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Full Length Research Paper

Exploring challenges of engaging in socio-economic activities due to traffic congestion in Sekondi-Takoradi

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Undoubtedly traffic congestion continues to be a challenge that negatively impacts socio-economic activities in most cities in the world. It does not only hinder the smooth movement of people but also freight and services. Admittedly, there have been a number of studies that have examined the causes and effects of traffic congestion in Ghanaian cities; nonetheless, these studies have largely concentrated on the larger metropolis which includes Accra and Kumasi with little attention given to mid-sized emerging urban centers. Using data collected from field survey, in-depth interviews and field observations in Sekondi-Takoradi, this study examines the effects of traffic congestion on socio-economic activities along five major road corridors in the study area. The survey data were analyzed using descriptive and inferential statistics while in-depth interviews were integrated with the results using quotes from informants. The findings from the study revealed a spatial variation of the effects of traffic congestion along the five corridors studied. In particular, it was observed that increased traffic congestion led to the reduction in sales made by traders and commercial drivers, while students and workers who used these roads also asserted they often get to school and workplaces very late. The study therefore recommends road expansion along these routes and use of road tolls to regulate the activities of 'trotro' (public buses) and taxis in the city in order to minimize traffic congestion in the city.

Key words: Traffic congestion, socio-economic activities, spatial variation, corridors, Sekondi-Takoradi Metropolis.

INTRODUCTION

Traffic congestion is a worrisome situation for most dwellers in cities across the world. In view of the constraints associated with traffic congestion, an efforts have been made through scholarship to understand the traffic congestion with the intention of providing appropriate remedies for this problem (Porter and Abane, 2008). Undoubtedly, major factors that have contributed to vehicular traffic worldwide have been the rapid growth of cities, mostly in an unplanned fashion and also the increase in automobile vehicles (European Conference of Ministers of Transport (ECMT), 2007). Notwithstanding efforts made by city planners in their attempt to finding lasting solutions to the problem of vehicular traffic, such planners cannot avoid the continuous modeling of

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efficient ways ofto providing the urban centre with the needed transport services since transport is the daily rhythm of life (Hoyle, 1988). In particular, traffic engineers, transportation planners and public officials responsible for metropolitan transportation systems are frequently criticized for failing to make an improvement in traffic congestion (Taylor, 2003; Victorian Competition and Efficiency Commission (VCEC), 2006).

According to Adenle (1981), the causes of vehicular traffic congestion in urban areas include the increased pace of growth of the population and expansion of urban settlements. The former is normally occasioned by regional inequalities in development which often drive human migration to the urban areas in search of employment opportunities in commerce, construction, and manufacturing. The inevitable outcome of this process results in pressure on the existing transport system in urban areas (Osoba, 2012), while the concentration of people and activities also seriously hampers the free flow of vehicles along main road corridors (Osoba, 2012).

The case of a country like Ghana becomes more pronounced as traders who ply their trade in cities refuse to abide by laws that restrict them from the use of the edges of roads as places of petty trading (Ministry of Road and Highways, 2010). This is a major characteristic of the Central Business Districts (CBD) in major cities in the country and Sekondi-Takoradi is no exception. Sekondi-Takoradi metropolis has experienced rapid growth over the years, with a current population size of 559,548, making it the third largest city in Ghana (Ghana Statistical Service (GSS, 2012a, b; Grants and Yankson, 2003). The traffic situation in the metropolis seems to be on the increase, and it is suggested that if the current trend goes unabated, it will be archetypal to that of Accra and Kumasi (Ministry of Energy and Petroleum, 2014).

Presently, Sekondi-Takoradi is faced with undesired traffic congestion due to the lack of efficient spatial planning and forecasting of the City's growth and performance (GNA, 2012). This is particularly true for most cities in Ghana, notably Accra and Kumasi, due to the failure by governments to implement policies and programmes to mitigate urban traffic congestion (Addo, 2006, p.5). Furthermore, the Department of Urban Roads (2012, cited in a report by the STMA (2013 p.44) stated that Takoradi over the years has experienced tremendous increase in the volume of road traffic especially in the CBD. For instance, in their study of 'Vehicular Traffic in Sekondi-Takoradi' on some selected arterial roads in Takoradi, Mahama (2012) found that road traffic in Sekondi-Takoradi generally experienced a positive growth rate of 1.51% between the years 2003 and 2008.

Again, according to the Ministry of Energy and Petroleum (2014), other factors that cause traffic congestion in the city include competition among different services that depend solely on the road transport services services in the city. Such services comprise catering, hospitality, logistics supplies, freight forwarding, fabrication and waste management services (Adams et al, 2014). Owing to the increase in traffic congestion, socio-economic activities within the city are negatively affected, resulting in a decrease in total economic output of the city (Sekondi- Takoradi Medium Development Plan (STMDP, 2011).

Since mobility is such a vital part of enhancing economic growth, it is important that we address constraints within the transport system in Takoradi, especially in light of its recent rapid growth. In particular, there is an urgent need to understand the consequential effects of vehicular traffic on socio-economic activities in the city. This study seeks to investigate the relationship between traffic congestion and socio-economic activities in Takoradi. The theory of Spatial Interaction as espoused by Ullman in the 1980s is used as the theoretical framework guiding this study. Our choice of the theory of spatial interaction emanates from the fact that in order to understand the interconnectedness between traffic congestion and socio-economic activities in the Central Business District (CBD) of Takoradi, there is a need to understand the causes, sources and direction of the flow of traffic in the city.

Situation of traffic congestion in Ghana

The vehicular population ratio in Ghana grew steadily from 31 vehicles per 1,000 population in 2002, to about 44 vehicles per 1,000 population in 2008 (Addison, 2012). Addison (2012) also estimated that Accra has the highest number of registered vehicles of 605,739 followed by Tema 256,956 and Kumasi 200,116 as of March 2012. The total number of registered vehicles in Ghana as of March 2012 stood at approximately 1,425,900. In the year 2013, however, the number of vehicles on roads in the country increased by nearly 23 percent between January and December (Ministry of Transport, 2014).

Unfortunately, the expenditure of the Government of Ghana to expand and build more roads to accommodate the increase in vehicle importations went down by GH¢200million in 2013 (GSS, 2012). In 2014, the number of vehicles registered by the Driver and Vehicle Licensing Authority (DVLA) was 174,234, which was 22.86% higher than the previous year's figure. At the same time, the DVLA inspected about 946,284 vehicles for road-worthiness in 2014, which brings the total vehicle population in the country to nearly a million, with concentration again in the two biggest cities, Accra and Kumasi (GSS, 2012). With this increased number of vehicles in the country coupled with increased population, poor planning of our cities and road infrastructure, poor traffic management, the nature of the public transport system force people to depend on private vehicles, hence

increasing the traffic. Thus, the point should be made that congestion is a systemic problem and all angles need to be looked at (Ministry of Transport MoT, 2012).

Case of Takoradi

Takoradi being the largest and most vibrant city in the Western Region of Ghana benefitted enormously from the establishment of a harbour in 1948 (Obeng-Odoom, 2014) and the development of the railway line connecting the city to the interior part of the country. The railway system, once constructed, enjoyed considerable support from Ghana's first president, Dr Kwame Nkrumah, after Ghana gained independence (1957-1966). However, the railway sector saw some decline during the 1970s (Tsey, 2013) and vehicular transportation took over as the major means of transport in the country and also in Takoradi. The problem relating to the decline of the railway sector is attributable to a number of factors. These include inadequate investment in the sector, inefficient management and competition from the road sector (Tsey, 2013).

Furthermore, according to Obeng-Odoom (2014: 428) ''the political elite oversaw an overt, systematic program to reduce the vibrancy of the rail sector, following a series of railway worker strikes''. As the sector became a nuisance to successive governments, it no longer attracted sufficient central government support. The 1980s witnessed a new approach to Ghana's economic development problems, identifying state-led management of the economy as an inefficient strategy and the bane of Ghana's problem and hence the need to adopt private sector management to enhance economic vitality. Unfortunately, the expectation that investment in the railway sector will revitalize the sector did not materialize.

