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'MANAGING CITY LOGISTICS IN GHANA' TRENDS, DEVELOPMENTS AND ITS IMPLICATIONS TO CITY DWELLERS

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Abstract

Logistics is vital to the life of city residents because it is a major provider of wealth and a source of employment. However, the concentration of logistics facilities and distribution in large metropolitan areas often cause nuisance due to trucks and small van traffic, with its attendant air pollution, gas emissions, noise, etc. Aside these problems, if well managed, it can help in improving environmental conditions in major cities. Cities would need comprehensive logistics plans and management, covering planning for infrastructure and transportation policies to maximize its impact and benefits to society. The provision of appropriate urban logistics services is slow in emerging economies despite growing needs due to poor land practices and indiscipline. Logistics cost in the cities is higher because freight transportation is mainly done by road. This paper presents an overview of city logistics trends, developments and implications to cities and its inhabitants in Ghana using Accra as a case study. It (1) identified the current development; (2) identified and discussed the impact of natural and man-made hazards; and (3) identify the challenges of city logistics in Accra and how these could be managed. Despite these problems identified, some solutions were identified and presented at the concluding section.

Key words: City logistics, Congestion, Traffic, Hazards, Logistics Management

INTRODUCTION

It is well noted that the movement of goods constitutes one of the main activities that influence every economy and society, as it assures a vital link between suppliers and customers. In medium and large cities, the delivery of goods represents a significant contribution to the problems of congestion, lack of parking, pollution and energy consumption (Jesus Muñuzuri et al 2010). For the city inhabitants, it supplies stores and places of work and leisure, delivers mail and goods at home, provides the means to get rid of refuse, and so on (OECD 2003). Taniguchi (2012) mentions that the concerns about the environmental impact of urban freight transport are growing along with population density and urban congestion. Thankfully, awareness of the need for sustainable urban development is also on the rise and the coordination of traffic and logistics is receiving greater attention. Yet the need is urgent for more efficient and effective freight transport systems that not only address costs, but also fully tackle environmental issues such as noise, air pollution, vibration and visual intrusion.

Freight vehicles compete in the street and parking space capacity in the urban centers thereby contributing significantly to congestion and environmental nuisances, such as emissions and noise (OECD, 2003, Patier, 2002, Figliozzi, 2007). These nuisance impacts the life of people living or working in cities, and the productivity of the firms located in urban zones and of

the associated supply chains. They also contribute to the belief that “cities are not safe” that pushes numerous citizens to move out of the city limits (Crainic et al, 2007). Logistics is understood to target the analysis, planning, and management of integrated and coordinated physical, informational, and decisional flows within a potentially multi-partner value network. It is from this view that the term city logistics has been coined to emphasize the need for a systemic view of the issues related to freight movements within urban areas. The term City Logistics encompasses these ideas and goals and explicitly refers to the optimization of advanced urban freight transportation systems (Crainic et al 2009).

Research Objective

This study is focusing on the current and the future of logistics that are generally associated with cities. The study will also look at the effects of natural and man-made hazards on city logistics as well as determine the challenges or problems facing city logistics. The main objective of this paper will be to present an overview of the future of city logistics in Ghana and to provide a system dynamics perspective of the problem of traffic congestion and air pollution in Ghana.

LITERATURE REVIEW

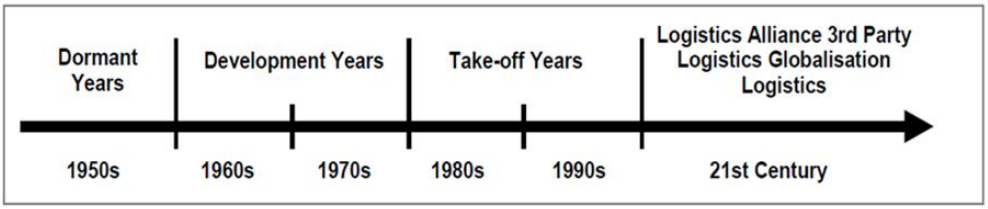
Evolution of Logistics

According to Hirohito et al. (2010), logistics is a military term used together with strategy and tactics. It started to be used as business term in the twentieth century. Logistics has developed as an important business area since the World War II. It has gone through several phases of development in attaining its current state. The aim of the execution of business logistics is to minimize cost and maximize value-added effort.

Coyle et al. (2003) argued that during the 1960s the military logistics began to focus on engineering dimensions of logistics, which includes reliability and maintainability configuration management, life cycle management with emphasis on quantitative analysis. The engineering related logistics activities gained attention among the sectors that deals with products that had to be maintained with repair over the life cycle of the product. The business sector’s approach to logistics developed into inbound during the 1970s and 1980s. It began to view logistics as supply or demand chain that links all the organization from the supplier’s supplier to the customer’s customer. TSENG et al (2005) added that logistics was initially a military activity that deals with getting soldiers and munitions to the battle front in forward flight, but it is currently viewed as an integral part of the modern production process. According to Chang (1998) as cited in TSENG et al (2005) the recession in America in the 1950s is the main backbone of its development, because during that period efficient goods circulations were important. The term

logistics were initially developed in the context of military practices in the late 18th and early 19th centuries. The probable origin of the term is the Greek logistics, meaning 'skilled in calculating'. During the 1960s it was called physical distribution and mainly focused on the outbound side of the logistics system. It gained attraction as a business in the 1960s (BTRE, 2001). Considering the American experience, the development of logistics could be separated into four stages (Chang, 1998). This has been represented in the figure 1.

Figure 1: Logistics Historical Development



Source: Chang (1998)

Logistics was under the dormant condition before and during the 1950s. Managers were mainly interested in production and industry logistics was seen as a "necessary evil". During the dormant period and the early stage of the development period executing innovate techniques was a tendency. Drucker (2001) regarded distribution as the most available development area in American Businesses but also the idle sector. From the late period of the development years onwards, more studies of logistics emerged. Impacts of logistics practices increased during the 1973 due to factors such as petroleum price increase, slow market growth and others. During the early 21st century third party logistics, logistics alliance and global logistics were still difficult to be accepted.

Definition of logistics

Various author such as Pryke (2009) and Ayers (2001) have argued that supply chain is just another term for logistic. Bowersox et al (2002) went further to state that logistics guarantees logical and safe succession of storage and stream of supplies, beginning from the source of raw material flow, through to the manufacturing complex and supply channel ending with the end user. Also Logistics is a planning orientation and framework that seeks to create a peculiar plan for the flow of information and products through a business (Christopher, 2011). Kuse (1999) also mentions that logistics include several activities within the production, distribution, and consumption process. The distribution process can split into the major processes of money flow and physical distribution involves the structured integration of transport, storage, assembling, packaging, cargo handling and information to efficiently flow.

Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. To varying degrees, the logistics function also includes sourcing and procurement, production planning and scheduling, packaging and assembly, and customer service. It is involved in all levels of planning and execution--strategic, operational and tactical. Logistics management is an integrating function, which coordinates and optimizes all logistics activities. As well as it integrates logistics activities with other functions including marketing, sales, manufacturing, finance, and information technology (Owusu et al, 2014).

According to the Council of Supply Chain Management Professionals, logistics management can be defined as, "that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements (Hans et al, 2010). It can be deduced that logistics is a planning orientation that strategically manages the procurement, material and information flow through the organization and its marketing channels to meet customer satisfaction. It entails the coordination of activities to attain current and future profitability are maximized through cost-effective fulfillment of orders.

Description and Definitions of City Logistics

According to Crainic et al (2009) city logistics system activities during the early 1970s was intense due to urban freight transportation issues. There were measure put in place to prevent traffic and heavy vehicle to enter the cities. These measures were not strictly implemented from the 1975 to 1980. Urban related issues started to go on the higher side during the 1990. Gonzalez et al (2008) argued that the periods before the 1980s the urban traffic due to freight transportation did not constitute a problem and was not managed by public administrators, but rather during the 1980s some route optimization measures were adopted and managed primarily by only transportation carriers. In the 90s and the 21st century public administrators started contributing due to high traffic and other issues, making the city not a conducive place to live. It can be seen that traditional operating companies were executing the freight transportation planning and decision, but has recently gained attention by the public administrators due to urban sustainability policies.

