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Stakeholder requirements affecting urban freight transportation to and from construction sites in the city

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We keep moving forward, opening new doors, and doing new things, because we are curious and curiosity keeps leading us down new paths.

- Walt Disney

ABSTRACT

Due to the great urbanization during the last centuries urban freight transportation has become increasingly important in order to solve the complexities arising when performing construction work in densified cities. When building in urban areas different types of stakeholders express a wide variety of requirements due to the urban freight transportation. A common transformation of modern cities has been coastal areas developing from heavy industrial focus into residential, livable cities. Thereby, urban areas are adapting due to sustainable premises such as in Västra Hamnen in Malmö, Norra Djurgårdsstaden and Hammarby Sjöstad in Stockholm, but also in RegionCity, belonging to the future project Älvstaden in Gothenburg.

Hence it is necessary to support the urban development and manage the enhanced population in the cities where accessibility and transport conditions are restricted. Therefore, the purpose of this master's thesis is to identify stakeholders and their respective requirements related to construction projects in residential areas. When mapping the stakeholders and requirements relating to urban freight transportation to and from the construction site, it might be possible to facilitate logistical transport solutions in the densified city. Thereby, the number of stakeholder requirements appearing too late in the construction process might be minimized.

By combining theoretical findings within urban freight transportation and choosing interview respondents belonging to the different categories of academia, governmental as well as business, it was possible to take different objectives and agendas into account. Due to the different interviewee segments, it became clear that each category had different insights and viewpoints. The academia emphasized research relating to for example efficient route planning, the governmental respondents highlighted social benefits enabling livable urban areas for the entire society and the interviewees belonging to the business segment most often had an agenda relating to monetary goals.

When identifying the different stakeholders associated to urban freight transportation at the construction site as well as their respective requirements belonging to the three pillars of sustainability, different matrices were established with the help of an analysis model. Thereby, the stakeholders identified as shipper, freight transport operator, customer, authorities as well as additional stakeholders were clearly stated, with most of the actors belonging to the shipper or authority segment. When further segmenting the different stakeholder requirements according to when these appear during the construction process, most of the demands appear during the actual construction process. However, the authorities might state their requirements already during the pre-construction phase, while the customers on the other hand state their requirements during the post-construction-phase.

Keywords: urban freight transport, stakeholder requirements, construction site, densified city

PREFACE

After having established a great interest in urban freight transportation associated to the development of densified cities, we found the writing process of this report very valuable. At a guest lecture at Chalmers University of Technology, we got in contact with WSP Group and learned about the company's contribution to urban freight transportation solutions. During the summer of 2014 we also attended an interesting seminar held by Jernhusen in Gothenburg, where future construction project plans of the urban development were presented. We found it interesting to learn about RegionCity in Gothenburg, belonging to the extensive city project Älvstaden. This experience was the foundation for our research and hence we found it interesting to explore the different stakeholders and their respective requirements associated to the urban freight transportation to and from the construction site when building in densified urban areas.

Working with the thesis has been both an interesting and a valuable experience, but also challenging from time to time. We would like to send a thank you to WSP Group for supporting us both during the writing process, but also for providing us with an office and necessary equipment. We would especially like to acknowledge the different company and organization representatives letting us interview them. We are also very grateful to the university professors who took their time to discuss the subject with us. Last but not least, we would like to thank our supervisors – Violeta Roso at Chalmers University of Technology and Nina Modig at WSP Group for your support, interesting discussions and valuable feedback throughout the project. Finally, we really hope that the findings of this report will constitute a valuable input for further research within this area.

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1 INTRODUCTION

The introduction provides a background to urban freight transportation as well as its significant importance and development. In this chapter also the purpose of the report will be presented, followed by the problem analysis and research questions. Finally will also the scope, limitations, delimitations as well as the outline of the report be presented.

1.1 URBAN FREIGHT TRANSPORT SOLUTIONS – A REQUIREMENT IN THE DENSIFIED CITY

During centuries urban freight transportation has been developed as a response to the great urbanization. When cities become more densified, not only an increased demand of residential areas, but also of a functioning infrastructure as well as efficient urban freight transportation, becomes a fact. Due to this aspect, the concept of urban freight transportation has developed and improved continuously over time.

1.1.1 FROM INDUSTRIAL FOCUS TO DENSIFIED RESIDENTIAL URBAN AREAS

Urbanization has always been a natural process in the human history. Even today people are moving from rural areas to cities for different purposes such as access of resources, better work opportunities and education (Internet Geography, 2008). According to the United Nations the world urban population will reach 72 per cent by 2050, an increase from 3.6 billion people in 2011 to 6.3 billion in 2050. As a result the world urban population will reach the same size as the total population was in 2002 (United Nations, 2012). Both metropolitan cities such as New York, Berlin, Tokyo, London and Paris, as well as smaller boroughs, are all facing even greater challenges of transport congestion, lack of accommodation as well as environmental deprivation (BBC, 2014), issues that all need to be addressed.

Ever since the industrialization took off during the second part of the 19th century, cities have developed into more densified residential areas. Hence a common transformation is the one from industrial areas to residential, liveable cities where urban areas have to adapt in order to live up to sustainable premises (Carter *et al*., 2014).

Some examples of industry areas that have transformed into liveable residential urban areas are Västra Hamnen in Malmö as well as Hammarby Sjöstad and Norra Djurgårdsstaden in Stockholm. Until the 21st century Västra Hamnen was an industrial location mainly for boatyards and during the second half of the 20th century, Kockums constructed the world's largest dock in the area (Persson, 2005). In a similar way, both Hammarby Sjöstad and Norra Djurgårdsstaden have developed from industrial zones including railways, harbours and heavy industries into liveable and sustainable urban areas.

Future projects like Älvstaden in Gothenburg will also constitute of a major transformation, changing the urban area from being the location of heavy industries to flourishing residential areas. RegionCity, one part of Älvstaden, provides the vision of letting the city grow, embracing

both sides of the river, which will allow for the different urban areas to integrate with each other (Jernhusen, 2014).

1.1.2 URBAN FREIGHT TRANSPORTATION IN DENSIFIED CITIES

To support the urban development and manage the enhanced population in the cities earlier described, new houses and residential areas must be built. However, building in densified cities, where accessibility and transport conditions are restricted, creates limitations and prerequisites for the construction projects. Due to the changed conditions different actors have different standpoints regarding issues related to the building construction sites (Chatterjee, 2004). As a result the logistical planning needs to be taken into consideration and especially the urban freight transportation to and from the construction site (Transport for London, 2013).

Due to the characteristics of the urban environment, there are significant problems regarding urban transportation that need to be considered. Stakeholders associated to the construction sites when new residential areas develop often express their requirements due to for example pollution, safety, noise and carbon emissions (European Communities, 2006). Such requirements have a tendency to appear too late in the process, why it is of high significance to clarify these at an earlier state in the building process (Transport for London, 2013).

In connection with a construction project a lot of actors are involved, which put a higher demand on efficient coordination and communication (Transport for London, 2013). However, problems occur when actors' opinions arrive too late to the construction project and it is therefore important to receive the information at an early point in time. By studying which stakeholders that are involved in a construction project, located in a densified city, and what opinions they have regarding the urban transportation connected to the construction site, several demands can be identified and categorized (Chatterjee, 2004).