Vehicular transportation on the other hand was seen by the managers of the economy as a more viable transport mode and symbol of modernity (Addo, 2006). The first road was completed in 1895 and the first car arrived in 1902 (Ministry of Roads and Highways, 2014). Today, most goods such as manganese and bauxite which used to be transported by rail are now transported by road and the situation is putting pressure on the already fragile roads, besides the increased accidents involving vehicles (Ghana News Agency, 2012; Asomaning, 2010). Obeng-Odoom (2014)) stated that the return on newly constructed roads which was 29% was far higher than rail (20%). As a result, the World Bank recommended that the management of rail should be left to market forces, with support to road construction and maintenance done by government (Obeng-Odoom, 2014).

The streets in the city of Takoradi are quite old, and only functioned optimally back in the 19th century. Other factors that account for the worsening traffic situation in Takoradi, according to Armah (2012), cited in a Ghana News Agency (2012), include ''the oil find, which is attracting several people to the city, the presence of the harbour which serves as a transit for the export and import of goods [as well as a market-place for the] services rendered by the banks, traders, manufacturing and construction firms and finally transport terminals such as Accra and Takoradi Stations''.

Socio-economic effects of traffic congestion

As indicated the paper could not have exhausted all the forms of socio-economic issues that can be or are influenced by traffic congestion. As a result, the following activities were exmanined:

Work

Traffic congestion affects work in many ways. A typical example is labour productivity since productivity deals with the ratio of volume measure of output to the volume measure of input and input of labour. This is further directly related to the supply of labour (OECD, 2006), implying that traffic congestion reduces man hours needed to work and further reduce the ability of labour to provide optimum input to yield an equal output. Nadiri and Mamuneas (1996) and Takyi et al. (2013) argue that productivity is an investment by a state in transportation while output is the gross domestic product (GDP). For instance, a study by Metro Denver Economic Corporation showed that in Metro Denver, Mountain Resort Region, Colorado, a 0.5% decrease in man's productivity due to congestion resulted in a $728 million decrease in national GDP (Development Research Partners, 2007). A state that invests efficiently in transportation will therefore ensure an adequate supply of labour.

Furthermore, road traffic congestion affects the ease to distribute goods and services within the city. In other words, congestion impairs people's free movement and therefore affects a wide range of activities such as the distribution of goods and services and market opportunities in the cities, which can best be delivered through transport mobility (May and Marsden, 2011). Congestion further reduces productivity through increased inventory holding by manufacturers and retailers as a result of unreliable travel conditions within cities. This is because business activities depend on the timely delivery of logistics, but productivity in most cases is hindered by the delay in the delivery of freight. Weisbrod and Reno (2009) concurred with the statement by proposing that increased traffic congestion leads to higher costs incurred by commuters and thereby negatively affects business operations.

Cost of transportation

More often than not the impact of vehicular traffic on travelers (the added time) as well as the increased costs of vehicle operators (fuel and spare parts) is the key components of travel system inefficiency (NRC, 1995).

Eddington (2006) argues that travel or economic costs of congestion take the form of time wasted through travel delays and unreliable transportation conditions, extra fuel, inability to forecast travel time, environmental damage and related cost to human health. For example, it has been shown that a 15% reduction in average speed in built-up areas may reduce fuel consumption by 20 to 25% (Baker, 1994; NRC, 1992). Furthermore, six times more gasoline is required for a vehicle to start from a complete stop than it does if the vehicle does not come to a complete stop (Baker, 1994).

Infrastructure dilapidation

Pressure on road infrastructure such as bridges and interchanges due to traffic congestion can cause their dilapidation. Bridges on such roads carry the weights of vehicles that have to queue on them. This puts excessive stress on the roads and causes them to wear out. More often than not these roads develop pot holes and failed portions due to the weights of over-loaded articulated vehicles; with time, decay sets in earlier than expected (May and Marsden, 2011; Atash, 2007).

Health

Most of the vehicles on the roads now are powered by derivatives from fossil fuel and other hydrocarbons. The carbon monoxide emitted by them warms up the environment so much that the ozone layer is so badly affected and the infrared wave now penetrates the atmosphere causing the greenhouse effect. The Ozone layer has been seriously depleted resulting in global warming which causes changes in the climate. The emissions from motorized vehicles not only affect the environment but also the health of the individuals. The effect of carbon monoxide on human and animals is devastating. Choking as a result of air pollution, high blood pressure and tension due to road rage are all after-effects of prolonged stays in road traffic congestion (Gardner, 2010).

Al-Mogrin (2005) asserted that lead poisoning occurs more frequently due to traffic. He further identified the symptoms of lead poisoning to include vomiting, constipation or bloody diarrhea with central nervous system effects such as insomnia, irritability, convulsion and even death. For instance, a recent survey on effects of traffic emissions on pregnancy outcomes linked exposure to emissions to adverse effects on gestational duration and possibly also intrauterine growth (Pereira et al., 2010). Other symptoms include headache, weakness, stress and constipation and death due to road accidents (Kayode, 2015; Tamakloe, 1993).

Education

School-related traffic congestion poses threats to the safety of students, teachers, parents, residents, and motorists in and around school locations and this has become a major problem in communities throughout the world. The most obvious cause of traffic congestion around schools is too many vehicles, and the biggest source of those vehicles is parents' dropping off and picking up their children from school. In the United States, roughly three-quarters of school-aged children are taken to school by car (National Center for Chronic Disease Prevention and Health Promotion, 2001). In the United Kingdom, the share of children taken to school by car is estimated to be between one-third (Derek Halden Consultancy, 2002a, b), and one-half. In both countries, the rate of increase in car transportation of children to school has been significant, often creating serious traffic congestion problems (Kearns and Collins, 2003).

Other factors include changes in school purposes and populations, new school construction, the addition or elimination of busing, and the overall physical infrastructure, street layout, and traffic signs and signals surrounding a school. School traffic congestion is a source of problem for students, school staff, residents in and around schools, and local police charged with enforcing traffic laws and responding to problems raised by residents and schools. More importantly, congestion can be a source of traffic crashes, child pedestrian injuries and death. Child pedestrian injuries due to traffic are more likely to occur in settings with high traffic volume and on-street parking, with children often emerging "masked" from behind parked cars (Porter et al., 2011; Adarkwa, 1991).

Religious activities

Developing countries such as Ghana do experience quite heavy traffic on days when majority go to church. According to Buah (1998), Ghana has close to about 70% of its citizens being Christians. Also, in Takoradi, the STMA (2012) estimated about 83% of the population being Christians and as such on Sundays in particular and during other Christian festive seasons the roads leading to the church zones get congested with vehicles transporting people to the church premises. This kind of congestion is temporal in that after the service, there is no traffic on the roads. However, effects of traffic congestion on church activities include the possibility of people joining different denominations or churches, which in most cases are not pleasing to them or can to lead to members breaking their promises. Such experiences could be challenging as they could even lead to others not attending the church anymore (Buah, 1998).

Recreation

Although initially congestion issues were not addressed within the main tourist road transport externalities, recent trends tend toward a higher use of private or hired cars in

tourism destinations (Palmer et al., 2007) and the popularization of the city-break holidays have led to a growing concern about and interest in the contribution of tourism to road traffic congestion. For this reason, city authorities in recent times have become conscious of how the presence of congestion can damage tourist image and how congestion has been recently pointed out as one of the main negative impacts of tourism (Cui and Ryan, 2011). Aguiló et al. (2012), mentioned that, currently cities are developing an interest in applying economic instruments for the regulation of tourism activities in order to yield optimum returns.

This is of special relevance because each country has its own image which is part of its tourist product, but is also susceptible to the effects of transportation problems (Teye, 1992). Traffic congestion, being one major setback of tourism, can reduce the time available for participation in tourist activities and could be perceived as an unsatisfactory experience by visitors. According to Alegre and Cladera (2006), traffic congestion can have a negative effect on a possible future visit by influencing visitors to seek out alternative destinations. For example, there was a $25 million business revenue reduction in Colorado after the percentage of visitors decreased by 1% in 2005 (Development Research Partners, 2007).

