to exit and access abutting areas, leading to the discouragement and eventual loss of most external clients. Exits on the expanded highway are few, and the directional and information signs are inadequate. Hence, only loyal clients continue to patronize local businesses. Respondents indicated that because of the relocation of businesses, the majority of these businesses collapsed, leading to the loss of jobs. Another economic challenge that negatively impacted local businesses as a result of relocation was their inability to afford rent outside the project communities. Respondents indicated that high rents led to the collapse of most of the local businesses that were forced to relocate to other areas. Local businesses that were not able to afford rent outside the project communities could not survive and were forced to lay off their employees.

Findings on the economic impacts were consistent with existing literature, which indicates that the acquisition of ROW for new or expanding roads requires additional relocation of businesses. Businesses that are adversely impacted as a result of relocation mainly include local grocery shops, banks, and shopping centers (Sinha & Labi, 2007). When a road project leads to the relocation of a significant number of businesses, residents are forced to seek services and employment outside their communities. This results in increased commutes to access services offered by the relocated businesses (Sinha & Labi, 2007).

Another economic issue consistent with the study findings is the lack of available and suitable housing for dislocated businesses. When businesses are relocated, they face the issue of inadequate land available where they can relocate and continue to be economically viable (Caltrans, 1997). Sinha and Labi (2007) indicate that large-scale transportation expansion projects result in the displacement of businesses that rely on highway traffic for patronage. In situations where businesses are unable to find suitable locations along busy roadways or are unable to attract customers to stay operational, they fail.

When businesses relocate to other areas in a community and do not experience loss of vitality, the unemployment impact is temporary. However, the relocation of businesses to areas outside of a community can lead to unemployment and the subsequent loss of multiplier effects. In cases when businesses relocate to other areas within a community, some workers may not be willing or able to travel to the new location, resulting in the loss of employees. Local businesses with longtime loyal clientele may have to re-establish contact with their customer base when they relocate to new areas (Harvey, 1996; Sinha & Labi, 2007).

Spatial impacts

Inadequate access roads

According to respondents, the expansion of the N1-Highway has cut off local access to certain services and facilities being. As a result, direct trips have now become circuitous and lengthy. Respondents indicated that they have consulted the Ghana Highway Authority (GHA) to address the poor accessibility problem, but for three years their actions have proven futile. As stated by one respondent:

> For instance, when one wants to travel from Akweteyman to Accra Central, one has to go through Achimota or Lapaz, which under the normal circumstance is out of their way. This has made traveling to Accra Central very lengthy and circuitous. This means that residents of Akweteyman now have to pay more for trips to Accra Central. As a result local commercial vehicle operators have started moving out of Akweteyman claiming it is no more beneficial to operate there. (September 11, 2015).

A respondent from the Ghana Highway Authority indicated that the lack of local access roads is impeding mobility. According to the respondent, the absence of local access roads led to the construction of at-grade intersections at places like Fiesta Royale, Darkuman, Abeka, Kwashieman, and Awoshie. This was intended to enable pedestrians to cross the road to access facilities and services, as well as undertake any other activities. The respondent stated that with access roads, these intersections would not have been necessary. They said:

> Although the focus of the highway expansion was on mobility, the lack of funds meant there was the need to find a way for residents to access their communities and businesses, hence the creation of at-grade intersections. (September 5, 2015).

Summary

The adverse impacts were categorized into social, economic, and spatial. The adverse social impacts were identified as a lack of available and suitable housing for dislocated persons, undesirable impacts on social capital, and poor road traffic safety. On the economic side, the adverse impacts were identified as loss or relocation of local businesses, loss of jobs and unemployment, and the inability of businesses to afford rent outside project communities. Spatially, the only adverse impact identified was inadequate access roads into the project communities. It was revealed through the data analysis that all these adverse impacts were consistent with the literature reviewed.

Overlooking adverse impacts

Responses from the surveys clearly identified the adverse social, economic, and spatial impacts of the N1-Highway expansion. However, what the statutory agencies deemed as important in discussing adverse impacts through the planning, design, and implementation of the project was different from the adverse impacts identified. Responses from statutory agencies identified compensation, mobility, funding, and time as the main issues that had to be addressed throughout the planning, design, and implementation of the project.

Compensation

Before the expansion of the N1-Highway, squatters occupied the ROW of the existing single carriage road. The Accra Metropolitan Assembly in charge of managing and protecting the ROW lacked resources to carry out this responsibility. When funding from the United States Government was made available, it became necessary to move encroachers and make way for road expansion. In moving the encroachers, the United States Government demanded that all encroachers be resettled and compensated, but money for this compensation had to come from the Government of Ghana. Respondents indicated that compensating the encroachers became a challenge, as this involved documenting every single encroacher, including "table-top sellers."

All the statutory agencies interviewed indicated that the N1-Highway project was time-sensitive. The project covered 4,000 properties, and it took about 12 weeks to valuate all properties and determine how much would be paid to owners. Based on the land valuation law in Ghana, an offer was made to property owners in the form of compensation. However, some property owners turned down the compensation, arguing

it was not enough to cover their properties. As part of the Executive Instrument (EI) that acquired the ROW for construction, it was within the rights of the property owners to turn down the offers made to them. Subsequently, they were then to allowed to hire private valuers to determine how their properties were impacted by the project, the value for their properties (compensation demanded), and the basis for the amount of compensation. In situations where the impacted owners turned down compensation offered by the Government of Ghana and went ahead to hire private valuers, the project valuation team negotiated the compensation amount with the private valuers. This was intended to get the Government of Ghana to pay impacted owners reasonable compensation.

The study also revealed that most of the impacted owners did not know they needed to put in claims for their properties, even though an Executive Instrument (EI) had been published in newspapers asking impacted individuals to file for compensation. According to respondents from statutory agencies, this delayed the project to some degree. One of the major issues that cropped up was the legitimacy of certain claims. For instance, according to a respondent from one of the statutory agencies,

> A claim made by an individual was deemed illegitimate because the Government of Ghana had already acquired the land, and had paid for compensation to the previous owner, who in turn had sold the property to the claimant. (September 10, 2018).

These issues took a lot of time and money to address. As a result, the project team paid little attention to other relevant issues, such as the adverse impacts that were likely to emerge, placing significant time mainly on addressing compensation challenges. As stated earlier in the study, the project was time-sensitive, and these compensation challenges created a delay. As a result, the project team was in a hurry to ensure they

minimized delays, avoided cost increases, and still met strict deadlines. There was, therefore, an urgency to address the compensation issues so that the project to commence. As a result, the project team placed little emphasis on potential adverse impacts that had been raised by residents.

