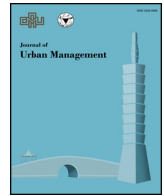




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Research Article

Managing traffic congestion in the Accra Central Market, Ghana

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ABSTRACT

Traffic congestion is a major phenomenon in most Ghanaian cities, especially in market centers resulting in massive delays, a decrease in productivity and reduction in sales. Therefore, the study sought to assess the management of traffic congestion in the Accra Central Market. The study employed an exploratory design to sample 300 respondents through the administration of questionnaires. In-depth interviews were conducted with four officials of management institutions in Accra. The quantitative data were analyzed using SPSS v 21 whereas the qualitative data was manually analyzed. The study revealed that bad attitude of drivers, traders, and pedestrians, Road Traffic Crashes (RTCs) and poor road designs were the main causes of traffic congestion. The effects of traffic congestion are decreasing sales and productivity and cause stress. The study recommends public education, strict enforcement of road traffic regulations, and provision of adequate parking spaces to help manage traffic congestion in the Accra Central market.

1. Introduction

Local experts from around the world ranked congested roads as the most important among nine common infrastructural deficiencies—congested roads, poor pedestrian facilities, power outages, flooding, slow/unaffordable internet facilities, leaking sewers, lack of potable water, lack of cooking energy and unreliable telephone service (Jones, Moura, & Domingos, 2014).

Traffic congestion as a global phenomenon is predicted to get worse in the future (Jain & Vazirani, 2010; Kiunsi, 2013). For instance, traffic congestion in the US has increased substantially over the last 25 years (Texas Transportation Institute (TTI), 2011 Mobility report). The Brazilian city of Sao Paulo is known to have experienced the world's worst traffic jams, where people are stuck for two to three hours every day in traffic jams (Mahendra, 2009). In August 2010, Hubei, one of the provinces in China experienced what is considered the world worst traffic jam ever, as traffic congestion stretched more than 100 km from August 14th to 26th (Hickman, Ashiru, & Banister, 2010).

Such situation has obvious implication on productivity and the socio-economic development at large resulting in delays, fuel wastage and money loss (Baffour, 2010; Texas Transportation Institute (TTI), 2011 Mobility report). Ghanaian cities such as Accra, Cape Coast, Kumasi, Takoradi and Tamale are not immune to the fundamental challenges of traffic congestion and this has attracted the attention of the academia and transport managers/professionals (Abane, 1993; Armah, Yawson, & Pappoe, 2010a, 2010b; Andoh, 2014).

Ghana has witnessed a number of institutional reforms across spatial-temporal scales, which have shaped its current transport system (Armah et al., 2010a, 2010b). These reforms date back to the early 1970s. The Ghana Highways Authority (GHA) under the Ministry of Works and Housing was established through Decree 298(1974) to improve the construction and maintenance of roads. Thus GHA was responsible for the administration, development, and maintenance of all highways in Ghana (Armah et al., 2010a,

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2010b). City and municipal councils managed urban roads.

The Structural Adjustment Policies (SAPs) including liberalization of the economy in the early 1980s led to an improved transport system and resulted in the importation of fleet of new and slightly used vehicles (Addo, 2002). In 1982, a new Ministry of Roads and Highways (MR&H) was formed from the Public Works Department (PWD). Thus GHA was placed under this ministry. In 1988, the Department of Urban Roads (DUR) instead of the city or municipal councils assumed the responsibility of maintaining urban roads. DUR still manages all urban roads till date. The Ghana Roads Funds established in 1985 and upgraded by the 1996 GHA Act is to finance periodic and routine maintenance of roads. The Act also provides financial assistance to the metropolitan, municipal and districts assemblies in maintaining road (Armah et al., 2010a, 2010b).

A common feature across road networks in many Ghanaian cities is the presence of critical congestion areas (Jain & Vazirani, 2010). This has been in existence for some time now and it is more severe at/around market centers that act as well as central business districts (Armah et al., 2010a, 2010b). Roads into/out of market areas attract a large volume of both human and vehicular traffic to traverse the common congestion area.

Traffic congestion occurs at market centres as a result of a conflict of space by users such as drivers, traders, shoppers, and pedestrians. Market centres as major critical congestion areas have poor traffic management systems (Jain & Vazirani, 2010). The resultant effects of poor traffic management systems in Ghanaian metropolitan cities has attracted a lot of attention but less research has been conducted to assess the causes and effects of traffic congestion in market centres and how to manage it (Armah et al., 2010a, 2010b; Essandoh & Armah 2011; Andoh, 2014). Accra Central Market is the most popular market in Ghana in general and Accra as a capital city in particular.

Therefore, this study seeks to assess the causes and effects of traffic congestion in Accra Central Market and how it can be managed from the user's perspective. Identifying these characteristics is the first step for efforts because it is an essential guide for selecting appropriate measures (Rao & Rao, 2012). The following research questions guided this study:

1. What are the causes of traffic congestion in the Accra Central market?
2. What are the effects of traffic congestion in the Accra Central market?
3. What are the measures put in place to manage traffic congestion in the Accra Central market? and
4. What are the possible measures that are needed to the traffic congestion in the Accra Central market?

Studies like this will help improve on managing traffic congestion in the most popular market in Ghana and as such influence policy, which can be replicated in other market, centres across the country. The findings of this study are of importance to traders, drivers, pedestrians, and shoppers in the Accra Central Market. It will help elicit the various causes and effects of traffic congestion in Accra Central. The study will also provide information on the measures to manage traffic congestion in the Accra Central Market. This paper anticipates expanding the existing knowledge about tackling traffic congestion in Ghana as a developing country. Furthermore, results of this study can be used to manage existing problems of traffic congestion in the Accra Central Market and other markets in Ghana with similar characteristics.

The paper is divided into seven sections. Following section one is the literature review showing the causes and effects of traffic congestion and how it is being managed. Section three presents the study area with section four containing the research methodology. Section five contains the results with section six presenting the discussion. Section seven concludes with the conclusion and policy implications.

2. Literature review

2.1. Traffic congestion as a concept

There is no agreed definition of traffic congestion because it is both a physical and a relative phenomenon (Rahane & Saharkar, 2014). As a physical phenomenon, it is defined as a situation where demand for road space exceeds supply and is reflected by slower speed, longer trip times and increased motor vehicular queuing (Downie, 2008). It is a relative phenomenon when there is a difference between road performance and road user's expectations (Downie, 2008; Kiunsi, 2013).