Hypothesis

In investigating the relationship between traffic congestion and socio-economic activities, this study has developed this hypothesis: *''There is a significant relationship between severity of traffic congestion and socio-economic activities, namely, work, transportation, education, health, religious activities and recreation in Takoradi''.*

METHODOLOGY

Epistemologically, this study adopted pragmatism as the philosophical basis and this allowed the use of mixed methods approach for data collection and analysis and analysis of the work. Thus, both qualitative and quantitative techniques were used to achieve convergence and corroboration of the data collected (Johnson and Onwuegbuzie, 2004). For example, interviews from participants from the Department of Urban Roads, Sekondi-Takoradi Metropolitan Assembly and terminals at Takoradi's CBD were used to support or corroborate patterns and measures obtained from the quantitative responses of the respondents within the research area.

Data collection

The data collection methods included in-depth interviews, personal observation and cross-sectional survey. A total of twenty people were interviewed and this comprised public officials with knowledge about transport planning, workers who ply these road almost every day and drivers. For instance, on Corridor 2 staff and employees in Ajumakoman Press, Shell and Goil Filling Stations were interviewed. Key personnel from the Department of Urban Roads, STMA, DVLA, MTTU, Metro Mass Yard the major terminals in the city were also interviewed to provide technical input into the research. Most of the interviews were conducted within a duration of 30 to 45 min. The interviews were conducted using an interview guide. The breakdown of the respondents of the questionnaire is shown in Table 7.

A total of 120 respondents were sampled for this study. Four categories of people were targeted for the survey. These were commercial drivers, passengers, traders including markers sellers and formal employees. In the absence of official data of the number of people that use these roads daily, the researcher had no other option than of equally distributing the total sample across the five main corridors that were being studied. Thus 24 people were sampled along the 5 road corridors. The sampling process was done in two stages. First a stratification of the four groups was done. After, respondents who fell within the four strata were randomly sampled as the researchers walked along the road. Below are the corridors, also termed as zones or master stations (MS) in Mahama (2012) in their study of vehicular traffic in Takoradi and which is also being adopted in this study.

Zone 1: Areas in and around the Takoradi Market Circle
Zone 2: Paa Grant Roundabout near New Takoradi and the Takoradi Polytechnic (T- Poly) Traffic Light Junction.
Zone 3: Effiakuma Traffic Light popularly known as Number Nine Traffic Light. Zone 4: Tanokrom Traffic Light also known as Pipe Ano Traffic Light.
Zone 5: Kwame Nkrumah Circle which is popularly referred to as Ajep Roundabout,

These zones comprised arterial roads linking different areas within the Metropolis to the city centre and are located within some residential suburbs as well (Figure 1). For this reason, the questionnaires were administered not only along the roads but also in the suburbs within which the roads are located. A typical example was New Site located around the road from Effiakuma Junction to Takoradi Polytechnic.

Description of variables

Both the dependent variable and the independent variable were ranked using the Likert scale 1 to 5, where for severity of traffic, a value of 1 represented very low congestion, 2 represented low congestion, 3 represented moderate congestion, 4 represented high congestion and 5, very high congestion. In the case of socio-economic activities a scale of 1 represented very low effects, 2 represented low effects, 3 represented moderate effects, and 4 represented high effects and 5 for very high effects. It implied that for the severity of traffic congestion to have a positive relationship with the effects (socio-economic activities) the beta value from the regression model has to be positive and a negative value of the beta also represented a negative relationship between the two variables. A key advantage of this technique is it made it easier to study the individual influence of the cause variables (traffic congestion) on the socio-economic effects (Abdal-Salam, 2008).

Data analysis

In analyzing the data, interviews conducted from the field were transcribed, analysed and discussed using the narrative technique There was a translation of interviews into the English language where necessary. The translated and transcribed interviews were later added to the findings of the study where they provided insight into the discussion done. This helped to follow the participants (interviewees) "down their trails'' (Reissman, 2002; Teye, 2012). There was also discussion of the observations made on the field. In order to identify the degree of the relationship between the severity

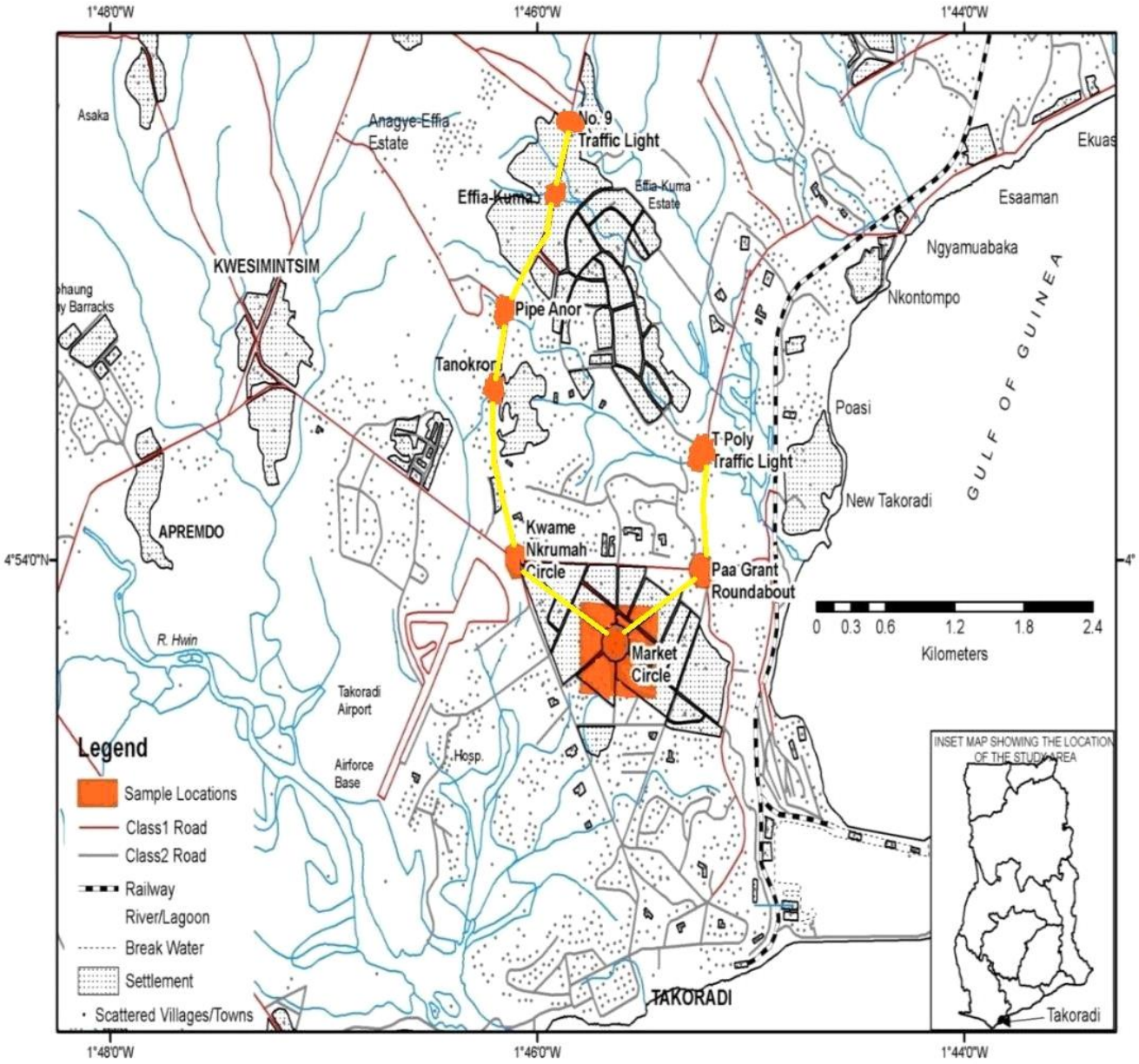

Figure 1. Map of the Takoradi study area showing sample locations.
Source: Ghana Geological Survey (2015).

of traffic congestion (predictor variable or Independent Variable (IV)) and the socio-economic activities (Dependent Variables) in Takoradi, a simple linear regression was performed (Atindanbila, 2013; Button and Hensher, 2001). Using the Statistical Package for the Social Sciences (SPSS) version 20, the strength and level of significance between the independent variables and the dependent variables were determined. The regression equation is as follows,

Linear regression model $\alpha = \beta x + c$,

Where α = Dependent or response variable (Socio economic Activities), X= Independent or Explanatory Variable (Severity of Traffic Congestion). β = the slope or gradient of the line. C = Regression Constant, the intercept (the value of α when $x = 0$).