Mobility

Prior to the expansion, the old roadway was a two-lane undivided road corridor. It was often congested and lacked the operational capacity required to serve high volumes (over 30,000 vehicles daily) of national, transnational, and local traffic (Millennium Challenge Corporation, 2012). The focus of the 14.1-kilometer section of the N1-Highway was to move people and agricultural products across the highway as fast as possible. As stated by a respondent from one of the statutory agencies:

> This is a highway that connects major horticultural points in the Central region to both the Tema Sea Port and the Kotoka International Airport. For these horticultural products to come from the Central region and make it to the airport for export on time, then you don't want to spend three hours between Mallam and Tetteh Quarshie [14.1-kilometer section of the N-1 highway]. (September 5, 2015).

The quote above clearly states the argument used by the Government of Ghana in justifying the need for the Millennium Challenge Corporation to finance the highway. Subsequently, a six-lane divided thoroughfare with major intersections for pedestrian crossing was constructed. The new highway was expected to reduce peak travel time from three hours to about 20 minutes and also to enable Ghanaians to easily access higher-order social services.

N1-Highway's priority was mobility. The main goal of its improvement was to address the bottleneck between Tetteh Quarshie and Mallam, thus drastically reducing

travel time between these points. As stated by a respondent from one of the statutory agencies, “The idea of the highway was to move people east-west and north-south as fast as possible.”

A critical factor that was considered in selecting the highway’s design was which design would provide the best mobility for drivers. Thus, the design that had the potential to move people and freight as quickly as possible in the north-south, as well as east-to-west directions, was chosen. The highway is the only route for people heading to Kumasi (and beyond), as well people heading to Tema and its surroundings. Considering this was a highway that had many pedestrian crossing points, the speed limit on the highway was between 80 and 100 kilometers per hour. Because the priority for the highway was its ability to move vehicles quickly and improve mobility, other impacts that were deemed likely to negatively impact the project were not given the necessary attention. This response from one of the project officials interviewed and quoted below paints a clear picture of the foregoing discussion on mobility:

> One of the weaknesses of the planning process was the failure of the Environmental Impact Assessment (EIA) to drill deeper into the issues that were raised by residents. Everybody was focused on constructing a fast highway where people could just drive through, and little crossings were expected even though there were areas with crossings. (September 9, 2015)

Funding

Through the Millennium Challenge Corporation, the United States Government had budgeted 100 million dollars for the N1-Highway expansion project. Any modifications outside the original design had to be funded by the Government of Ghana. As part of the design modifications made to the highway, interchanges were to be developed at Kwashieman, Awoshie, and Lapaz. Additionally, an improved interchange

and a new flyover were to be constructed at Apenkwa and Dzorwulu, respectively. These plans could not be implemented because of the lack of funds. As a result, these recommended modifications were packaged as the second phase of the N1-Highway project, to be completed by the year 2022 and funded by the Government of Ghana. As indicated by a statutory agency respondent,

> Officials had to procrastinate and say the interchanges are needed in ten years. But if we had the money and continued, it would have been useful. Because people need to go home. (September 9, 2015).

The inability of the Government of Ghana to build these interchanges made access to the project communities lengthy and circuitous. Additionally, the lack of funding made it impossible for the construction of access roads into project communities. As indicated by a respondent from a statutory agency:

> The project was in two phases, but the second phase has taken a little back seat because the Government of Ghana needed to come up with the money to provide access roads into communities along the project corridor. (September 9, 2015).

The lack of access roads led to the decision that pedestrians should be able to cross at grade at places like Fiesta Royale, Darkuman, Abeka, Kwashieman, Taborah, and Awoshie. From a safety standpoint, this decision was not the best, but due to limited funding, it had to be allowed. Allowing pedestrians to cross at grade has resulted many pedestrian crashes. At these intersections, crossing has become a challenge for both young and aged pedestrians, although pedestrian crashes and deaths at these locations involve pedestrians of all ages. Ghana would not have to experience these crashes and deaths had there been adequate funding to construct interchanges instead of allowing pedestrians to cross at grade.

As a result of a lawsuit by the Ghana Federation of Disability Organizations, a court order to construct a ramp to accommodate road users with disabilities could not be implemented due to limited funding. Respondents indicated that the court order came after the road had been completed, and thus the ramp construction was added to a different project whose funding had also run out. As a result, the Ghana Highway Authority has not been able to contract any engineer to construct the ramp. Additionally, only about 25 percent of recommendations from the road safety audit was implemented. This has all been attributed to limited funds on the part of the Government of Ghana. The safety problems discussed in the foregoing could have been easily addressed, but because of the lack of funds, they were overlooked.

Time

The Government of Ghana proposed that the N1-Highway project be executed under the Millennium Challenge Account (MCA). The Millennium Challenge Corporation (MCC) did its due diligence to assess the risk involved, determine if the project made economic sense, and decide if five years (compact term) was enough for the project to be completed. Procurement processes such as design evaluation and the acquisition of ROW for Lot 2 of the project delayed the schedule. The acquisition of Lot 2 took a long time and was completed a year after construction on Lot 1 had commenced. These delays impacted the overall schedule of the N1-Highway project.

For instance, Lot 2 of the project had a significant amount of work but the shortest time frame. All this was to ensure that professionals met the set targets for the N1-Highway components within the stipulated period. Not executing the project on time would result in the United States Government taking away the compact for the project.

As part of the contract, the compact money for the Millennium Challenge Account (MCA) had to be used in five years. Due to delays at certain stages of the highway, professionals had to rush to complete the project and meet the set deadlines. In most cases, this resulted in poor quality work. This is evident between Mallam and Kasoa, where the road has already developed potholes. The rush to complete the project also resulted in engineers not following standard engineering practices and exposing workers and road users to risk. As stated by a respondent from one of the statutory agencies, "Contractors should be given enough time to work very well. If genuinely, they should be given extension to complete the work. And that will be better."

As part of the highway project, a road safety audit was conducted. The audit team had the opportunity to review data including turning movements, pedestrian crossings, and intersections. However, due to limited time, a detailed road safety audit review could not be conducted. One respondent described the review as cursory and indicated that the time given for the entire audit was very short (four days) and challenging. From this, it is clear that professionals working on the project had limited time, meaning they could not address details that would have helped eliminate quality and safety issues.