Traffic congestion can be perceived as an unavoidable consequence of scarce transport facilities such as road space, parking area, road signals and effective traffic management (Blanco et al., 2009). Urban congestion mainly concerns two domains of circulation, passengers, and freight, which share the same infrastructure. Thus, traffic congestion condition on road networks occurs as a result of excessive use of road infrastructure beyond capacity, and slower speeds, longer trip hours and increased vehicular queuing characterize it. Any city that is economically active and vibrant will rarely be free from traffic congestion (Yildirim, 2001).

Traffic congestion can be viewed from two main opposing perspectives (Kiunsi, 2013). The first perspective is that it can be considered as an indicator of economic growth and as an urban lifestyle. The second perspective is that it is seen as an indicator of deterioration of urban life.

2.2. Types of traffic congestion

According to Victoria Transport Policy Institute (2009), there are two types of traffic congestion, recurrent congestion, and non-recurrent congestion. Recurrent congestion generally occurs at the same place, at the same time every day. This is generally the consequence of factors that act regularly or periodically on the transportation system such as daily commuting or weekend trips.

Recurrent congestion is predictable and typically occurs during peak hours. It displays a large degree of randomness in terms of duration and severity.

Non-Recurrent Congestion is the effect of unexpected or unplanned large events, example; road works, accidents, special events, etc., that affect transportation system more or less randomly and as such, cannot be easily predicted. Vickrey (1997) identified six types of congestion:

- Simple interaction on homogeneous roads: where two vehicles traveling close together delay one another;
- Multiple interactions on homogeneous roads where several vehicles interact;
- Bottlenecks: where several vehicles are trying to pass through narrowed lanes;
- “Trigger neck” congestion: when an initial narrowing generates a line of vehicles interfering with a flow of vehicles not seeking to follow the jammed itinerary;
- Network control congestion: where traffic controls programmed for peak-hour traffic inevitably delay off-peak hour traffic; and
- Congestion due to network morphology, or polymodal polymorphous congestion: where traffic congestion reflects the state of traffic on all itineraries and for all modes. The cost of intervention for a given segment of roadway increases through possible interventions on other segments of the road, due to the effect of triggered congestion.

2.3. Causes of traffic congestion

There are a number of specific circumstances, which cause or aggravate congestion: rapid increase in urban population, economic growth, increase employment opportunities, increase in number of cars and number of people using cars, low capacity of transport infrastructure, road layout, underinvestment in road infrastructure, poor traffic management, shortage of street parking, signal and equipment failure, non-adherence to traffic regulations, poor urban planning or poor urban development control, the rapid expansion of city boundaries, poor public transport, increased use of private cars, car accidents, special events gatherings, road works, and bad weather (Remi, Adegoke, & Oyerinde, 2009; Mahmud, Gope, & Chowdhury, 2012; Andoh, 2014; Mensah, Annan, & Andoh-Baidoo, 2014a, 2014b).

2.3.1. Causes of traffic congestion in developing countries

The situation has worsened for developing countries due to the following reasons: unplanned cities, poor discipline, alternate traffic means, archaic management, and improper lane management (Jain & Vazirani, 2010):

- **Unplanned cities:** roads are narrow and poorly built. As cities grow in an ad hoc manner, no provision is made towards scaling road capacities, eventually resulting in several bottleneck roads, which remain congested for extended periods of time. Furthermore, many developing countries have witnessed an explosive growth in their vehicular population resulting in a failure of conventional traffic management strategies.
- **Poor discipline:** drivers often are not trained enough to follow lane discipline. The impact of poor lane discipline, especially at traffic junctions, deteriorates the already overcrowded junction situation. Furthermore, drivers frequently jump red lights and block the intersection, causing further traffic congestion. These problems are compounded by the fact that traffic law enforcement is poor, thereby providing no incentive for drivers to follow the rules.
- **Alternate traffic means:** countries with fast-growing economies have witnessed a surge in the number of vehicles across major cities. These cities seldom have efficient mass transit systems, forcing people to operate private vehicles. This problem is compounded by the social stigma, where people view operating a private vehicle as a sign of prosperity, while public transport is viewed as being used by the lower echelons of society.
- **Archaic management:** traffic junctions are often unmanned, thereby allowing drivers to drive in a chaotic manner. Even if a junction is controlled by a cop or a traffic light, the traffic junctions are largely independent of any traffic management strategy, only optimizing the respective junction traffic flow, in the direction of maximum traffic build up. Furthermore, these approaches enhance traffic mismanagement in already congested roads, accelerating congestion collapse.
- **Improper lane management:** lane management is an important fact in managing the traffic. Many types of vehicles try to overtake other vehicles even in the single undivided road. This is the main reason that the city roads are unequipped with the lane dividers, which divide the lane into incoming and outgoing traffic.

2.3.2. Causes of traffic congestion in the Accra Metropolis

According to Mensah et al. (2014a, 2014b), the causes of traffic congestion in Accra Metropolis are best grouped into four categories called “BAM FACTORS” of road congestion.

2.3.2.1. BAM Factor 1- Horizontal causes of congestions.

- **Poor road network:** Transportation engineers have long studied and addressed the physical capacity of roadways, the maximum amount of traffic capable of being handled by a given highway section. Capacity is determined by a number of factors: the number and width of lanes and shoulders of roads; merge areas at interchanges; and roadway alignment (grades and curves). These things are completely absent on the five highways understudied.
- **Road checkpoints:** the several road checkpoints erected by Police officers also contribute to serious traffic congestions and

further restrict the flow of the traffic on our roads.

- **Pedestrian obstruction:** the missing crosswalks sometimes forces pedestrians to cross the roads at many different parts which eventually leads to congestions in different parts of the same road.

