

# The Effects of Bad Roads on Transportation System in the Gushegu District of Northern Region of Ghana

Andrews N. Naazie.<sup>a\*</sup>, Braimah S. R.<sup>b</sup>, Vincent A. Atindana<sup>c</sup>

<sup>a</sup>Department of Automobile Engineering, Tamale Technical University (TaTU), Tamale, Ghana West Africa

<sup>b</sup>Department of Mechanical Engineering, Tamale Technical University, Tamale, Ghana West Africa

<sup>a</sup>Email: [naaziea@yahoo.com](mailto:naaziea@yahoo.com)

<sup>b</sup>Email: [braimahsoale@gmail.com](mailto:braimahsoale@gmail.com)

<sup>c</sup>Email: [atindanavincent@yahoo.com](mailto:atindanavincent@yahoo.com)

## Abstract

The study sought to investigate the effects of bad roads on transportation system and its maintenance and service cost in the Gushegu District in the Northern Region of Ghana. Both primary and secondary data were collected for the study. The primary data involved 150 Drivers, Driver Mates and Transport Owners using mainly questionnaire. The findings showed that bad roads had effects on transportation system as this brought about frequent break down of vehicles and increased maintenance cost. It is therefore recommended that government should formulate a good road infrastructure policy that will enhance the sustainability of road infrastructure and should also encourage public participation in road infrastructure provision and maintenance to accelerate development of the District.

**Keywords:** Effects; Bad Roads; Transportation; maintenance; Service; cost; Gushegu District.

## 1. Introduction

Transport represents one of the most important human activities worldwide. It is an indispensable component of the economies of countries and plays a major role in spatial relations; helping create valuable links between regions and economic activities, between people and the rest of the world. Among the many importance of transport is its key role in specialization allowing production and consumption of products to occur at different locations. Better transport allows more trade and a greater spread of people. Economic growth has always been dependent on increasing the capacity and rationality of transport.

---

\* Corresponding author.

But the infrastructure and operation of transport has a great impact on the land and is the largest drainer of energy, making transport sustainability a major issue. Passenger transport is the essence of tourism, a major part of recreational transport [1]. Commerce requires the transport of people to conduct business, either to allow face-to-face communication for important decisions or to move specialists from their regular place of work to sites where they are needed. Among the many modes of transport, road transport is the commonest. However poor road infrastructure hinders road transport and curtails societal development and mobility. Rural areas are places for the production of primary goods and services worldwide. Increases in sufficient roads in rural areas tend to increase access to agricultural inputs and market, communication and technology. Today, governments of countries the world over are building more and more roads to gain access to the remotest region of their countries to unlock the vast and untapped reservoir of productive potential lying in these regions [1].

The [2] indicated that roads link towns and villages and enable the people to communicate at different places. When food is scarce in one place, it can be brought from another place without much difficulty. The better the roads are, the more goods can be transported from place to another. Good roads help people to travel easily to places where they can work and to develop their lands and industries. In Malaysia, for example, the improvement of roads has made it easy for skilled workers from the towns to work in remote villages. The people of the villages, on the other hand, have been able to learn much from the towns. This has resulted in improvement in all spheres of economic activity [2].

Many economists such as [3, 4, 5, 6] agree that road transport is a vital element for improving societal welfare. Reference [7] sees the role of transport as similar to an introduction of a “big push” in an otherwise stagnate situation. This “big push” is due to the introduction of an efficient transport system and overcomes stagnation by increasing the marginal productivity of capital which gives incentives for new investments. The resulting spillover effects have stronger impacts than the transport infrastructure itself, the attraction of purchasing power induces an expansion process with increasing demand, rising income, population growth and rural exodus. Reference [7] judges the negative effects caused by the growing spatial disparities to be smaller than the benefits. His conclusion was that a transport system by itself is able to create special impulses for an economic growth process and therefore road transport investment should be undertaken even if they are not economically viable [7].

Good road transport has so many benefits to countries, companies and individuals. It can facilitate the movement of goods and people, create employment, support economic growth, enhance access to education and health care services, as well as connect people to families and entertainment. But the benefits come with costs that have to be looked at. Although the link between roads and human development is not well-established, data from low income countries demonstrate that communities living furthest from good roads experience higher levels of poverty, lower levels of school attendance and worse health outcomes [8].

In Ghana, road transport accounts for 96 to 98% of overall national delivery of people and goods [9]. The medium term programme of the Ministry of Roads and Transport does not envisage any substantial realignment of the overall transport modal mix [9]. Thus, road transport remains the backbone of the national economy. As a result, the performance of the road transport system is of crucial importance for individual mobility, commercial

activities, public welfare and economic growth and development of the nation [10]. Thus, the effects of bad roads in Ghana particularly in the Gushegu District cannot be overemphasized. Bad roads impede development including transportation of goods and services from one location to the other. In spite of these perceived effects of bad roads, the issue has not been adequately addressed by researchers and scholars, hence the need for empirical investigation to ascertain its effects on the transportation system.

## **2. Research Question**

To what extent do bad roads affect the transport operations in the Gushegu District in the Northern Region of Ghana?

### **2.1 Literature**

The term transport is defined by many people in different ways to suit their need. According to [11] transport is defined as a system of transporting passengers or goods to a particular country or area. [12] defined transport as the movement of people, animals, goods or services from one location to another. Based on these two definitions, transport can be defined as the act, process or any means of carting people, goods or services from one place to another, through road, railways, sea or air.