Given previous research studies concerning identification of stakeholders connected to general urban freight transportation, one can perceive the need of extending that research with regards to the urban freight transportation to and from construction sites. Therefore already existing research regarding the stakeholders will be a point of departure in this study and will act as a framework when clustering the different stakeholders identified throughout this research. Furthermore, by segmenting the requirements and putting them into specific time spans, that is the period of time where the requirements enter the process, the complications related to coordination and communication will be diminished. According to Glavic *et al.* (2007), one way to segment the requirements of the stakeholders could be due to social, economical and ecological dimensions.

1.2 PURPOSE

The main purpose of this study is to identify stakeholders and their requirements related to construction projects in residential areas in the increasingly densified city, with focus on urban freight transportation. In order to facilitate logistical transport solutions in the densified city, a

mapping of the stakeholders as well as their requirements will be performed. By doing so, it is possible to avoid stakeholder requirements appearing too late in the construction process or when the construction project already is completed. It is by identifying these stakeholders and their requirements early on in the building process, that an attractive living environment in the densified city can be established.

With this focus it is of high significance to learn from previously already finished construction projects. For that reason, the coastal residential areas Västra hamnen in Malmö, Hammarby Sjöstad and Norra Djurgårdsstaden in Stockholm as well as RegionCity in Gothenburg were chosen as a foundation for the interviewing process. All of these urban areas have gone from being the location of heavy industries to expand into modern urbanization, housing several thousands of inhabitants, while exploring environmental urban living at the same time. By performing interviews with interviewees connected to these different residential areas from academic, organizational and business point of view, it is possible to support the stakeholders associated to urban freight transportation at the construction sites in densified city areas.

1.3 Problem analysis and research questions

The preceding introduction of the thesis proves the need for developing and improving the urban freight transportation along with the increasing grade of urbanization. Lindholm (2012) describes that urban areas often requires great quantities of goods that need to be delivered. At the same time the urban availability impairs due to inefficient route planning and lacking infrastructure. Because of the urbanization an increased activity of building residential areas in densified cities can also be emphasized. Even though the literature often describes urban freight transportation due to its general context, this report has put its focus on the issues concerning the freight transports to and from the construction site while building in the densified city. It is therefore of great significance to understand the characteristics of the construction site, but also of the different stakeholders involved and their respective requirements. Hence the focus of this thesis is to understand the different actors that are influencing and being influenced by the freight transportation related to the construction project as well as identifying the different kinds of demand these stakeholders propose.

1.3.1 Research question I

The first research question is to map the stakeholders that are affected by the urban freight transportation to and from construction sites in residential areas. In order to recommend what actors that are needed to be taken into consideration for this type of construction project, there are significant aspects to keep in mind. First of all, the different stakeholders will be identified and categorized into segments. In order to identify these actors, it is also significant to distinguish what the characteristics and the prerequisites of building construction sites in residential areas are. Therefore the first research question is

- **Who are the different stakeholders that are affected by freight transports associated to construction sites in the densified city?**

When understanding the complexity and the prerequisites of the construction site, it is also possible to identify and segment the different types of stakeholders associated to the building process. Furthermore also the characteristics and attributes of the freight transports to and from the construction site need to be explained and defined.

1.3.2 RESEARCH QUESTION II

Secondly, the different requirements, which stakeholders have regarding the urban freight transportations to and from construction sites in the densified city will be identified and analyzed. Consequently, the second research question is

- **What are the identified stakeholders' requirements related to urban freight transports to and from construction sites in the densified city?**

By seizing these requirements earlier on in the construction process, complaints and dissatisfaction among the stakeholders can be avoided and will hence not appear after the already finalized construction project. Once the requirements and demands of the different stakeholders have been identified it might also be possible to segment the demands into specific categories. Such a segmentation pattern might not only take the request characteristics into account, but also the time frame due to when the demands occur during the building process.

1.3.3 RESEARCH QUESTION III

Thirdly, when the stakeholders and their respective requirements are identified, it is also of great significance to clarify when during the construction process each requirement occurs as well as who the affected stakeholder is receiving the requirement. As a result, the third research question is stated as:

- **When in the construction phase will the identified requirements occur and which stakeholder is affected by a certain requirement?**

The overall environment of the stakeholders and their requirements is often experienced with a high level of complexity where many trade-offs occur. Thereby, the communication between the stakeholders might be facilitated when clarifying which construction phase each requirement belongs to, resulting in a more efficient building process.

1.4 LIMITATIONS AND DELIMITATIONS

To control the range of the study several delimitations are made. Firstly, when it comes to what type of construction sites that are being analyzed the focus will be on residential areas. By residential areas only construction sites related to building accommodations in urban areas will be considered. Hence, other types of construction projects in densified cities such as malls, bridges or road networks will not be included in this study. One reason for selecting residential areas is the great amount of new areas being built in Sweden. In big cities like Gothenburg, Malmö and Stockholm former industry areas have been transformed into residential areas to meet the growing trend of urbanization. Additionally, the report will focus on freight transportation to and from the construction site and not material handling at the site.

Furthermore, due to a geographical aspect the focus is put on construction sites located in Sweden. By interviewing different persons located in three different cities in Sweden, one can assure that the answers can somewhat be general applied to different sites in Sweden. The chosen cities are Malmö, Gothenburg and Stockholm, the three biggest cities in Sweden, since they all have urban areas, which have been transformed from industry into residential areas.

Another delimitation to take into account is that different stakeholders have different relations and impacts to the urban freight transportation. Some actors will have a direct influence, others will have a more indirect and far-sighted impact. In this report, there will be no distinction of the grade to which each stakeholder affect urban freight transport to and from the construction site. Hence, the report assumes that the identified stakeholders will have an equal impact due to urban freight transportation.

Regarding the limitations one significant aspect is the time perspective. Since the project is carried out during a limited period of time there is no possibility to actually visit every interviewee. Therefore more time is spent on telephone interviews, which makes it difficult to create personal bonds and become detailed answers. Consequently, most of the personal interviews conducted face-to-face took place in Gothenburg.

Even though there is a lot of literature concerning urban freight transportation in general, there is a lack of academic research and considering the topic urban freight transportation to and from construction sites. Hence this is a limitation for the report. This problem results in an issue concerning the definition of freight transports connected to the site and hence the majority of the theoretical framework is based on urban freight transports in general.

1.5 OUTLINE OF THE REPORT

The outline of the thesis is based on a theoretical framework treating the actors of urban freight transportation as well as how to segment these actors and their views into different segments. The theoretical section is followed by an empirical study constituting of several interviews with respondents associated to the academy, government as well as different logistic companies. Thereafter, with support from the theory an analysis is carried out to identify the different stakeholders affected by the urban freight transportation to and from construction sites as well as their requirements. Furthermore, the result will be summarized in a matrix including what type of requirements there are as well as when during the construction process the requirements enter. The matrix might constitute of a template for future use when planning new residential areas to avoid difficulties.