Summary

In discussing if project officials overlooked the adverse impacts identified, the study revealed that project experts were focused more on other issues than the adverse impacts identified. These issues were identified as compensation, mobility, funding, and time. The project involved many encroachers, and project officials had to compensate all of them. This involved a lot of time, and project officials spent a significant part of the project schedule on this. Also, project officials were focused on designing and

constructing roads that were primarily mobility-oriented. Because of this, there was so much emphasis on the fast movement of passengers, goods, and services that little attention was given to other components of the project. The lack of funding was also a reason why project officials could not address adverse impacts ahead of time to improve road design and reduce or mitigate most of these impacts. Generally, the project was time-sensitive, causing project officials to rush through various stages just to ensure that the project was completed on time. This, however, resulted in poor quality work and the inability of officials to focus on the identified adverse impacts. It is important to mention that all of these identified issues had been discussed already in existing literature.

Avoiding or mitigating adverse impacts

The study has revealed that the N1-Highway expansion project has adversely impacted project communities socially, economically, and spatially. Protecting project communities against the identified adverse impacts and providing safe and effective transportation is in the public interest, and also good public policy and practice. In determining how the adverse impacts of the N1 project could have been avoided from the planning, design, and implementation phases, the study data revealed three main codes (phrases) after the axial coding: public involvement (participation), social impact assessment, and education.

Public involvement

The provision of public infrastructure can be controversial and may affect the interests of many people in society (Deegan & Parkin, 2011). In achieving this, policymakers usually aim to convey their plans to the general public and solicit opinions from communities before making key policy decisions (Rowe & Frewer, 2000, 2004).

The objective is to ensure that public infrastructure is better planned, designed, built, and operated to serve the well-being of various parties in a complex society (Woltjer, 2009). The implication is that citizen input is critical and useful in the planning, designing, and implementation phases of public infrastructure such as roads.

Data from the N1-Highway study indicated that residents and businesses were engaged at different levels of the project. Respondents from statutory agencies indicated that project communities (residents) were mainly engaged in the resettlement process. In relocating residents and businesses that had been impacted by the project, they were informed of locations that had been identified but were not involved in identifying these locations for resettlement. Some business owners argued that locations sought for them were not appropriate and conducive for their businesses to thrive, subsequently leading to the collapse of many businesses that were relocated as a result of the highway project. Business owners believe that had they been engaged in the search process, there was no way they would have agreed on the locations selected for them. As stated by a business owner, “Residents and business owners would have raised questions that would have addressed most of the issues that have come up now.”

In ensuring that water being drained from the project does not flood the adjacent communities and destroy properties, drainage along the road corridor had to be developed. Respondents from statutory agencies indicated that this was one of the activities that required high-level community engagement. Engineers subsequently conducted informal interviews with residents to solicit opinions. Engineers believed that only residents would be able to describe details of the drainage challenges within the project communities. Based on responses from engineers, engaging residents revealed

detailed information such as specific flooding areas in project communities and people building in waterways. Engineers further stated that this level of information from residents was very influential in siting drains.

In discussing community engagement and how much of the project communities' values were represented in the planning, design, and implementation of the highway project, the study revealed that very little of the input from project communities were incorporated into the final product. For instance, the Ghana Highway Authority solely conducted the evaluation of design alternatives without engaging any of the project communities, the reason being that residents could not understand the details of the evaluation. According to the Ghana Highway Authority, technical issues such as the evaluation of designs should be undertaken by experts. This is highlighted in the quotes below:

> "When you hire an expert, you will want the expert to present you with something that is sensible. But the ultimate choice lies with you. You are the owner of the property, so the decision as to what to take and who to involve was for the Ghana Highway Authority. That is exactly what we did." (September 7, 2015).

> "Residents are not engineers, and they are happy the road is being provided. Designing is beyond these residents." (September 12, 2015)

> "I do not see the need to involve residents unless the ones affected by the relocation. Everything we are doing is to improve their lives." (September 15, 2015).

This perception can be related to another study finding: Project officials (statutory agencies) believed residents were not intelligent enough to be a part of the planning, design, and implementation of the project. Additionally, project officials believed only the rich were likely to voice their concerns when the public is engaged. This is evident in the quote below:

> Those who can talk publicly are those who have little money in their pockets. The ordinary people can only raise shouts, but you may have to listen. Some of the views are sometimes childish and they do not hit the point. But some of them can make very useful points, especially those who live along waterways. They gave us useful inputs. (September 12, 2015).

Based on the foregoing quote, it is evident that project officials were not keen on engaging project communities; however, they acknowledged that in situations where residents were engaged, this yielded useful results. Even in situations where residents were engaged, this usually involved project officials meeting residents and informing them about decisions that had already been made on their behalf—a concept Arnstein (1969) describes as "tokenism." This concept is evident in the quote below:

> What we did was that after we had selected a design and done everything, we engaged with the public to inform them what we were going to do and how it was going to impact them. (September 14, 2015).

However, responses from residents indicate that although they were open and willing to be an integral part of the highway project, they were not given the opportunity. Respondents felt that the various communities played little role in the planning, design, and implementation of the highway project. These residents felt more like the road was imposed on them. As much as residents believe they were sidelined, they have continued to communicate many solutions to the postimplementation problems through their local government representative, hoping to show government officials that they know their communities better and their contributions cannot be ignored. This is captured in the quote below:

> We need to make it clear to government officials that local residents have the knowledge and a lot to contribute towards development projects. We, therefore, call upon them to involve us in projects they undertake in our communities. (September 11, 2015).

Responses from residents indicate that the engagement of residents in the planning, design, and implementation of the highway was inadequate. Additionally, contributions made by residents during the few instances they had the opportunity to participate in the project were not considered. For instance, residents raised concerns about the location of and distance between footbridges. Residents indicated that the footbridges were located in places with little human activity and the distances between them were too far. Residents also raised concerns about how individuals with disabilities were going to cross the highway.

These issues came up strongly when contractors were ready to commence construction. A follow-up meeting with residents after contractors had been selected for the project revealed that residents were still concerned about the safety issues, especially about how crossings were going to be managed safely. In spite of this, footbridges were still constructed without project officials addressing concerns raised by residents. Although residents had the opportunity to voice their concerns, they lacked the power to ensure that the authorities in charge heeded their views. Residents indicated that a shortcoming of the project procedure was the failure of project officials to allow them to fully participate in the planning, designing, and implementation of the project. Residents believe the failure of project officials to involve them and incorporate their values and beliefs into the project has resulted in the challenges that have emerged.

