UNIVERSITY OF CAPE COAST

ROAD TRANSPORT GOVERNANCE, TRAVEL PLANNING AND MOBILITY IN GREATER ACCRA METROPOLITAN AREA OF GHANA

COLLINS ASAMOAH DEBRAH

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BY

COLLINS ASAMOAH DEBRAH

Thesis submitted to the Department of Geography and Regional Planning of the College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy in Geography

SEPTEMBER, 2019

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this country or elsewhere.

Candidate's Signature……………………………… Date …………………….

Name: Collins Asamoah Debrah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature ……………………….Date ………………..

Name: Professor Albert M. Abane

Co-Supervisor' Signature ……………………………..Date ………………….

Name: Dr. Edem Amenumey

ABSTRACT

The use of car is both necessary but devastating. The search for solutions has been skewed in favour of motorization. This study explored governance as a tool to balance the trade-offs between indispensable motorization and sustainable urban mobility. The respondents for this study were policy makers from the transport sector agencies, ministries and departments in Ghana, as well as formal and informal transport service providers.

The research design was mixed method, largely qualitative with minimal quantitative research instruments. Some qualitative research instruments used were interview, focus group discussions and observations. The quantitative data was obtained through a manual number plate matching technique to physically collect speeds of vehicles in GAMA during rush hours. The study concludes that the triple function of GAMA strangulate planning capacities of the Local Authority. Again, conventional road construction designs do not promote mobility, leaving GAMA with low Time Mean Speed of 1.05 km/h.

To address these mobility problems in GAMA, the study recommends, government must earmark a percentage of the road fund contribution to the assemblies to empower the local authorities in their planning capacities. Again, government must amend its approaches to road transport development in GAMA by harnessing means of accessibility and also, promote application of modern intelligent transport systems in traffic management. These would help manage the prevailing recurrent traffic congestion in GAMA particularly during peak periods for improved turn-around time of commuters.

KEY WORDS

Accessibility-based planning

Mobility-based planning

New urbanism

Smart City concept

Sustainable accessibility planning

Sustainable city planning

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DEDICATION

To my parents: Kwadwo Baffour Debrah, and Afua Oforiwa

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CHAPTER ONE

INTRODUCTION

Background to the Study

The increasing volumes of vehicular production and technology (Hajer, Hoen & Huitzing, 2012) backed by increasing income levels among the middle class (Schafer & Victor, 2000) and the desire for ownership and use of the motor vehicle (Royal Commission on Environmental Pollution [RCEP], 2007) in recent times are causes of concern among commuters, city planners and scholars due to associated environmental costs. These challenges become worse in developing economies where rapid urbanization and motorization in combination with insufficient investment in infrastructure exacerbate urban poverty and social exclusion.

The impacts of these actions on the resilience and sustainability of many urban areas have been acknowledged. Accordingly, in a review of the impacts of the Millennium Development aspirations ending 2015, the United Nations identified social exclusion and poverty as major threats to sustainable cities (International Council for Science [ICSU] & International Council for Social Science [ISSC], 2015). Consequently, the new UN Sustainable Development aspirations for 2016 to 2030 on cities and human settlements have been redefined to include cities that are *inclusive, safe, resilient and sustainable* to urbanization and its antecedent factors (Sustainable Development Goal 11). These exigencies ultimately bestow new challenges for city planners and academics to search for mutual solutions to transport problems. In response, some scholars have searched for public transport planning with emphasis on planning rather than on mere provision of infrastructure, service delivery and scheduling (Dodson, Mees, Stone & Burke, 2011; Mees & Dodson, 2011; Vuchic, 1999). Others have called for integrated urban management to reflect transportation and public management (ICSU & ISSC, 2015). These mutual consents have been boosted further with a growing awareness for stakeholder activism in governance from the local to the national levels (Banister, 2008; Bikerstaff & Walker, 2001).

In furtherance of the above ideals, sustainable city planning has been recommended as an option. In this connection, Banister (2008) has argued that urban transport policy should reflect two fundamental principles in which travel is derived not only by demand for its own sake, but that people minimise their generalised cost of travel which could be operationalized through a combination of costs of travel and time taken to travel. Therefore, in transport analysis, imperatives such as the nature of the built environment (urban form) relating to density and land use mix, socio-economic variables (people and proximity) as well as travel mode (automobile, mass transport, walking and cycling) are considered (Aditjandra, Mulley & Nelson, 2009; Banister, 2008). Others have advocated for smart cities (Giffinger, Fertner, Kramar, Kalasek, Pichler-Milanović & Meijers, 2007), new urbanisms (Cervero, 2006a) and mixed-uses (Lara, Da Costa, Furlani & Yigitcanlar, 2016) as alternatives that promote multiple urban policy options-affordable housing, construction, spatial containment and reduced car-dependency. According to GTZ (2004), the key principles to these transit-oriented developments include promotion of walking, cycling, connecting, transit, mix, density, compact cities and to achieve shift to the preferred modes.

These aspirations have been captured in Sustainable Development Goal 11 in which urban areas are mandated to strive to be inclusive, safe, resilient and sustainable. Unfortunately, the aspirations for inclusive and resilient cities appear sceptical in view of conflicts of interest in the use of space, particularly the challenges associated with land use, paucity of data and absence of funds to identify and coordinate these interventions (International Council for Science [ICSU] and International Social Science Council [ISSC], 2015). The problem becomes pervasive in the developing world and in Ghana in particular despite a long period of travel behaviour and transport research (Abane, 2011). The persistence of these problems is due to the neglect of the twin prerequisites of urban and transport planning (Cervero, 2013). The situations above cannot be different from the absence of effective urban and transport planning systems and their implications on mobility peculiar to Ghana in general and Greater Accra Metropolitan Area (GAMA) in particular.

The Government of Ghana in its transport sector review in 2008 identified weak governance, lack of travel planning and inappropriate mode of travel as some factors that saddle the efficiency of the sector (Government of Ghana [GoG], 2008). According to Hull (2005), these implementation deficits result from lack of integration, divergent agenda and lack of proper-fit between different disciplinary and administrative policy areas such as land use planning, transport planning and sustainability. Accordingly, the Ghana Shared Growth and Development Agenda Report (2010-2013), identified this mismatch in policy directions as being responsible for increased dependence on motorization with its attendant constraints on slow mobility, particularly in urban areas.

Slow mobility, according to Ison, Marsden and May (2011), impairs traffic flow and disrupts business activities in cities. Magaji and Shat (2016), agree with above, and postulate further that these tendencies affect a wide range of activities including services, goods, and market opportunities in cities. The White Paper on the European Union's Transport Impact Assessment in 2011 estimated the cost of congestion in densely populated areas with high economic activity to be above 1 percent of the EUs gross domestic product.

A range of factors have been identified to bring about congestion in urban areas based on the EU Transport Impact Assessment Action Plan (2011). Accordingly, the phenomenon of congestion in urban areas has been classified into macro-factors, micro-factors and weather factors. The macro-factors of congestion emanate from demographic and economic factors, land use and car ownership (availability of parking space for movement and delivery of freight) whereas micro-factors are triggered by driver behaviour, traffic information and use of vehicles. Lastly, the weather factors include precipitation of all forms which bring about time delays, accidents and destruction of infrastructure.

In order to mitigate the cascading effects of congestion on cities, several theories have been suggested. For instance, Zuehlke and Guensler (2007), have argued for travel demand management strategies to reduce congestion, and improve mobility by influencing travel behaviour in local areas. Also, Vinoutrive, van Malderen, Jourquin, Thomas, Verhetsel & Witlox (2010), have suggested mobility management in cities to enable companies manage mobility of employees to influence travel behaviour by drawing employees' attention to sustainable transport options (see also, GTZ, 2004).

In view of these, Employer Transport Plans (ETPs) have become very significant. Accordingly, Giuliano, Hwang and Wachs (1993), had earlier hinted that Regulation XV in the USA was promulgated to enable public and private employers with employees about 100 or more complete Employer Travel Plans (ETPs) to increase average vehicular ridership (AVR) in cities. In recent times, the most sustainable approaches such as accessibility planning (walking, riding and public transit) have been suggested (Bos & Lee, 2012) to reach substantial levels of services and jobs within the shortest travel time. In view of this, Banister (2008) has suggested new approaches to planning by emphasising transport analysis, discussion, decision-making and implementation of participatory actions such as street reclaim initiatives, relocation of spaces and streets to people (i.e. the World Square Initiative, pedestrianization, street closures) and lowering speed limits (i.e. Home Zones) as well as public transit-oriented development initiatives (GTZ, 2004).

The creation of walkable, cycleable and public transport-orientated communities require that designers re-examine the way streets are designed in order to meet the needs of all users. To achieve these objectives, urban layouts are engineered to (a) prioritise walking, cycling and public transport, and minimise the need to use cars, (b) ensure easy access for all users and to provide first-hand information to first-time visitors to find their way around, (c) promote efficient use of land and of energy, and minimise greenhouse gas emissions, and (d) provide a mix of land uses to minimise transport demand.

For these reasons in the UK, the Department for Transport [DfT] (2009) has advocated retrofitting of roads and space by local authorities to create more sustainable neighbourhoods. Basic urban planning models must be encouraged. For instance, urban planners are expected to segregate the car from people; they are also required to ensure mix of traffic and people on a more equitable basis. Lastly, planners are to ensure a total exclusion of the car altogether. As good as these stages may sound, they have characterised the design of urban congestion management for over five decades (Litman, 2017) but have left many communities disconnected with significant limitations on sustainable forms of transportation (DfT, 2009). According to the Smart Travel Plan (2009), segregated design solutions (particularly where the car is dominant) have failed as walking distances have increased in places. At the same time, route choices have become limited and users have to navigate through complicated street networks thereby increasing car dependency and reducing pedestrian and cyclist activity.

In view of the failure of the segregated street concept, the current literature advocates connectivity (and legibility) (Litman, 2017; Curtis & Scheurer, 2017; Bos & Lee, 2012).

Other theories adopted to manage congestion in urban areas are mobility demand management strategies (Texas Institute of Transportation, 1998; European Conference of Ministers of Transport [ECMT], 2007). Indeed, ECMT (2007) has argued that managing the demand for transport modes would forestall the susceptibility of a system to decadence arising out of excess traffic demand. However, this is the bane of local governance in many urban areas, particularly in developing nations. For this reason, advocates for governance push for network governance also referred to as policy governance to bring about collaborative action in urban administration (Rhodes, 1997;

Kooiman, 1993). According to Kooiman (1993), network governance ensures citizens evolve and function around their communities. The concept has thus been extensively applied to better understanding of complex decision-making and problem-solving in the housing systems research in the Netherlands (van Bortel, 2007); governance and social policy research in Britain, European Union and Canada (Saint-Martin, 2004), as well as economic policy research in Britain (Rollings, 2001). In the developing world, the Bretton Woods institutions have been at the forefront of the adoption of policy networks to emphasize the "rolling back" of the state, and the privatization of public services (World Bank, 1989). Policy governance is thus, a new catchphrase for policy-making and execution in which governments shift towards governance by and through a range of various actors (Rhodes, 1994; 1997) to bring about greater interaction between public and non-public actors to enhance the delivery of the public good (Kooiman, 1993). However, this approach has not been consistent in Ghana in the delivery of public policies since governments have often latched onto the hierarchical state-centred, top-down approaches to governance with all their challenges including traffic congestion.

Regrettably, several state-centred policies have been enacted owing to the desire to improve transportation services delivery in Ghana. Notable among these public policies are the Town's Ordinance Act of 1892 (Cap 86), Omnibus Services Authority Decree (NLCD 337), Omnibus Services Decree (NLCD 71) of 1972, Omnibus Services (Amendment) Decree (NLCD 181) of 1973, the Driver and Vehicle Licensing Authority Act (No 569) of 1999, and lately, the Road Traffic Act of 2004 (Act 683) to improve the transport sector. Despite these policies, the transport sector in Ghana in general, and Greater

Accra Metropolitan Area (GAMA) in particular continues to be inundated with myriads of challenges including abutting of roads due to land use mismanagement, inadequate stakeholder consultations, and imprecise transport policies in the design and implementations of transport programmes as well as governments' inaction in policy implementation.

The importance of land use in the development of public infrastructure and the contributions that land rights, and access to security of tenure can make to economic development and sustainable livelihoods have been substantially documented (Toulmin & Quan, 2000; Toulmin, Delville, & Traore, 2002). According to Mattingly (1993), land is a commodity with a principal source of wealth and power. Fafchamps and Quisumbing (2002) have identified this source of wealth in land as being a source of conflict in many places. The situation becomes worse in view of the de jure and de facto customary land ownership practices prevalent in Africa (Atwood, 1990), and Ghana is not an exception with substantial allodial rights vested in communities represented by stool and sub-stools, particularly in southern Ghana (Kasanga & Kortey, 2001), where chiefs exercise executive and judicial governance in land management functions (Larbi, Antwi & Olomolaije, 2004).

In a bid to mitigate the pressure of land acquisitions and the growth of the country, several land management policies have been implemented. For instance, the colonial government embarked on acquisitions using either expropriation (compulsory acquisition with compensation) or appropriation (compulsory acquisition without compensation)) in land management in Ghana from 1850 to 1957 (Larbi et al., 2004; Kasanga et al., 2001). Indeed, according to Kasanga et al. (2001), many parts of Greater Accra - Ga, Mashie, Osu, La, and Teshie - Nungua had their lands compulsorily acquired. According to Yankson and Bertrand (2012), this was done to meet the challenges of urban agglomeration with Accra being a primate city.

Land administration during the post-independence era was further driven by the 'Big Push' economic development orthodoxy (Hutchful, 2002). According to Rimmer (1992), the central government rolled out a stock of capital for industrialization to generate growth, within a centrally planned welfare economy as well as the development of bureaucratic control. Indeed, several interventions including the State Property and Contract Act, 1960 (CA 6) were enacted to vest all lands hitherto in the Crown in trust by the president. Secondly, the State Lands Act, 1962 (Act 125) was passed to enhance the purpose of compulsory acquisitions of land by the state to propel the prevailing economic growth. This was ably supported by the Land (Statutory Wayleaves) Act, 1963 (Act 186) and the Administration of Lands Act, 1962 (Act 123) to control land ownership, transaction and use for purposes of development (Larbi, 1996). According to Larbi et al. (2004), by this Executive Instrument, the President's declaration of public interest in a piece of land was enough to extinguish all subsisting interests in the land; such lands were freed from all encumbrances for public purposes.

In furtherance to remedying the situation above, Larbi (1996) reported that the Minister of Local Government and Housing in 1953 in a Policy Statement posited the right of the government to reserve any land compulsorily for any purpose which in the opinion of the government would be for the benefit of the country as a whole. Unfortunately, Larbi (1996) has described this statement as nebulous with the potential to be the bane of the confusion in the development of public infrastructure in Ghana. Indeed, land in GAMA has since continued to be rezoned from agricultural to residential, commercial and industrial as well as private purposes without recourse to the provision of public infrastructure, and thus heightening the tension in land management and future infrastructural needs. To remedy the situation of land management in Ghana, the Lands Commission Act of 1994 (Act 483) was promulgated with the advent of the 1992 Constitution of Ghana to, among other things, manage public lands and any land vested in the President or the Commission on behalf of the government. This noble project, according to Aryeetey, Ayee, Ninsin and Tsikata (2007), is constrained by poor institutional capacity, inadequate staffing, poor delivery capacity, lack of proper identification of training needs and failure to produce baseline study, among others.

Unfortunately, this top-down policy in land administration in Ghana hit a snag after the overthrow of the Kwame Nkrumah government in the 1966 coup. Hutchful (2002) reported that the National Liberation Council regime that succeeded the Nkrumah administration abolished the prevailing socialism at the time and allowed limited sale of some state farms in parts of the country. This turn of events marked the beginning of abuse and considerable friction between state and indigenous land-holding authorities in Accra (Kotey, 2002). Indeed, claims for compensation payments escalated with concomitant exploitation by private interests (Kasanga, Cochrane, King & Roth, 1996). According to Larbi et al. (2004), this situation arose in view of the despondent manner in which compulsory acquisitions were conducted.

Following from the above governmental challenges in land use and urban planning nexus, mobility in GAMA has been affected greatly with upsurge in accident rates and mismanagement of motorization in Ghana. The following observations could be made about the spate of motorization in Ghana from the Driver and Vehicle Licensing Authority. For instance, in 2005, the annual vehicular growth rate in Ghana stood at 6.9 percent (Driver and Vehicle Licensing Authority [DVLA], 2005). By 2012, this had increased by 5.6 per cent to 12.5 per cent, making passenger throughput in Greater Accra Metropolitan Area lower than 20 km/hr since 2005 (DHV Netherlands, 2005). According to Debrah (2010), the situation is not different from arterial roads with enhanced surface quality. Besides the upsurge in motorization, carnage on the road continues to be high in the past decade. For instance, in 2003, the country was second out of six selected countries with high road traffic accident rate, recording 73 deaths out of 1000 accidents, only behind Guinea (Sarpong, 2003). By mid-2012, the situation had worsened. According to the Motor Traffic and Transport Department of the Ghana Police Service, between 2010 and 2012, 57,236 of vehicles representing 29.4 percent of four-stroke motor vehicles were involved in road accidents involving about 45,552 persons. Out of this number, 6,290 representing 13.8 percent of passengers lost their lives through road accidents nationwide. In Accra alone, a total of 21,397 motor vehicles representing 37.3 percent were involved in accidents in which about 16,614 passengers representing 36.4 percent lost their lives.

Besides the above poor land-use, transport planning quagmires, the projections of the impacts of uncontrolled motorization to climate change are also vital. According to the International Energy Agency (IEA) estimates in

2009, sustained urbanization and motorization have contributed to unprecedented rise in greenhouse gas (GHG) emissions with more than 71 per cent global greenhouse gases. This is expected to increase to 76 per cent by 2030 and, particularly, the developing world is likely to contribute to about 89 per cent of this due to car use. Secondly, the IEA has advocated a change in travel behaviour among urban dwellers by exploring new technologies to improve vehicle efficiency and low carbon fuels to reduce emission standards. In Ghana, the absence of efficient public transport system has impelled the adoption of single occupancy vehicles (SOVs) as a mode of transport with some devastating consequences. According to the DVLA (2012), between 2010 and 2012, a total of 173,364 SOVs were registered in Accra as against a national average of 20,764 HOVs. In terms of road carnages, out of 24,558 motor accident cases recorded, 14.1 percent were SOVs in Accra alone (Motor Transport and Traffic [MTTD, 2012). Lastly, most of these vehicles imported into the country were second hand cars manufactured after 1994 and known to emit a lot of pollutants (Raven & Berg, 2001).

Again, despite the above challenges, mobility to work, leisure, personal and household management have become a basic human activity that requires transport. In these regards, several scholars have recognized the centrality of transport to human activities. According to Banister (2008), transport is indispensable to human endeavours; elixir of modern society in which humans acquire food, power, wealth as well as ideas (Hajer, Hoen & Huitzing, 2012) and so, the demand for transport constitutes the chunk of the time and income of many vulnerable urban dwellers (Abane, 2011). Indeed, Abane has intimated that many metropolitan areas in Ghana have expanded rapidly over the last two to three decades leading to long trips and high fares with the preferred mode being the motor vehicle (taxi and trotro). This trend puts enormous constraints on the mobility of residents in the urban areas of Ghana, especially for health services and other social functions (Amoako-Sakyi & Owusu, 2012). In response to the above mobility constraints, commuters have resorted to the use of motor bikes for urban travel, oblivious of challenges such as the absence of bike-lanes within the urban road transport system. According to the Motor Traffic and Transport Department (MTTD) of the Ghana Police Service, between the period 2010-2012, 120, 867 motor cycles were registered nationwide. Out of this number, 5, 360 were involved in road accidents and 1, 728 (32.2 percent) were recorded in Accra alone.

In order to stem the tide of deplorable urban transport system, efforts have been made in recent times to plan travel to mitigate the effects of road transportation and to enhance green city space. For instance, in 2005, the DHV Netherlands in association with Municipal Development Collaborative, Ghana were commissioned to study and suggest ways to plan and manage transportation needs for some key cities of Ghana, notably Greater Accra Metropolitan Area (GAMA), Sekondi-Takoradi, Cape Coast and Koforidua. Among other things, this study recommended long term institutional and regulatory frameworks, traffic management and the selection of pilot BRT corridor for Greater Accra Metropolitan Area (GAMA) which includes Tema, the second largest city within the GAMA. Prior to this study, Adam Smith International [ADI] (2004) was tasked to conduct an urban transport study in Ghana. The ADI report suggested among other things, the need to explore ways to improve upon urban transportation through private sector participation in transport service delivery in Ghana in general and Greater Accra Metropolitan Area in particular. Under this mandate, the ADI suggested policies, regulations and institutional options for improving bus transport services in Accra. This study further suggested the scope for use of route franchising as an instrument for promoting enhanced provision of bus services.

In view of the perceived non-implementation of policies by local assemblies, some elements of these recommendations have been enforced in GAMA. Consequently, the trepidations of some Concerned Taxi Drivers in Accra have forced them to go to court over a decision by the Accra Municipal Authority to regulate the activities of itinerant taxi drivers to restrict their activities per specific routes (Daily Graphic, 28th October, 2013). Indeed, this situation had been anticipated and remedy provided in the Omnibus Services Authority Decree (NLCD 71) of 1972 where route registration and assignment tasks had been planned, and expected to be implemented by municipal authorities to regulate the use of vehicles under their jurisdiction in Ghana. Unfortunately, this has never been implemented but remains as one of the laws that regulate transport provision in the country.

Statement of the Problem

The enormity of challenges in urban planning, particularly among developing nations is daunting. According to the World Bank's projection, majority (70 percent) of populations in developing countries would be dwelling in urban centres, particularly in the Global South (World Bank, 2011). In Africa, the implications of these projections are serious in view of disproportionate import liberalization policies which have made the continent a dumping ground for second-hand vehicles from Europe, Asia and the Americas (Cervero, 2013; Addo, 2006). This trend of motorization in developing countries is more worrying in view of rising incomes (Ingran & Liu, 1999), governmental obsession to pro-car policies (Cervero, 2013) and unbridled import liberalization (Davis & Kahn, 2011). The pervasiveness of this development on the city is manifested in high traffic densities and long trips by motorized transport (Suzuki, Cervero & Kanako, 2013). In a related development, this trend manifests in the prevailing primacy and mono-centricity in the developing countries with agglomeration diseconomies, including poorly planned concentrated growth (Cervero, 2013). Consequentially, there is loss of productivity due to traffic congestion with worsening condition on the air quality (Chin, 2011); and declining quality of urban livelihoods (Olajungu, 2015; Curtis & Scheurer, 2016).

These exigencies have rekindled search for sustainable urban planning solutions (Pojani & Stead, 2015; Banister, 2008), public transport accessibility planning (Curtis & Scheurer, 2016) as well as governance (Haeress, van Dijk, Arts & Tillema, 2017, Bickerstaff, Tolley, & Walker, 2002; Klijn & Koppenjan, 2000) to mitigate the impacts of poor urban land use and transport planning puzzles. Public transport planning thrives on effective planning rather than mere provision of infrastructure, service delivery and scheduling (Dodson et al., 2011; Mees & Dodson, 2011; Vuchic, 1999). In Ghana, Abane (2011) has observed that in spite of the modest gains in the last decades on behavioural aspects of transport research, a substantial proportion of developments within the sector is still limited particularly, the provision of infrastructure. Indeed, at the end of the 19th century, state intervention in road transportation services in Ghana focused on infrastructural provision. According to Boahen (1975), several kilometres of arterial roads had been developed over the colony by 1909 with a dedicated public transport department to cater for the needs of government workers. Earlier in 1972, over 100 buses were procured for the Omnibus Service Authority (OSA) to enhance public transport operations and to improve the turn-around time of workers within municipal areas. Lastly, the City Express Services (CES) was set up in the 1980s with the express charge to promote public transportation (Debrah, 2010). As the country expanded, some attempts were made at planning the system by establishing decentralized bus transportation systems for each of the municipal authorities to manage road transport services under a local government ministerial responsibility (OSA, 1994). This led to the promulgation of LI 414 to establish the State Transport Corporation in 1965 to spearhead this drive.

Inconsistent transport planning, unfortunately, became the bane of Ghana's transport sector from the 1980s. This period has been described as the 'era of dominance by unions' (Fouracre, Kwakye, Okyere & Silcock, 1994) resulting from unbridled administrative authority handed over to the transport unions from the municipalities by the government in the early 1990s. This action marked the end of the prevailing controlled travel planning in the country since the colonial period (Debrah, 2010; GoG, 2008). Out of this development, GAMA alone became replete with over 26,000 of such unionized transport systems performing similar commuter services (Agyemang, 2009). These unions influence the determination of transport fares, movement of vehicles at terminals and, the turn-around time of commuters. Despite these influences, the views of transport unions are hardly sought when it comes to transport decision-making in GAMA. This has led to many urban transport programmes, notably route registration and bus rapid transit systems (BRT), stalled due to opposition from stakeholders.

In Africa and many developing countries, road governance efforts have now assumed a new dimension to regulate movement of traffic. However, the cost effectiveness of these traffic control measures has become a bother to city managers (Okoko, 2006). In Ghana, in particular, governance efforts at mitigating the effects of improper operations of stakeholders within the transport sector have also been ineffective since the inception of the Fourth Republic in 1992. Indeed, section 35 (d) of the 1992 Constitution of Ghana mandates governments to take the appropriate steps to ensure administrative and financial decentralization to give opportunities for people to participate in decision-making at every level of national life and government. All these attempts are theoretically grounded in the United Nations Convention on Sustainable Development in Brundtland in 1987 in which the Local Agenda 21 aspirations espoused effective urban governance. Similarly, these attempts give credence to the view by John (2001) that the local level has the potential for democratic renewal as local elites can create opportunities to open up local politics. According to Gil, Calado and Bentz (2011), this development has the capacity to promote greater partnership between governing elites and the public.

However, after several decades of decentralization and transport infrastructure provisioning, as well as travel planning within the urban areas of Ghana, transport services within the Greater Accra Metropolitan Area continue to be slow due partly to congestion, and partly to the emergence of suburbs and satellite slums which challenge planning (Abane, 2011; Yankson & Bertrand, 2012). This prevalent situation at the municipal level has been attributable to the central government's unpreparedness to properly devolve power to the localities (Devas & Korboe, 2000; Yankson, 2000).

In terms of governance, the set-up of GAMA is problematic because of location as national capital, regional and municipal administrative capitals. In view of this triple function, the benefits of decentralization as espoused in both Local Agenda 21 and the 1992 Constitution of Ghana have not yielded the expected results due to central governments' continued hold unto policies making on behalf of the municipalities (Yankson, 2000). In the area of transport governance, this approach obviates the potential of employing local knowledge and experience from major stakeholders to make decisions regarding transport services delivery for the municipalities (Rye, 2005). Additionally, this problem is further heightened by improper compulsory land acquisitions and land use controls in GAMA where sale of land is privately conducted (Larbi et al., 2004). The private sale of land in GAMA affect the supply of land for infrastructure for housing, commerce and transport with negative implications on urban mobility (Adams Smith International, 2004). In view of these mobility challenges, Adjavor (2008) has called for road pricing while Agyemang (2009) has proposed mass transits, among others, to ameliorate the situation of slow mobility in GAMA. Indeed, some elements of these policies have been implemented already but the situation persists due to the lack of capacity to improve mobility (Porter, 2007). This phenomenon of stop-and-go mobility in the developing world is largely a result of improper system management (Gwilliam, 2003), and hence suggested governance and travel planning to soften their impacts on mobility. In the light of these challenges, that this study was focused on exploring how network governance could be used as a tool to plan travel and to manage road transportation in the Greater Accra Metropolitan Area to enhance mobility.

Research Questions

To promote sustainable urban development in response to global warming, the UN-HABITAT (2010) working towards sustainable urban mobility focused on five intervention areas for urban planning. These are to: link transportation and urban planning to reduce motorized trips; promote non-motorized transport infrastructure; enhance public transport systems and services; improve car traffic demand management/parking; and fuel technologies and efficiency. These imperatives thus guided the following research questions for the study:

1) How do the current transport policies in GAMA ensure sustainable controls to deliver transport to residents?
2) What transport choices are available for commuters in GAMA?
3) What factors influence the operational efficiency of the current public transport services in GAMA?
4) To what extent are travel plans embarked upon by some organizations to improve the efficiency of the movement of their workers?
5) How will travel plans improve urban mobility in GAMA?
6) How best can urban mobility be enhanced to improve peak hour travels in GAMA?

Objectives of the Study

The general objective of the study was to explore road transport governance, travel planning and improved mobility in GAMA.

The specific objectives were to:

1) assess how current urban transport policies and mobility improvement controls enhance turn-around times in the Greater Accra Metropolitan Area (GAMA).
2) examine the travel options available for mobility in GAMA
3) examine the phenomenon of travel planning in GAMA looking at its operational efficiency of the current public transport services regime.
4) determine factors that impede operations of travel plans by some selected organizations in the study area
5) assess how travel plans by some employers could improve mobility in GAMA.
6) suggest a travel model for GAMA to improve the efficiency of movement.

Assumptions

The following assumptions guided the study:

1. The greater the centralization of transport policies the greater the ineffectiveness of transport decisions.
2. The current land use and management policies in GAMA are inimical to transport development and inhibit mobility.
3. The acceptance of travel plans by governments, employers and operators can positively improve mobility in Accra.

4. The provision of personalised motor vehicles (PMVs) by governments and employers for their employees adversely constrains travel planning in the GAMA.
5. The greater the continuous expansion of road network without commensurate accessibility planning, the greater congested the network becomes during peak periods.
6. The more often feedbacks from transport service operators are incorporated into transport decisions, the greater the effectiveness in promoting mobility in the GAMA.

Significance of the Study

This study was meant to explore the possibility of integrating the phenomenon of travel plans into the urban transport system of the Greater Accra Metropolitan Area (GAMA) as a representative of the larger urban mobility management of Ghana in particular, and Africa in general. The literature is replete with mounting pressure imposed by the overly reliance on private motorization as mode of travel in urban areas. In Ghana, with the desire to ameliorate the negative impacts of motorization in sight, the National Development Planning (system) Act of 1994 (Act 480) has identified services, routes, passenger facilities, terminals and their ancillary infrastructure; ticketing, information and other customer support services as panacea to enhance service quality (GoG, 2008). Secondly, the enabling act for transport services provision and regulation in GAMA, Local Government Act, 2016 (Act 936) is very silent on how transport services are to be laid out. This provision thus contradicts the National Development Act of 1994 (Act 480) by which local areas are mandated to draw its own public transport plans to promote mobility. These policy incoherencies negatively impact mobility in urban areas, particularly GAMA.

The results of this study are therefore a useful guide to rethink the provision of transport from the over-concentration on infrastructural facilities and fiscal motivation to transport network planning to enhance effectiveness of the urban transport system in GAMA in particular. Again, the results have opened up the opportunities of sustainable transport paradigms prevalent in modern urban transport development programmes among nations to ensure that transport policy makers embrace inclusivity and stakeholderism away from the centre which has been found to be ineffective (Rhodes, 1997; Leach, Bloom, Ely, Nightingale, Scoones, Shah & Smith, 2007).

Delimitations

This study covered the Greater Accra Metropolitan Area for the following reasons: in the first place, according to the Ghana Population and Housing Census held in 2010, the capital area of Ghana has witnessed population growth from 43.8 percent in 2000 to 50.9 percent in 2010 (Ghana Statistical Service [GSS], 2012). Secondly, the Accra Metropolitan area had also witnessed horizontal expansion across its extent; and as at 2010, it was home to 2,106,696 persons representing 11.1 percent of the total population of Ghana (GSS, 2012).

In terms of road accidents, GAMA received the highest share of reported vehicles involved in road accidents between 2010 and 2012 with a total of about 45, 552 out of the national average of 57, 236 road accident cases. In terms of fatalities, 36 per cent of persons received various degrees of injuries while 13.6 per cent perished through road traffic accidents in GAMA alone for the period.

The mobility situation in GAMA continues to be high and inefficient; and dominated by car-based commuting with concomitant road traffic accidents higher among SOVs. For instance, from the data received from the MTTD, out of 57,236 accident cases recorded, 12,530 cases, representing 51 percent involved SOVs in GAMA alone.

Another delimiting variable that was considered was the rate of casualties resulting from motor bikes during the period. According to the report, during the same period (2010-2012), 5,360 motor bikes were involved in road traffic accident and 1,728 cases representing 32.2 percent were recorded in Accra alone.

Organizations of the Study

Following this introductory chapter, Chapter Two presented the theoretical basis in literature for road transport governance practices, travel planning as well as accessibility considerations to improve mobility for commuters. Further lessons are learned from traditional approaches for mobility management and, lastly, content analyses of transport systems were conducted to borrow a range of best systems from, notably, countries in Europe, Asia and North America to inform practices in the study area.

Chapter Three presented the conceptual issues in urban road transport governance. It presented the arguments for and against governments, and the transition to governance as the prerequisite for generation and ownership of public policies in liveable cities.

In Chapter Four, the how and where data was obtained from, the methods of presentation of data and the associated challenges with using these tools and methods during the field research. Additionally, the chapter contained the target population, sampling procedures and sample size, and ethical considerations of the study.

Chapter Five presented the findings relating to the capacity of the current transport policies and their implications on mobility in GAMA.

The Sixth Chapter threw more light on the empirical evidence of travel planning in GAMA, highlighting the major models that are in operation for mobility management today. The chapter looked at the strengths of these models, and ended with a suggestion on how to model mobility for residents to improve turnaround time of commuters.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter explores the theoretical basis in the literature for network governance practices, transport planning, and accessibility planning models that enhance mobility for urban commuters. The review is two parts: the first part covers the current planning strategy in which city managers adopt 'traditional' perspectives to road traffic congestion and seek mitigation strategies to assess their efficacy.

The second part adopts a content analysis of modern transport policies across Asia, Europe, the United States of America and Australia, to explore best practices. These models are then weighed against the traditional approaches identified in the first part to design a novel theoretical framework as an alternative urban transport policy option for GAMA. In this way, various modal choices such as travel plans, car sharing, and non-motorized transport, and drive-alone programmes that are germane to conventional urban mobility visioning.

Traditional Models of Mitigating Congestion

The traditional approaches to mitigate congestion have often looked at transport development in a vacuum; and the European Commission Ministers of Transport [ECMT] (2001) have warned against this practice. These traditional approaches are targeted at physical movements measured by trips, distance and speed, such as persons per mile or kilometres for personal travel and tonne-mile or tonne-kilometres for freight travel. This school of thought that seeks to ensure physical movement of persons and freight is referred to as mobility (Litman, 2017). Adherents of mobility hold the strong view that all things being equal, increased mobility increases accessibility which is a measure of how fast people can travel to any destination they can reach. The accessibility school on the other hand disagree (Litman, 2017, Bos & Lee, 2012; Banister, 2008) and call for efficient integration of transport and land use. Accordingly, the ECMT advocate for integration of land use transport planning. This factor gained a lot of attention three decades ago and Leibbrand (1970) has cautioned against its absence in transport planning. Against this background, Banister (1994) has argued that the absence of this phenomenon could be agonising at the municipal level with associated problems of congestion. For these reasons, Vuchic (2001) has advocated a balanced transportation system that is aimed at making the use of the car less attractive by providing viable alternatives to car travel backed by an integrated urban form.

According to May and Ison (2005), these suggestions have not been the case with the traditional models of mitigating congestion, and are the principal barriers to transport policy building which have tended to be counter-productive. According to Thogersen (2009), these traditional models no longer serve their purposes as the accepted panacea to urban mobility burdens since they have been found to be coercive. In a related thinking, Garvill, Marell and Nordlund (2003), have argued that these coercive measures are not effective for producing change in decision-making on the mode of travel.

This traditional view is further made alongside the notion that people's driving habits are usually produced by psychological reactance and political resistance (Schlag & Teubel, 1997 in Thogersen, 2009). These approaches, according to Bickerstaff and Walker (2001), have the tendency to deprive transport planners of the critical assessment of the sustainable mobility path that is both receptive and consultative. There is therefore some finality against the traditional planning approaches that tend to proffer one mode, straight-jacketed policy options to mitigate road traffic congestion everywhere (Hajer, Hoen & Huitzing, 2012). Against these backgrounds, Litman (2017) has identified that these conventional approaches tend to evaluate transport system quality primarily based on mobility indicators (average travel speed and congestion delays) and has advocated more versatile approaches to mitigating traffic congestion. In this regard, a new phase of urban transport governance which recognizes multiple determinants for making transport policy decision regarding traffic congestion mitigation measures is identified, particularly in view of their efficiency in the planning process.

Sustainable accessibility Models

The sustainable accessibility planning models have been advocated in place of the conventional mobility ethos primarily for the presence of mobility options, transport diversity and transport choices (Litman, 2017). The concept of sustainable accessibility planning has connotations for accessibility planning (Bos & Lee, 2012; Kilby & Smith, 2012). These models constitute innovative theoretical frameworks. Again, the models permit the redefinition of the current mobility problems as well as define the units for analysis and determine the categories of limits for implementation in an interdisciplinary manner. According to Micelli (2002), these models of mobility question the efficiency of the traditional congestion planning processes and the efficiency of authoritative urban planning and implementation tools while intending to correct the negative externalities associated with motorization in urban places. In this view, the contributions of public policy analysts such as Bickerstaff & Walker (2001); Bickerstaff, Tolley & Walker (2002); Banister (2008) and Curtis (2008) on participatory local governance and transport planning and sustainable mobility paradigms challenge the current 'traditional' planning are instructive.

Sustainable transport planning has thus become the fulcrum along which public transit systems, walking and cycling improvement programmes are promoted due to their environmental soundness (Hajer et al., 2012). Accordingly, Currie (2010) has argued that these strategies are the media to provide access for the socially disadvantaged groups. In a related development, Huwer (2004) has also espoused the amenability of the strategy to serve varied mobility needs of diverse range of persons in the city as well as catering for varied trip purposes; for instance, the bus for shorter distances while the rail is dedicated for longer trips.

In terms of urban form, sustainable city planning has become the springboard for growth. In view of this, Banister (2008) has argued that urban transport policy should bear in mind two fundamental principles that travel is a derived demand and not an activity that people wish to undertake for its own sake and that people minimise their generalised cost of travel operationalized mainly through a combination of costs and time taken to travel. Other urban planning-transport analysis imperatives such as the nature of the built environment (urban form) relating to density and land use mix, socio-economic variables (people and proximity) as well as travel mode (automobile, mass transport, walking and cycling) are important in sustainable city planning (Aditjandra et al., 2009; Banister, 2008). Again, in this regard, Bhat and Guo (2007) have identified some built-environment characteristics such as residential choice decisions as well as car ownership decisions of persons with the tendency to affect sustainable accessibility systems. To fully appreciate the above, the concept of urban governance is critical to reduce the need to travel (less trips), encourage modal shift, reduce trip lengths and encourage greater efficiency in the transport system (Klijn & Koppenjan, 2000; Rhodes, 1997). Pojani and Stead (2015) have suggested a seamless connection between land use planning and accessibility measures to actualize the aspirations of sustainable transport.