Transport can be divided into infrastructure, vehicles and operations. According to [13] in studying transport it is necessary to recognize two important but clearly interrelated elements; infrastructure and roads. Infrastructure includes roads, rail trucks, airspace and associated terminal facilities such as distributed centers, railway stations, ferry terminals and so on, on which movement takes place or on which transport needs are met. A road is an identifiable route, way or path between two or more places. Roads are typically smoothed, paved, or otherwise prepared to allow easy travel; though they need not be, and historically many roads were simply recognizable routes without any formal construction or maintenance. In urban areas, roads may pass through a city or village and be named as streets, serving a dual function as urban space easement and route. The 20th century saw the rapid development of comprehensive road transportation systems, such as national highway systems, and of automobile manufacturing as a major economic sector. Individual transportation became widely available to middle income social classes, particularly after the Second World War. This was associated with significant economic opportunities to service industrial and commercial markets with reliable door to door deliveries.

The most common road vehicle is the automobile; a wheeled passenger vehicle that carries its own motor. Other users of roads include buses, trucks, motorcycles, bicycles and pedestrians. As of 2002, there were 590 million automobiles worldwide. Road transport offers a complete freedom to road users to transfer the vehicle from one lane to the other and from one road to another according to the need and convenience. This flexibility of changes in location, direction, speed, and timings of travel is not available to other modes of transport [13].

### **2.2 The Nature of Road Transport in Ghana**

Transportation in Ghana is accomplished by road, rail, air and water. Ghana's transportation and communications network are centered in the southern regions, especially the areas in which gold, cocoa, and

timber are produced. The northern and central areas are connected through a major road system [14]. Road transport is by far the dominant carrier of freight and passengers in Ghana's land transport system. It carries over 95% of all passenger and freight traffic and reaches most communities, and is classified under three categories namely; trunk roads, urban roads and feeder roads [15]. The Ghana Highway Authority, established in 1974 is tasked with developing and maintaining the country's trunk road network totaling 13,367 km, which makes up 33% of Ghana's total road network of 40,186 km [15].

Trunk roads in Ghana are categorized as National roads, Regional roads, and Inter-regional roads, all of which form the Ghana road network. National roads, designated with the letter N, link all the major population centers in Ghana. Regional roads, designated with the letter R, are a mix of primary and secondary routes. These serve as feeder roads to National roads; while Inter-Regional roads, designated with the prefix IR, connect major settlements across regional borders. With respect to this mode of transport, many people prefer to use the public means. Many of the towns and cities in the country can be reached by the use of urban buses known as 'trotro' or taxis. For inter-regional transport bigger buses are usually used [15].

According to [16], road as a means of transport, is a path on land established for the movement of vehicles, humans and animals. Roads offer a dependable route for the movement of goods and services from one place to the other. For roads to effectively provide the functions described above, it should be in good shape. However, a deplorable road in itself is a recipe for vehicular accidents. It is not surprising that road accidents keep increasing day in day out with its adverse effect on the lives of its users and the country at large. According to the World Health Organization [17], about 1.3 million persons are killed and additional 30-50 million are injured annually in road traffic accidents. The worst part of these statistics is that majority of the road crashes that is over 85% occur in low and middle income countries where over 81% of the world's poor population live and own about 20% of the world's vehicles. Unfortunately most African countries and for that matter Ghana is placed in this category [17].

Statistics from the National Road Safety Commission indicates that between 1990 and 2010, a total of 200,678 crashes involving 311,075 vehicles were recorded with 272,689 casualties. There was a little respite in 2010 as compared to 2009 with a marginal reduction in crashes from the 2009 figure of 12,299 to 11,506. Regional breakdown places the Greater, Ashanti and Eastern Regions as the worst accident prone regions with the 2010 statistics for these aforementioned regions as 5122, 1944 and 1182 respectively. Interestingly, rural areas where agriculture is the thriving economic activity are the worst affected in terms of bad roads. This has subsequently affected productivity in the agricultural sector which is the largest sector in the Ghanaian economy employing some 50% of the country's total employed labor. Farming and for that matter agriculture thrives on good transport system as most of the produce from agricultural activities are bulky and hence requires vehicular transport on motorable roads to the various marketing centers [16]. The reason why most Ghanaians are extremely poor, especially those living in the three Northern Regions of Ghana, is partly due to the transport system of the country. People in rural areas are inarguably the most hardworking population of Ghana and contribute significantly to the country's labor force, yet the most deprived. They occupy more than half of the total land area of Ghana and contribute close to 50% of the total food and meat needs of the nation [18]. The refusal of governments to develop the poor roads in the north became a major topic for traditional authorities in

meetings of the Regional Houses of Chiefs in the Northern, Upper East and Upper West Regions in the last few years. There have been series of demonstrations by some community youth and their leaders amidst road blocks and destruction of government properties with the aim of drawing governments' attention to the deprived nature of their roads, schools and health centers especially during general elections. So far, out of the 25 Districts in the Northern Region in particular, only the Tamale-Yendi road is a tarred road built by government to enhance economic activities of the people. Districts like; Central Gonja, Savelugu-Nanton and West Mamprusi are accidentally enjoying asphalt roads because of their strategic location on the main Kumasi-Bolgatanga trunk road. It is argued that close to 87% of the roads in Northern Ghana are un-motorable and poses real danger to the lives and socio-economic development of the people [18].