RESULTS AND DISCUSSION

Effects of traffic congestion on work

On average, the expected number of working hours of employees, employed in the formal sector (public and private) in the economy of Ghana is eight hours (Takyi et al., 2013; Lartey, 1977; Adarkwa, 1991). Twenty three percent of the respondents surveyed on Corridor 1 indicated they often reported late to work (Table 1), a situation which Cortright (2009) termed as man productivity loss to time. This finding is also consistent

Table 1. Effects of traffic congestion on work.

Studied corridors	Effects in %					Total (%)
	Reduced work time	Difficulty in distributing goods and services	Increased inventory holding	Inability to work efficiently due to stress	Reduced output or city's growth	
1	23.7	35	15	14.3	12	**100**
2	17	49.4	19	10.4	4	**100**
3	18	23	17.8	11	30.2	**100**
4	15	21	17.4	27.4	19.2	**100**
5	36.3	35	9.3	12.4	7	**100**

Source: Fieldwork (2016).

Table 2. Effects of traffic congestion on transportation.

Studied corridors	Effects in %					Total (%)
	Increase in time spent on roads	Increase in fuel usage	Destruction of brakes and accelerators	Inability to forecast travel time	Environmental deterioration	
1	23.7	35	15	14.3	12	**100**
2	16.3	33.3	19.3	16.5	14	**100**
3	17	13	17	34	19	**100**
4	23	29	21	10	17	**100**
5	31	14.6	4.4	35	15	**100**

Source: Fieldwork (2016).

with the discussion by the OECD (2006) and Hon (2005) that traffic congestion affects labour productivity directly since input of labour is directly related to the supply of the labour (OECD, 2006; Hon, 2005). Furthermore, traffic congestion according to an informant on Corridor 5 reduces the economic growth of Takoradi. Hartgen and Fields (2009), in assessing the situation, stated that the effects of traffic congestion on cities' growth can also lead to a reduction of billions of dollars in productivity and output of the cities. It is therefore important for governments and employers to find ways of improving mobility in such cities since 'productivity is an investment by a State in transportation while output is the gross domestic product (GDP)', (Nadiri and Mamuneas, 1996; Okoye et al., 2010; Kayode, 2015). A hawker in an interview however disclosed to the survey team a positive effect of the traffic congestion. This is what she had to say,

'I make a lot of money during the late morning and evening because a lot of passenger vehicles use the road at these times. I therefore do not miss sales around this time at all'.

Effects of traffic congestion on transport

Respondents who did not own cars explained that it was quite expensive to board vehicles in Takoradi, thus a rise in transport fares was a major challenge to the household. A member of staff at the Department of Urban Roads described the situation in an interview as follows:

''The challenge of traffic congestion is rather appalling especially for private car users who drive over 5 km to work, *'I have to spend not less than 350.00 Ghana Cedis every month on fuel for my car which is more than 30% of my salary'*.

Eddington (2006) and Link (1999) referred to this occurrence as travel cost due to increase in travel delay and need for extra fuel. A household head from Tanokrom also reiterated that;
''It is not advisable for residents to use their own vehicles from areas such as Sekondi to Takoradi to enjoy a particular service. We have no choice since that is the order of the day''.

Fuel usage and cost of spare parts which according to the NRC (1995) and Eddington (2006) increases cost of driving is a challenge in Takordi as taxi drivers form the bulk of the drivers in the Metropolis. The huge cost incurred by especially public transport drivers on fuel was also found to add an extra burden to their other financial responsibilities like school fees, government taxes and levies. For this reason 10% of the drivers confirmed evading taxes (Table 2), thereby causing the Metropolis loss of funds which could otherwise have been used to provide infrastructure services.

Table 3. Effects of traffic congestion on education.

Studied corridors	Effects in %					Total (%)
	Issues of safety	Low performance among staff and students and parents	Increased expenditure by parents	Accident resulting in injuries and death	Stress to parents	
Zone 1	23.7	35	15	14.3	12	100
Zone 2	15.6	30	25.1	15.3	14	100
Zone 3	17	23	18	11	31	100
Zone 4	7.25	7.34	34.5	17	33.1	100
Zone 5	12	14.5	29	7	27	100

Source: Fieldwork (2016).

Effects of traffic congestion on education

Majority of the respondents on Corridors 1, 2 and 3 (35, 30 and 23% respectively) complained bitterly about not being able to have the required hours of sleep because of the need to wake up early in order to escape traffic congestion (Table 3). This results in their inability to perform well at work since they not only have to get to work early but also send their wards to school.

According to Porter and Abane (2008) one of the many ways to find solutions to such challenges is to increase children's participation in transport planning. Most school opening hours are usually from 7:40 a.m. to 8:30 a.m. This is the same time workers also get to work, making some families skip their breakfast or take it while driving. It was shocking to hear from a parent in an interview that he sometimes received calls from teachers, asking her to come and take her son back to the house as punishment for his late-coming. She said:

"It's not like we don't leave early enough. I spend more than half an hour driving from Sekondi before getting to the school and my work place is at the CBD''.

Effects of traffic congestion on recreation

One major negative impact of traffic congestion in Takoradi is the reduction in revenue obtained by tourism operators especially during the festive seasons. The roads leading to recreational centres such as Takoradi Harbour, Allan Beach and Hotel attract a lot of traffic on the road, which deters tourists from visiting the location. Teye (1992) explained that such situations can lead to unsatisfactory experience by visitors. According to Davison and Knowles (2006), people without private cars or vehicles during festive seasons are disadvantaged in a way as they are compelled to travel by public buses with their attendant delays and discomfort. This can make the tourist feel bad especially when caught in traffic congestion (Cui and Ryan, 2011).

It is however, appropriate to consider that traffic congestion does not always create unfavorable conditions during festive seasons or during periods of tourists' visit. Some people do benefit from the traffic congestion. For instance most taxi drivers at the taxi ranks in areas around Market Circle explained that they make a lot of sales during festive seasons because most passengers who wish to get to the recreational areas earlier use the taxis to avoid extra waste of time on the road (Table 4). The challenge however is the difficulty on the part of tourists to pay the huge amount charged by the drivers. Fifty-five percent of the traders also at Market Circle stated that they make higher sales during such occasional seasons. A shopkeeper in an interview said:

'Most customers prefer to buy around festive seasons like Christmas and they do that very early in the morning, that is during the rush hours since they believe that is the time they will get fresh goods especially the perishable ones to buy'.

Effects of traffic congestion on health and environment

Pollution from vehicles is usually inhaled by passengers caught in a traffic congestion and people working in firms and companies located around arterial roads (Al-Mogin, 2005). In Takoradi, however, people who inhale the unfavourable gases comprise mostly sellers along the roads around the Market Circlet. A commuter in an interview explained the situation as follows:

''I can't stay long in traffic since inhaling fumes from the cars chokes me''

This statement agrees with the assertion from the World Watch Institute (2008) that prolonged stay in road traffic leads to choking due to pollution. Kayode (2015) agreed with Al-Mogrin (2005) that lead poisoning which is often caused by inhaling polluted air in a traffic congestion can cause headache, weakness of the body, stress, constipation and death.

Most of the 'trotros', according to an officer at the MTTU, are not in good condition and therefore produce

Table 4. Effects of traffic congestion on recreation.