Conundrum of motorized mobility

The conundrum of mobility by motorized vehicles (MVs) today is high due to rising incomes and innovation in technology, and the primacy to private ownership of vehicles. The trend gives cause for concern due to potentialities of emissions from carbon monoxide (CO), carbon dioxide (CO2), hydrocarbons (HC), sulphur oxides (SO4), nitrogen oxides (NO4) and particulate matter (PB). Apart from these, Diaz and Pulwarty (1997) have underscored the negative effects of many secondary pollutants such as ozone and peroxycacetyl nitrates, and lead from unleaded fuels. The impacts of these car-dependent cities on climate change are well documented (Shergold, Parkhurst & Musselwhite, 2012). According to the International Panel on Climate Change [IPCC] (2001), the emissions from the transport sector mainly from the petroleum-based fuels have been growing since 1950 due to increase in travel cost and rising incomes. By the end of the 20th century, UNEP (1998) reported that the road sector alone had contributed to about 97 percent of carbon emission resulting from estimated increase in vehicle ownership from 50 million world's annual average in 1950 to about a billion. Of this total, the industrialized regions contributed about 60-70 percent of passenger vehicles, while the developing countries contributed about 20 percent (Hilling, 1996). To mitigate the effects of the transport sector, efforts were aimed at sustainable accessibility as concerted programme to involve many actors, particularly, urban planners and city managers to reduce GHGs (Campbell, 2006; Gossop, 2011). Bring all these actors on board, it was assumed would bring about the awareness to abandon the use of inefficient fossil fuel for transportation in the built environment (Owens, 1992) to a more sustainable energy efficient forms (OECD/IEA, 2015).

Despite these considerations, motorized mobility continues to be the elixir of modern society in which humans acquire food, power, wealth as well as ideas (Hajer, Hoen & Huitzing, 2012). Intrinsically linked to the above, is the truism that the car is no longer a luxury belonging to the middle classes but a necessity even among those who do not drive (Lex, 1999; Ingram & Liu, 1999). Ironically, Goodwin, Cairns, Dargay, Parkhurst, Polak and Stokes (1995) have opined that majority of these trips could have been made by foot, bicycle or bus, but people chose to drive to show their status (see also, Steg & Gifford, 2005). According to Eriksson (2011), this propensity to drive is explained by two modal choices: instrumental and symbolic or affective reasons. The instrumental considerations include factors such as speed, time, cost, flexibility, safety and comfort associated with car use (Jacobsson, 2004 cited in Eriksson, 2011). It is argued further that these characteristics make the car a versatile and an attractive mode compared to the other modes.

The symbolic or affective view, on the other hand, relates to the perceptible status-symbolism that is accorded the car. Accordingly, many people have the pleasure of using the car to affirm their status in society (Steg et al., 2005). Gatersleben (2007) has also attributed this phenomenon to people's adventure to communicate their status by means of the car. These reasons dominate users' obsession for the car than other modes across the world (Kingham, Dickinson & Copsey, 2001; Mom & Filaski, 2008; Eriksson, 2011). According to Mom and Filaski (2008), mobility has exploded over the past 200 years in many European cities; and the average distance that a person travels per-day has increased by 1-4 percent (Eriksson, 2011). In the developing world, as indicated by Cervero (2013), this growth is fuelled by economic growth and rising incomes. Davis and Kahn (2011), have identified the gory aspects of trade liberalization on the urban landscape as traders in the developing world mainly deal in the importation of old second hand vehicles meant for scrappage in high income economies for use in lower income countries.

Again, this increased mobility in recent times is directly attributable to technological innovations in speed and design, and have thus contributed to savings of roughly 15 percent of earnings of travellers (Schafer & Victor, 2000). Additionally, it has been observed that people have a natural tendency to travel, and this tendency has been fuelled directly by expansive infrastructure supply, innovation in transport policies to increase accessibility and reduce travel time (Hajer et al, 2012). These innovations and corresponding desire to use the car have consequences on the urban form and survival. According to Dieleman and Wegener (2004), reliance on cars leads to a decline in the central city areas, exacerbate congestion and consequently loss of space and scenic areas in and close to metropolitan areas. The implications on air quality are dire, particularly with the dependence of cars on gasoline fuels which are noted to emit greenhouse gases (GHG) and other particulate matter with the tendency to pollute the air, increase ambient temperature and lead to death. In consequence to the above, transport has been identified as a major culprit for loss of local amenities, causing flash flooding leading to property damage and negative impacts on flora and fauna (Royal Commission on Environmental Pollution [RCEP], (2007) due to its oil-based nature as well as the interdependence between car for mobility and urban sprawl. In furtherance to the above, the relationships resulting from increased car use are illustrated in Figure 1.

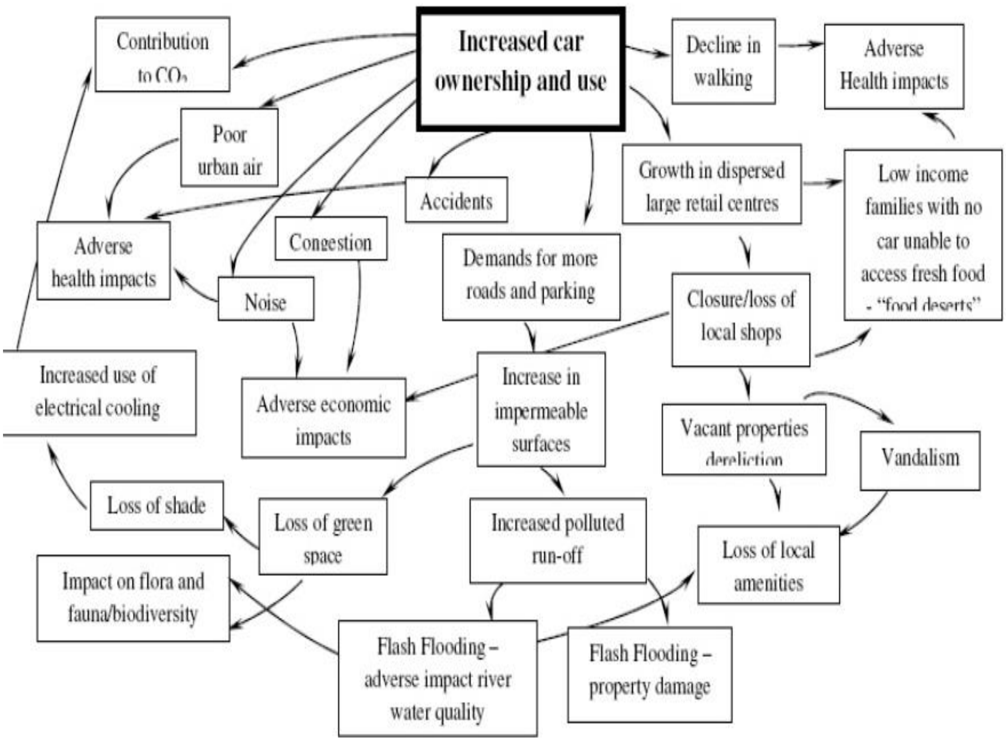

Figure 1: Inter-relations of impacts of increased car ownership and use in cities
Source: Royal Commission on Environmental Pollution [RCEP], 2007

Pathways to mitigate the conundrum of motorized mobility in cities

The bane of broadening income levels, proliferated knowledge and innovations as well as plethora of choices of cars to consumers in recent times abounds in literature. Additionally, Kingham, Dickinson and Copsey (2001) have acknowledged the phenomenal obsession to the car which continues to be dictated by how, where and when one has to travel with all its associated traffic challenges. This phenomenon of increased car dependency in cities could lead to traffic decadence by generating new traffic (Downs, 1962; 2004). Empirically, Downs (1962) has argued that new road constructions meant to increase capacity have propensity to prompt behaviour shifts-as some formerly supressed trips (latent demand) are made, and some motorists switch modes, routes, and times of travel to available capacity. This 'triple convergence', he asserts, would eventually clog the road network.

Secondly, the desire for housing has further exacerbated the demand for addition of roads, and therefore potential to build in anticipation of demand for cars. According to Cervero, (2001), significant 'induced growth' and 'induced investment' effects often fuelled by real estate developments tend to gravitate towards improved freeway corridors. This situation has been proven in his study on freeway investments and traffic increases by studying data on freeway projects across California for 15 years. For these reasons, Cervero (2001) has cautioned against the practice of fighting road congestion on grounds of induced-demand. To ameliorate this tendency, a variety of sustainable accessibility measures have been introduced to reduce the obsession to the single occupancy vehicle [SOV] (car-based travel) as the main mode of travel to work (Kingham, Dickinson & Copsey, 2001;

Aditjandra, Mulley & Nelson, 2009). These include non-motorized modes such as cycling and walking.

Non-Motorized Transport Planning

A critical transit-oriented mode of mobility in any sustainable city is non-motorized transport (NMT) mode. These NMTs, according to Pojani and Stead (2015) are effective in view of their environmental, economic and health accruals. However, their strength lies in the presence of safe and pleasant streets to promote walking and riding. Among NMT measures are cycling, walking and hand carts. In the developing world, the levels of uptake of NMTs are low due to wrongful perception by political elites (Vasconcellos, 2015).

However, to optimise the uptake of NMTs, Pojani and Stead (2015) have suggested that facilities must be built close to work places, schools and other services accessed by the poor. This view is supported by Dimitriou and Gakenheimer (2011) who posit that the urban rich and political elites neglect NMTs because they do not commensurate their status. Some of these known active and human-powered transport options are next described.

Cycling

Cycling is considered as one of the noblest human-powered modes of travelling, especially for medium-distance destinations (Antoci, Borghesi & Marletto, 2012). Bicycles are preferred in view of their propensity to create sustainable and equitable transport systems (Lovelace, Goodman, Aldred, Berkoff, Abbas & Woodcock, 2017). The potential of cycling to improve the vibrancy of cities is in vogue in urban transport literature (Parkin, Wardman, & Page, 2008; Zhang & Levinson, 2016; Larsen, Patterson & El-Genedy, 2013). Due to these benefits, three countries in the world- Denmark, Germany and the Netherlands - are at the forefront of an integrated bicycle usage in urban transport policies (Lovelace, Goodman, Aldred, Berkoff, Abbas, & Woodcock, 2017). According to Komanoff (2004), cycling provides reliable, healthy, affordable and convenient mobility to millions of people per day. Some of these measures are discussed below.

Cycling in Ghana and particularly in urban areas, has however not been effective because of the absence of facilities. In Ghana, Amoako-Sakyi and Owusu (2012) have reported that cycling is limited to children who run errands for parents and sparingly by adults for recreational purposes. To promote the uptake of cycling in urban areas, Parkin (2012) has suggested some strategies to enhance patronage:

Bicycle Lanes

These are dedicated lanes reserved to give priority to the rider (Plate 1). Bicycle lanes offer safety, and are designed to attract modal shift. Parkin (2012) has submitted that high quality infrastructure has a high propensity to promote cycling uptake. In a much conclusive manner, Buehler and Dill (2015) have established higher evidence that links cycling infrastructure to higher rates of cycling in cities, particularly in Germany. Related to bicycle lanes are bicycle bays (Plate 2). These are dedicated safe places where public bicycles (state-owned) are parked for use by potential riders free of charge. However, Pojani and Stead (2015) have identified that in Africa and many parts of the developing world, city managers consider cycling as backward venture and so tend to promote elitist modes that serve their stature.

In view of the above notions, the following Bicycle Improvement Plans have been recommended for use in urban areas by GTZ (2004) under the

Mobility Management for Sustainable Transport to effectively deploy bicycle system as an alternative mode to mobility in cities. These are (a) establishment of a network of walking ways, (b) provision of adequate vehicle parking ancillaries, (c) maintenance of path surfaces, (d) creation of bike lanes and boulevards to give priority to riders where appropriate, and (e) development of pedestrian-oriented land use and building design. Others include (f) provision of street furniture (i.e. benches) and design features (human-scale street lights), (g) application of traffic calming, speed reduction, law enforcement priorities, (h) provision of bicycle safety education, (i) integration of cycling with transit and (j) addressing security concerns of pedestrians and cyclists (see Figures 2 and 3).

Figure 2: Bicycle lane

Figure 3: Bicycle Bay

Source: ICLEI-Local Government for Sustainability, 2011

Walking

There are varied implications for promoting walking. According to Frank, Stone and Bachman (2000), walking environments have social benefits including air quality. Layden (2003) has submitted that these environments create community cohesion, trust and diversified social activities among citizens. Others such as Pivo and Fisher (2011) have intimated that improved walking environments enhance residential and commercial property values. To create these benefits, the principle of new urbanism (Charter of the New Urbanism, 2013) has been conceived. In this new urban context, physical attributes of neighbourhoods are designed to encourage functional and recreational walking purposes (Guo & Peeta, 2017).

Walking has also been used to promote mobility in an urban area. It is used most effectively by raising the awareness of people about the health benefits of walking by offering users with walking maps with calorie count watches. In Germany, Buehler, Pucher and Uwe (2009) have reported that German cities have provided more transit possibilities where pedestrian safety is prioritized. Accordingly, the authors suggest that a higher level of pedestrian safety has been achieved through a comprehensive integration of walking routes since 1970s, and culminated in a network of pedestrian streets and car-free zones.

Other measures include improved on-site conditions for pedestrians, on-site security, changing facilities, fold-up umbrellas and promotional lunches as well as interest free loans for commuters to purchase shoes and coats. Under this pedestrian safety programme, some German cities have promoted universal policies for the provision of sidewalks capable of achieving and calming traffic by 19mph by car. Additionally, well-lit and marked zebra crossings are promoted with pedestrian-activated crossing signals mounted at mid-blocks and intersections to give priority for pedestrians. A novel approach in the UK cities is the walking-bus strategy which is used extensively by adults to chaperon children to school and other social gatherings (Figure 4). Despite its economic, social and environmental security, the approach has not received wider appeal because of the absence of facilities and education (Pojan & Stead, 2015; Buehler, Pucher & Uwe, 2009).

Figure 4: Walking Bus school initiative in the UK.

Source: Managing Travel Demand, 2006.

Pedestrian improvement

The heart of all transport programmes is safety and reliability. According to Banister and Marshall (2000), transport policy measures must encourage modal shift to offer a plethora of choices to commuters to reach their activity points with least cost and time. To effectively roll out this policy, the policy strategies are made to ensure net reduction of traffic. For these reasons, the paradigm has shifted from mobility to accessibility planning which underscores quality and affordability of travel options, transport system connectivity and land use patterns. The benefits of these are broadly termed as pedestrianization policies (Litman, 2017; O'Flaherty, 2006).

Pedestrianization policies are measures which ensure that towns are made safe for commuters by reducing travelling by car and controlling travel behaviour. Again, these policies ensure that most existing shopping and commercial centres grow along main traffic routes, and at their intersections. This is done ultimately to ensure that human activity points are reached at the shortest time possible, all things being equal.

To ensure the realization of this goal, O'Flaherty (2006) has recommended the need to bring about improvement of access routes to shopping, commercial and leisure environments of an area. Secondly, an enabling economy that establishes edge-of-town and out-of-town centres of opportunities for commuters by ensuring their competitive edges is maintained to prevent travel from one place to another in search of a non-existent commodity. Thirdly, there should be regard for traffic engineering and road safety for efficient movement within the immediate vicinity of the pedestrianised area and over the highway network as a whole. In furtherance to the above views, Okoko (2006) has identified the CBDs to be most vulnerable to attract large population densities.

For these reasons, land values are likely to be high, and advocates for vertical rather than horizontal development of cities to improve the social and economic productivity of cities to contain high pedestrian activity. In view of the high potential to attract population densities, O'Flaherty (2006) has suggested a pedestrian priority approach to ensure that design considerations safeguard walkways, and are oriented to ensure that the young, elderly and the disabled persons are not disadvantaged.

To optimise pedestrianization programmes, transport planning and infrastructure provisions are integrated with facilities such as footways, kerbs or strips of textured paving to provide physical differentiation for vulnerable pedestrians such as people with poor eye-sight. Similarly, persons with hearing problems are provided with unobstructed views from the side of the vehicle in order to cross safely. Additionally, pedestrian phases in signal operations are provided at individual intersections to cater for the needs of elderly persons. Other facilities such as raised refuges are put on carriageways at pedestrian crossing points to assist persons with other natural infirmities.

In conclusion, footpaths and carriageways are made stable, not slippery and reduced undulations to enable patronage by intended pedestrians. For instance, pedestrian crossing points are designed at-grade and composed of (a) uncontrolled crossing e.g. zebra crossings, (b) light-controlled crossing fitted with conventional traffic signals with/without pedestrian phases, pelican and puffin crossings, and (c) person-controlled crossing such as police-controlled and school crossings. Some of these are illustrated in Figure 5.

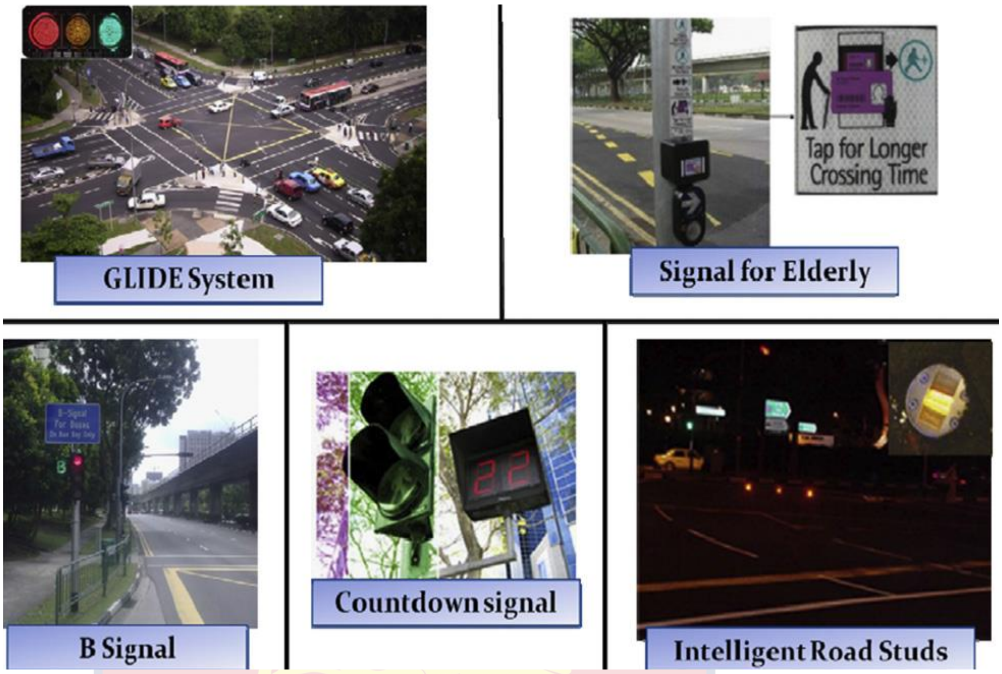

Figure 5: Some Traffic signalling measures.

Source: Haque, Chin and Debnath, 2013.

Segregated Crossing

These are measures used to ensure efficient crossing of roads by pedestrians at grade level. To optimise its use, crossings are built and separated from vehicular traffic to eliminate pedestrian-vehicular conflict and delays to vehicles. In order to enhance usage of segregated crossings, O'Flaherty (2006) has suggested that they should be mounted at points where there are high pedestrian flows to facilitate efficient crossing of high-speed roads carrying high volumes of vehicular traffic such as roundabouts and intersections. Secondly, the routes must be direct, easy to negotiate, generally appealing and safe. Thirdly, grade-separated crossings must be fitted with lighting systems and guardrails to encourage usage.

Traffic Calming

The concept of traffic calming emanated from the 1960s when some angry residents of the Dutch Town of Delft decided to prevent heavy vehicles from passing through their town to achieve a reduction in vehicle speeds by changing the road to a '*woonerf'* or '*living yard*' (Muhlrad, 2014). According to O'Flaherty (2006), traffic calming is a generic term used to describe changes to the horizontal and/or vertical alignments of existing roads in built-up areas, particularly residential and commercial areas in order to reduce speeds of motor vehicles. The Johannesburg Traffic Calming Policy (2012) has broadly defined the concept to include both physical and legislative measures used to reduce vehicle speeds and/or traffic volumes and/or travel patterns, thereby improving traffic safety, and quality of life in the urban environment, but with due regard to mobility and accessibility. Traffic calming measures seek to modify behaviour, control vehicle speed, reduce traffic volume and promote pedestrian safety in built-up areas. Largely, traffic calming measures are classified into strategies used to narrow real or apparent width of streets, deflect vehicular pace by introducing road curvatures and alter the vertical profile of vehicular path. Some notable traffic calming furniture includes the following:

Road humps also called speed humps are vertical deflectors used to lower vehicle speeds. These strategies are the most efficient means of reducing vehicle with their ability to cause discomfort to drivers when crossing at higher speeds. The main types are speed tables and crash cushions.

Trapezoidal flat-top road humps. These are also known as raised tables and speed tables, and are used as an alternative to circular profile humps. With their fitted flat crossing places between kerbs, these are more environmentally friendly to road users.

Build-outs describe features that extend into the carriageway on one side of the road only with the intension to narrow it. They are usually established at footpath level or higher, and are usually planted with plant materials to narrow the road space. Examples of build-outs include pinch-point (throttle) and a chicane. Build-outs are usually connected to verge or footways.

Rubble devices are attention-getting raised areas across carriageways. They are usually 15mm high and of contrasting colours but not white to differentiate them from road markings. Examples of these include rumble strips, rubble areas and jiggle bars.

Rubble devices have been used to alert drivers to reduce speeds and avoid accidents. However, they are not popular with cyclists.

Gateways on the other hand are information signs used to convey changes in the character of the road way to drivers. They usually carry signals at the side of the road and even above it. They do not have capacity to reduce speed, however, they are useful if combined with other measures to be effective.

Landscaping. This approach has the tendency to add to the aesthetic value of the road by growing shrubs at locations where pedestrians cross the road or where children play along the carriageway. Some of these are illustrated in Figure 6 below.

Figure 6: Traffic calming measures.

Source: Haque el al., 2013.

Bike/ Transit Integration

Integration of the various modes of transport makes transportation at the metropolitan areas more attractive and efficient. According to Buehler et al., (2009), integration can be achieved with effective transit services, scheduling, and fares systems. Additionally, the practice can effectively enhance transit between modes in terms of time and distances traversed. Furthermore, it is argued that maximum integration can be achieved by corresponding improvements in cycling and walking facilities at parking stations and bus stops.

Under bike-transit integration, bike-parking facilities are constructed at, or near major collective transport modes. The ICLEI-Local Government for Sustainability (2011) has reported that these measures can be implemented with success if they are implemented in addition to car-unfriendly measures such as limited transit zones, taxation and parking charges in the centre of the city.

Operationalising mobility considerations in public transport policies in cities: the role of public participation and stakeholder involvement

The new public management opens up in a bid to translate the managerial ideals of the private sector such as contracting out, client orientation and the introduction of market mechanisms into public policy (Kickert, 1997) and this view is properly situated in the policy science and public administration lexicon (Rhodes, 1997; Marsh & Rhodes, 1992). The network concept again, in policy science predates the early 1970s in what is referred to as 'bottom-up' approach (Hjern & Porter, 1981) and intergovernmental relations literature (Friend, Power & Yewlett, 1974). The network approach assumes that policy-making is a complex interactive process that can exist between actors who are also interdependent (Klijn & Koppenjan, 2000). The mutuality and interdependence among these actors means that policy outcomes can be realized through cooperation.

Fiorino (1990) has identified three approaches to participation. These are theoretical or normative approach, substantive approach and instrumental approach.

Theoretical or normative approach generates arguments about equality rather than quality of voice. This approach thus enables actors access the policy process and ensures that participation makes a difference to public policy outcomes Similarly, the substantive approach recognizes the validity of lay judgements to assume that actors see problems, issues and solutions that otherwise would be missed; and raises the issue of sensitivity that is socially and politically valuable. Lastly, the instrumental approach focuses on the effectiveness of policy delivery, and considers how public participation can make decisions more legitimate and offer better results.

The success in achieving modal shift in any urban area is contingent on participation by the actors for whom the policy impinges. According to Banister (2008), public policy acceptability is key to successful implementation of any radical change. On this note, calls for the involvement of the people in the process of discussion, decision-making and implementation of polices that affect them. These community actors are referred to as stakeholders (Burger, Gochfeld, Powers, Kosson, Halverson, Siekaniec, Morkill, Patrick, Duffy & Barnes, 2007) and include any group of people or individuals that are affected by or have interest in an issue that affects them. The involvement of these actors in policy formulation and implementation has yielded significant results (Burger et al., 2007; Tantivess & Walt, 2008; Merchand, 2011).

Some identifiable stakeholders could include transport service providers (infrastructure and operation); businesses which use transport services and operate from land uses in the area; and the general public who live, work, shop in the area and travel around using a range of passenger transport modes (IHT, 1996 cited in Bikerstaff et al., 2002). The Department of the Environment, Transport and the Regions (DETR) of the United Kingdom in 1998 referred to stakeholders in transport planning to include local people, businesses, transport operators, users (including those representing interests of women, disabled people with accessibility needs) as well as health and education providers, and environmental organizations. It is argued that these local people are well placed to decide the balance of priorities locally, and tailor strategies to meet the particular needs of the area (DETR, 1998a). Stakeholder involvement and collaboration throughout the conception, formulation and implementation stages portends success as it encourages ownership and strengthens outcomes.

Summary

In this chapter, the conceptual review of the traditional models of mitigating congestion has been undertaken. Additionally, the sustainable approach of city/urban governance has been explored with postulation for transport-urban planning imperatives that emphasise land use mix, socio-economic valuables as well as travel mode planning and residential choice decisions. The excruciating effect of increased car use has been highlighted with some negative interdependencies on the urban form. In terms of governance, some pathways to mitigating the effects of motorized cities have been addressed with sustainable accessibility planning models such as cycling, walking and pedestrian improvement strategies reviewed.

The implication of the review is to bring to bear possible strategies that could be harnessed to reduce the burden of the dependence on motorized modes for mobility with their attendant social and environmental challenges. The review concludes that the promotion of more sustainable forms of mobility emanates from an integrated approach in which policies ensure a balance between transport, land use, environment, economic development and social inclusion as key imperatives for improvement.

CHAPTER THREE

THEORETICAL AND CONCEPTUAL ISSUES IN URBAN ROAD TRANSPORT GOVERNANCE

Introduction

The approach to sustainable planned road transport in a multifaceted urban area in recent times thrives on several pathways, among which are: governance, land use control, accessibility planning and travel modelling. This chapter, therefore, reviews the theoretical and conceptual underpinnings of these pathways from the global perspective, and later justifies the choice of the network-systems framework for this study in GAMA.

Redefining Government

Government connotes several meanings. According to Stoker (1998), government refers to formal institutions of state and their monopoly of legitimate coercive power. This hierarchical bureaucracy has enabled public decision-making to be made from the centre and implemented through state mechanisms to control both the public and private sectors (Smith, 1998). Public decision-making is therefore possible from the apex in a hierarchical pyramid (Rollings, 2001). There are various features of this form of government including a strong cabinet, periodic elections, majority party control of the executive, and an elaborate convention for the conduct of parliamentary business (Gamble, 1990; Bevir & Rhodes, 1999).

In the last three decades, the ineffectiveness of this model of government has been found with the potential to present a partial picture of governance (Rhodes, 1997; Smith, 1998). It is also argued that its top-down state-led character in practice has rarely worked as intended (Leach, Bloom, Ely, Nightingale, Scoones, Shah, & Smith, 2007). According to Rhodes, the "hollowing out" of central government with a view of hiving off some of its responsibilities to agencies, private and other non-state actors make the concept unsustainable (Rhodes, 1997). To this end, Rhodes (1997) calls for appropriate description 'from governments to governance' to reflect the changing mandate of governments in response to the complex public policy process where there is mutual dependency (see also Smith, 1998). The success of this model is, however, contingent on drawing upon the resources and expertise of several actors (Rollings, 2001), and therefore, policy networks (Klijn, 2000).

Policy networks have thus become the new catchphrase in the modern era for achieving efficiency in governance (Borzel, 1998; Marsh, 1998). Governance, according to Lockett and Spear (1980) is an open system with various modes of exchange between actors, while Rhodes (1996) equates the concept of governance to sharing of power among key actors within an environment. This is the new face of governance advocated to engender liveable cities (Banister & Stead, 2004). These networks, unlike the hierarchical forms, have unique characteristics and are broader in extent than governments (Kitthananan, 2006). According to Smith (1993), power within the policy networks, is relational and fluid rather than absolute. Other observers such as Rhodes (1997) and Klijn (2000) have opined that each actor in this policy network is endowed with some resources and power, making them to exist interdependently of each other. These interdependencies exemplify the strength of the network and can positively impact the policy networks to affect the policy process (Marsh & Rhodes, 1992).

These strengths notwithstanding, scholars have criticised the policy networks as being too theoretical and metaphoric (Klijn, 2000). However, in spite of the associated difficulties, the approach has been used extensively to better understand the complex decision-making and problem solving challenges in the research of housing systems (van Bortel, 2007); governance and social policy research in Britain, European Union and Canada (Saint-Martin, 2004), as well as economic policy research in Britain (Rollings, 2001). In the developing world, the Bretton Woods institutions have been at the forefront of the adoption of policy networks to emphasize the “rolling back” of the state and the privatization of public services (World Bank, 1989).

The last two decades have witnessed a wind of change in the manner of governance in which passivity and laxity have given way to active citizenship participation. This trend of change, according to de Wilde, Hurenkamp and Torkens (2013), has manifested in local issues such as liveability, security problems, lagging emancipation of certain groups and social segregation by European Welfare states. Coaffee and Healey (2003) have ascribed this shift in governance to crisis of confidence in government to create cities inhabited by responsible, public-spirited citizens, and socially cohesive neighbourhoods. In recent times, however, this process has been accentuated by globalization and rising environmental consciousness of motorization with their concomitant imprints on the socio-economic environments of nations. In view of these fears, therefore, concepts such as liveable cities (Banister, 2008), new urbanism (van Lint, 2004), smart cities (Giffinger, Fertner, Kramar, Kalasek, Pichler-Milanović & Meijers, 2007) and mixed-use (Ewing, Greenwald, Zhang, Walters, Feldman, Cervero, Frank &

Thomas, 2011) have been espoused as the assumptions to promote urban livelihoods. Among these theoretical postulations, mixed-use development (MXD) is noted as a signature feature of smart growth, New Urbanism, and other contemporary land-use movements aimed at reducing the private automobile's dominance in suburban America. The approach is implemented by putting offices, shops, restaurants, residences, and other co-dependent activities in close proximity to each other. Eventually, MXD has the effect of shortening trips and thus allows what might otherwise be external car trips to become internal walk, bike, or transit trips. This in turn can reduce the vehicle miles generated by an MXD relative to what it would be if the same activities were separated in single-use developments. Fewer vehicle miles travelled (VMT) not only relieves traffic congestion but also reduces greenhouse gas (GHG) emissions, air pollution, and fuel consumption (Ewing et al., 2011). In a related development, Cervero (1988) has also opined that MXDs are promoted for their supply side benefits, such as possibilities for shared parking and economizing on roadway and related infrastructure expenditures. The assumptions above are further underpinned by global market forces which determine the extent of opportunities such as trade, foreign direct investments, capital flow, information exchange and technological transfer (Ghaus-Pasha, 2004). Unfortunately, these shifts are likely to further deprive and marginalize persons with little or no opportunity to adjust to the dictates of the global order particularly in the developing world and thereby exacerbated the rich-poor dichotomy with much harsher conditions for the poor (Ghaus-Pasha, 2004).

As a result of the above, the United Nations Declaration in September 2000, enjoined all nations to work together to, among other things, eradicate poverty, promote human dignity and equality, and achieve peace, democracy and environmental sustainability by 2015 (MDG, 2000). Unfortunately, according to the UNESCO (2010), vulnerable countries still lag behind these goals because of constraints of resource.

Stakeholder Participation in Urban Transportation

A new response to this trend has focused on the participation of the people in public service delivery and further couched broadly in the framework of Local Agenda 21 (Bikserstaff & Walker, 2001). According to Ghaus-Pasha (2004), the new governance form reflects the partnership in which state actors and civil society participants act in the design of strategies to provide service and act as watchdogs to ensure fulfilment of commitments. This framework seeks to ensure that local people are engaged in local transport planning, community regeneration, land use planning, and air quality management (DETR, 2000b). According to Bickerstaff et al., (2001), the Local Agenda 21 philosophy is tangential to the new constitutional provision of local governance known as 'democratic renewal' which opens up space to citizens to participate in what affects their lives. In this environment, public policy- making thrives on the understanding that environmental and social problems have assumed complex dimensions and require consensus building, iterative science and interactive dialogue with the affected parties (Burger et al., 2007). According to Gil, Calado and Bentz (2011) initiatives such as the Local Agenda 21 encourages greater use of partnerships between government agencies and the public in decision-making processes. Since then stakeholder participation in public policy-making has been promoted through environmental legislation, especially in Europe. In many cities of the developed world, smart cities concept has driven urban land-use and motorization.

In the words of Lara, Da Costa, Furlani and Yigitcanlar (2016), the concept of smart cities is viewed as a vision, manifesto or provocation—encompassing all techno-economic, techno-societal, techno-spatial, and techno-organisational domains—aiming to constitute the ideal 21st century city form. Again, the concept aims at building the cities of the future and the future of the cities by using the state-of-the-art information and communication technologies (ICTs): smart, intelligent, ubiquitous, digital, knowledge, sustainable, green, creative, innovative, and so on (Lara et al. 2013 cited in Lara et al., 2016). The scope of smart cities range from use of purely ecological (Lim and Liu, 2010) to technological (Townsend, 2013), and from economic (Kourtit, Nijkamp & Arribas, 2012) to organisational (Hollands, 2015) and societal (Deakin & Al Waer, 2012) prescriptions for urban planning. These prescriptions, in the view of Lara et al. (2016) make the definition of smart cities fuzzy. For these reasons, Lara et al (2016) advocate for a broader definition that ensures a community that systematically promotes the overall wellbeing for all of its members, and flexible enough to proactively and sustainably become an increasingly better place to live, work and play.

The transport-related challenges faced by many cities today are considerable, and in Europe, several member states have put in place mechanisms to ensure cities make use of best instruments and policy options to ensure a more sustainable development. In response to these challenges and ensure smart cities, the concept of Sustainable Urban Mobility Plans (SUMPs) (European Commission [EC], 2013) have been adopted by member states in the European Union from the previous Action Plans on Urban Mobility adopted in 2009. The SUMPs are meant to provide a competitive and resource-efficient urban transport system across Europe. The benchmarks to be achieved by SUMP include a movement towards integrated urban mobility with perfect coordination (across transport modes, city and agglomeration, transport and environment and participation) and targeted policy actions. In reference to the above concerns, the Directive 2001/42/EC on the Strategic Environmental Assessment Plans and Programmes of the International Convention on Access to Environmental Decision-making and Access have been designed (Gil et al, 2011). The European Commission’s adoption of the Aarhus Convention (2001) on sustainable development and climate change have gained greater momentum (Stead, 2008), as well as support for environmentally friendly modes of travelling (Banister, 2008).

For instance, the DETR (2000) as reported in the UK, these developments have culminated in a shift from the 1992 White Paper ‘The Future Development of the Common Transport Policy’ which did not properly assimilate the tenets of sustainable mobility aspirations to a new White Paper ‘European Transport Policy for 2010: Time to Decide’ to amplify the reduction of traffic growth and its attendant negative effects of pollution and congestion. According to Stead (2008), the 2010 White Paper directed a package of measures such as urban transport planning to enable local authorities to develop and implement Sustainable Urban Transport Plans (SUTPs) developed by the European Commission [EC], (2005). Some of these SUTPs entailed a system of regular reporting and monitoring, framework to facilitate dialogue with relevant stakeholders, as well as from citizens to private operators in the development phase of SUTPs (EC, 2005).

Gil et al. (2011) have reported the progress made in Switzerland with the involvement of the public in transport planning which has spiralled effective mobility in most cities. Similarly, in Germany, the strategy was helpful with periodic round-table meetings with city managers, employers and identified users. Bickerstaff et al. (2001) and Banister (2002) have reported that in France and in the UK, public consultations on transport plans were initiated with residents in London paying for congested routes.

From the above, there is a general acceptance for the involvement of local people in transport planning to engender widespread support for transport plans (DETR, 1998a). In furtherance to the above, Gil et al. (2011) and also Renn (2006) have re-echoed the view that public participation in transport planning is a valuable source of information for transport planning authorities, and this can lead to a wider range of possible solutions. Additionally, they argue that stakeholder participation is a useful tool with the capacity to obviate future conflicts with its sense of ownership. Reed (2008) as well as, O'Faircheallaigh (2010) have also added that the practice is likely to strengthen the democratic fabric of the society, which ultimately can serve as a tool for individual and community participation. From the above suppositions, possible implications of resorting to stakeholder participation in policy plan implementation could be achieved by involving the people whom a policy affects in the policy-making process. The more they feel committed and responsible for the consequences of the process, the better will be the implementation.

In reality, this is the new face of governance in urban transport planning and is strongly hinged on the local governance system and the planning unit (Rye, 2002; 2005) where people for whom public policies affect have crucial stakes in the decision that affects them (Gil et al., 2011). Renn (2006) has also posited that stakeholder participation in transport policy provides useful information for those in authority to lead to a wide range of possible outcomes. Similarly, Reed (2008) has argued that this platform offers the necessary condition to strengthen the democratic fabric of societies, and act as a vehicle for individual and community empowerment.

The potential benefits of stakeholder participation have been espoused further by Merchand (2011), who has suggested a renaissance in the governance perspective to highlight also the institutional setting for local policy-making. Institutionalising governance will explore how local collective action could mobilize fragmented resources for the realization of commonly defined goals. In a related manner, Salamon (2002) has further explained this in reference to the shifting-position of government from traditional centred-led, command and control governance system to persuasive and negotiated governance systems that recognize a network of actors.

