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Traffic Management in the Cape Coast Metropolis

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Abstract: Managing traffic in developing countries has become topical in recent years because of the externalities of transport-traffic congestion, air and noise pollution as well as RTCs (Road Traffic Crashes). This paper considers how these externalities are managed in the Cape Coast Metropolis. The study adopts a desktop review of transport related externalities in the metropolis. In an attempt to address these externalities, traffic management measures have been adapted in Cape Coast Metropolis such as one-way system, pedestrian safety measures, provision of on-street parking, improved junction control measures, and pedestrainisation, with minimal impacts. Therefore, it is recommended in this paper that Cape Coast Metropolitan Assembly in conjunction with the Department of Urban Roads of the Ministry of Roads and Highways adopt an integrated approach to managing traffic placing emphasis on the behavior of road users.

Key words: Developing countries, traffic management, Cape Coast, road users, Ghana.

1. Introduction

One of the major cardinals of transportation planning is to enable the movement of people and goods on urban roads [1]. The increasing size of urban areas and corresponding swelling population mobility have caused a rapid increase in the number of vehicle and demand for movement for various purposes which have resulted in many challenges for road traffic management authorities in terms of traffic congestion, RTCs (Road Traffic Crashes), air and noise pollution [2-4]. These traffic management problems affect the quality of life of urban dwellers [4].

The European Commission launched the European Initiative on Smart Cities in 2010 to address transport related challenges in cities in order to identify and support sustainable forms of transportation, to build intelligent public transportation systems based on real-time information, TMS (Traffic Management Systems) for congestion avoidance, safety and green applications (e.g. to reduce fuel consumption, gas emissions or energy consumption) [5].

According to the Victoria Transport Policy Institute's UMR (Urban Mobility Report) dated 18 December 2014, traffic congestion causes 5.5 billion hours of time and 2.9 billion gallons of fuel wasted in urban areas of the United States from 2000 and 2010 [6]. One other critical consequence of traffic congestion is the delay of emergency services, such as police, fire and rescue operations, medical services, etc. [4].

Traffic congestion besieges many urban areas/cities in developing countries [7, 8]. The increase in urban/city traffic is borne by a variety of socio-demographic factors in addition to the demand for motorized transport. Traffic congestion causes air and noise pollution [9]. Besides, an increase in vehicular movements also increases the probability of an RTC. The consequences of RTCs are many at the individual, group and societal levels and could be aggravated if emergency vehicles are involved in an RTC [4].

The number of vehicles in developing countries has increased exponentially but the bedrock capacities of road networks and transportation systems have not been developed in an equivalent way to efficiently accommodate the volume of the vehicle travelling on them [10]. Some local authorities consider the options

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of widening existing roads, which causes a number of buildings and properties to be pulled down. This is not the necessary panacea needed in traffic management in urban areas because of the expensive nature of such exercise [1]. Notably, the current urban street design practices in developing countries largely neglect pedestrians and other NMT (Non-motorized Transport) road users [11].

TM is the application of different strategies or measures to change the flow of traffic on roads to reduce the speed of vehicle passing by and/or to reduce the traffic volume itself or ensure pedestrian safety [12]. According to Atubi [13], traffic management is a variety of techniques for addressing highway and traffic related challenges. Adebisi [14] sees TM as a means of optimising the available road network in accord with specified objectives as dictated by the prevailing local issues.

TM measures (such as tidal flow or tidal traffic system, one-way system, pedestrian safety measures, provision of on-street parking, improved junction control measures, pedestrianisation, bus priority schemes) have attracted attention that seeks to utilize existing transport facilities with a view to minimizing social and economic costs while at the same time maximize benefits [14, 1, 13]. Similarly traffic management measures such as environmentally adapted "through" roads, 30-kilometer per hour zones, road humps, roundabouts, restrictions on traffic in special periods, speed control etc. are used on many urban roads in Europe [12].