According to Taniguchi (2012) about half of the world's population (7 billion) resides in the city. Citylog (2010) agreed in Sustainability and Efficiency of City Logistics that 80% of the population is living in urban areas and the economy and industrial production are also

concentrated on urban areas. The movement of people and materials in urban areas for better lives are very great and as a result generates the problem of traffic, environmental public health, safety and security. Many cities such as Bremen, Utrecht, London, Yokohama and others have suffered from these problems due to traffic congestions, low transport efficiency, environmental impact and others. The concept that integrates the existing resources to solve the problems of pollution, congestion, traffic ,noise caused by the impact of increasing population and vehicle ownership in the urban areas is city logistics. It involves processes such as transportation, handling, storage, inventory management, waste home delivery services and others. City Logistics concerns the means to enable goods transport in urban areas by improving the efficiency of urban transport. It can be seen that urban congestion has been attributed to freight distribution and this brought about the inception of city logistics and city distribution centers which was promoted as agreed by Ruske et al. (1994). City logistics aims at the fast and reliable transportation of goods and services efficiently to create environmental sustainability.

Logistics is currently seen to target analysis, planning and management of integrated and coordinated physical, related information and decision flow within a multi-partner value network. City logistics has been coined from this view to emphasize the need for a systemic view of the issue related to freight movements within urban area. According to Taniguchi et al (2001) City logistics is the “process for totally optimizing the logistics and transport activities by private companies with the support of advance information system in urban areas considering the traffic environment, its congestion, safety and energy savings within the framework of a market economy” It plays a vital role in the development of the economy and the city. Ramokgopa (2004) mentioned that city logistics “is the concept or process of managing and optimizing urban freight, passenger transport and all other transport movement taking into account the impact those movements have on the environment, society and economic activity of that particular city”

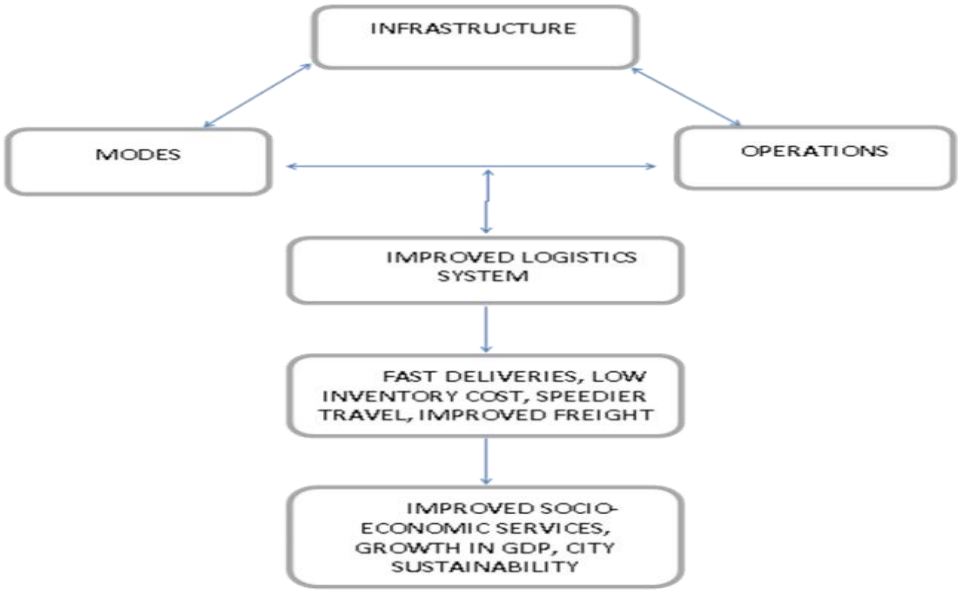
There should be a partnership between the actors involved in the dispatching and receiving of good within the cities. The partnership will in turn reduce the traffic congestion on roads. For companies to improve its distribution systems in order to increase competitiveness city logistics is needed. City logistics is vital for the efficiency of freight transportation and the improvement of environmental and social impact. CityLog (2010) also argued that city logistics is “the part of the supply chain process that plans, implement, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers’ requirements” city logistics incorporates a row of activities which results in complicated relationships between different stakeholders.

Components of City Logistics

Dablanc (2009) states that a city is provisioned by hundreds of supply chains servicing a wide array of economic sectors including grocery stores, retail, restaurants, office supplies, raw materials and parts (for manufacturing), construction materials and wastes. Depending on the circumstances, goods transport accounts for 10 to 15 percent of vehicle equivalent kilometers travelled in urban areas, 2 to 5 per cent of the employed urban workforce, and 3 to 5 per cent of urban land use. A city not only receives goods, but also ships them: some 20 to 25 per cent of truck-kilometers in urban areas are outgoing freight, 40 to 50 per cent are incoming freight, and the rest both originates from and is delivered within the city (Dablanc, 2009). A logistics system is composed of several elements relating to finance, ordering, cargo, and work and land use and traffic information. Eastern Asia Society for Transportation Studies, mentions that Logistics services, information systems and infrastructure/resources are the three components of logistics and they are closely linked Logistics services support the movement of materials and products from inputs through production to consumers, as well as associated waste disposal and reverse flows. They include activities undertaken in-house by the users of the services (e.g. storage or inventory control of a manufacturer's plant) and the operations of external service providers.

Logistics services comprise physical activities (e.g. transport, storage) as well as non-physical activities (e.g. supply chain design, selection of contractors, freightage negotiations). Most activities of logistics services are bi-directional. Information systems include modeling and management of decision making, and more important issues are tracked and tracing. It provides essential data and consultation in each step of the interaction among logistics services and the target stations. Infrastructure comprises human resources, financial resources, packaging materials, warehouses, transport and communications. Most fixed capital is for building those infrastructures. They are concrete foundations and basements within logistics systems. According to planning and design for sustainability urban mobility in its Global Report on human settlements GRHS (2013) it was argued that there are three main components of city Logistics namely the modes that carry the freight, the infrastructures supporting freight flows and the operations related to their organization and management as depicted in figure 2. Each component has subcomponents with their own characteristics and constraints. The interaction of the three main components in the logistics system and the subcomponents are elucidated as transport terminals, roads and distribution centers are infrastructure subcomponents of city logistics. Scheduling, routing, parking and loading/unloading, are operational subcomponents. While trucks remain the dominant mode supporting city logistics.

Figure 2: Conceptual framework of an effective logistics system



Logistics and City Development

An urban area can be seen as a cluster of activities that consist of different urban development in terms of size, type, land uses and location (Allen et al 2010). Ogden (1992) agreed and added that the size and density of cities is a key factor affecting urban form. Rodrigue et al (2009) stated that urban form is defined as the spatial arrangement of urban freight and its related infrastructures. A city with more distances between departure and destination points associated with more travelling time is said to be a large city while a dense city has greater congestion and higher costs of transport. According to Ogden (1992), higher levels of mixed land use associated with higher diversity of activities in a specific area might provide that possibility to decrease the total travel distance due to reduced links between destinations. According to GRHS (2013), most of the early city logistics projects were undertaken in Japan and Western Europe. Cities in countries such as Germany, France, Belgium, Netherlands, Luxembourg and the UK were more constrained by the lack of available land had well established urban planning traditions.

According Lindholm (2008), freight transport is ignored to a lager extent in city development planning due to lack of awareness, knowledge and information about freight transport role in sustainable development. Allen et al (2010) agreed and supported that there has not much comparable research regarding the interaction of urban freight and city development but rather large amount of research about the relationship between passenger transport and urban form. Changes affect urban transport due to, alteration of commodities, changes in departure and destination points, traffic flow, and rate of deliveries and time of

movements. This is as a result of social, economic, and technological changes in an urban area physical changes that happen in the urban development (Ogden, 1992). Allen et al (2010) shows that, the location of freight nodes affects the length of the journey, speed and choice of mode. Freight transport affects the urban form. It shows clearly that the use of a land in an area affects the selection of a place to be used as a freight node, therefore decisions relating to the freight nodes points and infrastructures can affect city transport. Ogden1 (992) mentions that location decisions should not only be based on access to market but attention should be given to transport network. Taking into consideration local distribution resources, number of facilities in urban areas determines the distance to be travelled and time consumption; as a result it might affect the frequency of transportation due to cost of transport. (Allen et al 2010). UN under-Secretary-General and UN-Habitant Executive Director, Dr. Joan Clos stated that "For cities and commuters urban density provides benefit and convenience, but can also increase the cost of commercial goods transport. This is why the two must be addressed together during the urban planning process as cited in the Global Report on Human Settlement in 2013.