Accordingly, in the UK, the Department of the Environment, Transport and the Regions [DETR] (1998a) has reported that the local authority levels are least placed to decide the balance of priorities locally. Indeed, Hull (2005) has argued that the UK government's transport policy has, since 2000, been placed under the responsibilities of local authorities to reduce car dependency through a combination of Transport Demand Management strategies to restraint demand for transport, ensure improvement in public transport alternatives to the car, as well as the adoption of 'soft' practices such as better land use planning. Apart from the UK, some European and North American cities also affirm local context governance with several urban mobility policies (Steers, Mawday and Shapiro, 2004; Department for Transport, 2002; European Commission Ministers of Transport, 2005 and Wake, 2007). Similarly, Rye (2005) has indicated that local area governance strategies have led to the development of important national and local transport policies such as promotion of cycling and walking, public transport facilities and access development, as well as other demand management goals in England and other parts of the UK. According to the Department for Transport of the United Kingdom (DfT), this scenario has precipitated the need to reduce the proportion of employees who drive alone (DfT, 2002; 2004).

Related to the European Commission, the United States of America Employer Transport Plans (ETPs) have become very significant. According to Giuliano et al. (1993), Regulation XV under the Employer Transport Plans charter required that public and private employers with employees about 100 or more institute mobility plans to increase Average Vehicular Ridership (AVR) and to regulate traffic.

Beside local travel plans, travel demand management strategies have been executed to reduce congestion and improve mobility by influencing travel behaviour in local areas. Some of these demand management concepts enable decisions to be made on when, where and how users offered mode, route and lane choices (Managing Travel Demand, 2006). The identifiable types include operational measures such as route information; physical measures such as auto restrictions to city centres; financial measures including congestion charging; and, organizational measures such as sustainable travel planning. Indeed, the European Commission has recognized the potential of mobility management for cities to influence travel behaviour towards sustainable transport options (Vinoutrive et al., 2010).

These views are necessary to reduce infrastructure susceptibility associated with overwhelmed traffic demand. The ECMT (2007) has also suggested, among other things, plans to ensure urban transport demand management linked to land use policies to mitigate congestion management. Additionally, the transport think-tank, has alluded to plans to ensure targeting of travel time variability by prioritizing measures to reduce misery of road users, and thirdly, to ensure that capacity-producing measures are aimed at 'locking in' the benefits of derived demand. As good as mobility management systems may sound, there is some pessimism about their introduction. In the view of Vuchic (2005), mobility demand management systems are often difficult to implement in view of political and economic vulnerabilities associated with their deployment.

Benefits of Stakeholder Participation in Public Transport Policy

The need for stakeholder participation in public policy formulation has been richly captured in the public policy literature. According to Reed (2008), these benefits can be summed up into two broad categories: normative and pragmatic claims.

The normative claims focus on the benefits for democratic renewal, citizenship participation and equity. It is argued that stakeholder participation in public decision-making process reduces the likelihood that those on the periphery of the decision-making context are marginalized. Additionally, stakeholder participation can increase public trust in decisions and empower stakeholders through co-generation of knowledge with researchers, and increase participants' capacity to use this knowledge (Wallerstein, 1999). In a related manner, stakeholder participation according to Richards, Blackstock and Carter (2004), could increase the likelihood of perceiving public decisions as holistic and fair. Finally, it promotes social learning (Blackstock, Kelly & Horsey, 2007). According to Reed (2008), these opportunities could afford the wider society to live, learn from each other through the development of new relationships, while building on existing relationships; and at the same time transform adversarial relationships as individuals learn from each other's view (Stringer, Prell, Read, Hubacek, Fraser & Dougill, 2006).

The pragmatic view, on the other hand, focuses on the quality and durability of public decisions that are made through engagement with stakeholders. As a result, they argue among others, that participation enables interventions and technologies to be better adopted to local socio-cultural and environmental conditions. According to Reed (2008), this will enhance the adoption and diffusion of knowledge among target groups, improve their capacity to meet local needs and priorities.

The importance of participation can also be seen how robust it can render research by providing higher quality information inputs (Read, 2008; Reed, Fraser & Dougill, 2006). Moreover, the strategy if adopted and started early in the initial stages of the development of any public policy, can inform project design with a variety of ideas and perspectives. This has a higher probability of meeting expected outcomes; and finally, lead to higher quality decisions since they are generated from complete information and anticipation.

This can largely reduce unexpected negative outcomes before they occur (Newig, 2007).

Despite these laudable benefits of stakeholder participation, some scholars have faulted the strategy as being limited to examination of public perceptions and attitudes about environmental problems such as siting of storage plant or nuclear facility among others, (Mitchell, Arte & Wood, 1997) and not the actual policy conception and formulation. Additionally, Kothari (2001) has argued that empowerment of previously marginalized groups have unexpected and potentially negative interactions with existing power structures. Nelson and Wright (1995) have also argued that participation can rather reinforce existing privileges and group dynamics to discourage minority perspectives from being expressed. This situation, according to Cooke (2001, p.19) can create 'dysfunctional consensus'. Other accusations against participation include consultation fatigue. In the view of Reed (2008), this situation is likely to occur if participation is not properly run and rewards not offered. Related to the above view, Burton, Goodlad, Craft, Hastings, Macdonald and Slater (2004), have also argued that participants in this situation may feel little affected and eventually disinterested in future engagements. This suggestion has pushed Vedwan, Ahmad, Moralles-Wilhelm, Broad, Letsen and Podesta (2008), to derogatorily describe the participation as mere talking shops that create ambiguities and delay decisive actions. According to Reed (2008), the resulting cynicism associated with the concept can lead to declining levels of engagement and put the credibility of the notion at risk.

Despite the above cynicisms, public participation is widely interpreted as involvement of people in the decision-making process with the intention of influencing choices being made. This definition, according to the participation literature, has been conceptualized in the well-known ladder of citizen participation by Arnstein (1969) who has argued that the only real participation is where there is at least full partnership and preferably full control by participants. In the perspective of Bickerstaff et al. (2001), participation is crudely defined as manipulation and tokenism.

Land use and transport development

The literature on land use planning is replete with compelling evidence that majority of persons are likely to live in cities. Indeed, the United Nations in 2011 found out that about 74 percent of the people who live in Europe do so in urban areas and this number is projected to double by 2050 (WDR, 2011). The Energy and Resource Institute (2014) analysing sustainable urban transport at the city levels, suggested that many of these populations would rely on private car for movement.

These calls by the UN, make the argument for smart cities stronger, and spark new round of thinking that there would be reduction in the desire for travel with the introduction of new urbanisms. According to Cervero and Radisch (1995), new urbanisms demand a return to compact neighbourhoods with grid-like street patterns, mixed land uses, and pedestrian facilities with the proposition that compact neighbourhood design practices could exert greater influences on local shopping trips and other non-work purposes. For work trips, compact, mixed-use, and pedestrian-oriented development appears to have the strongest effect on access trips to rail stations, in particular inducing higher shares of access trips by foot and bicycle. These transit-oriented developments (TODs) assume that new towns with agglomeration diseconomies and opportunities in sight, would prompt people to walk less, bike and ride in transit systems more. However, Cervero (2006a) has a different opinion and postulate that increased ridership could be achieved if TOD is linked with service enhancements.

The core of these arguments is the return to sustainable land use paradigms to primarily, contain the rippling effects of urban agglomeration. In view of sustainable land-use planning, some notable land-use urban development plans-Transit oriented developments (TODs) models are discussed:

TODs are straightforward concepts that are a mix of moderately dense and pedestrian-friendly developments built around transit stations to promote transit riding, increased walk and bicycle travel, and other alternatives to the use of private cars. Some of these are the Finger of Copenhagen and the Planetary Cluster of Stockholm in Europe, the Singaporean Constellation Plan, the *Curitiba* model of Brazil and the *Transmilineo* of Bogota, Columbia and lastly *woonerf* in the Netherlands. These are discussed below.

In Europe, the Finger Plan of Copenhagen, Denmark and the Planetary Cluster Plan of Stockholm, Sweden are cited. These models have the capacity of channelling extra load from the urban centres in a well-planned process, built around rail infrastructure to manage travel demand and to steer growth along desired growth axes. In both of these instances, corridors for channelling the overspill of growth of the urban centres are defined early in the planning process, and built along systems of rail infrastructure in advance of demand, to steer growth along desired growth axes. More importantly, all greenbelt wedges are set aside as agricultural preserves, open spaces, and natural habitats as designated. In accordance to this plan, all major infrastructure is directed away from these districts to forestall its existence.

According to Cervero (2006a), after half-century of strategic area planning, there has been growth in settlement and communication pattern planning, and devoid of emphasising solely on motorized transit. Accordingly, Stockholm has one of the lowest car-dependency ratio among the middle-income suburbs. Stockholm's transit modal share is nearly twice that found in bigger rail-served European cities like Berlin and even higher than inner London's market share. Perhaps most impressive, Stockholm is one of the few places where auto mobility appears to be receding.

In Asia, many Asian cities have historically been transit oriented, featuring fine-grain mixes of land uses, plentiful pathways for pedestrians and cyclists, and ample transit services on major roads (Cervero, 2006a). However, the most common TOD cited frequently is the Singaporean Constellation Plan meant to ensure compact and mixed-use of new towns around many suburban stations. With this plan, the city-state of Singapore has been successful integrated with transit for regional development by placing its urbanized inhabitants of 2.8 million people on a sustainable pathway, both economically and environmentally.

Similarly, in Bogota and Curitiba, the Bus Rapid Transit (BRT) TOD is mostly mentioned. These are the *Transmilineo* and *Curitaba* of Columbia and Brazil respectively. According to Cervero (2006a), Bogota's high-speed, high-capacity bus system-*Transmilenio*, was built after the Curitiba model with dedicated busways. The 42-kilometer, 3-line *Transmilenio* busway is the centre-piece of Bogota's vast bus network with dedicated bicycle facilities extending well beyond *Transmilenio* stations. Currently, Bogota boasts over 200 kilometres of dedicated bicycle paths and lanes. Car parking is mainly limited to the end stations of the *Transmilenio* busway. Nearly half of the 57 intermediate stations are served by skywalks/pedestrian overpasses. A phalanx of sidewalks and bikeways feed into all stations, most embellished by vegetative landscaping. Also, dozens of civic plazas, pocket parks, and recreational facilities lie within a half kilometre of busway stops. Today, 45 percent of *Transmilenio* users reach stations by foot or bicycle.

These TODs have been planned, implemented and developed at the local level by local actors by linking them with most affordable form of high-performance public transit programmes. According to Peterson (2003), this is possible because the local level has become the platform that is suitable to properly allocate strategic resources based on the principle of subsidiarity. To push the case for local governance stronger, the sustainable land use principle which was promulgated in the Local Agenda 21 Document of the Rio Earth Summit held in 1992 underpins this community development agenda.

This principle is based on what has worked earlier in some developed world like the UK. According to Mather (1986), the foundations of direct control in land use has long been captured in the UK Town and Country Planning Act of 1947 under which the UK local governance system operated within broad guidelines from the central government. Under this act, development controls have been emphasised at the local level by empowering the assemblies with the power to grant or refuse construction permits under their jurisdiction for general wellbeing of the people. Accordingly, the planning unit has since been able to control considerably the transfer of agricultural lands to residential and other urban land uses in the most efficient manner while controlling urban growth and transit.

The Danish land use policy is also largely decentralized, and is led by the Ministry of Environment. According to Enemark (2007), the government establishes the overall framework for policies, guidelines and directives by which development possibilities are determined through a general planning regulation at the local level or municipalities. These are further detailed in legally binding local neighbourhood plans. In this system, the municipalities are responsible for granting building controls and their decisions are final. Again, the Danish system has considered the political undertone of planning regimes and strives to balance effectively the aggregate and contradictory expectations of actors in their development control strategies.

The concept of *woonerf* was developed in the late 1960s in Delft, Netherlands to reclaim streets as public spaces for people's use. This action initiated the *woonerf* - or "residential yard" in Dutch - a residential street in which the living environment predominates rather than vehicular infrastructure. According to Appleyard and Lindsey (2006), through the physical alteration of the street, *woonerf* provides space for cars while fully accommodating the needs of residents. The main goal of a *woonerf* is to change the way streets are used and to improve the quality of life in residential streets by designing them for people, not just for traffic. In a *woonerf*, the street is shared among pedestrians, bicyclists, and motor vehicles; however, pedestrians have priority over cars. In other words, *woonerf* transforms the street into a liveable and attractive environment for a variety of activities (Collarte, 2012).

From the foregone, transport plans have been deliberately made to emphasize land-use planning to influence settlement growth. Other notable approach is the growth of liveable cities concept (Banister & Stead, 2004) to mitigate some of the environmental effects of car-based cities. Others include spatial planning and travel behaviour management scheme (Schwanen, Dijst & Dielenan, 2004). A sequel to these deliberate land-use policies is the creation of urban forms with the intent to preserve agricultural lands, open spaces and other environmentally valuable areas while promoting investments in built-up areas to prevent neighbourhood decay.

A typical urban form programme in the literature is the Dutch ABC concept (Dijst, 1997). Accordingly, the concept ensures the promotion of attractive cities by reducing the desire to drive or travel by car, by promoting tele-shopping, tele-commuting and tele-servicing. Additionally, this land use-plan ensures broader accessibility to shops and services by public transport modes as core. Other stronger alternatives to the car such as walking, and cycling are emphasised by improving conditions for use with dedicated lanes and bays. According to O'Flaherty (2006), these tenets are achievable with further attempts such as reduction of the availability of road spaces dedicated for cars and the institution of lower speed limits of 30-40km/h in residential zones as well as the introduction of e-zones to stimulate cleaner vehicles.

Land use and transport development: some sustainable accessibility planning measures

Accessibility is conceptualized, according to Bos and Lee (2012, pg.1) ‘as the volume of services and jobs people can access within a certain amount of travel time, considering multimodal modes of transport, notably walking, biking, driving and the use of public transport’. According to Banister (2008, pg. 76), ‘accessibility planning measures are the new approaches to transport analysis, discussion, decision-making and implementation that have emerged and include direct action (i.e *Reclaim the Streets*), the relocation of spaces and streets to people (i.e. *the World Square Initiative, pedestrianization, street closures)* through lowering speed limits (i.e. *Home Zones*) through travel plans, cycle network and exclusive bus networks as an active process that is participatory and inclusive’. These new epochs of mobility planning imply a shift in urban transport planning from infrastructure building to people and their needs (ECMT, 2007). Similarly, accessibility seeks to balance the negative effects of traditional mobility management (Bertolini, 2005).

This novel approach in travel planning was pivotal in the 1980s with its susceptibility to environmental sustainability and potential for promoting least cost interaction. According to Curtis (2008), accessibility planning benefits are obtainable by creating mixed use developments in close proximity to public transport, as well as walking and biking. In furtherance to this argument, Bertolini (1999) has stretched the debate to reflect the aspirations of decentralization and concentration processes at work in our cities to enhance spatial planning. The focus is to make spatial planning the core of all development aspirations in urban areas to redesign transport network and other land use potentials with a goal to promote accessibility at all spatial scales (Gehl, 1987). To realise an effective spatial planning, Arthur-Little (2014) has suggested that future urban mobility aspirations must cover three strategic imperatives namely, (a) rethinking the system to fundamentally redesign mobility systems towards public transport and sustainability; (b) ensuring a network system that fosters seamless multimodal mobility and attractiveness of public transport, and (c) establishing sustainable core that satisfies short-term demand at reasonable cost.

Related to accessibility planning is sustainable urban transit system. Contributing for inclusion of sustainable urban transit systems in effective city planning, Curtis and Scheurer (2016) have argued for the need for real alternatives for travel in an integrated environment. Others have alluded to the presence of population density backed by greater mixes of land use (Buehler et al., 2009). Accordingly, Banister (2008) has suggested mixed land use development through housing location, design of buildings, space and route layouts as well as transport development efforts such as car-free developments and establishment of size thresholds for services so as to sustainably improve the transport system.

Again, these could be strengthened if mixed land use is intentionally designed to reach activity points at shorter times for commuters than cars; and this obviously requires political and legal commitment (Curtis & Scheurer, 2016). To do these successfully, mixed land use for transport development requires some commitments namely (a) presence of vertical and horizontal cooperation and interaction among jurisdictions, (b) governmental policy on stricter control in new developments backed by efficient zoning practices and less competition for local taxes among municipalities (Dieleman & Wegener, 2004; Dieleman , Dijst & Spit, 1999). However, political and legislative frameworks for land use and urban planning are most often not achievable. In the interim, Mees and Dodson (2011) have suggested a configuration of a system of network coverage and service frequencies that offer viable alternatives to the car for most parts at the urban planning level. In a related manner, Vuchic (2005) has argued for a legible network that is efficient to operate, easy to navigate, and offers a choice of routes wherever possible. The other requirements for effective accessibility planning include the integration of public transport facilities with supportive urban development policies such as mixed use and walkable nodes around major interchanges (Cervero, 1998) as well as institutional framework that allows for the integrated, publicly accountable capital investment and service planning (Mees, 2010).

Another school of thought has pushed the debate further for spatial planning policies to efficiently deliver savings on travel distances, time and travel behaviours in general. Among these are Schwanen and Dieleman (2002), who posited that reliance on spatial planning policies in the Netherlands has contributed to average commuting times in Amsterdam being lower than there is in the whole of Europe with about 46 minutes per day. In a related study, Dieleman, Dijst and Spit (1999) have also intimated that travellers' awareness about cycling and walking as well as public transport options among the Dutch has improved from 4 percent to 12 percent.

These gains have roots in innovative policies such as balanced land use, transport planning and urban mobility policies that were implemented in cities and their surrounding areas advocated by the European Commission

[EC] in the 1990s (EC, 2007). In furtherance to this land use programme, other policies such as the Harmonized European Land Monitoring (EP7, 2011-2013); Spatial Competition between Railway Stations (FP7, 2008-2011); the Peri-urban Land Use Relationships: strategies and susceptibility assessment tools for environmental, social and economic effects of Multi-functional land use in European Regions (FP6, 2004-2006) among others, have been developed to ensure synergy in land use-transport arena.

Based on the notion to achieve synergy in urban land use planning, some innovative accessibility planning measures have been designed to improve the competitiveness of public transport systems by ensuring investments in relatively high-speed public transport systems at conurbations (Newman & Kenworthy, 1996). In a sequel to the above, O'Flaherty (2006) has suggested a suite of measures to institutionalise land use management to promote the efficiency of the city. These include the following:

Flexible working hours: This is a measure designed to reduce peak hour travel and its resultant congestion. According to O'Flaherty (2006), true flexible working hours provide employees with flexibility in hours of arrival at and departure from work while specifying the required core time and number of hours per week or month. This approach is also known as workplace travel plans. According to Caims, Newton and Davis (2010), workplace travel plans became known in the UK based on their success in the Netherlands and the USA.

Workplace travel plans, also called green transport plans, have been used extensively to promote sustainable transport (Rye, 2002). Wake (2007) has reported that the success of this model depends on the presence of a suite of packages such as improved cycling facilities at workplaces, and provision of information on options for travel to the workplace on the organizations' intranet facilities. Additional provisions include the holding of promotional activities for walking and cycling competition, and talks on travel options, establishment of carpool registers to link up interested employees to share ride home or to work; and lastly, the provision of public transport tickets to encourage patronage of these services.

Development densities: This is a way in which local authorities can deliberately specify new development densities to create opportunities for businesses while reducing journey times and promoting cycling as well as walking. The approach has the tendency to attract employers to site, once population densities have been created (O'Flaherty, 2006). According to Aditjandra et al. (2009), land use and design policies are meant to influence travel behaviour in many cities since the 1970s with positive impacts. Its success has been attributed to functional interdependencies in which there are mixed land use, with compact provision of pedestrian friendly as well as urban development plans to inhibit reliance on the use of the car for travel (Cervero & Kockelman, 1997). These functional interdependencies within metropolitan areas are critical conditions to promote public transport accessibility (Curtis & Scheurer, 2017).

Development within transport corridors: This approach is similar to denser development but differ in approach. According to O'Flaherty (2006), this is a corridor-style development and is similar to the Dutch ABA policy which was implemented with an emphasis on the renewal of urban housing stock. Further provisions include strict regulation of the location of retail facilities with a ban on the development of out-of-town shopping malls (Evers, 2002), ostensibly to reduce the repercussions of mobility by car.

According to Dijst (1997), under this policy, A-Locations were centrally located at sites often close to main railway stations and accessible to public transport. The B-Locations on the other hand, were situated in the developed nodes outside the larger central business districts (CBD) and centres of smaller urban settlements; also connected reasonably to public transport networks. Lastly, C-Locations usually had very good motorway access such as business zones. Consequently, Schwanen et al. (2004) have submitted that this policy was deliberately formulated to discourage private cars and to promote public transport together with walking and cycling.

Travel reduction ordinances: This is a policy driven by an urban management programme in which permissions are granted to would-be developers based on energy use plan or policy. Under this plan, estate developers and their tenants are expected to specify how they would reduce car use to levels below that which is available.

Parking standards: Under this model, city managers put restrictions on the minimum number of parking lots allowable in residential areas. According to O'Flaherty (2006), this model now can ensure that local authorities have proposed much more restrictive standards which limit the growth in parking space.

To realise these accessibility planning benefits, the DfT (2009) has advocated for retrofitting of roads and space by local authorities to create more sustainable neighbourhoods by obeying four basic urban planning models: First, in urban environments where the car is dominant, segregate traffic from people. Secondly, if the situation persists, segregate the car from people. Thirdly, they advocate for mix traffic and people at a more equitable basis. Lastly, ensure a total exclusion of the car altogether.

The retrofitting of local roads and spaces, the DfT (2009) argue would create walkable, cycleable and public transport orientated communities that would be attractive to the needs of all users.

Beside these institutional land use policy prescriptions, some physical measures have been designed to mainstream demand management. These measures are meant to strategically enhance choice and improve the efficiency of network facilities. Some of these include:

Carpooling/Car-sharing

This is another innovation to manage demand by controlling driving behaviour. According to Caims, Newson and Davis (2004), the United Kingdom Department for Transport and Regions has instigated a lot of car sharing schemes across the countries to regulate journey to work in the central business districts to coordinate car trips between drivers and potential passengers, travelling on identical or similar routes. In a similar manner, O'Flaherty (2006) has identified that car-sharing schemes have the potential to reduce car traffic while retaining many advantages of private car travel.

To optimise car sharing possibilities, Caims et al. (2004) have argued for the provision of attractive incentive packages such as guaranteed ride-home, preferential parking, promotional launches, direct relief from parking charges and effective communication system. The concept has numerous benefits, namely; reduction in the number of idle cars and induce faster movement for efficient car models (Mont, 2004); cold starts which negatively impact the total amounts of toxic emissions and greenhouse gas emissions per trip; induce modal split by bridging the gap between private and public transport systems through way-one trip chains; and, change the incentive structure from using private cars (Steininger, Vogl & Zettl, 1996). In reviewing the possibility of these benefits across cities, O'Flaherty (2006) has advanced the following views to optimise car-pooling (a) poolers be given preferential treatment over other vehicles when travelling to their destinations on congested roads and at busy intersections, and (b) there be a strict parking control at destinations so that poolers can be granted freedoms of paying less (or nothing) and parking closer.

These strategies are generally referred to as prioritization schemes (Litman, 2017) and are meant to give priority to higher value trips and more efficient modes of travel. Despite these benefits, Kingham et al. (2001) have some reservations against the strategy by insinuating that finding ride-matching partners may be a severe obstacle to this service. In a related development, Hajer (2009) has also identified the possibility of discomfort when driving with an unknown passenger associated with the practice.

Park-and-Ride

This is a strategy of designing parking spaces beside dedicated terminals to enable car drivers to stations on the main line. This strategy has the potential to provide low-cost way of extending the benefits of public transport and hence reduce congestion. Park-and-ride approaches are potentially viable at peripheral communities as integral part of a town's parking plan. Depending on the predominant mode of transportation in an area, park-and-ride schemes can be bus-based or rail-based and can operate all-year-round services to relieve the central business area of traffic congestion.

To realise the full potential of the approach, O'Flaherty (2006) has recommended that there must be park-and-ride schemes must interchange with services by public transport systems that offer reliable and frequent services both for inward and outward directions. Secondly, the outward public transport mode must provide reliable and fast services from the interchange into the central area. Thirdly, the parking fee at the interchange in addition to the two-way public transport fare should be less than the perceived cost of travelling to the central area by car and parking there. Fourthly, there must be ample parking space must be provided at the interchange to ensure that parking is easily obtained at all times. In addition to parking space, park-and-ride interchange must be properly located. Lastly, park-and-ride schemes must be well designed, marketed and supervised.

To this extent, the approach has been associated with the tendency to reduce environmental intrusions and accidents in the inner areas (O'Flaherty, 2006). However, the approach has been criticized for its tendency to focus on car users. Again, its sustainability comes into question in view of the availability and cost of land at the inner area. Despite the inhibitions, the strategy has been potentially beneficial with recent schemes being financed as part of new retail developments.

Public Transport Planning

The sustainable accessibility paradigm as an objective-based planning system which seeks to implement a range of interventions including a phased approach that moves flexibly in the direction of longer term goals as against the traditional mobility approach, tended to treat land use as given with no chance to alter it for efficiency (Curtis, 2008). Indeed, this deductive approach (Banister, 2002), started in the 1960s where transport planners developed a strong tradition of scientific method for solving urban transport problems. In this new approach, and since the 1980s, environmental sustainability has been given more impetus.

Public transport network planning recognizes the view that public transport operates most successfully when it is planned as a unified network to support seamless multi-destination travel rather than individual lines catering for single trips (Mees, 2010). According to Vuchic (2005), public transport systems built around networks can offer a wider choice of trip making based on individual destination and journey preferences than one that attempts to provide for every potential origin-destination. Mees (2010) has shown that a networked public transport can significantly improve patronage more than individual routes because of difficulty in predicting unforeseen factors associated with travel. Again, it has been shown that public transport network planning is more important in dispersed urban environments where demand is similarly dispersed (Dodson et al., 2011).

Strategies for Public Transport Network Planning

Planning public transport network can achieve its vitality if it is designed to achieve a network effect. This effect, according to Nielsen, Nelson, Mulley, Tegney, Lind and Lenge (2005), has two basic principles: First, to provide a simple and stable interconnectedness in lines throughout the day with a structure and timetables that are easy for users to learn and understand; and, secondly, a potential majority of users will be able to transfer between services to access their selected destination. To achieve these transfers, there is the need to coordinate timetables between services to reduce waiting times. The following two basic principles have been suggested:

Practice 1: Simple and direct network structures

This principle assumes a 'one section-one line' network that underscores the need to provide direct lines for the physical routes of which can be easily recognised individually or within the network. According to Mees (2010), direct routes are quicker and shorter than circuitous ones. In addition to simplicity, Nielsen et al. (2005) advocate network 'parsimony' such that the number of lines should be as few as possible to enhance efficiency, high quality main line system for the majority of transport users.

Practice 2: Plan a hierarchy of lines into a network

The interconnectivity of lines in terms of capacity and scale of operation is an important feature in public transport networks, ranging from high-speed cross city lines, intra-suburban lines and local lines.

High-speed cross-city lines require fast dedicated rights-of-way with high passenger loads. For these networks, heavy or light rail is commonly used. In other respects, high frequency busways can be used if deployed appropriately.

Inter-suburban lines typically operate at grade and can be used to link high-speed lines with distant activity nodes such as shopping centres. These lines are described as general purpose lines that interlock with each other to make intra-suburban mobility possible while linking passengers to trunk routes.

Local lines link suburbs with trunk or inter-suburban lines and nodes. These lines are often used to provide links to regional or metropolitan trunk and interconnections to and between nodes. They operate at low frequency and constitute consistency, reliability and speed of transfers.

Practice 3: Plan for speed, consistency and reliability

Nielsen et al (2005) and Mees (2010) have observed that public transport- system planning must aim at travel speeds comparable to or faster than door-to-door travel times achieved by cars. This must involve vehicles that can travel fast with minimal impedance from traffic or intersections. For this reason, support priorities such as right-of-ways, dedicated lanes and priority at intersections are provided for vehicles. An example of this is shown below in Figure 7.

Figure 7: Dedicated bus lane in the UK.

Source: Transport and Road Research Laboratory [TRRL], 1993.

The provision of priority services, the TRRL (1993) assume, would make transport services run consistently to the extent that timetables as well as stopping patterns would apply across wider periods.

Practice 4: Coordinate convenient transfers

This principle ensures that transfers within and between modes operate at minimal waiting times to the extent that time-tables are not relevant. According to Mees (2010) and Nielsen et al. (2005), this can be done at six services per hour. Fast and easy transfers support fast journeys to dispersed destinations within a public transport network. This principle is, therefore, at the core of public transport network planning for speed and high frequency trunk routes as well as the ability of inter-suburban and local lines to offer fast, convenient and reliable service.

Practice 5: Provide clear, ubiquitous and consistent information and marking

Clear accessible information for passengers is a key element of a public transport network. Stops should provide sufficient information for passengers to locate and navigate across network modes. Information about lines, as well as zones and fares should be properly displayed.

Institutional Design and Planning for Public Transport Network

A common institutional requirement for the design of any effective public transport network is a planning authority. According to Wickham (1999), the planning authority for public transport network is a key feature of good practice in urban transport policy implementation. Mees (2010) has underscored the usefulness of a centralized coordinating agency to efficiently plan the network, specify service characteristics for operators and manage subsidies, design fare structures to support the network, undertake marketing of the overall system and manage network financing. Additionally, Pucher and Kurth (1995), have identified pivotal role of regulatory authorities to improve transit services and equitable fare levels in Europe. Furthermore, Cervero (2013) has also accentuated the debate for transit authorities as being the pinnacle to ensure standardization of services, stops, frequency of service and safety.

According to O'Flaherty (2006), transit authorities are mandated to plan, control, and grant parking controls, as well as management of traffic within the local areas. Indeed, since 1985, the Public Transit Authorities in the UK have coordinated public transport services including entering into agreements for the provision of passenger rail services, administered concessionary fare schemes, ensured school transport services and subsidized socially desirable but non-profitable bus routes to secure specific fare and service bus levels. An acclaimed transit authority commonly cited in the institutional arrangement literature in cities across Europe is the *European Verkehrsverbund* (EVV) (Dodson et al., 2011, Pucher & Kurth, 1995). Haque, Chin and Debnath (2013) also talk of the Public Transport Council (PTC) in Singapore having similar operational characteristics.

The EVV, according to Dodson et al (2011), is the institutional arrangement for some European countries such as Germany, Switzerland and Austria with the mandate to deploy improved public network planning. Pucher and Kurth (1995) have reported that the EVVs have deployed, in these countries, enhanced service expansion, better quality of services, more attractive fare structures and improved marketing of products to customers. In a related manner, Haque et al. (2013) have also claimed that the Public Transport Council (PTC) in Singapore sets the standards for buses, including route design, bus stop locations, service frequencies and safety standards. However, the management of transit services in urban areas in many developing nations is self-regulated (Cities Alliance Report, 2015).

In addition to transit authorities, the UK government has through the Department of Transport (DoT) influenced transport decisions that affect the local authorities (O'Flaherty, 2006). This is done in line with the planning policy guidelines drawn in conjunction with the Department of Environment (DoE) to guide the development of local development plans, the approval of supplementary grants to assist in the development of capital projects such as street lighting, road safety and traffic management schemes, as well as publication of research findings through the Transport Research Laboratory to help improve transport at the local level. Accordingly, the DoT is the most authoritative in respect of its responsibilities for land, sea, and air transport and it (DoT) does these in collaboration with the DoE which has responsibility concerning physical developments regarding where people live and work.

Priority for Higher Occupancy Vehicles (HOVs)

The use of HOVs has great potentialities to improve mobility in urbanized societies. These are the springboards upon which many cities in the world, notably in Europe, North America and some Asian countries have sustainably promoted public transport patronage and green cities. According to the Singapore Land Transport Agency (LTA) (2008), HOVs are the sustainable aspects of any transport policy and are geared towards economic development, environmental protection and social equity. Haque et al. (2013) have reported that these efforts are deliberately sought to achieve high patronage of public transport systems. They are convenient when they are coordinated to other systems such as busways/bus roads, fares and information to customers. According to Litman (2017), the net benefits of privatization are derived if they are implemented in conjunction with other models such as ridesharing, and transit service improvement on the corridor, as well as transit-oriented development in destination areas. Some of these HOV priority measures are discussed below.

a. Busways otherwise known as bus roads are roads which guide bus systems and are specifically designed to enable buses to operate at regular services. Additionally, facilities include access facilities which enable buses operate with lateral guide wheels into the kerbing on a concrete guideway. According to O'Flaherty (2006), these facilities enable conventional buses to operate on segregated bus roads in high-volume urban corridors and can offer savings on time and cost. The efficiency of busways is realised if they are grade-separated and traffic-signalized from general purpose traffic to give priority to buses (Figure 8).

Figure 8: Priority measures meant to integrate rail and bus services
Source: Haque et al, 2013.

b. Bus-only street is another form of bus road that can be created to ban all vehicles except buses only. However, taxis are usually allowed to ply from an existing street during all or part of the day. These are targeted on busy destination streets or adjacent distributor roads to allow buses to cross quickly between housing precincts.

c. Bus lanes: These are special lanes made for use by buses only and can be classified under two main kinds: with flow and contra-flow. With-flow operations enable buses to operate on reserved lanes in the direction of the normal traffic flow. The kerbs are thus used on heavily-travelled arterial roads in the inner cities. These kerbside reserve lanes have the capacity to increase journey speeds and reduce travel time of buses. According to O'Flaherty (2006), the benefits can be realized if rigorous policing is enforced to prevent non-priority vehicles. Secondly, it requires a cut across commercial vehicle access to kerbside properties. For this reason, high potentialities to accident rates and other traffic on non-suitable streets have been identified as the associated menace.

Contra-flow priority lanes on the other hand are usually installed in the kerbside lane of one-way streets and used only by buses. They have the tendency to shorten bus routes as compared to one-way streets, and save bus running time while increasing service reliability. Additionally, lower bus operating costs, reduced bus-passenger walking distances and increased ridership for buses have been identified. However, the cost of additional signalization and channelization of service lanes often obviates its benefits particularly to low-income cities. To mitigate these, O'Flaherty (2006) has suggested clear signage and lane markings as essential to safe and efficient operation of both with-flow and contra-flow priority lanes for cities.

d. Priority for buses at intersections: This is another simple access measure that can be used to improve the turn-around time for buses in a congested city. This is done by favouring traffic streams known to contain buses over other streams by calculating normal delay-minimising signal timings. According to O'Flaherty (2006), this is done by installing transponder units in buses which can be detected by signal controllers and then given priority when needed at intersections. Two main priorities can be identified: These are, priority-by-extension and priority-by-recall. Priority-by-extension enables a green light to stay on until a bus has negotiated the intersection while priority-by-recall enables red light to be recalled to green as soon as it is safely possible to give priority for buses. These measures have tendency to minimise delays at intersections for buses. Some of these are shown in the Figure 9.

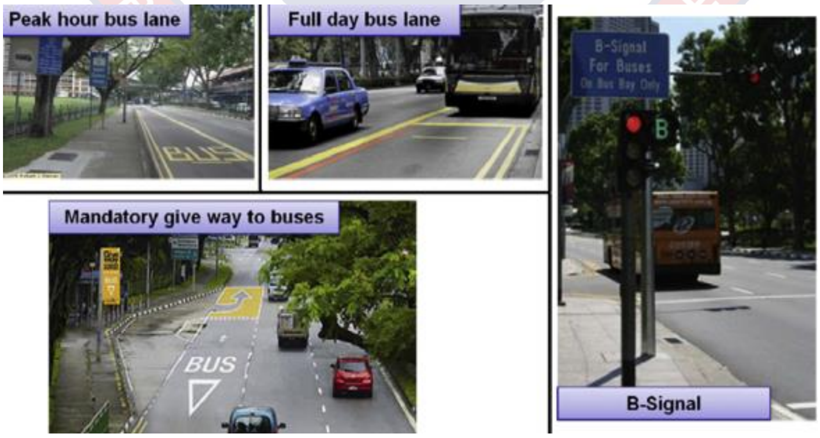

Figure 9: Schemes to improve bus operations

Source: Haque et al. 2013

Modelling and analysing travel speeds in urban settings.

In an attempt to mitigate the challenges arising out of congested road networks, expanded cityscape and population explosion, attempts are made to expand carriageways with segregated humps to ensure operational efficiency (Vuchic, 1999). These strategies are often undertaken to eliminate the cost of time and energy wastage, reduce travel stress levels and decrease loss of productivity that congestion imposes on the society (Rao & Rao, 2012).

Other models that have been used beside carriageway expansion programmes to achieve efficiency on travel times include Travel Time and Delay matrix (Lomax, Turner, Shrank, Levinson, Pratt, Bay, and Douglas, 1997). According to the authors, this model has been used in some cities in the US to analyse congestion census data and concluded that unacceptable congestion occurs when more than 10 percent of commuters spend more than 60 minutes to commute to work. The OECD (2006) has also identified the measurement of vehicular volume on a transportation facility (street or highway) with Demand/Capacity models to address congestion. Again, according to Shrank and Lomax (2006), these models have capacity to increase travel time, reduce cost of travel and modify, to a large extent, human behaviour.

With the persistence of the challenges of congestion in urban areas, other models such as Level of Service (LOS) have been advocated to traditionally model congestion in cities. Several of these models including Roadway Congestion Index (RCI) developed by Shrank and Lomax (2005) measure daily Vehicle Mile Travel (VMT) per lane-mile of freeways and principal arterial streets. In addition to RCI, Lane Mile Duration Index

(LMDI) has been developed (Cottrell, 1991 cited in Rao & Rao, 2012) as a product of congested freeway miles and congested duration (hours) for individual roadway segments and, is calculated using the indicator of average annual daily traffic volume per hourly capacity (AADT/C). Byrne and Mulhall (1995) have criticised the LOS analysis as being limited, useful for only measuring localised congestion and not efficient enough for analysing congestion on a representative scale.

Other models such as Delay Measures (Lindley, 1987) as well as the widely acclaimed Data Collection Models including the use of Fixed Sensors for collecting data on traffic volume and speed, journey speed using floating car method have evolved. Shrank and Lomax (2005) have acknowledged the acceptance of these models in view of their ability to offer speed of 60 mph for freeways and 35mph for arterial road networks for cars. One of these models is the Travel Time Data Collection Method (Texas Institute of Transportation, 1998). According to Mathew (2014), travel time enables the measurement of real-time travel prediction on congested roads for traffic management. This method enables travel times to be determined by directly collecting travel speeds in actual traffic conditions at 100 metres per 20 seconds interval. The main techniques for Travel Time Data Collection include Test Vehicle Techniques, License Plate Matching Technique, ITS Probe Vehicle Technique and Emerging and Non-Traditional Techniques.

The Test Vehicle Technique is often called floating car technique and is used by specifically dispatching a vehicle along a traffic stream to collect traffic data. The technique usually has a driver with a passenger whose main duty is to manually record driving speeds using stopwatches and clipboards or electronically using distance measuring instruments (DMI) or global positioning system (GPS) receiver at designated checkpoints or intervals. According to Mathew (2014), the technique has the advantage of low initial cost and detailed results. However, human and electronic errors, as well as data storage may be difficult to contain.

