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**“Efficient Distribution Systems for goods to the City centre”**

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## ***ABSTRACT***

Goods distribution is an important part of activity in urban life. It is important in sustaining human lifestyle and generates wealth to industrial and trade activities. Thus an efficient distribution system of good can play a vital role in urban economy in term of income generation and employment opportunities.

On the other hand, goods distribution into the city centre is responsible for the adverse effects of the city such as traffic and environmental condition. The issues of congestion, accidents, pollution, noise and fossil fuel use are some of the dislikes that go to inflict a negative impact on city life. This situation of enjoying city life and making goods deliveries to the city centre to support industrial and trade activities leaves city dwellers, politicians and logistics providers in a dilemma position.

Thus, this research paper is aim at attempting to provide a better way in which goods can be distributed to the city centre, without jeopardizing the lives of city dwellers, depleting our environment and also enabling a good profit margin for the stakeholders (industries, shops and logistics providers).

***“Do not follow where the path may lead. Go instead  
where there is no path and leave a trail”***

***George Bernard Shaw***

***“Dedicated to My Niece Aleena Shahzad (Faisal) with  
Lots of Love and to my family (Tenti)”***

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***Chapter 1***  
***“Introduction”***

## ***1 INTRODUCTION***

City freight transport is an important branch of activity in the city life. It is needed to sustain our lifestyle, and serves industries and trade activities in the aspect of wealth generation. It supports the city economy both in terms of income generation and employment activities. However, this freight transport is responsible for traffic and negative environmental impacts in the city centre such as congestion, pollution, noise and fossil fuel use.

The distribution of goods by light vehicles or heavy trucks to the city centre has been the center of academic writings and discussion for some time now, and is an emerging field especially looking at the physical and the environmental impact of such activities. Every city wants to have a lively and accessible city centre that will promote culture and trade activities, where the city dwellers will move about freely and carry out their daily activities at ease. However, the distribution of goods to the city centre has never been accordance to the desire of the inhabitants due to the space factor in the city and the environment. One efficient way of addressing such a situation is to develop an efficient distribution system of goods to the city centre.

### ***1.2 THE OUTLINE***

The introductory part of this thesis consists of mainly presenting the role of city freight in the daily lives of city dwellers. The background, gives us an understanding on the traffic situation and problems in the city. In the research methodology, we are going to state the research design we have used. In that part of the research, we are also going to follow models of existing business researches so that our work can be well structured, so as to achieve our objectives at the end of the whole work. The theoretical framework of the research will be considered on the background on which the whole project is based on. The reviewed of existing literature, relevant to our subject, which will intend be used in the analytical part of the project. The review of the present system in the distribution of goods will come in the empirical section, which will then be preceded by analysis and solutions to the present system so as to have a better distribution system in the future. The last part will be comprised of recommendations to the alternatives presented, conclusions and suggestions for further research on this area of study.

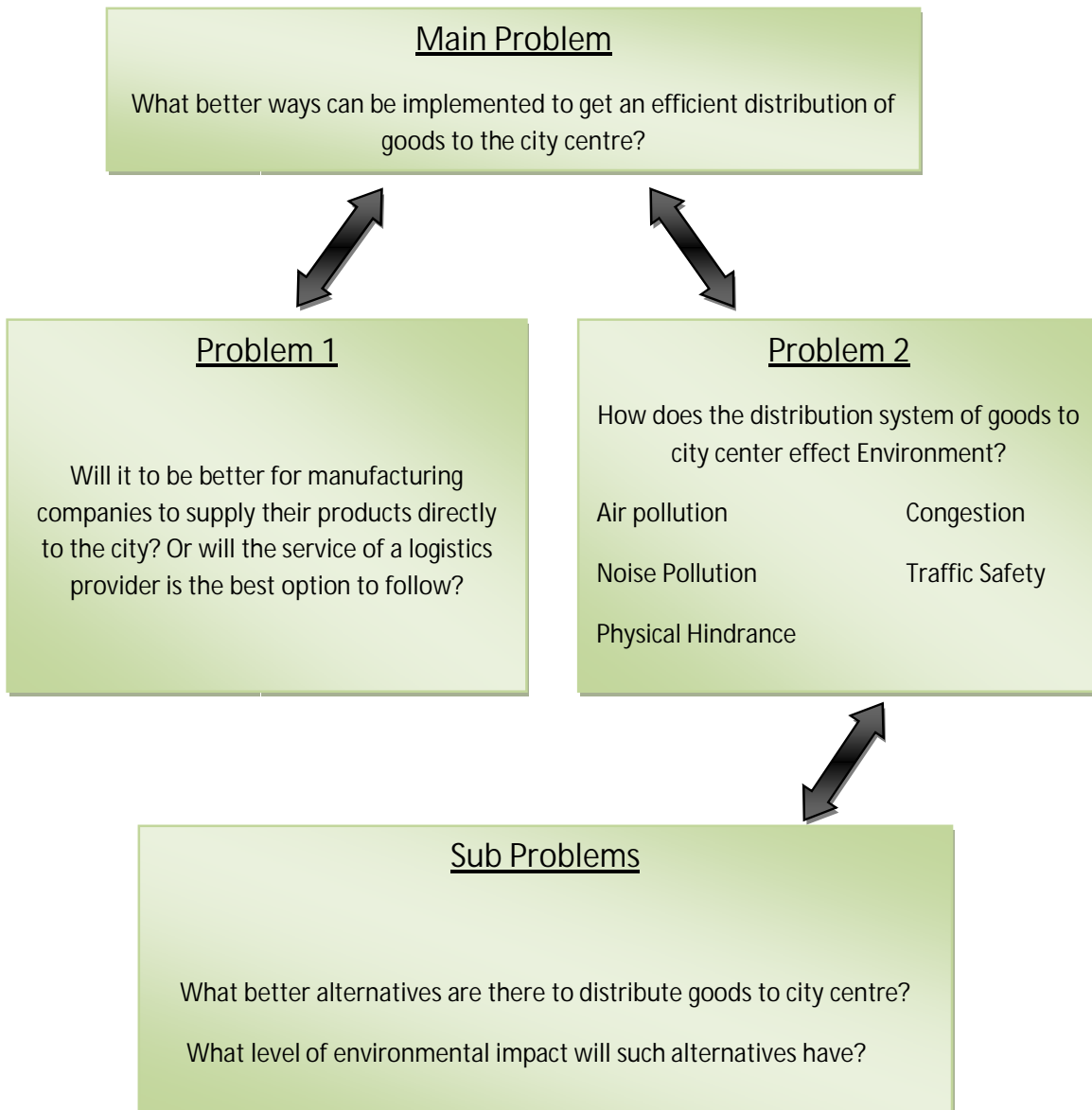
### ***1.3 BACKGROUND***

Nowadays, it is commonly noticed that the rate of traffic is high in the city centre which leads to congestion and other environmental hazards due to the limited space in the city centre. Thus from a transport planning point of view time has come to change the ways of distributing goods to the city centre, so that other stakeholders (shops and people) may benefit from such a move. Thus this thesis paper is aimed at outlining the such environmental impacts of city traffic, such as congestion, pollution, noise and other environmental hazards, then trying to suggest ways in which such impacts maybe handled or reduced, but looking at relevant sources of information. On the other hand, it will also be able to state and proof or show in which way(s) is better to efficiently distribute goods to the city centre so that shops can better optimize their profit. Therefore the thesis work will be aimed at bring the stakeholders (logistics providers and the administration) to better deal with the issue of city space so as to curb the issue of congestion in the city and improve on the city's economy.

This may involve setting up new co-operation ties and partnership agreement between those involve (city council, property owners, retailers and freight forwarders) in the process of making efficient distribution of goods into the city centre. Such ties will result to reduction in number of trucks to the city centre, reduction in delivery times, and reduction in the kilometers run by the trucks. Such will improve on the city's atmospheric conditions, reduction in noise, road damage and city resident as a whole.



## 1.4 PROBLEM DEFINITION AND PROBLEM ANALYSIS



Companies worried about their goods or products getting to the final consumer in a timely fashion, so as to guard against the lost of money, what options are there for such companies?

What better ways can be implemented to get an efficient distribution of good to the city centre? Will it be better for manufacturing companies to supply their products directly to the city or will the service of a logistics provider the best option to follow? The issue of how many forwarders to employ, how many terminals to use, how the goods should be distributed, mixture or not are all challenging for efficient distribution of goods. The environmental consideration on the one hand and the economic on the other hand play a dilemma on this

issue. The welfare of city and the city dwellers also has an impact on the distribution of goods to the city centre.

Looking at the economic activities of the city centre, numerous businesses and offices commuter of people, what is the way out for an efficient distribution of goods to the city centre? Everybody wants a lively and accessible city centre, where they move around safely and where trade and culture are flourishing. This cannot be achieved if the goods and services needed to provide such standards are not delivered on a daily basis. However, such an enormous task has never been to our wishes, regarding the city's space and the environmental impacts of such transactions. Therefore, looking at the environmental aspects of goods distribution to the city centre by trucks and Lorries is an exciting research area and possibly developing new ways so that both the welfare of city dwellers and goods distribution can be best handled.

Therefore our problem in this thesis paper will be look at the environmental aspects of goods distribution to the city centre. Such environmental aspects will compose of air pollution, noise pollution, congestion, and also to attempt solutions to our problems. From this main problem sub research questions can be developed such as; what better alternatives are there to distribute goods to the city centre? What level of environmental impact will such alternatives have? What might be the cost structure of such an alternative and what might be the impact on shops?

## ***1.5 THE PURPOSE***

The main aim of this thesis work is design and develops better possibilities of distributing goods to the city centre. In order to come up with a better way of distributing goods to the city centre, we are going to consider the some aspects of distribution systems. These include the environmental issues, whereby, we shall relate the available alternatives and their environmental impacts, basing our arguments on the cost structure of the alternatives.

Secondly, also evaluating the role of the city council vis-a-vis logistics providers, and the different approach they may implement to better handle the distribution system of goods to the city centre, and how their activities contributes to the welfare of the environment. At the end of the thesis work, we shall be able to tell which options are better for efficient distribution system of goods to the city centre.

## ***1.6 THE SCOPE AND LIMITATION***

The scope of this thesis work is only focus on the physical distribution of goods. It does not cover the entire supply chain process. Thus other logistics aspect of goods flow will not be examined in this thesis. It will focus mainly on the distribution of goods from the point of the logistics provider. It will further boil down to designing and suggesting better ways of distributing goods efficiently to the city centre, taking into consideration the environmental aspects of such activities, as well as the economic, social and road safety aspects.

As a matter of fact, the main limitation to this thesis work is that of financial resources, to enable us get to the right channel for available information. A further limitation is the time and space factor that will limit us from gathering all the necessary materials and facts needed to come up a better thesis than this. However, with the available resources, we were able to come up with something reasonable, and that can be of help to the city's administration to address the numerous problems there are facing. Thus at the end of this thesis work, we shall suggest and recommend further research in areas we shall not look at due to our limitations.

***Chapter 2***  
***“Literature Review”***

## ***2.1 INTRODUCTION***

In this chapter we are basically going to revisit existing and related literature relevant to our subject of discussion, that is, an efficient distribution system of goods to the city centre. In most big cities around the world, the centres of the city determine the rate of economic activities in that city. Thus a well designed and built city centre will attract a lot of businesses and people every day. Therefore a well structured, built and efficient transport as well as distribution of goods is a necessity for such cities. However, there are many challenges to face which span from economic, social, society, road safety and environmental. These issues need to be taken into consideration in order to have a well structured and organized city centre. We are not going to have a brief look at some of those challenges.

## ***2.2 SOME MAJOR CHALLENGES TO DISTRIBUTION SYSTEMS IN THE CITY***

The adverse impact of city distribution or city logistics can be felt from many angles. Such issues as the economic, the society, the road safety, and the environment are all affected by the manner in which goods are distributed in the inner city and such issues need to be address in the short run to guard against their adverse effects in the long run.