Best Practices and Trend of City Logistics

Sustainable Urban Goods logistics Achieved by Regional and local policies (SUGAR, 2011) in their handbook identified 19 best practices within their sites and 25 practices outside their sites. These practices address different policy levels and benefits different target groups. There are specific choice criteria in the various sites. For all the sites best practices are supported by a public administration, have a sustainable business model thus they do not depend upon financial sources that are time-limited, their impact is being evaluated through some kind of assessment. For the SUGAR sites, each of the best practices sites are considered important by the site itself, most practices are transferable to other cities and there are comparable number of best practices for each of the best practices. Whiles for the non-SUGAR sites innovative best practices are favored especially those using the intelligent transport systems; practices recorded into the Best Urban Freight Solutions (BESTUFF) II best practices are favored. Cleaner and better transport in cities CIVITAS in their brochure argued that based on the experience of the projects undertaken by them and other reference there is no "absolute best practices". It depends on the framework conditions which make the transferability of result difficult. According to Taniguchi et al (2012), key performance indicators for evaluation are; life quality, economic development, accessibility and transport efficiency. The best practices can be put under four groups: Transportation Truck Planning, Distribution Network, Distribution Framework and Institutions/Organizations (SUGAR, 2011).

Transportation Trucks Planning

Urban Rail Logistics

This is a practice employed in Paris/ France. It entails Change from road to rail. It was initiated by the Ministry of transport and its regional branch. Public and Private; monoprix, logistics and transport companies; SNCF/VFLI, Samada, trucking companies; GOEDIS BM and GT actor are involved. Operation started in 2007. Had duration of 3 years, (2004-2007 Nov). The Paris city council invested 10million euro. Only dry general products and non-alcoholic beverages were transported through this means. Assessment was done in respect to economic, social, and environmental sustainability. Media such as articles, news, TV coverage, website conferences were used. 26 CNG trucks for deliveries were financed by Monoprix and ADEME. There was partnership between all the actors involved. 12000 trucks have been avoided thereby having; 25% less carbon dioxide, 7% less CO, 50% less NOx, 16% less PM .However there was an increase in transportation cost. Government doesn't provide subsidies for additional cost.

Low Emission Zone

It is being practice in London / UK. It has been implemented since Feb 2008 with the motive of achieving the EU air quality for 2010. It involved all public roads including certain motorways within the Greater London Authority boundary. Feasibility started from 2001 of GLA, TfL, ALG, DfT, and Defra. The Mayor delegated responsibilities to TfL in June 2005. Initial implementation lasted for 6 months. During this period only Euro III Lorries between 3.5 and 12 tones buses and coaches could enter the LEZ whiles from October 2010 only the minibuses and Vans were allowed. Since Jan. 2012 only Euro IV over 3.5 tones and buses and coaches over 5 tones can enter. There are infrastructures such as LEZ road signs, Entering LEZ, Within the LEZ and approaching the LEZ advance information which is enforced through fixed and mobile cameras which reads the vehicles details and checks it against a data base of vehicles which meet the LEZ standards. Older diesel-engine vehicles were the primary target. Lorries, buses and coaches that don't meet the LEZ standards are charged 1,000 pounds per day. Whiles large vans and mini buses pay 500 pounds. 50% discount if paid within 14 days, and extra charge of 50% if not paid within 28 days. Media such as TfL homepage, leaflet, large prints, public statements is use to deliver information. It applies to not only the congestion charging zone but also all roads across greater London. It operates 24 hours all year round. In 2008, 96% of trucks over 12 tones were compliant with the new emission standard as compared to 70% in 2007. Compliance rate currently stands at 91%. No calculated result is out yet but Tfl projects that PM has reduced by 6.6% exceeding the annual quality by 5.8%. It is expected that it should reduce by 14% in 2012 and NOx should shrink by 20% in 2012. There has been long and controversial

consultation process about air quality and environmental policy, including freight and passenger transport. It is been released that enforcement cost is high due to critical consideration in choosing the vehicles that are included or excluded is a factor. The practice has been transferred to other parts of the world.

Night Deliveries

It been practiced in Barcelona / Spain. It main objective is to allow more silent trucks to operate in city centers in the late hours. It avoids congestion, while respecting the noise legislation. It requires special trucks, special equipment and corresponding driver behavior. They have made 14 measurement trials at 11 sites in the period of March 2006 to May 2007.The municipal mobility services, municipal unit, three private transport operators (Mercadona, Condis, Lidl) and Renault are the actors involved. This practice was initiated because there is very high congestion towards the suburbs, where the logistics centers are located. The first night-time delivery was made by Mercadona in 2003 with a 40 tones truck. There was 6 months experiment to traffic regulation by the Municipality. Infrastructure such as electric lift, insulation carpet, kerb adoptions for access using fork lift, trained staff, cones to signal are used. It is important to train driver not to talk whiles working. The food sector is the primary target. Approximately 20,000 euro is spent per site to modify pavement, ramps etc., 30,000 euro is the cost for measuring noise and staff time. Transport operators don't incur this cost but rather invest in the vehicles and other facilities they need. The PIEK target of 65 (A) could be met but not the city's target. Vehicle knowledge has much improved. The program has generated improved knowledge. It shows that operators are only partially successful in 45% cases in unloading within the ambient noise condition. It also identifies the most important noise sources (truck arrivals, goods unloading 15%). Two large Lorries (40 tones) at night replaces seven medium size trucks used in the day. This practice avoids daytime congestion thereby reducing per trip of around 1 hour.

Distribution Network

City Porto

It been employed in Padua/Italy. It deals with optimizing and consolidating the urban distribution of goods in order to decongest the traffic in the city centers. It uses an urban consolidated centers and a fleet of low polluting vehicles. Traffic congestion, noise, and low air quality are the main problem in Padova. A restricted access zone was defined called the ZTL. A survey was initially conducted by the municipality in 1997. There was a regional law to promote urban logistic projects in 1999. During the year 2001 the municipality of Padua identifies its mobility

policy (ZTL). In 2003 there was an agreement between the municipality and associations to promote a more environmentally friendly commercial fleet including UCC as well as Interporto di Padua having a feasibility study. In April 4, 2004 there was the signing of the program agreement and in April 21, 2004 it started operations. The project leaders, service management operator, co-leader of the project are the actors involved. Funding and regulation advice were provided by the commercial chamber of Padua. Twenty freight transport operators in 2004-2009 were the users of the system. €360,000 is the grant attributed from the public administrators. As the UCC increases in success, the grant decreases; 2004:85%, 2005:50%, 2006:24%, 2007:22%. No public funding as 2007. With this practice Logistics center is near the city. There is economic sustainability, industrial plan development, choice of the terminal's location in a strategic position. There was underestimation in delivery capacity as compared to the demand during the first 6 months. In the first two years, activity was performed with two vehicles only. It took four years to get to the breakeven point. From September 2004 four (4) vehicles were used and from October 2005 eight (8) vehicles (two for perishable goods). The appropriate area for terminal consolidation is 300-550 sq.m. There was management software for tracking and tracing as well as 10 vehicles running on CNG. There was one operations manager directly employed by City Porto. Goods handling and distribution was entrusted to a third party. Freight transport operators and vehicles technical standards were the primary target. In 2001 there was limited time window to access the ZTL. In 2003 there was electronically monitored gate to access the ZTL which helped in the monthly monitoring statistics of the number of deliveries. In September 2004- December 2005, there was a survey to estimate the effect of the UCC. Media such as the media coverage and general press is being used since 2004. Talks in conferences, workshops and round tables are also employed. There was the organization of the city logistics Expo in 2007. Public funds were used to finance the infrastructure .Transport operators belonging to consortium had advantages. There was reduction in the level of pollutant emission during the surveyed period. (15 months). There was reduction of traffic and congestion. Quantitative result shows that there was reduction of CO2:38.4 tones, CO: 202kg, NOx: 163kg, VOC: 58.1, PM10: 41.4kg (15 months) and also reduction in externalities in respect to air pollution: 76% of social cost saved, noise: 11%, accidents: 6%, energy saving: 4%, global warming: 3%. There were 55,000 deliveries in the year 2005. 33 couriers and operators owned account are involved. Delivery trips accounted by tracking and tracing were 1892. There was also reduction of length of trips for deliveries in km. According to the qualitative results more than double of transport operators are involved as compared to the beginning. The consolidation of goods in the city center gives more space to different mobility policies for citizens. It was learned that transport operators have to be involved in the project on a voluntary

basis. Also economic sustainability is necessary. Express courier operators don't like these systems as they see it as an anti-competition policy. The know-how of Interporto di Padova, neutrality of the UCC managing operator towards transport operators, location of main transport operators and location of the logistics terminal near the city center was a critical success factor. A survey is needed among local transport operators to evaluate if they will accept a city logistics service. The municipality should always be involved to enforce a mobility policy. If the experiment is good for traditional goods then perishable goods may be tested.