The ITS Probe Vehicle Technique utilizes passive instrumented vehicles in the traffic stream and remote sensing devices like signpost-based transponders, automatic vehicle identification (AVI) transponders, ground-based radio-navigation, cellular phones or GPS receivers to collect traffic data. The technique has the advantage of low cost per unit of data, continuous data collection, automated data collection and reduced disruption. However, it was not selected due to the initial cost of instrumentation and skills of application.

There are also emerging and non-traditional techniques. These are based on using 'point' vehicle detection equipment such as inductance loop detectors or video cameras. These methods are still at the emergent stages and so there is limited information on them regarding their efficiency to offer valid results.

License Plate Matching Technique similarly consists of collecting vehicle plate characteristics and arrival times at various checkpoints and computing the difference in arriving times. Two sub-methods are identified: These are manual and computer-based methods. The computer-based technique can allow for large sample size to be taken, and provides a continuum of travel times during the collection period. The method is, however, faulted due to limited travel time at locations where observers or video cameras can be positioned. Other demerits include limited geographic coverage on a single day, and accuracy of reading manual and electronic data. For the purposes of this study, the manual method of Number Plate Matching technique which allows for using of field personnel to read licence plates of vehicles using paper and pen, was adopted. The approach works by employing a test vehicle while two passengers use stopwatches and pens to record cumulatively travel times along study routes. The purpose of this is to collect travel time data using pen and paper to record road characteristics that occasion delays. According to the Texas Institute of Transportation (1998), the standard spacing for mounting checkpoints for travel data collection is 0.4 km to 0.8 km. The approach enabled trained field research assistants collect travel times of specific number plates at these intervals on selected road corridors to determine the travel time (seconds) drivers traverse every 100 metres in GAMA during peak periods (6 am to 8:30 am and 4:30 pm to 8:00 pm) and off peak periods (11 am to 12:30 pm). The approach was post-tested in the New Juabeng Municipality of Koforidua, which is a regional capital that shares boundaries with the Greater Accra region of Ghana for purposes of validating the results obtained in GAMA.

Conceptual Framework

The push factors that drive effective mobility in any country are strong institutions, strong civic participation and activism. According to Vuchic (2007), political considerations have taken central stage in decisions by governments in many cities. In GAMA, this factor cannot be understated, as in a city with over twenty political parties waiting to rule over the country. Beside political party influences are interest groups such as transport operators and owners associations who wield bargaining rights (Fouracre Kwakye, Okyere & Silcock, 1994).

Based on this understanding in GAMA, this study adopted the network-systems framework (Lockett & Spear, 1980; Rhodes, 1996), a framework that integrates the two views (governance as open system and sharing). The assumption is that key actors or stakeholders (local government agencies, employers and transport service providers) collaborate on certain transport needs (road congestion, high emission levels and demand for roads etc) within a specific environment to produce favourable public policy (urban design, new roads, or access lanes). These needs are input into a black box where policy makers engage in discussions, trade-offs and make output called transport policy. The success or otherwise of this policy is not without the feedback from end users (commercial transport service drivers and union members). This feedback is multi-directional and useful to shape the final output to keep the system running. This is illustrated in Figure 10.

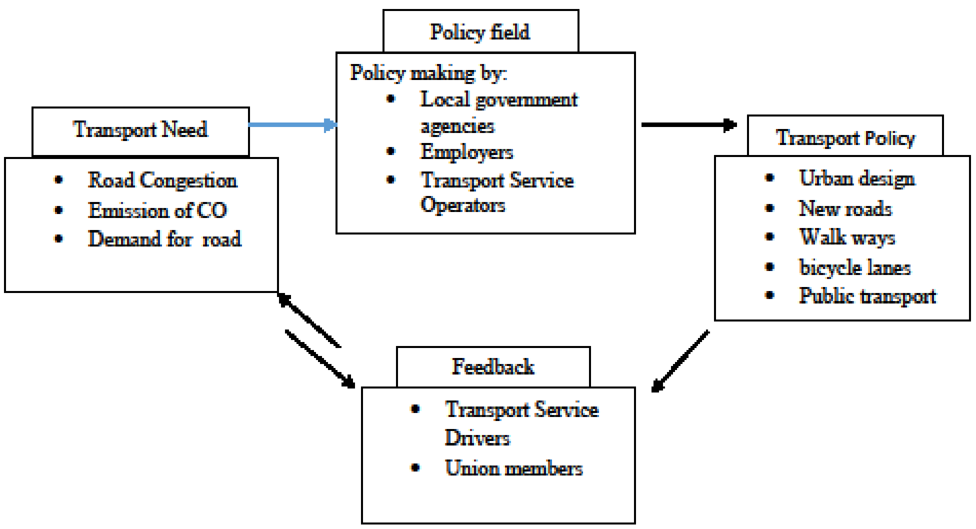

Figure 10: The Network-systems Framework.

Source: Lockett & Spear, 1980; Rhodes, 1996.

The Network-system framework operates on solid grounds making it suitable for the study. Among these include its ability to enable users who are the direct beneficiaries of policies to make the necessary inputs into the process of formulating transport decisions that affect them. Additionally, its feedback mechanism finally enhances ownership and acceptance of public transport policies so made. It has also been argued that once decisions are generally accepted, new innovations can be imported to enrich policy outcomes. This is based on the knowledge that policy makers can forecast beforehand, the expectations of diverse users which can facilitate acceptability of transport policies. Again, this makes possible forecasting, visioning and the design of appropriate transport interventions to ameliorate urban mobility challenges for an area, particularly in GAMA. The concept has the ability to engage, and offer opportunity for participation with its unique versatility in fashioning policy programmes to solve urban challenges notably transport planning.

The choice of this model for GAMA was therefore significant in view of the presence of a vibrant civic culture that is underpinned by a strong civic and participatory democracy which serves as a bait for innovation in policy introduction. This trait is functional among all Ghanaian cultures where the formation of interest associations is perceptible. For instance, it is common in Ghana to find among ethnic groupings unions such as Ga-Adangbe Association, Fante Union; in professions various groupings such as the Ghana Private Road Transport Union and Police Wives Association; and in institutions, common interest groups such as the University Teachers' Association and Ghana National Teachers' Association, among others, who meet regularly to jointly espouse their common interest, defend and protect their identity and advance their views for inclusion in the socio-political space. In the Greater Accra Metropolitan Area (GAMA), there are a lot of such public and private interest groupings who seek inclusion in the transport decision-making space. Unfortunately, they have not been mainstreamed in the urban transport decision-making process but constitute a useful building block for policy development in the country. For this reason, the main transport services in GAMA, notably the Ghana Private Road Transport Union, Progressive Transport Union and the views from management members of transport services providers such as Metro Mass and Agate were sought to bring about innovation in the transportation policy design.

Summary

From the theoretical review, the ineffectiveness of hierarchical model of government has been identified with its potential to present a partial picture of governance. Secondly, it is established that its top-down state-led character in practice rarely works as intended, and this has culminated in the hollowing out of many state centred institutions giving way for vibrant private and other non-state actors in the productive channels of development, and resulting in a new phase of complex public policy process. The review has also identified that the success of this is contingent on drawing upon the availability of private resources and expertise of several actors.

Again, the review has established the strengths of the governance framework to allocate scarce resources and prescribed some best practices of a balanced land use, transport and accessibility planning model from Europe for GAMA. In consequence to this framework, policies such as the Harmonized

European Land Monitoring (EP7, 2011-2013); Spatial Competition between Railway Stations (FP7, 2008-2011); the Peri-urban Land Use Relationships: strategies and susceptibility assessment tools for environmental, social and economic effects of Multi-functional land use in European Regions (FP6, 2004-2006) have been recommended in GAMA to bring about synergy in land use-transport development. Based on these strategies, some innovative accessibility planning measures such as cycling, walking and public transit models have been advocated.

The implications of these reviews for the study in GAMA are the realisation that sustainable urban development and accessibility-based planning have become the core functions for urban governance, new urbanism and smart cities. To achieve this, therefore, urban planning must be multidisciplinary and encompass technical improvements, as well as opportunity for participation by local actors. It also demands that planning regimes in GAMA must employ inter-disciplinary in which collaboration with other professional associations and policy actors is an essential requirement for efficient land use planning.

CHAPTER FOUR

METHODOLOGY

Introduction

This chapter focuses on the research design, study area, population, sampling procedure, data collection instruments, data collection procedures as well as data processing and analysis. The chapter ends with possible associated limitations of these approaches.

Research Design

According to Bryman (2001), the purpose of any research is to determine data sources and strategies for analysis; and in consequence, the mixed method with sequential procedures were adopted. This method allowed for the use of qualitative methods such as interviews, focus groups and observations initially for exploratory deductions. Based on the results obtained from the qualitative data, space-mean speed was measured quantitatively to determine travel time on the selected road corridors for quantitative conclusions and generalization.

The exploratory approaches allowed for the investigation of little-understood phenomena of road transport governance in GAMA and to discover important variables for further research into the phenomenon (Kitchin & Tate, 2000). The quantitative method explored modelling of time mean speed (average speed of vehicles traversing a segment of the road within specified time) using travel time data collection strategies (number plate matching technique) to determine travel time for pertinent sections of the study. The choice of the qualitative approaches enabled the researcher to gain normative insight into the phenomenon of road transport governance and, finally, the quantitative approach was used to propose model travel plan for the Greater Accra Metropolitan Area (GAMA) to promote efficient mobility by commuters.

The choice of exploratory design, unlike other designs, has the capacity to allow investigation by gaining basic details, settings and concerns. Secondly, travel time data collection method enabled the measurement of travel times on routes used for the study. Based on this understanding, a grounded picture of the phenomenon of road transport governance was developed for GAMA. The study was largely limited to GAMA for want of time and resources, and so its homogenous characteristics might hamper the ability to generalize results across the whole country.

Study Area: Greater Accra Metropolitan Area

The study was carried out in Greater Accra Metropolitan Area (GAMA), in which Accra is the national, regional and metropolitan capital city. The triple function of GAMA makes the area prune to high population densities in Ghana (GSS, 2012). Similarly, the area receives higher vehicular population and usage (DVLA, 2012). In terms of governance, the area is home to government ministries and agencies responsible for transport planning in Ghana (GoG, 2008). In view of its greater share of vehicular and human population, GAMA area receives greater difficulties related to road safety and infractions than any other operational region in Ghana (MTTD, 2012). The following subthemes further explain the study area.

Population of GAMA

The GAMA has continued to grow since the early 1980s in form and appearance as a result of the liberalization policies in 1983 (Korea

International Cooperation Agency [KOICA], 2016). In 1985, the urban form was just 133.35 km^2 and grew at a rate of 6.56 percent yearly. As at 2000, this form had expanded by 88 percent to 344.26km^2.

The population growth rate of GAMA is high compared with other regions of the country being the regional as well as the national capital of Ghana with a population density of 441.0 and a growth rate of 4.5 percent (GSS, 2012). Thus, the 2010 Population and Housing Census of Ghana pegged the population of the Greater Accra region at 4,010, 054 with density of 1,235.8 at 3.3 percent growth rate.

In terms of spatial extent, the Greater Accra Metropolitan Area of Ghana comprises Accra Metropolitan Assembly, Adentan, Ga East, Ga West, Ga South, Ga Central, La Nkwantanan-Madina, Ledzokuku-Krowor and La Dade-Kotopon. Together, these municipal and district assemblies (MDAs) occupy a land area of 1, 494.4 km^2 out of the total land area of 3, 698.5 km^2 comprising the Greater Accra Metropolitan Area of Ghana (Figure 11).

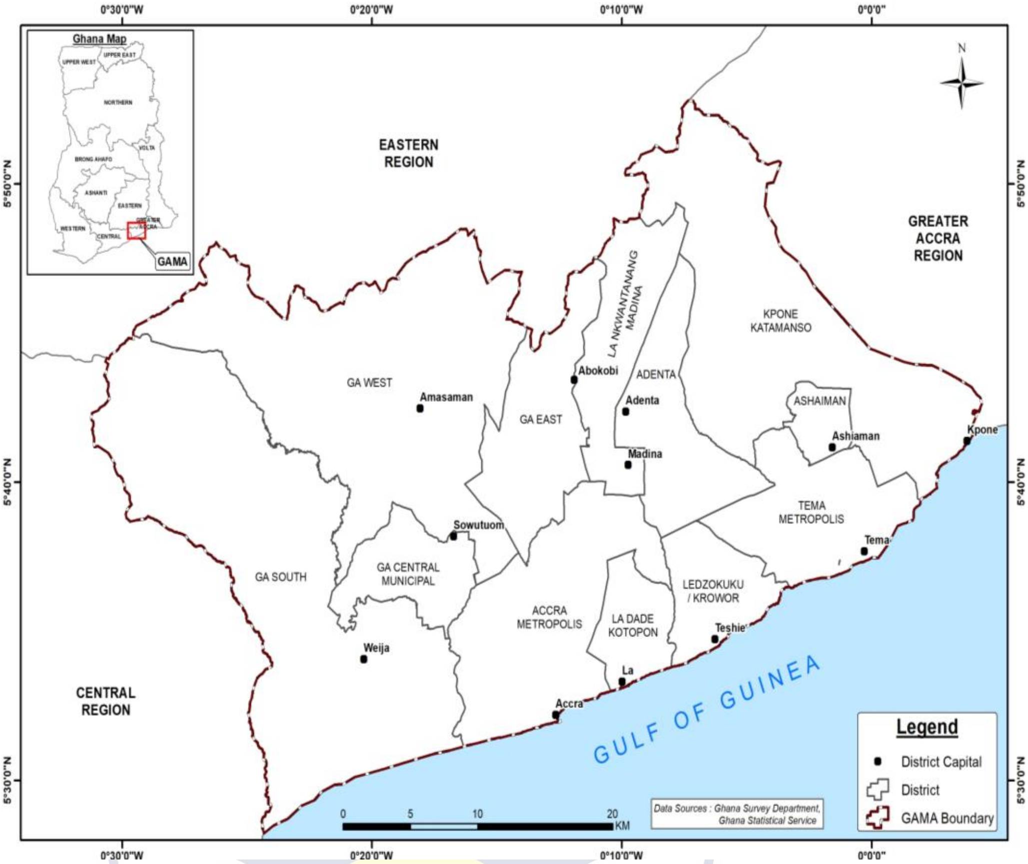

Figure 11: Map of Greater Accra Metropolitan Area of Ghana.

Source: KOICA, 2016

Transport sector Government Ministries, Departments and Agencies in GAMA.

GAMA is home to all the government transport sector ministries such as Roads and Highways, Transport, Local Government and Rural Development responsible for transport development in Ghana (GoG, 2008). These ministries are responsible for infrastructure, service and regulation of transport activities respectively. Additionally, the area is home to major departments such as the Departments of Urban Roads, Feeders Roads, Town and Country Planning and the Road Fund Secretariat. Lastly, the headquarters of many transport agencies including the National Road Safety Commission, the Driver and Vehicles Licensing Authority, Motor Traffic and Transport Department of the Ghana Police Service are found in GAMA.

Traffic Volume of GAMA

According to a recent draft report by the Ministry of Transport jointly published by the Greater Accra Coordinating Council and Korea International Cooperation Agency [KOICA], (2016), the Accra agglomeration has expanded to about 900 km^2, spreading 70 km west-east, 30 km north-south to cover areas such Ga South and Central municipalities towards Kasoa in the Central region. On the northern sides, the area spreads to Ga West and East municipalities while the eastern spread extends to La Nkwantanang, Adentan, Ledzokuku/Krowo municipalities as well as Tema,and Kpone Katamanso enclaves. The area also expands towards Dangme (Shai-Osudoku) districts. This trend is illustrated in Figure 12.

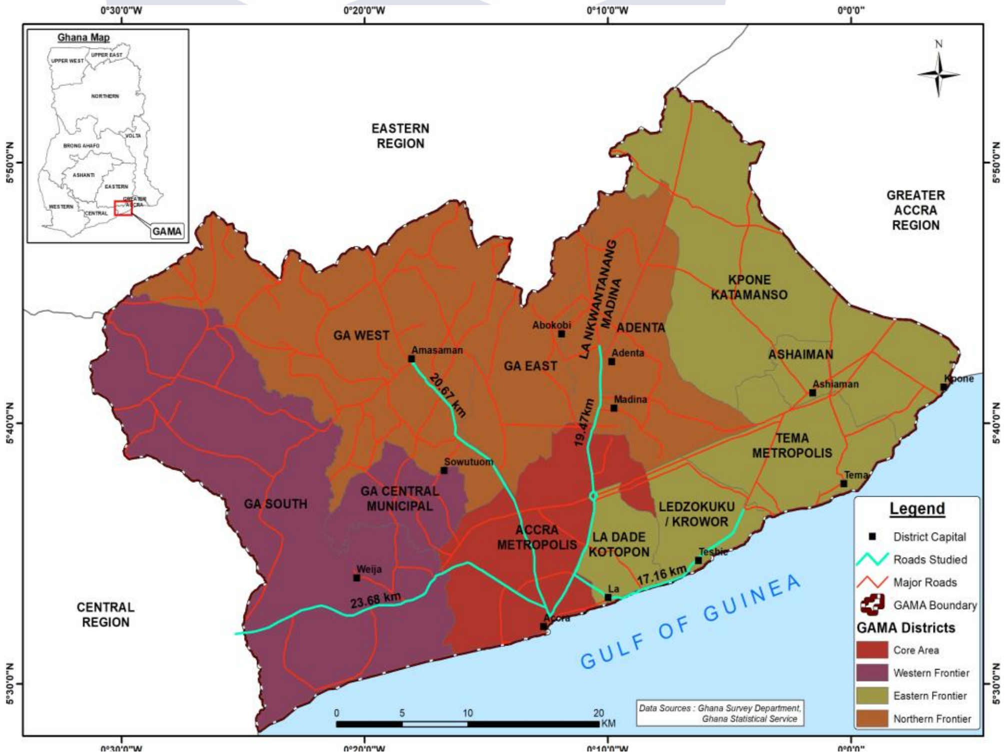

Figure 12: Spread of traffic in GAMA.

Source: Ecological Laboratory, University of Ghana, Legon, 2018.

In terms of traffic volume, the KOICA (2016) report puts it that as at 2015, volume of traffic was 62.8 percent inbound (morning rush hour) and

54.1 percent outbound (evening rush hour). This translates to 3,105 vehicles per hour from 7-8 am averagely and with lower speeds of 15 km/h.

Road network and conditions in GAMA

According to the data obtained from the Department of Urban Roads [DUR] (2016), as at 2013, the road condition mix of GAMA was made up of asphaltic, surface dressed, gravel, earth and concrete road networks. In 2016, the DUR reported the road length of GAMA is 3535.81 km. From this length, the component of asphaltic road network is 373.46 km and constitutes 10.56 percent of goods roads in GAMA. In a related manner, the proportion of surface dressed network is 1493.35 km of roads and constitutes 42.24 percent of good roads. The gravel component is 392.89km and represents only 11.11 percent of roads in fair condition in GAMA while a whopping 32.92 percent (1164.11 km) of roads are earth. Only 112 km (3.17 percent) of roads in GAMA has concrete surface (Table 1).

Table 1: **Road condition Mix of GAMA**

	Asphalt Mix			**Surface Dressed**				**Gravel**				**Earth**				**Concrete**		
Area	**Total**	**Fair**	**Poor**	**Total**	**Good**	**Fair**	**Poor**	**Total**	**Good**	**Fair**	**Poor**	**Total**	**Good**	**Fair**	**Poor**	**Total**	**Good**	**fair**
Accra	286.82	157.75	20.08	1230.49	824.43	73.83	332.23	47.38	455.02	0	18.36	304.25	00.00	00.00	304.25	0.060	0.00	00.00
Ga	86.64	78.74	0	262.86	157.72	21.03	84.12	345.51	775.32	28.37	141.83	859.86	00.00	00.00	859.86	1.63	1.22	0.00
Total	373.46	236.22	20.08	1,493.35	1,000.15	94.86	416.35	392.89	1,230.34	28.37	160.19	1,164.11	00.00	00.00	1,164.11	2.23	1.22	00.00

Source: DUR, (2016)

Transport Terminals in GAMA

The Greater Accra Metropolitan Area (GAMA) has about 251 transport terminals and includes 110 in Accra Metropolis, 20 in Adentan, 28 in Ga East, 32 in Ga West, 25 in La-Nkwantanang-Madina, 20 in Ledzokuku-Krowor, and 16 in La Dade-Kotopon. These are illustrated in Figure 13.

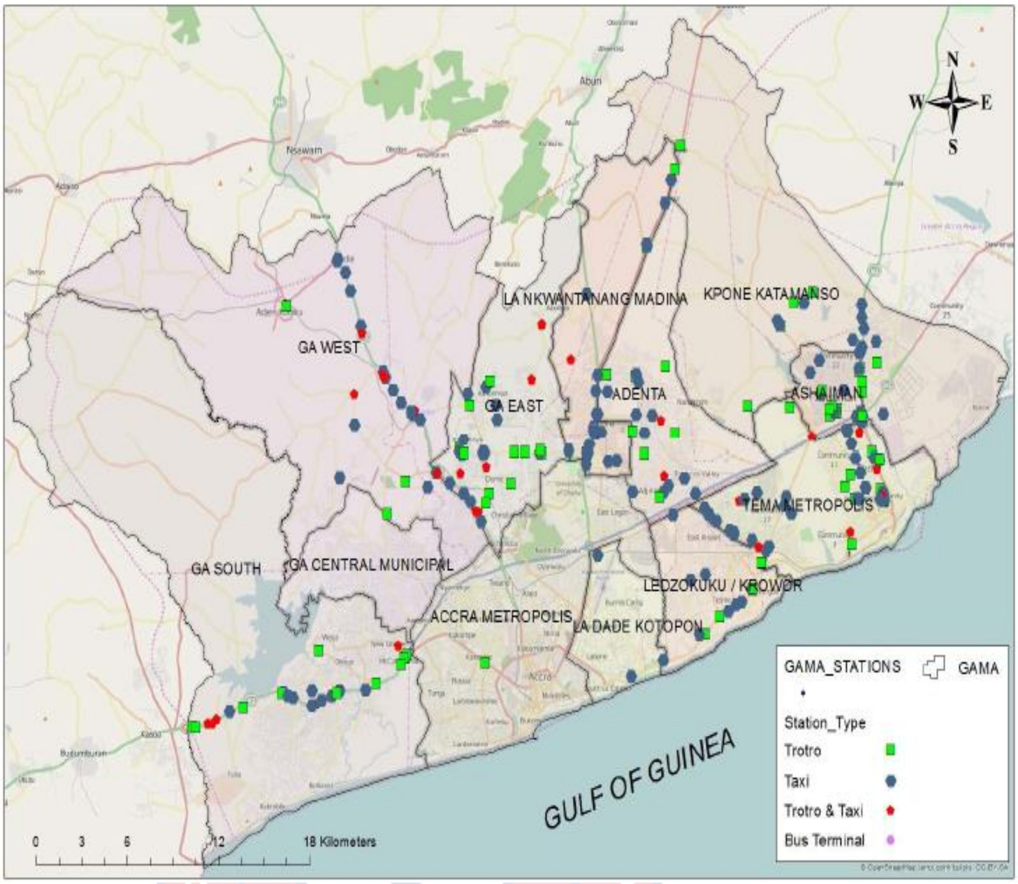

Figure 13: Road transport terminals in GAMA.

Source: KOICA, 2016.

Target Population

The first target population for the study included policy makers from Greater Accra Metropolitan Area (GAMA), the Ministry of Transport (MoT), the Ministry of Roads and Highways (MRH) and the Department of Urban Roads (DUR). These populations were selected to obtain primary data regarding transport policy making in GAMA.

Beside these policy groups, other representatives with interest in transport policy and urban settlement planning namely the Building and Road Research Institute, the Land Use and Spatial Planning Authority were targeted and interviewed for primary data. The area assessed pertained to ways to enhance the potency of urban transport policies to improve housing and transport infrastructural developments for efficient turn-around time of commuters in GAMA.

The second cohort interviewed for primary data were transport managers of the formal transport service providers including Metro Mass Transit, Agate Transport Services, Ghana Revenue Authority, Social Security and National Insurance Trust and Greater Accra Transport Service Executives (GAPTE). Like the earlier respondents, these groups of respondents were interviewed to elicit some of the challenges of travel planning in GAMA.

The third cohort was drawn from drivers and executives of the main informal transport service unions in GAMA such as Ghana Private Road Transport Union (GPRTU) and Progressive Transport Drivers' Union. They were engaged in focus group discussions to elicit their views on transportation in GAMA and how to improve upon mobility to enhance efficiency.

Sampling Procedure

The sampling procedure adopted was mainly purposive. The approach has the capacity to enable the selection of sampling units subjectively to obtain a representative sample for a given population (Kitchin & Tate, 2000; Nachmais & Nachmais, 1996). The choice of purposive frame was largely due to its ease of adoption and particularly, given the nature of the activities of the key respondents used for the study in GAMA. For this reason, policy makers from the main transport sector agencies and ministries were selected purposively and interviewed. In the same manner, scheduled transport officers from Social Security and National Insurance Trust (SSNIT), Ghana Revenue Authority (GRA), Land Use and Spatial Planning Authority (LUSPA) and Building and Road Research Institute (BRRI) were selected.

In addition to the above, purposive sampling was used to select terminals for qualitative data. The following terminals or stations were selected for the study: the [new Achimota Terminal for transport service operators who ply their businesses towards the eastern sector of GAMA, the Madina Terminal for the Southern part, the Kaneshie Terminal for the western bound and the 37 Military Hospital Station Terminal for the coastal sector] as key informants. These terminals were purposively selected based on population and coverage of area served.

Four arterial roads were selected for the study. These roads were also purposively selected based on the use and capacity or throughput. These roads serve as the main arterials networks that connect the Northern, Southern, Eastern and Western corridors of GAMA and so receive the largest traffic during rush periods. The choice of these roads for study was based on GoG (2008) assessment that these roads as the most highly trafficked roads in GAMA.

However, the respondents for the focus group discussions held in the transport terminals were conveniently sampled. This is a technique in which researchers could select from a population that is conveniently available (Bryman, 2001). The choice of convenience sampling enabled selection of key informants, including drivers, drivers' mates and union executives, the convenient sampling was used to select respondents for the focus group discussion. Therefore, given that operations of commercial transport drivers in GAMA demand that loading is based on 'first come, first served' notion at stations, respondents who were readily available at the time of the focus group discussions were conveniently selected.

The quantitative data was obtained by prioritizing the sampling technique to conveniently sample number plates on road corridors that were critically congested. The selection of number plates matching technique is based on a standardized selection of 10 to 20% of vehicles from critically congested roads and 80 to 90% from other roadways in the municipality (Texas Institute of Transportation, 1998). For these reasons, specific number plates were recorded at specific times of interest (100 m for every 20 seconds) on the selected roads in GAMA (Appendix A).

Data Sources

The quality of this research could not had been fulfilled without an evaluation of secondary data from literature, and content analysis of urban transport planning in Ghana and in some developed countries, notably from Europe, North America and Asia. Therefore, books, articles on urban governance, transport planning, census reports and other materials relevant to the study were sourced from the transport sector ministries, departments and agencies, as well as internet and library sources for information.

In terms of primary data, the following research strategies: focus group discussions, personal interviews, observations as well as travel time data collection methods were employed.

Content Analysis

For the purposes of this study, a detailed and systematic examination of contents of urban transport policies was made for the purpose of identifying patterns and themes for urban transport planning. These policies and documents were obtained from the six (6) ministries (Transport, Roads and Highways, Interior, Local Government and Rural Development, Finance and Lands) whose activities impact transportation development in Ghana. Beside the ministries, the Greater Accra Metropolitan Area Urban Roads Unit (AMAUR) and agencies such as the Spatial Planning Authority (SPA), the Building and Road Research Institute (BRRI) and the National Development Planning Commission (NDPC) were also contacted for information.

Focus Group Discussions

This method of data collection was adopted to elicit primary data from about 20 transport operators comprising minibus (*trotro*) and taxi drivers at major terminals in GAMA. The choice of focus group size was based on the suggestion offered by Morgan (1998) who posited a typical group size to be 6-10. This calculation was made to cater for the likelihood of discussants agreeing to take part initially but may not turn up eventually due to other unforeseen reasons. Consequently, discussion sessions were held with GPRTU and PROTOA members at four different terminals in GAMA. At each terminal, two levels of meetings were held. The first meeting was held with drivers and their mates. The second meetings were held separately with the union executives at the terminals to substantiate matters raised by the earlier respondents and to offer further information. In all, four discussion sessions of average of six (6) members per session were held at separate terminals in Accra for the study.

The choice of four focus group discussions was meant to cater for each of the four main corridors, thus north, east, south and west-bound corridors. Each session lasted about an hour. The groupings were screened to include commercial drivers aged 30-60 years with minimum of five years driving experience.

The focus group discussion guide was prepared along the structure below:

- Drivers' assessment of the condition of mobility in GAMA.
- Operational regulations in GAMA.
- Level of coordination among service providers.
- Level of coordination among modes.
- Level of recognition from policy makers.
- Prospects of operations.
- Considerations for travel planning.
- Recommendations for improvement of the system.

Some weaknesses identified with focus groups related to delays and intrusion by other drivers as they found the discourse discomforting because of the nature of their informal operations. Secondly, the recordings were sometimes interfered with by variations in voice pitches. Lastly, the problem of dealing with group effects, particularly reticent speakers as compared with those who were likely to hog. Eventually, it was a useful strategy since it offered the opportunity to understand critical issues from the view of stakeholders.

Personal Interview

This approach was employed to elicit primary data from officials from government agencies and scheduled transit officials (Table 2) for their views on, desires for an efficient urban transport programme.

From Table 2, twenty four (24) officials comprising five (5) each from the main transport sector ministries, (MoT and MRH), 2 from MLGRD and 3 from departments and agencies such as DUR and Spatial Planning Authority. Additionally, one (1) scheduled officer from SSNIT and two (2) from GRA were selected to represent employers who run shuttle services for employees in GAMA. Also, two (2) officers each from Metro Mass Transit (MMT) and Agate Transport Services (Agate) representing formal transport/shuttle service providers were interviewed. Lastly, one (1) person from the Building and Road Research Institute, and two (2) from the Accra Brewery Limited were also interviewed.

Table 2: **Respondents for Qualitative Data**

Respondent	Number	Type of data
MoT	5	Secondary Primary
MRH	5	Secondary Primary
DUR	3	Secondary Primary
MLGRD/SPA	2	Secondary Primary
MMT	2	Secondary Primary
Agate	2	Primary
BRRI	1	Primary
ABC	1	Primary
SSNIT	1	Primary
GRA	2	Primary
Total Population	24	

Source: Debrah, 2017.

The structure of the guided interview was framed according to the need to:

- ascertain the capacity of transport policies to promote effective mobility;
- align transport service operations and plans;
- manage informal transport service operations;
- model travel planning in GAMA and consideration of policies to that effect;
- balance the provision of transport system with non-motorized access; and
- identify considerations for sustainable transport systems, including integrated transport planning for GAMA in particular and Ghana at large.

Observation

Mobility Management strategies are measures designed to emphasise the movement of people and goods, not just for motor vehicles, by giving priority to public transit, ride-sharing and non-motorized modes, particularly under congested urban conditions (GTZ, 2004). Mobility management strategies, thus, provide variety of impacts ranging from offering of diverse transportation options, incentives for users to change the frequency, mode, destination, route and timing of travel. Others, reduce the need for physical travel through mobility substitutes or more efficient land use. Lastly, some concentrate on policy reforms to correct distortions in the planning practices (GTZ, 2004). For the purposes of this study, mobility management strategies that prioritize travel based on value and cost of trips designed by GTZ (2004) were adopted for use in GAMA. Four options (Improved Transport option, Incentives to Reduce Driving, Parking and Land Use Management options and Programmes and Policy options) are available. Out of these four, only the first two were tested in GAMA as part of the study. Based on these two (Improved Transport option and Incentives to Reduce Driving option), there are a total of 26 (i.e. 14 and 12 in each case) travel options for mobility management by urban transport practioners. Given these two Mobility Management toolkits, two (2) major observations were conducted on selected arterial roads for the study, to ascertain the physical presence of these aspirations in GAMA.

Beside the observing physical presence, the travel speeds of some roads were assessed. These include, the Amasaman- Accra corridor which covers a distance of 20.67 kilometres, the Kasoa- Accra corridor with 23.68 kilometres, Adentan-Accra corridor with 19.47 kilometres were studied. Lastly, the Teshie/Nungua – 37- Accra covering a distance of 17.16 kilometres were purposively sampled for observation during peak and off-peak hours as part of the field study (Figure 12).

Travel Time Data Collection

To determine the travel speed, some imperatives for efficient mobility management for commuters (distance, road condition and time of travel) are essential to describe the speed of motorization *in-situ.* For these imperatives, the travel time data in GAMA were taken from four main corridors selected for the study namely: Amasaman- Accra, Kasoa- Accra Adentan- Accra, and Teshie- Accra corridors (Figure 12).

For the purposes of this study, the stopwatch was manually used to collect travel speeds of identifiable vehicles for the License Plate Matching Technique. The designated interval of 100 metres at 20 seconds was set along traffic streams on road corridors selected for study. The results were then recorded and manually analysed using the Time Mean speed formula and travel speed:

Equations:

$$\text{Time – Mean – speed} = \frac{\sum \frac{d}{t_i}}{n} = \frac{\sum v_i}{n}$$

$$\text{Travel speed} = \frac{d}{\sum t_n}$$

Travel Time according to the Texas Institute of Transportation (1998), is the time taken to traverse a route between any two points of interest when the vehicle is in motion. Speed is the distance travelled divided by an average travel time. Mathematically, this is referred to a harmonic mean speed.

To determine, the Travel time in GAMA, data was captured using the Number Plate Matching Technique. This technique has the capacity to match identifiable vehicle license plates between consecutive checkpoints with video camera or stopwatch. The method has advantage of using simple technique of number plate matching to measure travel time of sample motorists and recording of same over specific interval and time. Secondly, it provides a continuum of travel times during data collection period. However, the method is limited to locations where observers or video cameras can be positioned, usually on a single day.

Data Capturing

Data was captured on the field with stopwatches, video cameras and note books. This was done by sending formal introductory letters to the respondent organizations for approval to collect information pertaining to transport services. Upon the approval of the requests, a scheduled meeting was arranged with the schedule officers concerned and subsequently a date was fixed for the interviews. The interviews were conducted during the day at the offices of the transport sector ministries, departments and agencies with scheduled officers. Each interview section lasted about 30 minutes.

In the case of the transport service operators, upon the granting of the request to interview members, formal meetings were organised at specific locations within the terminals. This was done to reduce interference from other drivers and mates at the station which had the tendency to negatively impact the outcomes of the study. Lastly, employers were interviewed in their offices during the day.

Fieldwork Challenges

The main challenges encountered related to time constraints on the side of the policy makers during interview sessions, mistrust on the part of the informal transport service operators regarding the nature of their activities during discussions, and difficulty locating employers who ran shuttle service for workers for interview.

Since the period for the conduct of the field work coincided with the 2016 general electioneering campaigns, most senior policy makers were out of their offices to either inspect or commission projects with governing party officials. This made it difficult to contact them. However, because formal notifications had been sent, the researcher resorted to carrying the interview guides and instruments with him anytime he went to the offices of the interviewees. This made it possible to contact as many policy makers as possible during the period of study. Secondly, their assistants were forthright with the release of relevant secondary information for the conduct of an informative content analysis for the study.

The informal transport operators in GAMA were seen to be operationally mindful about their activities and therefore resisted inquiry into their operations. To interview them, the researcher submitted an abstract of the thesis, in addition to the introductory letter from the Department of Geography and Regional Planning of University of Cape Coast to the National General Secretary of Ghana Private Road Transport Union (GPRTU). After this initial arrangement, formal meetings were organized to assure the National Executives of the Unions of the purpose of the study before permission was granted to conduct the focus group discussions with members in the selected terminals.

Data Processing and Analysis

The secondary data on the capacity of the current urban transport policies obtained through documents search were matched against the sustainable mobility demand management strategy designed by GTZ in 2004 to improve movement of people and goods in Greater Accra Metropolitan Area to assess their efficiency. Again, the content analysis was made easy by analytic memo writing which involves organizing data by date and source, filing by concept or theme to aid final report (Newman, 2014).

Similarly, primary data obtained from guided interviews with the policy makers from the ministries, departments and agencies were analysed by mechanical sorting, classifying and coding data. The coding process involved organizing the field data into categories and creating themes or concepts for them by assigning descriptive codes (Miles & Huberman, 1994). In all, open coding which includes the use of words, phrases, sentences or whole paragraphs as well as connected or unconnected transcripts of interviews were generally adopted and used for the study.

Again, to analyse the extent to which actors within the transport sector shape public transport policy making in the Greater Accra Metropolitan Area, data obtained from discussions with members of the transport service providers were recorded and coded. After this, the recordings were transcribed and analysed according to the Mobility Management framework to build the body of the thesis. Again, while conducting discussions, responses were analytically written down to enhance the final analyses. In furtherance to the above, field observations were conducted after interviews and discussions with respondents to confirm or disprove responses. Thereafter, the report of the discussions was written based on themes and concepts that the study sought to address. Tools used included pen, paper, field note books, files, and photocopiers and computers. Data obtained were later compared with the Mobility Management framework produced by the European Union Commission for its member states and inferences were made to describe the narrative for the study.

To analyse the capacity of governmental policies to promote mobility in Accra, the imperatives contained in the Mobility Management framework (*interview schedules attached in the Appendix*) were used to measure the capacity of current policies and actions to manage mobility in Ghana in general and GAMA in particular. The findings obtained from interview sessions with policy makers, focus group discussions, content analysis and observations were analysed based on their strengths and weaknesses in view of the current urban transport models for Greater Accra Metropolitan Area.

Exploratory factors that could impede smooth introduction of a travel plan for some selected organizations on selected routes in the Greater Accra Metropolitan Area were analysed by assessing the prospects, challenges of running shuttle services by some of these organizations that ran shuttle services for workers against the standard mobility framework used previously under Objective One.

Lastly, an evaluation was made at the end of the interviews, discussions, content analysis and observations to make a statement about the viability or otherwise of travel plans to reduce traffic congestion in Greater Accra Metropolitan Area. Based on the findings, the study explored factors that could impede the smooth introduction of travel plans for some selected organizations on selected routes in the Greater Accra Metropolitan Area. The outcome of these was used to model transport policy alternatives for GAMA solely based on the empirical data that were revealed from the field study.