### ***2.2.1 Economic***

The economic impact of distribution systems in the city cannot be undermined. Such issues cause by time delays and congestion in the city only translates to increase cost to the logistics providers. Congestion will no doubts increase the inventory carrying cost, lengthy time-to market delays, increase transport cost, such issues when translated into monetary terms will cost a lot for the logistics providers, thus confirming the saying “time is money.” Thus it will be common to find logistics providers in such a situation trying to develop alternative routes, which will not provide the ultimate solution to the problem at hand. Such alternatives routes are usually longer, unsafe both for the drivers and the goods, thus just turning around to increase the transport cost and the security risk allowances, implying increase in operating cost. The effects of such a move can only be felt by the supply chain partners, since such a step will imply increase cost at each level and the burden will final rest on the consumers and the society at large. (*Ramokgopa. L .N ,2004, City Logistics “Changing How We Supply.”*)

### ***2.2.2 Social***

The social ills of distribution systems in the city are also a point to consider when designing a better distribution system for the city. Just as the city dwellers or residents enjoy the high rate of activities in the city, and also as they are customers who cause demand, the high rate of unwanted congestion and accidents caused by many big trucks in the city are not welcomed by such residents. Such impacts increase the social cost of the city since money will have to be disburse to clean-up after and also for the repairs of infrastructure. Therefore with such a negative effect of distribution system in the city, there is need for a better distribution system in the city. (Ramokgopa. L.N,2004, *City Logistics “Changing How We Supply.”*)

### **2.2.3 Road Safety**

The issue of road safety has been thrown into the bin most often when trying to design roads for the cities. Most cities roads have not made provision for big trucks to supply goods to the city centre. Thus, since goods are very necessary for the activities of the city and to make live worth living for, such trucks must ply the city roads. Lack of better knowledge to designed good route for big trucks to reach city centre, cause more problems. This problem can be felt by the society when it comes for drivers to supply goods to the city. Problems such as damage of road infrastructure, property and accidents are issues that must push the stakeholders in designing a better way of distributing goods to the city, especially in time of emergency. (Ramokgopa. L.N,2004, *City Logistics “Changing How We Supply.”*)

### **2.2.4 Environmental**

The environmental impacts inflicted on the society by high traffic of trucks in the city are just abundant that such issues must be looked at immediately. The high demand of fuel by such numerous trucks in the city contributes a great deal to deplete our natural resources which are scarce. Such high rate of consumption by big trucks translates to high rate of emission of CO<sub>2</sub> and other harmful gases into the atmosphere, thereby causing air pollution. Other related environmental impacts are noise pollution, due to the big size of the engines and the ageing nature of such trucks, land pollution resulting from the discharge of hazardous materials unto the surrounding environment, and also high rate of accidents due to the high rate of congestion. (Ramokgopa. L.N,2004, *City Logistics “Changing How We Supply.”*)

After a closer look at some major challenges, we are going to look in greater details the environmental impacts, since it is one of our problems in this thesis.

### ***2.3 ENVIRONMENTAL IMPACTS OF TRANSPORTATION***

After looking at the challenges that face city transportation and that may hinder the efficient distribution of goods, we are going to have a closer look at the environmental issues of city transport or transportation as a whole. Transportation causes tremendous damage to the society, ranging from land consumption, air pollution, noise pollution, and so on. These factors will there be examined below, in greater details.

#### ***2.3.1 Land Consumption***

Huge tracts of land are cleared off each time to provide the badly needed transport especially in the cities where congestion is becoming a major problem, thus depriving these acres of land from constructive usage. As a result to provide such transportation corridors, roads are widened and speed limits increased, thus putting more pressure on the land development and traffic congestion. Nowadays, most cities are facing urban sprawl, as more and more people are moving into the countryside, in order to run away from such adverse effects of such developments. They want to enjoy the natural environment that can no longer be found in the cities due to the fact that land is been covered with concrete, to provide streets and parking lots. The livable and walk able place is no longer found in the cities for people to enjoy. *Environmental Impacts of Transportation* (<http://www.cwac.net/transportation/index.html>).

#### ***2.3.2 Increase Taxes***

It is no doubt that all the money needed for expansion in the transportation corridors in the cities are extracted from the tax-rolls. This implies that all other property taxes are increase to raise money for such construction works. As an effect, the transportation budget of cities rises tremendously due to the increased in the lane of the road from 2 to 4 lanes to curb the congestion problem. Thus is common practice that in major cities, a major portion of the property taxes is used for road widening, new roads, streets lights, parking lots, and other inflated transport cost. Thus it is common to find people living cities to settle in big highways, due to the adverse effects of life in the city. As such, certain facilities are expanded

to get to such class of people, thus taxes have to be raised to provide such facilities (public services) to them. *Environmental Impacts of Transportation* (<http://www.cwac.net/transportation/index.html>)

### **2.3.3 Air Pollution**

Vehicle emissions are the number one source of air pollution in cities. Diesel trucks and cars emit a wide variety of environmentally unfriendly gases such as carbon monoxide, nitrous oxides and other hydrocarbons. It is known that diesel emissions are a leading source of highly toxic dioxin, which affects our food chains. Such an effect is highly felt in the summer period when nitrous oxides are converted into unhealthy surface ozone gases. *Environmental Impacts of Transportation* (<http://www.cwac.net/transportation/index.html>)

### **2.3.4 Water and Land Pollution**

Chemical gases and particles which are released by trucks and car often fall on the streets surface and land. Vehicles often leak gases, oil, and brake fluid and other related particles unto the surface of the road. Cars tires often leave particles of their zinc and others as they wear out. Thus in the winter times, these pollutants are washed away into the nearby lakes and rivers in the cities, thus causing life difficult for such organisms living in these lakes and rivers. *Environmental Impacts of Transportation* (<http://www.cwac.net/transportation/index.html>)

### **2.3.5 Noise Pollution**

As the number of cars in the cities increases, so too does the level of noise in such cities. Thus people keep on leaving the cities for the countryside for a quiet and peaceful life. As a consequent of such a movement, the problem of congestion on the road is increased, since such people need to commute in the city for work and other related purposes, shopping, recreation and so on. Such a move also increase the society cost of providing public services and facilities to this class of people, which thereby increase the society's taxes. *Environmental Impacts of Transportation* (<http://www.cwac.net/transportation/index.html>)



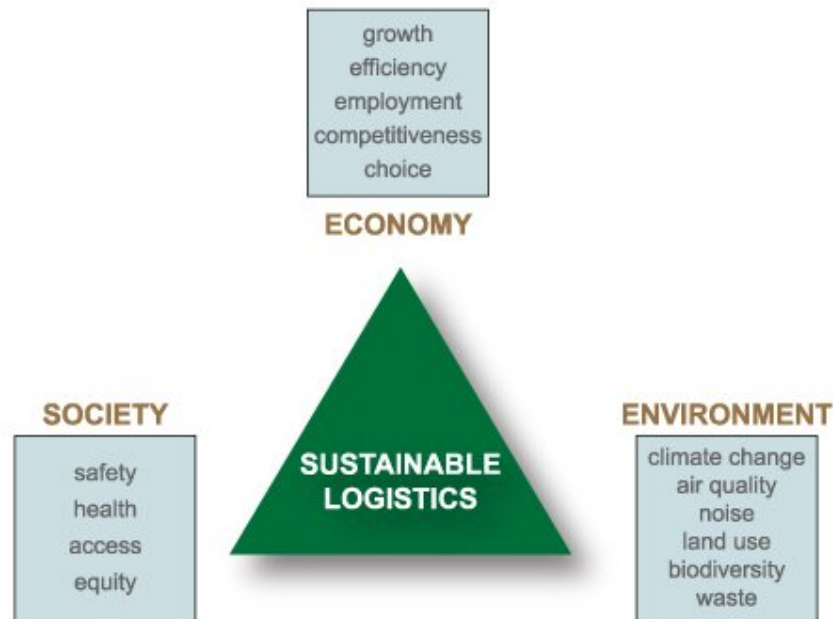
After pointing out the environmental impacts of city transport, we have come to realize that, if the notion of sustainable and green logistics is bore in mind when drafting policies concerning city logistics, then such environmental problem will be solved.

#### **2.4 SUSTAINABLE TRANSPORT AND GREEN LOGISTICS**

Sustainable transportation concerns systems, policies and technologies. It is aim at the efficient transit of goods and services, and sustainable freight and delivery system (*Urban Environmental Management*, <http://www.gdrc.org/uem/sustran/sustran.html>). An efficient distribution system of goods to the city centre cannot be reach without proper consideration of the immediate environment. Basically discussing logistics activities as minimizing cost and maximizing efficiency is not enough; the aspect of minimizing environmental impacts should be included. The concept of environmental logistics has been the centre of discussion during the past decade especially as the world faces an increased impact of global warming. To understand the concept of sustainable logistics or transport, is better we start to look at the word sustainable development in it real meaning. Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Thus from this definition of sustainable development, we can come up with an understanding of sustainable transport to be; a concept developed to take into consideration those clauses in the transportation policy that were lacking. Issues such as excessive energy consumption, affecting the health of the population, decline in delivery level of service and others are some of the issues that come into discussion in sustainable transport. Thus the decision making process has a great impact on the sustainability of a logistics system and the outcome in terms of environmental impacts. Sustainable transport have their greatest impacts at the cities, thus many cities worldwide are now considering the discussion if sustainable transport in the development of their cities. Thus sustainable logistics or transport tries to play a balance between the cost of transport and the adverse environmental impacts in the city.

Logistics is the integrated management of all the activities required to move products through the supply chain. Typically involving activities from raw material source, through production and distribution to the point of consumption and associated reverse logistics. This logistics

activity comprises freight transport, storage, inventory management and so on. The main objective of logistics is to co-ordinate these activities in a way that meets customer requirements at minimum cost. Thus, as the concern for the environment rises, more and more emphasis is placed on the external cost of logistics, such as climate change, air pollution, noise, vibration and accidents. (*Green Logistics* <http://www.greenlogistics.org/PageView.aspx?id=97>) From the above, Green Logistics can be understood as that aspect of logistics which integrates the Economy, Society and Environment to achieve sustainability in the logistics activities. That is reducing externalities and achieving more sustainable balance between economic, environmental and social objectives, as can be viewed in the diagram below.