Chapter 1 introduces the historical background of urbanization and its importance as well as difficulties with urban freight transportation in densified cities. Secondly, the purpose and the research questions of the report are outlined.

Chapter 2 describes the theoretical framework used to identify and segment the actors and their requirements regarding urban freight transportation to and from construction sites. It includes a description of urban freight transportation and its actors as well as the different stages of the construction project. Additionally, an analysis model, based on the theoretical framework, is presented to structure the analysis.

Chapter 3 contains the methodology section where the research process is described as well as the data collection methods. The chapter ends with a data accuracy section.

Chapter 4 focuses on the empirical study of the thesis. The different views of the respondents are presented according to what type of stakeholder group they belong to. That is, academic, governmental or a business point of view.

Chapter 5 covers the analysis, which focus on identifying the actors and their needs according to the analysis model developed in chapter 2. It constitutes of information both from the theory section in chapter 2 as well as the empirical findings in chapter 4.

Chapter 6 treats the result of the analysis, explained in two different charts. Firstly, the different requirements of the stakeholders are identified according to when during the construction process each demand occurs. Secondly, the receiving part of the requirement is also identified, resulting in an emphasis of the complexity of the stakeholder demands.

Chapter 7 concludes the report by presenting not only the purpose of the report, the analysis model and the results, but also recommendations relating to further research within the area.

2 THEORETICAL FRAMEWORK

This chapter initiates with a general description of freight transportation and its characteristics and further treats the more narrow part of urban freight transportation as well as its increasing complexity. The section also discusses the importance of urban freight transportation development as well as how this concept relates to construction sites while building residential areas in densified cities. Also a background of different stakeholders and their respective requirements associated to urban freight transportation is presented. Finally, regarding the segmentation of the stakeholder requirements, the three pillars of sustainability are also provided.

2.1 FREIGHT TRANSPORTATION

As described by Lindholm (2012) freight transportation belongs to a much broader context of the entire supply chain, where many freight transport chains start, end or bypass urban areas. While belonging to this extended perspective, the freight transport chain includes physical handling and activities related to the consignment such as transport, planning and control. In order to fulfill the demand of goods movement in freight transportation, there is a need for resources, making the movement of the goods valuable due to time and location aspects (Lindholm, 2012). According to Lumsden (2007) it is the transport service that provides certain stakeholders with time and place utility, not only within organizations but also between.

Lumsden (2007) describes the material flow system as the current flow within and between organizations where the products bypass different processes. The transport flow system, on the other hand, only emphasizes the flow between different organizations where the use of resources such as vehicles and equipment becomes a necessity. Finally the infrastructure system includes the different types of assets such as terminals and road networks, making the transport flow possible. Furthermore, the diverse types of transportation systems create different markets, where the connection between the material and transport flow creates a demand and supply for freight transports and hence the transport market. In addition, the transport flow and the infrastructure create the traffic market, where the movement of vehicles is defined due to the infrastructural limitations.

2.2 URBAN FREIGHT TRANSPORTATION

In many cases, some or all of the three layers of freight transport can be identified in urban areas and as described above, freight transport chains might be related to urban areas. Especially urbanized cities often represent major centers of both production and consumption, allowing a significant proportion of the transport operations to start and end in urban areas, whereas some transport related activities only bypass urban areas (Lindholm, 2012).

The transport operations in urban zones are associated to for example goods movement between industries, warehousing and retail activities, gateway operations such as seaports, truck and train terminals, distribution centers and airports (Rodrigue *et al*., 2006). A significant part of the urban

freight transportation activities are also related to the construction sites while building residential areas and densifying the city. Freight truck transports are conducting the movement of goods, such as the delivering of building material and equipment to the construction site as well as the transportation of waste away from the building area (Transport for London, 2013).

2.2.1 Complexity of urban freight transportation

While considering the trend of urbanization as being one of the most substantial processes related to population growth, urban freight transportation issues require significant support in order to enable the freight mobility in the densified city (Rodrigue *et al*., 2006). As mentioned earlier, cities are often the location of production, distribution as well as consumption, creating a demand for activities associated to goods movement in densified areas (Lindholm, 2012).

According to Rodrigue *et al.* (2006), especially freight transportation in urban areas raises complexity issues due to several factors involved. The multiple number of different origins and destinations of goods as well as a significant variety of traffic modes emphasize the importance of proper route planning and mode choice. Freight truck transportation in urban areas might be viewed upon as an increasingly disturbing activity since the vehicles drive on the same streets as the private and public transportation vehicles, resulting in increased congestion and impaired mobility (Crainic *et al.*, 2004).

Furthermore does the urban freight transports also contribute to nuisances such as emissions, noise, air pollution as well as unsafe living environments, resulting in an overall decreasing quality of life in the urban areas. Moreover, the urban form, its transit as well as spatial structure affect and is affected by the urban transport system especially in highly densified areas (Rodrigue *et al.*, 2006). Depending on the urban characteristics and its intricacy, the urban freight transportation system will hence be exposed to a various range of complexity.

2.2.2 The importance of urban freight transportation development

Planning and control of freight transports is often much more complex than the case of passenger transportation since many more actors are involved where a significant part of these belong to the private sector (Chatterjee, 2004). Due to the many issues raised associated with urban freight transportation, policy planners have tended to view urban movement of goods as a problem rather than an essential component of urban development (Wolmar, 2012). This approach has resulted in policies aiming to restrict rather than support the development of urban freight transportation such as vehicle time, weight, size and routes regulations (Lindholm, 2012).

According to Wolmar (2012) the policy makers of today have started to emphasize the importance of developing urban freight transportation. First of all, the view has shifted into focusing on the importance of supporting the urban economy. The densified city and its urban areas need support by freight transportation policies reinforcing both growth and competitiveness. Due to this point it is also of high significance to ensure that the people living and working in the city obtain the goods and services they demand at the right time, quantity and

quality. The activities associated with urban freight transportation result in conflicts between economic, social and ecological interests. Addressing these trade-offs and conflicts requires changes, innovations and adaptations both in the private and in the public sector (Wolmar, 2012).

Gonzalez-Feliu and Salanova (2012) described that an appropriate way of facing the challenge of urban freight transportation development is due to a collaborative approach where a framework of an accommodative support of transportation decisions can be made. Thereby, both public and private stakeholders are able to support the decision makers associated to the urban freight movements, resulting in efficient logistic solutions in the densified city.

2.2.3 URBAN FREIGHT TRANSPORTATION TO AND FROM THE CONSTRUCTION SITE IN URBAN AREAS

As mentioned earlier, a significant part of the urban freight transportation activities are also associated to the construction sites while building residential areas in cities. Freight truck transports are conducting the movement of goods, such as steel and fabrication, rebars, aggregates or mechanical and electrical devices (Transport for London, 2013). Depending on the type of material, different requirements due to time and handling restrictions are put on the shipping entity where certain materials such as concrete needs to be delivered within critical time spans or will else solidify. Other types of material such as steel rebars are less critical regarding Just-In-Time deliveries. In this case there are often higher demands for high filling grades of the freight transport however (Construction Logistics Plan Guidance for Developer, 2013).