Ethical Considerations

A letter of introduction was obtained from the Department of Geography and Regional Planning of the University of Cape Coast, and taken to the Chief Directors and/or Directors of MDAs to introduce myself as a researcher, and to request information. After letters had been despatched, follow-ups were made for approval to my requests. Then after approvals had been granted, days for interviews were arranged with the scheduled officers and interviews were conducted consequently.

These same steps as above were taken to interview transport sector planning institutions such as BRRI and LUSPA, and the formal and informal transport operators, namely; MMT, GAPTE, AGATE and GPRTU/PROTOA respectively.

The need for confidentiality and anonymity of participants in the study were high as participants were assured by the researcher of the intent of the study. In furtherance to explaining objectives to respondents, they were told of their rights to participate in or object to the interviews. These steps were helpful because respondents' turn-up was encouraging.

To ensure quality of the research, interviews with policy makers in the ministries, departments and agencies, as well as company transport planning officers were conducted in English language to aid effective transcription whereas focus group discussions conducted in Akan which was agreed upon with the respondents. To ensure the sanctity of findings, respondents were probed sparingly to seek further interpretations during sessions.

In the writing of the narrative, pseudo names were used to present crucial statements by respondents such that important references presented in the write-up are not injurious to the job security or image of contributors of information for the study. The reporting of the findings was guided by utmost reflexivity that ensured that personal biases were minimized to the barest level to enhance the credibility of the findings. Again, an audit trail was meticulously observed to enhance auditability of the findings.

Summary

The chapter has presented the type of research design employed for the study. Also, a brief description of the study area has been provided to cover the following: population, transport sector MDAs, traffic volume, road network and conditions, and transport terminals in GAMA. Additionally, the target population, sampling procedure and methods of data collection have been described. Furthermore, the data capturing tools as well as challenges encountered during the field work have been explained. Last but not least, the methods of data processing and analysis used for the study have been outlined. Lastly, some ethical considerations that guided the study have been described in the chapter.

CHAPTER FIVE

CAPACITY OF THE CURRENT TRANSPORT POLICIES AND IMPLICATIONS ON MOBILITY IN GAMA

Introduction

The success of any principle or policy to deliver the required outcome is a function of its production and acceptability by the people. In modern democracies, the catchphrase is stakeholder participation which seeks to incorporate the will of the people in policy outcomes in view of the changing effects of coercive and hierarchical governments in the public policy literature. This chapter sought to investigate the capacity of current laws in GAMA and juxtaposing them to existing best practices to gauge their strengths to achieve the desired goals of efficient accessibility. The chapter ends with an assessment of the implications of urban transport policies on mobility in GAMA.

Sustainability of the current road transport policies on mobility

In an attempt to answer the first objective of the study, the content analyses of documents, policies and other journals published by the transport sector ministries, agencies and departments were conducted. These information were later verified during the field research either through focus group discussions or interview sessions with key informants for the study. The results are presented below.

The literature search conducted has revealed that there has been only one policy document, 'the National Transport Policy' published in 2008 which is used to implement transport actions in GAMA. It covers the general improvement of transportation in Ghana and was crafted to enable government work with civil society and private sector to improve the well-being of people. Among other things, *Section 2.1* of the National Transport Policy (2008) has specific roles for governments, private sector and civil society. For instance, governments are enjoined to (i) formulate and coordinate transport infrastructure services in line with sustainable development of Ghana; (ii) integrate transport, land use and spatial planning by ensuring that intermodal solutions are properly assessed; (c) monitor and evaluate sectoral performance in line with national development indicators; (d) to have a policy led, data collection and information management; and (e) ensure sector-wide human resource development strategies.

In a similar breadth, the private sector is expected to ensure that (i) the needs of investors are reflected in transport policy, strategies and plans, and (ii) a level of commercialization is balanced with social and environmental requirements during the development of transport infrastructure and services.

Lastly, the civil society is required to engage with the transport sector by (i) applying management skills and competencies to engender performance-based approach to managing transport assets; (ii) training personnel to ensure continuous improvement in standards of management, technical competences and service delivery; (iii) participating in research activities and utilizing the results; (iv) complying with transport licensing laws and regulations; and (v) adopting modern corporate governance standards.

In terms content analysis, these normative aspirations in *Section 2.1* of the National Transport Policy are consistent with the provisions in the Local Agenda 21 document of the Brundtland Commission's report of 1987. According to the World Commission on Environment and Development

(1987), these aspirations are means to deliver local social infrastructure with people whom such project affects. In a related manner, Iribarnegarey and Sughezzo (2012) have suggested that these aspirations are consistent with sustainable development targets that seek to balance economic, social and environmental aspects of development for the wellbeing of the people. Other scholars have added that this desire is responsive to draw on board the expertise and goodwill associated with the new public sector in the provision of public services (Rhodes, 1997).

In terms of pragmatics viewpoint, the Section 2.1 is not consistent with the Local Agenda 21 aspirations. These developments in GAMA were amplified during the focus group discussions held with the informal transport service providers. The respondents revealed that except for environmental impact assessment, little is said about social and economic impact assessment for road transport projects in GAMA. The absence of this, denies the people for whom such projects are intended for the opportunity to properly offer their opinions and ultimately make decision making inclusive and bring governance closer to the people. This is thus an aberration to the aspirations of pragmatic governance which seeks to ensure quality and durable public policy through public engagement to promote socio-cultural as well as environmental wellness (Reed, 2008)). The view from the respondent from the Ghana Private Road Transport Union during a focus group discussion session concerning Environmental Impact Assessments of transport projects further amplifies the dilemma of governance regime that…

> *except for initial briefing sessions that are offered to the leadership of driver unions at the headquarters, concerning environmental impact assessments, no other briefing is done.*

He added that

> *even with this, the junior members of the local unions, including drivers and their mates at the terminals are excluded.*

From the above views, it can be inferred that public engagement with the local people in transport projects is limited to a section of the society in the transport industry, thereby neglecting the majority of the people with allied interests in road transport development.

This tendency in GAMA feeds into the long upheld cynicism associated with the normative view-point that empowerment of marginalized groups has potentially worsened with negative interactions with existing power structures. Indeed, in GAMA, the situation has not been different due to prevalence of top-down policy-making approaches and consequent negative effects on road transport governance at the municipal level.

The main dilemma of motorization on cities should not be lost on urban planners as in theory and practice, there is consensus among scholars that use of motorized transport is harmful environmentally and socially, and solutions require joint efforts (Verhoef, 1996; Rietveld & Verhoef, 1998). Indeed, much progress has been made to coteminously determine the environmental, as well as social impacts of transport activities (Ruta, 2002). In furtherance to the above, the content analysis conducted on the uptake of social impact assessment for transport projects for the MMDAs in Ghana revealed that there has not been any such attempt since the last two decades. The absence of social impact assessments could therefore explain why many transport projects are constructed but their use is changed for other purposes in GAMA.

To remedy the above situation, Ruta (2002) advocate for transport projects in urban areas on the basis of urban form, structure, rate of urbanization and incomes. Indeed, this approach has been part of transport projects in many cities in the developed world such as the construction of the Delhi Metro project in India (Ruta, 2002; Rietveld & Verhoef, 1998 and Verhoef, 1996; Murty, Dhavala, Gosh & Singh, 2006). To buttress the situation further in GAMA, the content analysis has revealed that of all major transport infrastructural projects springing up, particularly in the capital city (such as the proposed bus rapid transit system in GAMA, the rehabilitation of the Accra- Asaproachona railway track and the expansion of the existing road networks to superimpose the Greater Accra Non-Motorized Network Plans upon the road infrastructure system in Ghana) none has thought of social cost accounting. These are an affront to sustainable transport development (Murty, Dhavala, Gosh & Singh, 2006).

To achieve sustainable mobility in modern societies, the supply for transport demand is targeted to meet basic desires. Therefore, the posture of policy making in GAMA with provision of transport projects as 'a way of helping the poor' is pejorative. In view of this, the evidence revealed through the focus group discussions that members of the informal transport service providers are not consulted on development of transport projects; and that projects are virtually forced on drivers and other transport users as if they are helping road users is a poor attitude to governance. This observation was affirmed by a member of the informal transport service providers who said that,

> *they only come to work to realise that road projects have begun and even though the construction affects their health and daily incomes, they don't have any cause to complain but to comply since such projects ultimately would enhance the quality of their jobs.*

The above statement further points to a weaker urban governance regime in GAMA where transport policies emanate from the centre to the peripheries. This develop supports the first assumption that the more centralization of transport policies, the more they negatively affect transport decisions.

The preponderance for centralization of transport policies in GAMA further emphasize a shift in governance paradigm to fully exploit the benefits of cooperation, communalism and participation as espoused by the Network-systems Theory (Lockett & Spear, 1980; Rhodes, 1996). This framework operates that as the persons for whom public policies affect are involved in the design and implementation of programmes to reduce impacts, such policies turn to achieve greater results. Evidence of these could be found in GAMA where places such as Odorkor, Kaneshie, Kwame Nkrumah Interchange, Caprice, Madina, old Achimota station, Pokuase, Amasaman and Accra central business district have road furniture (constructed bicycle lanes and walkways) changed for other purposes such as trading and taxi parks that suit immediate needs of road users (Figure 12).

This explains why travelling in GAMA is unimodal and concentrated on motorization with its negative effects on the development of modes such as walking and cycling. The persistence of these practices in GAMA according to evidence from the focus group discussion is the result of absence of ownership arising out of limited stakeholder consultation regarding development of road projects. According to Lipsky (1980) persons lacking true ownership, could result in misuse or underuse of projects in the long run. Lipsky adds further, projects that are developed discretionally are likely to encounter implementation constraints and other unpleasant experiences. In relation to this development, Bikerstaff et al, (2001), have argued developing road projects with the needed buy-in could breed apathy, and sometimes affect sustainability of government policies. In conclusion, the presence of limited stakeholder consultations regarding transport projects, as well as the absence of social impacts assessments exemplify the weak governance and unsustainability of road transport programmes in GAMA today.

Governance issues impeding sustainability of Transport Policies in GAMA today

The triple function of GAMA has affected the capacity of local government authorities to sustainably develop programmes to improve its transport system. The following chapter expatiates on some of the persistent factors that impede road transport governance at GAMA based on evidence obtained from the field interviews.

(a) Lack of ownership and control by the assemblies.

One most important best practice cited in the literature on provision of public transport services is the need to develop transport service with the people for whom it is intended (Bickerstaff & Walker, 2001; Banister, 2008). The Barcelona Centre for International Affairs [CIDOB], (2016) has also identified the complex interdependencies that exist among actors at the municipal level, for which reasons policy makers must seek coordination in transport planning. The development above is termed interactive governance (Kooimam & Jentoft, 2009) and is noted with the capacity to broaden multi-stakeholder decision-making processes for effective public policy-making. With regards to the advocates of participation, the pragmatics supports the interactive governance approach with the view that public policies that are developed by the ruling elites and handed down to the poor do not achieve the required results because such policies usually lack ownership.

From the foregone, *Section 2.1* of the National Transport Policy with its top-down nature is largely normative and not pragmatic enough in line with international best practices regarding local area governance. In view of the above shortcoming, the provisions in *Section 2.1* of the Ghanaian Transport Policy do not in earnest help improve the empowerment required of the local authorities to independently address major transport problems that affect the local people as most transport decisions for GAMA are planned and executed by the central government and handed to the local authorities to manage. This makes local government agencies and departments vulnerable when it comes to dispensing the mandate of local level governance.

It is compelling to note that in view of the fact that the local government agencies at the local level do not perform technical functions as per the structure of Section 2.1, there is paucity of skilled personnel to regulate themselves. For instance, evidence from the interview conducted has indicated that none of the eleven (11) local authorities within GAMA had its own home-grown Local Transport Improvement Plan to regulate its transport needs because the assemblies lack the technical skills to put together the document. In view of the normative local governance structure at GAMA, the area again, lacks critical staff to execute its mandates (Ministry of Transport Draft Sector Medium Development Plan 2014-17). This human resource inadequacy at the local levels was corroborated with some negative implications for transport policy making. Accordingly, a respondent from the Ministry of Local Government and Rural Development remarked that 'none of the 11 municipalities has its own Local Transport Development Plans to regulate its activities'. Home-grown transport development plans, according to Kooiman and Jentoft (2009) is one of the surest ways to achieve interactive governance and create opportunities including formulation and application of principles, and institutions to promote urban growth.

Another local governance administration that is affected at GAMA by the absence of skilled personnel is the development of network cities. According to WAPC (2004), the potential of networked cities is to male local areas resilient in which metropolitan authorities will be able to prioritize activity centres, activity corridors, and transport corridors to enhance spatial planning.

In GAMA evidence from the content analysis (SMTDP, 2014-2017, the Local Government Act, 2016, the Land Use and Spatial Planning Act, 2016 and the Ghana National Urban Policy Action Plan, 2012) have all identified this as a gap in the local governance system. Further, the interviews conducted with transport policy makers, have also revealed that the network city of GAMA has been compromised by the low capacity of the assemblies to develop its systems to prioritize transport activities that enhance spatial planning and greater accessibility.

This problem, has led to several years of neglect in spatial planning frameworks in Ghana since 1944. However, Yankson and Gough (1999) have identified some benefits of having spatial development plans with the creation of suburbs as Ridge, Cantonments and Airport Residential areas.

The authenticity of this assertion in literature has been confirmed during the interview session when the Accra Metropolitan Roads Division remarked that there are plans to *rationalize staff from the Department of Urban Roads to augment the capacity of the assemblies with the needed skilled personnel to provide transport services in their jurisdiction.* This view was further corroborated by the respondent from the Ministry of Roads and Highways during the interview session with them at their office.

The task to improve the capacity of personnel at the GAMA is a good indicator for the design of multi-level metropolitan plans to improve spatial design, housing development and accessibility planning. These are the tasks for metropolitan authorities to create the enabling planning frameworks to mobilize contributions by state and non-state actors for the development of transport infrastructure and services (CIDOB, 2016).

Another governance challenge saddling the development of the transport sector within GAMA is its weak location being saddled by national capital, regional capital and administrative head of metropolitan administration. This fuzzy governance structure impedes the capacity of the authorities in GAMA to function as expected. This location has made local government authorities at GAMA become mere 'managers of facilities rather than implementers of home-grown programmes. This view was espoused by respondents from the Ministries of Transport and Roads and Highways during the interview sessions. Again, the view was affirmed by the Metro Director of Roads during the interview session.

The problem has arisen in view of the fact that GAMA, being the national capital houses all government ministries, departments and agencies involved in transport development. Again, being the national capital, receives the largest number of population with its attendant mobility challenges. There is therefore a subsumed line of political authority under the national governments (central and regional) in the management of public policy. This explains why revenue from the Road Fund and other fees realised in GAMA through vehicle importation fees from the ports, vehicle registration fees, as well as driver-licensing fees and the fees charged on insurance and vehicle roadworthiness tests by the Driver and Vehicle Licensing Authority are paid into the Consolidated Fund operated from the centre and released for the execution of programmes only by national government agencies.

Theoretically and in practice, this approach to governance in the maintenance of transport facilities at the metropolitan authority further stifles the capacity of the local authorities to identify their areas specific needs and address them appropriately on their own without recourse to the central government (Yankson, 2000). In a related development, since the chunk of revenue raised through the transport sector goes into the consolidated fund operated by the central government, it became expedient to further inquire to determine the extent to which the assemblies were able to deal with their weakened financial position vis sa vis transport provision.

Expectedly, the feedback from interviews conducted as part of the study generally revealed a planning malaise in which road users' drive on inaccessible lanes which further limits mobility in GAMA. The view below exemplify the frustrations of city planning that *basic road maintenance regimes are often based on need rather than planed programmes.* Again, this assertion explains why basic periodic road maintenance works in GAMA are not done leading to deterioration of road networks.

The above governance challenges contribute to worsening conditions of roads particularly, access lanes while over emphasizing the development of main corridors with its consequent slow mobility in GAMA. According to Zhang and Levinson (2016), these developments in planning at the local level are myopic since they often turn to be ad hoc. Similarly, Pojani and Stead (2015) regard the phenomenon as mistaken investment choice with the potential to obstruct economic recovery programmes in cities. Indeed, evidences from the field observations conducted as part of the study in November 2017 (Figure 14 and Figure 15) show the desperation of mobility on improved surfaces and the misery of commuters on some access lanes respectively in GAMA during rush traffic audits. These developments support the assumption that improved surfaces alone do not bring about improved mobility unless they are linked with other facilities such as alternative access roads, as well as, other demand management plans.

Figure 14: Congestion on N1 Express lane at Malam Junction

Source: Debrah, 2018

Figure 15: Deplorable access lane behind NI at Malam junction

Source: Debrah, 2018

(b) Absence of Transit Authority

According to Banister (2008), the need for transit authorities is crucial for transit-oriented societies. Unfortunately, this phenomenon has not happened in GAMA and the absence of which affects mobility of commuters. The evidence of which became manifest during the interview with the transport policy makers in GAMA. In theory however, a body known as the 'Authority' has been mentioned in the statute books of Ghana in the Omnibus Services Authority Decree (NLCD) 337 of 1969. Section 5 of this decree *'mandates the municipalities to regulate, manage and control urban transport services by a body to be known as the 'Authority'*. The functions of this Authority, inter alia, include '*the prescription of routes and parking places of buses, determine fare levels for commuters, and coordinate activities of commuters in urban areas'* (Section 5 of NLCD 337).

Yet it became evident during the interview sessions that this impressive institutional arrangement has never been implemented in Ghana, particularly in GAMA with all its governance challenges. Today, the failure to implement this policy has left in its wake low mobility brought about by self-regulation and amorphous urban transport governance structure in GAMA in particular. This problem has been acknowledged by members of the informal transport industry operators who argue that:

> *the absence of an authority has created a personal level relationship rather than institutional level relationship among practioners in view of the perceived friction among service operators in Ghana*.

In an effort to formalize transit service regulation and provision, evidence from the interview indicated that some 11 municipalities and assemblies within GAMA have come together to institute a transit authority under the brand name Greater Accra Transport Executives (GAPTE) to coordinate transport activities. This assertion was confirmed by key respondents representing transit operators and regulators. The situation is regrettable in view of the numerous benefits of transit authorities globally (Pucher & Kurth, 1995). In the first place, this regulator-as-operator syndrome is a dangerous precedent and incongruous to best practised institutional arrangements. Secondly, this action has the tendency to usurp the authority of the Assemblies and further weaken them at the expense of the operators.

Empirically, one most cited negative precedent in Ghana was how the government in the early 1990s handed administrative and regulatory powers to Ghana Private Road Transport Union [GPRTU] (Fouracre, Kwakye, Okyere & Silcock, 1994). This mandate made the Ghana Private Road Transport Union de-facto public transport regulator in the 1990s to the extent that they usurped the regulatory powers of the assemblies in transport management. In the words of Fouracre et al. (1994), this position empowered the GPRTU in the early 1990s to simultaneously manage and regulate transport activities at terminals while operating commercial vehicles at the same time in Ghana. In the end, the GPRTU could determine fares at will, collect revenue on behalf of the assemblies and control driver operations at the terminals and on roads. This tendency, therefore made the municipalities lose control of transport operations under their jurisdiction in Ghana contrary to their mandate.

Therefore, the formation of GAPTE as an operator and regulator simultaneously in GAMA is unsustainable to transit service management and an affront to the developed model such as the *EVV*. Indeed, according to the set-up of the transit authorities, it is practically impossible for GAPTE to become an efficient operator and a neutral arbiter with overarching planning functions. For instance, Pucher and Kurth (1995) have reported that the *EVV* in Europe is vested with the sole power for institutional design and promotion of transit policies in the metropolitan areas without any vested interest in service provision.

In a related development, the absence of a transit authority has led to the absence of a multi-modal transit policy in GAMA. Multi-modal policies according to Banister (2008), are necessary to balance the volume of services and jobs people can access within certain travel time, considering modes such as walking, biking and public transport. The need for transit policies is thus crucial in transit-oriented societies to sustainably develop transport systems. To achieve this, Banister (2006) has suggested that population densities of over 25 000 -50 000 for cities (40 persons per hectare), be annexed with mixed use developments and preferences for public transit accessible corridors and interchanges.

In their contribution to the debate above, Curtis and Scheurer (2017), argued that an adequate size of the population is a prerequisite for the uptake of an effective accessibility plan by creating a functional interdependence between travel distances and public transport accessibility in metropolitan areas. It was an unfortunate situation to find out during the interview that Ghana did not have a multi-modal policy let alone have one for GAMA. This development explains why there is self-regulated transport system in GAMA to take advantage of the current population densities, scattered settlement patterns and demand for mobility particularly during peak periods. Asked about why this problem persist in GAMA, during the interview session with the Building and Road Research Institute, an obviously disconcerted planning officer asked,

> *whether we have a vision as to what we want for the city of Accra at all?*

The absence of this policy is strange given that Ghana had ratified the concluded Millennium Development Goal 9, in which cities were tasked to be resilient by designing and enhancing urban mobility that is environmental sustainability. According to the EC (2013), these were the same transport-related challenges that faced many European cities such as France and UK faced that forced them to strengthen their urban transport planning systems by developing Integrated Transport Planning programmes.

These programmes later culminated in the Sustainable Urban Mobility Plans (SUMPs) which were adopted for greater Europe in 2009. In Ghana, it was the same concerns that resulted in the development of the Ghana Poverty Reduction Strategies 2010-2013 and 2014-2016 in response to actualizing the goals inherent in the MDG 9. Under this goal, cities set targets to reduce CO_2 emissions from transportation services, reduce congestion, combat pollution, GHGs, noise and environmental problems. The success achieved in the concluded MDGs further informed the recently adopted Sustainable Development Goals (SDG 11) in which cities and human settlement forms are enjoined to be inclusive, safe, resilient and sustainable (UNEP, 2013). To fully actualize the tenets of sustainable cities, Haque et al (2013) have advocated improved legislations on economic development, environmental protection and social equity as well as consistent education which could affect behaviour change and other unintended consequences.

In a related development, sustainable development could broaden institutional-building. Others such as, Iribarnegaray and Sughezzo (2012) have added that this is a tool to maximize opportunities for development. These are essential lessons Ghana in general, and GAMA in particular can take advantage of to develop a transit policy to strengthen its institutional and logistical provisions to enhance mobility and liveability for their inhabitants.

(a) Multiplicity of challenges (numerous transport sector agencies, lack of financial independence and lazed land use control).

The urban transport governance regime in GAMA is saddled by numerous transport sector agencies, financial inadequacy and lazed land use control. Ghana continues to weaken mobility in GAMA. According to Suzuki et al., (2013), these are the result of the lack of proper appreciation of the nature and form of the connexion among urban planning, transport development and productivity in urban areas. In GAMA at the moment, evidence from the content analysis conducted as part of the study has revealed that there are several transport sector agencies, ministries and departments doing several things without synergy aimed to improve transport development in Ghana. For instance, the Ministry of Finance and Economic Planning has produced Ghana's Integrated Transport Plan in 2010 while the National Development Planning Commission with the mandate to produce long-term planning goals for the country, has developed the National Infrastructure Plan in 2014 in a bid to concretize the goals and objectives under the Ghana Shared Growth and Development Agenda (GSGDA) (2010-2013). The most interesting source of all these inter-ministerial and agency plans is the National Transport Policy developed in 2008 by then Ministry of Roads and Transport.

A major observation about these plans is that each of these government agencies try to do one thing separately to improve upon the problem of congestion in Ghana generally and GAMA in particular; however, these programmes lack synergy. The absence of synergy among these inter-agency interventions affect efficiency of public policies aimed to reduce congestion in GAMA. In relation to this view, the World Bank in their Project Appraisal Document on Ghana for the release of credit line to support Transport Sector Improvement Project in 2017, also agree. The Bank further adduced that the absence of synergy among multi-sectors bring about lapses including overlapping sub-sectorial development initiatives. Accordingly, in the area of mobility management in urban areas, the World Bank (2017) did identify the absence of a multi-modal transport masterplan to guide the overall transport development of Ghana in their appraisal report.

It must be emphasised that having policies and programmes can be noble, but it can be ineffective sometimes if certain prerequisites are absent. In urban planning lexicon, one noticeable prerequisite is control over land and land use (Mather, 1986). From the content analysis, the government of Ghana has apparent hold on land use management in GAMA. However, the assemblies have subdued influence and control over land sale in urban centres. This is another infraction that reduces the capacity of the assemblies to have transport policies that promote mobility in GAMA. These practices, Ewing and Cervero (2010), have identified could hamper the capacity of the assemblies to capitalize on the notions of density, diversity, design, distance to transit and destination accessibility which are the heartbeat of urban land use and travel planning, and which must be coordinated and implemented in unison from one central government agency.

However, in GAMA these aspirations are untenable in view of the multiplicity of government ministries, departments and agencies performing disjointed planning roles. For instance, land administration falls under Lands Ministry, transport infrastructure comes under the Ministry of Roads, transport service provision falls under the remit of the Ministry of Transport while urban planning and regulation of transport service activities fall under the purview of Ministry of Local Government and Rural Development. Besides these ministries are governmental agencies such as the National Development Planning Commission under the Ministry of Finance and Economic Planning.

Again, this ministry has since been decoupled and the planning department hived off into a stand-alone Ministry of Planning. Others include the Land Use and Spatial Planning Authority that falls under the Ministry of Local Government and Rural Development, and the Lands Commission under the Ministry of Lands. For these reasons, the implementation of the goals to increase length, expand lanes and upgrade pavement as well as provision of other ancillary road furniture to achieve interconnectivity under the National Infrastructure Plan of Ghana prepared in 2014 is likely to be hit by a snag in view of the numerous separate inter-agency plans. Evidence from the field interviews has alluded to the preponderance of dysfunctional arrangements in transport planning as one respondent unequivocally re-echoed that:

> *the perceived absence of control over land management and developments by the metropolitan authorities in Ghana is one major challenge that confronts development of transport infrastructure in Accra and major urban centres today*.

This challenge above has hampered the development of spatial plans for the municipalities in GAMA. According to the Design Manual for Urban Roads and Streets [DMURS] (2013) adopted for planning local areas by the Northern Ireland government, plan-led approaches have the capacity to enable city authorities to design a hierarchy of spatial plans including Development plans, Local Area Plans, Masterplans, Movement Frameworks and Public Realm Strategies to guide the implementation of more integrated street designs for sustainable cities. The thrust of a spatial plan in GAMA is the control over land management.

The absence of this therefore in GAMA, makes the potential to develop expansive infrastructure overlay like the George Bush NI expressway (Figure 16) as well as the Kwame Nkrumah interchange project and many more intended projects aimed to accommodate the ever increasing rate of motorization in GAMA illusive if the current trend of land governance is not halted. Additionally, absence of control over sale of land has made cost of land very expensive in GAMA. This development also affects the quantum of compensations demanded for private citizens whose land abuts roadway constructions in GAMA. The apprehensions of the respondents from MRH and the Directorate of Roads at the Accra Metropolitan Area that *the cost* *overruns resulting from compensations paid to private individuals whose properties abut zones earmarked for expressways in GAMA is absurd* sums up the challenges that affect the development of new roads in GAMA. That, the costs of compensations alone make expansion of roads disincentive.

Figure 16: The expansive George Bush Expressway (NI) in Accra
Source: Debrah, 2018

Another revealing institutional barriers to transport development in GAMA was also that the newly promulgated Local Government Act of 2016 (Act 936) is silent on transport services provision. Again, transport governance at the local level is further compounded because the recently developed Land Use and Spatial Planning Law of 2016 has failed to address the land-holding bottlenecks prevalent in GAMA. The only assurance for local governance is the establishments under the Land Use and Spatial Planning Policy with functions for local spatial planning and controls to promote local development (*Section 4 clauses a, e, f, s, r, u, w and y*). These injunctions are good and laudable on paper but they are more sluggish regarding their ability to addressing the provisions enshrined in Section 36 of the Land Use and Spatial Planning Bill of 2016 since land sale is still privately executed.

These developments in GAMA are not consistent with modern land-use transport development plans across the world. For instance, in England, the UK Town and Country Planning Act of 1947 (Mather, 1986) has specific broad guidelines from the central government to local governance. Under this act, development controls are exercised with strict adherence to the granting or refusal of construction permits by the municipalities. Accordingly, the planning unit in the UK has since been able to control the transfer of agricultural lands to residential and urban uses, considerably. In an attempt to augment the process further, the Departments of the Environment and Transport, through the Planning Policy Guidance on Transport for England (PPG13) in 1994 ensured a balance between land use and transport in ways that people carry out their everyday activities with less need to travel.

In a related development, Stead (2001) reports that the need for better integration is usually scaled up by proper spatial planning and transport policy integration. This integration has been achieved to a great extent in some European cities and is captured under the Transport White Paper of 2001 (European Commission, 2001). Banister and Stead (2004) have also added that the European Transport White Paper ensures that transport policies work effectively in tandem with the aspirations of the city. Curtis and Scheurer (2017) share the view that it is necessary to establish the degree of closeness (ease of movement) and centrality (reduced number of transfers between journeys) to promote public transport uptake. In GAMA, the same cannot be said about the above in view of the prevailing lazed land-use policies (land acquisition, development of physical properties) coupled with prevalent implementation challenges (land use control).

Beside imprecise land ownership guidelines and control regime in Ghana, there is also inadequate financial independence in GAMA making the assemblies unable to attract persons with the required skilled to propel spatial planning programmes. A review of documents as part of the study in GAMA has revealed the presence in the statutes of country, the Road Fund Act of 1997 (Act 536) enacted by parliament to finance routine, periodic maintenance and rehabilitation of public roads in Ghana.

However, inflows into the fund do not commensurate with the expected expenditure because expenditure overflows. This development has been corroborated by the Mid-Year Budget Statement and Economic Policy presented by the Ministry of Finance on Thursday, 19th July, 2018 that amount received at the end of December 2017 was GHc 1, 058, 114, 291 with expenditure overrun by GHc 888, 501, 240.9. The under-performance of accruals into the Road Fund, according to the Special Report of the Auditor General of Ghana on the Audit of the Road Fund Act spanning 2008-2010, was due to delays in the payment of collected tolls into the fund by accredited levy collectors and sometimes unaccounted for tickets. In view of these, the Auditor General agree, 'the establishment of the Road Fund however, does not appear to have halted the deplorable state of the road network it was intended to address as the poor road conditions are still prevailing' (pg.1 of the Auditor General's report on Road Fund).

The under-performance of accruals into the Road Fund was confirmed during the interview conducted with transport policy makers in GAMA as part of the study. Respondents during the interview confirmed that *receipts into the Fund are low despite increases in taxes in the funding sources since the last* *decade*. Another added, that '*consequently, there is a funding gap for road facility improvement and expansion in GAMA'*. Indeed, the World Bank in their 2017 appraisal of the performance of the transport sector in lieu of their Transport Sector Support Programme acknowledged that real Road Fund contributions do not cover the cost of sustainable maintenance leading to accumulation of maintenance gap.

In addition to limited inflows from the road fund act, there is the inadequacy of skilled personnel with the technicalities and expertise to deliver modern urban planning strategies. The benefits of skilled personnel in urban planning discourse have been amplified by Phin and Dotson (2013) who advocate supportive staffs trained with requisite skills is necessary to achieve long-term goals in urban areas. According to Cervero (2013), urban planning is enhanced if it is linked with personnel with adequate qualification and experience. This skilled personnel set is lacking in GAMA.

This call is theoretically appropriate in the light of modern urban development aspirations that seek to foster better synergy between land use-and-transport planning in urban areas. For instance, to develop a better synergy, Cervero (2006) has advocated an urban spatial planning which emphasizes 5Ds (density, diversity, design, distance to transit and destination accessibility) as the prerequisites to achieve sustainable mobility and livelihoods. In a related manner, Suzuki et al (2013), have suggested the development of long term goals regarding transport land-use planning to favour urban agglomeration in the right direction. In GAMA, these skills set are inadequate.

To support the development of improved urban planning ethos, the following sentiments expressed by a key respondent from the Spatial Planning Authority is noteworthy, that:

> *town planning must be deployed by persons who have the requisite skills such as proficiencies in neighbourhood development planning and are able to design plans with achievable time lines, deploy land- use maps, offer periodic training and retraining to staff, enforce development controls and street address systems that are germane to modern community-level planning without prompting.*

He further said, it the absence of these skilled personnel that many programmes aimed at spatial planning over the years such as Vision 2020 did not see full implementation in GAMA and therefore affected substantially, the attractiveness of the city. He intimated that:

> *the absence of skilled personnel and instability in the country affected the full implementation of the earlier Towns Ordinance act of 1852 which favoured long-term development plans, as well as the State Lands Act of 1962 (Act 123) which was crafted with this vision in mind to enable the state and its appellate agencies to control land and its uses.*

Accordingly, he posited that several other programmes have not been fully implemented in Ghana since 1966. These include the 10 Year Development Plan of Nkrumah's government. The 1996 medium term 'vision 2020' as well as, the 3-5 year Development Plans under the PNDC regime.

These views support the findings of Energy Resources Institute (2014) in their work on analysis of sustainable urban transport using the city modelling approach in India. The study unearthed major institutional inefficiencies and policy measures in urban management, urban planning, financing, budgeting, accounting and supervision, particularly in the developing world.

In Ghana, the absence of long-term development planning to promote urban and transport improvement programmes for towns in Ghana, and GAMA in particular has been acknowledged. Accordingly, several postulations have been put forward and they range from schools that proffer amorphous and inefficient urban form with blurring boundaries between surrounding districts (Yankson & Bertrand, 2012) to poorly managed compulsory land ownership in Ghana by political elites (Aryeetey, Ayee, Ninsin & Tsikata, 2007), as well as absence of strong legal framework which could remove all existing risks and uncertainties surrounding the use of compulsory acquisition powers and land management in general (Aryeetey & Tarp, 2000).

These theoretical postulations to the problem in GAMA resonate with an approach adopted in Hanoi, (Vietnam) to decentralize responsibilities to local government agencies to plan and deliver long-term planning regimes (Phin & Dotson, 2013). This legal framework must be sought in earnest if the tenets of the Land Use and Spatial Planning Bill in Ghana are to be realised and harnessed effectively in GAMA.

(b) Wrong conceptualization of travel purposes and supply of transport services.

Another dilemma hampering the development of transport systems in GAMA is the wrongful connotations given to the purpose of travel. Evidence from the interview conducted as part of the study again indicated that the provision of transport services have often been improperly conceptualized as '*derived demand*' and for which reasons, transport services are provided in anticipation of demand. This conventional view has been contested and found to be unsustainably limited in terms of value. Accordingly, Mokhtarian and Salomon (2001) have argued that the demand for travel is completely derived from the demand for spatially planned activities and are underpinned by a plethora of intrinsic factors including attractiveness of destination, interest of the commuter and impulse.

In view of these, Mokhtarian and Salomon (2001) recommend a holistic approach to travel planning that requires a review of the destination factors that generate the trip in the overlay of urban transport infrastructure. Banister (2008) has added his view to the above urban transport-land use dilemma by suggesting that for a city to be sustainably accessible, citizens and other stakeholders must have a role in the choice of their mode of communication. The tendency to balance demand and supply is necessary to mitigate the challenges associated with unimodal transport system in GAMA to offer accessibility models including public transit, cycling, walking. The interview conducted as part of the study revealed that due to the continuous over reliance on the inefficient cars (private and shared taxis) and *trotro* (minibuses) operations in GAMA, while other modes such as rail, non-motorized access (bicycle and walking) and water transport have been neglected GAMA.

This development could be attributed to the absence of multimodal transit policy in GAMA which has led to an unregulated transport systems with its attendant mobility challenges particularly during peak periods in both the inner city and the peripheries. From the interview session with the Building and Road Research Institute, it became evident that these challenges occur in Ghana, and GAMA in particular due to the absence of long-term plan for urban land use and transport planning with people first thinking.

The idea of people-first development has strong roots in the provisions of the Local Agenda 21 of the Brundtland Commission's Report of 1987 (UNEP, 1998). This notion has gained currency in recent times in view of the threat of climate change, adaptation constraints, ageing infrastructure and densification (CIDOB, 2016). Under this notion. the European Commission has set its emission levels at 2^0C and near-zero by improving air quality, reduction of levels of noise, combating contaminated sites and fostering efficient waste management in urban areas by 2050 (EC, 2013).

According to CIDOB (2016), metropolitan areas are urged to devise integrated planning approaches to rethink their cities to make them resilient. Globally, the UN Charter on Sustainable Development Goals (2016-2030) has been emphasized to ensure the development of long term goals with community participation in planning. The SDG 11 therefore aspires to '*make cities and human settlements inclusive, safe, resilient and sustainable'*. These intentions have been made against the backdrop of increasing urban agglomeration (Curtis & Scheurer, 2017), higher energy consumption and inadequate transport systems (Giffinger, 2015).

According to the ICSU & ISSC (2015), the SD Goal 11 implies integrated urban management across diverse sectors such as transportation, health and public finance. Additionally, the SDG 11 espouses social, economic and environmental dimensions of sustainable development and aspirations of inclusion, safety, sustainability and resilience of the urban structure. Further, the SDG 11 proposes resilient urban form at national and sub-national levels of cities. One major point of entry for building resilient cities is the injunction for local authorities to ensure a proper balance on land use to achieve synergies between transport systems and the urban form.

According to O'Flaherty (2006), the responsibility for this is a shared one; and the prevailing relationship between the British central government and local authorities is a good model. To sustainably deliver transport programmes in GAMA, the tenets as espoused in the Network-Systems framework (Lockett & Spear, 1980; Rhodes, 1996) is relevant. The framework works on the principles that when key actors for whom public policies affect, are brought under a common umbrella to identify solutions to their own social challenges, there is often times, positive outcomes in the roll out of such public policies. In view of this framework, advocates the need to fully bring on board transport service users (drivers and employers) in GAMA to generate broad based discussion of the mobility challenges faced by commuters to enhance accessibility during rush hours.

Summary

The study has revealed a preponderance of a unimodal attempt at transport development in GAMA in which car-based transportation is emphasized. Beside the dominance of car-based transport system, there is absence of social impact assessment of road projects. Again, there exist a prevalence of a dysfunctional governance system which negatively impact on urban transport development in GAMA.

Lastly, the study has further revealed that the presence of a dysfunctional urban governance system has affected the institution of core governance instruments such as transit authorities in GAMA to coordinate mobility and improve access. This is against the backdrop of an enabling Omnibus Services Authority Decree (NLCD 337) of 1969.

CHAPTER SIX

THE URBAN MOBILITY QUAGMIRE AND TRAVEL PLANS IN GAMA

Introduction

The previous attempts of transport development have concentrated on mobility by four-stroke engines at the expense of other modes. The effects of this unimodal attempt at transport development have been espoused in the previous chapter. In this chapter, the quandary of commuting in GAMA, and the phenomenon of travel planning are examined in line with the second and third objectives of the study. While the first part of the chapter discussed mobility choices and the possibility of improving transport options, the second part critically examined the existing travel plans using the data collected from the field survey.