### ***2.3 The Road transport infrastructure in the Gushegu District***

The transport system of the Gushegu District is characterized by a network of trunk roads, feeder roads, and footpaths, which are categorized into engineered, partially engineered, and non-engineered. The non-engineered roads which are the majority in the district, are predominantly unpaved, and ranges in conditions of poor, fair, and good [19]. Apart from the 3.5 km bituminous surface feeder road within the Gushegu Township, all the other feeder roads within the districts are of earth or gravel surface. The feeder roads within the district are mainly connected to the major trunk roads that link the Gushegu District to other districts, namely, Karaga, East Mamprusi, Bunkpurugu/Yunyoo, Chereponi, Saboba, and Yendi Municipality [19]. According to the [19], the main trunk roads which link the regional capital Tamale are, Yendi Municipal, and East Mamprusi. However, these trunk roads are poorly maintained and are in deplorable states. The poor maintenance of these roads, coupled with their poorly drained nature, has resulted in erosion and potholes, making it difficult for vehicles to ply them. Also found in the district are foot bridges, which connect to some villages that are out of reach, especially during the rainy season. The bridges enable inhabitants in those villages to be able to carry their farm produce to market centers, have access to health facilities and other social services.

[20] state that transport modes available within the district are characterized by motorized and non-motorized means with various carrying capacities. Head loading and walking, bicycle, donkey cart, and push cart, mainly used over short distances, constitute non-motorized modes, while motorbikes, passenger vehicles, such as minibus, and cargo vehicles (medium and heavy trucks), are the main motorized modes of transport in the district. Data from the field indicated that the most frequently used modes of travel are bicycles and walking. Motorized transport services are mostly found on market days, with the exception of the Metro Mass Transit Buses (MMTB), which provide two round-trip's from Gushegu to Yendi and Gushegu to Tamale. These vehicles move on a daily basis. According to the transport operators, the low volume of vehicles operating in the area is as a result of the poor nature of the roads, as it increases their maintenance cost.

### ***2.4 Road Transportation and Economic Development***

Poor road conditions and transportation system hinder movement of goods and people in the urban areas. Lack of adequate infrastructure could also be a disincentive to both local and foreign investors in our urban areas. Constraints to productivity at the city level, such as infrastructure deficiencies reduced the productivity of firms

and households and this affected the aggregate productivity of the economy [2].

According to [21], the economic importance of transportation development is related to improving the welfare of a society through appropriate social, political and economic conditions. The expected outcomes are quantitative and qualitative improvements in human capital for example income and education levels as well as physical capital such infrastructures e.g. utilities, transport, telecommunications. While in the previous decades, development policies and strategies tended to focus on physical capital, recent years has seen a better balance by including human capital issues. Irrespective of the relative importance of physical versus human capital, development cannot occur without both as infrastructures cannot remain effective without proper operations and maintenance while economic activities cannot take place without an infrastructure base. Because of its intensive use of infrastructures, the transport sector is an important component of the economy and a common tool used for development. This is even more so in a global economy where economic opportunities are increasingly related to the mobility of people, goods and information.

The relation between the quantity and quality of transport infrastructure and the level of economic development is apparent. High density transport infrastructure and highly connected networks are commonly associated with high levels of development. When transport systems are efficient, they provide economic and social opportunities and benefits that result in positive multiplier effects such as better accessibility to markets, employment and additional investments. When transport systems are deficient in terms of capacity or reliability, they can have an economic cost such as reduced or missed opportunities and lower quality of life. At the aggregate level, efficient transportation reduces costs in many economic sectors. In addition, the impacts of transportation are not always intended and can have unforeseen or unintended consequences. For instance congestion is often an unintended consequence in the provision of free or low cost transport infrastructure to the users. Transport also carries an important social and environmental load, which cannot be neglected. Assessing the economic importance of transportation requires a categorization of the types of impacts it conveys [21].

Mobility is one of the most fundamental and important characteristics of economic activity as it satisfies the basic need of going from one location to the other, a need shared by passengers, freight and information. All economies and regions do not share the same level of mobility as most are in a different stage in their mobility transition towards motorized forms of transport. Economies that possess greater mobility are often those with better opportunities to develop than those with scarce mobility [22]. Economic growth is increasingly linked with transport developments, but also with managerial expertise, which is crucial for logistics. Thus, although transportation is an infrastructure intensive activity, hard assets must be supported by an array of soft assets, namely management and information systems. Decisions have to be made about how to use and operate transportation systems in a manner that optimize benefits and minimize costs and inconvenience [23].

### ***2.5 Rural Roads and Transport Structure on Development***

Rural transport network in most developing countries are still underdeveloped and of poor quality. Rural households particularly women, spend much time and effort on transport activities to fulfil their basic needs. Too many communities still do not have reliable access to main road network or motorized access (of the 3

billion estimated rural population in developing countries, 30% are living in villages without reliable access while ten percent 10% are not provided with motorized access at all [24]. The Commission for Africa's report, the document which served as the basis for the United Kingdom's recent attempt to include Africa on the agenda of the G8 and European Union, proposed a "big push" on many fronts at once to enhance Africa's economic growth [25]. Rural roads in this report were seen as a key component for encouraging economic growth and therefore poverty reduction [26], have argued that tropical Africa is stuck in a poverty trap, also requiring a "big push" in investments, especially infrastructure. According to [25], low domestic saving is not offset by large inflows of private foreign capital, for example foreign direct investment, because of Africa's poor infrastructure.

Rural roads again were held up as a necessary mechanism to improve economic growth [25], argued that, before high-intensity modern trade can get started, Africa needs an extensive road system both from the coast to the interior and within the interior. The [27], defined rural road provision as an intermediate form of development, its demand being derived from activities of other sectors. According to the [1] report on rural roads and transport, 70% of the world's population live in rural areas. The World Bank defines rural transport as all transport activities that take place at local government and community household levels. It comprises both motorized and non-motorized transport and rural transport infrastructure. Most literature on transport in developing countries describe rural transport infrastructure as in bad condition, seasonally passable and poorly maintained. This constrains access as well as social and economic development [28, 29]. Within the rural travel and transport sub-sector, men and women's experiences of transport and transport services differ. Majority of transportation in the rural areas is done on foot and by head load. Women particularly, have to travel long distances to reach fuel wood supplies, health facilities, portable water and markets. The extent to which the transport burden on women can be improved will depend on the policies affecting rural development and the role of women in the planning of transport and social services. Reference [30] explained that, impacts relating to rural road provision were distinguished and subdivided as direct and indirect effects. Direct effects are registered in the impact zone by reduced travel time to work, schools, hospitals, markets, etc. and savings in fuel and other direct transport costs. The indirect effect consists of increases in income and other dimensions of well-being such as health, education, social interaction and political participation.