Furthermore, Transport for London (2013) elaborates on the importance of construction logistics planning in order to reduce the congestion in densified cities. When driving through urban areas, freight transports are not always allowed during the entire day, but only on certain non-rush hours. Furthermore, the report emphasizes that several construction projects when building in residential areas do not have delivery bookings scheduling systems. However, when trying to optimize the freight transport routes to and from the construction site, not only the congestion is alleviated but also the environmental benefits arise according to the report. Due to narrow loading and unloading areas at the construction site, the demand for accurate and precise Just-In-Time deliveries becomes even higher.

Not every construction project when building in densified urban areas takes the logistical planning of the freight transports at the construction site into consideration. The independent organization Traffic for London emphasizes the importance of developing a Construction Logistics Plan for every construction project, not only to ensure efficient and cost-effective freight transports, but also to ensure safety for inhabitants and visitors in urban areas. These plans are documents setting out the planned logistical activities, including freight transports to and from the site, acting as a catalyst for minimizing the negative effects associated to the construction project (Helman *et al.*, 2012).

2.3 Introduction to construction project

In order to become a better understanding of the entire construction process relating to building in residential areas it is significant to form an understanding of both the characteristics of the construction project as well as its different time phases. Thereby the urban freight transportation to and from the construction site will be easier defined.

2.3.1 Definition of the construction project

When referring to the building construction project, both the process of preparing for as well as establishing the building should be kept in mind (Transport for London, 2013). The construction project is initiated by a planning process, essential for effective construction work, where not only project design, infrastructural planning and scheduling is of great importance, but also environmental impact, financing budgeting as well as safety at the construction site (Rahmana et. al, 2014).

The design team related to the building construction process consists of civil, cost, mechanical and electrical engineers, architects, as well as planning and archaeological consultants (Transport for London, 2013). Normally, a project manager is executing the constructing project under the supervision of a construction engineer as well as a project architect. Such a team is most often denoted as the contractor and is employed, i.e. in contract with, the property owner, which is the building constructor (Gressgård & Hansen, 2014).

Hence, it is the property- or landowner, the constructor, initiating the construction process, allowing several different construction companies to bid for the construction work, where the most cost efficient bidder will be awarded with a contract. The contract between the constructor and the contractor is in general based on strict time limitations (Gressgård & Hansen, 2014). Under the contractor there might also be one or several sub-contractors, providing with necessary material, equipment and workforce (Rahmana et. al, 2014).

During the last period of time, the environment associated to building construction projects has changed and developed into new areas, where a higher focus has been put on joint ventures, partnering as well as public or private partnerships (Rahmana et. al, 2014). The importance of collaboration and information sharing throughout the construction project has increased (Transport for London, 2013).

However, the collaboration between the constructor and the contractor is sometimes lacking, resulting in unachieved goals due to cost, quality and time (Gressgård & Hansen, 2014). When managing the contractor relations, external input to local activities associated to the construction site should therefore be realized. Contractors often originate from a variety of backgrounds and have experience with a wide range of companies and different types of building projects (Gressgård & Hansen, 2014). Thereby, the contractors also possess valuable competencies relating to risk factors as well as challenges occurring during the building process.

2.3.2 THE PHASES OF THE CONSTRUCTION PROJECT

When understanding the need for transports to and from the construction site it is also significant to understand the characteristics of the actual construction site and especially when different activities occur. The construction project, when building in residential areas, consist of three different stages and according to Anderson *et al.* (2006) these constitute of the *Pre-construction phase*, *Construction phase* and *Post-construction phase*. Nordstrand *et al.* (2002) mention that building a residential building implies a complicated interaction between the different actors involved. Anderson *et al.* (2006) state that having control of the building process through coordination and management is important at every different stage, an act often perceived as anything but simple. A description of the three different construction phases and its respective characteristics is shown in Figure 1 below.

FIGURE 1. THE PHASES OF THE CONSTRUCTION PROJECT, GENERATED FROM ANDERSON *ET AL*. (2006)

2.3.2.1 THE PRE-CONSTRUCTION PHASE

The first stage, that is the Pre-construction phase, consists of a planning, budgeting and permitting section. Anderson *et al*. (2006) explain how every project starts with a conceptual plan and budget. This demands a lot of time to develop and usually starts with the planner who analyzes site- and budget constraints. According to Smith (1991) it is a complex process to choose a suitable place for the construction site and it often requires a team of specialists within different segments such as environmentalists and land agents to achieve a reliable decision. Furthermore, the access to roads to and from the construction site is an expensive feature of the site development and need to be considered when choosing the location. Extreme weather conditions like deep snow or high winds can also determine which location that is most suitable. Additionally, focus is also put on environmental constraints. Nordstrand *et al.* (2002) stress early planning and emphasize the importance of having the possibility of influencing the construction.

Furthermore, Anderson *et al.* (2006) introduce a part called engineering and emphasize the importance of minimizing future construction problems by involving pre-construction consulting activities. In this case preliminary cost estimates as well as constructability reviews and value engineering is added. The last one is referred to a third-party participation, where it is evaluated if the design of the building should be done in a more cost efficient way. When it comes to

constructability reviews the actors have the possibility to identify logistical challenges and matters of trade coordination.

Another essential area is according to Anderson *et al.* (2006) the contractor selection. This selection is very individual depending on what kind of legislative constraints there are and what project that needs to be planned for. In this phase the selection of a specific contract method is made as well as potential contracting constraints such as time for completion and insurance requirements. Walraven *et al.* (2009) mention that the present procurement method, when the lowest price often is the main factor for winning the contract, is not an efficient way to go. Instead it is recommended to choose the contractor, which has the best potential to deliver the highest value for the money invested. Additionally Anderson *et al.* (2006) explain the bid phase that differs depending on if the project is public or private. When the contract is signed a meeting is organized to discuss the different administration and communication methods for the project. Often the meeting involves participants such as the owner, construction and project manager.

2.3.2.2 The Construction phase

Furthermore Anderson *et al.* (2006) describe the second phase called the construction phase. First of all it includes managing the process, which is constituted by several different areas. In this case it is crucial that the contractor, owner and designer create a working communication and decision-making process. According to Charehzehi *et al.* (2012) there is a large risk of accidents related to the construction site. It is therefore important that the designer and the client work together to create a risk analysis regarding what different accidents that can occur. By doing this the risk will significantly decrease.

Anderson *et al.* (2006) mention among others requests for information as a way to document the communication. Furthermore, Hewage *et al.* (2009) explain the difficulties the construction industries face when it comes to incorporating the new advanced technology in order to secure market share. The construction industry is lagging behind other industries such as transportation and manufacturing when it comes to this aspect. Additionally, Anderson *et al.* (2006) refer to notice of delay and changed conditions to highlight alterations during the project. Furthermore, quality inspections and payment processes are also steps in the managing process that need to be taken into account to get a good quality of the project and to avoid the situation when not getting continuously paid during the project time. After managing the process, there are the activities before the construction starts where the contractor needs to submit all detailed information about materials and methods to make sure that everything is aligned with the contract. Thereafter the contractor has a certain amount of time to proceed with the preparations on the construction site and then finally the groundbreaking ceremonies can take place.