2.3.2.2. BAM Factor 2-Vertical causes of road congestion.

- **Trading obstruction** is events that disrupt the normal flow of traffic, usually by physical impedance in the travel lanes. In addition to blocking travel lanes physically, events that occur on the shoulder or roadside can also influence traffic flow by distracting drivers, leading to changes in driver behavior and ultimately degrading the quality of traffic flow.
- **Narrow traffic lanes:** Construction of roads with narrow lanes several years ago is now causing serious congestions in Ghana. With the width of most of our roads in Ghana, many of the modern heavy vehicles have a wider width reducing the lane widths on our roads.
- **Reserved Parking lots:** It was observed from most of these arterial roads that the various shops, offices, and churches along it had either no or inadequate parking spaces. As results of this, a lot their customers tend to park their cars along the shoulders of the road. Lack of pullouts or designated stopping points for jitneys results in numerous interruptions to flow of the vehicles, even within non-conflicting streams of traffic, which seriously contribute to the road congestion.

2.3.2.3. *BAM Factor 3- Traffic control devices traffic control congestion.* Intermittent disruption of traffic flow by control devices such as railroad grade crossings and poorly timed signals also contribute to congestion and travel time variability.

2.3.2.4. *BAM Factor 4- Loading and picking off passengers along the road.* In Accra, most of the taxi and commercial mini-busses (troto) do not have permanent terminals and routes. They move around picking passengers along the routes. Landmarks may serve as route names or route termini. These taxis and troto can also be boarded anywhere along the routes which obviously cause road traffic congestion in the city.

2.4. Effects of traffic congestion

The effects of traffic congestion can be categorized into four main groups of environmental, economic, health and social (Mahmud et al., 2012; Weisbrod, Vary, & Treyz, 2003; Remi et al., 2009; Levy, Buonocore, & Von Stackelberg, 2010). The nature, extent, and severity of the effects differ from one city to another depending among other things the city size, road capacity and road layout, spatial distribution of land use, modes of public and private transport systems and travel patterns (Kiunsi, 2013).

Despite the growing number of hybrid vehicles on the road, cars stopped in traffic still produce a large volume of harmful carbon emissions. Besides contributing to global warming, these emissions can cause more short-term and localized problems, such as smog and increased respiratory problems in a community due to poor air quality. Commuters who are exposed to air pollution, like those riding in non-air conditioned vehicles, double their health risk. Aside from stress, they are also exposed to pollutants that can affect the lungs.

In fact, the World Health Organization (WHO) said that air pollution is to blame for 3.2 million preventable deaths worldwide every year. The National Emissions Inventory in 2012 said that 71 percent of air pollution in the country comes from vehicles on the road. This number is even higher in the National Capital Region (NCR) where 85 percent of air pollution comes from vehicles.

The economic impacts are increasing in fuel consumption, which leads to higher transportation costs, wastage of working time and delay in service delivery. Health impacts, which primarily occur due to extended exposure to polluted air and unnecessarily long periods spent on roads, are mental stress, tiredness, and headache. Social impacts include a reduction in quality of life as reflected by a reduction in personal incomes due to increased transportation costs, loss of time that could have otherwise been spent on social activities (Weisbrod et al., 2003). Drivers who become impatient may be more likely to drive aggressively or dangerously. This contributes to poor health for those affected by the stress and puts other drivers in danger. Road rage also increases the danger posed to emergency workers or construction crewmembers that are working on the congested road close to dangerous drivers.

2.5. Tackling traffic congestion

Traffic congestion in urban areas cannot be completely eliminated but can only be minimized to an acceptable level and its approach is multi-faceted. Rodrigue, Comtois, and Slack (2009) outline some measures that could help deal with the congestion menace-traffic signal synchronization, incident management, congestion pricing and the use of public transit as possible effective strategies available in dealing with congestion situation, although not without their associated challenges. Other measures proffered to address traffic congestion are:

2.5.1. Smooth traffic flow by using speed controls

Transport engineers have found that variable speed limits are an effective way to regulate traffic dynamically. Sudden braking is bad for flow, but controlled slowing down can actually make traffic move faster, on the whole. Adaptive speed limits (i.e., adjusting speeds based on conditions) help in two ways:

- Drastically reducing accident rate; and

- Improving traffic flow instead of jamming. When road capacity has been reached, even a lane change can have a big effect.

2.5.2. *Strict lane management*

Different lanes for different types of vehicles should be marked on the roads and law and financial penalty should be imposed to make the drivers maintain the lane discipline.

2.5.3. *Deterrent measures*

The government can take such strict steps as imposing a financial penalty on offending drivers, pedestrian and traders. They should be made to dissuade the drivers from certain congestion causing habit such as wrong overtaking, one-way driving. Truck drivers should be fined for disobeying traffic law and driving unfit truck. This kind of implication of law can mitigate the traffic jam in short run, but in long run, all the people should be involved to create awareness and responsibility to the society.

2.5.4. *Road capacity*

Congestion can be reduced by either increasing road capacity (supply) or by reducing traffic (demand). Road capacity can be increased in a number of ways such as adding more capacity over the whole of a route, creating new routes, and improvements in traffic management. Reduction of demand can include, parking restriction, park, and ride, congestion pricing, road space rationing, incentives to use public transport and introduction of carpooling (Armah et al., 2010a, 2010b).

2.5.5. *Employing more traffic warden or police*

As the city is running with an inadequate amount of traffic police or wardens than required, so there is a need for the authority to increase the number of traffic police or wardens. This will create some scope of employment also. Only recruitment is not enough, they should be trained up for the betterment of the traffic management.

2.5.6. *Dedicated lanes for pedestrians and cyclists*

There should be dedicated lanes for pedestrians and cyclist.

2.5.7. *Provision of car parks*

Car parks should be created in market centers for private cars who wish to shop to use instead of parking by the roadside. There should be dedicated bus stops for public transport “trotro” and taxis for picking up passengers.

The conceptual framework as shown in Fig. 1 was adopted from an ecologist Mead who used it to categorize the causes of diseases into three. His model was adapted by Jorgensen and Abane (1999) and a host of transport experts to be applied to the causes of road traffic accidents. The conceptual framework above gives the graphical model of managing traffic congestion in Accra Central Market. It seeks to explain that the causes of traffic congestion in Accra central market, which are poor discipline, archaic management, unplanned cities, etc., have effects on the economy and individuals. Some of these effects on individuals are stress, road rage, etc. It affects the economy by decreasing the level of production of the economy, polluting the air, etc. However, there are measures that can be taken to reduce these effects and possibly prevent the causes of traffic congestion in Accra central market. Some these measures are penalties for indiscipline, strict lane management, dedicated lanes among others. This will decrease stress and increase productivity at both individual and national level.