Motomachi Urban Consolidation Center

This practice is being employed in Yokohama/ Japan. It was implemented in 2004 for all shops. Initial funding was from the Ministry of Transport and it is managed by three shopkeepers association. With this practice Trucks companies that use the UCC pay ¥150 per parcel. It contributed in making the city pleasant and less polluted. It started when three retailers association with more than 450m shopkeepers facing problem of congestion, double parked heavy goods vehicles impending shop window visibility and traffic accident. This was preventing the retailers from developing their business and cultivating a better environment. Initiation of the project was in April 1999, initial experiment in 2000, official introduction of experiment test in 2001 definition of extension in 2002-2003 and full implementation: June 2004. It took a period of 6 years. The public support qualitatively. The main actor is the retailers association with operating budget of ¥55 million. A subsidy covering operational deficit of ¥2.4 is paid by shopkeepers association. It was a national pilot program. Carriers delivering to clients accepted this practice. In 2002-2003 there was the creation of public private partnership. The UCC terminal occupies 330m2. On an average day 22 remitters use the facility. Sawaga is the most significant at 60% of the activity with the three users at 80% and the top five at 90%. The center processes 340-350 parcels per year and operates from 8am-8pm. The operating budget is ¥55million. There are three low-emission CNG trucks that make delivery. There are 14 employees (7part time and 7 full times). All the retail shops are the target group. Six years awareness campaign was used to convince shopkeepers. In order to preserve the neighborhood quality life potential vehicle reception area were used. The main stakeholder is the retailers association however there is little involvement by the municipality. The UCC has managed to break even financially. The service quality has been recognized by shopkeepers, customer, and carriers. The initial survey identified 1800 parcels a day but only 1500 were delivered. But now a delivery to private home is back to the initial target. Qualitative results show that the service has been recognized by shopkeepers, customers and carriers. Costing and funding were not major obstacles. Awareness was slow. Also there was a fear of carriers to

see a competitor make the final deliveries. Patience and wealthy neighborhood with capacities to support initial operating deficits were critical success factors. Transferability require some elements combined notable among them are : high density of retail shops in at least three or four streets, an available transport company, some interest and support from the public side.

Distribution/Logistics Framework

Cityssimo

It is been practiced in La Defense. It started in December 2006. It is a system of dedicated locker banks which constitutes an alternative to home delivery for parcels delivered by Colissimo. (Post Parcel Delivery Service). In 2011, 31 Cityssimo boutiques were available in France, most in the Paris region. Some are located in the subway. The first Cityssimo boutique was implemented at the end of 2005 in a context when distance selling and home delivery were growing. The distance selling business in France increased between 2003 and 2007, from €11.4 to 22.1 billion. The retail areas abandoned by the Paris public transport operator provided opportunities for Ctiyssimo to develop boutiques for locker banks. Those locker banks serves as automated pick up points from which customers pick up their parcels ordered on the internet. Actors such as RATP, Promo metro, and Coliposte were involved. Cityssimo has been integrated into the RATP network due to the fact that the market was more mature. The common choice of location for a Cityssimo boutique is the metro to other retail activities. But for the la defense the Cityssimo was implemented close to other services such as the post office. The security and safety of the customers constitute an essential stake for RATP. First contact made was in June 2006. There is a request for safety certificates from the fire control service of the RATP and the service for control risks, quality, safety and environment (SOCOTEC). Authorization for public opening by IGSI was all done. In December 2006 the first Cityssimo in the RATP network was opened. There is a boutique cost of € 1000m2 representing €50000/year. Cost such as the reinforcement of the ground, high security doors, and the installation of a security system by cameras. The cost for the locker banks is also high. The number of parcels delivered determines the profitability. No staff is needed at these locations. There is a permanent monitoring procedure but no public yet. There is an advertising campaign to inform its customers of the availability of this new service. Media such as the internet and the post office were used. The e-merchants are their partners, as well as companies which accept to accommodate Cityssimo locations such as Casino or RATP. The results are not out yet due to its innovative character of service in a competitive market. However according to Coliposte the first assessment proved satisfactory both Coliposte and Promo metro. At the end of 2008 two Cityssimo boutiques were opened in metro stations. The number of parcels picked up every

day is about 30. Strategies to advertise the Cityssimo service is now being developed. In 2007, 35000 subscribers were recorded for 12 sites. The objective is to reach 4000 to 6000 by site. The collaboration between the partners has to take place from the very first phases of the project. It was learned that site and deliveries safety for promo metro and accessibility are primary obstacle. A common objective and a coordinated timing partners as well as an understanding of each partner's constraint from the other ones is needed. This practice can be transferred to all metro station.

Consignity

It is been practiced in Paris/France. It is a new type of delivery service which is based on a network of automated lockers for goods pick-ups and deliveries. Two companies (Darty and Schindler) in a Paris implemented it as a trail and its now aiming at full development, although faces many obstacles. The service is aimed at improving the mobility of commercial vehicles, specifically service/utility vehicles in urban areas. Consignity is based on three concepts: a delivery in the absence of the receiver, night time delivery and final consolidation of the delivery trips. Before Consignity was established spare parts necessary for technicians were delivered by different suppliers (200) to Velizy then forwarded to warehouses close to Paris. 2004 was the creation of Consignity. 2004-2005 was the period for feasibility study. Manufacturing of the automated lockers, financing and other activities were done during this period. In 2004 the firm won a prize for innovation. An additional R&D and development loan was obtained from ANVAR refundable in five (5) years. Paris city council and other private actors such as DHL express. Vinci Park was involved. Funding by ESF was in 2003, creation of the network lockers was in 2004-2005, the first by the Darty was in Sept, 2006 and first pilot evaluation was in Oct, 2006. Network developing was slow due to competition and economic crises. A new service was opened in 2008-2009 through partnership with Koppen. Two persons were employed: 1 telecommunication engineer and an internet, communication and press specialist, maintenance technicians, freight forwarders and car park managers were the primary target. The experiment can succeed only if the network of lockers is dense enough. Multi-use scheme is under consideration. Consignity participated in many local meeting as a medium for creating awareness and campaign. There was a partnership among Council of Paris, Ministry of Environment, Vinci Park, DHL and others. The pilot done in Dec, 2006 showed that the revenue needed to attain a balanced budget were €300,000(fixed cost) and to obtain this result it would be necessary to have 50-60 locations in Paris with 7-17 lockers each. Quantitative result shows that 11.8 deliveries were done in a month, two automated lockers were used and 71 deliveries were made in a total of 12 boxes. Whilst the qualitative result shows that they appreciate the

ease of parking near the locker boxes and others. It was learned that Consignity could be useful through the trail made by Darty and Schindler. It could provide a considerable gain in the number of movement, vehicles, distance and time. The cost is huge and also users of the service find it difficult to reorganize their logistics integrating an urban network of locker boxes. Consignity is trying to implement its locker boxes in other French cities.

Institutions/Organizations

Cargo-tram

It is been practiced in Zurich. Thus involves the use of tramway to collect goods such as bulky waste and electrical and electronics equipment through the city. This was established in 2006. Only half of all Zurich household owns a car and the average age population is increasing. Zurich is not surrounded by beltway thereby making the traffic congestion very high. Municipality faces difficulty in reaching to clients. Facilities have to be provided at hours when the working population is no longer at work. The public stakeholders had a major role in this project. It started with €35,000 with an existing tram network owned by the city. This service was setup in 2003 and dedicated to the residents of Zurich. According to the established time Cargo-Tram parks there for four (4) hours. Waste to the tram should not exceed 2.5 meters of length and 40 kg. On an average six (6) - seven (7) tones of bulky waste and more than a tone of electric and electronic devices are dumped at each station. Locomotive and two cars need for startup. New containers are provided with a press for bulky goods. Medium in the form of ERZ disposal calendar were given to each household at the end of the year. It contains timetable about the cargo-Tram. Waste management and transportation departments are the stakeholders involved. During the first year 380 tons of bulky wastes were collected which represent twice the tonnage waste left on the pavements before its implementation. Quantitatively in 2004, 785 tons of garbage was collected at 8 stops in 94 collecting rides from which 644 tones were bulky goods and 141 tones were metals. This represents approximately €3200 per ride. Whiles qualitatively Cargo-Tram offers a new service to the residents, representing a valuable addition to the concept of a better quality of life without automobile.

It has been seen that, needs of the citizens should be taken into account. All actors should be associated from the beginning of the project. Sharing tramway infrastructure between passenger transport and goods is an obstacle. Needs have to be identified that, investments minimized and all three players (operators, the municipality, waste management administration) have to be involved to achieve success. To be able to transfer this practice consideration should be given to the tramway technical constraint.