Source: Green logistics website

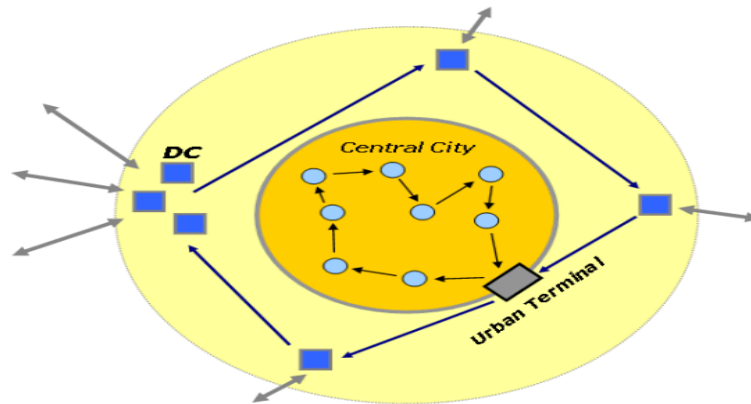
### ***2.5 Distribution and City Logistics***

As has been earlier outlined, urban freight transport faces many difficult problems. “Freight carriers are expected to provide higher levels of service within the framework of Just-In-Time transport systems with lower costs. Congestion levels on urban roads have been constantly rising due to the increasing levels of traffic demand. The environmental problems caused by traffic have become major issues in many cities. Large trucks produce a substantial amount of air pollution in urban areas by emitting NO<sub>x</sub>, SPM (Suspended Particle Material) and other “Efficient Distribution System for Goods to the City Center”

gases. Energy conservation is also an important issue not only because of the limited amount of natural resources available but also for reducing CO<sub>2</sub> emissions to limit global warming. Truck crashes often lead to substantial trauma for the community.” (*Taniguchi et al, 2000, In City Logistics*)

Since an efficient distribution system of goods to the city center cannot be achieved without mentioning the concept of city logistics, we are going to throw some highlights into the concept. City logistics is a relatively new field of investigation brought by the challenges of moving quantities of freight within metropolitan cities. As a matter of fact, during the industrial revolution, much of the freight took place between transport terminals, such as ports and rail yards, with very limited freight into the cities. But, today, there has been a shift in the manner of those activities, with major cities acting as transit for goods to other cities. As coined out by (*Taniguchi et al, 1999a*), “city logistics is the process for totally optimizing the logistics and transport activities by private companies in urban areas while considering the traffic environment, the traffic congestion and energy consumption within the framework of a market economy.” A definition that is not different from that of the Institute of City Logistics, where they define it as, “the process for totally optimizing the logistics and transport activities by private companies in urban areas while considering the traffic environment, the traffic congestion and energy consumption within the framework of a market economy.” To put it in simple terms, it concerns the means to achieve freight distribution in urban areas, by improving the efficiency of urban transportation, reducing traffic congestion and mitigating environmental impacts. Thus we see that the aim of city logistics is to optimize logistic systems within an urban area by considering the costs and benefits schemes of both the public and private sectors.

The concept of city logistics is a distributional strategy that can be of various forms. As can be seen on the diagram below, the highly density central city can be service with goods from the terminal located at the margin of the city. From this terminal, smaller vehicles are then used to service the customers in the city to deliver or pick the goods and parcel and back to the terminal. The idea of using smaller vehicles is because of convenience in the city since there will cause little congestion problems, but a matter of cost is also another issue to be considered in mind. This trade off, we shall be able to tell at the end of our work which way to follow.



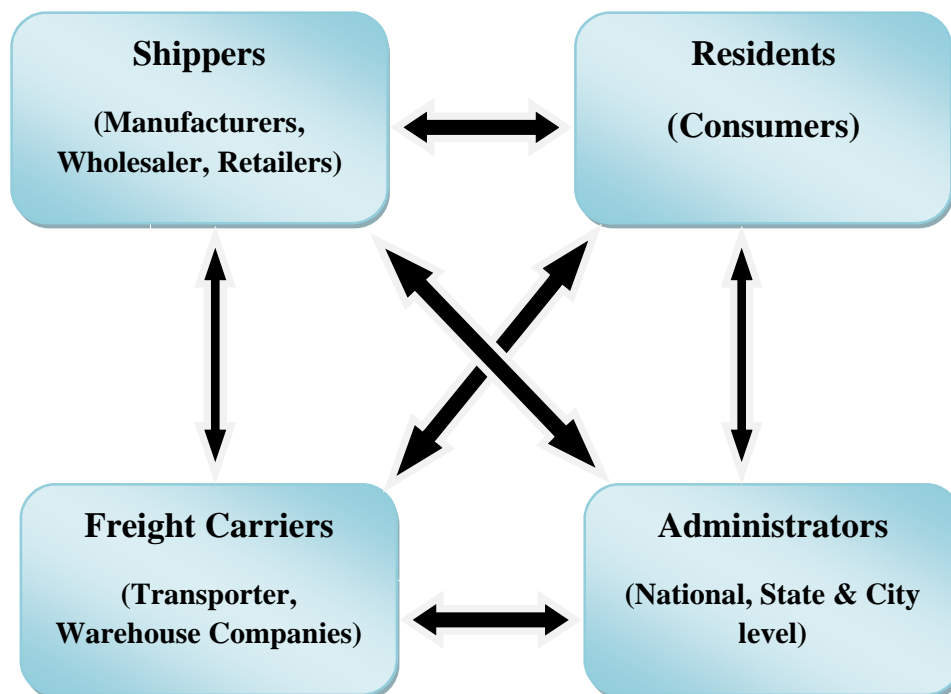
Adapted from: [www.people.hofstra.edu/geotrans/eng](http://www.people.hofstra.edu/geotrans/eng)

Bearing in mind the objectives of city logistics, and the idea of achieving an efficient distribution system of goods to the city center, it is very important to note the various stakeholders involved. Basically, there are four stakeholders involved in urban freight transport; shippers, freight carriers, residents and administrators. Thus to achieve an efficient distribution system, the objectives of each of these stakeholders must be bear in mind, since they all have different objectives.

- a) **Shippers:** Shippers are customers of freight carriers, who either send goods to other companies or persons or receive goods from them. They tend to maximize their levels of service, which includes the cost, the time for picking up or delivering, and the reliability of transport as well as trailing information. As has become, the requirement for carriers to arrive at customers within specified time windows for pickup and delivery has become popular. With such a strict time window, smaller loads of goods are being transported frequently, by smaller vehicles. The reliability (without damage and delay) of delivering goods has become more important for Just-In-Time transport systems.
- b) **Freight carriers:** This category of stakeholders, try to maximize their profits by minimizing collecting and delivering costs. They have much pressure to provide higher levels of service to customers at a lower total cost. They are under the pressure to arrive at customers' within a designated time period, but in urban areas, this requirement is hardly met due to traffic congestion. Thus we find inefficiency in the use of trucks since there will have to arrive at customers' location earlier enough to avoid traffic congestion.

- c) **Residents:** People, who work, live and shop in the city will often want a conducive life. They don't welcome large trucks in the city, even though these trucks are carrying commodities necessary for life. They want to minimize traffic congestion, noise, air pollution and traffic accidents, near residential areas. Retailers within the city also want to receive their goods at a convenient time, thus there is a conflicting subject in this case.
- d) **City Administrators:** they try to enhance the economic development of the city and increase employment opportunities. They will also want to alleviate traffic congestion, improve the environment and increase road safety within the city. They are supposed to be neutral in their activities and resolve problems within the other stakeholders, involved in urban transport. Therefore, the administrator is to coordinate and facilitates City Logistics initiatives.

From the illustration below, we can see that there is a close collaboration between the various stakeholders in this whole business of City Logistics. None of them is totally independent of the other.



*Key stakeholders in City Logistics*

Source: *City Logistics, Network Modeling and Intelligent Transport Systems*, Taniguchi et al (August 2000).

***Chapter 3***  
***“Methodology of Thesis Work”***

Here in this chapter of our research, we are going to explain the various ways in carrying out a business research, the tools and techniques we are going to employ and typically use in business research.

### ***3.1 Research design***

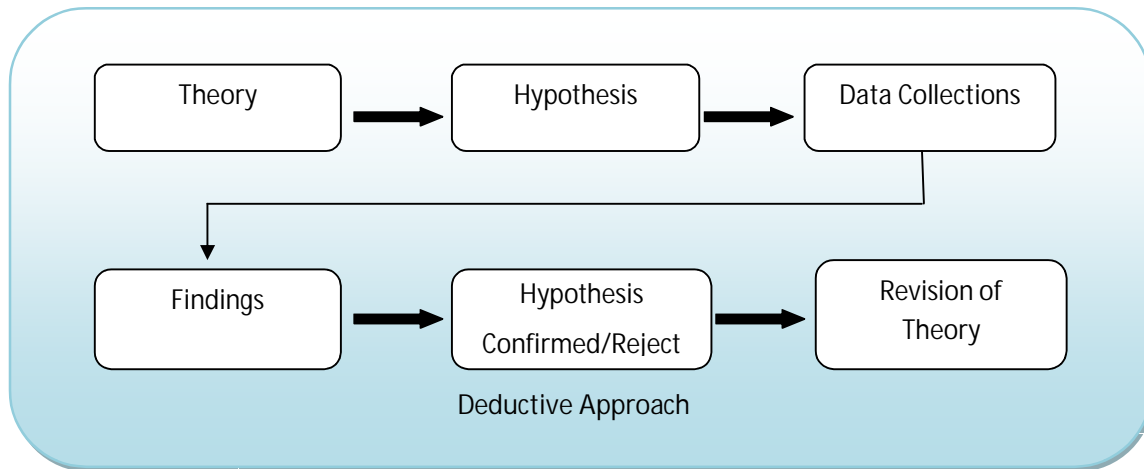
A research design provides a framework for the collection and analysis of data (Bryman/Bell 2007). It is the blueprint that is followed in carrying out a study. According to Ghauri/Gronhaug, 2002, a research design is the overall plan for relating the conceptual (theoretical) research problem to relevant and practical empirical research. That is serves as a linkage between the theoretical and empirical research. The choice of the research design reflects decisions about the priority being given to a range of dimensions of the research process. Thus one useful classification of research design is in terms of the objective of the research considering what is already known about the phenomenon to be studied. Base on this, and the nature and subject of our research topic, we are going to implore a cross-sectional design or social survey, where we shall be able to administer structured interviews. Further we shall use case study design, where the city of Bristol shall be use in this case. And lastly, we shall implore the comparative design, where more or less identical methods are use in solving problems, like the case of Bristol city compared to Göteborg city.

The aim of a research design is to create wanted information for our research. Thus we have to choose a research strategy that we shall follow during our entire research. Basically there are two broad research strategies, deductive and inductive research strategies.

#### ***3.1.1 Deductive strategy***

This strategy allows for the present knowledge for structuring the research problem so that the researcher knows what to look for, what factors are relevant and what hypotheses should be tested empirically. Here, the researchers must be able to select, adjust and apply related concepts (theories) to the chosen problem. This strategy expresses the relationship between theory and research, and the researcher basis on the knowledge that is known in that particular domain is able to deduce a hypothesis that is subject to scrutiny. To simplify the understanding of a deductive strategy, it implies:

Theory —————> observations/findings



### 3.1.2 Inductive strategy

Here the prime task is identify relevant factors and construct explanations (theories). It starts with observations and gathering of data and concludes with theory construction. That is theory is the primary outcome of the research, drawing generalizable inferences out of observations (Bryman/Bell 2007). To simplify it, inductive strategy implies:

From observations/findings  $\longrightarrow$  theory

According to Bryman/Bell, 2007, both strategies are inter-related, since the deductive strategy entails some elements of induction, and the inductive process is likely to entail a modicum of deduction.

Thus from the understanding of the above strategies in conducting business research, we are going to implore the deductive approach in our thesis. This means we shall move from theory and related literature on our subject matter to presenting observations and findings at the end of the thesis. By employing this deductive approach, we are basically going to carry out a qualitative study, where we are going to use more words rather than quantification in the collection and analysis of data.