3. Study area

Accra as shown in Fig. 2 is the capital and most populous city of Ghana, with an estimated urban population of 2.27 million as of 2012. It is also the capital of the Greater Accra Region and of the Accra Metropolis Assembly (AMA), with which it is conterminous. Accra is furthermore the anchor of a larger metropolitan area, the Greater Accra Metropolitan Area (GAMA), which is inhabited by about 4 million people and the thirteenth largest metropolitan area in Africa.

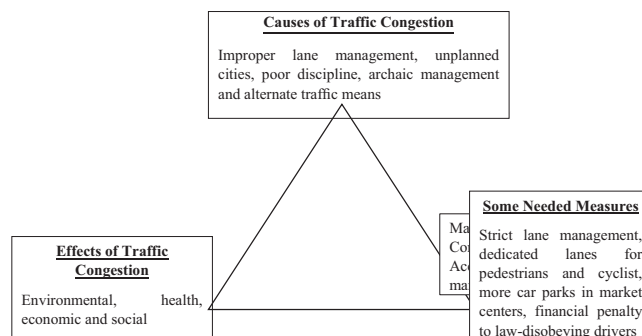


Fig. 1. : Triad of managing traffic congestion. Source: Adapted from Jorgensen and Abane (1999).

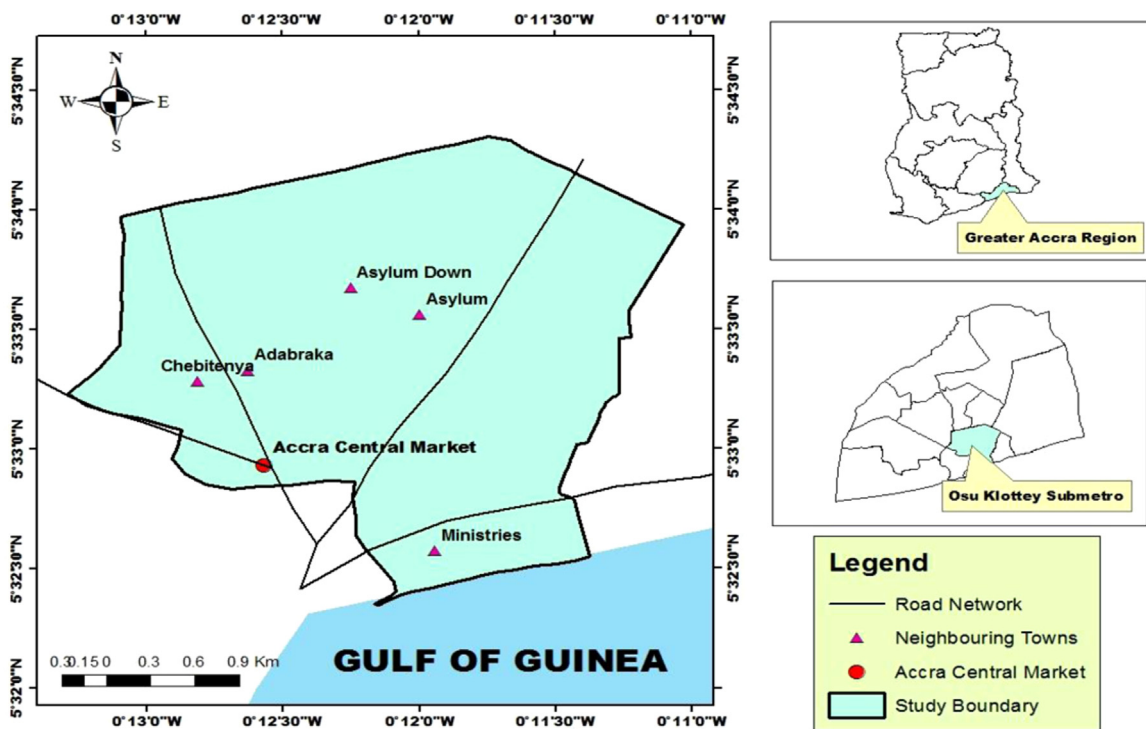


Fig. 2. Map showing the location of Accra Central Market.
 Source: GIS Unit, Department of Geography and Regional Planning, UCC, 2017.

Accra Central Market (Makola Market) as shown in Fig. 2 is a renowned marketplace and shopping district in the centre of the city of Accra, the capital of Ghana. Makola Market is located next to the Kwame Nkrumah memorial park over the High Street and bounded by Kinbu, Thorpe Road which becomes Kojo Thompson Avenue to the North, and Pagan Road. Makola Market is located in Accra Metropolitan Assembly. Makola Market is located on latitude and longitude of 5°32'52.05" N and 0°12'24.71" W respectively. In terms of land size, Makola market has an area size of about 6.84 acres (MoF, 2014).

Makola market is mostly characterized by the informal economy with most of their activities not regulated as well as not demanding any qualification. The market facilitates the wholesale and retail trading of all kinds of goods and services including foodstuffs, cookware, clothing, medications, detergents, building materials, car parts, shoes, tools, pots, pans and almost anything else that is a legally traded commodity. These goods are both home-made and imported. Furthermore, jewelry made from locally handcrafted beads can also be found for sale in the market. With regards to the current economically active population, female traders constitute the greatest share engaged in these economic activities. Moreover, financial institutions such as banks, savings, and loans, micro-finance as well as Susu companies are a major characteristic of this market.

4. Methodology

4.1. Research design

The exploratory research design was used for this study, which is not intended to provide conclusive evidence but to help in better understanding a phenomenon. Exploratory research tends to tackle new problems on which little or no previous research has been done (Sarantakos, 2006).

4.2. Sample size and sampling technique

Transport studies in Ghana are fraught with the inability to generate a sampling frame because of lack of record keeping (Abane, 2011; Ojo, Amoako-Sakyi, Agyeman, Amenumey, & Abane, 2014). Owing to this inherent challenge, transport researchers in Ghana tend to use 0.01%, 0.02%, or 0.03% of the estimated target population depending on the subject/area of study (Abane, 2011; Andoh, 2014; Mensah et al., 2014a, 2014b; Ojo et al., 2014). Therefore, Mensah et al. (2014a, 2014b) used a convenience sample of 500 (0.03%) of the estimated population (1,658,937) of Accra metropolis assessing the impact of vehicular traffic on energy demand. The current study, which focused on a market in the Metropolis, adopted a convenience sample 0.02% (332) of the target population because of the study area.