Studied corridors	Effects in %					Total (%)
	Reduction in tourist attraction	Decrease in revenue from tourism	Reduction in time spent at tourists sites by tourists	Reduction of revenue obtained by tourists sites	Road rage	
1	23.7	35	15	14.3	12	**100**
2	17	19.4	34.1	2.23	27.3	**100**
3	11	7.6	19	14.3	47.1	**100**
4	2.3	22.7	17.7	22.4	35	**100**
5	25	22.3	19.5	12	21.2	**100**

Source: Fieldwork (2016).

Table 5. Effects of traffic congestion on health and environment.

Studied corridors	Effects in %					Total (%)
	Headache	Choking and high blood pressure	Stress and loss of energy	Fear caused by road rage	Others	
1	23.7	35	15	14.3	12	**100**
2	17	4	19.4	36	24.7	**100**
3	23.1	32.2	17.4	11.3	16	**100**
4	12	21	27	17	23	**100**
5	37	14	29	27.2	33	**100**

Source: Fieldwork (2016).

harmful gases such as Carbon Monoxide which are risky to inhale. An official of the GPRTU also expressed the challenge as follows:

‘‘I wish most of the ‘trotros’ that have out-lived their expected number of years are stopped from using the road but nothing like that has ever been done to regulate the types of vehicles on the roads since I began working in the Metropolis’’.

Effects of traffic congestion on religious activities

Most respondents reported being late for religious activities due to traffic on the five corridors studied (Table 5). A majority of this group which comprised of Muslims complained of heavy traffic during their festive seasons (IdirFitir and IdirAdhar) because of the location of the central mosque. One of the mosques is located close to the Tarkwa station, and the other is also located close to the Segou area. This situation increases vehicular traffic on the road as there are a lot of people plying these roads, while the festivity also attracts a lot of people from adjacent towns. According to informants, the Jumah or Friday prayers also make such roads highly congested. An appeal, therefore, was made for the relocation of the mosque by one Imam (Prayer Leader) in the Metropolis.

A resident at Effiakuma explained this as follows,

‘‘We hear the sound of trotros and their ‘mates’ shouting for passengers to board their vehicles making it difficult sometimes for us to concentrate at church’’.

Test of hypothesis

Table 6 shows the test of hypothesis which guided the study. The hypothesis is stated as follows: The data as shown in Table 7 were generated by asking all respondents interviewed, 24 each of the 5 corridors (Table 8) studied to indicate their views on the severity of congestion on the roads. This was done by using a Likert Scale as discussed earlier. Using the same Likert Scale, the severity of traffic congestion was used to predict the major socio-economic effects acknowledged by the respondents as significant predictor of traffic congestion on the individual roads appraised. The test performed with a significant value of 0.05 allowed for the determination of the level of relationship between severity of traffic congestion on the 5 arterial roads and socio-economic activities. From Table 8, socio-economic effects of traffic congestion represent dependent variables while the independent variable is represented by traffic congestion severity on the various roads.

Corridor 1, that is, areas in and around Takoradi Market

Table 6. Effects of traffic congestion on religious activities.

Studied corridors	Effects in (%)					Total (%)
	Change of place of worship	Delay to other commuters	Noise	Increase cost	Others	
1	23.7	35	15	14.3	12	**100**
2	17	44	19	6	14	**100**
3	15	21	27	11	26	**100**
4	16.2	23.2	17.7	27.4	16	**100**
5	3	41.9	9	17	29.1	**100**

Source: Fieldwork (2016).

Table 7. Number of questionnaires and categories of respondents.

Zone	Category of respondents				Total
	Drivers (Private and commercial)	Passengers	Traders Hawkers and market sellers	Formal employees	
1	6	6	6	6	24
2	6	6	6	6	24
3	6	6	6	6	24
4	6	6	6	6	24
5	6	6	6	6	24
Total	**30**	**30**	**30**	**30**	**120**

Source: Fieldwork (2016).

Circle, recorded no significant relationship between delay to places, stress and fuel consumption. However, there is a significant relationship between traffic severity and probability of accident occurring (p value = 0.012) and reduction in worker productivity (p value = 0.042) and severity of traffic congestion. Again, on Corridor 1 there is also a significant relationship between traffic congestion and increase in prices of goods and services (p value: 0.015) and severity of traffic congestion. This could be as a result of the time taken for workers especially those employed in the formal sectors to drive through the heavy traffic at Market Circle before they get to their work places. This reduces their working hours and reduces economic growth of the city of Takoradi (Takyi et al., 2013; Harten and Fields, 2009).

On Corridor 2, however, the significant relationship between traffic congestion and road accidents can be as a result of transporting cargo from the port to Sekondi using the intersection at Paa Grant Circle. The trucks produced a lot of fumes and moved slowly. This can also be as a result of the several roads joining the circle which makes it imperative for drivers to be extra vigilant when joining the road. For this reason, officials from the MTTU are mostly assigned to the circle to control the flow of the traffic in order to prevent possible accidents.

On Corridor 4, the negative relationship between traffic congestion and prices of goods and services could be due to the fact that most shop owners along the road to Tanokrom patronize their goods from the Market Circle and resell them to the residents in the suburbs. The sellers do not increase the prices so much because it does not cost much to commute to the Market from their shops.

On Corridor 5, however, a positive relationship between traffic congestion and delays implies that passengers and drivers that used the road or the Circle in the morning rush hours get to their destinations late. This relationship is consistent with the data from the Department of Urban Roads that Zone 5 is the most congested place among the 5 corridors and also the assertion by the OECD (2006) that productivity of labour is directly related to the supply of the labour.

CONCLUSION, IMPLICATION AND RECOMMENDATIONS

This paper brings to the table the particular challenges faced in most cities in the world. It is however not a new fact to announce though, nonetheless, the dimension we sought to focus on in this study can be linked to a rather more appalling situation. Takoradi with her expected growth could be a curse in disguise for particularly the city dwellers if traffic congestion is not checked. The

Table 8. Test of hypothesis.

Socioeconomic effects (DV)	MS 1		MS 2		MS 3		MS 4		MS 5	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Lateness	0.084	0.611	0.216	0.268	0.148	0.474	-0.050	0.763	0.423	0.022*
R	0.012		0.058		0.024		0.004		0.208	
Increase fares	-0.018	0.927	-0.373	0.063	-0.063	0.633	-0.283	0.105	0.451	0.005*
R	0.000		0.156		0.011		0.115		0.150	
Stress	-0.006	0.963	-0.116	0.604	-0.437	0.015*	0.149	0.334	0.180	0.398
R	0.000		0.013		0.239		0.042		0.031	
Increase prices	0.400	0.015*	0.211	0.242	-0.063	0.738	-0.574	0.000*	0.024	0.883
R	0.062		0.170		0.005		0.556		0.001	
Lower demand	0.139	0.494	0.054	0.764	-0.049	0.798	0.159	0.332	-0.227	0.181
R	0.022		0.004		0.003		0.043		0.076	
Low sales	-0.012	0.948	-0.158	0.341	0.014	0.943	0.091	0.780	0.237	0.247
R	0.000		0.043		0.000		0.004		0.058	
High fuel Cons.	0.048	0.780	-0.046	0.842	0.190	0.472	0.149	0.316	0.246	0.238
R	0.004		0.002		0.024		0.046		0.060	
High land rent	0.337	0.061	-0.250	0.179	0.007	0.971	0.138	0.467	0.193	0.400
R	0.150		0.084		0.000		0.024		0.031	
Rd. dilapidation	0.078	0.620	0.087	0.679	-0.070	0.750	-0.237	0.192	0.150	0.446
R	0.011		0.008		0.005		0.076		0.026	
Accident	0.313	0.012*	0.401	0.032*	0.268	0.152	-0.293	0.214	0.047	0.826
R	0.111		0.200		0.091		0.079		0.002	
Ina. To forecast	-0.157	0.359	-0.105	0.617	-0.134	0.470	-0.054	0.755	-0.044	0.849
R	0.038		0.012		0.024		0.005		0.002	
Pollution	-0.265	0.147	0.341	0.041*	-0.310	0.130	-0.314	0.084	0.088	0.685
R	0.093		0.184		0.101		0.130		0.007	
Reduce worker P.	0.325	0.012*	-0.280	0.105	0.148	0.464	-0.046	0.767	-10.32	0.268
R	0.131		0.120		0.025		0.004		0.053	

p < .05%., R = R Square Value and * = highly significant relationship.
Source: Fieldwork (2016).

paper therefore presents evidence and direct examples on how the city can be rescued. In discussing the remedies to the canker, the study suggests the need for the formation of minor companies to regulate the activities of 'trotros' and taxis in the Metropolis.