### 3.2 Research method

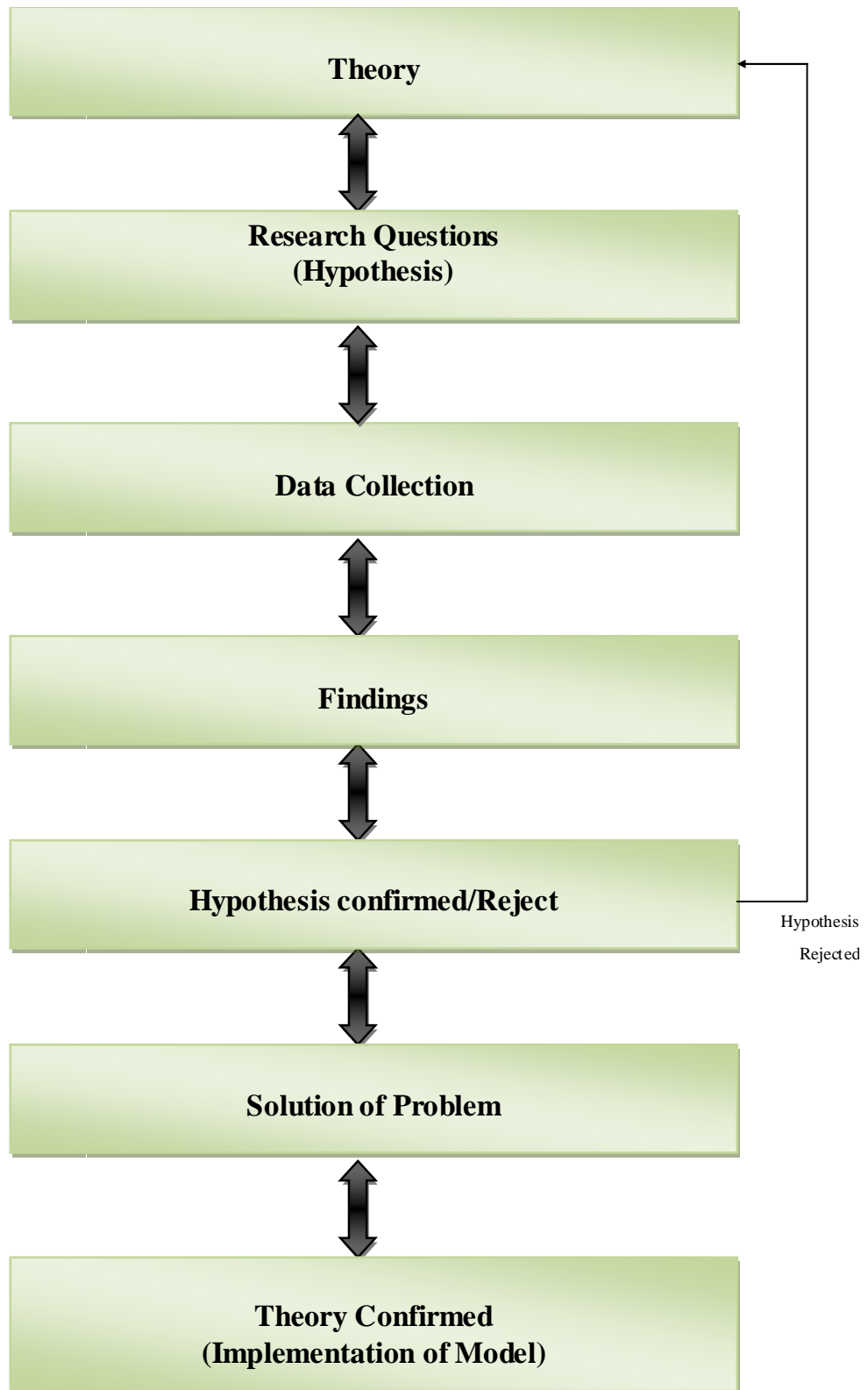
A research method is simply a technique for collecting data. It can involve a specific instrument, such as a self-completion questionnaire or a structured interview schedule, or participant observation whereby the researcher listens to and watches others (Bryman/Bell 2007). Research method can be seen as rules and procedures, and can be use as tools or ways



of proceeding to solve problems. Generally, research theory describes two broad basics of data collection process, qualitative and quantitative approaches.

### ***3.2.1 Qualitative approach:***

A qualitative research method can be construed as a research strategy that usually emphasizes words rather than quantification in the collection and analysis of data (Bryman/Bell 2007). As a research strategy, it is inductivist, constructionist, and interpretivist, but is difficult to see a situation where all three of these methods are employed. The skills and experience of the researcher play an important role in the interpretation and analysis of data collected. It focuses on the understanding of the respondents' point of view. It focuses on the insider's view and closeness to data. Qualitative data is also known as soft data, which can be attitudes, values, beliefs, values, and so on. Thus interviews and observations are considered appropriate for qualitative studies. This type of research cuts across many disciplines and subject matters, and it is very efficient if smaller sizes of data are used in the investigations rather than larger sample sizes. This type of research approach sort to know and understand the why and how of decision making process, in-depth understanding of the behavior of humans and the reasons surrounding such behaviors.



Framework of Our Research (Source: *Outline of Lectures, Arne Jensen, 2008*)

### ***3.2.2 Quantitative approach:***

A quantitative research can be construed as a research strategy that emphasizes quantification in the collection and analysis of data (Bryman/Bell 2007). It focuses on facts and/or results of social events. Hypothesis testing is done in an objective manner that is the outsider point of view from the data collected. It embodies a view of social reality as an external, objective reality. It also incorporates the practices and norms of the natural scientific model. It is based on facts arrived at by other statistical methods, outsider's view. Quantitative research method is also refers to as hard data. Questionnaires are considered suitable for this type of studies. This form of research is widely used in natural and social sciences.

It may look as if the two types of research methods are mutually exclusive, but it is not. There is more to the distinction other than the fact that quantitative researchers employ measurement and qualitative researchers do not. Therefore, the fundamental differences between quantitative and qualitative research strategies can be traced from the role of theory in relation to research; where quantitative research applies deductive, testing of theory and qualitative applies inductive generation of theory. With regards to epistemological orientation, natural sciences model are used in quantitative research and interpretivism used in qualitative research. As a matter of fact, an interface of both research approaches will be implore in the collection of data, especially when it comes to conducting interviews and administering of questionnaires. But qualitative approach is the main approach we are employing in our thesis, thus the analysis of the outcome from the interview will be base on qualitative method.

## ***3.3 Data collection Methods***

Here the various forms of collecting and processing data will be presented. Basically, there are two major types of collecting data, namely; primary and secondary data sources.

### ***3.3.1 Secondary data:***

Already existing data is referred to as secondary data, such as literature, documents and publications. Thus in this category of data, we search information from internet sources, articles, books, academic writings, publications about cities and so on. This information will be used to design a better way in which we are going to present our own findings in relation

to our subject matter. Thus after our research proposal, we started searching relevant literature secondary data in respect to our thesis.

### ***3.3.2 Primary data:***

Primary data is data observed or collected from first-hand information. Thus from our research questions we are going to conduct interviews with relevant parties regarding our subject matter. Primary data can be collected through various means, such as interviews and questionnaires, and surveys. Thus the data collected through this mean is unique to you alone and until you publish the data, nobody has access to the data. In the case of interviews, they can be carried out in the following ways;

- Structured interviews
- Semi-structured interviews
- Unstructured interviews

In case of structured interviews, there is schedule and having fixed question (close questions), the respondent are answer the question by following the pattern, in unstructured interviews there is no schedule and respondent is freely to answer and the questionnaire is not structure (open questions). (Bryman/Bell 2007). Base on the sensitivity of our thesis, we are going to conduct an interview with the authorities in Bristol following an open ended questions format, so that much more information can be gathered from the interview, and room for prompting and probing will be given. If possible we shall use a recorder to record down the responses from our respondents.

### ***3.4 Reliability and Validity:***

The concept of reliability and validity are concepts that are very important when it comes to writing business research and appears to be much related in their meaning. Although the terms reliability and validity seem to be almost like synonyms, they have quite different meanings in relation to the evaluation of measures of concepts (Bryman et al 2007). We shall then present both concepts in greater details in the paragraphs that follow.

#### ***3.4.1 Reliability:***

Reliability can be referred to as the consistency of a measure of a concept (Bryman et al 2007). It is concerns with the question of whether the results of the study can be repeatable.

The term reliability is commonly used in connection to the question of whether or not the measures that are devised for concepts in business and management are consistent. Therefore, it is fundamentally concerned with issues of consistency of measures. There are three prominent factors of reliability such as; stability, internal reliability and inter-observer consistency. However, we are not going to deal into that for the moment. However, we are going to say here how reliable is our research work. As concerns the reliability of our work, we believe that if any other business researcher is carrying out a similar research, and with the use of the resources we employ, then he/she will come up with the same results. The result of our research can be consistent when two or more researches are carried out in the same field. Thus if the same problems that affects the smooth distribution of goods to the city centre are to be studied, then the same suggestions will be made at the end of the study that will be similar to ours. However, the concept of reliability is best applicable to quantitative research since it deals with quantitative measurements.

#### **3.4.2 Validity:**

A further and most important criterion of business research is validity. Validity is concerns with the integrity of the conclusions that are generated from a piece of research (Bryman et al 2007). However, it is important to note that there are four types of validity; we are not going to focus on them anyway. Validity refers to the issue of whether or not an indicator that is devised to gauge a concept really measures that concept (Bryman et al 2007).

When doing out the research there are lot of factors that affect together on the investigating, interview technique and the openness of the respondent. The validity consists of internal and external part. (<http://writing.colostate.edu/guides/research/relval/pop2b.cfm>). The internal validity directly connected between the theoretical and empirical studies, like in our research we conducted the interview from different persons and its help us to support the theoretical part with more practical. The external validity concerns the studies in more wide perspective.

In our research we have to achieve the both part of validity, we mainly focus on internal and external validity. We come to result; we studied cases of different cities that come in external validity. Conducting of interview supports our internal validity.

We come to result and we suggest and give a model that in future the City of Gothenburg is like. It is important to evaluate the consequences of difference between the model and what is the reality? And what will be. Time factor, funding, Cooperation between stakeholder,

Cooperation between City councils and residents, rules and regulation will also be consider. These factors affect the validity and influence the model, don't neglect these factors. We have got the information from good sources and hope that our research work reliable and valid when its implemented in Gothenburg City like Bristol and Amsterdam.

## ***Chapter 4***

### ***“Goods distribution Systems in Bristol, Gothenburg, Amsterdam, Linkoping”***

## **4.1 Bristol:**

### ***4.1.1 Distribution systems in the city of Bristol***

As part of the START project, the city of Bristol introduced access control priority measures to improve the efficiency of freight movement within the city. They successfully operated a freight consolidation scheme that is serving the city centre and its environs. The city of Bristol is one of UK busiest city in the south west region and provides an interesting site for industrial, educational commercial and cultural activities. About 500,000 cars make their way in and out of the city centre every day, implying heavy traffic during peak hours making it one of the most congested cities in UK. About 23% of travelling time is spend stationary in traffic queues, with freight vehicles contributing to most of the problems found in the city today, such as road maintenance and so on. The city council is the local authority that is charged with organizing the transport activities of the city. With a population of approximately more than 400,000 inhabitants, in recent years, more developments have been taken place to make the city more livable, attractive place to visit. The city centre of Bristol receives about 90,000 Lorries per year, which contributes heavily to congestion, traffic, environmental issues and also conflict in loading space. Therefore there was need for the city council to plan transport activities that will minimize the impact of such environmental and congestion problems.

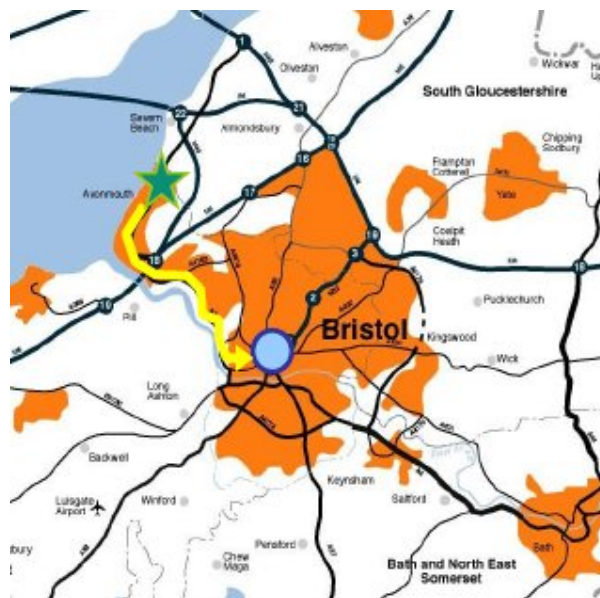
As a major step to addressing the problems faced by this city, certain parts of the city were chosen for redevelopment such as the Broadmead shopping area where retail space was increase by 40%, the surrounding road network for the redeveloped area was seen to bring in new challenges, as the city council's plan of providing the better freight network and air quality were appropriate. In addition, the city centre access control and restriction measures were known to support and helped develop model for consolidation. This was to manage the city centre shopping areas where conflict with pedestrians' traffic was seen to be in existence. Thus the exemption of consolidation centre delivery vehicles from this access control further enhances consolidation schemes to retailers.