An accidental sampling technique was therefore used in administering the questionnaires on 332 traders, drivers, pedestrians,

shoppers and office workers found at the market. Five officials of the Motor Traffic and Transport Department (MTTD) of the Ghana Police Service, AMA, Ministry of Transport (MoT) and Drivers Union and market women union were also purposively interviewed.

4.3. Instruments

Questionnaires, in-depth interviews (IDIs) and observational checklist were developed to collect primary data from the field. The questionnaire comprising a mix of open-ended and closed-ended was divided into five sections. Section A focused on the demographic characteristics of respondents such as gender, the level of education, occupation, etc. Section B centred on the causes of traffic congestion in Accra Central Market. Section C was on the effects of traffic congestion in Accra Central Market while section D focused on the measures put in place to manage traffic congestion in Accra Central Market and the final section, section E on the possible measures needed to manage traffic congestion in Accra Central market.

The In-depth interview guide was to elicit information on causes and effects of traffic congestion and how it has been managed and how it can be managed from the officials of relevant stakeholders such as MTTD, MoT, AMA, Drivers Union and the Women Union. The interview guide for the IDIs was in a semi-structured format in line with Sorantakos (2006) assertion that semi-structured interviews are flexible, and they allow for the exploration of emerging themes and ideas.

The study also made use of non-participant observation. With this method of data collection, observers studied the phenomenon as users of the market (Sarantakos, 2006). Observation checklist was prepared to guide and used to observe road traffic congestion in the study area.

4.4. Data collection procedures

Two research assistants were trained in a classroom environment for a day. These research assistants piloted the research instruments in order to fine-tune the research instruments at Abura Market in the Cape Coast Metropolis. The main fieldwork was carried out between 11th and 18th April 2017. Literate respondents completed the questionnaire with little or no assistance whereas the content of the questionnaires was interpreted into Twi (the widely spoken language in Ghana) for the illiterate. Out of the 332 questionnaires administered, only 300 (90.4%) were correctly filled and thus formed the basis for this study.

4.5. Data analysis

The quantitative data were analyzed using the Statistical Product for Service Solutions (SPSS) v 21. Frequencies and percentages were used to present the results from the questionnaires in form of tables and charts. The IDIs were analyzed manually. The data from the IDIs were transcribed, then categorized under specific themes and manually analyzed.

5. Results

5.1. Background characteristics of respondents

As shown in Table 1, the majority of the respondents (78.3%) were females and the mean age of respondents was 32.5 years old. The majority of the respondents had attained basic education (50.7%) and was married (43.0%). Christianity is the dominant religion

Table 1
Socio-demographic characteristics of respondents.
Source: Field survey, 2017.

Characteristics	Frequency (N = 300)	Percentage (%)
Gender		
Female	235	78.3
Male	65	21.7
Marital status		
Married	129	43.0
Divorced	97	32.3
Single	53	17.7
Widowed	21	7.0
Religion		
Christian	185	61.7
Muslim	115	38.3
Purpose		
Shopping	96	32.0
Selling	197	65.7
School	5	1.7
Office work	2	0.6

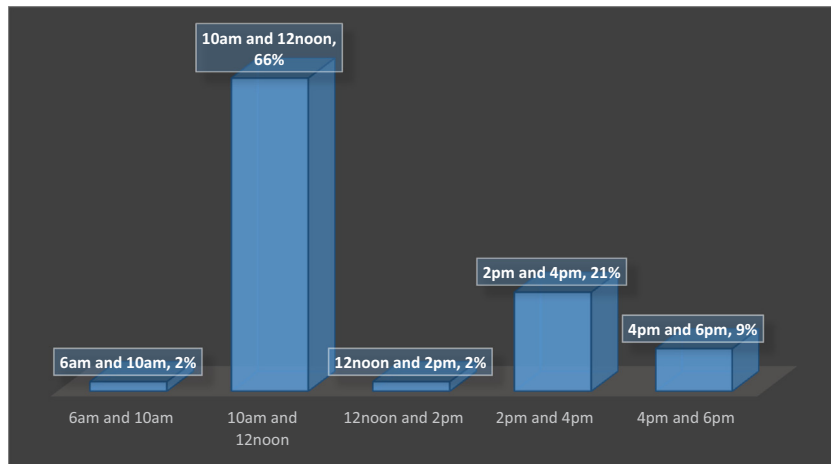


Fig. 3. Time of the day traffic congestion is experienced. Source: Field survey, 2017.

among the respondents (61.7%). The Table further shows that the majority of the respondents (65.7%) were traders/hawkers with 32% being shoppers.

According to Fig. 3, the traffic congestion peaks from 10a.m. to 12 noon (66%) and goes down significantly thereafter. Then it peaks again from 2 p.m. to 4 p.m. (21%). As shown in Table 2, more than half of the respondents experienced the traffic congestion frequently with 44.7% experiencing it more frequently. The Table further shows that the majority of the respondents experienced the traffic jam between 16 min and above. More than 50% of the respondents spent 16–45 min in traffic with 46.3% spending more than 45 min.

5.2. Causes of traffic congestion in the Accra Central Market

According to Fig. 4, the bad attitudes of the traders (80.70%), narrow roads (54.70%), and bad attitude of drivers (45.70%) are the main causes of traffic congestion in the Accra Central market. Traffic congestion in the Accra central market is also caused by poor road design (29.70%) and bad attitude of pedestrians (18.30%). As indicated in Fig. 5, traders or street hawkers (47%) and commercial vehicle drivers (37%) are the major cause of traffic congestion at Accra Central Market.

5.3. Effects of traffic congestion

According to Table 3, the majority (29.7%) of the respondents perceived that traffic congestion is time-consuming and 18% opined that it causes stress. Table 3 further shows that traffic congestion affects the productivity of more than half of the respondents (51.1%).

5.4. Measures to manage traffic congestion

A number of measures to tackle traffic congestion at the Accra Central were proposed by the respondents: A trader responded that:

Table 2
Frequency and duration of experiencing Traffic congestion in Accra central market.
Source: Field survey, 2017.