The effectiveness of these traffic management measures depends on the following attributes [7, 14, 1, 13]:

1. Traffic management measures should be relatively inexpensive and should be easy to implement.

2. They should improve the performance and capacity of existing transportation facilities.

3. They should reduce the incidence of RTCs (Road Traffic Crashes).

4. They must strive to improve and protect the environment.

5. They must be sufficiently flexible to adapt to land use changes. Construction of new roads, new public transport measures and to parking standards.

6. They must ensure the overall throughput in the town.

7. (Re)training of personnel to handle traffic problems more efficiently.

A number of researches have been conducted on TM in Ghanaian metropolitan cities such as Accra, Kumasi and Tamale [7, 15, 16, 8]. But its implementation is noted to be weak because of the associated challenges of traffic congestion, air and noise pollution and RTCs. The authorities' inability to plan holistically will dislocate the urban system and indeed lead to a virtual infrastructural systemic breakdown, compelling frustrated commuters and other road users to find adaptation strategies [8].

Cape Coast Metropolis has not attracted much attention in terms of researches on TM in Ghana despite its importance as the formal capital and citadel of education and tourism in Ghana. Its population and volume of vehicles on the road are also increasing steadily. Therefore, this study seeks to assess traffic management in the Cape Coast Metropolis from the users' perspectives. This is because any attempt to step up traffic management in Ghanaian cities is to be approached from the users' perspective [17, 18, 7].

The present paper is to contribute to the ongoing discussion on traffic management in urban areas/cities in developing countries like Ghana. The background to traffic management and control in Cape Coast Metropolis is first examined. Following is a discussion on its dimensions and measures adopted in the metropolis. The third and final section focuses on how to improve on traffic management in the metropolis not forgetting the financial implications of such interventions in developing countries like Ghana [17, 18, 7].

2. Data and Methods

Data for the paper were obtained from two main sources. Firstly, information was collected from

CCMA (Cape Coast Metropolitan Assembly) on issues on traffic management in the metropolis. This information relates to RTCs, traffic congestion and air and noise pollution. The rest of the information was through library research and official documents [19]. In addition, the author relied on google scholar for all other relevant articles [20]. The author also included publications he knew about from informal contacts.

2.1 Contextual Issues

Cape Coast Metropolis as shown in Fig. 1 is located at 5.10535 (latitude in decimal degrees), -1.2466 (longitude in decimal degrees) at an average elevation of 21 meters. It covers an area approximately 122 squarekilometers. Cape Coast ceased to be the administrative capital of Ghana in 1877 but still remains the regional capital of the Central Region. Although Cape Coast is not one of the primary cities in Ghana such as Accra, Kumasi, Sekondi-Takoradi and Tamale, it is the educational and tourism hub of Ghana. It is one of the six metropolitan cities in Ghana (others being Accra, Kumasi, Tamale, Tema, and Sekondi-Takoradi).

Cape Coast is the administrative, commercial and entertainment hub of CCMA (Cape Coast Metropolitan Assembly) that comprises 19 settlements such as Abura, Amomoma, Esuekyir, and Ekon. It has an estimated population of 227, 269 in 2013 and with a growth rate of 3.1%, the population is estimated to be 249, 094 in 2016.

Improved socio-demographic characteristics and increasing population as shown in Cape Coast are an open sesame for an increase in demand for transport [7]. The available infrastructure may not be able to support the volume of vehicle and its externalities such as traffic congestion, air and noise pollution and RTCs.