Using building code regulation for off-street delivery areas

It is being practiced in Barcelona/ Spain. Initiation started in 1998. For private sectors developments, the 1999 ordinance of the city of Barcelona organizes several regulations to build off street delivery areas. All new commercial building of at least 400m2 have to arrange for at least one delivery zone within their premises. Bars and hotels have to build a storage area with a minimum size of 5m2 or 5% of the total floor. This started when the municipality of Barcelona realized that many public markets contributed to street traffic congestion. The measure was challenged in court by business association but the court decided in favor of the city. The city presented the environmental benefit of a reduction in truck traffic in the city. Bars and hotels were seen as the main target. Remodeled markets and private developments are the actors involved. Since the implementation of the Mercat de la Concepcio two markets have been remodeled and three more are in progress. A control brigade had to be organized to verify compliance of the rule by the stores. Inspection team was set up. The primary target are the local shops, businesses, bar and restaurants. ECAs are involved in site inspections once the work is complete and then every two years. Roadwork's access signing and information to local citizen were used as the media for campaigns. It was supported by EU and national funding. There was partnership with IMB. No studies have been made to access the performance yet. Implementation continues based on experience and possibility studies made by IMB. Qualitative results show that there is strong local support for market remodeling from districts, market stalls and from citizens. It have been learned that the redesign of municipal building and the surrounding public space is an opportunity to improve goods delivery conditions. It was learned that recharging for electric vehicles may not have been taken into account and may require revision of the design model. Involvement of local organization is a factor for success. Cities without Municipal markets cannot practice this. Laws in some Europeans countries may also not permit this.

Challenges of city logistics

According to GRHS (2013), good transport systems are unique to distinct urban built environment, meaning that no city is alike with respect to the nature and challenges of its city logistics. The adverse impact of high freight movements and congestion within city centers can be felt economically, socially, environmentally and from a road safety perspective.

Economic

The growth in the amount of freight circulating within urban areas has increases traffic congestions. The economic activities involve movement of people and goods from places to places. The economic challenges can be seen in the form of trip length, delivery time, traffic

congestion, and infrastructure cost. Transportation of various consignments is an essential element supporting people's lives. GRHS mentions that urban goods transport is usually subject to smaller volumes but frequent deliveries, as inventory levels in urban stores tend to be low. Urban goods are delivered regularly from distribution centers at the periphery as a result of limited availability of storage space in the city centers. Economic growth is underpinned by productivity growth (OECD 2006; Nadiri 1996). It was further added that the productivity is a national investment in logistics and transportation whiles the output is gross domestic product. Ogden (1992) also supported that almost 5% of the GDP which is comparable to the magnitude of people transport cost and these cost increase with the size of urban area at a higher rate than passenger transport. Therefore an effective transportation system is therefore key in sustaining economic growth by linking people to job, deliver product to markets where there is demand, drives supply chain and logistics and enabling domestic and international trade.

Time delays caused by congestion translates to increased travel time for the service providers, increased inventory carrying cost, lengthy lead time and higher transportation cost which can be translated into monetary value, because time is money. For example, time utility that may be critical value added activity, is created by inventory and storage of products until they are needed, its realization is dependent on transportation activities as it determines how fast and how consistent products and services move from one point to another. Despite peak-hour traffic congestion, a regular flow of deliveries must be maintained as a result freight distributions are forced to be done in the evenings sometimes. If the products are not made available to the customer at the right time and in the right condition could lead to customer dissatisfaction. As suggested by Harriet *et al* (2013), efficient and effective transportation management plays a vital role in ensuring socio-economic development. As a result they can be force to use alternative routes, which might be longer and less safe, again increasing the transport cost and security risks of supplying the same goods to the same location.

Weisbrod et al (2009) also add that increased traffic congestion is a major disturbing factor that imposes cost upon travel and business operations, thus exposing variety of negative impact on people and on business economy. It can be seen that extra cost incurred may be passed down the supply chain and transferred to the final user. It can be said that in this 21st century business are adopting to just-in-time production, distribution and inventory management system these challenges can make it difficult to deliver up to the task.

Socially

From the social perspective the interactions between people and freight in the cities creates many challenges related to health, safety and quality of life. Movements occur within the city to

satisfy purpose such as employment, education, leisure or access to goods and services. As supported by Russo & Comi (2010) in a statement that the goods or freight transport has a significant role in the economy of urban areas as it serves as a source of income as well as employment. This is to say that each time a delivery needs to be done a trip is generated. Rodrigue et al (2009); Munuzuri *et al* (2005) mentioned that in the developing countries there are so many challenges such as discomfort, commuting related stress and delays resulting from the challenges of infrastructure system i.e. ineffective and inefficient infrastructure systems. Social impact can relate to the way the activity affects and has effect on the society. Even though demand for the transportations and delivery of goods is created by residents, disturbances related to satisfying those demand are not accepted. Different types of vehicles may not only cause nuisance but also increase the rate of accident occurrence thereby increasing demand on social service. It can be seen that living and working close to roads exposes one to harmful pollutant such as emission from diesel engines. GRHS (2013) also opined that freight-intensive activities such as warehouses, truck depots, container storage area and others can be an aesthetic blight on the urban landscape, and are associated with lower property value. As many freight facilities operate in a 24-hour basis, light can disrupt their sleep. Noise emission from freight trucks is nosier than vehicles. City Log (2010), added that trucks or Heavy Goods Vehicles and Commercial Vehicles (CVs) that engage in logistics work are usually assumed to have a different rate of flow. HGV are less maneuverable and may be limited to a lower speed whiles the CVs make frequent stops to load and unload, often on- street. According to OECD (2003), there have been changes in urban congestion due to the movement of the use of HGV to the use of lighter vehicles.

Environmental

This impact occurs as a result of large traffic volumes that begin with the high demand for fuel, thereby depleting our natural resources at a faster rate than they are replenished. They are essentially the consequences of the actions of goods movement in the city. Gonzalez (2008) supported by saying that considering the usage of energetic assessment as an indicator for measuring these effects, it can be seen that goods movements represent 30% of the global impact of urban transports (in vehicle km, which is equivalent for green-house gases). The environmental issue can be seen through the energy use, emission and noise, CityLog (2010). It further said that energy use is an important indicator to determine the effect on the environment. The rate of fuel consumption can be measured by vehicle type, length of distance to be travelled and the opportunity for alternative fuel type. It can be seen that the traffic congestion, road system, driving behavior and the delivery time will determine the fuel consumption. It went

further to state that the EU was committed to reducing emissions of six greenhouse gases to the 1990 base level, less 8% by 2008-2012 in order to meet the Kyoto obligations in the CO_2 sector. Because the same source shows by 2030 the emission will be 22% higher than the 1990 base. The pollutant from the exhaust emissions by the urban freight transport can be seen as one of the major problems in the cities. The combustion of diesel fuel in an internal combustion engine of a vehicle results in the production of gaseous substances such as carbon monoxide (CO), Carbon Dioxide (CO_2), Nitrogen Oxides (NOx), and Particulate Matter (PM). The incomplete combustion of diesel produces carbon monoxide which is a toxic gas can be very harmful to the health of residents. Frequent inhaling can be lethal as well as small concentration can result in cardiovascular disorder and the corrosion of the respiratory tract. Greenhouse effect is mainly as a result of the gaseous pollutant called Carbon Dioxide. According to Susan et al (2004), CO_2 has a continuum of effect that ranges from physiologic (e.g. ventilator stimulation) to toxic (e.g. cardiac arrhythmias and seizures), anesthetic and lethal. The effect of CO_2 depend on the level of concentration and the duration of exposure as well as individual factors such as age, health, occupation, lifestyle and others.

The Nitrogen Oxide which is made up of Nitrogen monoxide and Nitrogen Dioxide are emitted at a rate of about 95% as NO. NOx is given in the form of smog or particles. The atmospheric reaction that occurs between oxidants like Ozone (O_3) and NO produces NO_2 concentration. This NO_2 causes the corrosion of the respiratory tract. It can be seen that the exhaust of NOx emission will result in the souring which affect historic building in cities. It helps form acidic rain, global warming and others. It can be said that NOx can reduce lung function, and damage our water bodies in the cities. According to the World Health Organization (2013) PM is a widespread air pollutant of a mixture of solid and liquid particles suspended in the air. PM can be seen in the form of dust and smoke. The exposure to PM causes respiratory and cardiovascular morbidity such as asthma and mortality from cardiovascular and respiratory disease from lung cancer. It can be seen that exposure to PM may reduce the life expectancy of the population. Anderson et al (2012) cited that the world health organization estimated that PM air pollution contribute to approximately 800,000 premature deaths each year.