Variables	Frequency	Percentage
Frequency of traffic congestion		
Most frequently	134	44.7
Frequently	161	53.7
Seldom	5	1.3
Duration of traffic congestion		
< 15 min	6	2.0
16–30 min	65	21.7
31–45 min	90	30.0
46–60 min	71	23.7
> 60	68	22.6

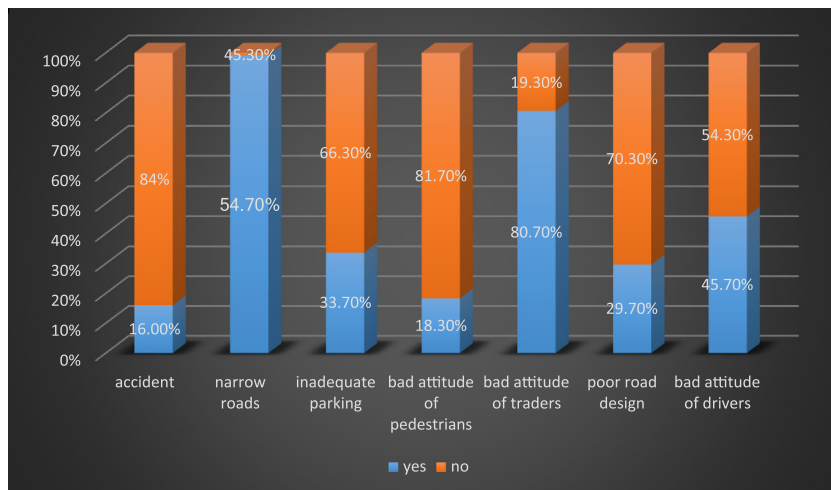


Fig. 4. Causes of traffic congestion in Accra central market.
Source: Field survey, 2017.

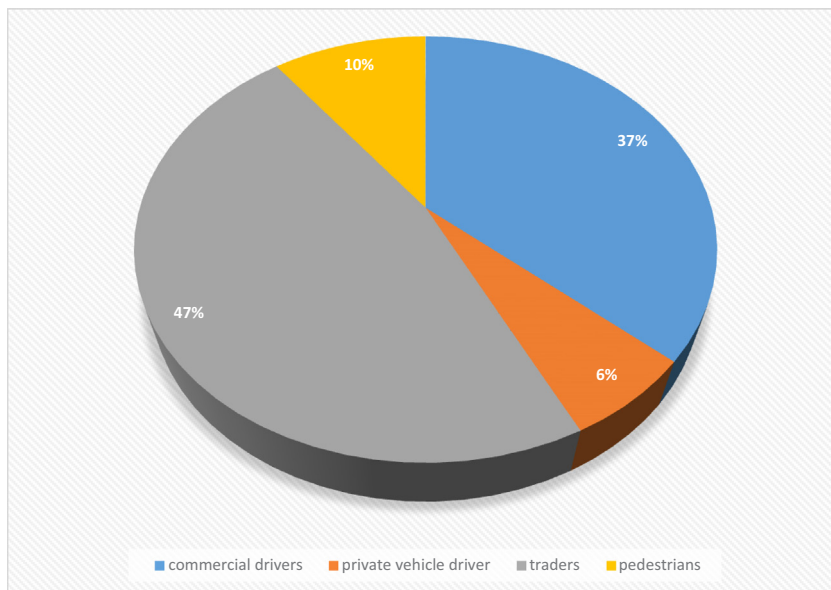


Fig. 5. Users responsible for traffic congestion in Accra central market.
Source: Field survey, 2017

“Even though I am a trader, I think one of the best ways to manage traffic congestion in Accra Central Market is by sacking the traders who are selling along the streets”.

A taxi driver observed that:

“If the responsible institution provides more traffic wardens at vantage points, the traffic congestion in the market will reduce”.

A street seller responded:

“I know we the street sellers are part of the causes of traffic congestions in the market. If we are given a better place to sell, we will leave the streets and the congestion will reduce.

A pedestrian stated:

“Evacuating sellers from the street and pedestrian walkways, providing traffic lights and more traffic wardens will help manage traffic congestion in the market”.

A Transport planner at the Ministry of Transport:

Table 3
Effects of traffic congestion.
Source: Field survey, 2017

Characteristics	Frequency	Percentage
General effects		
Decrease in productivity	42	14.0
Pollution	29	9.7
Stress	54	18.0
Time consuming	89	29.7
No effects	86	28.7
Total	300	100.0
Effects on daily life		
Decrease in productivity	12	4.0
Lateness	52	17.3
Stress	72	24.0
Takes time	84	28.0
No effects	80	26.7

“The road infrastructure has limited capacity so when there is frequent congestion the lifespan of the road and pavements will reduce, and more money will be spent for maintenance and reconstruction. Our institution is a policy-making institution. We make policies, which are turned into strategies, which are also turned into activities. There are agencies put in place to implement these policies. Example when it comes to road safety, the National Road Safety Commission is there to ensure safety on the roads by educating the public”.

6. Discussion

Traffic congestion is a global nagging phenomenon confronting cities (Jain & Vazirani, 2010; Kiunsi, 2013). This could be current and non-current traffic congestion (Andoh, 2014). However, current traffic congestion is found at market centres as it occurs at a particular place, time and daily. This is generally the consequence of factors that act regularly on the transportation system such as daily commuting to work, shop, school or sell. These are users that experience the traffic congestion on daily commuting.

Rapid increases in car ownership in addition to poor land use planning, inadequate road space, lack of regulated parking systems, bad attitude of pedestrians, and motorists cause traffic congestions globally (Abane, 1993; Mahmud et al., 2012; Kiunsi, 2013). In the Accra metropolis, the causes of traffic congestion are poor road networks, road checkpoints, pedestrian obstruction, trading obstruction, narrow traffic lanes, reserved parking lots and load and picking of passengers along the road.

In the study the causes of traffic congestion in the Accra Central market are narrow roads, bad attitude of traders and drivers are the major causes of traffic congestion in that order. The road networks in most Ghanaian metropolitan cities like Accra were constructed during the colonial era with most buildings occupying setbacks for future road expansion (Andoh, 2014). There is no corresponding increase in the provision of new or expanded road networks to meet the increase in the volume of vehicular movements using the congested area (Fuseini & Kemp, 2016). As such rapid urban dynamics in Ghanaian cities exert much demand on urban road infrastructure and services.