The foregoing assertion is shared by authors such as Glass (2007) as well as Böhler-Baedeker and Lindenau (2013). These authors believe that involvement or participation is critical to stakeholders in the decision-making process. According to Böhler-Baedeker and Lindenau, transportation planning is a complicated area with highly

debated decisions that require public involvement in the face of democratization of politics (2013). Glass on other the hand describes participation as providing citizens with opportunities to take part in governmental decisions or planning processes (2007). Involving stakeholders and citizens helps legitimize decisions, and can possibly lead to new, innovative governance models balancing different positions and interests (Böhler-Baedeker and Lindenau, 2013). When participation or involvement is done right, citizens gain some degree of power and are able to compel key institutions to become responsive to their views and needs.

Public participation requires the involvement of individuals and groups that are positively and negatively affected by proposed interventions (Andre et al., 2006). Engaging citizens improve the chance of project success and increases the consideration of the needs of various parts of society before plans and solutions are finalized (Giddings et al., 2010; Landge et al., 2005; Woltjer, 2009). Despite the benefits of public involvement in the provision of infrastructure, literature has shown that the process has been less than satisfactory, especially in developing nations (Ng, Li, & Wong, 2011).

Public participation has not matured in most developing countries, and authorities are not usually receptive to involving the public in making decisions, as we have seen in the case of the N1-Highway project. This is attributed to the fear of overactive citizens who could plunge the process into social disorder and conflict, as well as increase the chance of project failure (Shan & Yai, 2011; Song et al., 2011; Moore & Warren, 2006). Public participation practices in developing nations take the form of informing the public of the finalized plan or design rather than inviting them to express their opinions before a decision is made (Shan & Yai, 2011). This is likely to impose a burden on people to

cooperate and support the government in project implementation.

However, it is believed that citizen involvement in a democratic environment will produce more public-preference decision-making on the part of administrators and a better appreciation of the larger community among the public (Box, 1998; Oldfield, 1990; Stivers, 1990). Citizen involvement should, therefore, be a transformative tool for social change (Nelson & Wright, 1995). Additionally, citizen involvement is envisioned to produce better decisions and more benefits to the rest of society (Beierle, 1999; Thomas, 1995).

Improved participation in Social Impact Assessment

The impact of projects on the social well-being of communities has become a field of concern. As a result, there has been an increase in the development and practice of social impact assessment (Esteves, Franks, & Vanclay, 2012; Suopajarvi, 2013; Vanclay and Esteves, 2011). Social Impact Assessment (SIA) has been used in a variety of situations around the globe, reflecting the recognition of SIA as a major component in the planning process for interventions (Ahmadvand et al., 2009; Momtaz, 2005).

Data gathered from the field indicated that an environmental impact assessment (EIA) study was conducted as part of the N1-Highway project. In Ghana it is a legal requirement under the Environmental Protection Agency (1994) Act 490, Environmental Assessment Regulation (1999), Legal Instrument (L.I.) 1652 and Amendment (LI 1703, 2002) that any proposed project, such as a road expansion project of this magnitude, be subjected to an EIA. The EIA was consistent with the Millennium Challenge Corporation (MCC) Environmental Guidelines. The MCC environmental guidelines were aimed at establishing a process for the review of environmental and social impacts of projects

undertaken as part of programs funded under MCC Compacts. These guidelines were intended to ensure that projects are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and, as required by the legislation establishing MCC, are not likely to cause a significant environmental, health, or safety hazards.

As part of the EIA, the Millennium Challenge Account Ghana and the Ghana Highway Authority undertook a scoping exercise between 2005 and 2006. This was done to determine the range of issues that the environmental assessment would analyze. The purpose was to incorporate timely, participatory, and meaningful stakeholder and public consultation in the development of the EIA and the Environmental Management Plan (EMP). It was also to ensure that the EIA addressed all the issues relating to environmental impacts, mitigation options, and residual effects relevant to the assessment of the highway project, including, as appropriate, those related to other operations in the vicinity of the project. The EIA included an EMP to ensure that mitigation measures were carried out. The effectiveness of construction mitigation measures largely depended on the contractor's working practices. Management of these impacts was best to be achieved through the incorporation of relevant clauses in the construction contract document. With the support of the MiDA Environmental Unit and other institutions responsible for monitoring the environmental impact of the project, the supervising engineer was assigned to monitor and control any of the activities likely to render the proposed mitigation measures ineffective.

The environmental impact forecast was based on the expected effects of the N1-Highway project on the various environmental and socio-economic impact indicators

identified. The EIA study tried to answer questions like, “Who will be affected by the project?” and “How much of an impact will the project cause?” The EIA also sought to show how the highway project would be designed or modified to minimize or mitigate any adverse impacts. The key issues of environmental concern identified through field surveys and consultations as well as their corresponding mitigation measures were categorized as direct and indirect impacts.

As part of the EIA, the environmental parameters assessed were identified as physical/natural environment; health and safety of workers and public; local economy; local transportation; landscape and aesthetics; land use; and resettlement/compensation issues. Given the variety of project activities, only those that were likely to have a significant impact on the environment were considered. As shown in Table 6 below, the direct environmental impacts were further categorized into impacts during and after construction (project operation). Based on the EIA, the most significant construction impacts pertaining to the N1-Highway project were those related to land clearing, grading, and roadbed construction, as well as the removal of vegetative cover and other land uses. These impacts were estimated not to arise only at N1 construction sites, but also at quarry sites, borrow pits, and material storage areas serving the project. Adverse environmental and sociocultural impacts were also estimated to occur on the N1 project site during both construction and operation phases of the project. These included air and soil pollution from asphalt plants; dust and noise from construction equipment and rock blasting; fuel and oil spills; generation of garbage; and the large presence of a nonresident labor force.

Potential direct environmental impacts during operation of the project were identified as increased demand for fuels; road traffic accidents; displacement of nonmotorized methods of transport; increased air pollution, noise, and roadside litter; injuries or deaths of animals and people attempting to cross the road; and health risks and environmental damage from accidents involving hazardous materials in transit and water pollution from spills or accumulated contaminants on the road surface.