Urban freight deliveries produces a significant amount of noise in a city, not only from the engine and tyre noise but also unloading and loading of goods can be very obtrusive. According to Lee (2001) as cited by Emmanuel et al (2013) it is predicted that the number of vehicles on our street will increase from 4:1 to 5:2 in the year 2020. The top five of the most congested cities in North American range between 33% for Los Angeles to 25% for Tampa (table 7). In Europe the top five most congested cities ranges from 42% for Warsaw to 32% for Paris. In African cities Johannesburg ranks top amongst South African cities with congestion level of

32%, which represent a travel delay and traffic in the cities for 37minutes for every hour, driven in peak hour traffic as depicted in table 1.

Table 1: Traffic Congestion Index

City	Congestion level	Average free flow/speed	Average speed at peak	Delay/hour at peak
Los Angeles	33%	62.7 km/h	54.7 km/h	40 min
Vancouver	30%	56.3 km/h	48.3 km/h	34 min
Miami	26%	67.6 km/h	61.2 km/h	29 min
Seattle	25%	61.2 km/h	54.7 km/h	35 min
Tampa	25%	69.2 km/h	64.3 km/h	28 min
Johannesburg	32%	63 km/h	56 km/h	37 min

Source: Tom Tom Congestion Index (2012)

Road Safety

High accident may have direct impact on the road safety issues. Road design, vehicle design, and traffic management may not be an issue that is usually kept in the minds when deciding on a route for large vehicles. According to CityLog (2010) and Taniguchi *et al* (2001) safety is a very important issue in urban freight transport. The issue is significant in urban areas where pedestrians might be exposed to freight vehicles. Goods vehicles are seen as hazardous entities in the urban environment. Ogden (1992) added that Road safety issues consist of four economic cost; delay cost, clean-up cost incurred the government and institutions, increased in vehicle operating cost due to high congestion traffic flow conditions caused by the accident and accident cost which includes fatality cost and others.

METHODOLGY

The case study approach was used for the study. This approach allows for investigation and understanding the dynamics of the phenomenon. It is useful in dealing with contemporary issues in real life situations and the researcher has no control over the event. In case studies, researchers do not focus on the discovery of a universal generalized truth, nor do they typically look for cause-effect relationships; instead emphasis is placed on exploration and description. The study adopted both non-probability and probability sampling. The non-probability sampling made use of purposive sampling. By this, specific units were selected for study due to their unique characteristics. Accra was chosen as the study area for this research. The choice of Accra as the core unit was due to its strategic location as the capital city of Ghana and the characteristics it exhibits for the purpose of the study. The study was also extended to Tema and Ga West due to their proximity and location in terms of linking Greater Accra to other parts

of the country. The three metropolises were selected purposefully for the study because they are located to the major highways in the country linking to very important part of the country. The sample size of the three peripheral district centers were determined by using the mathematical formula as given by:

$$n = \frac{N}{1 + N(\alpha)^2} \quad (1)$$

Where n is the sample size, N is the sample frame, ∝ is the margin of error and 1, a constant. The population size of the various districts was projected from the 2000 population and housing census result in a more reflective size. Using the intercensal growth rates for the various metropolitan and municipalities, the size is projected using:

$$P_t = P_0(1 + r)^t \quad (2)$$

Using 95 percent confidence level, the sample size for the various district centers are presented in table 2.

Table 2: Sample size determination

Metropolis	2010 (millions)	Growth rate (%)	2014 projected population (million)	Sample Size
Accra	2.500	4.0	3.040	1708.7
Tema	0.402	3.8	0.409	627.3
Ga	0.305	3.5	0.305	541.5

Empirical field information from multiple sources were collected and analyzed to support the findings as they pertain to Ghana and the study areas in particular. These were gathered through interview guides, personal observations and questionnaires. Institutions interviewed include the Accra Metropolitan Assembly and all the departments of planning in the three peripheral metropolises, Ministry of Transport, Ghana Private Road Transport Union, Haulage Union, and Environmental Protection Agency (EPA), Motor Traffic & Transport Unit of the Ghana Police Service, Ghana Freight Forwarders Association and selected companies. All institutions were selected purposefully as they possessed the kind of information required for the study. Probability sampling, specifically, random sampling was used to select individual respondents from the peripheral metropolis where questionnaires were distributed and interviews also conducted by the researcher. By this method the units are selected at random using the serpentine method. The study used both qualitative and quantitative tools to present and analyze the data gathered.

DATA ANALYSIS & FINDINGS

Current Trend of City Logistics Practice in the Study Area

Logistics practices in the peripheral cities

Interviewing with selected companies revealed that their vehicles move within the centers to deliver directly to customers. They mentioned that due to inadequate parking lots in the centers they are forced to park on the streets and the pedestrian pavements to make deliveries and pickups. 40% of the companies indicated that they do not have planned time for their movement, they enter the city as and when customers make demands.

The researcher realized that many service companies have parked along the roads to receive deliveries in the early morning (peak periods). Most of the businesses in the central business district (CBD) lack parking lots in their premises. Selected companies in the industrial zones mentioned in an interview that 60% of their trailers and trucks exit the city to make deliveries in the other parts of the country. The companies revealed that due to poor security system in the cities, 5% of their vehicles deliver on the night. They further established that due to low power supply all the vehicles used within and outside the city are all fuel based. 70% of the respondents from the informal sector stated that they engage the use of commercial vehicles, taxis, manual trucks to transport their goods and make pickups. The 30% revealed that 97% of their vehicles use was (second hand) used cars.

Researcher noticed a number of trends such as predominance of mixed-used and stand-alone commercial activities commingled with residence and the relationship of this activity with the area logistics network. It also noticed that in addition to selling their items within their shops, many shop owners make use of the space in front of their shops, including the pedestrian walkway, to showcase their stock. There is an also extensive informal commercial activity within the three peripheral cities which often encroaches on the pedestrian walkway and at the bases of footbridge and along their elevated walkways. Both forms of activity, limit pedestrian space along the roads city centers. Distribution takes place on the outer lanes of the roads, contributing to congestion. Although these areas are highly commercial areas the researcher did not observe any specific area set aside for customer parking. Based on the extraordinary volume of vehicles accessing the area, the lack of amenity straining the available space forcing drivers to park their vehicles on the sides of roads and walkways. Informal commercial activities including roadside vending is ubiquitous throughout the three peripheral cities extending the form Obetsebi Lamptey circle to first light. The majority of these activities is concentrated around the central business district, north industrial zone, southern industrial zone, and the major markets in the centers, which often leads to both vehicular and human traffic.

Transportation mode

It can be seen from the table 3 that 97.8% of freight transportation in the centers is done by road. Coastal and inland shipping is not being practiced. The railway system is not being used in transporting goods because it is insufficient. 2.2% of freight transportation is done by the rail system. City residents, informal business sector and the SMEs mentioned that their main mode of logistics was by private cars, taxi, Metro Mass Transit buses, trotro (local private commercial vehicles), walking and cycling as a means of transport. Whiles the big companies from various industrial sectors uses vans, mini buses, trucks and long trailers. During an interview, it was noticed that people's perception of public transport being used in logistics activities reveals satisfactory or better rather than poor, because that was the best choice they could get. However about 70% of the respondents from the informal and SMEs sector expressed concerned about the reliability of the trotro and buses to pick up and deliver goods on time and to the right people. According to the Ministry of Roads and Transport the railway network is insignificant and has been neglected. It currently handles less than 2.2% of freight traffic. Even though rail infrastructure is concentrated in the three peripheral centers and was designed to transport commodities it has been abandoned. Table 3 also indicates that water bodies are not being used in freight transportation.

Table 3: Mode of transportation in the cities

Mode	Percentage Share
Road	97.8%
Rail	2.2%
Water bodies	0%
TOTAL	100%

Vehicles used

Van and buses account for 63.8 percent of vehicles on the roads in the peripheral cities whiles trailers account for 23.2% of the vehicles (Table 4). Further, motorcycles are not mostly used in the transportation of goods in the peripheral cities, accounting for only 10.5 percent.

Table 4: Types of vehicles used on Roads

Types of vehicles	Percentage Share
Vans and buses	63.8%
Motorcycles	10.5%
Trailers & Trucks	23.2%
Others	2.5%
TOTAL	100%

Delivery and pick up period

The study reveals that 50.3% of the interviewed companies move their vehicles in the morning peak periods. Majority of deliveries and pickups are done during this period. 31.2% move their vehicles during the evening peak periods whiles 16.1% move vehicles in the afternoon during the off- peak periods and only 2.4% move vehicles to make delivery or pickup. In all, 43.4% of vehicles move out during the peak periods whiles 35.2% of vehicles move in the evening peak periods. It can be seen that most activities take place during this period. 20.1% of the vehicles from the companies in the cities during the off-peak periods and the least value of 2.4% of vehicles moving in the night.