One prominent example of research on impact of rural roads was the impact assessment on rural road provision in Peru [31]. In this study, focus was given to human development as well as income oriented measures. The findings proved illuminating, in particular, within the targeted areas. There appears to be a tendency to improved living conditions such as availability of potable drinking water, lighting, or communal facilities or availability of goods such as televisions, tractors or bicycles [27]. In other economically oriented study across 129 villages in Bangladesh, villages with better access to roads were found to have significantly better agricultural production, household incomes, wage incomes of landless labor, health and the participation of women in the economy [32].

In two similar studies in rural China and India, a remarkably stable trio of factors emerged, namely: education, rural road provision and research and development into food productivity. In India, rural road provision had the biggest single impact on poverty reduction [33] while in China it had the third largest [34]. The results in India led [35] to conclude that, "for every one million rupees spent on roads, 124 people are raised above the poverty

line”. [36] in [37] that found “that road density was one of the significant determinants of household-level prospects of escaping poverty in rural China”. Even as early as 1982, USAID was reporting the positive impacts of rural road provision. It was noted, for example, that rural roads enabled inhabitants to more easily reach health clinics [38]. The cited studies appear to offer a persuasive argument to increase expenditure on rural road provision. Yet, neither the arguments nor the evidence were by any means conclusive in demonstrating the necessity of a “big push” in rural road provision in Africa. As [37], states unfortunately, there is as yet little convincing empirical evidence that rural roads affect social outcomes beyond what they would have been without the road. [37] statement resonates in a number of other documents. For instance, in the World Bank’s Poverty Reduction Strategy Paper (PRSP) sourcebook, it was stated that knowledge of the transport conditions of the poor, and especially how these interact with other factors is modest [39]. The 2004 World Development Report affirms that baseline data is needed for rural roads with far-reaching impacts on poverty, health, and education outcomes [40].

As [41], states; “our ability to predict, either positive or negative social outcomes - resulting from specific investments - remains primitive. Investment in transport, especially if this is simply in the road element, as is commonly the case, without a corresponding effort to improve actual services – remains as a “necessary but not sufficient” condition for changes to occur”. The equitable distribution of the economic benefits of rural roads has also been questioned. It has been argued that the economic benefits of rural road interventions accrue mainly to the rich and that this process is accentuated by the present rural road Cost Benefit Analysis (CBA) methodologies whose focus is on efficiency not effectiveness or equity [37, 32 , 39]. This raises concerns about the viability of the suggestions of the [42 , 26], as these arguments were premised on the ability of rural road interventions to impact upon the income of the poorest. The implication was that even with money spent on rural roads, poverty levels as measured by income could remain largely unaffected [25]. Given these methodological and contextual limits, some suggestions have been made to improve the knowledge of the impact of rural roads [41], states that “re-orienting the debate away from a focus on investment in roads and towards more holistic changes in transport conditions has to be the key component of any way forward”. This statement reverberates amongst other experts.

## ***2.6 Bad Roads and Vehicles’ Maintenance/Services***

Most motorists and transporters face a lot of inconvenience and hardship due to bad roads in India. The poor road conditions have increased the vehicle maintenance costs of city transporters as compared to their counterparts in states like Gujarat or south Indian. These bad roads has increased the maintenance cost of buses by 30%. Bad roads are damaging the suspension, steering box and shock absorbers of many buses [43].

Reference [43] observed that due to bad roads, technical snags on buses have increased manifold. Problems at foundation bolt, suspension and reports on flat tires have become common. Reference [43] who runs a fleet of buses in the city, said that the wear and tear of tyres has increased. This increases the transportation costs, which are passed on to consumers [44], a transporter, said that the potential effects of deteriorating roads extend far beyond increased vehicle maintenance and repair costs. Driving on roads with deteriorated pavement and potholes leads to frequent maintenance, trucks plying on bad roads experience more vibrations and could



damage the cargo being transported and increased consumption of fuel which possibly could hike cost of maintenance of vehicles and prices of transportation.

Reference [45] analyzed the impact of road maintenance on VOCs. He compared a limited number of potential road maintenance strategies against a base case which consists of routine maintenance only at a cost of \$322 per km (i.e. off-carriageway work). The five maintenance strategies evaluated include: patching; surface-treated reconstruction (flexible pavement with a crushed stone base and double bitumen surface treatment), initiated when surface roughness reaches Seven International Roughness Index (7IRI m/km), with patching; surface-treated reconstruction as above, without patching; asphalt-concrete overlay, initiated when surface roughness reaches 5 IRI, with patching; and asphalt-concrete overlay, initiated when surface roughness reaches 5 IRI, without patching. The analysis examined these strategies over a twenty-year period during which traffic was assumed to grow at 3% annually. The net present values of each option were calculated using a 12% discount rate. The results were summarized for roads in both poor and fair condition for initial average daily two-way traffic volumes (AADTs) of 500 and 1,000 vapid. Seventy percent of the traffic consists of trucks. Expenditures on maintenance and VOC savings expressed as annualized cash outlays and savings. The benefit and cost ratios likewise showed the annualized cash payoff from each strategy.