2.3.2.3 The Post-construction phase

When it comes to the post-construction phase, Anderson *et al.* (2006) point out different stages that are important when wrapping up the construction project. The completion of a project will not end at a specific time but is a process itself. It starts with the substantial completion where

the contractor, owner and other involved parties make a list, which consists of items that need to be finalized. Nordstrand (2002) explains that the mistakes found during the inspections are executed instantly. Thereafter the final inspection takes place to see that everything is done according to the agreement. This is followed by several different stages such as the contractor's submission of documents and obtaining the eventual completion before the final payments and releases are made (Anderson *et al.*, 2006). Furthermore, Nordstrand (2002) mentions the importance of gathering the knowledge obtained during the construction project in order to make future projects more efficient.

2.4 STAKEHOLDERS ASSOCIATED TO URBAN FREIGHT TRANSPORTATION

According to Lindholm (2012) the stakeholders associated to urban freight transportation have an interest in the transport system including for example individuals and groups of people, companies and organizations. Several stakeholder theories emphasize the individuality and uniqueness of each stakeholder, who belongs to an extended network of strategic relationships (Hensher and Brewer, 2000). This point of view hence stresses the existing network of relationships where customers, suppliers, businesses, communities as well as governments are included, which all form an extensive supply chain of stakeholders. Furthermore did Lindholm (2012) describe how different stakeholders have different interests and prerequisites associated to urban freight transportation. For this reason, it is of high significance to identify, describe and segment the different types of stakeholders associated to urban freight transportation.

Ballantyne *et al*. (2013) mention the development of categorizing stakeholders over the years and the importance of developing an even broader perspective. A primary division involves participants such as shippers, forwarders, receivers, trucking firms, truck drivers, terminal operators, road and traffic authorities and governments. The authors also argue further that recent studies bring up even more stakeholders like freight carriers representatives, local policy makers as well as retailers. Furthermore, do Russo and Comi (2011) discuss the inhabitants, visitors and end-consumers as important stakeholders. Lindholm (2012) made a distinction between different stakeholders due to different categories of for example shippers, customers, freight transport operators and authorities. The author argues further the significant impact these actors have on the urban freight transportation system, why the characteristics of these different segments are important to consider. An illustrative description of the different stakeholders according to Lindholm (2012) can be seen in Figure 2.

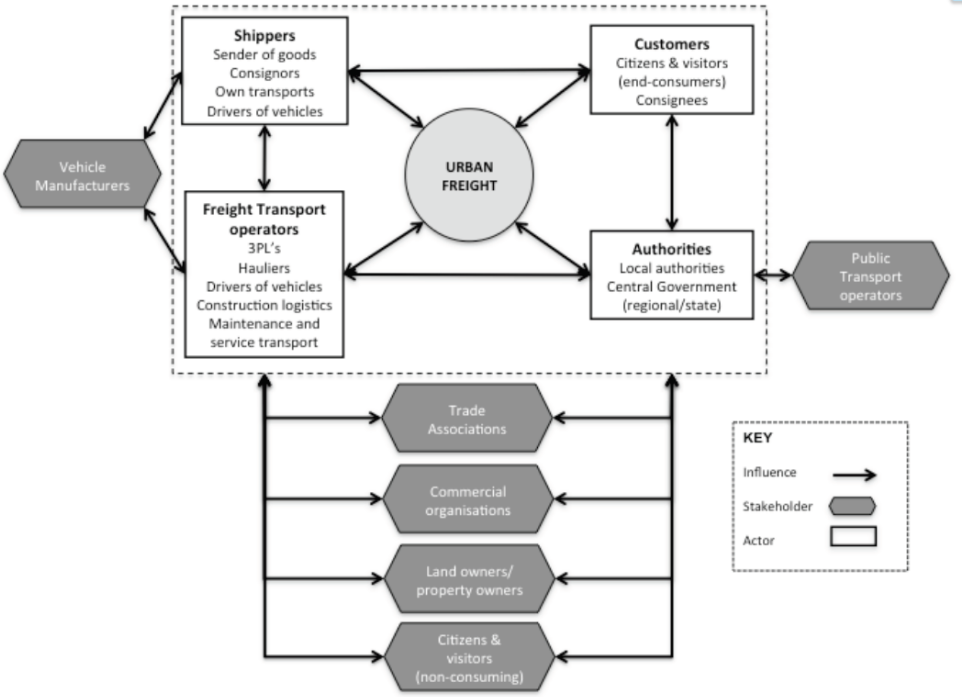

FIGURE 2. URBAN FREIGHT STAKEHOLDERS AND THEIR RELATIONSHIPS, LINDHOLM (2012)

When Lindholm (2012) discusses the different stakeholder perspectives due to distinct segments, the author also stresses the different stakeholder characteristics and the importance of notifying these. Especially in urban areas, the freight transportation sector is often recognized as one of the main contributors to congestion and traffic accidents (Cherrett, 2012). In order to understand the network of different stakeholders and how these interact, it is therefore necessary to understand each of the underlying individual stakeholder characteristics.

2.4.1 SHIPPERS

The *shippers* are the stakeholders sending the freight and ordering the transport service, either with the help of a third-party logistics service provider or by performing the service within the company (Lindholm, 2012). Wohlrab *et al*. (2012) identify the shippers, including manufacturers, wholesalers and retailers, as key stakeholders associated to urban freight transportation. Quak, (2008) recognizes shippers as the stakeholders at the origin of the urban freight transportation process. Furthermore the shipper might be described as a stakeholder responsible for the delivery and collection of goods at the lowest possible cost while meeting the customer demand at the same time (MDS Transmodal Limited, 2012).

According to Lindholm (2012) the shipper aims for both high efficiency and competitiveness and emphasizes short routes due to effective route planning and control. In the same way, Russo and Comi (2011) describe how the shipper requires low costs as well as high-quality transportation operations. Flodén (2007) states that there often exists a demand for frequency and flexibility at

the shippers, especially when working due to Just-In-Time arrangements. Especially on-time deliveries and price, related to the urban freight transportation are important.

Furthermore, according to Lumsden (2007) the shippers are also concerned about creating place and time utility and hence satisfying the customer needs in an optimal way. This is an important aspect due to the shippers, since the transport service never can be stored, and hence the shippers stress the importance of making better use of resources in order to increase the efficiency and customer satisfaction.

2.4.2 CUSTOMERS

The *customers*, on the other hand, are the receivers of the goods and might constitute of shops, restaurants, organizations as well as offices (Lindholm, 2012). This category also includes inhabitants as well as visitors in the urban area, also referred to as the end-consumers (Russo and Comi, 2011).

The customer is recognized as one of the key stakeholders since this actor is the true source of urban freight transport demand. For this reason, the customer satisfaction is of great significance and is often used as performance measure for urban freight services (Wohlrab *et al.*, 2012). Hence the urban freight transportation industry is constantly looking for alternative ways to satisfy the varying customer demand (Flodén, 2007). Different customer solutions due to urban freight transports are necessary in order to keep old and attract new customers, why the cooperation in urban freight logistics, where the customer is given priority, becomes a necessity (Wohlrab *et al*., 2012).