### ***4.1.2 Bristol Consolidation Scheme:***

The initial start-up point was to understand the current distribution pattern of freight within and around the Broadmead before a consolidation centre could be set up. Thus in the Autumn of 2003, a survey of retailers in the Broadmead was conducted and the results used to



analyzed retailers that will fit into the consolidation scheme. Thus after such experimentation, recruitment of retailers for the project began in April 2004, and full commencement of the project started on the 17<sup>th</sup> of May 2004, with the aim to grow to full capacity which it doing at the moment. The consolidation centre works by acting as a central delivery hub on the periphery of the city where deliveries are streamlined and the number of delivery vehicles travelling into Broadmead are reduce, whilst at the same time it provides an improved delivery service to retailers. The goods from the consolidation centres are operated by 9 and 18 tons electric vehicles to the city centre. The consolidation centre is located 10 miles from the city centre, app 25 min of driving. The area of warehousing is about 3000 sq ft. since then, the scheme has expanded it activities to neighbouring shopping streets, and also serves stores in the new Cabot Circus Centre. The city council and DHL Exel, work hand-in-hand with the management and retailers to provide them with the necessary information about the consolidation scheme and to make it known to the public. The main local partners in the project includes; Bristol City Council and DHL Exel Supply Chain. The main local stakeholders includes; Broadmead Board, Mall Galleries, Business West and Bristol Alliance.



 Consolidation centre  
  Delivery Route  
  Target Area:

#### ***4.1.3 The main Aims of Bristol Consolidation Scheme:***

The city council of Bristol with DHL Exel, since May 2004 has successfully been operating a consolidation scheme for the city, with the aim of achieving the following:

- Minimize the impact of freight deliveries into the city centre
- To reduce the number of delivery vehicles in the city centre
- Contribute to traffic reduction in the city centre
- To reduce conflict between vehicles in loading areas and delivery bays
- Help to improve air quality in the city centre area
- Contribute to reduction in the supply chain cost
- Provide an enhanced delivery service for retailers and allow them to benefit other services.

#### ***4.1.4 Benefits from the scheme:***

Over the last few years, the scheme has been run effectively and achieved its primary objectives, often exceeding expectations. Some of the major benefits resulting from this project are:

- The scheme now serves about 70 retailers, which greatly reduce their delivery vehicles movement by 80%.
- There is saving of about 8.967 Lorry trips to the city centre which is an equivalent of 226.816 Lorry kilometers.
- There is a reduction in the emission of: carbon dioxide (CO<sub>2</sub>) equaling to 27 tones, nitrogen oxide (NO<sub>x</sub>) equaling to 870 kgs, and PM10 equaling to 25.9 kgs.
- There is no lost nor damage suffered by the retailers on their part due to the effective operation of the system.
- There is approximately 100% time on delivery to the retailers.
- Retailers can save approximately 20 minutes per delivery and can use that time for other matters in the shop.
- In addition, there is a collection mechanism put in place for waste and packaging materials from the retailers, which further serves the retailer time and money for the dispose of material. This collection amount to 17.1 tons of recycle material collected from the shops.

Since from the start of the consolidation scheme in Bristol, there has been a tremendous improvement in its activities. There has been a continuous reduction in the emission of CO<sub>2</sub> and NO<sub>x</sub>. The amount of waste and packaging material collected from the retailers for recycling has been on the rise. A survey carried out to determine the level of satisfaction of retailers showed that 94% of retailers were in support of the consolidation scheme.

The Bristol consolidation scheme has demonstrated and shown that the consolidation of goods in the urban area brings a lot of benefits to the city and also attempt to solve some of the problems faced in the city centre. The scheme also serves as a good example for replication in other cities. However, it is very important to manage such schemes so that the retailers will participate and subsequently pay their contributions for the running of the project. It is also worth mentioning here that the Bristol consolidation scheme is very expensive to run, and that it has up till date not yet break even. To keep such a project will certainly depend on the focus of the city council in the long and also drawing a balance between the environmental impacts and the congestion problems in the city centre.

#### ***4.2 Gothenburg:***

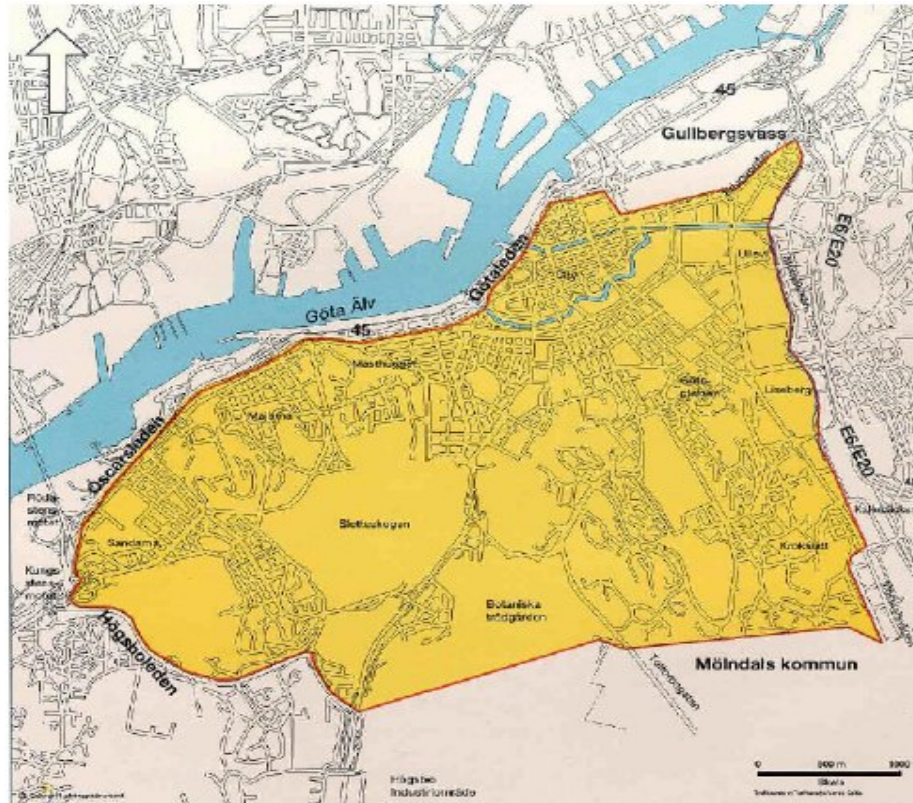
The city of Goteborg situated on the west coast of Sweden with a population of about 500,000 inhabitants, makes it the second largest city in Sweden. Goteborg has a long standing history as an industrial and a trading city in Sweden, with the port of Goteborg as the largest in Scandinavia. The city is also significant when it comes to land as major highways pass through the city. With river Göta Älv flowing through the city, the distribution network of the city becomes more complicated since the city is by such divided into northern and southern half. The total number of cars that make their way into the city is on a constant increase therefore posing more problems since congestion rates and environmental impacts statistics figures are increasing. Therefore the City Authority during the past years is spending a lot of efforts in establishing close relations with the transport business and stakeholders in order to develop a good logistics system for the city.

When we visited the City Authority, we found out that, co-operation was the crucial tool in the center of their activities unlike in Bristol where efficient delivery of goods is essential. The City Authority co-operates with the Police, Parking Guards, Property owners, and other

Stakeholders to make distribution of goods in the city centre more efficient. From the discussions held with the personnel, the authority does not have any direct influence on the manner in which the logistics providers (Schenker, DHL), make deliveries to the city centre. Their main purpose is to provide the infrastructure and the better environment for such companies to carry out their duties. Such as ensuring the non-existence of one-way tracks in the city centre, removing of parking spaces in the streets, mapping out environmental zones and access restriction areas.

However, a pilot project was carried out in 2006, but the results were not beneficial as expected from the initial setup. So after a year of operation, the project crumble because companies that where involve back out due to the non-fulfillment of the load factor demand. The scheme however did not change the companies' way of loading their vehicles and the distribution habits in the city, thus there was no feasible solution to the distribution problem. On the other hand, the authority implements rules and regulations for the companies to follow such as the implementation of deliveries time windows in the city centre (7am-10am), ensuring that trucks more than 8years do not have access to the city centre. Further information gathered, from the 1<sup>st</sup> of September 2009, trucks more than 10metres long will not be permitted to the city centre. In other circumstances, vehicles other than distribution vehicles are restricted to drive on the streets. The implementation of access restriction is also another major that the city authority is using to ensure that the distribution of goods in the city is done with little problems. To achieve these objectives, the city authority collaborates with the police and parking guards who ensure the enforcement from the very first beginning. The identification of environmental zones also ensures the smooth deliveries of goods to the city centre.

However, much is yet to be done as concerns efficient distribution of goods in the city centre of Goteborg. Looking at the above aspects and the area of concentration of the city council (congestion), the issue of the environment is left to take care of itself. Therefore for the city to have an efficient distribution system of goods to the city centre, it must try to develop an efficient system where issues such as congestion, energy consumption, environment and others will be covered.



“Gothenburg Environmental Zone”

The delivery system of goods to the city centre of Goteborg still has much to be done. At present, there seem to be no co-operation between the logistics companies in the line of setting up a consolidation centre which can be a major step in solving these adverse effects suffered by the city. They still spend much money on energy as the vehicles make trips round the city to make deliveries. The drivers are put under pressure to make deliveries in the city within the time window. This situation can lead to more congestion and environmental problems as the drivers may decide to use shorter and smaller routes in order to reach their destinations faster. On the part of the retailers, many more deliveries come to them from different companies, and also a lot of pressure from them to be in the shops early enough to receive the goods. With the present distribution system in the city centre, the implementation of time window delivery system, more congestion and environmental problems will faced the city centre of Goteborg as the city expands.

**4.2.1 Environmental Zone:** Many cities in Europe are facing the environmental issues like high level of emissions, congestion, and poor air quality. The environmental zone was introduced on 1<sup>st</sup> July 1996 to restrict the heavy traffic into the inner city. Lorries which full

fill the requirement of an environmental zones enter to the zone, thus reduction in the emission of particles and gases.

The local regulation (Swedish Road Traffic Ordinance, SFS 1998:1276, Chapter 10) for all environmental zones in Sweden passed the rules to allow the vehicles which are permitted to enter environmental zones are as follows.

Year of Registration	As per general rule	Euro 2	Euro 3	Euro 4 + Adapted vehicles	Euro 5 + Adapted vehicles
1998	2004	2006			
1999	2005	2007			
2000	2006	2008			
2001	2007	2009	2009		
2002	2008		2010		
2003	2009		2011		
2004	2010		2012		
2005	2011		2013	2016	
2006	2012		2014	2016	2020
2007	2013			2016	2020
2008	2014			2016	2020
2009	2015			2016	2020
2010	2016				2020

Source: Assessment of Environmental Zone in Gothenburg by Traffic and Public Transport Authority, Göteborgs Stad.

**4.2.2 Rules and Definition of Euro Standard:** All heavy vehicles are permitted to use environmental zone for 6 years with exception of Euro 2 and Euro 3 vehicles which may use environmental zones for 8 years. Vehicles certified or fulfill the Euro 4 enter into an environmental zones until 2016.