Bad attitude of drivers such a wrong overtaking, one-way driving, disobeying traffic signals and dropping and picking of passengers have been identified as causes of traffic congestion (Remi et al., 2009). Typically, there is no provision for parking lots for drivers going to the Ghanaian markets. However, there may be a terminal or station where commercial drivers operate. These terminals may be relatively far from the market hence all categories of drivers choose to stop/park indiscriminately on the shoulder of the road to either drop or pick passengers or go into the market to shop/work. This illegal parking does not only reduce the size of the existing narrow road but encroaches on the pedestrian walkway if any. The pedestrians as users of the market will as well struggle with other users such as traders and motorists to use the small portion of the road left after the incursion by illegal on-street parking.

In the study, traders are responsible for almost half of the traffic congestion occurring at the Accra Central market. Traders/hawkers are expected to be the major users in a market area. However, these traders/hawkers have taken over pedestrian walkways and even portions of the road to showcase their wares to shoppers. This inadvertently causes pedestrian and motorists to share the already narrow roads in market centres (Abane, 1993).

The external effects of traffic congestion are broadly categorized as environmental, health, economic and social (Levy et al., 2010; Mahmud et al., 2012). Most studies have always laid emphasized on the economic burden of traffic congestion to the individual and the economy in both the developed and developing countries (Levy et al., 2010; Mahmud et al., 2012). This is substantiated in the study where the majority of the respondents noted the experiencing traffic congestion is time-consuming as a major externality. For instance, in the US, time wasted in traffic leads to an economic burden ranging from 83 -124 billion dollars (Schrank & Lomax, 2007; Victoria Transport Policy Institute, 2009). To the driver time-consuming externality of traffic congestion means an increase in fuel consumption, which leads to higher transportation costs and to the worker or trader it is wastage of working time and delay in service delivery which results in financial losses (Jain & Vazirani, 2010; Mahmud et al., 2012; Kiunsi, 2013).

Multiple externalities from traffic congestion such as pollution have public health impacts of excess air pollutant emissions or noise pollution during periods of traffic congestion (Levy et al., 2010). Motor vehicles are a major source of traffic congestion as they

are responsible for carbon monoxide, nitrogen dioxide and hydrocarbon emissions (Currie & Walker, 2011). Users of Accra central markets are exposed to intractable road traffic noise every day with traders, commercial vehicle drivers, traffic wardens and police officials, and school children were the most affected. This group may be exposed to day noise levels in excess of 75 dB (A) (Essandoh & Armah, 2011).

The magnitudes of public health effects of traffic congestion from pollution are expected to be significantly high in market areas because of the population density of users (Essandoh & Armah, 2011). The resultant effects of the exposure to air and noise pollution due to unnecessarily long periods spent on roads at the market centres are breathing problem, hearing problem, unexpected sweating, mental stress, eye problems, tiredness, and headache (Essandoh & Armah, 2011; Mahmud et al., 2012; Shamsherand Abdullah 2015). Traders, traffic policemen/warden, shoppers and workers at the market are the most affected groups exposed to these dangerous factors during their working hours and in their leisure time (Omidvari & Nouri, 2009). This exposure may invariably cause a decrease in productivity.

The decrease in productivity as a social effect causes a reduction in personal incomes and loss of time that could have otherwise been spent on social activities (Weisbrod et al., 2003; Harriet, Poku, & Emmanuel, 2013). The decrease in productivity results in financial losses in terms of manpower lost on working days (Mahmud et al., 2012).

Traffic congestion in Accra Central market cannot be prevented but rather managing it to an acceptable level (Blanco et al., 2009). Managing traffic congestion in the Accra Central Market calls for a multi-faceted approach (Blanco et al., 2009). The Ministries of Road and Highways (MR&H) in conjunction with the Ghana Highways Authority (GHA) and the AMA have attempted addressing the causes of traffic congestion in Accra Metropolis as a whole and Accra Central Market is not an exception with appreciable financial and political will from the Government of Ghana and international donor agencies including World Bank and DANIDA (Abane, 1993). As a result of these efforts, some of the recommendations applicable to the Central market are:

- Improvement/provision of pedestrian walkway-
- Retraining/enforcement of personnel to handle the traffic problems-
- Provision of parking lots-
- Lane management or/and vehicular flow through traffic management-
- Banning of traders/hawkers on the streets -

7. Conclusions and policy implications

From the study, it can be concluded that the ranked causes of traffic congestion in the Accra Central market are the bad attitude of traders, narrow roads, bad attitude of drivers, poor road design, bad attitude of pedestrians and accidents. The effects of traffic congestion are time-consuming, pollution and stress, decreased productivity. Measures to be put in place to manage traffic congestion in the Accra Central market are multifaceted.

There is no holistic measure to tackle traffic congestion at the Accra Central market. The AMA must wield its power to evacuate street sellers/vendors/hawkers on the street with the provision of personnel of the Ghana Police Service to arrest offenders and a special court to prosecute to serve as a deterrent to others.

The officials of the Motor Transport and Traffic Department (MTTD) of the Ghana Police Service or trained traffic warden or task force should be directing the flow of traffic. In addition, no stopping/parking signal should be mounted on the roads to the market. Offenders are to be arrested and prosecuted by the mobile court. Display of wares by traders/vendors on pedestrian walkway should be discouraged and offenders are to be fined or their wares seized by the Ghana Police Service personnel. All these measures will be effective if the National Council for Civil Education (NCCE) mounts periodic campaigns on the dos and don'ts of all road users at the market center.