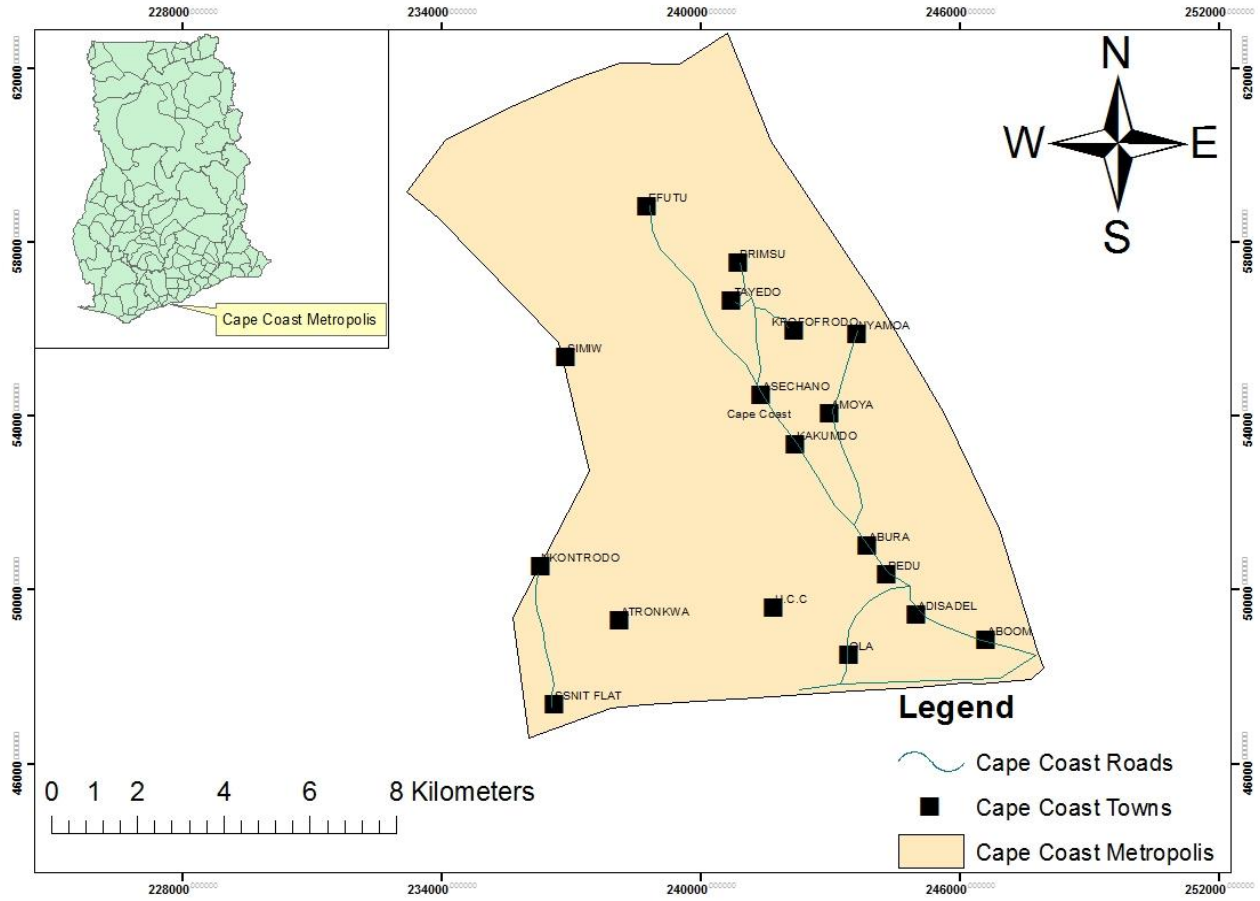

Fig. 1 Map of Cape Coast Metropolis.

Source: GIS (Geographic Information System) unit of the Department of Geography and Regional Planning, UCC.

3. Background of Externalities of Transport

3.1 Air and Noise Pollution

Residents of urban areas are exposed to intractable road traffic noise every day with traders, commercial vehicle drivers, traffic wardens and police officials, and school children who attend schools close to the main road been affected the most. This group may be exposed to day noise levels in excess of 75 dB (A) [21]. Similarly, the residents living close to the main road, junctions or busy roads may be exposed to night noise levels in excess of 75 dB (A). Essandoh and Armah [21] concluded that noise levels at all the 10 measurement points in Cape Coast exceeded the Ghana EPA (Environment Protection Agency) recommended upper limit by values of 1-15 dB (A).

3.2 Traffic Congestion

Traffic congestion in the Cape Coast Metropolis has become topical of late to relevant stakeholders in the transport industry. There is increasing rate of traffic congestion due to increase in human and vehicular population. However, there is no corresponding increase in the provision of new or expanded road networks. The road networks were constructed during the colonial era with most buildings occupying setbacks for future road expansion [22]. There is a huge deficit in road infrastructure in Ghana [23]. As such rapid urban growth dynamics in Ghanaian cities exert much demand on urban road infrastructure and services.