Euro norm emissions for category N2, EDC, (2000 and up)					
Standard	Date	CO (g/kWh)	NO <sub>x</sub> (g/kWh)	HC (g/kWh)	PM (g/kWh)
Euro 0	1988-1992	12.3	15.8	2.6	none
Euro I	1992-1995	4.9	9.0	1.23	0.40
Euro II	1995-1999	4.0	7.0	1.1	0.15
Euro III	1999-2005	2.1	5.0	0.66	0.1
Euro IV	2005-2008	1.5	3.5	0.46	0.02
Euro V	2008-2012	1.5	2.0	0.46	0.02
Euro VI					

### Emissions Standards of Large Vehicles Goods

Source: European Emissions Standards, Wikipedia (April 21, 2009)

#### 4.2.3 Benefits from Environmental Zone Scheme:

After the implementation of an environmental zone, it was realized that a lot of decrease in percentage of emission of gases and particles are reduced in atmosphere.

	Percentage %	Kg/Year
<b>Reduced Emissions of Carbon monoxide (CO)</b>	3.6	286
<b>Reduced Emissions of Hydrocarbons (HC)</b>	6.1	6652
<b>Reduced Emissions of NO<sub>x</sub></b>	7.8	13229
<b>Reduced Emissions of Particles (PM)</b>	33.2	2767

Source: Assessment of Environmental Zone in Gothenburg by Traffic and Public Transport Authority, Göteborgs Stad.

### **4.3 Amsterdam:**

#### **4.3.1 Goods distribution system in Amsterdam (The case of City Cargo):**

The quest for clean and efficient goods distribution system in the city of Amsterdam has been a major center for concern in the past years. To address such a problem, the city of Amsterdam launched a pilot project under the auspices of the City Cargo. Inner city goods transport is responsible for air pollution, congestion and noise annoyances.



Looking at these drastic effects, the city of Amsterdam strikes a new path in using cargo trams to deliver goods to the city centre. The narrow streets and traffic-laden canals have made deliveries to the city centre very difficult couple with the issue of delivery time windows, which allow Lorries to make deliveries only between the hours of 7: am to 11: am. This leave the transport companies with no choice than to make deliveries in a hasty manner which further cause more traffic problems. Before the implementation of the pilot project in the city of Amsterdam, more than half of the air particles were caused by diesel traffic, and more than 35% come from goods transport in the city. Thus the use of freight trams and electric powered cars to distribute goods to shops and supermarket will greatly reduce traffic in the city centre.

#### **4.3.2 The project:**

City Cargo is focused on using old existing things and infrastructure in new ways, particularly in sustainable goods distribution. At the early phase of the project, two trams were to be used for a period of one month. During the first half of the month, the trams will ply the city without any load and in the next halve, the trams will be loaded with goods. This



was to test the viability of the project to see whether it will interrupt with the passenger trams. However, it was noticed that the cargo trams did not interrupt the schedule of the passenger trams, due to the fact that the cargo trams were not allowed to stop at the passenger tram stops. As a matter of fact, the project turned out to be successful since the cargo trams used special lanes of the Amsterdam tram network and had shorter distances to make. Under the pilot project, City Cargo will use the Amsterdam tram infrastructure to distribute goods to the city centre. The process starts by receiving cargo in a distribution centre or the Cross Dock that is established at the outskirts of the city near the tram lines so that the trams can easily be loaded with the goods that have been sorted and destined for the city centre. A single cargo tram is capable of carrying or transporting the load of four trucks to the city centre. The supplies to the Cross Dock were to be done using optimal trucks (large and multifunctional), during off-traffic hours. From the Cross Dock, the trams depart for the inner city where they are met by smaller electric vehicles that take cargo from the trams to the final destinations.



Then, from the hubs in the inner city, goods delivery will be made to retailers and shops using electrically powered vehicles. Through this means, the freight trams will be loaded and unload goods outside the delivery windows of Lorries.

#### ***4.3.3 The Results:***

At the end of the pilot phase, it was noticed that the project has produced good results. Thus the project will provide a reduction in air pollution in the city centre, as about 5000 Lorries were known to drive round the city centre every day, but with the introduction of the project, City Cargo could be able to halve the number (implies 2500) within four years, and reducing emissions of nitrogen oxides by up to sixteen percent. The project also turns to reduce the

noise burden in the city centre, because noisy trucks will be replaced by trams which operate more quietly. The project also provide an efficient loading means through which 4 trucks of 7.5 tons conveniently loaded to one cargo tram, resulting in reduction of carbon dioxide emissions. The project also turns out to produce a great reduction in city congestion increase in road safety measures and also a reduction in the maintenance cost of roads. Furthermore, there was a significant benefit in the distribution chain. The loading and unloading of large commercial vehicles in the Cross Dock will keep these vehicles off the city centre. Consequently, there will be less traffic in the streets. The trams and e-cars will be allow to deliver outside the delivery windows of Lorries, thus no waiting time for distributors. The transport firms will incur less scheduling costs because they will not have to stick to delivery windows if they connect to the freight trams. The saving of the city economy through this means went up to 125 million Euros per year, through enhanced deployment of workers and more efficient planning. The system was also thought to have created more than 1200 new jobs in the city.

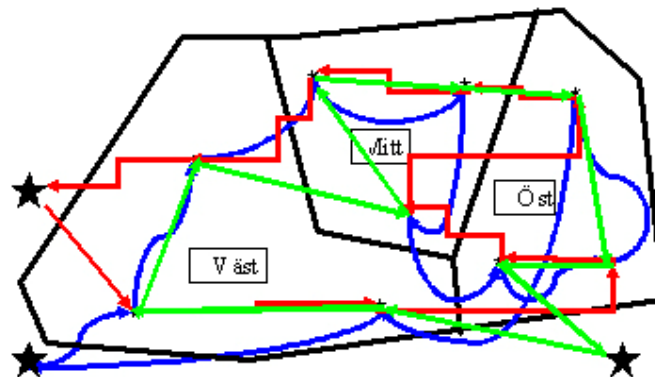
What will then make the present and future distribution system in the city? The present will allow for restriction by delivery times windows and regulation of transportation within the city centre. The City Cargo Amsterdam method will allow for continuous use of trucks, but they will not go as far as the edge of the city to do their deliveries. However, the use of City Cargo trams in the transportation of goods was limited so some types of goods. For instance goods such as construction materials were not transported through this means due to their sizes and voluminous nature. Thus the use of trucks in the city centre was and will still be necessary for these classes of goods. However, such trucks will have to fulfill the regulations of the environmental zones and must be of high standards (less pollution, less noisy). The goods are then transported to the inner city using cargo trams to the hubs from which E- cars (electrical cars) do final delivery to destinations.

#### 4.4 Linköping:

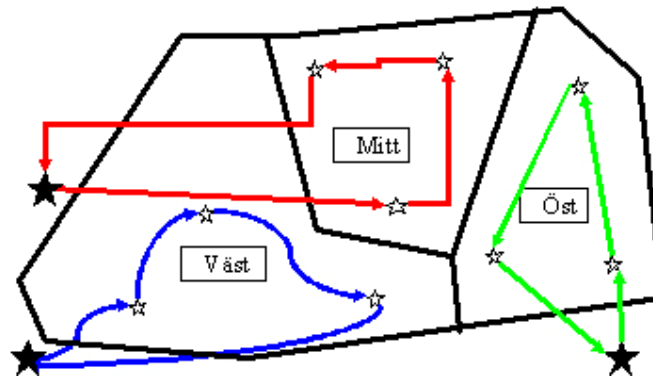
In Linköping, due to the increasing congestion and queues in traffic and also at loading and unloading bays, the local network of transporters came up with the Samlic project. The coordination of goods distribution was seen as a better alternative by the city council and authorities, as a means of reducing inner city environmental problems and costs.

##### 4.4.1 The Project:

In an attempt to providing solutions to the adverse effects suffered by city dwellers, a pilot project was carried out in 2004, which was to set up and implement a consolidation centre for distribution of retail goods to shops in the city centre (SAMLIC PROJECT). To start with, a trial period of 9 weeks was used with the involvement of three logistics providers; SCHENKER, POSTEN and DHL. As a matter of fact, the city had to be divided into three zones, and at the consolidation terminal, the goods were sorted and each logistics provider had to carry goods to its allocated zone. In other words, before the city could be divided into zones, each retailer had to get goods from all three logistics providers, but after the division into zones, each retailer got goods supply from just one logistics provider, thus curbing the issue of congestion in the city, as shown in the figures below.

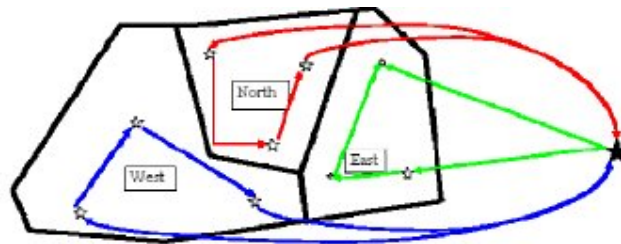


**Figure 1** Transport pattern without coordinated distribution.



**Figure 2** Transport pattern with coordinated distribution.

At the consolidation centre, the goods were sorted according to zones and so each logistics provider was to drive from the consolidation centre to its distributing zone and back.



**Figure:** Transport pattern with coordinated distribution.

#### **4.4.2 The Results:**

After the implementation and monitoring of the trial period, it was realized that a lot of savings could be made from such a project.

- Firstly, the number of stops in the city decreases to  $\frac{2}{3}$ , when the city was divided into zones.
- Secondly, the total time for loading bays decrease by  $\frac{2}{3}$ .
- Thirdly, the total number of driven kilometers in the city centre decrease by  $\frac{1}{2}$ .
- Fourthly, the total time in the city centre decrease by  $\frac{3}{4}$ .

- Fifthly, the average time for loading bays was 4minutes per day for each vehicle.

The loading efficiency increases by 50% that is from 51kg to 76kg/m<sup>2</sup>. There was a reduction in the number of Lorries by 33%.

#### ***4.4.3 The Advantages:***

After the pilot project period, some advantages were seen to benefit the distributors (logistics providers), the city and the retailers. On the path of the distributors, fewer Lorries were required, implying more profitability, and fewer stops which gave the drivers better working conditions. The city on its path experience fewer Lorries driving into the city, implying that the environmental conditions were better. The retailers had fewer deliveries, knowing when the goods will come, and got to know the drivers better signifying less disturbance in deliveries, better planning and also a better working condition. It was also noticed that there was a remarkable increase in savings.

#### ***4.4.4 Failure of Project:***

However, it is worth mentioning that the project did not last for a couple of years due to some personal reasons that were noticed to come from the stakeholders like Schenker, Posten and DHL. For instance, DHL wanted to have its trade mark on the trucks and the color of its trucks maintain. This altitude let to division and eventual collapse of the project. It is also worth wide to mention here that projects such as these are hard to manage and run because they entail huge amount of capital, however, if the focus of the city is to provide an efficient system in the long run, then it is good to start thinking of ways to better design an efficient distribution system of goods to the city centre. Also if the environmental problems faced by our city centre are in a way to be minimized, the city authority must be able to face the initial set cost of such projects and put in place a better management structure that will be able to run the project through in its early phase.

***Chapter 5***  
***“Analysis and Conclusion”***

## **5.1 ANALYSIS**

The distribution system of goods in cities however, causes emissions and is not necessarily energy efficient. The consolidation approach can play an important role in reducing the number of vehicles trips that needs to take place in the urban area to deliver goods to their destination, especially the city centre. Consolidation schemes benefits both businesses and citizens by making goods distribution more energy efficient and hence reducing the related air pollution. It is built on collaboration between city government, transport companies and local businesses formalized in local freight network in each city. The major aims of such schemes are numerous as we have earlier presented on this paper, however, more analysis of such will be presented in the following paragraphs.