Mobility choices in GAMA

Transportation and land-use planning decisions often require trade-offs between different forms of accessibility. Accordingly, Litman (2017) has identified the following trade-offs to be associated with urban transport planning: that road designs that maximise motor vehicle traffic speeds may reduce active traffic transport (walking and cycling) accessibility. Additionally, more central locations are likely to be accessed by walking, cycling and public transits; however, speeds would be lower due to congestion and parking.

The goal of any transport planning mandate must therefore be geared towards accessibility planning. According to Haque et al (2013), unavailability of choices in an urban economy, and their inadequacies creates imbalances in the quality of transport. The GTZ's Mobility Management Module 2 has indicated that urban mobility management must increase travel options and encourage travellers to choose the most efficient mode for each trip (GTZ, 2004). The report has further advocated modal choices for cities be based on demographic, geographic and political characteristics of an area to increase travel options and encourage travellers to choose most efficient modes per trip.

Unfortunately, this is the bane of planning in GAMA and the result is that conditions of mobility are debilitated, and these are next discussed below:

Reduced mobility choices

According to GTZ (2004. p3), '*a well-planned mobility management plan must ration road and parking space more efficiently to improve travel options programme and must ultimately, make everybody better off overall, including people who would shift to alternative modes and those who may wish to continue driving*'. Unfortunately, the availability of mobility choices in GAMA is ineffective and often limited to motorization, resulting in choked networks with attendant negative effects on the turn-around time in the city centre, as well as the periphery. For purposes of this study, only two of the four mobility management strategies developed by GTZ for use by urban areas were adopted to investigate the level of mobility choices available in GAMA. These two strategies are Improved Transport Option which has 14 transport opportunities, and Incentives to Reduce Driving which has 12 options.

The study deliberately excluded parking and land-use management, as well as programmes and policy reforms to reduce congestion to costs and time constraints. The discussions below illustrate the dearth of choices available to commuters in GAMA.

i. Improved Transport Options

The presence of this transport option was assessed in GAMA based on the proposition by Hung (1996), that the top echelons of a professional staff of an organization could alter their activities to bring the best out of them.

Travel models such as compressed workweeks, telecommuting and flexible work scheduling which could be used by employees and managers to manage working hours to create convenient work times in an urbanized places, were investigated. The models have the tendency to bring out the best in workers while reducing stress associated with peak-hour driving.

The results of the survey are shown as ***Present*** and ***Not Present*** respectively in Table 3. From the Table, all 20 interviewees admitted the absence of alternative work scheduling, bicycle improvement plans, flexible working times, individual actions for efficient transport, ride sharing and taxi service improvement schemes in GAMA. Another 19, representing 95 percent of respondents admitted the presence of bike/transit integration, car sharing, park-and-ride and shuttle service in GAMA. Again, all the 20 respondents admitted the presence of pedestrian improvement plans. Lastly, 10 respondents admitted the presence of guaranteed ride home while the same number disagreed with the presence of this option in GAMA.

The presence of this option has been confirmed in the evidence provided in figure 17 and 18 obtained during the observation tour conducted as part of the study.

Table 3: **Improved Transport Option Checklist**

Item	**Improve Transport Options**	**Present**	**%**	**Not present**	**%**
1	Alternative Work Schedules	0	0	20	100
2	Bicycle Improvement Plan	0	0	20	100
3	Bike/Transit Integration	1	5	19	95
4	Car Sharing	1	5	19	95
5	Flexible Working Time (Flextime)	0	0	20	100
6	Guaranteed Ride Home	10	50	10	50
7	Individual Actions for Efficient Transport	0	0	20	100
8	Park and Ride	1	5	19	95
9	Pedestrian Improvement	20	100	0	0
10	Ridesharing	0	0	20	100
11	Shuttle Service	1	5	19	95
12	Taxi Service Improvement	0	0	19	95
13	Traffic Calming	19	95	1	5
14	Traffic Improvement Universal Design	8	40	12	60

Source: Debrah, 2018

Additionally, inferences from Table 3 are that there are no plans to promote alternative work schedules for commuters in GAMA to decide when to come to work. Similarly, no policy on Flexible Working Time schedules was found to enable workers choose when to go to work. The data again show that workers in GAMA report to work at 8.00 o'clock in the morning and close by 5.00 o'clock in the evening for each working day which is the mandated working time in Ghana. In addition to the low mobility in GAMA, no organization in GAMA has a policy that gives recognition for its workers to ride bicycles to work. Again, none of the organizations the researcher interviewed had workplace programmes such as bike-parking bays, and incentives like changing rooms, as well as shoe and clothing allowances for riders as they pertain to countries like Germany and the Netherlands.

Another useful opportunity to reduce the number of employees who drive alone to work is ridesharing. These programmes enable employers to optimise their cost and savings by encouraging employees who live close by to share vehicles to work. However, the system has the potential to invade privacy of sharers. Evidence from the interview conducted with transport policy makers in GAMA showed that no organization had a policy that promote ride sharing opportunities for workers. Similarly, there were no taxi improvement plans in GAMA, except for UBER model which operates using private number plates and through online platforms. Again, the presence of these online taxi services add to the number of vehicles that use the road space daily and consequently breed congestion and air pollution (Santia, Restab, Szella, Sobolevskya, Strogatzc, & Rattia 2014).

From the discussion above, taxi services are a vital part of urban transportation, and a considerable contributor to traffic congestion and air pollution causing substantial adverse effects on human health. For this reason, good taxi improvement plans must be backed by structures such as unique colouration and plans that define their operations away from other systems (Giuliano, et al., 1993). Again, others such as Batty (2013), suggests that the rapid deployment of digital information and communication technologies could help make cities "smarter" and, in particular, manage vehicular traffic more efficiently.

These structures must be present at GAMA for effective management of taxi services for regulation and purposes of taxation. However, from the interview conducted with policy makers as part of the study, it was revealed that even though UBER operates in GAMA, the vehicles are embossed with private number plates different from other commercial number plates as allowed in Ghana. This practice makes it difficult to identify an UBER car from any other personalized vehicle in GAMA for routine regulation. Like other ridesharing schemes, UBER activities must be differentiated for easy regulation and patronage. Again, the proper adoption of this model of taxi improvement plan has the capacity to eliminate redundant taxis from running in GAMA to improve the turn-around time for commuting.

Figure 17: Bicycle Lane at Achimota

Source: Debrah, 2018

Figure 18: Pedestrian flyover at Achimota

Source: Debrah, 2018

Pedestrian improvement actions, on the other hand, have received attention to a great extent. Of all the main arterial roads visited, 10 pedestrian improvement plans were counted at busy crossing points such as in front of school buildings and bus terminals. Indeed, all recently-reconstructed arterial roads had bicycle lanes as well as walkways to facilitate pedestrian movement (Figures 19 and 20).

In another development, even though there have been strenuous efforts at ensuring pedestrian improvements in GAMA, most of these interventions had not been thoroughly delivered, with some having dead-ends as shown in Figure 18 thus impeding riding on those lanes. Similarly, some portions of walkways (Figure 19) have been removed by utility companies which make the essence of these interventions counter-productive.

Figure 19: Pedestrian walkway cut-in by utility companies impeding free flow of walking
Source: Debrah, 2018

Figure 20: Dead-end of bicycle lane impeding free flow of riding
Source: Debrah, 2018

Other traffic calming measures such as islands and traffic lights had also been provided at many intersections in GAMA on all major corridors. However, there was paucity of road furniture on minor carriage ways particularly collectors and local roads in front of schools and other public places such as worship and markets centres. The absence of these tends to widen exclusion, and demonstrates the deficiency of public engagements with road users in GAMA (Lara et al., 2016).

ii. Incentives to reduce driving.

The second variable was to measure the presence of incentives to reduce driving in GAMA. The results are presented in Table 4 and generally, indicate a preponderance of car-based transport system in GAMA. This lassiez-faire transport system shows an absence of restrictions on vehicle usage, street reclaiming, priority for higher occupancy vehicles (HOV), and distance-based pricing, congestion pricing, commuter financial incentives and deliberate efforts at encouraging walking and cycling. The absence of demand restraint measures again, obviates the benefits of smart cities (Giffinger et al, 2007), mixed-use urban forms (Lara et al, 2016) and most importantly, liveable cities (Banister, 2008) as well as the aspirations espoused in the SDG 11 for sustainable, safe, and resilient cities.

Indeed, all 20 respondents interviewed at the government Ministries, Districts and Agencies (MDAs) involved in transport management in GAMA affirmed the non-existence of these transport options. However, efforts at fuel taxes and pay-as-you-drive vehicle insurance options exist but with limited opportunities for parking pricing. Contrary to the above, all 20 respondents admitted the presence of road pricing, pay-as-you-drive vehicle improvement plans and fuel taxation in GAMA. Another 17 respondents of these MDAs agreed that there was the presence of parking pricing in GAMA while three disagreed with the notion of parking pricing in GAMA.

Table 4: *Incentives to improve transport option toolkit*

Item	**Incentives to Reduce Driving**	**Present**	**%**	**Not Present**	**%**
1	Vehicle Use Restrictions	0	0	20	100
2	Street Reclaiming	0	0	20	100
3	Speed Reductions	1	5	19	95
4	Road Pricing	20	100	0	0
5	Pay-as-You-Drive Vehicle Insurance	20	100	0	0
6	Parking pricing	17	85	3	15
7	Fuel Taxes	20	100	0	0
8	HOV Priority	0	0	20	100
9	Distance Based Pricing	0	0	20	100
10	Congestion Pricing	0	0	20	100
11	Commuter Financial Incentives	0	0	20	100
12	Walking/Cycling Encouragement	0	0	20	100

Source: Debrah, 2018.

Beside the absence of choice for mobility management in GAMA, other factors also impede the free-flow of commuters. These are physical factors such as the nature of road designs and rise of private motorization among the middle class.

Conventional traffic planning paradigm in Ghana is similar to models peculiar to many developing nations (GTZ, 2004). These conventional designs are meant to separate usage with consequential permanent road furniture. In GAMA these road designs dominate road furniture provision built to minimize interaction. Evidence from the field observations conducted from November 2017 and January, 2018 revealed that rather than improving sanity and control behaviour, the permanent road furniture in the middle of roads impede innovation in urban traffic management as championed by smart cities

(Giffinger et al, 2007; Deakin & Al Waer, 2012). The current approaches in GAMA thus restrict the deployment of Intelligent Traffic System (ITS) during peak periods making traffic allocation on under-served lanes impossible. The situation above is illustrated in Figure 21 showing how physical separation on a dualized corridor had traffic clogged in single lanes while the other lanes in opposite direction lay fallow particularly during rush periods. These developments in GAMA are contrary to the Planetary Cluster Plan of Stockholm, Sweden where the urban form has been modelled to ensure a unique synergy between land-use and transport planning underpinned by technology to improve accessibility of efficient modes (Cervero, 2006).

The challenges above are further exacerbated by the rise in motorization among the middle class leaving women and children being the worst affected in GAMA who largely depend on public transport. Evidence from the field observation conducted in November, 2017 and January, 2018 showed commuters wait at bus stops and terminals for long hours in search of vehicles to work or go home. This is evident in Figure 22 showing the drudgery women go through before and after work daily in GAMA. Again, these developments in GAMA have potential to widen exclusion of vulnerable groups. This is the challenge modern urban governance regimes are mandated to confront (GTZ, 2004).

Figure 21: An avalanche of inefficient car based transport

Source: Debrah, 2018

Figure 22: Some market women struggling for vehicles at bus stop in Accra central after market.

Source: Debrah, 2018

These descriptions affirm what the GTZ (2004) has said about mobility management in the developing world, where nations lack adequate traffic education and enforcement institutions, as well as connection between traffic rules. For these reasons, there is the need to advocate institutional capacity, professional skills and training, as well as adequate pay and modern equipment to drive urban mobility in GAMA. These concerns are similar to the views expressed by two respondents during the interview in GAMA, notably, the Spatial Planning Officer as well as the Building and Road Research Officers that the local assemblies must employ persons with requisite skills in order to fulfil the difficult task of urban planning and maximize opportunities for accessibility planning. These are the requisite ingredients for GAMA to enhance the aspirations of stakeholders for urban spatial planning which emphasizes 5Ds [density, diversity, design, distance to transit and destination accessibility] (Cervero, 2006). When spatial planning is achieved in GAMA, urban planners would be able to plan and execute long-term transport-land use planning goals to favour urban agglomeration as postulated by Suzuki et al (2013).

Models of Travel planning in GAMA

The results of the field interview indicated that two forms of travel planning exist in GAMA. These are the owner-operated employer busing services and privately operated-contract services.

Currently, Agate Transport Services is the dominant private transit service provider with specialisation in hiring services for expatriates, driver-out-sourcing and shuttle services for employers in GAMA. According to the respondent from Agate, at the moment the company provides shuttle services for organizations such as Nestle Ghana Limited, Ghana Cement Limited and Accra Brewery Limited, Volta Aluminium Company (VALCO), Alliance Motors as well as Ghana Airport Company. Additionally, it has emerged that even though Agate Transport Services Limited outsources busing services for organizations in GAMA, the company itself does not provide busing services for its employees numbering over one hundred. On the contrary, the company provides top officials with personal vehicles with fringe benefits including drivers, and fuel coupons; the company also bears maintenance costs of company-supplied vehicles.

In terms of cost benefits endowments, the study has revealed that companies that depend on Agate for busing services have been able to reduce operational costs by contracting out transportation costs of employees to another company. In the view of the key respondent from Agate, and echoed by another respondent from Accra Breweries, the provision of 24-hour shuttle services has taken away the burden of procurement of buses to shuttle workers to and from work, as well as contracting and management of drivers for buses. In furtherance to this, the respondent from the recipient institution (Accra Breweries) added that the savings could be ploughed back to expand and diversify the scope of operations.

The second strand of travel planning identified in GAMA was owner-operated travel plans. This model was largely dominant among state-owned institutions like Ghana Revenue Authority, the Social Security and National Insurance Trust, as well as Cocoa Processing Company. Unlike the contract-hiring model, the self-operated travel services have unique features, including the taking up responsibility towards the cost of procurement and maintenance of buses, and the management of drivers, including payment of social security contributions on behalf of drivers, as well as management of workstations with staff mechanics who provide other ancillary works on buses. In effect, the state-owned organizations employ full-time workforce with full benefits to drive, repair and manage company buses. Another unique feature about this model was that all top management staff of these organizations were offered personalized vehicles to match their activities and status. The vehicles are registered and managed as assets of these organizations.

Regarding uptake of which model to adopt for travel planning, evidence from the field interview indicated that multi-national companies preferred contract hiring for employees whereas state-owned companies preferred owner-operated shuttle services to enable them (SOEs) embark upon their welfare commitments such as, funerals and marriage ceremonies during weekends at less cost.

In a related development, it has also emerged that even though Metro Mass Transit Limited (MMT), has large fleet size and with mandate to provide shuttle services in GAMA, the practice of running shuttle services has not caught on well except for running bussing services for university campuses, private schools and hospital staff in the Greater Accra Metropolitan Area on a minimal scale.

Relevance of Travel Plans in GAMA

In view of the dominance of private cars, the researcher wanted to establish whether the potential for travel plans in GAMA was high, and to determine the extent to which travel plans could improve the turn-around time of commuters during peak hour travel times. Evidence from the interview conducted in November, 2017 and January, 2018 indicates an overwhelming support for travel plans even though private motorization was still pervasive among commuters in GAMA. Additionally, the travel plan was identified as one panacea to control travel behaviour and to achieve modal shift by eliminating idle vehicles which clog road networks, particularly during rush hours in GAMA. The following views were sifted from the opinions expressed by the informal transport providers, transport policy makers and planners regarding travel plans in GAMA during the field research: A respondent from the GRA commented that,

> *……considering the pressure of moving to and from the peri-urban area of Kasoa and the headquarters in Accra every morning, in view of the choked peak-hour driving, the use of buses would significantly improve turn-around time..*

Similarly, a respondent from SSNIT, opined that,

> *……bus services are effective to optimize staff efficiency and to reduce the cost of productivity of labour; and so we provide bus services for our workers.*

A respondent from the GPRTU, also commented that,

> *......in our terminal here, there are over one thousand vehicles and one hardly gets the opportunity to load more than once if you are not an officer……………….such a programme (travel plan) would ensure that all of us do not come to the terminal everyday as we always do. This would ensure that the few who come to work would get the opportunity to load more than once, while the others who do not turn up, rest, or do minor repairs to help reduce the rate of accidents on roads.*

The views above coalesce and are indications that travel plans could reduce greatly, idle vehicles from the road, particularly in the morning and evening rush hours, improve the productivity of workforce and offer freedom from stressful peak-hour commuting patterns prevailing in GAMA. These views support the fifth proposition for this study that the acceptance of travel plans by governments, employers and transport-service providers could positively improve the turn-around time of commuters in GAMA. However, this proposition alone is not enough to bring about modal shift. Evidence from the field interviews conducted with transport service providers indicated that certain challenges needed to be overcome. The next section throws light on these challenges from operational and structural perspectives.

Operational challenges of Owner-operated busing schemes in GAMA

In a bid to further enquire about the sustainability of owner-operated busing services for employees, it came to light that despite its uniqueness, the model was found to be unsustainable in view of operational cost-benefit assessments. It emerged that owner-operated buses do not make savings as intended in view of the expensive social engagements, particularly travelling costs.

To buttress the frustration of transport planners in these organizations, an obviously disturbed officer wondered how the organization could meet the costs of travelling long distances (across the length and breadth of Ghana) in view of their organizational policy on welfare, high workforce and low fleet to service high demands for funerals and marriage ceremonies every weekend. His lamentations were borne out of the disproportionate number of staff being served by the slim fleet size. The following view represents that of a desperate transport officer in GAMA:

> *How can a bus size of about 25 respond to the needs of over one thousand workforce? Meeting their weekend engagements are daunting tasks which threaten the sustenance of the scheme.*

In a related manner, the institution of employee loan schemes has the tendency to obviate the capacity of travel plans to eliminate inefficient vehicles from the street. This policy could therefore make travel planning counter-productive as it would enable workers who have worked for five or more years with particular organizations procure private vehicles for work, in addition to provision of buses for workers who have worked under five years. This practice has implications for parking and congestion considerations. However, asked about the viability of this Personal Vehicle Loan Scheme, a planning officer who was delighted about this policy responded positively in the feedback below:

> *It's one prestigious facility in which every member of the organization* aspires for. *This entitlement has taken away huge burden off the company's busing system, particularly on weekdays. Further, company busing normally runs at losses in terms of low load factor; overall, it was still cost effective in view of the nature of the work they perform.*

From the feedback above, two statements with compelling implications on mobility and congestion in GAMA are crucial:

First, that owner-operated travel plans with provision of personal loan schemes would enable workers drive alone to work; and this would be contrary to the tenets of employee ride-sharing schemes as in the USA under Regulation XV.

This regulation requires public and private employers with employees of about 100 to institute mobility plans to increase average ridership and to regulate traffic in urban areas (Giuliano, et al., 1993).

Secondly, the policy has the potential to enable company buses run at low capacity, and therefore increase the operational cost and eventually lead to the demise of transit programmes in GAMA.

In a bid to promote privacy and convenience of the motoring public in GAMA, employers offer private motor vehicles to enhance travel to work by their employees through Employee Ride Sharing schemes (Giuliano et al, 1993). To take advantage of this model, planning authorities in GAMA must ensure that ridesharing schemes are designed to enable workers up to four, living in the same vicinity, are of similar age group and share similar interests are assisted to own their private car to work. In this case, the riding-party will share the cost of maintaining the usage of the vehicle. Ultimately, this policy could eliminate the burden associated with congestion and under-boarding associated with employee busing schemes, eventually improve the turn-around time and labour productivity in GAMA.

Other Operational Challenges

In addition to the above internal operational challenges, there are also some external operational challenges that generally confront both owner-operated and contract-hiring shuttle services in GAMA. These include:

- High exchange rate volatility and increased cost of procurement of buses. This issue received an overwhelming expression in view of the fact that all vehicles used in Ghana are imported. As an officer from Agate Transport Services remarked:

  > *since every bus was procured from abroad using United State of America dollars, this becomes a drain since we (the organization) had to borrow from banks at high interest rates. This coupled with high operational costs of fuel and spare parts make running of transport businesses difficult.*

- High operational costs. This cost was described in two different ways: traditional rush hours costs and weekend employee engagement cost. The first cost is attributable to recurrent choked networks during peak hours and constitutes a huge drain on the overhead costs of running company buses. The second cost relates to the costs of running weekend social programmes such as attending funerals and other employee engagement programmes. The cost becomes unsustainable when the workforce of these companies is very large and the distances for trips are long.

These unintended costs tend to significantly throw overboard the budget lines of these organizations, thus making the running of company buses unsustainable.

- Absence of right of way for buses.

The absence of right of way is the result of the absence of a transit policy in Ghana in general and Accra Metropolitan Area in particular. This challenge affects the turn-around time of buses, and increases running cost. It is one major operational deficiency in the urban mass transit arena that received affirmation by all the respondents interviewed. Accordingly, the view expressed by a respondent from the main transport policy ministries is that this remains the greatest mistake in the transport landscape of Ghana; and these further worsen the challenges of running busing services in GAMA.

Structural Challenges Militating against Travel Plans in GAMA

In addition to the operational challenges identified above, some structural challenges were also identified and these are grouped into weak urban structure and limited stakeholder participation.

Weak urban structure

Ghana's form of urban governance has been described as a weak planning authority, as assemblies are fraught with under staffing, inadequate logistical resources and weak financial muscle to deliver their mandates (Yankson & Bertrand, 2012). In view of the weak local governance structure, travel plans for workers within the jurisdiction of GAMA are ineffective, and are left in the hands of employers rather than the assemblies. This planning vacuum was alluded to during the interview conducted with policy makers in GAMA as a respondent from the Spatial Planning Authority indicated that *plans earmarked for streamlining the development of utility services, as well as provision of transport facilities at the localities often encounter implementation challenges because development of settlements of newly-opened up areas start before town planning schemes emerge*.

This planning challenge has been alluded to by Yankson and Gough (1999) two decades earlier that much of the development in the peri-urban area of Accra goes on before planning schemes are prepared. The tendency unfortunately impedes the capacity of the assemblies to regulate housing and transport supply in view of compensations for demolition of private property that abuts carriageways, and ultimately protect already zoned areas before development of housing and other physical estates begin. This situation is again contrary to best practices like the UK Planning Act of 1947 in which local authorities are mandated to grant or refuse development controls in the best national interest (Mather, 1986).

Another factor that was evident was the absence of multi-level development and transit-oriented planning regime in GAMA. The problem is made worse by weak land-use controls and inexplicit land-ownership mandates. The absence of these affects land use solutions, including reservations for transport-access improvements such as right of way, median for beautification, provision for utility services installation, non-motorized access, as well as other street infrastructure provisions that must at all times reflect in land use plans for cities to promote transit-oriented patterns for inhabitants. Ultimately, inability of the city to promote efficient transport system has dire implications on economic development. The justification for this, in the view of the respondent from the Building and Road Research Institute, could be attributed to vexed land use rights in Ghana. The implications of this inefficient land-use management policy negatively impacted land-use and environmental management in the inner and outer cities. Related to the view above, the respondent from the Spatial Planning Authority, indicated that the problems are compounded by

> *corrupt practices which subvert the systems and procedures regarding preparation of plans and permits, as well as activities which tend to inhibit transparency and weaken the arms of the authority to fully execute its mandates.*

These views further support the earlier claim that 50 percent of buildings in Accra are without building plans and permits from the assemblies (Yankson, 2000). Beside low uptake of building permits in GAMA, there is also inadequacy of skilled personnel to deliver the fiscal obligations of the local authorities. Accordingly, evidence from the interview conducted with a planning officer of the Spatial Planning Authority, revealed that the current decentralization concept is adjudged to be helpful towards spatial planning but this benefit has not realised in view of the inadequate human resource at the local authorities even though the assemblies have been equipped with the necessary enabling legislative instruments. This view is supported in the literature on decentralization in Ghana (Yankson, 2000; Devas et al., 2000) that governments must ensure total devolution of financial and administrative decentralization to enable the assemblies thrive. The absence of fiscal and administrative decentralization in GAMA, defeats the purpose for which the assemblies were set up particularly, to address issues related to planning, financial management and administrative governance.

The presence of weak governance structure in GAMA has resulted in multiplicity of urban challenges including: unmotorable minor and collector routes in GAMA, use of bus stops as car parks for broken-down land trains (articulator trucks) and taxi cars. Others include negative attitudes of drivers such as parking and stopping at the rear of parking bays to offload and pick passengers on major roads, mix use of roads by articulator trucks, bicycles and cars, difficulty in evacuating immobilized vehicles and trucks on road corridors on time, and scattered settlement patterns in GAMA. From the transcriptions of the video recordings taken during the interview sessions and focus group discussions, there was unanimity among the formal and informal transport sector actors concerning the challenges above.

These challenges therefore impede mobility, and negatively impacts effective implementation of spatial planning regulations in GAMA to improve operation of travel plans. Juxtaposing this development again to theories on urban form across the world such as smart cities, new urbanisms and mixed-use developments which underpins accessibility planning, these developments in GAMA are directly antithetic and potentially, have the tendency to deny the inhabitants of GAMA from benefiting from inherent goodness espoused in these mixed-land use and TODs (Lara et al., 2016). Under these models of urban form, interconnectivity exits among human activity points and TODs to reduce the desire to travel, improve environmental well-being to ensure sustainable cities (SDG 11).

Limited stakeholder consultation

Evidence from the interviews conducted in GAMA has affirmed the prevalence of limited stakeholder participation at the local level. Unfortunately, this practice is challenged with the capacity to breed apathy, and negatively impact on travel planning in GAMA and undermine the progress made in Local Agenda 21. From the interviews it became evident, there was no stakeholder participation in project development, and participation in transport services provision at the local level. That the only collaboration city managers and transport service executives have was the platform to brief transport service providers about possible changes city authorities intend to introduce in the operations of transport services usually held at the assembly level. From the interviews, it emerged that there was no interaction with the generality of union executives, drivers and mates with city authorities at the terminal level to take input for project development and planning.

This development has affected planning programmes in GAMA, and created a superiority complex in the terminals which affects other non-executives' income levels. The tendency breeds superiority 'complex' in the executives within the terminal. A respondent from the drivers' union at the terminal at Kaneshie remarked this complex among executives at the terminals '*offers them loading right called 'priority'*. By this priority loading right, executives of each of the local unions could load passengers on scale (loading of passengers at the terminal) ahead of all other drivers in the terminals in GAMA. Another respondent during the focus group discussions remarked that

> *holding of positions within the unions is lucrative (view by a GPRTU member at Achimota New Terminal).*

This is a possible threat to participation by the grassroots and rather deepens apathy among junior staff members at the terminals. The magnitude of this loading right (priority to executives of transport unions) was felt when three Union Executives with two vehicles each had their vehicles loaded ahead of non-executive member vehicles at Kaneshie and Madina terminals. An infuriated driver at the Tema Station terminal lamented that the arrangement makes loading '*exhausting in view of the fact that each union executive has at least two to three buses'*.

Given the fact that these vehicles have the right to load ahead of non-executive members, it disproportionately affects the income levels of the majority of drivers who turn up at the terminals. This problem has bred apathy and further affected the turn-around time of commuters at the terminals. Indeed, an obviously distraught driver in his perturbation remarked, during the field research, that

> *the issue of 'priority' has made leadership so powerful that they cannot even see the problems other drivers face since at the end of the day each executive member can load about four of their own vehicles while others (non-executives) struggle to make one trip daily.*

This tendency has negatively affected the policy of picking passengers from the catchment area of the new Achimota Station free of charge (fare) into the terminal for onward boarding of other vehicles to their destinations. Indeed, one respondent remarked:

> *When this policy (*picking of passengers from the catchment area for free to board buses at the terminal*) was in force, patronage by passengers at the terminal was high with short waiting time, usually less than 20 minutes.*

However, this policy has since been turned down by angry drivers who obviously drive to the terminals often with empty vehicles without bringing passengers en-route for free to board vehicles to their destination. According to the report obtained from the field survey, the failure to bring oncoming passengers into the terminal for free has affected patronage of commuters, thereby increasing waiting time at the terminal from less than 20 minutes to over 1 hour to 2 hours. The situation becomes dire in the afternoons, when waiting times become unbearable due to the scorching sun.

In a related manner, the situation become worse as commuters had to stand at bus stops (often without shelters for waiting commuters) along main corridors in anticipation for pick-up by itinerant commercial drivers known as *zamzam*. These itinerant drivers do not operate from any terminal, and are not members of any local union. They pick passengers en-route at bus stops and usually anywhere possible in GAMA. In the view of a member of the GPRTU, by the nature of their operations, these itinerant commercial drivers, make a lot of money, drive carelessly, cause accidents and eventually, the blame is apportioned to all commercial drivers.

From the focus group discussions held with the informal transport service operators, it became evident that even though drivers and their mates are not consulted during transport planning programmes, they are very informative regarding deployment of road infrastructure and designation of shortest possible paths to ease congestion on major road corridors. From the field interview, a respondent from the GPRTU at Kaneshie Terminal asked,

> *Why he can't drive through Tantra Hill from Kaneshie terminal to connect Pokuase and Amasaman but has to use the main corridor from Achimota through to Pokuase to Amasaman ?*

Another respondent from PROTOA at Tema Station Terminal wondered,

> *why can't one not drive through Mamprobi, a suburb in Accra, to reach Accra central but has to use the main Kaneshie-Accra route to enter Accra business district.*

These comments emphasize the difficulties associated with the absence of accessible roads in GAMA to ease congestion on the major corridors. In addition to the absence of distributers, drivers complained that most traffic lights have been wrongfully sited and lamented why this was so. A typical mention was the siting of traffic lights in front of Neoplan Car Assembly plant, and at the same time the location of a bus stop for the Quality Bus Services at the same place, and wondered why such a confusion could be allowed at a point where long train vehicles (articulator trucks) are designated to turn. A respondent at the Achimota terminal asked,

> *so what would happen if an Aayalolo bus has parked for passengers to disembark and an articulator truck decides to negotiate the turn in front of the traffic lights at Neoplan Car Assembly plant in Achimota?*

From the discussions so far, the informal transport service respondents appeared to be very informative about road traffic engineering *albeit* in an informal way. For this informal knowledge, they are usually neglected by transport service policy makers. This is what Renn (2006) has alluded to as valuable information which could lead to a wide range of possible actions by authorities. From the interviews conducted with transport policy makers in GAMA, it became evident that there is an old-fashioned conceptualization of stakeholder involvement by people whom transport projects affect.

Policy makers perceive stakeholder engagement akin to the model that was prevalent in the 1960s which *van* Tatenhove, Arts and Leroy (2003) call awareness raising. Hence, transport service users are only informed about transport projects intended for users and not consulted as to their expectations. In modern times, these approaches have been described as anti-modernization phase; and implore nations to move from rapid and participatory rural appraisal stages (Chambers, 1994) to participation in which there is consensus on best practices, and learning from mistakes and successes (Hickey & Mohan, 2005).

Again, it is established that the informal drivers have fair knowledge of which roads to be developed to promote shortest possible alternative in GAMA but their views are hardly heard. Again, by the nature of their operations, they are always the first actors to create access to new sites. They are conversant with the site plans and their opinions could be sought in road infrastructure development, particularly deployment of shortest possible paths within the Greater Accra Metropolitan Area. This knowledge can further enhance the development of east-south and south- west connections which are lacking in the urban road network choices. For these reasons, their absence from decision-making processes at the local governance level of GAMA regarding transport decisions such as route assignments, traffic allocation and distributions obviate the usefulness of feedback as espoused in the conceptual framework of this study, and is thus a further blot inhibiting the growth of urban road transport policy-making in GAMA.

Further, the limited stakeholder engagement in GAMA deny the local area of the capacity of drawing upon the expertise, skills and the ownership necessary for policy preparation, implementation and acceptance as advocated by Lara et al. (2016) for the growth of smart cities.

In conclusion, the nature of traffic congestion in GAMA resulting from more cars using limited space, support the fourth assumption underpinning this study, that the provision of personalized motor vehicles for employees would adversely constrain travel plans in GAMA, unless other demand management practices are enforced. These developments are the reasons for which exploring governance approaches to mitigating the burden of mobility in GAMA is appropriate. The Network-Systems framework (Lockett & Spear, 1980; Rhodes, 1996) operates on the assumption that there is better results to be achieved when actors for whom public policies affect are involved in the design, implementation and the evaluation of strategies to address the problem (Richards, Blackstock & Carter, 2004; Blackstock, Kelly & Horsey, 2007; Merchand, 2011)

Summary

In this chapter, the burden of mobility in GAMA has been espoused with a call for trade-offs between urban land use and transport planning to maximise active transport opportunities (walking, cycling and mass transit), as well as improve motor vehicle traffic speeds during peak hour travels. Additionally, it has been established that GAMA is faced with limited choice for mobility management.

Beside the absence of choice, there is also the presence of conventional road designs which impede the free-flow of commuters. Again, the presence of these conventional road designs, minimizes efficiency of road spaces by preventing deployment of Intelligent Transport options with potential to improve rush hour accessibility on routes in GAMA. Furthermore, against the backdrop of inefficient road designs, local authorities in GAMA are unable to attract the needed skilled personnel to fulfil the difficult task of urban planning and maximize opportunities for accessibility planning.

The chapter concludes with identification of two main models of travel planning in GAMA and advocated for approaches to enhance modal shift while improving liveability in urban areas.

CHAPTER SEVEN

MOBILITY CONTROL MEASURES AND RELATED EFFECTS ON MOBILITY

Introduction

GAMA has witnessed the deployment of both physical measures, including expansion of capacity, mass transit systems and traffic policing as well as soft measures such as traffic regulation and management to mitigate recurring congestion. The fourth objective of the study was to assess how these mobility controls have helped to reduce congestion resulting from micro factors (many people, freight, too many vehicles using limited road space). The analysis was based on the data from traffic audit conducted as part of the study.

Road improvement programmes and land uses

As part of the challenges of mobility in GAMA, some physical restrain humps have been mounted on major corridors including Amasaman-Accra road, Weija-Accra, Adenta-Accra and Teshie-Nungua-Accra roads. Additionally, these roads have been dualized with ancillary facilities to contain increasing traffic volumes as well as provision of alternative means of travel such as walking and cycling lanes. Despite these expansion works, traffic conditions on these roads continue to be low with Mean Time Speed being 1.05 km/h.

In furtherance to the lower speed levels in GAMA, physical observations conducted during morning and evening rush hour journeys as part of the study, revealed among other things, that congestion in GAMA results from growing private motor vehicle presence, non-uniform carriageway and shoulder width, encroachment by pedestrians and street-trading, abutting of carriageways, as well as improper positioning of bus stops and unfettered on-street parking by commercial drivers. These challenges emanate from inefficient land-use policies which permit concentration of economic and social activities along major road arteries, often without adequate parking and offloading bays in GAMA. Some empirical evidence of these phenomena are captured in Figure 6 where there are concentrations of major economic and social activities sited along major road corridors in GAMA.

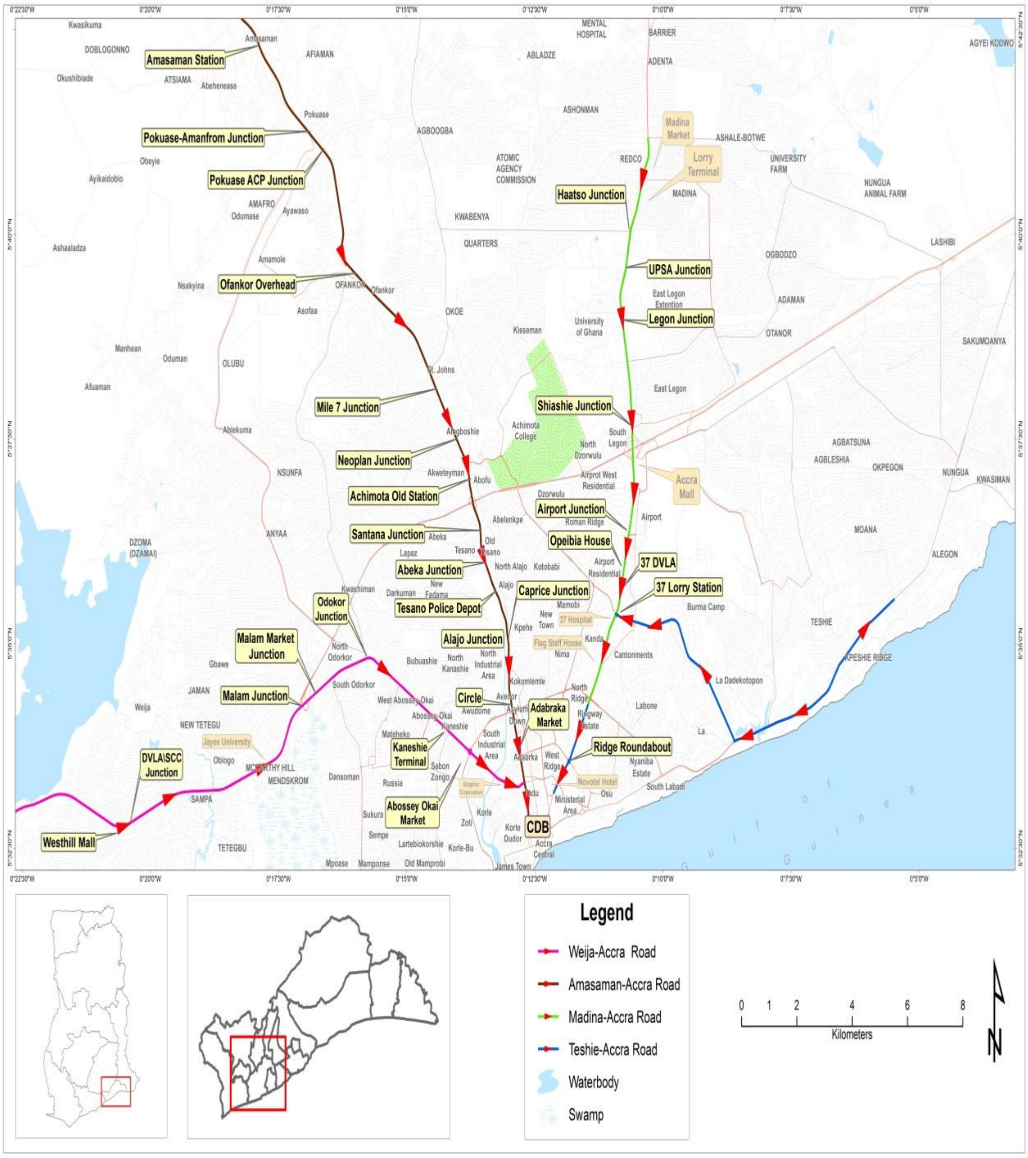

Figure 23: Land use activity map of GAMA.
Source: Ecological Laboratory, University of Ghana, 2018.