Table 5: Delivery and pickup period

Period of movement	Percentage of companies	Percentage of their vehicles
Morning Peak period	50.3%	43.4%
Off-peak period	16.1%	20.1%
Evening peak period	31.2%	35.2%
Night deliveries	2.4%	1.2%
TOTAL	**100%**	**100%**

Effect of Hazards on City Logistics

Causes of man-made hazards

During an interview with the Town and Country Planning Department it revealed that Greater Accra region being the heart of the country with the three peripheral cities being parted. Rural, urban drift is on the higher side and due to land management system issues migrants are forced to erect a building on waterways which intend causes flood during the rainy periods. This makes movement within the city difficult and unlivable for residents. They went further to state that due to poor land management system and weak enforcement of legislations on city formation, there is poor demarcation and arrangement of structures in the city thereby creating congestion and traffic in the city. The Ghana National Fire Service and National Disaster Management Organization (NADMO) officials in an interview mentioned that due to inadequate number of utility vehicles and water for fighting fire when there is a little spark of fire it ends up destroying large infrastructure. Mr. Isaac Mensah (chief disaster control officer) at NADMO in a discussion added that 95% of the north industrial zone companies lack fire safety measures. Latex Foam Company fire disaster was an example.

The Greater Accra Municipality Assembly (GAMA) and the Environmental Protection Agency revealed that due to high illiteracy and poverty rate contractors and residents engage the use of inferior materials to construct a building which makes it weak and as a result collapsing in short period. An example is the recent collapse of a six floor-apartment at Nii Boi town whiles still under construction. It was noticed that the road leading to the site of the collapsed building was blocked in order to prevent other casualties and as a result, causing traffic and congestion on the other minor road linking to the George W. Bush Highway.

Forms and Effects of man-made and natural hazard in the three peripheral city logistics

The Ghana National Fire Service and NADMO in an interview stated that Ghana is prone to natural disasters such as Pest and Insect Infestation, Disease Epidemic, Fires, Hydro, meteorological, Geological. It was established that man-made disasters such as Ethnic Conflicts or Political War, Aviation and Lake Maritime accidents, Pollution of water bodies, Industrial accidents, Failure of structures (Collapse of buildings, dams and mines), Nuclear and radiological accidents , Oil spillage were rampant in Ghana. They went further to state that man-made hazard occurrence is 80% as compared to that of natural hazard. An example is the Melcom Disaster that occurred on the 7th November, 2012. Melcom being one of the biggest retail shop with branches all over the country especially the three peripheral centers had it building collapsing. This caused the death of 18 employees and customers. Hawkers, residents and small retail shops that purchase from the shop had to move into the other branches and the central business district as a result causing traffic congestion on the roads. The Ghana Police and the Motor Transport and Traffic Unit (MTTU), a division of the Ghana Police Service also mentioned that Trucks and vans about to be loaded and unloaded during this time frame had to return causing lots of noise and traffic congestion. NADMO, Ghana Fire Service and the Ghana Police in an interview also mentioned also all the five (5) hubs in the peripheral centers have been destroyed by fire all in a span of a year as well as some industrial companies in the North industrial zone. These hubs are; Tema market, Makola No.1, Kantamanto, Agbobloshie market, and Makola No.2. Traders in these hubs during an interview mentioned that they were in great agony and debt because they did not incorporate this risk and higher percentage of their capital is funded by loans. They added that they had to buy and import more goods in order to meet inventory level and satisfy customer requirements.

The team from GPRTU and MTTU during an interviewed revealed that there was a 10 % increase in traffic congestion during these periods. Because bigger and older trucks were forced to enter the centers to make deliveries. They went further to say that road accident also

increased by 4%. Almost everyday road accident was recorded due to different vehicles fighting for space and also freight forwarders, transporters, and company vehicles wanting to meet demand and make more profit. The Town and Country Planning in an interview also revealed that most residents block roads and streets to hold ceremonies and functions which results in traffic congestions in the city. Chiefs being the people in charge of allocating land in the three peripheral centers sell most of the land reserved for high streets and other centers thereby leaving the cities with Narrow Street creating traffic. The researcher noticed that most streets during the weekends were blocked due to funerals and off-loading at some warehouses. AMA responded that they have recently demolished over 360 unauthorized structures on waterways as an effort to reduce flooding in the metropolis. The Environmental Protection Agency (EPA) under the GAMA when interviewed also revealed that flood is one of the major disasters in the peripheral centers. They said flooding in the city is both man-made and natural. Citing Odawna River as an example; climate change is the natural cause while the man-made activities are poor land use, unplanned development of settlements, and indiscriminate disposal of refuse into and on the banks of the river. The researcher noticed that during the weekends and some days in the week, roads are blocked by private people to hold events which lead to vehicles, concentrating on the other roads, thereby creating traffic congestion and inaccessibility to deliver or make pickups in those areas in the city. On the 28th March, 2014 another fire gutted the Makola Market again, which makes fire disaster in the city alarming. It can be deduced from figure 3 that those hazards that happen due to the activities of stakeholders of the sites is at the rate of 80% as compared to the hazards that happens naturally. According to figure 4, 51% of the hazard is from fire whilst 18% is from blockage of roads. It was also surprisingly revealed that 15% was from flood, 12% was political and ethnic conflict and other forms that were not identified.

Figure 3: % share of hazards in peripheral cities

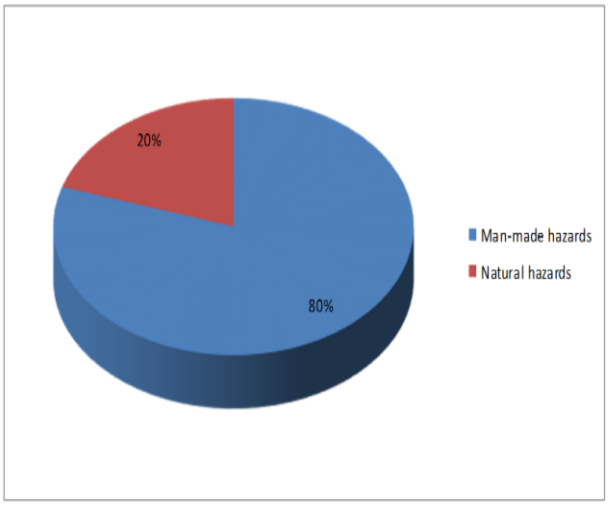
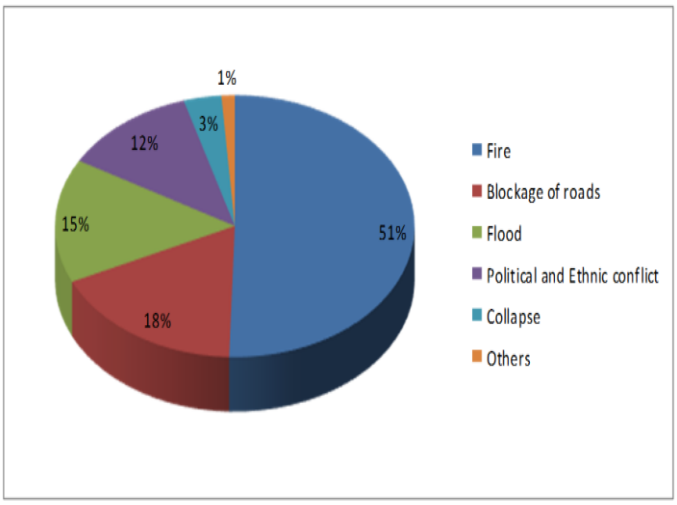


Figure 4: Man-made hazards in peripheral cities



Challenges of City Logistics

An interview with the Environmental Protection Agency, Ghana Police Service and Town and Country Planning Departments revealed that the major challenges facing the peripheral cities are traffic congestion, shortage in energy (electricity and fuel) supply, noise, pollution and other hazards. The researcher noticed that some parts of the center are inaccessible by vehicles due to the poor state of primary, secondary and tertiary access roads.

Currently the city is experiencing an energy shortage; the electricity goes off for 12 hours and works for 12 hours. During those periods most activities within the city comes to a standstill, most vehicles do not move because most of the fuel stations stop operations. Traffic light does not work creating congestion on the road for the few vehicles moving within the city. When the electricity flow begins traffic congestion, noise and road accident increases. Stakeholders in the city all airing this period will want to meet targets for the day.