The UN report indicated that 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) [24]. Urban congestion has an effect on the safety of networks [25].

Congestion arises from two causes [26]. Most important is when the demand for mobility exceeds the capacity to support it [27]. It can also occur when random events bring about a temporary disruption to services, such as an accident or a natural hazard such as flooding [26].

There are a number of factors responsible for traffic congestion in Cape Coast Metropolis [22]—inadequate parking spaces, bad attitude of drivers, too many vehicles on the road, inadequate road routes, poor road designs, bad attitude of pedestrians, breakdown or accidents, inadequate timing of traffic lights and road works. Out of which, the prominent ones are the first five in that order.

As shown in Fig. 2, between 1995 and March 2017, more than 34,000 vehicles were registered in Cape Coast [28]. However, there are other vehicles registered in other towns/cities/regions that are used in the metropolis. Despite the increase in the volume of vehicles and license owners in Cape Coast, the length of roads has not actually increased. However, there have been upgrading of sections of the road networks within the Metropolis. Some of the roads there were not tarred have been tarred and some asphalted.

3.3 Road Traffic Crashes

The speed at which RTCs occur can influence the fatality of the RTC [29]. This underlies why the majority of the RCTs did not result in a high fatality in Table 1. Although traffic congestion increases the incidence of RTCs, its effects ranges from victims being hospitalized or injured but not hospitalized and property damage. Traffic congestion increases the traffic density affecting RTCs rate by increasing the number of interactions between different vehicles. Therefore, creating more occasions for RTCs to occur [25]. RTCs risk is almost five times higher in traffic congestion than free flowing traffic [30].