From the Figure 23, yellow rectangles show concentration of schools, markets, lorry terminals, and informal shops along major roads. For instance, on the Madina-Accra road, as many as six university campuses (the University of Ghana, University for Professional Studies, Institute for Local Government Studies, Valley View University, Islamic University and Radford University) can be assessed along the corridor. Beside universities, there is also the location of important socio-economic activities such as Kotoka International Airport, the national headquarters of the Driver and Vehicle Licensing

Authority and major settlements such as Shiashie, Airport city as well as new rich enclave, East Legon.

These developments, according to Okoko (2006), can breed congestion as turning and crossing tend to impede the smooth flow of traffic. In a bid to prove the possibility of interference from intersections and junctions on the flow of traffic during rush hours along the corridor, a traffic audit based on License Plate Matching Technique was conducted on these road corridors. The results of the travel audit revealed peak hour Time Mean Speed in GAMA was 1.05 km/h while off peak travel speed was 4.97 km/h. This indicates that both inbound and outbound peak-hour travels are low and indeed lower by 90 percent of the intended speed posted on the roads with improved surfaces. This development supports the earlier study by KOICA (2015) which identified travel speed of 15 mp/h in GAMA.

Effects of peri-urban growth on transportation

In addition to lower speeds on improved surfaces in GAMA, ineffective land use controls on peri-urban areas also impede mobility on major road corridors in GAMA. The distribution of human settlement to areas previously regarded as agricultural enclaves has implications on mobility. These centres and their corresponding activities spread traffic either way particularly during morning and evening rush hours (Cervero, 2013; Curtis & Scheurer, 2017). In view of these, the attractions of the inner core for jobs saddle the periphery (*albeit* with cheaper rates of land and accommodation) with mobility constraints on the peripgery. This development is evident with discernible cascading effects where former agricultural zones such as Pokuase-Medie, Haatso-Abokobi, Adenta-Ayi-Mensah and Weija-Kasoa have contiguously been metamorphosed into urban settlements with municipal governments namely: Ga West Municipality on the Accra-Nsawam-Kumasi road, Ga East Municipality in the Haatso-Abokobi enclave, Adentan Municipality on the Adentan-Ayi-Mensah enclave on the Accra-Aburi-Dodowa road, the Ga South Municipality of the Weija-Kasoa enclave on the Accra-Winneba road, as well as the Teshie-Nungua enclave now Ledzokuku-Krowor Municipality on the Accra-Tema corridor (Figure 24).

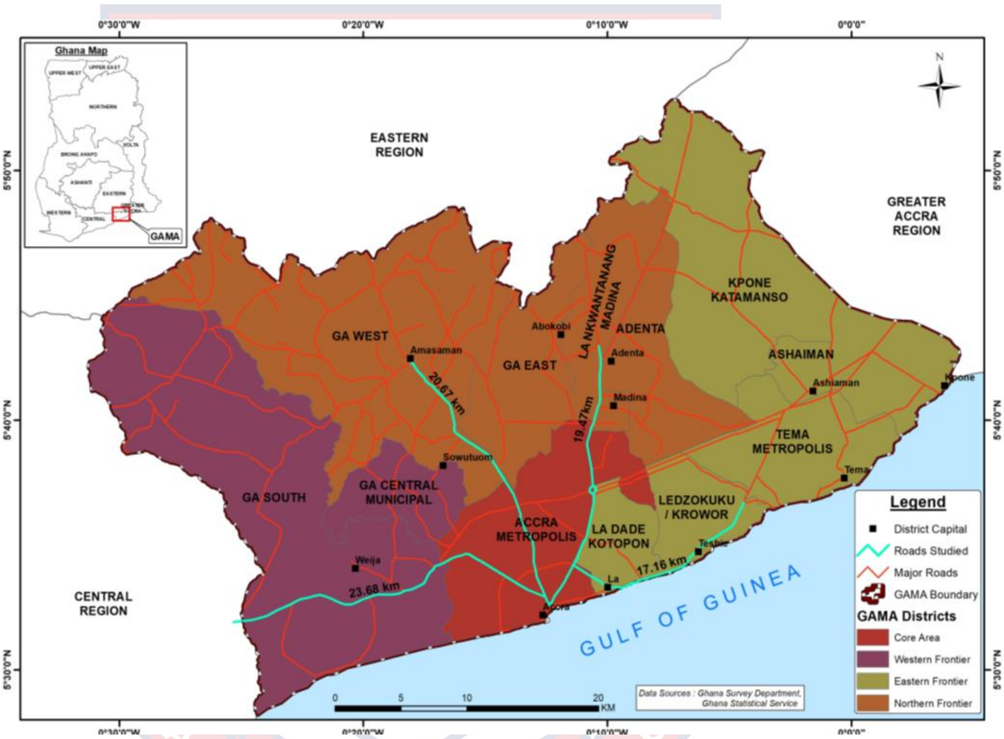

Figure 24: The spatial extent of GAMA.

Source: Ecological Laboratory, University of Ghana, 2018.

The implication of the above developments on GAMA is the growth in population with attendant challenges of congestion (low speed of 1.05 km/h) in the inner core. There is no doubt about the potential for the growth of towns along improved road corridors in GAMA in theory and in practice. According to Cervero (2001), significant ‘induced growth’ and ‘induced investment’ effects tend to gravitate towards improved freeway corridors. This situation has been proven in his study on freeway investments and traffic increases by studying data on freeway projects across California for 15 years. For these reasons, Cervero (2001) has cautioned against the practice of fighting road congestion on grounds of induced-demand. Similar findings have been found in the UK where Goodwin (1996), in his meta-analysis of more than 100 road expansion projects in the United Kingdom showed a proportional savings in travel time and increases in traffic. Accordingly, the UK government jettisoned its long standing policy of 'predicting and provision' of motorways in response to demand. The decision is supported by the popular maxim in traffic management that 'you can't pave our way out of traffic congestion' (Downs, 1962). Rather, city managers are implored to plan accessibility to give preference to the most sustainable form of mobility (Litman, 2017).

Indeed, the proliferation of towns and associated economic activities in GAMA has been identified with further vertical expansion of the municipality into growth of new social settlements without economic attraction. This development again, explains why the flow of traffic tends to be directed from peri-urban areas into the inner core during morning rush hours to impede free-flow of traffic. The development above has been corroborated by the evidence achieved from the interview held with public officials in GAMA. For instance, asked why traffic in GAMA tend to predictive, a respondent from the transport sector agencies, attributed this development to the dearth of economic activities at the periphery, and therefore every movement in the morning in GAMA is directed to the central core, which is the base for economic and social interaction. This development disproves the assertion in GAMA that the spread of human settlement alone will spread traffic from the city core. Rather, according to Curtis and Scheurer (2017) to ensure efficient cities, urban planners must internalize mixed land use with commensurate economic activity, backed by population densities to spread traffic in the city (see also, Dieleman, Dijst & Spit, 1999).

Suggested travel plan for GAMA

In view of the bottlenecks that impede mobility in GAMA, the last objective of the study was aimed at suggesting a travel plan for commuters based on a travel audit. The results of the travel audit are captured in Tables 5, 6 and 7 to illustrate the findings of the Manual Number Plate Matching conducted on selected roads in GAMA and NJM. In theory, average running time is the time in which the vehicle is in motion, and does not include Stopped Delay or the time the vehicle has stopped. From Table 5, the average running time achieved in GAMA was 4 minutes 12 seconds while average Stopped Delay realised was 1 minutes 59 seconds for every 800 metres. The average running time and stopped delay equal Travel Time which is the time taken to traverse a route between any two points of interest. Cumulatively, the travel time achieved in GAMA on the selected roads was 6 minutes 31 seconds for every 800 metres.

In a similar manner, the peak hour Travel Speed which is a function of the distance traversed over the running time also yielded a paltry value of 0.29 km/h. In conclusion, the Time Mean Speed for peak hour travels on the four selected road corridors in GAMA, is 0.23 km/h.

Mathematically, Time Mean Speed = $\frac{\sum \frac{d}{t_i}}{n}$.

This model could also be written as $\frac{\sum v_i}{n}$.

where: d = distance travelled or length of the roadway segment
t_i = travel time of the ith vehicle
n = number of observations
v_i = speed of the ith vehicle

Travel Speed was also mathematically defined as = $\frac{d}{\sum t_n}$

where d = distance travelled or length of the roadway segment
t_n = travel time of the nth vehicle

Applying the models above, the following Tables were computed to determine the Travel Speed and Time Mean Speeds in GAMA.

Table 5: **Peak Hour Traffic on selected roads in GAMA**

Data Items	Teshie to 37 Corridor	Adenta to CBD Corridor	Amasaman CBD Corridor	Weija CBD Corridor	Sum	Average
Road Length (km)	11	17	26	23		
Travel Time (s)	144.8	397.7	404.25	542.86	1489.61	378.40 (6min31s)
Running Time (s)	63.8	340.5	276.6	328.8	1009.7	252.4 (4min 12s)
Stopped Delay (s)	139.50	47.14	139.50	150.57	476.71	119.2 (1min 59s)
Travel Speed (m/s)	1.60	0.58	0.73	0.34	3.25	0.81m/h (0.29km/h)
Travel Mean Speed (km/h)	0.5	0.24	0.2	0.013	0.95	0.23

Source: Debrah, 2018

In a related manner, the off-peak Travel Mean Speed for GAMA were also noted to be low even though relatively higher than the peak-hour travel speed conditions. From Table 6 the average off-peak running time in GAMA was 1 minute 56 seconds while average off-peak Stopped Delay realised was 1 minute 47 seconds for every 800 metres. The cumulative off-peak average Travel Time was 2 minutes 56 seconds for any 800 metres of roads in GAMA. Consequently, these yielded off-peak hour Travel Speed of 6 km/h with a Time Mean Speed of 1.05 km/h on the selected roads used in the study (Table 6).

Table 6: **Off Peak Traffic on selected roads in GAMA**

Data Items	Pokuase Awoshie Corridor	Dworwulu 37 Corridor	Amasaman CBD Corridor	Weija to Motorway Corridor	Sum	Average
Road Length (km)	21	4.6	26	20		
Travel Time (s)	1.60	341.3	67.0	216.3	626.2	156.55 (2min 36s)
Running Time (s)	130.5	180.6	48.2	102.8	462.1	115.5 (1min 56s)
Stopped Delay (s)	66.25	160.6	48.6	114.2	389.6	97.4 (1min 47.4s)
Travel Speed (m/s)	1.6	0.69	4.24	0.21	6.74	1.68 6km/h
Time Mean Speed (km/h)	0.5	0.41	2.0	1.29	4.2	1.05km/h

Source: Debrah, 2018

Comparing the Time Mean Speed of GAMA with Pre Test result of New Juabeng Municipality (NJMA)

To ascertain the validity of the Time Mean Speed of GAMA, the same Number Plate Matching audit was tested in the Eastern Regional capital to determine the Time Mean Speed of vehicles in the New Juabeng Municipality. To achieve the desired effect, roads with similar characteristics such as concentration of social and economic activities were selected. On this note, two main roads: Effiduase to Central Market road as well as the by-pass through Oyoko to Koforidua Technical University road was selected in view of the peculiar characteristics: high concentration of social and economic activities such as hotels as well as physical restraint humps.

The results of the pilot speed audit in the New Juabeng Municipality indicate that average peak-hour Travel Time was 2 minutes 56 seconds for any 800 metres of road while peak hour Travel Speed was 1 km/h. Together, these yielded lower Time Mean Speed of 5.94 km/h on the selected roads in the municipality selected for the pilot study (Table 7). Comparing the post-test results of peak hour speed audits in NJMA and that of GAMA (1.05 km/h and 5. 94 km/h) respectively indicates that peak hour travel speeds in the two areas are low. The reasons for these low speeds in the two areas, are attributable to the nature of the urban form which is largely mixed use but grossly de-emphasis accessibility planning measures (Litman, 2017).

This development therefore, obviates the benefits of mixed-used planning paradigms in GAMA (Lara et al, 2016). The situation again, is due to the absence of the main pillars of smart cities: participatory governance based on the engagement of civil society in the processes of urban transformation

(Rizzo, Concilio, Marsh & Molinari, 2013). According to Litman (2017), any urban area that promotes mobility without accessibility planning experiences slow mobility because of the lack of provision for the diverse needs of road users.

Table 7: **Traffic Audit in the Koforidua New Juabeng Municipality: central market to Oyoko corridor**

Data Items	Central Market	Commercial link	Bank	Ministries Link	Effiduase Police station	Oyoko Traffic Lights	Sum	Average
Travel Time (s)	833	585		736	295	425	2874	574.8
Running Time (s)	48	44		67	119	358	636	127.2
Stopped Delay (s)	785	541		669	176	67	2238	447.6
Travel Speed (m/s)	0.24	0.34		0.27	0.67	0.47	1.99	0.398 5.94km/h

Source: Debrah, 2018

From the tables above, it could be inferred that both off-peak travel conditions in GAMA and peak-hour travel conditions in NJMA are generally low, and attributable to mixed use of land without necessary accessibility planning in the two urban areas. Secondly, considering that the average running speed limit in GAMA is 50 km/h, the current peak and off-peak hour speed of 1.05 km/h and 4.97 km/h respectively are low and costly. In terms of content analysis for standard speeds for the various modes (walking, cycling and public transport), the rush hour speed yield on improved roads in GAMA is lower than the standard average travel speed for pedestrians/walking [5km/h] and for cycling [16-24km/h] (Aspelin, 2005).

The preponderance of lower speeds in an urban area according to the EC (2013), is attributed to micro factors (many people, freight, too many vehicles using limited road space). From the field study, it has been revealed that in addition to the presence of micro factors creating congestion, there is also the absence of transit policies and accessibility planning regimes in GAMA. Again, the field interviews have also revealed that delayed mobility in GAMA is attributable to uniform working hours where majority of workers leave to work at the same time and close at the same time and move in similar direction (see Figures 25 and 26 for outbound and inbound traffic conditions in GAMA). These mobility trends are further compounded in GAMA by a self-regulated transport system which is unfortunately dominated by inefficient transport modes (personalized motor vehicles).

Figure 25: The inbound traffic from Weija to Accra while outbound lane lies idle

Source: Debrah, 2018

Figure 26: The outbound traffic Accra to Amasaman while inbound lane lies idle

Source: Debrah, 2018

These developments explain why the rush hour Time Mean Speed of GAMA is low (1.05 km/h instead of 50 km/h). This Time Mean Speed of 1.05 km/h realised during peak-hour travels in GAMA is lower than 30 km/h recommended for arterial roads in urban areas (Smart Travel Plan, 2009). The study therefore, concludes that mobility in GAMA is slow and could negatively impact productivity of labour and environment. Therefore, in order to promote mobility and productivity of labour with this lower speed, it is expectation that some employers could stagger starting work times from 8:30 am to 12 noon and close by 8:30 pm instead of 4:30-5 pm to reduce travel stress and environmental costs.

This lower speed in GAMA can be attributable to conventional road building designs that seek to physically segregate slower modes from faster modes of transport with their perceived safety and relatively traffic-free environment. The sustainability of these travel modes, to provide safe streets for passengers has been questioned by planners (DfT, 2009). For this reason, modern approaches must prioritise user travel needs that ensure that designers place pedestrians at the top of the user hierarchy by promoting sustainable walking. It is argued that since all journeys begin and end on foot, walking must be prioritised by providing walkable facilities in communities. Secondly, efforts must be made in GAMA to prioritise cycling to enable trips by bicycle an alternative means of transport for short to medium range trips (UK National Cycle Manual, 2011). After cycling, the next priority is placed on buses. As noted by Smart Travel Plan (2009), commuters will only begin to consider a shift from car to bus transport when the advantages of the bus are greater than those of the car. Then the car will be placed at the lowest bottom of user's hierarchy of travel needs to create convenient and flexible option for longer and inaccessible areas.

In view of the absence of modal choice in GAMA, both lower-peak and off-peak areas speeds in GAMA are low despite expanded road transport infrastructure over the past two decades. This development supports the assumption underlying this study that the current road designs such as speed cushions, trapezoidal flat-top road humps, build-outs, rubble devices and false roundabouts have rather contributed to the lower travel times.

The findings in GAMA are supported by finding in the UK shown by the Smart Travel Plan (2009) that segregated design solutions have failed, as walking distances in places have increased and route choices have become limited as pedestrians navigate through complicated street networks with a view to increase turn-around time of cars. For these reasons, the current speed-calming measures in GAMA must be reviewed to bring on board innovative measures such as Intelligent Traffic Systems (ITS) to regulate traffic. Again, slow mobility as discussed above, are the reasons why transport governance option is required in GAMA to enhance accessibility rather than managing mobility. According to the Network-Systems framework (Lockett & Spear, 1980; Rhodes, 1996), there are greater benefits to be derived from involvement and participation by the people for whom public policies affect. The framework works on the notion that local people have local knowledge which can be useful for the design, implementation of localized public policies to improve the wellbeing of the people (Richards, Blackstock & Carter, 2004; Blackstock, Kelly & Horsey, 2007; Merchand, 2011).

Summary

The implications of unplanned land-use developments and expansionist- constructionist approaches to building of road networks in GAMA in response to demand without commensurate accessibility planning have been examined with its resultant effects. The evidence of travel audit in GAMA has shown that travellers commute at exhausting Time Mean Speeds of 1.05 km/h during peak periods and 4.97km/h for off-peak periods even though road surfaces have been improved to do 50 km/h at all times. These low speed could be improved to 5.97 km/h if some employers could stagger working hours from 8:30 am to 12 noon to reduce travel stress, and improve labour productivity.

Secondly, the study has revealed that lower speeds are due to conventional road designs and ineffective land use policies in GAMA. In view of these, sustainable accessibility policies such as walking and cycling must be promoted by encouraging conducive urban environments to achieve density, diversity, distance to transit, and destination accessibility to enhance patronage of public transport.

In addition to the provision of speed calming to control driver behaviour, the study postulates that other innovative measures must be sought to assign traffic rather than the current approaches in GAMA. The study concludes that the presence of segregated humps along carriageways on the Amasasaman-Accra corridor, Weija-Accra corridor, Madina-Accra corridor and the Teshie-37-Accra corridor has negatively obstructed mobility during peak periods. Again, the empirical findings of the study has revealed that slow mobility in GAMA is created largely by the absence of choices even though majority of workers begin work and close at the same time.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter explains the findings, conclusions, contributions to knowledge and recommendations for policy making and urban road transport governance in view of the social and environmental challenges of motorization in Greater Accra Metropolitan Area (GAMA). This study generally explored how network governance could be used as a tool to plan travel, and to manage road transportation in to enhance mobility in GAMA.

The specific objectives were to:

a. assess the capacity of the current urban transport policies to improve mobility in GAMA.
b. examine the presence of options for mobility for commuters in GAMA
c. examine travel planning possibilities in GAMA, looking at the operational efficiency of the current public transport services regime.
d. explore factors that impede operations of travel plans by selected organizations in GAMA.
e. assess how travel plans by some employers could improve mobility to reduce traffic congestion in GAMA.

In order to achieve the stated objectives, mixed method approach was adopted to collect data on the road transport governance by qualitatively using interviews, focus group discussions and observations for in-depth understanding into this least-investigated phenomenon of travel planning in Ghana. Subsequently, travel time data was collected and analysed for quantitative conclusions based on important variables of time-mean speed.

Additionally, conclusions are drawn, and recommendations were made based on the suggested Sustainable Mobility toolkit designed by GTZ for cities. These approaches offered the researcher the opportunity to define the phenomenon of road-transport governance normatively, and to gain background information for future travel planning experience in Greater Accra Metropolitan Area (GAMA) to promote mobility for commuters.

Two main sampling methods were employed for the study. These were purposive sampling and convenience sampling. Purposive sampling was adopted to select respondents from the transport sector ministries, agencies and departments in GAMA. Similarly, convenience sampling was used to select members of the Ghana Private Road Transport Union, as well as the Progressive Transport Union members from the new Achimota, Madina, Kaneshie and 37 Station Terminals to represent respondents from the four main corridors in GAMA.

The research instruments were largely qualitative, and minimally quantitative involving interviews, focus group discussions, observations and number plate matching. The main policy makers from the transport sector MDAs were interviewed at their offices in Accra whereas the informal transport service operators were interviewed through focus group discussions. Lastly, observation and traffic audits were conducted on the field to observe and collect demonstrable data for substantiated findings and conclusions.

Summary of Findings

This section presents the main findings of the study.

- The capacity of the current urban transport policies has been found to be inadequate, and lacks the force to deliver efficient transport services in GAMA. This is in view of the revelation in the content analysis that there has been only one policy document 'the National Transport Policy' published in 2008 which is used to manage transportation services in GAMA. In view of this GAMA as a whole does not have its own home grown transport development plan by which local government authorities manage transport services.

- In terms of stakeholder engagement in policy making at GAMA, the study has found that there is limited stakeholder engagement which is only offered to the leadership of driver unions and not drivers at the terminals concerning environmental impact assessments. The absence of social impact assessment for transport projects in GAMA has affected the public acceptance of accessibility projects such as walkways and bicycle lanes in GAMA. The neglect of these access lanes therefore promote street trading and other commercial activities with adverse effects on mobility in GAMA.
- Regarding the offering of mobility choices for commuters in GAMA, the study has revealed absence of choices for commuters due to ineffective land-use controls and lack of synergy resulting from numerous ministries, departments and agencies (MDAs) involved in transport management.
- On lack of synergy among transport sector MDAs, the study has revealed that most mobility programmes in GAMA are delivered from the central government MDAs and usually do not have buy-in from other contending units. Consequently, these MDAs in transport planning design different programmes aimed at improving mobility in

GAMA. In the end, these programmes turn to conflict and often result in disjointed programming. Eventually, the divergence in transport planning regime in GAMA negatively affect mobility to the extent that there are limited choices for mobility in the area. This situation therefore limit mobility in GAMA to single modes and consequently impede mobility by commuters.

- In relation to possibilities for travel planning in GAMA, there study has revealed a challenge in the management of land use controls which negatively impacts transport development plans. The prevalence of this problem, challenges the country's allegiance to international conventions such as the just concluded Millennium Development Goal 9, in which cities were supposed to be designed to enhance environmental sustainability. Again, the ineffective control over land use in GAMA challenges the nation's commitment to its own Ghana Poverty Reduction Strategies 2010-2013 and 2014-2016, and ultimately the aspirations in SDG 11 in which cities are enjoined to improve human settlement forms to make them inclusive, safe, resilient and sustainable. Ineffective land use controls in GAMA has thus affected reservation of land for road infrastructure development, and therefore increased the cost of road constructions as compensations paid for private properties that often abut road projects turn to be deterrent. Lastly, these make GAMA prune to severe traffic congestion caused largely by micro factors including land use, too many vehicles for given road capacity and lane-switching. This form of congestion in

GAMA has adverse health impacts, loss of shade, impact on flora and fauna, flash flooding and low income particularly for the poor.

- On factors which impede introduction of travel plans in GAMA, the study has revealed the nature of urban road infrastructure development is characterized by the use of concrete road fences and kerbs to separate traffic. Notable among these developments include expansive road furniture which achieve limited effects on improving the turn-around time of commuters. These is because, these road furniture seek to control driver behaviour rather than enhancing broader interest of accessibility management.
- In furtherance to the above, the current traffic control measures are not amenable to application of intelligent transport systems to improve traffic assignment during peak periods in GAMA.
- On institutional factors which impede introduction of travel plans in GAMA, the study has revealed that the area lacks the necessary financial resources to implement its own road transport programmes due to its triple function of being national, regional and metropolitan capital. In view of its location, revenue realised at the local areas through vehicle importation fees from the ports, vehicle registration fees, as well as driver licensing fees and the fees charged on insurance and vehicle roadworthiness tests by the Driver and Licensing Authority are all paid into the Consolidated Fund operated from the centre. This arrangement hampers the accrual of adequate internally funds to propel transport development projects to aid mobility within GAMA.

- Operationally, the study has also revealed that none of the municipalities in GAMA has transit authority and consequently absence of transit policies. Rather, 11 municipalities have come together to initiate a transit authority under the auspices of the Greater Accra Passenger Transport Executive (GAPTE). The formation of GAPTE thus hampers the ability of the local authorities to regulate transport activities as they are required to perform under the Local Government Act of 2016. This institutional arrangement points to yet another operational incongruity in which a regulator could become an operator as the same time in an urban area.
- In terms of understanding the nature of congestion in GAMA, the study has revealed that congestion is largely due to proximate factors. These include the nature of road design as well as employment conditions prevalent in GAMA. The study has revealed that the nature of road designs restrict driver behaviour by separating road ways. Coupled with this, the employment patterns in GAMA demand that working hours begin and close at the same time (that is majority of workers start work at 8: 30 a.m. and close by 4: 30 p.m.). The recurrence of these practices turn to clog road networks during rush periods (either inbound or outbound) while the lanes are free. In view of the nature of road designs (raised humps meant to separate road ways), small changes in available capacity due to differential vehicle speeds, lane changes and vehicle break downs often trigger stop-and-go traffic in GAMA.

- Lastly, the study has suggested that since traffic congestion in GAMA is largely due to recurrent factors, that is congestion resulting from micro factors including too many cars, freight, lane switches and people using fewer roads, some employers could alternate working hours by changing working times from 8:30 a.m. to 12 noon to achieve faster travel speed of 5.9 km/h rather than the current 1.05 km/h in GAMA during morning peak period and evening peak hours. In this way, motorists could save time on travels, running costs and reduce stress burdens of workers.

Conclusions

With reference to the findings of the study, the conclusions detailed below were reached.

First, with reference to Objective 1, the capacity of the current urban transport policies has been found to be inadequate because they lack the impetus to deliver efficient transport services in GAMA. Additionally, even though the current policy is replete with well-intended local governance as captured in the Local Agenda 21 initiative 1992, real transport decisions are largely top-down and not consultative enough in view of the triple function of GAMA. Lastly, except for environmental impact briefings that are often conducted for the senior officers of the transport unions, no attempt is done to examine the social impacts of projects on the livelihoods of the beneficiaries of the intended projects in GAMA.

In a related manner regarding the second objective, the study has concluded that contrary to the intention to improve the turn-around time of commuters, there has been rather low mobility in GAMA even though the aesthetic value of city has been enhanced significantly. Again, low mobility in GAMA has been occasioned by the absence of alternative access road and east-west connectivities that promote network interoperability. The absence of interoperability among road network in GAMA, eventually clogs the road networks. This situation is the case of all newly constructed road networks in GAMA with their attendant negative effects on the quality of environment in urban areas, efficiency of workforce, cost of living, as well as family bonding and unity.

In line with the third objective, which was to explore factors that impede operations of travel plans by selected organizations in the Greater Accra Metropolitan Area (GAMA), the conclusions drawn from the study indicate that the current traffic control measures and urban planning models are ineffective and unsustainable to accessibility planning aspirations. In that road designs are operationally restrictive, only able to control driver behaviour but unable to improve mobility.

On objective four, the study concludes that travel plans by employers in GAMA could potentially eliminate the use of the prevailing inefficient modes like cars, shared taxis and mini buses from clogging the network during morning and evening rush hours daily. Secondly, that employers who adopt flexi-work scheduling and alternative working times would make savings on time, conserve energy that is dissipated in traffic and save cost environmentally and socially to the organisation. This could be achieved by streamlining travel behaviour of commuters in GAMA.

Lastly, objective five tended to model a suggested travel plan in GAMA and the study revealed that by staggering work schedules from the current 8:30 am to 12 noon, Time Mean Speed of 5.59 km/h could be achieved even with the current road-building designs. This would reduce traffic congestion, improve environmental safety and promote livelihoods of commuters in GAMA.

Contributions to knowledge

The study has presented a unique approach to understanding transport governance. This approach has not been adopted in Ghana to fully appreciate the challenges of urban mobility away from usual expansion of infrastructure and services. Secondly, the study has contributed to some mixed perspectives in the urban transport discourse that emphasises governance and regulation away from the conventional road pricing and mass transit to address the urban mobility quagmires in the Greater Accra Metropolitan Area. The study has addressed the problem of urban mobility from two fronts: physical/social and conventional/sustainable dimensions.

In terms of the first dimension, the study advocates a shift from the current physical mobility planning that espouses large-scale traffic forecasting to social transport provision in which accessibility planning, backed by people-centred and compact-form multi-level travel planning. Regarding the conventional to sustainable approaches, the study has further added to transport planning lexicon in GAMA, by advocating retrofitting of the urban form to ensure the current conventional approaches that emphasize segregation of transport infrastructure give way to integration to enable the introduction of innovative traffic assignment techniques, promote other modes including walking and cycling in the urban mobility management programmes.

Similarly, the study has advanced the view that the current approaches in which streets are seen as conduit to traffic movement are changed to create a 'sense of place' in which integrated street designs are created to enhance connectivity and the quality of the built environment is improved for greater pedestrian activity and interaction**.** Again, the study has argued that transport services be provided, not based on demand but supplied to offer alternatives to commuters. For these reasons, the study has advocated travel options that seek to calm traffic rather than promoting free flowing traffic paradigms which have the capacity to bring about temporary efficiency but eventually tend to clog the network as demand increases.

Recommendations

In order to achieve efficiency of roads in the urban space, the following recommendations are made based on the conclusions and findings of the study:

1) To address the inadequate capacity of the current urban transport policies and lack of force to deliver efficient transport services in GAMA, the study recommends policy makers in the government MDAs must ensure integration of social cost accounting into project-conception plans. This would forestall any future negative social-cost challenges as prevailing at the moment where road users fail to use projects after they have been completed because they do not address their immediate needs. This practice could mitigate congestion challenges in GAMA because many road users would switch to walking by using walkways. When this is done, those who would choose to ride by using bicycle lanes and those who would switch to

walk would do so on road reservations for those purposes to ultimately reduce traffic on the carriageway for those who want to travel by motorized transport.

2) In terms of addressing the limited options for mobility in GAMA, the study recommends for the establishment of one major urban planning government ministry by the government of Ghana. When this is done, the established ministry would achieve policy coherence and synergy to coordinate urban planning by controlling land use, deliver transport and communication programmes, promote housing, water and sanitation management and lastly, achieve resilience cities for all.

3) In relation to the above, the study recommends that urban and transport policy makers in the MDAs must aim at retrofitting of the urban transport planning paradigm to superimpose an urban form. This practices would balance land use and transport planning considerations to ensure that the current conventional approaches give way to integration and accessibility planning. Again, adopt place making strategies to connect places and activities in space rather than the current mobility and traffic flow management which have rather become counterproductive.

4) To improve the take- up of travel planning in GAMA to improve the turn-around time of commuters, the study recommends for strict enforcement of the provisions in the Part 3 of the Local Government Act of 2016 (Act 936) by the sector ministry, Ministry of Local Government and Rural Development. Under this provision, city authorities have functions for land use and spatial planning aspirations

to ensure that buildings and other permanent projects are regulated. Again, observance of these provisions would afford the development of innovative programmes to improve transport development. Again, this would ensure that adherence to land-use controls would promote accessibility planning, enhance the efficiency of road ways, reduce interactions by modes and maximise cost of traffic intervention projects in GAMA.

5) Regarding improving efficiency of travel plans in GAMA, the study recommends that the following bottlenecks saddling mobility planning be addressed by the responsible transport sector MDAs:

   1. The ministry of Finance and Economic Planning must address inadequate funding for transport projects at GAMA by committing a certain percentage from the Road Fund Act of 1997 (Act 455) to the metropolitan authorities within GAMA. This would enable the assemblies to develop their own transport development plans rather than relying on the central government for everything including minor road repairs. Again, when this is done, it would afford the assemblies the opportunity to hire services of requisite personnel to perform transport improvement audits, undertake periodic maintenance regime and ascertain impacts of transport on the livelihoods of the people to reduce impacts on mobility and livelihoods.
   2. Again, the government must allocate a certain percentage from the Road Fund to the assemblies within GAMA to enable the local authorities' address some of the operational challenges of planning

travel. This would enable the planning authorities recruit skilled personnel to design home-grown travel plans and multi-modal transit policies to coordinate transit activities. The development of these plans, would eliminate inefficient modes on the roads, improve mobility and enhance accessibility for all

3. Again, to improve governance of the transit services in GAMA, the study recommends that the Ministry of Transport amends provisions in the Omnibus Services Authority Decree (NLCD 337) of 1969 in line with current trends for implementation. This must be done by institutionalizing transit authorities within the local government system in Ghana. Transit Authority in GAMA would serve as the official mouthpiece for road transportation, set standards for fares (pricing) and negotiate for fuel prices to cushion commuters in GAMA. Secondly, the body could design an effective urban transit policy to ensure harmony in transit operations, and improve service delivery to attract the bourgeoning middle and vulnerable classes with unique mobility attractions.

6). As a way of addressing the recurrent traffic congestion, the study recommends for change in the manner in which working times begin and end in GAMA. To ensure this works for all, the study recommends for collaboration among employers, local authorities and transport service operators to plan for coordinated travel plans for GAMA. This would enhance optimization of roadways, and efficiency of traffic management policies in GAMA. To deliver predictable travel times, local authorities, employers and transport service operators in GAMA must aim at:

i. ensuring stronger coordination in transport and land use policies to reduce incidence of severity of congestion.

ii. there is periodic response by fixing defective traffic signals as well as removing defective vehicles on roads.

iii. managing congestion on roadways using three basic options to broadly manage physical access by motorized vehicles into the central business district of GAMA. These could be done by introduction of access policies such as ramp metering to ensure that road users register to access certain areas before they do so. Some of these places include access to historical centres such as visits to airport and airport city must be ramp metered. This would improve access, improve speed and reduce environmental livelihoods in prime zones. Secondly, zone-based access restrictions could be used to block access to urbanized zones in GAMA by use of one-way streets. Others could be restructuring some road networks to prevent through traffic. The reduced capacity would deter access by other motorists on those zones or links. In addition to access restrictions, some parking polices including public on-street parking, public off-street parking and private off-street parking could be employed to modify demand for area wide travels in GAMA. Lastly, road pricing policies such as non-pricing controls (area-wide bans, planned delays and operating permits) as well as area pricing policies including tolled cordons and supplementary licenses could be introduced in urbanized zones in GAMA to reduce congestion and manage traffic. These would minimize opportunities for travel by car to high trafficked places during rush hours and improve urban livelihoods.

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APPENDICES

APPENDIX A

TRAVEL AUDIT DATA AND CALCULATIONS

Koforidua Central Market to Effiduase Road (Inbound Traffic)

Central Market

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 35: 35	7: 35: 57	22s	Asphalted single lane with Traffic lights connecting the CBD and ministries area with Effiduase township with high level economic and social activity
Vehicle B	7: 48: 22	7: 48: 48	26s	
Stopped Delay	785s			
Total Travel Time =833s Running Time =48s Stopped Delay = 785s Total distance=200metres				

Commercial Bank link

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	8: 00: 53	8: 01: 12	19s	Asphaltic dual carriageway without ancillaries in both direction with high level economic and social activity
Vehicle B	8: 10: 13	8: 10: 38	25s	
Stopped Delay	541s			
Total Travel Time = 585s Running Time = 44s Stopped Delay = 541s Total distance=200metres				

Ministries Link

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 41: 23	7: 41: 47	24s	Asphaltic dual carriageway without ancillaries in both direction with high level economic and social activity
Vehicle B	7: 53: 37	7: 54: 20	43s	
Stopped Delay	669s			
Total Travel Time = 736s Running Time = 67s Stopped Delay = 669s Total distance=200metres				

Effiduase Road

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 51: 45	4: 52: 44	59s	Asphaltic one-way access road connecting the Central Market, central Transport Terminal
Vehicle B	4: 55: 00	4: 56: 00	60s	
Stopped Delay	176s			
Total Travel Time = 295s Running Time = 119s Stopped Delay = 176s Total distance=200metres				

Oyoko Link

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	5: 06: 28	5: 10: 45	257s (4min 17s)	Asphaltic one-way access road connecting the Central Market, central Transport Terminal
Vehicle B	5: 12: 15	5: 13: 56	101s (1min 41s)	
Stopped Delay	67s			
Total Travel Time = 425s Running Time = 358 Stopped Delay = 67s Total distance=200metres				

Measuring Time Mean Speed in the New Juabeng Municipality

Data Items	Central Market	Commercial Bank link	Ministries Link	Effiduase Police station	Oyoko Traffic Lights	Sum	Average
Travel Time (s)	833	585	736	295	425	2874	574.8
Running Time (s)	48	44	67	119	358	636	127.2
Stopped Delay (s)	785	541	669	176	67	2238	447.6
Travel Speed (m/s)	0.24	0.34	0.27	0.67	0.47	1.99	0.398

Total Length of Amasaman to Accra Central corridor=26km

Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = 0.726m/s

(0.2km/h ie every one hour a vehicle covers a distance of 200metres on the Amasaman to CBD corridor during morning rush hour).