According to [45] potholes cause immense damage to vehicles. He said to better understand the additional costs associated with potholes, the Federation of Zambian Road Hauliers interviewed truckers to compare the running costs of a truck and trailer combination on a road with potholes with those on a road without potholes. He said the vehicle considered was a combination tractor and trailer with twenty-two wheels. The costs estimated are those over and above normal running costs. He said on a road with bad potholes, a driver can either pursue a defensive strategy or ignore the potholes and carry on as usual. If he follows a defensive strategy, he first slows down and changes gears. He then has to negotiate the loaded truck and trailer, weighing between 44 and 50 tonnes, through the potholes. This causes extra stress on the tyres, wheel bearings, spring assemblies, spring hangers, chassis, cross-members, engine mountings, gear box mountings, brakes, steering assemblies, and shock absorbers. Having negotiated the potholes, he accelerates and changes gears again. On the other hand, if he ignores the potholes, he will drive through them at his regular speed, resulting in more damage to the vehicle and tyres and increasing the risk of accidents which could result increasing axle pressure by at least three times.

The survey conducted concluded that annual expenditures are over and above normal running expenditures due to extra fuel consumption, damage to goods, down-time of trucks under repair, and accidents caused by potholes.

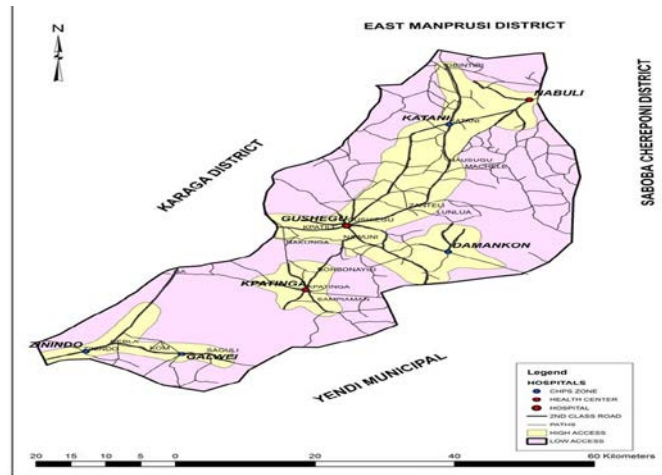
### **3. Methodology**

This section of the paper outlines a brief description of the study area and methodology. The methodology encompasses the research approach, sampling techniques and methods of data collection.

#### **3.1 The Study Area**

The Gushegu District is one of the twenty-six (26) districts in the Northern Region of Ghana where the study

was done. The Gushegu District was carved out of the former Eastern Dagomba District, and is the third largest district in the Northern Region. The capital is Gushegu which is 105 kilometres North-East of Tamale, the capital of the Northern Region. The district shares boundaries with the East Mamprusi District and Bunkpurugu/Yunyoo District to the North, Yendi municipal to the south, Saboba and Chereponi Districts respectively to the east and Karaga District to the west. Figure 1 shows the map of the district under study.



**Figure 1:** The Map of the study area. Source: [www.gushegudistrict.gh.com](http://www.gushegudistrict.gh.com)

Gushegu, can boast of the largest cattle market in the region. It also has one of the largest and busiest agricultural produce markets in the region, which attracts traders from Techiman, Bawku and even Burkina Faso.

The district covers 395 communities. According to the Population and Housing Census of 2010 [46] released by the Ghana Statistical Service, the district has 112,826 inhabitants. The sex distribution of the population is made up of 55,285 males, representing 49% and 57,541 females representing 51%. The main trunk roads in the district consist of Yendi- Gushegu, Tamale-Karaga-Gushegu, and the Nakpanduri-Gbintiri- Gushegu roads. Total feeder roads amounts to 311.1 km out of which 147.8 km is engineered, 108.2 km partially engineered and 55.1 km is not engineered [46].

### 3.2 Research Approach

The survey approach comprising mainly quantitative methods was employed in collecting and analyzing data. Quantitative research approach provides a relation between empirical observation and mathematical expression of quantitative relationships. This approach emphasizes the collection of numerical data and is a deductive approach [47]. As a deductive approach it develops theories, hypotheses and designs a research strategy to test the hypotheses [48]. Quantitative research approach is based on already decided and well-structured questions, whereby all the respondents will be asked the same questions. Thus, the survey design allowed for easy quantification of data on the effects of bad roads on transportation.

### 3.3 The Study Population and Sampling Procedures

The study population constituted 50 Drivers, 50 Driver Mates and 50 Transport Owners ply the Tamale-Gushegu road on daily basis. In this regard, the accidental sampling technique was employed since these group of people are always on the move.

### ***3.4 Instruments for Data Collection***

The researcher used survey questionnaire to gather data for the study. The survey questionnaire was administered to Drivers, Driver Mates and Transport Owners. According to [49], there are distinct advantages in using a questionnaire versus an interview methodology. Questionnaires are less expensive and easier to administer than personal interviews, they lend themselves to group administration; and, they allow confidentiality to be assured. Questionnaires allow for the collection of unbiased information since data given by respondents is with limited interference on the part of the researcher [50]. For these reasons, the researcher used a questionnaire to assess opinions on the effects of bad roads on transportation system and its maintenance and service cost in the Gushegu District of Northern Region of Ghana.

### ***3.5 Data analysis***

In analyzing research data, the main task is to understand the case through teasing out relationships, probing issues and aggregating the data categorically [51]. Therefore, the Statistical Package for Social Sciences (SPSS) software was used to analyze the data. The results were presented as frequencies and percentages in tables and figures in order to help discussions. The response with the highest frequency and percentage was considered as the majority or general opinion of the people with regard to that question.