To better analyse and possibly design a better way of distributing goods to the city centre, that will in effect attempt a solution to the numerous environmental problems; we shall examine the cases presented in the previous chapter separately. Basically, we shall base our analysis on the advantages and disadvantages of the systems that were/are in the various cities. Then we shall also try to think out of the box by bringing in some abstract cases that might come to solve our problem.

### **5.1.1 AMSTERDAM**

With the establishment of a consolidation centre at the outskirts of the city of Amsterdam, the city was able to establish an efficient distribution system of goods into the city centre with the use of CityCargo. At the consolidation centre, the goods were able to be sorted so that goods from different transport companies could be sorted together destined for the same receiver. With the dense and flexibility in the Amsterdam tram network, CityCargo could use the infrastructure to distribute goods to the city. The nearness of the consolidation centre to the major road leading to the city gave it an edge for trucks to offload and load without any major congestion problems. With full introduction of the CityCargo concept, Amsterdam inner city is expected to benefit the following:

- There will be reduction in air pollution in the city centre. The total number of Lorries (5000) that was noticed to drive round the city, the concept of CityCargo could halve the number within a period of four years, thus less air pollution in the city.

- Due to the reduction in the number of Lorries coming into the city centre, and also the fact that trams are less noisy than Lorries, the city centre will be less noisy, making it a conducive environment for living.
- Supply Chain partners will also benefit from such a project. The number of Lorries needed to make deliveries in the city will not be needed except for construction materials that cannot be transported by the trams. The shop owners are not put under pressure to be early enough in the shops to receive the goods. Therefore there is an aspect of time saving on their part to do other things in the shop and also a reduction in cost on the part of shop owners.
- The presence of time windows that is implemented when Lorries have to make deliveries to the city centre will not be present. With the use of cargo trams, goods are supplied to the city centre at all times. Therefore, there is no cost for the transport companies as regard scheduling of trips for the Lorries, there is no waiting time to the trucks to load and unload.
- No time pressure (time window delivery) on the drivers to deliver quick enough, thus drivers has a better working environment since they can deliver the goods to the consolidation centre at any time.
- There will be jobs creation, especially at the consolidation centre, where people will be needed to sort the goods before there are loaded onto the trams for the inner city.
- With such a concept, the city will be able to save 125 million Euros a year, especially from the businesses, since there will be improve traceability in the trams and e-cars.
- With the use of cargo trams and e-cars, the issue of congestion in the city will be reduced. Thus improvement in the environmental conditions, such as less leakage from Lorries, less destruction of roads, which will enable the city to save money.

On the other side of the coin, the implementation of the project cannot be as smooth as it may appear. To begin with, the present network of tram rail will need to be extended to the consolidation centre so that the cargo trams can easily be loaded with the goods. There will also have to be re-use of old trams roads, the construction of new roads for the trams to reach their hubs in the city centre. The use of Cargo trams is limited to some type of goods, (construction materials cannot be transported through this means). The scheme is much beneficial to cities with adequate tram road infrastructure, therefore it will cost much to cities without such to implement. To operate such a system, there need to be adequate space in the city centre to construct the hub for the trams and e-cars. The issue of proper management of



the scheme can pose great problems if not well taken care of. The case of Amsterdam city goods distribution has the potential to solve the problems of distribution goods to the city centre, but will add some environmental problems, due to the land use in the city centre for the construction of the hub.

The CityCargo concept appears to be a good one to implement in other cities to solve congestion and environmental problems. CityCargo Amsterdam is seen to be more efficient for distributors and transport firms, despite the many transfer points that will be necessary to run such a project. There is the possibility of carrying delivery on 24/7 bases, and also increase efficiency in storage, distribution and collection of goods in the city. There is much flexibility in the concept because the cargo trams are not allowed to stop at the passenger tram stops, thus no interruption with the present traffic system. With goods transport by trams, there will be safer city centre and increase in livability of city centers, reduce accidents on the streets, less maintenance on roads due to less heavy trucks in the city. This system of goods delivery to the city centre is more cost efficient, because one tram can contain four trucks (7.5 ton).

### **5.1.2 LINKÖPING:**

So far, consolidation of goods has been seen as a better way to distribute goods to the city centre. The case of the city of Linköping that was seen above can somehow be replicable to the city of Göteborg. With the implementation of the consolidation centre in the out skirt of the city, where goods could be sorted and put together before been delivered into the city centre. The implementation of the consolidation scheme in the city of Linköping was place under SAMLIC, there were to oversee the activities of the scheme. So after the coming together of the local network of freight forwarders in Linköping to give birth to SAMLIC, they thought one way to reduce traffic congestion and its negative environmental effects in the city centre is to implement retail consolidation centre which was a good idea. Goods consolidation is considered by city councils as a possible solution to more restrictive regulations and control of Lorrie's traffic in inner cities, which will demand more energy and time to be allocated for that. However, economic profitability is necessary for such consolidation scheme to be successful.

It is obvious that after the implementation of a project such as this, there are going to be some advantages and disadvantages, which will be our base for analysis. Some of the advantages that came to the city, retailers and transport companies as a result of implementation were:

- There was less congestion in the streets in the city centre of Linköping. Due to the fact that the city centre of Linköping was divided into three zones, only few trucks could be seen in the streets. Each transport company's truck was supposed to drive from the consolidation centre to its zone and back.
- With such a scheme, the retailers enjoy much more freedom, since they will receive goods only from one Transport Company unlike before when they receive goods from three suppliers. They can save time in the process, which can be used in the shops to do other things in the shops. They have better knowledge of the delivery system, when it comes to timing, knowing when the goods will arrive and less damage of goods, and an overall reduction in cost of the shop owners.
- The drivers get better working environment as they are not working in a hurrying manner to deliver goods throughout the city centre. They just need to drive to their zone and do deliver, leading to more freedom and less tiring work environment.

- The transport companies on their part save a lot of money on fuel, as their trucks do not need to drive round the city to deliver goods. The total kilometers to be driven by the trucks for the companies reduced resulting to savings; they could save much time at the loading and unloading bay, since drivers will not wait for their fellow drivers to finish before they could take their turn. In that case only one truck could be seen at such spots.
- The environmental conditions of the city gets better due to less pollution in the city centre, less emissions of oil, less destruction of city roads, which implies less maintenance work carried out on the roads. The dense network of trucks movements in the city is reduced.
- With such a scheme, there is the possibility of more employment opportunity, such workers will be needed to sort the goods at the consolidation centre before there are transported to the city centre.
- With such a scheme, there is the possibility to mixed parcels and goods together, that is the truck can carry parcels and goods for delivery to the retailers in the city, unlike the case where only goods will be delivered.

On the other side of the coin, there seems to be some drawbacks that accompany such schemes.

Firstly, the division of the city into zones will not be equitably done. Some zones will contain much bigger shops and retailers than other. This will thus bring discrepancy into the whole show; it will be hard to decide which transport provider to allocate that zone to. Thus the zone with more shops will imply that more trucks trips will be made to that zone, which might increase the environmental impact and congestion figures level higher than other zones. Further, if allocation is done by ballot, it result that a small company stands the chance of winning that zone. As a result, there might be some delay in delivery due to the capacity of the transport company. Such a division may result to conflict between the companies and obvious withdrawal to go back to the old system of delivery.

Secondly, the issue of personal interests of the companies maybe a major hindrance to the project. Each company has its own aims and objectives that may not necessarily be in line with that of participating companies. Companies may desire their trademark to be in script on their trucks, their truck colour maintain and also a change of management. Changes in the technology of the company may result to another problem in implementation of the scheme.

Thirdly, to decide whether to treat the companies according to their sizes, in term of their present market share may also be another conflicting factor. How to determine the market share may pose difficulties, and companies may inflate their market share values to be granted a bigger zone to deliver in.

With such uncertainty in mind, it is difficult to draw a clear cut line to deal with the companies. However, applying the concept of “thinking out of the box” the possibility of rotating the zones can go a long way to solve such uncertainties. The concept of merely observing the companies can determine which has a bigger share of the market. Thus for such project to be successful, criteria must be set for the companies to fulfill before they can be part of it, if not then it will only start to fail tomorrow. However, a consolidation idea promise to serve the city, retailers and transport companies in a beneficial way, and it should be encouraged in major cities.

### **5.1.3 BRISTOL:**

The city of Bristol just like any other European city suffers from urban congestion, pollution, a constrained road network, road safety, maintenance and conflict with other road users. To curb these effects, the city council sees the efficient delivery of goods as an essential factor to be implemented in the city. With the city having just the same characteristics as the city of Goteborg, in terms of population and the role in the economy of the country, the congestion and environmental problems, there is need to act. The need to act saw the city of Bristol coming up with a consolidation scheme that will provide the lime light into these problems. With the setting up of the Bristol consolidation scheme, there is hope that better ways can be design to effectively and efficiently distribute goods to the inner city that will lead to less congestion and environmental impacts. Much has already been said of the scheme, therefore, our point of concern here is to put across what can we learn from such a project. With the implementation of access restriction areas, the scheme is growing ever as more and more retailers are joining the scheme. We are going to base our analysis of the Bristol consolidation scheme on the advantages and disadvantages. The re-development of the city centre has benefited both the retailers, city council and transport authorities.

Firstly, with the implementation of the consolidation scheme, less trucks have to made their way to the city centre to deliver goods, because the goods will have to be sorted at the centre so that goods destine for the same retailers are put together. With the access of few trucks into the city centre, it will imply that less congestion problems will be noticed. The maintenance of the city centre roads will be low because if more heavy trucks make their way into the city, the rate of depletion will be high. The city centre will be a livable environment due to less noise from the fewer trucks that access the city. With the collection of waste and plastic materials mechanism put in place by the scheme, this will imply that the city council will have to spend fewer amounts of resources on cleaning up the city. Fewer trucks on the streets of the city imply that that people can move about freely within the city. The amount of air pollution, land and water pollution will decrease due to less number of trucks that have access to the inner city and a safer city centre, in terms of the number of accidents.

Secondly, the supply chain cost will reduce. Transport forwarders will see their cost reduce because of the fewer numbers of trucks that will be required to make delivery in the city. This is because goods from different suppliers will have to be sorted at the consolidation centre so that goods that are belonging to a particular retailer are been supplied by one trucks. Thus it

will result to the number of trucks to the city centre been reduced. The scheme will also provide the freight forwarders with a better planning, since it will be easy to manage and schedule the trips of the trucks. Better working conditions for drivers, due to the non-presence of time window deliveries. The implementation of time window deliveries comes as a result of congestion problems caused by the trucks, so is a major to solve that problem. There will be more savings coming from the less used of fuel by the freight forwarders, due to fewer used of company's trucks for delivery per day. The work of the drivers will become less tiring because they will not have to drive round the city to do delivery; they made have to supply retailers that are located close to each other.

Thirdly, on the part of the retailers, they will have to receive goods from fewer freight forwarders unlike the case before when each supplier has to make its own supplier to the retailers. This new approach of consolidation will give the retailers more time work on the shops, because they will not be receiving goods minute by minute from the suppliers. A system of fix supply, they will understand when goods are coming. It will allow the retailers to have more time for them since they will not be require being in the shops early enough to receive the goods, as was the case with the time window delivery. This consolidation approach will also benefit the retailers in that they will few spoilage and damages of goods since the goods will have to be sorted at the consolidation centre. The supply of goods to the shops will be all day round, because less congestion will be in the city and thus no shortage of particular items in the shops, thus increase in turnover for the retailers.

Fourthly, the scheme can be benefited from by nearby cities and towns, which mean that the consolidation approach can be transferable. Thus by the participation of nearby cities will mean more revenue coming into the scheme.

On the other hand, the Bristol consolidation scheme is very expensive to run. From the onset of the scheme, it has been very difficult to realize some benefits from the project. More capital is needed to run the project. The fear of liquidation is an aspect that must be carefully looked into. The fear that the retailers will not pay their fees for participating in the project is one aspect that can put the project to an end. Special training programs for drivers from the freight operators on how to improve fuel efficiency and technical guidance are some of the aspects of the project that involve capital. The production of leaflets to constantly educate the retailers is an aspect that the project management spends money on.