Space-Mean Speed= Number of runs *distance/sum of Travel Times (8*26000/2213 = 93. 99m/s)

26.1km/h

GAMA: Amasaman to Accra Road

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 27: 26	6: 34: 04	398s (6mins 38s)	Asphaltic dual carriageway without ancillaries in both direction with two U-Turns at Amanfrom and Pokuase junctions
Vehicle B	6: 38: 39	6: 43: 50	311s (5mins 11s)	
Stopped Delay time	275s			
Total Travel Time (s) = 984s Running Time = 709s Stopped Delay = 275s Total distance= 200metres				

GAMA: Ofankor on Amasaman to Accra Road

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	7: 30: 16	7: 32: 25	129s (2mins 09s)	Asphaltic dual carriageway Round-about with holding access and other ancillaries in both directions
Point B	7: 34: 20	7: 41: 20	180s (3mins)	Asphaltic dual carriageway with holding access and other ancillaries in both directions
Stopped Delay	115s			
Total Travel Time = 424s Running Time = 309s Stopped Delay = 115s Total distance=200metres				

Achimota Expressway

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	8: 10: 50	8: 14: 01	191s (3mins 11s)	Asphaltic 5 lane carriageway with double express lanes separated by fences as well as holding lanes and NMT access lanes in both directions.
Point B	8: 21: 16	8: 24: 03	167s (2mins 47s)	
Stopped Delay	435s			
Total Travel Time = 793s Running Time = 358s Stopped Delay = 435s Total distance=200metres				

At Achimota (BRT Bus)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	8: 49: 49	8: 51: 01	72s (1min 12s)	Asphaltic 3 lanes carriageway in both directions
Point B	8: 51: 08	8: 52: 25	77s (1min 17s)	
Stopped Delay	07s			
Total Travel Time = 156s Running Time = 149s Stopped Delay = 07s Total distance=200metres				

Tesano on Amasaman - Accra Corridor

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	8: 57: 32	8: 58: 45	73s (1m 13s)	Asphaltic 3 lanes carriageway in both directions with mixed BRT use
Point B	9: 00: 20	9: 01: 10	50s	
Stopped Delay	95s			
Total Travel Time = 218s Running Time = 123s Stopped Delay = 95s Total distance=200metres				

Abeka Junction to Caprice Junction (measuring Travel Speed of BRT Bus) on Amasaman - Accra Corridor

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	9: 03: 58	9: 04: 40	42s	Asphaltic 3 lanes carriageway in both directions with mixed BRT use
Point B	9: 07: 25	9: 09: 12	107s (1min 47s)	
Stopped Delay	105s (2min 45s)			
Total Travel Time = 254s Running Time =149s Stopped Delay = 105s Total distance=200metres				

From GOIL Station at Caprice to Circle GCB

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	9: 12:30	9: 15: 09	149s (2min 29s)	Asphaltic 3 lanes carriageway in both directions with mixed BRT use
Point B	9: 16: 03	9: 18: 30	147s (2min 27s)	
Stopped Delay	54s			
Total Travel Time = 350s Running Time = 296s Stopped Delay = 54s Total distance=200metres				

From Circle GCB to Tudu BRT Terminating Station

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Point A	9: 21 : 00	9: 22: 25	85s (1min 25s)	Asphaltic 3 lanes carriageway in both directions with mixed BRT use
Point B	9: 22: 55	9: 23: 30	35s	Asphaltic 3 lanes carriageway in both directions with mixed BRT use
Stopped Delay	30s			Asphaltic 3 lanes carriageway with BRT lane in the median but several interruptions
Total Travel Time = 150s Running Time = 120s Stopped Delay = 30s Total distance=200metres				

Comparing Time Mean Speed and Space Mean Speeds on the Amasaman to Accra Corridor.

Morning Rush Hour Traffic:

Data Items	Amasaman	Ofankor	Ofankor Expressway	Achimota	Tesano	Abeka Junction	Caprice	Tudu BRT lane	Sum	Average
Travel Time (s)	984	424	798	156	218	254	350	150	3234	404.25
Running Time (s)	709	309	358	149	123	149	296	120	2,213	276.625
Stopped Delay (s)	275	115	435	07	95	105	54	30	1116	139.50
Travel Speed (m/s)	0.20	0.47	0.25	1.28	0.92	0.79	0.57	1.33	5.81	0.726
Total Length of Amasaman to Accra Central corridor=26km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = 0.726m/s (0.2km/h ie every one hour a vehicle covers a distance of 200metres on the Amasaman to CBD corridor during morning rush hour). Space-Mean Speed= Number of runs *distance/sum of Travel Times (8*26000/2213 = 93. 99m/s) 26.1km/h										

On Accra –Kasoa Corridor (Outbound Traffic audit)

Kaneshie

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	5: 08: 03	5: 09: 27	84s (1min 24s)	Asphaltic 4 carriageway with interchanges in both directions as well as Kaneshie Market and transport Terminal
Vehicle B	5: 11: 38	5: 12: 55	77s (1min 17s)	Asphaltic 4 carriageway with interchanges in both directions
Stopped Delay	131s			
Total Travel Time = 292 Running Time = 161 Stopped Delay = 131s Total distance=200metres				

Darkuman Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	5: 22: 40	5: 29: 24	104s (1min 44s)	Asphaltic 4 carriageway with interchanges in both directions
Vehicle B	5: 32: 25	5: 35:12	167s (2mins 47s)	
Stopped Delay	181s			
Total Travel Time = 462s Running Time =271s Stopped Delay = 181s Total distance=200metres				

1st Light

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	5: 37: 25	5: 42: 55	330 (5min 30)	Asphaltic 4 carriageway with interchanges in both directions
Vehicle B	5: 45: 25	5: 47: 35	130s (2mins 10s)	
Stopped Delay	150s			
Total Travel Time = 610s Running Time = 460s Stopped Delay = 150s Total distance=200metres				

Odorkor Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	5: 54: 09	5: 56: 15	126s (2mins 06s)	Asphaltic 3 carriageway in both directions with traffic lights and other interchanging facilities
Vehicle B	6: 01: 43	6: 03: 20	97s (1min 37s)	
Stopped Delay	328s			
Total Travel Time = 551s Running Time = 223 Stopped Delay = 328 Total distance=200metres				

Malam Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 34: 57	6: 39: 39	282s (4min 42s)	
Vehicle B	6: 42: 48	6: 46: 57	251s (4min 11s)	
Stopped Delay	189s			
Total Travel Time = 722s Running Time = 533s Stopped Delay = 189s Total distance=200metres				

Jayee University

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 50: 48	6: 54: 57	249s (4min 09s)	Asphaltic 5 carriageway in both directions with interchanging access
Vehicle B	6: 56: 05	7: 00: 04	239s (3min 59s)	
Stopped Delay	68s			
Total Travel Time = 556s Running Time = 288s Stopped Delay = 68s Total distance=200metres				

Weija to Weija Shop Rite Mall (Outbound Traffic Audit)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 05: 05	7: 09: 01	236s (3min 56s)	Asphaltic 5 carriageway in both directions with interchanging access as well as high levels of economic and social activity
Vehicle B	7: 11: 59	7: 15: 12	193 (3min 13s)	
Stopped Delay	178s (2min 58s)			
Total Travel Time = 607s Running Time = 426s Stopped Delay = 178s Total distance=200metres				

Comparing the Time-Mean and Space Mean Speed on the Weija to Accra Corridor

(Evening Rush Hour Traffic)

Data Items	Kaneshie	Darkuman Junction	1st Light	Odorkor Junction	Malam Junction	Jayee University	Weija Shoprite	Sum	Average
Travel Time (s)	292	462	610	551	722	556	607	3800	542.86
Running Time (s)	161	271	460	223	533	228	426	2302	328. 86
Stopped Delay (s)	131	181	150	328	189	68	178	1054	150.57
Travel Speed (m/s)	0.68	0.43	0.32	0.36	0.26	0.36	0.33	2.38	0.34
Total Length of Weija to Accra Central corridor=23km Time-Mean Speed= (sum of distance/travel Time) / number of runs = 0.049m/s (0.013km/h ie every one hour a vehicle covers a distance of 13metres per hour the Kaneshie to Weija corridor during evening peak hours) Space-Mean Speed= Number of runs *distance/sum of Travel Times (7*23000/2302 = 69. 94m/s) 19. 43km/hour									

Adenta to Accra (Inbound Traffic Audit)

Adenta Redco Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 43: 22	7: 45: 25	123s (2min 03s)	Asphaltic 5 carriageway with interchanging access lanes in opposite directions as well as NMT lanes
Vehicle B	7: 46: 25	7: 52: 25	360s (6mins)	Two lane asphaltic connector linking 5 lane corridor
Stopped Delay	60s			
Total Travel Time = 543s Running Time = 483 Stopped Delay = 60s Total distance=200metres				

Madina Market Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 56:57	7: 58: 34	97s (1min 37s)	Asphaltic 5 carriageway with interchanging access lanes in opposite directions as well as NMT lanes in front of University of Ghana
Vehicle B	7: 59: 19	8: 01: 55	156s (2mins 36s)	
Stopped Delay	45s			
Total Travel Time = 298s Running Time = 253s Stopped Delay = 45s Total distance=200metres				

Legon to Accra (Inbound Traffic Audit)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 07: 22	9: 12: 38	316s (5mins 16s)	Asphaltic 5 carriageway with interchanging access lanes in opposite directions as well as NMT lanes in front of University of Ghana
Vehicle B	9: 12: 52	9: 15: 58	186s (3mins 06s)	
Stopped Delay	14s			
Total Travel Time = 516s Running Time = 502s Stopped Delay = 14s Total distance=200metres				

Emmanuel Eye Traffic Lights

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 23: 19	9: 25: 55	156s (2mins 36s)	Asphaltic 5 carriageway with interchanging access lanes in opposite directions as well as NMT lanes in front of University of Ghana
Vehicle B	9:26: 17	9: 30: 30	253s (4mins 13s)	
Stopped Delay	23s			
Total Travel Time = 432s Running Time = 409s Stopped Delay = 23s Total distance=200metres				

Shiashie to Accra (Inbound Traffic)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 31: 54	9: 33: 15	81s (1min 21s)	5 lanes asphaltic corridor with traffic Interchange at Gulf House
Vehicle B	9: 33: 28	9: 34: 55	87s (1min 27s)	Traffic on 5lane road at Shiashie
Stopped Delay	13s			
Total Travel Time = 181s Running Time = 168s Stopped Delay = 13s Total distance=200metres				

Opeibea to Accra (Inbound Traffic Audit)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 42: 44	9: 45: 03	139s (2mins 19s)	Opeibea traffic interchange
Vehicle B	9: 45:10	9: 47: 03	113s (1min 53s)	Traffic on 5 lane road in between Opeibea and 37 DVLA
Stopped Delay	7s			
Total Travel Time = 269 Running Time = 252 Stopped Delay = 7s Total distance=200metres				

37 Enclave

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 49: 50	9: 52: 22	152s (2mins 32s)	Opeibea traffic interchange
Vehicle B	9: 55 : 10	9 : 59: 15	165 (4mins 5s)	Traffic on 5 lane road at 37 DVLA
Stopped Delay	168s			
Total Travel Time = 485 Running Time = 317s Stopped Delay = 168s Total distance=200metres				

Comparison of Time-Mean and Space Mean Speeds of the Adenta to Accra CBD corridor

Morning Rush Hour Traffic

Data Items	Adenta Redco Junction	Madina Market	Legon Junction	Emmanuel Eye Traffic	Shiashie Mall area	Opeibea Traffic lights	37 enclave	Sum	Average
Travel Time (s)	543	298	576	432	181	269	485	2784	397.71
Running Time (s)	483	253	502	409	168	252	317	2384	340.57
Stopped Delay (s)	60	45	14	23	13	7	168	330	47.14
Travel Speed (m/s)	0.36	0.67	0.34	0.46	1.10	0.74	0.41	4.08	0.58

Total Length of Adenta to Accra Central corridor=17km

Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (0.87m/s) 0.24km/h (or travels 240m per hour).

Space-Mean Speed= Number of runs *distance/sum of Travel Times (42.74m/s) (11.87km/h)

Accra to Teshie corridor (Outbound Traffic Audit)

37 station

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 16: 20	4: 16: 32	12s	Traffic on 3lane road corridor with interchange and NMT in front of Burma Camp
Vehicle B	4: 16: 44	4: 18: 25	101s (1min 41s)	
Stopped Delay	8s			
Total Travel Time = 121s Running Time = 113s Stopped Delay = 8s Total distance=200metres				

Elwak Stadium Traffic

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 18: 32	4: 18: 40	08s	Traffic on 3lane road corridor with interchange and NMT in front of Burma Camp
Vehicle B	4: 22: 00	4: 22: 40	40s	
Stopped Delay	240s			
Total Travel Time = 288s Running Time = 48s Stopped Delay = 420s Total distance=200metres				

Burma Camp

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 22: 25	4: 22: 37	12s	Traffic on 3 lane dual carriage with interchange facilities in front of Burma camp.
Vehicle B	4: 23: 30	4: 23: 43	13s	
Stopped Delay	93s			
Total Travel Time = 118s Running Time = 25s Stopped Delay = 93s Total distance=200metres				

Trade Fair Site

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 27: 07	4: 27: 18	11 s	Traffic on 2 lane dual carriage on the Military enclave towards trade Fair site with minimal civilian interface on the Teshie road.
Vehicle B	4: 28: 18	4: 28: 27	09s	
Stopped Delay	13s			
Total Travel Time = 33s Running Time = 20s Stopped Delay = 13s Total distance=200metres				

La Hotels Traffic Light

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 28: 40	4: 28: 50	10s	Traffic on 2 lane dual carriage on the Military enclave with minimal civilian interface on the Teshie road.
Vehicle B	4: 32: 23	4: 33: 52	89s (1min 29s)	
Stopped Delay	253s			
Total Travel Time = 352s Running Time = 99s Stopped Delay = 253s Total distance=200metres				

Teshie Township (Outbound Traffic)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	4: 34: 36	4: 35: 55	79s (1min 19s)	Traffic on 2 lane dual carriage in Teshie township
Vehicle B	4: 36: 15	4: 37: 18	63s (1min 03s)	
Stopped Delay	60s			
Total Travel Time = 202s Running Time = 142s Stopped Delay = 60s Total distance=200metres				

Comparing Time-Mean and Space Mean Speeds of 37 to Teshie Corridor

Evening Rush Hour Traffic Audit

Data Items	37 Station	Elwak Stadium	Burma Camp	Trade Fair site	La Palm Hotels	Teshie Township	Sum	Average
Travel Time (s)	121	288	118	33	252	202	1014	144.85
Running Time (s)	113	48	25	20	99	142	447	63.85
Stopped Delay (s)	8	420	93s	13	253	60	847	121
Travel Speed (m/s)	1.65	0.69	1.06	6.06	0.79	0.99	11.24	1.60
Total Length of Amasaman to Accra Central corridor=11km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (1.8m/s) Drivers traverse every half of a kilometre in one hour (0.5km/h) or 500metres per hour. Space-Mean Speed= Number of runs *distance/sum of Travel Times (6*11000/1014= 65.1m/s) 18km/h								

Teshie to Accra (Inbound Traffic Audit)

Burma Camp

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 01: 22	6: 05: 45	263s (4min 23s)	Traffic at the La Trade fair Site to Elwak Stadium on the newly constructed 3 lane dual carriage with interchange facilities.
Vehicle B	6: 06: 12	6: 10: 59	287s (4min 47s)	
Stopped Delay	67s			
Total Travel Time = 617s Running Time = 550s Stopped Delay = 67s Total distance=200metres				

Elwak Stadium

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 13: 39	6: 18: 05	306s (5min 1s)	Traffic at the La Trade fair Site to Elwak Stadium on the newly constructed 3 lane dual carriage with interchange facilities.
Vehicle B	6: 21: 39	7: 25: 05	266s (4min 26s)	
Stopped Delay	214s			
Total Travel Time = 786s Running Time = 572s Stopped Delay =214s Total distance=200metres				

37 to Accra (Inbound Traffic)

<table>
<tr><td>Run</td><td>Start Time</td><td>End Time</td><td>Travel time (in seconds)</td><td>Road Characteristics</td></tr>
<tr><td>Vehicle A</td><td>7: 26: 00</td><td>7: 31: 07</td><td>307s (5min 07s)</td><td rowspan="3">Traffic in front of Survey Department to 37 roundabout on the newly constructed 3 lane dual carriage with interchange facilities.</td></tr>
<tr><td>Vehicle B</td><td>7: 33: 35</td><td>7: 45: 53</td><td>738s (12min 18s)</td></tr>
<tr><td>Stopped Delay</td><td>148s</td><td></td><td></td></tr>
<tr><td colspan="5">Total Travel Time = 1783s
Running Time = 1045s
Stopped Delay = 738s
Total distance=200metres</td></tr>
</table>

Teshie to Accra Morning Rush Hour Traffic

<table>
<tr><td>Data Items</td><td>Burma Camp</td><td>Elwak Stadium</td><td>37 Traffic Lights</td><td>Sum</td><td>Average</td></tr>
<tr><td>Travel Time (s)</td><td>617</td><td>876</td><td>1783</td><td>3276</td><td>1092</td></tr>
<tr><td>Running Time (s)</td><td>550</td><td>572</td><td>1045</td><td>1860</td><td>620</td></tr>
<tr><td>Stopped Delay (s)</td><td>67</td><td>214</td><td>738</td><td>1019</td><td>339.6</td></tr>
<tr><td>Travel Speed (m/s)</td><td>0.32</td><td>0.22</td><td>0.11</td><td>0.65</td><td>0.21</td></tr>
<tr><td colspan="6">Total Length of Amasaman to Accra Central corridor=11km
Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs =
(1.8m/s) Drivers traverse every half of a kilometre in one hour (0.5km/h) or 500metres per hour.
Space-Mean Speed= Number of runs *distance/sum of Travel Times (6*11000/1014= 65.1m/s) 18km/h</td></tr>
</table>

37 to Amasaman (Outbound Traffic Audit)

37 Roundabout

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 15: 38	6: 19: 50	252s (4min 12s)	Traffic on the evening peak hour travel situation on the Olusegun Obasanjo dual carriageway
Vehicle B	6: 19: 51	6: 24: 22	251s (4min 11s)	
Stopped Delay	1s			
Total Travel Time = 504s Running Time = 503s Stopped Delay = 1s Total distance=200metres				

Kaukudi Interchange

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 25: 00	6: 25: 42	42s	Traffic on the evening peak hour travel situation on the Olusegun Obasanjo dual carriageway
Vehicle B	6: 29: 20	6:31: 11	111s (1min 51s)	
Stopped Delay	258s			
Total Travel Time = 411s Running Time = 153s Stopped Delay = 258s Total distance=200metres				

Dwowulu Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 31: 53	6: 34: 29	156s (2min 36s)	Traffic on the evening peak hour travel situation on the Olusegun Obasanjo dual carriageway joining the 5 lane Ofankor corridor
Vehicle B	6:41:00	6: 43: 35	155s (2min 35s)	
Stopped Delay	431s			
Total Travel Time = 742s Running Time = 311s Stopped Delay = 431s Total distance=200metres				

Neoplan Traffic Interchange

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 15: 25	7: 18: 09	164s(2min 44s)	Evening peak hour travel situation on the Ofankor 2 lane dual carriageway
Vehicle B	7:30: 29	7:32: 39	130s (2min 10s)	
Stopped Delay	722s			
Total Travel Time = 1016s Running Time = 294s Stopped Delay = 722s Total distance=200metres				

Pokuase Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 33: 08	7: 34: 16	76s (1min 16s)	Evening peak hour travel situation on the Pokuase 2 lane dual carriageway
Vehicle B	7: 36: 16	7: 40: 34	258s (4min 18s)	
Stopped Delay	120s			
Total Travel Time = 454s Running Time = 334s Stopped Delay = 120s Total distance=200metres				

Comparing Time-Mean and Space Mean Speeds on 37 to Amasaman Road Corridor

Evening Rush Hour Traffic Audit

Data Items	37 Roundabout	Kuakudi Interchange	Dwowulu Traffic lights	Neoplan Traffic Interchange	Pokuase Junction	Sum	Average
Travel Time (s)	504	411	742	1016	454	3127	625.4
Running Time (s)	503	153	311	294	334	1595	319
Stopped Delay (s)	1	258	431	722	120	1532	306.4
Travel Speed (m/s)	0.39	0.48	0.26	0.19	0.44	1.76	0.352
Total Length of Amasaman to Accra Central corridor=23km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (1.4m/s) Drivers traverse every half of a kilometre in one hour (0.3km/h) or 300metres per hour. Space-Mean Speed= Number of runs *distance/sum of Travel Times (5*23/3127= 0.03m/s) 8km/h							

Pokuase to Awoshie By pass road (Inbound Traffic)

Ablekuma Stretch

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 05: 47	6: 05: 55	08s	New East-West connector with ancillary facilities and interchanging lanes.
Vehicle B	6: 07: 18	6: 08: 14	56s	
Stopped Delay	123s			
Total Travel Time = 187s Running Time = 64 Stopped Delay = 123s Total distance=200metres				

Fan Milk

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 08: 25	6: 08: 35	10s	New East-West connector with ancillary facilities and interchanging lanes.
Vehicle B	6: 09: 25	6: 10: 07	42s	
Stopped Delay	09s			
Total Travel Time = 61s Running Time = 52s Stopped Delay = 09s Total distance=200metres				

Odorgonnor Senior High stretch (Inbound Traffic)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 11: 33	6: 11: 55	22s	Awoshie Junction traffic lights effect
Vehicle B	6: 12: 54	6: 15: 53	179s (2min 59s)	
Stopped Delay	99s			
Total Travel Time = 300s Running Time =201s Stopped Delay = 99s Total distance=200metres				

Awoshie Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 16: 30	6: 17: 02	32s	5 lanes apart with ancillary facilities and fences
Vehicle B	6: 17: 36	6: 20: 39	173s (2min 53s)	
Stopped Delay	34s			
Total Travel Time = 239s Running Time = 205s Stopped Delay = 34s Total distance=200metres				

Comparing Time Mean and Space Mean Speed of the Pokuase to Awoshie Bypass

Morning Rush Hour Traffic

Data Items	Ablekuma Traffic lights	Fan Milk	Odogonnon SHS	Awoshie Interchange	Sum	Average
Travel Time (s)	187	61	300	139	687	171.75
Running Time (s)	64	52	201	205	522	130.5
Stopped Delay (s)	123	09	99	34	265	66.25
Travel Speed (m/s)	1.06	3.27	0.66	1.43	6.42	1.605

Total Length of Amasaman to Accra Central corridor=11km

Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs =

(1.8m/s) Drivers traverse every half of a kilometre in one hour (0.5km/h) or 500metres per hour.

Space-Mean Speed= Number of runs *distance/sum of Travel Times (6*11000/1014= 65.1m/s) 18km/h

N1Highway to Lapaz (Inbound Traffic)

Baayard Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 17: 36	6: 20: 39	173s (2min 53s)	5 lanes apart with ancillary facilities and fences
Vehicle B	6: 21: 44	6: 25: 09	245s (3min 65s)	
Stopped Delay	65s			
Total Travel Time = 483s Running Time = 418s Stopped Delay = 65s Total distance=200metres				

Lapaz stretch (Inbound Traffic)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 27: 12	6: 29: 15	99s (1min 39s)	5 lanes apart in opposite directions with ancillary facilities and fences
Vehicle B	6: 31: 02	6: 31: 11	09s	
Stopped Delay	147s			
Total Travel Time = 255s Running Time = 108s Stopped Delay = 147s Total distance=200metres				

Apenkwa Overhead

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 31: 44	6: 32: 08	24s	5 lanes apart in opposite directions with ancillary facilities and fences
Vehicle B	6: 35: 25	6: 35: 36	11s	
Stopped Delay	197s			
Total Travel Time = 232s Running Time = 35s Stopped Delay = 197s Total distance=200metres				

Dwowulu Junction on the N1 Highway (Outbound traffic in the morning rush hour without traffic)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 45: 22	6: 45: 27	05s	5 lanes apart in opposite directions with ancillary facilities and fences
Vehicle B	6: 46: 10	6: 46: 16	06s	
Stopped Delay	83s			
Total Travel Time = 94s Running Time = 11s Stopped Delay = 83s Total distance=200metres				

Akweteyman Junction on the N1 Expressway (on outbound lane)

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 48: 15	6: 48: 26	11s	5 lanes apart in opposite directions with ancillary facilities and fences
Vehicle B	6: 49: 35	6: 49: 44	09s	
Stopped Delay	69s			
Total Travel Time = 89s Running Time = 20s Stopped Delay = 69s Total distance=200metres				

Fiesta Royal Hotel Traffic lights

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	6: 50: 13	6: 50: 23	10s	5 lanes apart in opposite directions with ancillary facilities and fences
Vehicle B	6: 52: 25	6: 52: 40	15s	
Stopped Delay	122s			
Total Travel Time = 145s Running Time = 25s Stopped Delay = 122s Total distance=200metres				

Comparing Time Mean and Space Mean Speed of the Malam to Accra end of Motorway Corridor

Morning Rush Hour Traffic

Data Items	Baayard Traffic lights	Lapaz Traffic lights	Akweteyman Overhead	Apenkwa Overhead	Dwowulu Junction	Fiesta Royal Traffic	Sum	Average
Travel Time (s)	483	255	89	232	94	145	1298	216.33
Running Time (s)	418	108	20	35	11	25	619	102.83
Stopped Delay (s)	65	149	69	197	83	122	685	114.16
Travel Speed (m/s)	0.41	0.78	2.24	0.86	2.12	1.36	7.77	1.295
Total Length of Malam to Motorway corridor=21km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (2.69m/s) Drivers traverse every half of a kilometre in one hour (0.74km/h) or 740metres per hour. Space-Mean Speed= Number of runs *distance/sum of Travel Times (6*21000/1298= 97.0m/s) 26km/h								

Lapaz to Dwowulu on outbound lane in the morning peak hour with minimal traffic

Abofu Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 14: 59	7: 15: 17	18s	2 lanes apart in opposite directions with partly developed ancillary facilities and fences in the median and shoulders
Vehicle B	7: 19: 16	7: 19: 29	13s	
Stopped Delay	279s			
Total Travel Time = 310s Running Time = 31s Stopped Delay = 279s Total distance=200metres				

Dwowulu roundabout

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 22: 24	7: 22: 57	33s	2 lanes roundabout with developed ancillary facilities and fences in the median and shoulders
Vehicle B	7: 23: 40	7: 24: 17	77s (1min 17s)	
Stopped Delay	83s			
Total Travel Time = 187s Running Time = 110s Stopped Delay = 77s Total distance=200metres				

Dwowulu Traffic Interchange

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	7: 23: 37	7: 26: 09	192s (3min 12s)	2 lanes apart in opposite directions with partly developed ancillary facilities and fences in the median and shoulders
Vehicle B	7: 28: 15	7:31: 04	209s (3mins 29s	
Stopped Delay	126s			
Total Travel Time = 527s Running Time = 401s Stopped Delay = 126s Total distance=200metres				

Mid-morning Time Mean Speed on the Dwowulu to 37 corridor (Outbound Traffic)

Data Items	Abofu Junction	Dwowulu Roundabout	Dwowulu Traffic Interchange	Sum	Average
Travel Time (s)	310	187	527	1024	341.3
Running Time (s)	31	110	401	542	180.6
Stopped Delay (s)	279	77	126	482	160.6
Travel Speed (m/s)	0.64	1.06	0.37	2.07	0.69
Total Length of Dwowulu to 37 corridor=4.6km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (1.49m/s) Drivers traverse every half of a kilometre in one hour (0.41km/h) or 41metres per hour. Space-Mean Speed= Number of runs *distance/sum of Travel Times (3*4600/1042= 13.2m/s) 3.6km/h					

Pokuase to Achimota late morning (Inbound)

Amanfrom Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 18: 56	9: 19: 02	06s	Dual carriageway without ancillaries in both direction
Vehicle B	9: 20: 10	9: 20: 20	10s	
Stopped Delay	68s			
Total Travel Time = 84s Running Time = 16s Stopped Delay = 68s Total distance=200metres				

Pokuase Junction

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 20: 25	9: 20: 32	07s	Dual carriageway without ancillaries in both direction
Vehicle B	9: 20: 40	9: 20: 47	07s	
Stopped Delay	8s			
Total Travel Time =22s Running Time = 14s Stopped Delay = 8s Total distance=200metres				

John Teye

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 21: 25	9: 21: 34	09s	Dual carriageway without ancillaries in both direction
Vehicle B	9: 21: 50	9: 22: 00	10s	
Stopped Delay	16s			
Total Travel Time = 35s Running Time = 19s Stopped Delay = 16s Total distance=200metres				

Ofankor

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 32: 22	9: 32: 31	11s	3 lane in both directions with ancillary facilities and high pedestrian activity.
Vehicle B	9: 33: 06	9: 33: 14	08s	
Stopped Delay	75s			
Total Travel Time = 94s Running Time = 19s Stopped Delay = 75s Total distance=200metres				

Achimota Overheard

Run	Start Time	End Time	Travel time (in seconds)	Road Characteristics
Vehicle A	9: 41: 25	9: 41: 34	09s	3 lane in both directions with ancillary facilities and high pedestrian activity.
Vehicle B	9: 42: 10	9: 42: 25s	15s	
Stopped Delay	76s			
Total Travel Time =100s Running Time = 24 Stopped Delay = 76s Total distance=200metres				

Comparing Time Mean and Space Mean Speed of the Pokuase to Achimota Corridor late Morning when Traffic volumes are low

Data Items	Amanfrom Junction	Pokuase Junction	John Teye	Ofankor	Achimota Overheard	Sum	Average
Travel Time (s)	84	22	35	94	100	335	67
Running Time (s)	165	14	19	19	24	241	48.2
Stopped Delay (s)	68	8	16	75	76	243	48.6
Travel Speed(m/s)	2.38	9.09	5.71	2.12	2.00	21.3	4.26
Total Length of Pokuase to Achimota corridor=14km Time-Mean Speed= Summation of ATS/Number of Runs= (sum of distance/travel Time) / number of runs = (8m/s) Drivers traverse every half of a kilometre in one hour (2km/h) per hour. Space-Mean Speed= Number of runs *distance/sum of Travel Times (5*14000/335= 203m/s) 56km/h							

Comparing Estimated Travel Time and Actual Travel Times in GAMA

Route	Distance to CBD	Estimated Travel time	Space Mean Speed	Actual Travel Time
Adenta to CBD (inbound)	17km	30mins	11.87km/h	1hour 24mins
Weija to CBD (outbound)	23km	41mins	19.43km/h	1hour 10mins
Amasaman to CBD	26km	44mins	26.1km/h	1hour
Teshie to 37	11km	22mins	18km/h	36mins

APPENDIX B: **INTERVIEW GUIDE FOR URBAN PLANNING IN GAMA.**

Spatial Development Plan for GAMA, Ghana

1. Why did it take so long a time to review the spatial development plan for Accra since 1944

2. What have prevented same for the whole nation?

Challenges of Implementing Urban Planning regulation

3. Do you agree with the view espoused by the National Urban Policy Framework (2012) below:

    (i) weak governance structures;

    (ii) lack of capacity of the MMDAs to perform urban management functions under the decentralization policy as outlined in the provisions of the National Development Planning (Systems) Act, 1994 (Act 480);

    (iii) failure of MDAs to transfer functions, personnel and resources to the MMDAs as required under the decentralization policy;

    (iv) failure of MMDAs and RCC to effect institutional coordination, as required under amended Act 462;

    (v) parallel statutory provisions; and

    (vi) External donor programmes and projects whose implementation arrangements tend to undermine the decentralization policy.

4. Have these challenges being overcome to advance the courses identified in the National Spatial Development Framework towards effective urban life in GAMA?

Decentralization in GAMA

5. Do you agree that the current programme of decentralization is helpful?
6. There are plans to decentralize road infrastructure management where DUR and DFR will be fully devolved into the MMDAs, to what extent would this programme help given the low capacity of the decentralization programme?
7. What is the level of decentralization do you subscribe to be devolved to the MMDAs?

Challenges of land ownership and Transport infrastructure in GAMA

8. Do you agree the presence of the following policies: the State Lands Act, 1962 (Act 125), the National Development Planning Commission Act, 1994 (Act 479) as well as the National Development Planning (Systems) Act, 1994 (Act 480) are suitable for spatial, land use and human development planning functions in GAMA
9. If yes, to what extent does the inadequate budgetary support to MMDAs, hampered the weak statutory basis for strategic planning, land use control and urban management in GAMA?
10. To what extent do the above issues affect spatial development plans in Ghana as a whole?

Potential Factors impinging Travel Plans in GAMA

11. Would you support travel planning as an option to improve mobility in GAMA?
12. What considerations do you think are likely to impede the efficiency of travel plans in GAMA today?
13. In the midst of the challenges of mobility today, what in your opinion are the prospects for travel plans in GAMA?

Challenges of NMT

14. The GHA and DFR have plans to incorporate NMT facilities in transport development plans. What has been the main challenges to this programme?

Challenges of land ownership and Transport infrastructure in GAMA

15. Do you agree with the view that the 'efficiency of GAMA in managing housing and transport infrastructure is humped greatly by its lack of control on land ownership land use planning under its jurisdiction'?
16. To what extent does the issue of land ownership and control in Ghana affect housing and road infrastructure development in view of the fact that the development of land tenure institutions have not moved in tandem with socio-economic development in Ghana?

APPENDIX C: **INTERVIEW GUIDE FOR TRANSPORT POLICY MAKERS**

A. Current Transport Policy

1. Is the current transit policy suitable for mobility in GAMA?
2. Please check its strengths and challenges against the Mobility Management Checklist

Please check the list below.

Item	**Improve Transport Options**		×	**Incentives to Reduce Driving**		×
1	Alternative Work Schedules			Vehicle Use Restrictions		
2	Bicycle Improvement Plan			Street Reclaiming		
3	Bike/Transit Integration			Speed Reductions		
4	Car Sharing			Road Pricing		
5	Flexible Working Time (Flextime)			Pay-as-You-Drive Vehicle Insurance		
6	Guaranteed Ride Home			Parking pricing		
7	Individual Actions for Efficient Transport			Fuel Taxes		
8	Park and Ride			HOV Priority		
9	Pedestrian Improvement			Distance Based Pricing		
10	Ridesharing			Congestion Pricing		
11	Shuttle Service			Commuter Financial Incentives		
12	Taxi Service Improvement			Walking and Cycling Encouragement		
13	Traffic Calming					
14	Traffic Improvement Universal Design					

B. Managing GPRTU and others for Travel Plans

3. The members of the GPRTU are often in arms with policy makers regarding transport policies such as route registration and the BRT
4. Is there any plan to include them in future transport programmes
5. What specific strategies do you envisage will woo them into your fold?

C. Travel Planning

1. Does the presence of company bussing, school bussing and the prevalence of the GPRTU conjure the need for travel planning in Accra?
2. What other factors motivate travel planning in Accra?
   a. Non motorized access facilities

   b. Mass transit
   c. Private Motor Vehicles
3. Kindly rank these strategies in order of preference in an ascending order
   a………………………………….
   b………………………………….
   c………………………………….

D. Mass Transit

1. In your estimation have we done well with mass transit programmes such as OSA, CES and now MMT in Accra today? Yes………..or No……….
2. If yes,
   a. What do you think are wrong with the models by which these programmes are implemented?
   b. What can be done to prevent the recurrence of what has happened to the previous mass transit models?

E. Non-Motorized transport facilities

1. The current 2008 Transport policy mentions this as an integral aspect of our transport systems, but their implementation has not been effective………
   Why, please assign some of the reasons for our inability to provide these facilities:
   a…………………………………………..
   b…………………………………………..
   c…………………………………………..

F. Stakeholder participation in transport provision

1. What is your take on stakeholder participation in transport provision going forward.

APPENDIX D: INTERVIEW GUIDE FOR EMPLOYERS

1. Does your organization own company bussing services for employees
   Yes………………No……………..
2. If Yes,……………….why
   a. It is cost effective
   b. Improves the efficiency of staff
   c. As an incentive to attract high performers
3. What are your challenges
   a.
   b.

4. In the mist of your challenges, would you consider teaming up with the government agencies, transport operators and employees to share travel for your employees ……Yes………No…………

5. Check which of the following you would like to be present in GAMA.

Please check the list below.

Item	**Improve Transport Options**		×	**Incentives to Reduce Driving**		×
1	Alternative Work Schedules			Vehicle Use Restrictions		
2	Bicycle Impr 4zqovement Plan			Street Reclaiming		
3	Bike/Transit Integration			Speed Reductions		
4	Car Sharing			Road Pricing		
5	Flexible Working Time (Flextime)			Pay-as-You-Drive Vehicle Insurance		
6	Guaranteed Ride Home			Parking pricing		
7	Individual Actions for Efficient Transport			Fuel Taxes		
8	Park and Ride			HOV Priority		
9	Pedestrian Improvement			Distance Based Pricing		
10	Ridesharing			Congestion Pricing		
11	Shuttle Service			Commuter Financial Incentives		
12	Taxi Service Improvement			Walking and Cycling Encouragement		
13	Traffic Calming					
14	Traffic Improvement Universal Design					

APPENDIX E: **INTERVIEW GUIDE FOR SSNIT**

6. Does your organization own company bussing services for employees
   Yes……………….No……………..

7. If Yes,……………….why
   d. It is cost effective
   e. Improves the efficiency of staff
   f. As an incentive to attract high performers

8. What are your challenges running these shuttle services?

9. Apart from STC which other transport service provider you have helped to set up and what are your equity in these companies?

10. What are your challenges funding these transport services

11. What can be done to fund more extensive mass transit services in Ghana like we have in the developed world?

12. Should Ghana consider teaming up with the government agencies, transport operators and employees to share travel for your employees? ……Yes………No…………

13. What possible benefits do you envisage from planning travel in GAMA?

14. Check which of the following you would like to be present in GAMA.

Please check the list below.

Item	**Improve Transport Options**		×	**Incentives to Reduce Driving**		×
1	Alternative Work Schedules			Vehicle Use Restrictions		
2	Bicycle Impr 4zqovement Plan			Street Reclaiming		
3	Bike/Transit Integration			Speed Reductions		
4	Car Sharing			Road Pricing		
5	Flexible Working Time (Flextime)			Pay-as-You-Drive Vehicle Insurance		
6	Guaranteed Ride Home			Parking pricing		
7	Individual Actions for Efficient Transport			Fuel Taxes		
8	Park and Ride			HOV Priority		
9	Pedestrian Improvement			Distance Based Pricing		
10	Ridesharing			Congestion Pricing		
11	Shuttle Service			Commuter Financial Incentives		
12	Taxi Service Improvement			Walking and Cycling Encouragement		
13	Traffic Calming					
14	Traffic Improvement Universal Design					

APPENDIX F: GUIDE FOR FOCUS GROUP DISCUSSION

FOR MEMBERS OF THE GPRTU

1. Are you pleased with the condition of driving in GAMA presently?
2. If not pleased, what do you think is the problem?
3. Would you want a state's total control in mass transit operation in GAMA?
4. If no, how can you intervene and what do you want done to enhance the turn-around time for commuting in GAMA?
5. What has been the level of relationship with your members and MMT operators?
6. Would you want to be considered jointly in the provision of transport services with policy makers, employers and users/employees?
7. If yes, what specific roles can you play for this to work out?
8. If No, what are some reasons you think this is not possible?

APPENDIX G: OBSERVATION CHECKLIST

Basically drive along selected routes to assess the presence of some of the Mobility Management Checklist (attached) in GAMA against the assessment from the policy makers and the employers.

Item	**Improve Transport Options**		×	**Incentives to Reduce Driving**		×
1	Alternative Work Schedules			Vehicle Use Restrictions		
2	Bicycle Impr 4zqovement Plan			Street Reclaiming		
3	Bike/Transit Integration			Speed Reductions		
4	Car Sharing			Road Pricing		
5	Flexible Working Time (Flextime)			Pay-as-You-Drive Vehicle Insurance		
6	Guaranteed Ride Home			Parking pricing		
7	Individual Actions for Efficient Transport			Fuel Taxes		
8	Park and Ride			HOV Priority		
9	Pedestrian Improvement			Distance Based Pricing		
10	Ridesharing			Congestion Pricing		
11	Shuttle Service			Commuter Financial Incentives		
12	Taxi Service Improvement			Walking and Cycling Encouragement		
13	Traffic Calming					
14	Traffic Improvement Universal Design					