## **4. Results and Discussion**

This section of the paper presents results and discussion of field data on the effects on bad roads on transportation. This includes the frequency of road use by respondents.

### ***4.1 Frequency of Road Use***

The field data revealed that Gushegu road had been used by Drivers and Driver Mates daily in carrying passengers from Tamale.

Following from this, greater percentage (98.7%) of respondents indicated they use the road daily. In terms of the frequency of the usage of the roads, 52.7% representing 79 respondents admitted used the road weekly, 32% used the roads monthly, with the rest of 15.3% used the roads on a daily basis.

This confirms the fact that most of the users in the district are government workers and business men and women who mostly reside in urban areas but commune on the roads on daily basis to transact businesses.

### ***4.2 Nature of Road Network***

In terms of the assessment of the road network in the district, about 80% of the respondents agreed that the roads

were generally bad. Only 20% agreed that the roads were moderately good as shown in Table 1

**Table 1:** Results on the assessment of road network

| <b>Responses</b>                         | <b>Frequency</b> | <b>Percent</b> |
|--|------------------|----------------|
| They agreed the roads were generally bad | 120              | 80             |
| They said the roads were moderately good | 30               | 20             |
| <b>Total</b>                             | <b>150</b>       | <b>100</b>     |

Source: Field Survey, 2014

On the issue of travelling through the roads, almost all (98%) the respondents agreed that they did not find it comfortable travelling by the roads in the district as in Table 2. Reasons cited in this case were numerous potholes, illegal rumble strips, dust and long hours spent on the road. The nature of the roads also had negative impact on transportation of certain goods namely perishable and breakable goods.

**Table 2:** Responses on travelling through the roads

| <b>Responses</b>                                | <b>Frequency</b> | <b>Percent</b> |
|---|------------------|----------------|
| They do not find comfortable travelling through | 147              | 98.0           |
| They found comfortable travelling through       | 3                | 2.0            |
| <b>Total</b>                                    | <b>150</b>       | <b>100</b>     |

Source: Field Survey, 2014

#### **4.3 Effects of Bad Roads on Vehicle Maintenance/Service Cost**

Bad roads contribute negatively to national development because transport systems become dormant affecting economic activities, which by extension stagnant economic growth. Bad roads also tremendously affect the cost of maintenance as vehicles plying bad roads mostly experience frequent breakdowns. The research outlined questions to determine the extent of bad roads on vehicle maintenance.

In the light of this, respondents were equally asked if the nature of roads did affect the lifespan of their vehicles plying this route. Almost 130 representing 86.7% said yes.

This finding is consistent with the study carried out by [42] that, the potential effects of deteriorating roads extend far beyond increased vehicle maintenance and repair costs.

Transporters here pay more to drive than the rest of the country the reason he found was the bad roads. Thus, driving on roads with deteriorated pavement and potholes leads to frequent maintenance, he said. Moreover, trucks plying on bad roads experience more vibrations that could damage the cargo being transported. While 13.3 % representing 20 respondents said the nature of the roads did not affect lifespan of vehicles as presented in Table 3.

**Table 3:** Responses of how the nature of roads affects the lifespan of vehicles

| <b>Responses</b>                                       | <b>Frequency</b> | <b>Percent</b> |
|--|------------------|----------------|
| The nature of roads affect lifespan of vehicles        | 130              | 86.7           |
| The nature of roads do not affect lifespan of vehicles | 20               | 13.3           |
| <b>Total</b>   | <b>150</b>       | <b>100</b>     |

Source: Field Data, 2014

As shown in Table 4, when respondents were further asked if the nature of roads affected their vehicles maintenance/service costs, 139 representing 92.7% said yes with few respondents 11 representing 7.3% said no. This finding also conforms with [41] who in his study on the effects of bad roads on costs of transport maintenance in southern-Indian put the percentage increase of maintenance/service costs of vehicle as 30% due to poor roads nature compared to that of cost of vehicles on good roads which is not different in Ghana.

**Table 4:** Results on how bad nature of roads affects vehicle maintenance/service costs

| <b>Responses</b>   | <b>Frequency</b> | <b>Percent</b> |
|--|------------------|----------------|
| Nature of roads affect vehicle maintenance/service costs           | 139              | 92.7           |
| Nature of roads does not affect vehicle maintenance/service costs. | 11               | 7.3            |
| <b>Total</b>   | <b>150</b>       | <b>100</b>     |

Source: Field Survey, 2014

Respondents were further asked whether their cars frequently break down resulting from bad roads. In this regard, 64% of respondents indicated that indeed they frequently experience break down of their vehicles. Those who said they do have their car frequently breakdown, their reasons were not different from what they mentioned with regard to the effects of the nature of roads network on cost of maintenance of vehicle.

On the issue of how much they pay on average for breakdown repair, 60% of respondents indicated that they spent above GHC100.00 on maintenance whilst the rest indicated they spent above GHC200.00

## **5. Conclusions and recommendations**

### **5.1 Findings**

The findings of study are summarized as follows:

1. In terms of the assessment of the roads network in the district, majority of the respondents agreed that the roads were generally bad and affected transportation in the district.
2. Due to the bad nature of roads most travelers found it uncomfortable travelling on the roads.
3. It was found that the bad natures of roads had greatly increased vehicle maintenance and repair costs.
4. The study also revealed that the bad nature of roads is greatly affecting the farming communities, leading to high increased of prices of agricultural products and declining, health care deliveries on maternal/child care mortality among others.