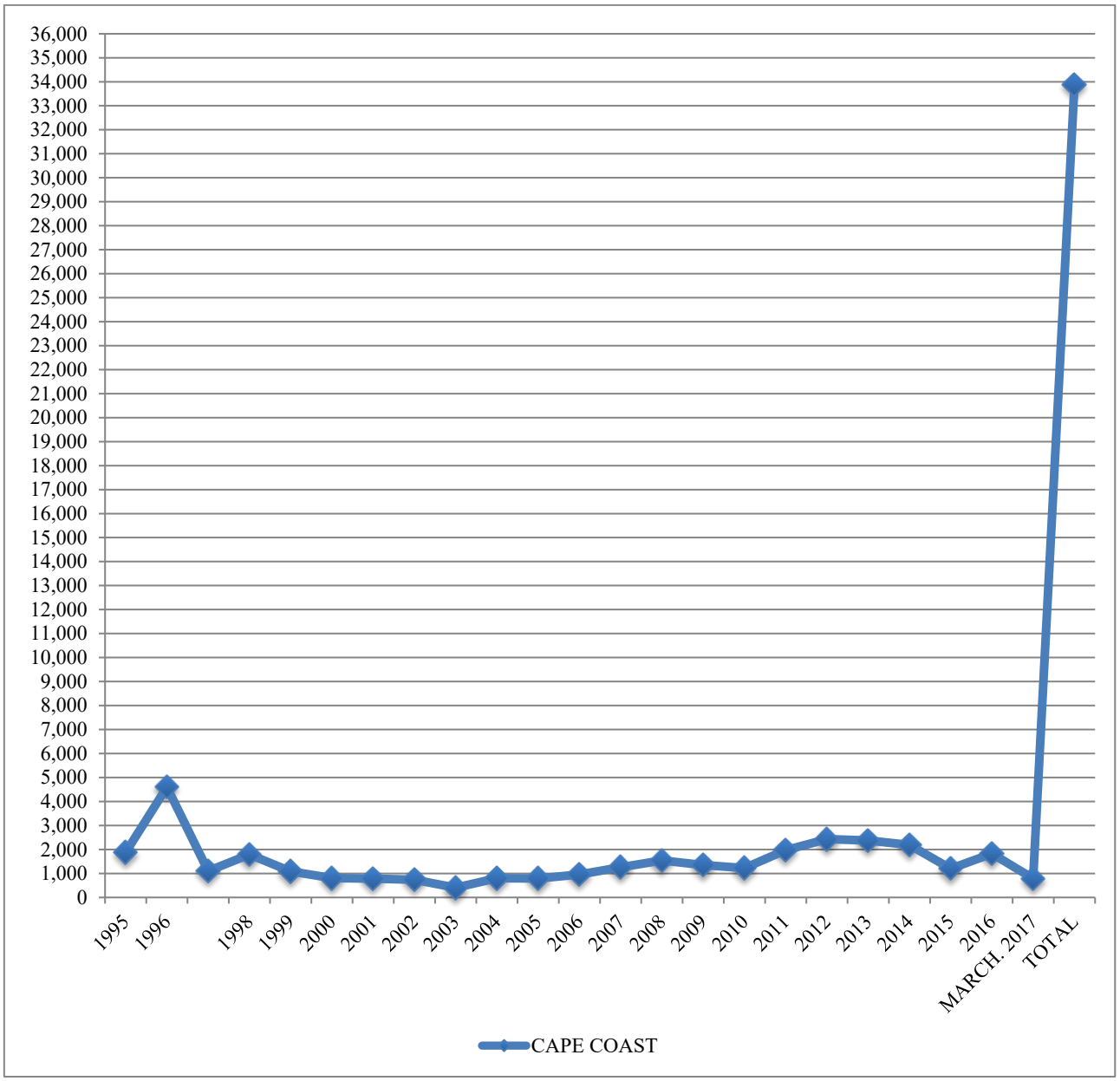

Fig. 2 No of registered vehicles in Cape Coast.
Source: DVLA, 2017 [28].

As shown in Table 1, there was a decline in the incidence of RTCs in 2007 as against that of previous two years by more than 30%. But there was more than 100% increase between 2010-2015. Similarly, the fatality of RTCs reached its climax between 2010-2013 until a number of measures were put in place by the NRSC. This caused a massive decline in fatality between 2014 and 2015. There was an increase in the number of victims hospitalized or injured but not hospitalized between 2009-2012.

Table 1 further shows an incidence of RTCs according to days of the week. Between 2005-2015 most of the RTCs occurred on Saturday (358) followed by Fridays (315). This is because there is a high volume of traffic during these days. Besides, there are a number of social activities such as wedding and funeral ceremonies where alcoholic beverages are served. This invariably contributes to the high incidence of RTCs immensely as alcohol consumption impairs the ability to drive safely.

Table 1 Road traffic crashes severity in the Cape Coast Metropolis.

Year	Fatal	Hospitalized	Injured not hospitalized	Damage only	Total
Year					
2005	15	29	50	41	135
2006	10	24	28	40	102
2007	13	28	22	28	91
2008	13	21	33	29	96
2009	11	26	25	40	102
2010	18	29	73	62	182
2011	18	48	104	118	288
2012	25	51	95	115	286
2013	24	52	80	92	248
2014	3	45	77	77	202
2015	3	36	94	81	214
Total	153	389	681	723	1946
Day					
Monday	17	59	106	98	280
Tuesday	20	52	83	79	234
Wednesday	16	46	105	85	252
Thursday	19	59	86	103	267
Friday	18	53	107	137	315
Saturday	43	72	108	135	358
Sunday	20	48	86	86	240
Total	153	389	681	723	1946
Month					
January	14	35	57	58	164
February	12	37	43	52	144
March	13	30	49	56	148
April	11	33	54	53	151
May	7	33	62	67	168
June	13	33	51	50	147
July	9	29	54	58	150
August	19	27	49	65	160
September	15	37	68	71	191
October	9	38	59	63	169
November	12	24	65	60	161
December	19	33	70	70	192
Total	153	389	681	723	1946
Time					
00-01	3	1	3	9	16
01-02	1	1	5	12	19
02-03	1	6	3	5	19
03-04	1	1	7	5	14
04-05	5	4	8	15	32
05-06	1	13	14	9	37
06-07	4	9	13	12	38
07-08	3	16	36	29	84
08-09	4	19	43	33	99
09-10	5	21	30	57	113

Table 1 to be continued

10-11	6	21	33	37	97
11-12	7	25	45	48	125
12-13	3	6	42	49	100
13-14	7	20	29	44	100
14-15	12	31	51	38	132
15-16	12	19	55	60	146
16-17	11	34	50	50	145
17-18	10	19	38	42	109
18-19	9	26	28	27	90
19-20	14	39	53	49	155
20-21	12	20	38	29	99
21-22	12	18	19	34	83
22-23	4	16	23	14	57
23-24	6	4	15	16	41
Total	153	389	681	723	1946

Source: BRRI, 2017 [31].