Traffic Congestion

The road network systems in the three peripheral centers have been categorized by the department of Urban Roads as shown in table 6. The categorization was done in the order of congestion levels. The researcher observes that traffic flow is very high in the three peripheral cities because of many houses, major hubs, industries and many institutions in these centers.

Selected companies interviewed revealed that due to lack of parking places for freight vehicles, both on-roads and off-roads, they are forced to park in unauthorized places which increases congestion as well as causing disruption to traffic and safety problems and also even where such places exist, they are often illegally occupied by other vehicles since restrictions allowing only freight vehicles to use such places are rarely enforced. The industrial pollution of sound, odor, dust, and carbon are setbacks to the development of the metropolis. The heavy trucks, articulators and trailers plying the roads in the metropolis reduce the life span of the roads.

From table 6, it can be deduced that the high street is the busiest road with 5.0 average kilometers and congestion index of 13.8 whilst Sanyo road has the lowest average speed kilometer of 4.8 per hour and congestion index of 1.7. It reflect the actual situation on the ground since majority of vehicles use the high street because of its proximity to businesses and other stakeholders of the city whilst Sanyo roads leads to few businesses.

Table 6: Major key roads in the 3 peripheral cities in order of congestion level

Name of Road	Functional class	Average speed (km/hr)	Congestion index
High street	Principal Arterial	5.0	13.8
Tema Motorway	Principal Arterial	3.3	8.9
Ring Road	Principal Arterial	5.5	6.0
Kanda highway	Principal Arterial	5.4	5.8
Harbor Road	Principal Arterial	2.5	5.6
Abbossey okai	Minor Arterial	9.8	3.0
Valco Road	Minor Arterial	11.3	2.8
Spintex Road	Minor Arterial	8.5	2.3
Sanyo Road	Minor Arterial	4.8	1.7

Source: Urban Roads

Vans and buses account for the highest percentage (69.1%) of means of transporting goods in the three peripheral cities, followed by trailers and trucks (21.4%), whist the use of motor cycle recorded 7.2% and other means of transportation recorded 2.3% as illustrated in table 7. It was established that, the use of vans and buses were easy and cost effective in the distribution industries since fuel consumption was reasonably cheaper, and also maneuvering was perfect, hence maximum usage. The cost involve in the usage of trailers and truck was high even though it was used in the carting of bulky goods for a longer distance. It was also popular when transporting goods from the three cities to other parts of the country, especially in the northern parts of the country. Motorcycles were not popular because of the volume of goods it can convey at a time, but was helpful during heavy traffic periods with deliveries of lighter parcels within the cities. The other means of transport included unconventional forms such as wheelbarrows, head carriage and the likes which were not popular.

Table 7: Distribution of average traffic mix of vehicles in the cities

Types of vehicles	Average Percentage Share
Trailers & Trucks	21.4%
Motorcycles	7.2%
Vans & Buses	69.1%
Others	2.3%
TOTAL	100%

Environmental impact

During an interview with the environmental protection agency it emerged that emission from vehicles forms a major part of pollution in the cities. This massive emission from vehicles was largely attributed to the poor maintenance culture of some vehicle owners, and adulteration in some fuel by some dealers.

Road safety

Accident level has been on the rise in the three cities and Ghana is causing significant detractions in the distribution system. The table 8 indicates the sharp increase in the rate of vehicular accidents in the areas. The cause of majority of these accidents was attributed to reckless driving, poor roads, poor maintenance, second-hand tire usage and others. These were revealed by the road safety commission of Ghana during one of the visitations to their office.

Table 8: Trend in road accidents and causalities in Greater Accra Region 1991-2011

	Accidents						Casualties					
Year	Total	Index	Fatal	Index	Injury	Index	Total	Index	Persons Killed	Index	Persons Injured	Index
1991	2835	100.0	90	100.0	1166	100.0	1565	100.0	103	100.0	1462	100.0
1992	2097	74.0	140	155.6	1073	92.0	1905	121.7	164	159.2	1741	119.1
1993	2187	77.1	111	123.3	1070	91.8	1703	108.8	115	111.7	1588	108.6
1994	2302	81.2	113	125.6	1071	91.9	1819	116.2	155	150.5	1664	113.8
1995	3645	128.6	176	195.6	1637	140.4	2453	156.7	190	184.5	2263	154.8
1996	3654	128.9	165	183.3	1603	137.5	2612	166.9	186	180.6	2426	165.9
1997	4231	149.2	160	177.8	1834	157.3	2764	176.6	174	168.9	2590	177.2
1998	4963	175.1	243	270.0	2178	186.8	3182	203.3	258	250.5	2924	200.0
1999	3414	120.4	158	175.6	1490	127.8	2278	145.6	172	167.0	2106	144.0
2000	5234	184.6	214	237.8	2259	193.7	3295	210.5	237	230.1	3058	209.2
2001	5003	176.5	220	244.4	2214	189.9	3420	218.5	240	233.0	3180	217.5
2002	4229	149.2	150	166.7	1581	135.6	2798	178.8	169	164.1	2629	179.8
2003	4110	145.0	207	230.0	1765	151.4	3136	200.4	232	225.2	2904	198.6
2004	4624	163.1	253	281.1	2028	173.9	3782	241.7	299	290.3	3483	238.2
2005	4983	175.8	259	287.8	1975	169.4	3565	227.8	313	303.9	3252	222.4
2006	5454	192.4	305	338.9	2533	217.2	4215	269.3	335	325.2	3880	265.4
2007	5936	209.4	363	403.3	2883	247.3	4857	310.4	407	395.1	4450	304.4
2008	5044	177.9	351	390.0	2180	187.0	4267	272.7	385	373.8	3882	265.5
2009	5588	197.1	385	427.8	2539	217.8	4971	317.6	429	416.5	4542	310.7
2010	5122	180.7	384	426.7	2267	194.4	4292	274.2	423	410.7	3869	264.6
2011	4311	152.1	360	400.0	1889	162.0	3794	242.4	408	396.1	3386	231.6

Source: MTTU division of Ghana Police Service

CONCLUSION

The Greater Accra Region is a rapid growing Metropolis with non-controllable migration from peripheral outskirt in view to change the economic fortune due to it being the capital region of Ghana which aggravates the urban facilities of the inhabitants in limited infrastructures including

narrow roads and streets of pre-urban and initial urban age. The result of the survey shows that stakeholders in the city do things on their own way; this is an indication that there are no city logistics practice policies governing activities in the city. In this regard the following recommendations would be meaningful for an improvement in the city logistics of the peripheral:

- Government institutions in charge of city development and sustainability should set rules to control the number, place and periods for vehicles entering as the Low Emission Zone (LEZ) practice being done in London/UK. The authorities should build consolidation centers far away from the city centers so that small vehicles will cart goods to the city center instead of huge trucks coming to the city center to off load goods as done by City Porto in Padua/Italy.
- Authorities should undertake intersection improvement designs in almost all vehicular intersections, areas most especially in Accra and Tema, and its corridors to reduce delays and queues. Also, the efficiency of the N1 Highway and other highways in the capital city of Accra in terms of delays, queues and capacity should be studied and analyzed and if necessary redesigned to improve traffic flow.
- There is also the need for crucial decision to be made by Metropolitan authorities of Accra and Tema to decentralize institutional and administrative premises to somewhat distant away from the most congested commercial zones, resulting in significant reduction in congestion.
- The AMA and TMA can enforce some rules on developing high-rise infrastructure. In that case the high-rise building should obviously provide multistoried parking facilities to help prevent parking on major streets which are already constrained by vehicular capacity as using building code regulation for off-street delivery areas practice set out in Barcelona, Spain.
- Apart from the narrow roads which were observed in the CBD of Accra and Tema it would be essential for authorities to remove floating shops, mobile hawkers, artisans and temporary traders from roads and roadsides to help ease traffic congestion.
- The Ministry of Transport and its sub branches should make the use of rail line attractive by increasing the lines destinations and reducing the cost. Efforts should be made to have less polluting and more energy-efficient vehicles such as electric vehicle which can reduce energy consumption and lower environmental pollution.
- Finally, to ease the traffic congestion within the peripheral cities, authorities should undertake initiatives through proper study and applying engineering science in

traffic management aided with computer models. There is the need to utilize the knowledge of traffic engineers and the involvement of experts, specialist and concern academicians. This will lead to a short term and long term solution for efficient traffic management and city logistics planning in the peripheral case study area.

FUTURE RESEARCH

The findings of this research give numerous opportunities for further research be carried out:

- To extend the study to include the other main regions and cities in Ghana.
- To extend the research to other related dimensions of supply chain.

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