## **6. Conclusions**

From the findings, it can be concluded that the study finds evidence of the effects of bad roads on transportation and maintenance of vehicles in the Gushegu District of Northern Ghana. Good roads infrastructure makes transportation of goods/services and human easy which is a country's wheel of development. Good roads facilitate easy transportation and timely delivery of goods/services. They can also contribute to high agricultural productivity and good quality health care delivery. Apart from this, good roads keep the loss of human life, goods and properties at minimal rates and provide convenient and comfortable mode of transportation of people and serve as a recreational avenue. Good roads help reduce maintenance, fuel and running cost on transport. There is no doubt about the benefits good roads can bring to the Gushegu District. The nature of roads in the Gushegu District was the major issue affecting its developmental activities. Successive governments and decision-makers need to improve the policies with regard to roads infrastructure in the District to accelerate the needed development the District deserves.

## **7. Recommendations**

Based on the conclusions, the following recommendations are made to improve the road infrastructure policies and practices in Ghana so as to help improve the local communities in the districts.

Successful implementation of road infrastructure policies and projects in the Northern Region will bring development to the districts. The amount that goes into the Road Infrastructure Development Fund (RIDFF) should be reviewed and increased to help fund more developmental projects due to an increase in population of the catchment communities in the Districts.

The government needs to train selected teams well to be able to successfully face the challenges of implementing road infrastructure policies. A responsible and active team is needed to engage members of the district well enough to assist in implementing road infrastructure strategies effectively.

The government must always follow up on reports to check whether projects being implemented are done properly. Standards assessments should be the number one priority.

Wherever possible, road infrastructure projects should be carried out by expert roads construction Engineers.

Routine monitoring and evaluation can be built into road infrastructure investment policies to ensure that roads construction carried out by contractors are properly done. When the roads are good, it will bring more development into the District and last longer.

## **References**

- [1] World Bank (2000), Rural Roads and Transport: Overview and Conclusions from managing and financing rural transport infrastructure. Washington. World Bank, electronic; <http://www.worldbank.org/file>.
- [2] World Bank (1992) Urban Policy and Economic Development. An Agenda for the 1990's. World Bank, Washington D.C.
- [3] Lombard, P., & Coetzer, L. (2006). "The Estimation of the Impact of Rural Road Investment on Socio economic Development".
- [4] Van de Walle, D. (2002). "Choosing Rural Road Investment to Help Reduce Poverty", World Development, Vol. 30(4), pp. 575 – 589.
- [5] Ojukwu, C. (2000). "Economic Analysis and Prioritization of Feeder Road Rehabilitation: Incorporating Vehicle Operating Costs, Passenger Time and Producer Surplus Transport Costs Savings -the Case of South- western Uganda", Economic Research Paper No. 54, African Development Bank.
- [6] Rwebangira, T. (2005). "Rural Roads as Stimulants of Economic Development".
- [7] Kwabina. A. (2010) "Economic appraisal and prioritization of feeder road projects in Ghana". Electronic:
- [8] Watkins, K., & Sridhar, D. (2009). Road Traffic injuries: The hidden development crisis. A policy briefing for the First Global Ministerial Conference on Road Safety, Moscow, 19-20.
- [9] Salifu, M. (2008). Course Notes on Road Safety, KNUST, Kumasi, Ghana.
- [10] Mustapha, M., (2011). "Impact of Transportation on Economic Growth". An Assessment of road and Rail Transport System. Wednesday, January 26, 2011.
- [11] Oxford Advanced Learner's Dictionary for International Students Edition, (2013). Definition of

transport.

- [12] Jean-Paul, & Theo. Notteboom (1998). *Transportation in Geography*. Retrieved July, 12, 2013, from: <http://www.people.hofstra.edu/geogras/eng/ch1en/conc1/ch1c1en.html>.
- [13] Bamford, C.G. (2001). *Transport Economics*, University of Huddersfield. Huddersfield.
- [14] Clark, Nancy L. (1994) "Transportation and Telecommunications" A Country Study: Ghana, La Verle Berry, editor. Library of Congress Federal Research Division, November 1994.
- [15] Veronica Ablordeppey (2012). "The Transportation Problem of a Beverage Industry: A case study of Accra brewery Limited. A thesis submitted to the Department of mathematics, Kwame Nkrumah University of Science and Technology Ghana, 2012.
- [16] Yeboah, K. (2012). "Effects of bad roads on transport in Ghana". Retrieved: August 23, 2013, from Ghana Web Site: <http://www.ghanasocccernet.com/a-look-at-deplorable-vis-vehicularaccidents>.
- [17] World Health Organization. (2007). *Maternal Mortality in 2005. Ashanti Region Report 2009: Ghana Health Services*.
- [18] Ativor, D. (2009). Deputy Minister Assures Business Community of Reliable Transport System. *Ghanaian Chronicle* August 19, Edition (Accra). electronic: retrieved 20th June, 2014 from <http://www.modernghana.com/deputy-minister-assures-business-community>.
- [19] Gushegu District Assembly (GDA, 2006). [Gushegudistrict.gh.com](http://Gushegudistrict.gh.com). retrieved 2010-06-08.
- [20] Ekekpe, E. Boani, M. P., & Bonny, A.A. (2009). "Combating Maternal Mortality" in the Northern Region. Electronic: Retrieved from September, 2014. <http://www.ghanadistricts.com>.
- [21] Jean-Paul, & Theo. Notteboom (1998). *Transportation in Geography*. Retrieved July, 12, 2013, from: <http://www.people.hofstra.edu/geogras/eng/ch1en/conc1/ch1c1en.html>.
- [22] Hine, J., Starkey, P., Ellis S., & Ternell, A. (2002). "Improving Rural Mobility, Options for Developing Motorized and Non-motorized Transport in Rural Areas", World Bank Technical Paper No. 525.
- [23] Jean-Paul, & Theo. Notteboom (1992). *Transportation in Geography*. Retrieved July, 12, 2013, from: <http://www.people.hofstra.edu/geogras/eng/ch1en/conc1/ch1c1en.html>.
- [24] Schelling, D., & J. Lebo (2001). "Design and Appraisal of Rural Transport Infrastructure: Ensuring Basic Access for Rural Communities" Technical paper. Washington, D.C.: World Bank. ISBN 0-821-491-8.