Table 6

Potential Adverse Construction and Post-Construction Impacts Identified

Potential adverse construction impacts identified	Potential adverse post-construction impacts identified
i. Displacement of roadside business (during and after construction) ii. Taking of properties iii. Increased soil erosion and sedimentation during construction and the impact on Dzorwulu, Odaw and Lafa streams iv. Temporary flooding v. Increased dust and noise pollution vi. Increased road congestion and travel times vii. Impact on land uses due to siting of borrow pits viii. Improper disposal of construction waste ix. Disruption of public utilities x. Inadequate public relations–timely adverts and announcements regarding construction activities xi. Aesthetic impacts from poorly maintained construction areas	i. Permanent loss of income and livelihood opportunities to hawkers and business people along the current road ii. Decreased air quality from increased traffic iii. Noise increases from increased traffic volumes and speeds iv. Safety Impacts: Increased speeds, because of the road improvement, are one of the major factors that could produce vehicular/pedestrian conflicts v. Increased local flooding from inadequate drainage due to road

A wide variety of potential indirect negative impacts that were primarily sociocultural were attributed to highway improvement. Some of the indirect environmental components considered were induced development (e.g., commercial, industrial, and residential activities, as well as urban sprawl development); increased traffic volume; impairment of nonmotorized transportation economy (e.g., cyclists and pedestrians); visual intrusion by roadside billboards; and labor force migration and displacement of local economics.

Based on the EIA study, the identification of potential impacts and the search for appropriate mitigation measures were considered from two aspects. Firstly, the project consultant analyzed the project from a construction aspect where impacts from the N1-Highway project were deemed as similar to those experienced under many similar projects throughout Africa. Lastly, the specific concerns of the local communities were studied through consultations. Based on the EIA study, the proposed mitigation and enhancement measures for both social and environmental impacts were standard for a project like the N1-Highway project. The EIA study further indicated that particular attention was given to the planning, coordination, and implementation of the mitigation activities that relate to the relocation of traders through the development and implementation of the Resettlement Action Plan (RAP).

Additionally, public participation was given considerable priority during the EIA study. The objectives of the EIA public participation program was to identify and categorize interested and affected stakeholder groups; present the N1-Highway project (the road development and alternative scenarios and their impacts) to stakeholders; collect, collate, and analyze stakeholder feedback; and incorporate stakeholder feedback into project design where appropriate. In addressing the potential impacts identified in the scoping process, mitigation measures were

defined and focused on sound technical and engineering modifications to the project design. Indicated below are all the mitigation measures identified during the scoping process.

- Development and implementation of a formal Resettlement Action Plan that will ensure appropriate and adequate compensation to project-affected persons.
- Relocation of project-affected persons (as appropriate).
- Air (dust) pollution control measures during construction.
- General management and rehabilitation of borrow pits.
- Traffic control during construction.
- Relocation of public utilities.
- Prevention and minimization of soil erosion and sedimentation.
- Prevention of surface and groundwater pollution.
- Health and safety measures during construction.
- Water to be acquired from raw sources, so as not to be in competition with domestic sources.
- Appropriate location of construction camps.

As indicated earlier, the purpose of SIA is to predict the likely environmental, social, and economic consequences of a project before the project is approved, adjusted, or rejected. Based on the foregoing listed mitigation measures, it is obvious that the SIA undertaken as part of the N1-Highway project placed greater emphasis on environmental and economic impacts with little attention on the project's likely impact on the social well-being of impacted communities. Additionally, all the identified mitigation measures targeted impacts that were likely to be experienced during the construction phase, but nothing on the list relates to post-construction impacts.

SIA emerged as a component within environmental impact assessment to address the social aspects of sustainable development (Esteves, Franks, & Vanclay, 2012). The goal was to use SIA to gauge, moderate, and mitigate the likely intended and unintended impacts of planned interventions (Budge, 2004; Scott, 2000; Vanclay, 2012). In the case of the N1-Highway project, an SIA was conducted to bring social change, but the issues raised under the SIA were environmentally inclined. Even though the SIA, in this case, was used as a tool to prompt planners and decision-makers as to the likely social impacts of the N1-Highway project, the majority of the mitigation measures identified focused on environmental issues.

Residents within the project communities indicated that they understand the need to protect the environment, but it is not reasonable to have mitigation measures solely focused on addressing environmental issues. In addition, residents believed that the community should have led the SIA process and that participatory processes allowing community discussions and interventions agreed upon by all stakeholders should have been incorporated. This is an assertion shared by Esteves, Franks, and Vanclay (2012). Respondents acknowledged the fact that SIA sometimes gets technical and in the process, the participatory aspect is given less attention. There was, therefore, the call for professionals to merge technical and participatory approaches of SIA to enhance its effectiveness and provide significant information for decision-makers, while at the same time giving project communities control over their own development. This is an assertion that has been confirmed by Becker et al. (2004) as well as Lane, Ross, and Dale (1997). The incorporation of a stronger participatory approach is also supported by other researchers and preserved in best practice principles (Esteves et al., 2012; Vanclay, 2003; Vanclay & Esteves, 2011).

Public education

Findings from the study revealed that although there was some level of public education on how the N1-Highway was to be used, it was inadequate. Additionally, respondents from statutory institutions in charge of the N1-Highway admitted to the inadequacy of informational and directional signs on the road corridor. Respondents, therefore, called for the provision of adequate signage, and also for the public to be well educated on the use of these signs and information on the newly constructed N1-Highway. Due to the complex nature of the road corridor, educating the public on the use of the road infrastructure would enable road users navigate the system safely.

There was also the call for the appropriate agencies (e.g., National Road Safety Commission, Information Service Department, etc.) to develop strategies to educate the public so that they could use the N1-Highway safely. The road safety audit team from the Ghana Highway Authority undertook a child road safety audit, where teachers and students were trained to use the road during construction. This catered to the need for safe use of roads by pedestrians during the construction phase of the project. Respondents emphasized that a similar exercise should have been conducted for teachers and students after the construction.

Even though some respondents admitted to seeing some level of public education on national television, there were others who stated that they never saw any educational material on how to use the N1-Highway. As indicated earlier, it was a general consensus that the new highway was difficult to navigate and unsafe for all users. Respondents, therefore, called for officials to conduct effective education campaigns on how drivers and pedestrians should use the road. Respondents believe this will serve as a good source of information to the general public as well as improve safety on the road corridor. As stated by one of the respondents, education is a

major component of road safety: “I see road safety as the integration of standard methods, which includes the engineering, enforcement, education, and emergency.”

It is important to note that “public education” as an emergent code deviates from existing literature. Thus, in the literature review for this study, public education was never identified as a factor that might help mitigate or avoid the adverse impacts of highway expansion projects.