Furthermore, there is the need to expand the roads to make way for the realization of the bus rapid system which has been on the heart of the government in recent times. Such a recommendation will allow space for large articulated trucks and vehicles (buses) that travel relatively slow thereby causing traffic on the roads. In addition there is the need for rehabilitation of the railway line to ease the pressure on the roads. Firm regulations have to be made and implemented to discourage old vehicles from being used in the city, as they are a greater contributor to air pollution on the roads. A more critical recommendation is the need to decongest the CBD. This could be achieved through the establishment of other market centres and other socio-economic facilities such as hotels and vehicular terminals outside the CBD that is, areas far from the Market Circle to serve as intervening opportunities. Finally, the building of settlements within the Metropolis should be well- regulated by the city authorities to make the roads easily accessible in the towns.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Inter-regional differential in access to, and satisfaction from basic infrastructure between oil-producing and non-oil producing areas of Ondo State, Nigeria

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This study aims at measuring and appraise the differential access of people in the oil bearing and non-oil bearing sub-regions of Ondo State, Nigeria; to living facilities. Housing, transportation, healthcare, power and potable water are the basic infrastructural facilities selected for the study. Four local government areas (LGAs) constitute the sample frame, while the sample size was taken from fifteen communities in the area. 1.0% of 148,574 population (1485) was sampled, using both purposive and random sampling techniques. Parametric and non-parametric statistics were used in data analysis, tabulation and cross tabulation for infrastructural counts, z-score for infrastructure ranking to determine access to, and satisfaction from infrastructural facilities; while correlation analyses to determine the level of significance. The result revealed that housing was rated highest in both areas, followed by transportation (30.1%), while water supply was rated lowest (7.8%). The z-score revealed that both water supply and power supply, on both sub-regional and general basis had negative values. Health care delivery (0.0313) in the oil producing area but negative value (-0.0313) in the non-oil producing zone and also, negative value (-0.0915) in the general analysis. In the final analysis, the oil producing areas expressed better infrastructural satisfaction compared to the non-oil producing areas. The study concludes that access to, and satisfaction from infrastructure were poor in both sub-regions and therefore recommends that, for the purpose of policy formulation on infrastructure provision, water supply requires highest attention, followed by power supply, healthcare delivery, transportation and housing in that order.

Key Words: Region, differential access, satisfaction, infrastructure.

INTRODUCTION

The presence of natural resources in a particular region may be a development liability. This can happen if exploitation of the resources causes degradation of the physical environmental without implementation of the

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necessary amelioration measures, while the proceeds from the resources are used to develop other regions within the same state (Carter, 1976).

The Niger Delta oil producing region of Nigeria consists of nine states one of which is Ondo, which has two of its eighteen local government areas (Ilaje and Ese-odo) as oil producing. The main thrust of this paper is to take stock of the basic infrastructural facilities in both oil producing and non-oil producing sub-regions of the state separately, and compare level of access people in each sub-region have to these basic facilities.

The terrain, topography, vegetation and general geographical, socio-economic and socio-cultural characteristics of the two sub-regions differ and the differences have impacted on their socio-physical characteristics. In the recent past, agitations and militancy have become common occurrences in the oil producing sub-region, whereby the people were, and are still accusing the government of marginalization and negligence. Complaints about lack of development, poverty and diseases have been heard from the people in the oil producing sub-region. This raises questions such as: What is the credibility of the complaints of the people in the mineral endowed sub-region? What are the major basic infrastructural facilities provided by the government in the areas? How effective are these facilities? Which gap exists in the availability, effectiveness and access to these basic infrastructural facilities between the oil producing and non-oil producing local government areas in Ondo State. In the paper, specific improvement oil production has brought to the oil producing area relative to non-oil producing area was also evaluated.

Specifically, existing basic infrastructural facilities in the study area were identified, their availability and effectiveness were ranked, the level of satisfaction people derived from the available facilities was measured and the specific improvement occasioned by oil production, as perceived and expressed by the respondents were measured and ranked. This gave the researcher an insight into the level of deprivation and enjoyment people are experiencing in both sub-regions, separately and comparatively. Basically, the study is both perceptive and empirical.

Statement of problem

The Nigerian oil producing areas, being a resource endowed region of the country, is expected to be safe from poverty, hunger and socio-economic vices, but the reverse is the case. Complaints about hunger, poverty, diseases, death and environmental degradation, which in turn have led to break down of law and order in the area, continue to aggravate.

The ecological disturbance, which oil mining is causing has led to both geographical and economic displacement of the people. Reardon et al. (1998) posited that the low income earned in agriculture and fishing livelihood in the oil producing areas has made farming and fishing households to diversify to non-farming and non-fishing sources for upkeep of their families. Adeyemi (2004) reported oil spillage that happened in Araromi of Ondo State in 1908 as the first of such and which continues unabated in several areas of the oil producing region till today.

The scenario described above is a surprise when compared with non-oil producing sub-region of the state. In the oil producing areas, the state of basic infrastructural facilities such as electricity, potable water, transportation infrastructure, housing, and so on are poorer when compared with the non-oil bearing sub-region. This paper therefore seeks to compare the level of access of the people in both sub-regions (taking Ondo State as a region) to the basic infrastructures and satisfaction they derived from same.

LITERATURE REVIEW

Concept of region and Inequality

Agbaeze (2003) and Glasson (1978) defined a region as ‘a flexible concept, referring to a continuous and localized area intermediate between national and urban level’. The Oxford Advanced Learners Dictionary defines a region as ‘an area or division with or without definite boundaries or characteristics’. Within the context of national planning, it is viewed to be a geographical area intermediate between national and urban level otherwise known as ‘state’ (Basorun, 2003). A region illustrates a territory of distinct political unit or district.

There are many types of regions, each with its peculiar attributes that make it distinctive from others. These attributes may be physical, political, economic or social. For instance, activities of militant groups in terms of hostage taking, kidnapping and general socio-economic sabotage distinct the oil bearing region (Niger Delta) of Nigeria from the non-oil bearing regions, while incidence of desert distinct the northern part of the country from the other regions.

In defining a region more succinctly, two views exist in literature, they are the subjective and objective views. The subjective view sees a region as a way of achieving something, a model to aid in the study of the world, and as a method of classification to segregate spatial feature. The objective school sees a region as an end in itself, a real entity, an organism that can be identified and mapped (Sule, 2000).

Chorley and Hagget (1970) and Dickson (1972) considered subjective as being generally total. They hinge their argument on the fact that regions are regarded as descriptive tools defined after a particular criterion and that it is a method of classification and a means used to segregate features. Consequently, there

could be as many regions as there are criteria to define them. Hartshone (1959) asserts that a region can no more be seen as a concrete object as was conceived by the early scholars.

Within a particular region, access of the people to basic public infrastructural facilities and public utilities may be different. This is what scholars refer to as inequality. Defining inequality, Tanimowo (1987) pontificates that; regional inequalities can be defined as uneven levels of economic development and social wellbeing of people living in different geographical areas within the country. The geographical variation in distribution of resources is evident and therefore "the process of economic development in its geographical setting requires growth at different rates in different areas". In the measurement of inequality, Tanimowo employed the use of development indicators which are; The main development indicators he (Tanimowo, 1987) employed in the study are; health, education, housing, water supplies, communication, recreation and leisure, cash income, transportation, commerce and industries. Whereas, Adedipe (2002), in his measurement of inequality considered factors such as; level of unemployment, per capita income, quality of social services, quality of housing, environmental quality and out-migration of the people; which are naturally dependent on one another.