- [25] Porter, S. (2005). "Enhancing Rural Road Policy: The Case of Incorporation of the Capabilities Approach into Rural Road Appraisal in Africa", CSSR Working Paper No. 115, University of Cape Town.
- [26] Sachs, J. M. T. (2004). "Ending Africa's Poverty Trap" UN Millennium Project Retrieved from Brooking Papers on Economic Activity 1:2004, pp117-240.: electronic: <http://www.unmillennm'sproject.org/document/>
- [27] World Bank. (2001). World Development Report (2001/2002): Attacking Poverty." Washington: World Bank.
- [28] Airey, T. (1992). Transport as a Factor and Constraint in Agricultural production and marketing. Retrieved from World Bank Suba-Saharan. Africa.TransportProgram,Rural Travel and Transport project.
- [29] Nancollas, S. (1999). From Camels to Aircraft: The development of a simple transport management system designed to improve health service delivery.
- [30] Grootaert, C. (2002). Socio-economic Impact Assessment of Rural Roads. Washington, Retrieved from World Bank: electronic .copy: [http://www.poverty.worldbank.org/files/11274.\\_c.grooter-impact Rural\\_Roads\].pdf](http://www.poverty.worldbank.org/files/11274._c.grooter-impact Rural_Roads].pdf).
- [31] Nasir, O (2016). "The Impacts of Transport infrastructure Provision on Economic Development". A Case study of Aweday Town of Oromia Region Ethiopia. A Master's thesis proposal from in the Department of Urban Infrastructure Provision Management. June 14, 2016.
- [32] Gannon, C., & Liu, Z. (1997). "Poverty and Transport", TWU Discussion paper, TWU – 30. Washington, D.C World Bank. Electronic copy: <http://www.worldbank.org/transport133>.
- [33] Zhi. (2000). "Economic Analysis of a Rural Basic Access Road Project - the Case of Andhra Pradesh", the World Bank Infrastructure Notes No. RT-5, January, 2000.
- [34] Dieter, S., & Liu, Z. (2000). "Designing a Rural Basic Access Road Project - the Case of Andhra Pradesh, India", the World Bank infrastructure Note No. TR-4, January, 2000.
- [35] Fan, S., Hazzel, P., & Thorat, S. (2000), "Government Spending, Growth and Poverty in Rural India", American Journal of Agricultural Economics, Vol. 82(4), pp 1038 – 1051.
- [36] Jalan, J., & M. Ravallion (1998) "Is Transient Poverty Different? Evidence from Rural China" Journal of Development Studies, Vol. 36, No. 6, pp.8.
- [37] Van de Walle, D. (2002). "Choosing Rural Road Investment to Help Reduce Poverty", World Development,

- [38] United State Agency for International Development. (1982). "Rural Road Evaluation Summary Report – A.I.D Program Evaluation Report No. 5", PN-AAJ-607, U.S Agency for International Development (USAID), USA.
- [39] Gannon, C., & Liu, Z. (2000). "Transport, Infrastructure and Services" in the World Bank Poverty Reduction Strategy Paper. A Source Book, Washington, World Bank, Washington DC. Electronic <http://www.worldbank.org/transport/publicat> Grant-Muller, S. M.
- [40] World Bank, (2004): World Development Indicators CD-ROM, World Bank, Washington, D.C.
- [41] Howe, J. (2003). "Transport for the Poor or Poor Transport?" International Labor Organization (ILO), Geneva. Electronic copy: <http://www.ilo.org/asist>.
- [42] Commission for Africa (2005). "Our Common Interest: Report of the Commission for Africa", United Nations Commission for Africa. Electronic, [www.commissionforafrica.org](http://www.commissionforafrica.org), accessed, 21 February, 2008.
- [43] Proshun, C. T. (2011). Bad Roads Increase Vehicles Maintenance. Retrieved July10,2013, from <http://www.articles.times.indiatimes.com/2011-8-09/nagpur/29868488-1-roads-burst-transport>.
- [44] Jaiswal Pankaj (2011). "Qualitative assessment of landslide hazard along transportation lines using historical records.
- [45] Heggie, I. & Vickers, P. (1998). Impact of poor road maintenance. Retrieved August, 21th 2013, electronic:<http://www.worldbank.org/INTROADSHIGHWAYS/10-poor-rd-ma>.
- [46] Population and housing census (PHC, 2010). "Gushegu District Analytical Report". Ghana statically service,October, 2014.
- [47] Bryman, A., & Bell, E. (2003). Business Research Methods. New York. Oxford University Press Inc.
- [48] Saunders, M., Lewis, P., & Thornhill, A. (2003). 3rd. Research Methods for Business Students, Prentice Hall.
- [49] Leary, M. R. (1995). Behavioral Research Methods. 2<sup>nd</sup> Ed.).Pacific Grove, CA: Brook/ Cole.
- [50] Sarantakos, S. (1998). Social Research. (2<sup>nd</sup> Ed.). China: Macmillan Publishers.
- [51] Stake, R.E. (1994). Case Studies, in N.K. Denzin and Y. Lincoln (eds). Handbook of Qualitative Research. California: Sage Publications, 236–47.