However, since the conception and implementation of the Bristol consolidation project, much has been done to keep the project alive. The city centre of Bristol and especially the Broadmead shopping centre has been able to solve the congestion and environmental problems and has been able to design an efficient goods distribution for the city. The Bristol case is worth emulating in other cities within Europe, especially as it has a collection of waste and plastic materials for recycling. This special service also fetches some revenue for the project. For a city that has the long term plans of providing better services to its citizens and making the city centre attractive to visitors, it must go an extra mile to act.

### **5.1.4 GOTEORG:**

The case of Goteborg presented above is an important issue to write home above. One thing for sure is the similarity between the city of Goteborg and that of Bristol. Taken into consideration the role both cities play in their respective country's economy, it is obvious that a clean and efficient system of goods distribution must be design in the cities. The city of Goteborg has enough potential for designing an efficient system of goods distribution, with the presence of natural resources such as the river Göta Älv that flows within the city which also serves as a major challenge to providing better distribution channels within the city.

The city of Goteborg or the City Council Authority has no doubt been working strongly on clean distribution of goods into the city centre. The City Council Authority has developed rules and strategies to fight the adverse effects of congestion and environmental impacts in the city. Some of these moves include:

The City Council has in the past years been trying to eradicate the one-way roads within the city. This effort leads to many outlets for the transport forwarders to access the city to make deliveries. Therefore, the effect of congestion is minimized as such roads will not be crowded by vehicles. Further, the retailers tend to receive the goods early enough which will obviously have an effect on the turnover of the shops in the city centre. Also, with less congestion on such one-way roads, due to alternative roads, the level of maintenance will also reduce.

The City Council has within the past years implemented a time window delivery system. With the time window delivery system, delivery trucks are permitted to make their deliveries in the city centre within the hours of 7:am-11:am. This effort leaves the city centre free from heavy trucks during the rush hours and also clean for commuting by city dwellers, because the streets will be free from such trucks during the remaining part of the day. The streets will be lively for people living in the city and less noisy environment in the city centre. With such a time window delivery system, the retailers will also have enough time to displace their goods in the shops before opening hours for the shops.

The implementation of environmental zones and access restriction is also another major step that the city authority has taken to make the city centre of Goteborg look lively. In collaboration with the traffic police and the parking guards who ensures that vehicles do not access such areas, the streets become free for the freight forwarders to make their delivery with ease.



The restriction of trucks older than eight years into the city centre leaves the city centre free from noise pollution, air pollution, and leakage of fuel from the old engines possible effects of accidents cause by such old trucks. It is very obvious that such category of trucks cause a lot more nuisance in the city centre than new trucks. Such fuel leakage also goes to cause hazard to the micro organisms and may eventually flow into the river causing further harm. The restriction of trucks longer than 10 meters into the city centre with effect from the 1<sup>st</sup> of September is also another major step that the council is taking to make the city centre free from the adverse effects of congestion.

The City Council has constantly been providing better conditions for the freight forwarders to make efficient deliveries into the city centre. The City Council constantly provides the infrastructure and develops better working conditions, in collaboration with representatives from the transport authorities. Co-operation is a crucial factor to meet these objectives that is why the council has been working hand-in-hand with other stakeholders.

However, much is still to be done in the city of Goteborg to make it clean for free and round the clock distribution of goods. The implementation of time window delivery has not yet proven to make the distribution of goods efficient in the city centre. Time window delivery only goes to solve the problem in the short run but on a clear note in pit more problems. Some of the adverse effects of time window delivery are:

Time window delivery puts the driver under time pressure. They have to make sure that before the 11:am they are through with their deliveries. This aspect goes to cause more congestion problems as the drivers might tend to use shorter routes which by no means solve any problem but further congestion in the city. Further, the time window delivery system puts the retailers under time pressure too. They have to be in the shops early enough to receive the goods from the freight forwarders, increase in cost on the part of shop owners. On the part of the transport companies, time window delivery system may push them to use more delivery vehicles to carry out delivery in the city, implying more use of fuel, which goes to affect the profit of the company. With more trucks in the city centre, the rate of air pollution with increase, congestion will also increase and also increase rate of accident, thus making the city centre not livable.

The retailers, on their part want to have some freedom, they don't want to be under the time factor, and thus they demand deliveries at rare hours, which is making goods transport in the city still very difficult. The absence of a consolidation scheme is making goods delivery into

the city centre of Goteborg difficult. There has not been any cooperation with regards to consolidation on the part of the freight forwarders.

***What can the city of Goteborg benefit from the above situations?***

To begin with, the case of the city of Bristol has provided a perfect example for the city of Goteborg to emulate. If the City Council Authorities are bends on providing an efficient distribution system of goods into the city centre, then they must look for mean to deliver that. Firstly, the city must think of a consolidation approach that will serve the city. Much about the benefits of consolidation has been presented on this research paper. Thus it will not be worth wide mentioning them here after. It has been proven beyond reasonable doubts that a consolidation scheme serving the city can provide future solutions to goods distribution in cities, to an extent, even though with the emerge of information technology, more viable solutions may come up. However, if such a scheme is to be operated in Goteborg, then partners involve must be ready to put their differences and work for the betterment of the city. Maybe a kick-off point can be for the City Council to tender for bits from the freight forwarders such as Schenker, Posten, DHL and that with the necessary resources be appointed to be the main partner of the project. In that case, the provider with enough capacity to run the project in terms of technology, capital and so on is appointed as the main partner of the project while others are local partners. With a waste and plastic collection mechanism in place, it may bring in revenue for the project since in that light it will be collecting waste for recycling companies.

If the city of Goteborg can operate a cargo tram system, it will be very much beneficial for the Nordstan shopping. Especially as it will reduce or there will be no need for trucks coming into city centre to make deliveries into the mall. With the cargo trams system implemented in Goteborg, the cargo tram will leave the consolidation centre directly to the mall from which goods will be unloaded into the shops.

However, such a system is a difficult one to implement. The City Council will have to provide the infrastructure and allocate the space in the city centre for the hub to be constructed. Then the company that is chosen to run the project must be financially viable to provide the necessary trams and the electric cars to transport the goods from the hub to the retailers. The city of Goteborg or the Council Authorities must look for ways to attempt to provide long term solutions to the problems facing distribution of goods now. The problem of funds is a major setback to providing an efficient distribution system of goods in the city

centre. If the city of Goteborg can copy the examples of Amsterdam and Bristol goods distribution to the city centre and incorporates with their notion of environmental zones and the strategies there are implementing, then the city of Goteborg will have a livable city centre.

## 5.2 CONCLUSION

An efficient distribution system of goods is essential for the development of the city. When discussing city logistics, a long-term perspective is necessary in order to find solutions that are sustainable from a financial, efficient and environmental perspective. It is relatively easy to set up pilot schemes and stakeholders show interest as long as the city is financially responsible. However, cities fight with finding solutions that are attractive for companies from a business perspective. Each city needs a lively city centre where people can move about freely, shop, relax and enjoy life. A city centre that is free from congestion, air pollution, land pollution, noise pollution, and accidents. Shops are one of the things that make a city centre lively, and these shops need to have daily supply of goods. This operation cannot be carried out without such issues as congestion and environmental impacts affecting people, the city and the supply chain partners. Therefore, there is need to design a system of distribution that will attempt to solve such problems. The approach of co-operation between stakeholders has been seen as a major step that can be use to solve such problem. Another aspect is the efficient delivery of goods, which was the main focus of the city of Bristol. An effective co-operation and an efficient delivery system of goods can only come when there is a good consolidation scheme operated that will take control of the activities of delivery goods to the city centre. The issue of consolidation has proven it worth in many aspects as the best means to attempt to solve these problems presented above. The benefits from such scheme are numerous and all participating partners, such as the city, retailers and the transport providers both benefit from it. Just to enumerate some of the benefits;

- Reduce congestion in the city due to few delivery trucks in the city centre.
- Better distribution of goods in the city, due to the fact that goods are being sorted at the consolidation centre.
- The elimination of time window delivery, implying delivery can be made all through the day.
- The retailers have time to work in the shops since they know when and how the goods are coming to the shops.
- There is reduction of cost on the whole supply chain process
- Reduction in air, noise, and land pollution in the city centre.

As has been presented above, a better way of organizing distribution in the city is by setting up a consolidation scheme that will serve the city. However, to run such schemes huge

financial resources are required. Therefore, there is a constant need for Public authorities' support to keep the project financially viable.

### ***5.3 RECOMMENDATION***

So far, we have seen the importance of operating an efficient distribution system of goods in the cities. The task is not just to have a distribution system, but a system that is sustainable in the long-run. We cannot pretend not to care about the future, thus a long-term perspective should be the model of designing such a system. Whenever the issue of setting up a pilot project is brought forward, it sounds nice to the ears, but caution should be taken. Proper research is needed to be put in place, where the role of various stakeholders is considered. As a matter of fact, an incentive policy can be a buzz up for the stakeholders. The awareness of the society needs to be a priority for such schemes to succeed. Therefore at this stage, we suggest that proper research should be carried out to ascertain the role and benefit of the various stakeholders before embarking on an effective and efficient distribution system in the city centre. If such loopholes are not considered, then the project will start only to fail in the nearest future. "Sustainability" should be the watchdog for any such projects.

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**“Appendix”**

**...Questionnaire...**

**Situation of City before Implementation of Distribution System:**

Situation of the city before implementation of the new distribution system. The main essence of these set of questions is to paint a picture of the city before the implementation of the new distribution system to the city.

***Question one.***

We have seen and understood that the city of Bristol provides a better way of handling city logistics or distributions to the inner city. How was the system of delivery before the implementation of this system? Is there more you will like to add to this?

***Question two.***

Before the implementation of this new system, how many stakeholders were involved in the distribution of goods to the city? More that we need to know about this point?

***Question three.***

At the time of implementation of this system, what was the status of the logistics providers, like DHL? (Market share) Was there any resistance from such providers?

***Question four.***

Were there any congestion charges to trucks and Lorries making deliveries to the city center at certain hours of the day? Any other additional information you will like us to know?

***Question five.***

How was the environmental problem of the city targeted before the new design of the system? Issues such as land pollution etc? Any further information on this that maybe deem necessary?

***Question six.***

What were the drawbacks of the old system?



***Question seven.***

What were the positive aspects of the old system?

***Question eight.***

What was the efficiency level of the old system?

***Situation of city after Implementation of Distribution System:***

Situation of the city after implementation of the new distribution system. The main essence of these set of questions is to paint a picture of the city after the implementation of the new distribution system to the city.

***Question one.***

When the new distribution system was implemented, was there any decline in the market share of the big logistics providers? Some more information you will like to provide on this point?

***Question two.***

When the idea of designing a new distribution system for the city was implemented, did the shops in the city center experience any change in the turnover, either positively or negatively due to either change in the manner of delivery of goods? Anything more you will like to add?

***Question three.***

After the implementation of the new distribution system, what was the level of environmental hazards? More information you will like to add?

***Question four.***

After the new distribution system was put in place, has there been any reduction in charges to the trucks and Lorries that make deliveries to the city center? More information you will like to add?

***Question five.***

What was the total cost of implementing such a system? Was the idea easily accepted by the politicians of the city?

***Question six.***

What is the efficiency level of the system?

***Question seven.***

What are the drawbacks of the system?

***Question eight.***

What are the positive aspects of the system?

***OTHERS.***

Is there any charge levy to vehicles that come into the city during rush hours? Will shall be grateful if you can provide us with more knowledge on other aspects of sustainable transport that we could not cover with our questions.

Thanks for your time and corporation.