In the foregoing paragraph, it can be inferred that Tanimowo's (1987) measurement of regional inequality is more detailed and exhaustive, though some of the variables he listed can be related with Adedipe's list. For example, Adedipe listed unemployment as a variable, Tanimowo mentioned industries and commerce, both of which are two major employment generating indicators or variables. The per capita income and quality of social services listed by Adedipe can be affected by all the indicators listed by Tanimowo, while each of the Tanimowo's indicators or a combination of them can determine the rate of out-migration of the people, listed by Adedipe. The bottom line is that these variables and development indicators vary between regions in terms of quality, quantity, effectiveness and the way they affect people's life. The locational hypothesis of Rich (1980) captures the local attribution of uneven development to resource base, on which Carter and Jones (1989), in their assessment of the hypothesis write;"All regions in a given economic system are competing for a share of the total economic activity generated by that system; but that, by virtue of their location, some possess relative advantages for production and are, therefore, able to attract an over-large share of producers at the expense of other regions."

MATERIALS AND METHODS

The study is essentially both descriptive and analytical in nature and therefore relies heavily on field survey, complemented by desk works. However, the study explored both formal and informal sources of information which involves both primary and secondary sources of data.

Primary data were collected through questionnaire administration. A total of 1485 copies of questionnaire were administered among the residents in the study area. The primary data used in the research with the instruments of collection are as follows:

(1) Information on the socio-economic characteristics of the people which was obtained through administration of questionnaires to the residents of both oil producing and non-oil producing areas of the sub-region.

(2) Data on the impact of oil production on the environment of the study area and improvement oil production has brought to each of the sub-regions in terms of access to basic infrastructure, obtained by the use of questionnaire administration, interview and direct observations.

Secondary data are those that were collected to supplement the primary data collected which include population figures of the local government areas studied in the state, obtained from National Population Commission (NPC), Ondo State and reports of the existing research works carried out on the area of study.

Out of the eighteen (18) local government areas in Ondo State, four which are Ese-Odo, Ilaje, Okitipupa and Irele formed the sample frame for the study. Ese-Odo and Ilaje Local Government Areas are in the oil bearing sub-region, while Okitipupa and Irele Local Government Areas are in the non-oil producing sub-region. The oil bearing local government areas were purposively selected while the non-oil bearing local government areas were selected based on contiguity. In the four local government areas selected, fifteen communities were randomly selected as units of data collection for the study based on the sizes and population of the local government areas.

Sample size was taken, using 1.0% of the total population of the sampled communities, that is, 1.0% of 148574. So, a total of 1485 copies of questionnaire were distributed across the sampled units. Out of this number, only 1375 copies of questionnaires (92.6%) were returned with varying figures.

The number of respondents selected for questionnaire administration in each sampling unit (locality) was therefore obtained by dividing the population of the locality by the total population of the fifteen (15) localities in the four (4) selected local government areas and multiplied by one thousand four hundred and eighty-five (1485). This is expressed as:

$$\frac{P_1}{P_2} \times 1485 = N$$

Where P_1 = Population of each locality; P_2 = total population of the fifteen (15) localities selected; = Numbe r of respondents/questionnaires in each locality.

Data processing and analysis

In this paper, both qualitative and quantitative techniques were used. Non-parametric and parametric statistics were employed to analyze the data obtained and test the level of significance of variables and differences in access to, and satisfaction derived from infrastructural facilities in each sub-region. The non-parametric analyses include tabulation and cross tabulation, while the parametric statistics include Chi-square (X^2), correlations and Phi-coefficient (Ø). The mean, standard deviation and z-score were used to rate the level of access to infrastructural facilities and satisfactions derived therefrom; and determine the types of improvement oil production has brought into the two sub-regions separately.

Infrastructural satisfaction count and ranking was done, both inter-regionally and intra-regionally. Five basic infrastructural

Table 1. Infrastructure count and accessibility.

Infrastructure	Oil producing		Non-oil producing		Total	
	Count	%	Count	%	Count	%
Healthcare	249	20.3	105	16.8	354	19.1
Housing	426	34.8	152	24.3	578	31.2
Power	109	8.9	107	17.1	216	11.7
Transportation	341	27.8	216	34.6	557	30.1
Water	100	8.2	45	7.2	145	7.8

r = 0.800, P > 0.01 = 0.104 (not statistically significant). Source: Author's Field Survey, 2012.

facilities (health care delivery, housing, power supply, transportation and potable water) were selected. In addition, inter-sectoral analysis was done on the infrastructural facilities regionally. Also, intra-regional and inter-regional improvement or otherwise, occasioned by oil mining and production in the study area was measured, using correlation analyses. Sixteen forms of improvement variables were expressed by the respondents. Infrastructural count was done, where respondents indicated the infrastructural facilities they enjoyed within each sub-region and between the two sub-regions.

RESULTS

Infrastructure satisfaction count (ISC)

Infrastructure satisfaction count (ISC) is the aggregate of the frequencies of the choice of infrastructural facilities by respondents in the study area. The number of items each person chose in a particular community indicates the number of infrastructural facilities available and accessible in such a community to the best knowledge and satisfaction of the respondents, hence their level of access to such facilities. As explained to the respondents, availability alone does not determine the level at which they enjoy such facilities. The level of efficiency of such facilities is also a determinant factor of their level of satisfaction.

Generally, in the total infrastructure satisfaction rating in Table 1, it is revealed that housing facilities was the most accessible of all the infrastructural facilities in the area (31.2%), closely followed by transport facilities (30.1%), healthcare (19.1%), power supply (11.7%) and portable water supply (7.8%), which was the lowest. While housing, transportation and healthcare facilities were the most accessible (in descending order) in the two sub-regions; people expressed accessibility to portable water and power supply. If it is taken that short power supply is a general problem in the country at the time of data collection, short supply of potable water, especially in the coastal zone should not occur.

In Table 1, it was revealed that housing was the most accessible infrastructure in the oil producing sub-region which took 34.8% of the total infrastructure count in the area, while transport infrastructure took the highest percentage (34.6%) in the non-oil producing area, which are close to each other. It is interesting that housing ranked second in the non-oil producing area with 24.3% while transport ranked second (27.8%) in the oil producing sub-region. It is healthcare delivery infrastructure, which had 20.3% that ranked third in the oil producing but only 16.8% in the non-oil producing sub-region. While people in the non-oil producing expressed 17.1% access to power supply, it was only 8.9% in the oil producing area. In both sub-regions, portable water supply was rated lowest (8.2% in the oil producing and 7.2% in the non-oil producing).

In Table 1, it was revealed that there were 1850 total counts on infrastructure, including the respondents who chose more than one infrastructure. To be able to get the actual level of satisfaction, the scores were standardized by calculating percentages and z-scores, and the counts were ranked (from 1st to 5th) according to the numbers, as demonstrated in Table 2. For oil producing sub-region, mean ($\boldsymbol{x}$) is 245, standard deviation (σ) is 142.75328 while the mean ($\boldsymbol{x}$) for the non-oil producing sub-region is 125 and standard deviation (σ) is 63.50984.

Infrastructure satisfaction ranking

In terms of quantity, the statistics reveal that transportation and housing were the infrastructures from which the people derived satisfaction most in both oil producing and non-oil producing sub-regions. Table 2 shows that in sub-regions, housing and transportation ranked 1st and 2nd (inter-changeably). Housing took the lead with 34.8% in the oil producing with transportation coming 2nd (27.8%) while in the non-oil producing sub-region, transportation was the most enjoyed infrastructure (34.6%) and housing came 2nd with 24.3%. While power and water supply were not satisfactory at all in both areas, as revealed by the z-scores (negative values), people in the oil producing expressed very low satisfaction in the health sector but with a negative value (health) in the non-oil producing area which showed some level of deprivation in that area, relative to the other. The summary is that both sub-regions have relative satisfaction in housing and transportation, non-oil producing area expressed lack of satisfaction in three infrastructure (health, water and power), oil producing

Table 2. Infrastructure satisfaction ranking.