The different types of customers have several different interests and characteristics in common associated with urban freight transportation. Lumsden (2007) describes the main aspects due to environmental issues, but also safety and cost efficiency are stressed. Also Wohlrab *et al.* (2012) point out the customer characteristic of the demand for environmentally friendly urban transports. Furthermore is also an attractive urban area of high significance in order to attract residents, visitors and other end-consumers.

Another important aspect is also the reliability of urban freight transports, where it is of great importance for the transport services to keep their promises in order to create place and time utility (Lumsden 2007). MDS Transmodal Limited (2012) puts a focus on how the customer stresses the significance of on-time delivery of products, where short lead times and the availability of various types of freight in the urban areas are of great importance. Wohlrab *et al*. (2012) explain how the customer often emphasizes the service level of the freight transport solutions including shipping price, lead time, delivery time and frequency as well as delivery precision and accuracy.

In a resembling way, Russo and Comi (2011) describe the customer stakeholders related to urban freight transportation as for example the end-consumers, which is a group consisting of citizens

and employees. These stakeholders are concerned about minimizing the difficulties connected to urban goods transportation. Additionally, this group includes visitors and people consuming goods in the area, who also want to minimize the hindrance of freight transportation as well as find the latest products in the shops in combination with low prices.

According to Lumsden (2007) the customers often put a high pressure on the shippers to deliver the right products in the right time and in the right quantity, why creating high urban freight transport efficiency due to route planning becomes a necessity. The urban freight transport system results in a large number of transport relations, where poor utilization of resources and a low transport frequency when delivering smaller volumes constitute a significant challenge. When the urban freight vehicles are not utilized enough, there will be more vehicles on the streets in urban areas, which in turn results in increased congestion, decreasing attractiveness of the urban region as well as an increased risk of road accidents (Lumsden, 2007). This aspect hence stresses the importance of having a stakeholder responsible for the route planning in order to secure efficient use of vehicles and other resources, such as the freight transport operator (Lindholm, 2012).

2.4.3 Freight transport operators

The *freight transport operators*, often third-party logistics service providers or hauliers, are the stakeholders responsible for actually delivering the goods to the customers by performing the freight transport service in the urban areas (Lindholm, 2012). These stakeholders also ensure an appropriate route planning as well as an efficient use of resources (Lumsden, 2007).

MDS Transmodal Limited (2012) states how the transport operator emphasizes low costs, but also high quality transport operations as well as fulfilling the customer needs and interests. Also the driver of the vehicle who actually performs the driving operation in the urban area is associated to this group of stakeholder. Lumsden (2007) stresses the importance of the driver as the one who accompany the freight as well as securing the urban freight transports while avoiding goods damages and thefts. Hence, these stakeholders emphasize the significance of accessibility to the urban end destination as well as proper and safe loading spots in the urban areas.

Taniguchi *et al*. (2001) discuss the importance of considering the impact of the shipper and freight operator behaviors and characteristics and how these interact. Thereby, it enables the urban planners to evaluate transport policies while mitigating congestion and environmental issues in urban areas. Wohlrab *et al*. (2012) discuss how the shippers and the freight operators are associated with the same objectives of keeping costs down and meeting the customer demand at the same time.

2.4.4 Authorities

An understanding of freight transports is often required and seen as the first step in the development of freight partnerships between authorities and freight actors (Cherrett, 2012).

Another stakeholder according to Lindholm (2012) is hence the *authorities* consisting of the local and national government and their respective characteristics.

According to Lindholm, (2012) this group comprises the local government, whose interest affects an attractive city for the citizens, as well as the national government with a focus on minimizing external effects and maximizing economic advantages related to urban freight transportation. Moreover, MDS Transmodal Limited (2012) states that the public authorities are categorized into local and national government. The author describes the local government and stresses the importance of developing an attractive city for both inhabitants and visitors, where the negative impact from urban freight transportation is limited. The description of the national government, on the other hand, puts a focus on minimizing the externalities from urban freight transports, while maximizing the economic efficiency at the same time.

Traditionally it has been common for authorities to consider urban freight transports only as a response to complaints raised by residents and other stakeholders (Cherrett, 2012). Hence, the main objectives due to this type of stakeholder are to keep the attractiveness and support the quality of life for both inhabitants and visitors in the urban area (Lindholm, 2012). Cherrett (2012) emphasizes that a common characteristic for authorities is the requirement to consolidate goods and deliveries as well as identifying the opportunities of doing so in order to create efficient freight transport solutions in urban environments. Thereby the authorities are able to perform changes in the infrastructure due to transport planning policies while striving for an efficient road network resulting in optimal routes and minimized congestion (Lindholm, 2012).

2.4.5 Additional stakeholders

Furthermore there also exist more fragmented stakeholders associated to this topic. The *vehicle manufacturers* for example, also have an impact on the urban freight transportation according to Lindholm (2012). Due to this aspect, the innovative vehicle technology is of high significance in order to enable efficient urban freight transport solutions. Moreover the *public transport operators* also need to be considered as an important stakeholder since the urban movement of passengers often is prioritized before the urban movement of freight, i.e. the aim of more efficient public transports are often of higher significance in urban areas than creating an optimal mobility for the freight transports (Cherrett *et al*., 2012). Finally do also the *landowners* constitute of a certain type of stakeholder, where demands are expressed regarding where and when urban freight transports should be allowed and to what extent (Lindholm, 2012). Landowners emphasize keeping a positive profitability of the local areas. Often it is the requests and demands of the tenants living in certain urban areas that are the underlying cause for the landowners to be interested in influencing urban freight transports (MDS Transmodal Limited, 2012).

2.4.6 The complexity of urban freight stakeholders

Creating a strategic change in urban freight transportation, through consolidating the ideas, interests and objectives of several different types of heterogeneous stakeholders, is challenging

(Hensher and Brewer, 2000). Likewise do Spickermann *et al*. (2013) emphasize the importance of considering the diversity of different stakeholders and their individual interests due to urban freight transportation. Furthermore does Lindholm (2012) describe the complexity of different stakeholder interests and prerequisites associated to urban freight transportation that need to be considered and individually evaluated.

Savage *et al*. (2011) define stakeholders as a person, group or organization, which influence or is being influenced by an organization's actions. Additionally, the complex structure of the stakeholder relationships influences the way organizations act. Regarding urban freight transportation, Russo and Comi (2011) mention different groups of actors, who all have their unique needs and requirements. Example of different requirements can be the receiver's wish to have short lead times, which demands high transportation frequency in the densified area, as well as the resident's desire of a calm neighborhood. These are two perspectives that contradict each other, increasing the complexity of satisfying different stakeholder requirements.

According to Lindholm (2012), the different stakeholders associated to urban freight transportation have different relationships to each other and interact in different ways. Additionally these stakeholders influence and are influenced by the urban freight transportation in various ways. Lindholm (2012) explains the importance of including more stakeholders in the process to get a better understanding of the situation and as a result make correct decisions. Organizations such as trade associations, commercial organizations, landowners and non-consuming visitors will also influence the urban transport system, even though these actors influence the system from a certain distance.