According to Table 1, most of the RTCs irrespective of severity in Cape Coast Metropolis occur in December (192). This is quite attributable to the festive period in December with a lot of wining and dining. Furthermore, the celebration of Fetu Afehye (Festival) in September has an influence on the high incidence of RTCs in the metropolis. This festival is celebrated during the first Saturday in September with festive activities spanning a week before and after the first Saturday. The festive period attracts all sons and daughters from home and abroad with tourists. As such, there is an increase in both pedestrian and vehicular traffic in the Metropolis. This higher traffic density increases the risk of RTCs [25].

The time of day/night has a strong relationship with incidence of RTCs with higher risk during times when the average network speed is lower [25]. According to Table 1, there is a study increase in the incidence of RTCs in Cape Coast Metropolis from 04-05 am to 09-10 am. However, the majority of the RTCs occur within the 14-15 pm to 15-16 pm and thereafter start declining. These periods are noted to be peak periods for commuters with vehicles moving at low speed but increasing the risk of RTCs [32]. Andoh [22] submitted that the extent of traffic congestion is observed during peak hours (7:00-9:00 and 4:00-7:00 pm) and can cause commuters to spend between 15-30 minutes to travel a short distance.

4. Current Traffic Management Measures

CCMA has put stiff penalties against unlawful parking, dedicated one-way streets, traffic signal lights, paid and free on-street parking lots in place in order to manage traffic in the metropolis. The presence of task force on clamping down of unlawfully parked vehicles is felt around the central market (Kotokuraba) and Abura Market. Offenders' vehicles reams are locked and asked to report to the Metropolitan office to pay a fine ranging from Gh¢ 20-50 (USD 5-12).

The dedicated one-way streets are found in core parts of the city comprising Ntsin, Commercial Street and Coronation Streets. Generally, all the streets in the core parts of the city are narrow. In that wise, it may not be able to accommodate opposite vehicular traffic. However, they don't attract much traffic as these three principal streets in addition to the ones surrounding the Central Market. Besides, Ntsin and Commercial streets are popular streets during Feu Afehye (festival) in September). There are two giant trees (which house lesser gods, which play pivotal roles during the festival period), located on Ntsin Street. On the other hand, Commercial Street accommodates a very high traffic

flow as the official route for the Traditional Rulers and the host of celebrants en route Victoria Park (Jubilee Park) for the grand finale of the festival.

All public transport operators (be it intra or inter urban/city) terminate their service at the Central Market. This increases vehicular movements around the market. Owing to this all the adjoining streets are dedicated one-way lane. Yet there is a heavy vehicular movement during the day and on weekdays. Traffic signal lights are installed in three places in the metropolis-UCC, Pedu Junction and Interbeton Junctions. There are three intersections where the management of UCC has installed traffic lights. All the three traffic lights are located at the new site where there is observed high vehicular and pedestrian movements. The university security officials control the traffic flow at the Science intersection when the traffic light is faulty.

However, the Ministry of Highways through the Department of Highways and Urban Roads installed and managed the traffic lights at Pedu and Interbeton Junctions, respectively. Officials of the Motor Transport and Traffic Department of the Ghana Police Service man the Pedu intersection whenever the traffic light becomes faulty.

5. Way out

Traffic management in developing countries like Ghana has been fraught with a number of challenges. Hence, more time is needed to determine the full impact of these measures, which have been exposed in the paper. Congestion, air and noise pollution and road traffic crashes are externalities plaguing the metropolis. A number of other measures are required to beef up the existing ones. It is based on this that the following recommendations are made.