Infrastructure	Oil producing				Non-oil producing			
	Score	%	Z-score	Rank	Score	%	Z-score	Rank
Health	249	20.3	0.0313	3rd	105	16.8	-0.3521	4th
Housing	426	34.8	1.4176	1st	152	24.3	0.4754	2nd
Power	109	8.9	-1.0652	4th	107	17.1	-0.3169	3rd
Transportation	341	27.8	0.7519	2nd	216	34.6	1.6021	1st
Water	100	8.2	-1.1356	5th	45	7.2	-1.4085	5th
Total	**1225**	**100**	0.0000		**625**	**100**	0.0000	

Source: Author's Computation, 2012.

area demonstrated little satisfaction in health and no satisfaction in both power and water.

Analyses of inter-regional and inter-sectoral infrastructure satisfaction count

The inter-regional and inter-sectoral infrastructure satisfaction comparison was made both in quantitative and qualitative terms. Percentages were used for quantitative comparison (Table 3), while z-scores were applied for qualitative differentials (Table 4).

Inter-regional infrastructure satisfaction count

Inter-regional satisfaction count (IRSC) is the comparative study of the level of satisfaction on infrastructural facilities across the two sub-regions in the study area, as reflected in the Tables 3 and 4. The tables show the total infrastructure count on each sector of the infrastructure in each sub-region (oil producing and non-oil producing). This enables the researcher to compare the level of satisfaction the people had on each infrastructural facility in one region, according to the ranking, relative to the other region.

Quantitatively, Table 3 reveals that housing was the most enjoyed infrastructure in the oil producing area, having 23.0% of the total infrastructure count in both sub-regions. This was followed by transportation infrastructure (18.4%), whereas, in the non-oil producing area, transportation led in the count with 11.7% and followed by housing (8.2%). This means that while people of the oil producing sub-region enjoyed housing more than non-oil producing, the non-oil producing expressed better satisfaction in transportation more than housing. Probe into this gap in access to, and satisfaction from infrastructure facilities revealed that the marshy nature of the ecology of the oil bearing region, which made land less available for building construction; and the non-availability of roads, also due to the ecological characteristics of the oil producing region, were the major reasons for the differentials.

In qualitative term, a striking revelation from Table 4 is the satisfaction on healthcare infrastructure where the people in the oil producing recorded positive z-score (0.0313) against the non-oil producing people whose expression was negative (-0.3521). This is not unconnected with the various healthcare programmes introduced to the oil producing areas by both NDDC and OSOPADEC, which means that having development agencies for the oil producing areas makes deference in terms of infrastructure development. Both sub-regions expressed high level of dissatisfaction in water and power supply. The low percentages and negative z-scores are evident in Tables 3 and 4.

As reflected in Tables 3 and 4, there was a total of 1850 count on infrastructure satisfaction in both sub-regions. The oil producing had 1225, while the non-oil producing had 625. These totals are greater than the total number of respondents because the count was based on the choice of infrastructure, not on the number of respondents. The total count for transportation was 557 out of which 341 was for the oil producing area, which is 18.4% of the 1850 total count whereas, only 11.7% of the total was found in the non-oil producing area. Transportation ranked 2nd in the oil producing sub-region but 1st in the non-oil producing area. Housing, with z-score of 1.4176 (23.0% of the total) was the 1st in rank in the oil producing area but ranked 2nd in the non-oil producing area with 0.4754 z-score (8.2% of total).

According to the statistics in Table 4, potable water supply and power supply, on both sub-regional and general basis, had negative values; healthcare delivery, which had positive z-score value (0.0313) in the oil producing zone but negative value (-0.0313) in the non-oil producing zone, also had negative value (-0.0915) in the general analysis. While housing ranked first in the study area, transportation infrastructure took the second position, followed by healthcare delivery infrastructure, then power supply; and potable water supply, as important as it is to human survival, came last. It can be concluded that water supply is the worst in the study area.

In the final analysis, going by regional comparison, the oil producing area had better expressed infrastructural

Table 3. Inter-regional infrastructure satisfaction count.

Infrastructure	Oil producing			Non-oil producing			Total		
	Score	%	Rank	Score	%	Rank	Score	%	Rank
Health	249	13.5	3rd	105	5.7	4th	354	19.1	3rd
Housing	426	23.0	1st	152	8.2	2nd	578	31.2	1st
Power	109	5.9	4th	107	5.9	3rd	216	11.7	4th
Transportation	341	18.4	2nd	216	11.7	1st	557	30.1	2nd
Water	100	5.4	5th	45	2.4	5th	145	7.8	5th
Total	1225	66.2		625	33.8		1850	100.0	

Source: Author's Computation, 2012.

Table 4. Inter-sectoral infrastructure satisfaction count (ISISC).

Infrastructure	Oil producing			Non-oil producing			Total		
	Score	Z-score	Rank	Score	Z-score	Rank	Score	Z-score	Rank
Health	249	0.0313	3rd	105	-0.3521	4th	354	-0.0915	3rd
Housing	426	1.4176	1st	152	0.4754	2nd	578	1.1897	1st
Power	109	-1.0652	4th	107	-0.3169	3rd	216	-0.8809	4th
Transportation	341	0.7519	2nd	216	1.6021	1st	557	1.0696	2nd
Water	100	-1.1356	5th	45	-1.4085	5th	145	-1.2869	5th
Total	1225	0.0000		625	0.0000		1850	0.0000	

Source: Author's Computation (2012).

satisfaction in the study area as it accounted for 66.2% of the total infrastructure count, while the non-oil producing sub-region had 33.8% of the count. So, the oil producing area came first while the non-oil producing area came second in the ranking. Viewing this analysis generally, access to infrastructural facilities and infrastructure satisfaction across the two sub-regions compared was poor. For the purpose of policy making, water supply infrastructure requires highest attention of the government, followed by power supply, healthcare delivery, transportation and housing in that order.

Inter-sectoral infrastructure satisfaction count (ISISC)

Inter-sectoral infrastructure satisfaction count is the summation of the total access counts of one infrastructural facility relative to others in each of the sub-regions (oil producing and non-oil producing separately) in the study area. It also shows the percentage of the total count on one infrastructure to the totality of the counts on the entire infrastructure count in a particular sub-region, using the standardized score to measure the level of satisfaction and deprivation on one infrastructural facility relative to others as shown in Tables 3 and 4.

The tables revealed that both quantitatively and qualitatively, the total percentage and sum of z-score across the two sub-regions compared revealed best access to and satisfaction on housing which was closely followed by transportation. While housing had 31.2% of the total count and a positive z-score of 1.1897 (Table 3), transportation had 30.1% of total count with a positive z-score of 1.0696. Ordinarily, one might think that healthcare infrastructure might have average performance with a percentage of 19.1, but the negative z-score of -0.0915 is a prove of deprivation, though the healthcare infrastructure was better in the oil producing area (positive z-score of 0.0313) than in the non-oil producing area (negative z-score of -0.3521). Both separately and collectively, across the two areas, power supply and water supply had negative z-scores.

So, inter-sectorally, housing infrastructure was the best, followed by transportation, healthcare delivery, power supply and water supply in descending order. This means that in policy formulation and decision making on infrastructure plan and provision, water and power supply deserve more attention than others so as to level up with the other infrastructural facilities.

CONCLUSION AND RECOMMENDATION

In the final analysis, going by regional comparison, the oil producing area had better expressed infrastructural satisfaction in the study areas as it accounted for 66.2% of the total infrastructure count, while the non-oil

producing sub-region had 33.8% of the count. So, the oil producing area came first while the non-oil producing area came second in the ranking. Major reasons for the differences were ignorance of some of the people in the oil producing region, politicization of decisions in project planning and implementation, militancy of the youth (in most cases, with support of elders) and dictates of nature (ecological characteristics, particularly of the oil bearing region).

Viewing this generally, access to infrastructure facilities and infrastructure satisfaction across the two sub-regions compared was poor. For the purpose of policy making, water supply requires highest attention of the government, followed by power supply, healthcare delivery, transportation and housing, which had highest ranking in the count and rating, and deserves lowest attention of administrators and policy makers.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests.

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