Summary

Data from the study revealed that public involvement, improved public participation in SIA processes, and public education were ways in which the identified adverse impacts could be avoided, reduced, or mitigated. Citizen involvement was identified as a very important part of planning, designing, and implementing a highway that would be beneficial to society. Involvement or participation of citizens should also be allowed in technical processes such as Social Impact Assessment (SIA). These measures would provide decision-makers with the best information, while also giving project communities control over their own development. This would enable project officials to identify and address adverse impacts timely and appropriately.

Lessons Learned

Responses from the data collected revealed some significant lessons that the researcher believes could be used to make similar future projects better. The researcher is by no means implying that these lessons can be generalized and made to work for every road expansion project. The lessons identified from the study are discussed below.

Allot reasonable time for project completion

Going through responses from most of the statutory institutions, it became clear that inadequate time for project completion was a concern. For instance, respondents indicated that procurement processes such as the designs were delayed, and this adversely impacted the overall

schedule of the project. As a result of the schedule delay, other parts of the procurement process were rushed.

The acquisition of Lot 2 of the highway expansion took a long time as a result of the valuation and compensation processes, causing a significant delay in the project schedule. As a result, Lots 1 and 2 were given out to two different contractors, making the management of the project very difficult. Instead of the project managers managing two different contractors at the same time, early acquisition of Lot 2 would have prevented this challenge. Had the contract had been awarded as a single project to one contractor, its management would have been easier.

The project's challenges meant it would need considerable time for it to be successfully executed. For instance, Lot 2 (Apenkwa-Mallam) of the highway expansion project had a significant amount of work, but it also had the shortest time frame for completion. This was because there had been a delay in the Lot 2 acquisition, and also the Compact money from the United States Government had to be utilized within a stipulated period. If project managers failed to execute the project within the stipulated time (five years), the United States Government would take away the Compact money for the project.

The rush to complete the project to meet the deadline resulted in poor quality work. This is evident between Mallam and Kasoa, where the road corridor developed potholes within a short period. The rush to complete the project also resulted in engineers not following standard engineering practices and exposing all road users to safety risks. There is, therefore, the need to ensure that in the future, projects are alloted considerable time to enable contractors to execute their works successfully.

Road safety should not be underestimated

A major lesson that can be taken from this study is that project professionals should not underestimate road safety in the planning process. Rather, more attention should be paid to road designs that promote safety. In the case of the N1-Highway, the focus was very much on constructing a highway that could move freight and passengers as fast as possible with very few crossings. As a result, less attention was paid to safety. It was assumed that people were going to cross at designated points, but it turned out that residents behaved differently. Additionally, it became clear from the study that future road projects should have designs to accommodate users with diverse needs, including the elderly, young, and those with disabilities.

In designing roads, the room should be made for road safety audit professionals to conduct feasibility audits on all design alternatives. Road safety audits should be extensive and incorporated into the planning and design process. Also, adequate time should be given for road safety audit professionals to carry out their work. According to road safety audit professionals, the greatest challenge in the delivery of road safety in Ghana has been the unwillingness of politicians to accept changes that do not benefit them politically. For instance, in the case of the N1-Highway project, it was revealed that politicians were reluctant to accept some of the audit recommendations that were going to improve safety. It is therefore not surprising to know that only about 25% of the audit recommendations made for the N1-Highway were implemented. Respondents believe this has contributed to many of the road traffic crashes on the road corridor.

Improve communication and coordination among statutory stakeholders

The study shows that there is a need to improve communication and coordination among all institutions involved in future projects. Roles for these institutions would have to be extensively defined. Roles for the statutory stakeholders in the N1-Highway project were clearly

defined, but the role of local government institutions such as municipal offices was not. The roles of statutory stakeholders and that of local government institutions sometimes overlapped, causing delays and waste of resources.

Encourage sustainable local funding sources

Developing nations such as Ghana have always received assistance from developed nations and donor agencies in funding road infrastructure. This study has revealed that governments in developing nations will have to seek local alternative funding sources that are sustainable to fund local road infrastructure. Although the United States Government funded the construction of the N1-Highway, other components such as the compensation for project-impacted populations and the construction of interchanges had to be funded by the Government of Ghana. For instance, due to the lack of funds to construct interchanges so that residents could access their communities and business, the creation of at-grade intersections was recommended. When funding becomes available, there are plans to construct interchanges in the future to improve road safety.

Additionally, due to the lack of funds, there were delays in payment of contractors by the Government of Ghana. These financial challenges resulted in the extension of some project activities. For instance, the relocation of electricity, telephone, and water lines had to be paid for by the Government of Ghana. Because the foregoing costs were not allotted as part of the government's budget, officials had to scramble to find funds for consultants and contractors to continue road construction. Had funds being made available ahead of time, delays in the project schedule could have been avoided.

Flexibility on the part of funding agencies/countries

Funding agencies and countries should be flexible with the terms and conditions they attach

to funds given to developing nations. For instance, developing countries receiving funds from donor agencies or countries should be given adequate and reasonable conditions to utilize the funds given.

Chapter 6

Implications for Research and Practice

Implications for Research

The findings of this study have implications for future research and educational purposes. This study has contributed to the knowledge base of using qualitative research approaches to determine the impacts of road expansion projects on residents and their communities. Future research can use this knowledge base and further develop and apply it to larger populations. Future research can help refine the qualitative approach adopted in this study and use that to address social, economic, and spatial challenges faced by the transportation sector in Ghana and other developing countries.

In developing the body of research on the social, economic, and spatial impacts of road expansion projects, it is recommended that more studies be conducted using qualitative approaches. Qualitative research approaches such as grounded theory help researchers get a better more detailed understanding of issues that cannot be easily quantified. Even for issues that are easily quantifiable, researching these issues through qualitative approaches brings a different perspective to the issues and adds to the knowledge base. If well developed, a qualitative study could be designed to use validated tools to ascertain the impacts of road capacity expansion on project communities. This will also create the opportunity to undertake a comprehensive study on the impacts of road capacity expansion by combining qualitative and quantitative approaches.

Implications for Practice

Professionals in the transportation industry, as well as stakeholders, can use the results of this study to better understand the impacts of road capacity expansion on project communities. With this knowledge, the Government of Ghana can undertake road expansion projects and

successfully manage the adverse impacts. This understanding will enable professionals to identify the necessary adverse impacts and address them timely and appropriately to help improve the quality of life in project communities. Understanding the adverse impacts of road capacity expansion projects will guide statutory institutions on how to mitigate these impacts and protect project communities.