References

- Abane, A. M. (1993). Tackling traffic congestion in Accra, Ghana: A road user's perspective. *Journal of Advanced Transportation*, 27(2), 193–206.
- Abane, A. M. (2011). Travel behavior in Ghana: Empirical observations from four metropolitan areas. *Journal of Transport Geography*, 19(1), 313–322.
- Addo, S. T. (2002). Urban transport in Ghana and Africa: Problems and solutions. *Ghana Social Science Journal*, 2(1), 1–8.
- Andoh, A. K. (2014). *Managing road traffic congestion in the Cape coast metropolis, Ghana (Masters dissertation)*. university of cape coast.
- Armah, F. A., Yawson, D. O., & Pappoe, A. A. (2010a). A systems dynamics approach to explore traffic congestion and air pollution link in the city of Accra, Ghana. *Sustainability*, 2(1), 252–265.
- Armah, F. A., Yawson, D. O., & Pappoe, A. A. (2010b). A systems dynamics approach to explore traffic congestion and air pollution link in the city of Accra, Ghana. *Sustainability*, 2(1), 252–265.
- Baffour, R. (2010). *Managing traffic congestion in Accra by overhauling the signal timing procedures*. <[http://www.ghanaweb.com/GhanaHomePage/??](http://www.ghanaweb.com/GhanaHomePage/?)> (Accessed on August 2, 2016).
- Blanco, H., Alberti, M., Forsyth, A., Krizek, K. J., Rodriguez, D. A., Talen, E., & Ellis, C. (2009). Hot, congested, crowded and diverse: Emerging research agendas in planning. *Progress in Planning*, 71(4), 153–205.
- Currie, J., & Walker, R. (2011). Traffic congestion and infant health: Evidence from E-Z Pass. *American Economic Journal: Applied Economics*, 3(1), 65–90.
- Downie (2008). The world worst traffic jams time. (Retrieved on 14th August 2017) Available at. <<http://www.time/world/article/0,8599,1733872.html>>.
- Essandoh, P. K., & Armah, F. A. (2011). Determination of ambient noise levels in the main commercial area of Cape Coast, Ghana. *Research Journal of Environmental and Earth Sciences*, 3(6), 637–644.
- Fuseini, I., & Kemp, J. (2016). Characterising urban growth in Tamale, Ghana: An analysis of urban governance response in infrastructure and service provision. *Habitat International*, 56, 109–123.
- Harriet, T., Poku, K., & Emmanuel, A. K. (2013). An assessment of traffic congestion and its effect on productivity in urban Ghana. *International Journal of Business and Social Science*, 4(3).

- Hickman, R., Ashiru, O., & Banister, D. (2010). Transport and climate change: Simulating the options for carbon reduction in London. *Transport Policy*, 17(2), 110–125.
- Jain, K., & Vazirani, V. V. (2010). Eisenberg–Gale markets: Algorithms and game-theoretic properties. *Games and Economic Behavior*, 70(1), 84–106.
- Jones, H., Moura, F., & Domingos, T. (2014). Transport infrastructure project evaluation using cost-benefit analysis. *Procedia-Social and Behavioral Sciences*, 111, 400–409.
- Jorgensen, S. H., & Abane, A. M. (1999). A comparative study of urban traffic accidents in developing and developed countries: Empirical observations and problems from Trondheim (Norway) and Accra (Ghana). *Bulletin of the Ghana Geographical Association*, 21, 113–128.
- Kiunsi, R. B. (2013). A review of traffic congestion in Dar es Salaam city from the physical planning perspective. *Journal of Sustainable Development*, 6(2), 94.
- Levy, J. I., Buonocore, J. J., & Von Stackelberg, K. (2010). Evaluation of the public health impacts of traffic congestion: A health risk assessment. *Environmental Health*, 9(1), 65.
- Mahendra, A. (2009). Vehicle restrictions in four Latin American cities: Is congestion pricing possible? *Transport Review*, 28, 105–133.
- Mahmud, K., Gope, K., & Chowdhury, S. M. R. (2012). Possible causes & solutions of traffic jam and their impact on the economy of Dhaka City. *Journal of Management and Sustainability*, 2(2), 112–135.
- Mensah, J., Annan, J., & Andoh-Baidoo, F. (2014a). Assessing the impact of vehicular traffic on energy demand in the Accra Metropolis. *Journal of Management Policy and Practice*, 15(4), 127.
- Mensah, J., Annan, J., & Andoh-Baidoo, F. (2014b). Assessing the impact of vehicular traffic on energy demand in the Accra Metropolis. *Journal of Management Policy and Practice*, 15(4), 127.
- Ministry of Finance (2014). reports.**
- Ojo, T. K., Amoako-Sakyi, R., Agyeman, W., Amenumey, K. E., & Abane, A. M. (2014). Factors influencing the modal choice of intercity bus service transport on Accra-Takoradi route, Ghana. *International Journal of Physical and Social Sciences*, 4(10), 149–169.
- Omidvari, M., & Nouri, J. (2009). Effects of noise pollution on traffic policemen. *International Journal Environmental Research*, 3(4), 645–652.
- Rahane, S. K., & Saharkar, U. R. (2014). Traffic congestion-causes and solutions: A study of Talegaon Dabhade city. *Journal of Information, Knowledge and Research in Civil Engineering*, 3(1), 160–163.
- Rao, A. M., & Rao, K. R. (2012). Measuring urban traffic congestion-A review. *International Journal of Traffic Transport Engineering*, 2(4), 286–305.
- Remi, A. J., Adegoke, A. A. I., & Oyerinde, A. J. (2009). A study of the causes, effects and ameliorative measures of road traffic congestion in Lagos Metropolis. *European Journal of Social Sciences*, 11(1), 119–128.
- Rodrigue, J. P., Comtois, C., & Slack, B. (2009). *The geography of transportation system*. New York: Routledge.
- Sarantakos, S. (2006). *Social research* (4th Ed). London: Macmillan Press Ltd.
- Schrank, D., & Lomax, T. (2005). *The 2005 Annual Urban Mobility Report*. Texas: Texas Transportation Institute.
- Shamsher, R., & Abdullah, M. N. (2015). Traffic congestion in Bangladesh-causes and solutions: A study of Chittagong metropolitan city. *Asian Business Review*, 2(1), 13–18.
- Texas Transportation Institute (TTI) (2011). *The keys to estimating mobility in urban areas: Applying definitions and measures that everybody understands*. Texas: Texas Transportation Institute.
- Vickrey, W. (1997). *Principles of efficient congestion pricing*. Columbia University.
- Victoria Transport Policy Institute (2009). *Transportation cost and benefit analysis: Techniques*. Victoria, BC, Canada: Estimates and Implications.
- Weisbrod, G. Vary, D. and Treyz, G (2003). *Measuring the Economic Costs of Urban Traffic Congestion to Business*. Transportation Research Board. #1839. 2003. (Accessed 24 November 2011) <www.edrgroup.com/pdf/weisbrod-congestion-trr2003.pdf>.
- Yildirim, M. B. (2001). *Congestion toll pricing models and methods for variable demand networks (Doctoral dissertation)*. University of Florida.