Furthermore does Lindholm (2012) emphasize the importance of feedback and communication to get a better comprehension of the situation. An implication of the stakeholder requirement complexity is hence that finding a strategy regarding urban freight transportation, in which several different stakeholders are willing to invest in, is often a significant challenge (Hensher and Brewer, 2000). One idea is however to segment the different stakeholder requirements into separate categories where requirements belonging to the same segment have similar characteristics (Lindholm, 2012).

2.5 SEGMENTATION OF THE STAKEHOLDER REQUIREMENTS

Segmentation methods can be used in different branches and areas such as market segmentation (Wedel *et al*., 2000) and labour segmentation (Morrison, 1990). The different segmentation patterns are all based on the idea to divide customers, workforce and other groups according to different characteristics. When it comes to market segmentation Wedel *et al*. (2000) describe that the segments can be directly connected to the heterogeneity of customers' demand. Furthermore, one has to view the heterogeneous market as a set of diminished homogeneous markets. Raulerson *et al.* (2009) highlight the difficulties of treating all customers equally even though they have different characteristics. Companies could for example miss out customers' desires and chances to meet customer demands outside the segments.

Today the market environment has changed and due to a more evolved information technology there is a possibility for companies to get much more information about each stakeholder. This results in even smaller segments with more accurate information about each actor's requirements (Wedel *et al*., 2000). Additionally, structuring a segmentation pattern can be done in different ways depending on what to segment. Wedel *et al*. (2000) describe some general classifications of segments useful when segmenting customers. In this case the groups are connected to cultural, geographical, demographic and socioeconomic factors. Another type of segmentation pattern is also due to economic, ecological and social factors Glavic *et al.* (2007), which has developed into an established concept of meeting different stakeholder demands and can be recognized as the three pillars of sustainability.

2.5.1 THE THREE PILLARS OF SUSTAINABILITY

According to the report World Commission on Environment and Development: *Our Common Future*, "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Iisd, 2013). According to Glavic *et al.* (2007) the term sustainability consists of three different principles, the ecological, economic and social principle. Additionally, Placet *et al.* (2005) emphasize the importance of relating the three different segments to each other and also that these should support each other.

2.5.1.1 THE ECOLOGICAL PRINCIPLE

The ecological principle consists of several different areas, which all affect the environment in some way or another. Glavic *et al.* (2007) mention the areas of renewable resources, minimization of resource usage as well as purification. When it comes to the renewable resources, these assets should not be obtained from fossil fuels. This area emerged from the increased need of decreasing the carbon dioxide emissions. By using energy resources like solar, wind and biomass the reduction can be achieved.

Another part of the ecological principle, that Glavic *et al.* (2007) mention, is minimization of resource usage. This is important since the resources will not last forever. It covers for example use of energy, water and raw materials as well as fishing. Furthermore, purification is mentioned as one part of the ecological principle. Purification means the elimination of undesired mechanical particles, a process that could be chemical, biological or mechanical. Placet *et al*. (2005) emphasize that the ecological aspect should concern both a local, regional and global level.

2.5.1.2 THE ECONOMIC PRINCIPLE

The second part involves the economic principle including both cost savings as well as economic advantages for the enterprise, stakeholders and society (Placet *et al*., 2005). Moreover, Glavic *et al.* (2007) explain a content, which comprises environmental accounting and ethical investments. Environmental accounting is a method to bring up the importance of environmental costs to the corporate stakeholders. However, the environmental quality and profitability of the company

should also be improved. The environmental accounting can be divided into different sections such as national, regional and corporate levels. In addition, the economic principle also consists of ethical investments. These investments are connected to financial instruments, which support environmental actions and diverse labour.

2.5.1.3 THE SOCIAL PRINCIPLE

Regarding the societal principles, Placet *et al*. (2005) describe a way of developing the quality of life for both employees and the society in general. Furthermore do Glavic *et al*. (2007) refer to social responsibility as well as health and safety. These sections highlight the importance of equal human development as well as safe working environments. Additionally, reporting to stakeholders about a company's current situation and future actions are also an essential part of the social principle. Slaper *et al*. (2011) mention several different potential variables to measure the social perspective. Unemployment rate, average commute time and health-adjusted life expectancy are examples of factors, which can be collected both at community level as well as national level.

2.6 ANALYSIS MODEL

As a result of the literature study an analysis model can be illustrated to show the relationship between the different areas of the study. The analysis model will act as a foundation for the analysis carried out later on in this report. The model, illustrated in Figure 3, describes the analysis in three different layers. The first layer depicts the stakeholder segmentation according to shippers, customers, freight transport operators, authorities and additional stakeholders. The second layer represents the stakeholders' requirements and how these connect the stakeholders to the urban freight transportation to and from construction sites. The requirements are illustrated as arrows with three different colours, which represents the segmentation areas; ecological, social and economic principles.

The model elaborates on Maria Lindholms' research regarding the stakeholders associated to urban freight transportation. However, the focus of this report will be on the five main stakeholder segments, associated to the urban freight transportation to and from the construction site. That is, the characteristics of each stakeholder segment represented in Figure 3 will be considered when identifying the concerned stakeholders during the analysis. Furthermore, the third layer expresses the various phases of the construction project when the requirements will enter the process, that is, in the *Pre-construction phase,* the *Construction-* or *Post-construction* phase.

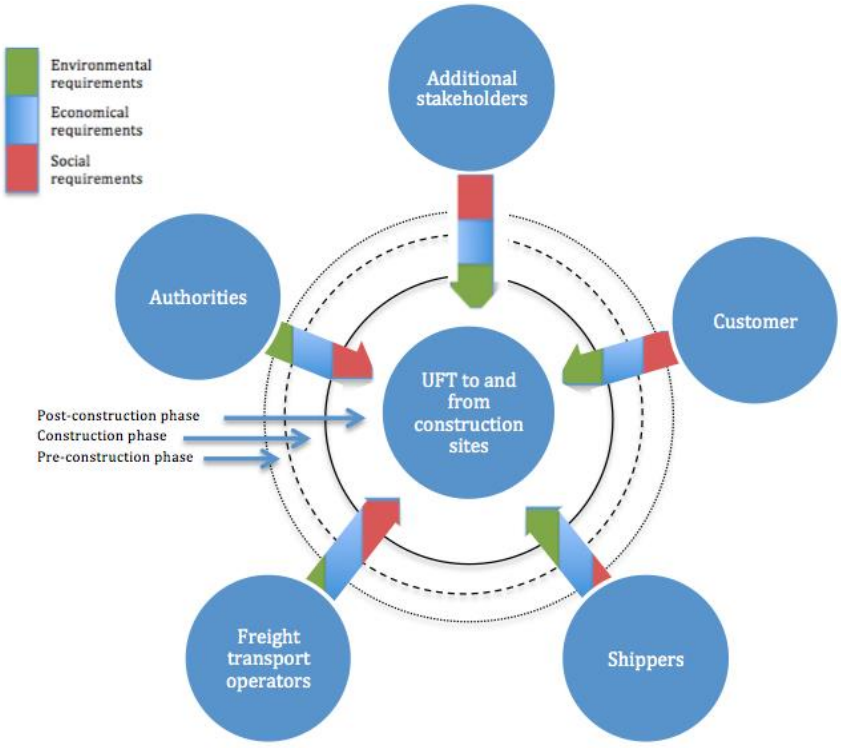

FIGURE 3. ANALYSIS MODEL, WHICH DEPICTS THE THREE DIFFERENT THEORETICAL LAYERS; STAKEHOLDER AND REQUIREMENT SEGMENTATION AS WELL AS CONSTRUCTION PHASES

3 METHODOLOGY

In the methodology section the research process of the thesis will be presented. Also a description of the data collection method such as literature reviews and interviews will be provided. Finally the chapter will discuss data accuracy and quality.