Findings from this study generally reinforce prior research and recommendations. However, this study has identified some lessons that can enable the Government of Ghana and stakeholders to handle road expansion projects diligently and successfully. Lessons identified by this study include allotting reasonable time for road projects, incorporating safety in road designs, improving communication among stakeholders, and identifying sustainable local funding sources. This study has revealed that if road projects are allotted adequate time, contractors will be in a position to provide good-quality roads that will last. Incorporating safety into road designs and implementing these safety recommendations are important for protecting road users.

Underestimating safety in the design of roads will result in stakeholders battling to address road safety issues that could have been tackled as part of the planning process. This will take efforts from all stakeholders involved in the planning process, so the roles of these stakeholders will have to be clearly defined. Communication between stakeholders will also have to improve drastically. The end goal is to make sure time, money, and all other resources invested in road projects are used efficiently. The study recommends that the Government of Ghana invest in identifying sustainable local funding sources for road projects. As revealed by this study, there were many modifications that the Government of Ghana would have liked to make to the original design. However, these modifications were not going to be covered under the Compact. The only way to add these modifications was for the Government of Ghana to pay

for them. Because the Government of Ghana did not have funds, these ideas, such as building additional footbridges and interchanges, were abandoned. Some of these modifications would have improved safety and saved lives on the N1-Highway.

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APPENDICES

THE UNIVERSITY OF TEXAS AT ARLINGTON
COLLEGE OF ARCHITECTURE, PLANNING AND PUBLIC AFFAIRS

ASSESSING THE IMPACTS OF ROAD CAPACITY IMPROVEMENT ON PROJECT COMMUNITIES: A CASE STUDY OF THE NATIONAL HIGHWAY-1 (N1-HIGHWAY) ACCRA, GHANA

FOCUS GROUG DISCUSSION QUESTIONNAIRE

A. General Information

Name of Interviewer_____

Name of Community_____**Number of People Present**_____

District_____

Date of Interview_____**Time of Interview**_____

B. Community Involvement

1. What were the major transportation problems or challenges the community encountered before the N-1 highway project?
   _____
   _____
   _____
   _____
   _____

2. How did the community become aware of the N-1 highway project?
   _____
   _____
   _____

3. Was the community involved in the design, planning and implementation of the N-1 highway project? Yes [ ] No [ ]

4. If Yes, which stage and how were you involved?
   _____
   _____
   _____
   _____

5. If Yes, which institutions were involved in the process?

_____
_____
_____

C. <u>Social Impacts</u>

6. Has the highway project negatively impacted your ability to interact with friends, family or neighbors?

   Yes [ ] No [ ]

7. If Yes, how?

_____
_____
_____
_____

8. Has the highway project negatively impacted access to community facilities and services? (E.g. Schools, churches, mosque, parks)

   Yes [ ] No [ ]

9. If Yes, how?

_____
_____
_____
_____

10. Has the highway project negatively impacted road safety?

    Yes [ ] No [ ]

11. If Yes, how?

_____
_____
_____
_____

12. How has the highway project impacted the displacement of local residents?

_____
_____
_____
_____

13. How has the displacement of local residents impacted the quality of life in project communities?

_____
_____

_____

14. How can these negative impacts be mitigated?

_____
_____
_____
_____

D. <u>Economic Impacts</u>

15. Has the highway project negatively impacted business activities?
    Yes [ ] No [ ]

16. If Yes, how?

_____
_____
_____
_____

17. Has the highway project negatively impacted your ability to patronize local businesses?
    Yes [ ] No [ ]

18. If Yes, how?

_____
_____
_____
_____

19. Has the highway project negatively impacted employment of any of your friends, family or neighbors?
    Yes [ ] No [ ]

20. If Yes, how?

_____
_____
_____
_____

21. Has the highway project negatively impacted property values?
    Yes [ ] No [ ]

22. If Yes, how?

_____
_____
_____

23. If Yes, how has the property values impacted local business?

_____
_____
_____
_____

24. If Yes, how has the property values impacted residential properties?

_____
_____
_____
_____

25. Are there any special business needs you think the highway project did not address (E.g. employee access/parking, customer access/parking, freight delivery, special needs clientele)?
Yes [ ] No [ ]

26. If Yes, indicate?

_____
_____
_____
_____

27. How can these negative impacts be mitigated?

_____
_____
_____
_____

E. <u>Spatial Impacts</u>

28. How has the highway project impacted land use?

_____
_____
_____
_____

29. Has the highway project negatively impacted historic districts and structures, historic or scenic landscapes, and local landmarks?
Yes [ ] No [ ]

30. If Yes, how?

_____
_____
_____
_____

31. Has the highway project negatively impacted mobility within the community (vehicles, pedestrians and bicyclist)? Yes [ ] No [ ]

32. If Yes, how?

_____
_____
_____
_____

33. Has the highway project negatively impacted mobility from one side of the community to the other? (E.g. pedestrians and bicyclist)?

Yes [ ] No [ ]

34. If Yes, how?

_____
_____
_____
_____

35. Has the highway project created any barrier that has divided the neighborhood or limited access to any part of the community?

_____
_____
_____
_____

36. How can these negative impacts be mitigated?

_____
_____
_____
_____

37. Please list any additional comments

_____
_____
_____
_____

Thank you for your time

THE UNIVERSITY OF TEXAS AT ARLINGTON
COLLEGE OF ARCHITECTURE, PLANNING AND PUBLIC AFFAIRS

ASSESSING THE IMPACTS OF ROAD CAPACITY IMPROVEMENT ON PROJECT COMMUNITIES: A CASE STUDY OF THE NATIONAL HIGHWAY-1 (N1-HIGHWAY) ACCRA, GHANA

HOUSEHOLD QUESTIONNAIRE

B. Demographic Information

1. Gender [ ] Male [ ] Female
2. Age [ ] 15 – 29 [ ] 30 – 44 [ ] 45 – 59
   [ ] 60 – 74 [ ] 75 and Above
3. Please indicate your level of education.
   [ ] No high school
   [ ] Some high school (Did not graduate)
   [ ] Some college (specify)_____
   [ ] 4 year college degree
   [ ] Graduate degree
   [ ] Other (specify)_____
4. How long have you lived in this community?_____