5.1 Air and Noise Pollution

The introduction of the Environmental Impact Assessment regulation is to be identified. Besides, there is more to be done in pollution management even with the implementation of the Environmental Assessment Regulation (1999). EPA (Environment Protection Agency) should come out with the statistics on transport related noise and air pollution in the Metropolis in order to assist in policy formulation.

5.2 Road Safety

The National Road Safety Commission should intensify road safety education for road users to reduce the incidence of RTCs in the metropolis. This measure should target pedestrians and market women who display their wares along the major roads and market centers. To salvage the incidence of reckless driving, the Driver and Vehicle Licensing Authority (DVLA) should put in place proactive measures meant to make it difficult for people to acquire license without demonstrating adequate competence of driving skills and proper understanding of the Highway Code comparable to the standards used in the developed countries [17, 18]. Furthermore, a graduated system of licensing has to be institutionalized by the DVLA. Licensed drivers wanting to upgrade their licenses must also undergo stringent procedures.

5.3 Traffic Congestion

The MTTD (Motor Transport and Traffic Department) officials of the Ghana Police Service should ensure that road traffic regulations are enforced and offenders are punished to serve as a deterrent to other road users. In addition, the MTTD officials should make their presence felt along the major roads in the metropolis by warding off misdemeanor of drivers and hawkers who display their wares by the roadside.

The DUR (Department of Urban Roads) of the Ministry of Roads and Highways in conjunction with CCMA should assign more roads as one way because the majority of the roads within the metropolis are very narrow and thus, cannot accommodate vehicles coming from the opposite direction.

The CCMA should endeavor to provide more on-street parking facilities along the major roads in the

metropolis. This on-street parking facility may attract a fee. The parking fees should be based on hourly bases. This can act as a deterrent to motorists who may intend to park there for long hours. The facility should also be provided on the main road surrounding the central market in the metropolis in addition to the existing one-way lane.

The use of taxis and private cars for travel is prominent in the metropolis instead of large buses, which causes congestion. This can be surmounted by the use of small public buses (otherwise called trotro) accommodating between 7-14 passengers. This is in spite of the challenges associated with the use of public buses (trotro), which borders on quality of service (such as reliability of service, comfortability, empathy, tangibility and responsiveness) [33, 26]. The use of public buses holds many advantages over the use of a private automobile for the individual, for the community and cities from the standpoints of energy conservation, environmental impact, social equity and economy.

Street design practices in Ghana do not take into consideration pedestrians and non-motorised users [11]. Walking and cycling are alternative ways of reducing traffic congestion in the Metropolis. This can be achieved if there are provisions for pedestrian walkways and ample space for cycling. The CCMA can restrict the movements of vehicles around the Kotokuraba Market (CBD) to promote walking and cycling. Besides, human drawn carts can also be used to carry goods where vehicles are not supposed to ply around the market.

6. Conclusion

Traffic management has become topical because of traffic congestion, air and noise pollution and RTCs in cities in developing countries like Cape Coast. There are two major causes of congestion arises—when the demand for mobility exceeds the capacity to support it and during a temporary disruption to services, such as an accident or a natural hazard such as flooding. However, the first problem is caused by factors such as inadequate parking spaces, too many vehicles on the road, inadequate road routes, poor road designs, inadequate timing of traffic lights and road works. On the other hand, bad attitude of drivers, bad attitude of pedestrians, breakdown or accidents comprised the second major cause.

The increase in the volume of vehicles on the road has effects on RTCs, air and noise quality. Those affected the more are the traders, commercial vehicle drivers, traffic wardens and police officials, and school children that attend schools very close to the main road. Vulnerable road users such as pedestrians and traders are the receiving ends in the event of RTCs in the metropolis.

Based on these results, three main conclusions have been drawn. First, it is important to reduce traffic congestion in the metropolis as a whole to improve road safety. Secondly, road safety education has to be carried out for all classes of road users. But more attention has to be focused on vulnerable road users such as pedestrians, school children and traders. Lastly, the issue of air and noise pollution is topical as it poses danger to all classes of road users.

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