E. Involvement

5. How did you learn about the highway project?
   _____
   _____
   _____

6. Did you ever have the chance to share your opinion about the highway project with other stakeholders?

   [ ] Yes [ ] No

7. If Yes, which stakeholders were involved?
   _____
   _____
   _____
   _____

8. If Yes, was it during the design, planning or implementation of the highway project?
   _____
   _____

9. In your opinion, was this process beneficial?

   [ ] Yes [ ] No

10. If Yes, why?

    _____
    _____
    _____
    _____

11. What were the major transportation problems or challenges the community encountered before the highway project?

    _____
    _____
    _____
    _____
    _____

F. <u>Social Impacts</u>

12. How do you feel about living in this community after the highway project?

    _____
    _____
    _____
    _____

13. Do you have friends or family that were relocated because of the highway improvement?

    [ ] Yes [ ] No

14. If Yes, how has that affected your interaction with them?

    _____
    _____
    _____
    _____

15. Do you have friends and family on the other side of the highway?

    [ ] Yes [ ] No

16. If Yes, how has the highway project affected your interaction with them?

    _____
    _____
    _____
    _____

17. How has the highway impacted your ability to access and use neighborhood public facilities

(E.g. schools, churches, mosque, clubs)?

_____
_____
_____
_____

18. Has the highway project displaced any of your family, friends or neighbors?
    [ ] Yes [ ] No

19. If Yes, how has that affected your relationship?

_____
_____
_____
_____

20. Do you think the highway project has negatively impacted road safety?

    [ ] Yes [ ] No

21. If Yes, how?

_____
_____
_____
_____

22. If Yes, which group of people are greatly affected by the poor road safety situation?

_____
_____
_____
_____

23. Generally, how has the highway project impacted the quality of life in the community?

_____
_____
_____
_____

24. How can these negative impacts be mitigated?

_____
_____
_____
_____

G. Economic Impacts

25. How has the highway project affected economic activities in the community?

_____
_____
_____
_____

26. Do you have friends, family or neighbors whose businesses have been affected by the highway project?

[ ] Yes [ ] No

27. If Yes, how?

_____
_____
_____
_____

28. Do you have friends, family or neighbors whose willingness to access their favorite local businesses have been impacted by the highway project?

[ ] Yes [ ] No

29. If Yes, how?

_____
_____
_____
_____

30. How has the highway project affected your ability to physically access local businesses?

_____
_____
_____
_____

31. Do you have friends, family or neighbors whose employment has been affected by the highway improvement?

[ ] Yes [ ] No

32. If Yes, how?

_____
_____
_____
_____

33. Are you aware of any local business the highway project has displaced?

[ ] Yes [ ] No

34. If Yes, how has that affected you?

_____
_____
_____
_____

35. Do you think the highway project has negatively impacted road safety?

[ ] Yes [ ] No

36. If Yes, how?

_____
_____
_____
_____

37. If Yes, which group of people have been affected the most by the road safety situation?

_____
_____
_____
_____

38. Are there any special business needs you think the highway project did not address (E.g. customer access/parking, special needs clientele)?

Yes [ ] No [ ]

39. If Yes, indicate?

_____
_____
_____
_____

40. How can these impacts be mitigated?

_____
_____
_____
_____

F. <u>Spatial Impacts</u>

41. How do you think the highway project has impacted land use in this community?

_____
_____
_____
_____

42. Are you aware of any historic structures, landmarks or scenic landscapes that has been affected by the highway project?

Yes [ ] No [ ]

43. If Yes, how?

_____
_____
_____
_____

44. Has the highway project affected your ability to move freely through the community mobility (E.g. walking, cycling, driving)?

Yes [ ] No [ ]

45. If Yes, how?

_____
_____
_____
_____

46. Has the highway project affected your ability to cross from one side of the community to the other side?

Yes [ ] No [ ]

47. If Yes, how?

_____
_____
_____
_____

48. How can these impacts be mitigated?

_____
_____
_____
_____

49. Please list any additional comments

_____
_____
_____
_____

Thank you for your time

THE UNIVERSITY OF TEXAS AT ARLINGTON
COLLEGE OF ARCHITECTURE, PLANNING AND PUBLIC AFFAIRS

ASSESSING THE IMPACTS OF ROAD CAPACITY IMPROVEMENT ON PROJECT COMMUNITIES: A CASE STUDY OF THE NATIONAL HIGHWAY-1 (N1-HIGHWAY) ACCRA, GHANA

INSTITUTIONAL QUESTIONNAIRE

A. General Information

Name of Interviewer_____

Status of Interviewee_____

Date of Interview_____**Time of Interview**_____

B. Institutional Involvement

1. Why was there the need for the highway project?

   _____

   _____

   _____

   _____

2. What stage of the planning process was your institution engaged, and what stage will you have preferred to be engaged?

   _____

   _____

   _____

   _____

3. What challenges did you face in the planning process?

   _____

   _____

_____

_____

4. What role did the institution play in the design, planning and implementation of the highway project?

_____

_____

_____

_____

5. As per the role played, did you engage the community at any time?

Yes [ ] No [ ]

6. If Yes, what was the purpose, and how were they engaged?

_____

_____

_____

_____

C. <u>Social Impacts</u>

7. What were the anticipated negative social impacts of the highway project?

_____

_____

_____

_____

8. Are there new negative social impacts being experienced now that were not anticipated?

Yes [ ] No [ ]

9. If Yes, indicate them.

_____

_____

_____

_____

10. What do you think is responsible for the new negative social impacts?

_____

_____

_____

11. What mitigation measures will you recommend for the negative anticipated social impacts?

_____

_____

_____

_____

D. <u>Economic Impacts</u>

12. What were the anticipated negative economic impacts of the highway project?

_____

_____

_____

_____

13. Are there new negative economic impacts being experienced now that were not anticipated?

Yes [ ] No [ ]

14. If Yes, indicate them.

_____

_____

_____

_____

15. What do you think is responsible for the new negative economic impacts?

_____

_____

_____

16. What mitigation measures will you recommend for the negative anticipated economic impacts?

_____

_____

_____

_____

E. <u>Spatial Impacts</u>

17. What were the anticipated negative spatial impacts of the highway project?

_____

_____

_____

_____

18. Are there new negative spatial impacts being experienced now that were not anticipated?

Yes [ ] No [ ]

19. If Yes, indicate them.

_____

_____

_____

_____

20. What do you think is responsible for the new negative spatial impacts?

    _____
    _____
    _____

21. What mitigation measures will you recommend for the negative anticipated spatial impacts?

    _____
    _____
    _____
    _____

Thank you for your time