3.1 RESEARCH PROCESS

The research process of this report originates from the theoretical framework where an understanding of urban freight transportation and its stakeholders is established. The literature review also reflects the complexity and necessity of urban freight development as well as the importance of different stakeholder requirements due to freight transports to and from the construction site. By combining the theoretical findings with empirical studies, the research process could be executed. The different types of primary and secondary data were collected because of its focus on urban transformation in modern cities. The selected material relevant for this report relates to written or oral data regarding transformations from heavy industrial locations into liveable residential urban areas.

In order to identify and map the different stakeholders associated to urban freight transports to and from the construction site, the theoretical framework describes actors related to urban freight transportation in general. Hence, the stakeholders identified in this report are a subset of all stakeholders associated to urban freight transportation and can only be mapped when the extensive interview process is finished.

3.2 DATA COLLECTION

During the data collection method two different approaches were carried out; literature reviews and interviews, hence both primary and secondary data were collected. The literature review acted as a foundation for the theoretical framework. By this mean, the focus was on freight urban transportation and its complexity and development, as well as the characteristics of stakeholders and the building construction site. How the literature studies and the interviews were conducted in more detail is described below. The research approach for the study was performed by combining general theory about the subject with more specific observations connected to the field studies. By doing this, a proper conclusion could be drawn.

3.2.1 LITERATURE REVIEW

The theoretical framework of this report provides a general knowledge of urban freight transportation, its complexity and development, as well as theory about the stakeholders associated to this context. Despite an initiate structure of the theory section, the literature review also developed continuously throughout the writing process of the report, as the thesis faced new perspectives over time. Firstly, a broad literature study was carried out to get familiar with the topic of urban freight transportation and its stakeholders, which was later on narrowed down to define urban freight transportation to and from the construction site in urban areas. Additionally,

a literature study on the construction project and its different phases was made to get an understanding of the building process. By looking at different theory regarding segmentation theory a suitable analysis model could be developed to support the analysis.

Written material relating to urban freight transportation and urban transformation of modern cities were of high relevance for the report. Scientific journals, dissertations and publications related to construction logistics were frequently used during the literature review. Internet sources were used in order to find accurate material and databases, for example Science Direct and Emerald were of great use when finding academic articles. Furthermore, Chalmers University of Technology's library search engine Summon did also supply with relevant sources. Books related to the study were found at both the Chalmers University of Technology library, but also in the public city library.

3.2.2 INTERVIEWS

When conducting the empirical data collection of the report, two major focuses were chosen. The purpose during the first number of interviews was to identify and map the different stakeholders associated to urban freight transportations to and from the construction site in the densified city. These interviews were conducted nationally either face-to-face or over telephone or Skype. When enough interviews had been conducted in order to clarify the subset of these actors, the next aim was instead to identify the different requirements due to these stakeholders. The interviewees were chosen from a wide background, but all relating to urban freight transportation and/or urban transformation.

Selected interviewees were chosen from three different areas; persons with academic background relating to urban freight transportation, project related respondents such as logistical companies supplying the construction project with logistical solutions as well as governmental institutions. The interviewees found in the academic segment were all located at different university within research. The business segment includes interviewees located at organizations where profit-driven activities are priority. At last the governmental point of view relates to interviewees who are connected to governmental institutions. By following this approach it was possible to take different viewpoints and objectives into account.

The interviewees were initially contacted by e-mail and the interview dates were also set in this way. Mainly the interview format consisted of open questions, allowing for the interviewees to elaborate on the topic related to their respective competences. The interviews started by an introduction and a presentation of the thesis topic and often ended in an open discussion. Hence the data collection due to the interview process resulted in qualitative data. The question sheet was always provided in advance to the interviewee ensuring the respondent to be as prepared as possible. During the interview process, notes were written down continuously during the interview, but also audio recordings were used. In total 17 numbers of interviews were conducted at different companies, organizations and institutions, see Table 1.

TABLE 1. THE DIFFERENT INTERVIEWEES WITHIN THE ACADEMIC-, BUSINESS- AND GOVERNMENTAL SEGMENT

Academic viewpoint		
Name	*Position*	*Organization*
Sönke Behrends	PhD, Division of Logistics and Transportation	Chalmers University of Technology
Anders Hagson	Artistic Professor	Chalmers University of Technology
Maria Lindholm	Project Manager	Lindholmen Science Park
Kenth Lumsden	Professor, Division of Logistics and Transportation	Chalmers University of Technology
Martin Rudberg	Professor, Construction Management and Logistics	Linköping University

Business viewpoint		
Name	*Position*	*Organization*
Fredrik Bergman	Project Leader	Bygglogistikcenter, Norra Djurgårdsstaden
Mattias Hellner	Managing Director	Starke Arvid
Samuel Lindén	CEO	Svensk Bygglogistik
Christoffer Widegren	CEO	CW Logistikutveckling
Boldi Kisch	Business Developer	Jernhusen
Urban Hammarlund	Region Manager	Jernhusen

Governmental viewpoint		
Name	*Position*	*Organization*
Elin Engkvist	Traffic Planner	Gatukontoret
Sofia Hellberg	Strategic Planner	Trafikkontoret
Katja Ketola	Project Leader	Stadsbyggnadskontoret
Maria Lööf	Strategic Planner	Miljöförvaltningen
Anders Mikaelsson	Coordinator Västsvenska paketet	Trafikverket
Martin Skillbäck	Project Manager	Hammarby Sjöstad, Stockholm stad

3.2.3 DATA ACCURACY

In order to keep a high validity of the report it is also significant to question the data accuracy and relevancy of the collected material during the data collection method. According to Glatthorn & Joyner (2005), there are a few aspects worth taking into consideration when writing an academic report. The authors discuss the importance of both collecting the right data as well as the data with the highest accuracy. Also the way the collected data is handled and stored is emphasized by the authors as a common mistake when not handling it in an organized accessible way. During the work of this report, collected data was stored, organized and shared in folders at Dropbox and Google Drive. Safety back-ups were also kept regularly in order to avoid losing both important data but also written material.

First of all, before starting the data collection process, it is of high significance to know exactly what the purpose and the research questions of the thesis are. By this mean, a clear structure of the report was established before the data collection was carried out. When following this method, the risk of collecting irrelevant data becomes minimized (Glatthor & Joyner, 2005). In a similar way does Randolph (2009) discuss the problems of not relating the data to the researcher's own study as being one of the most common mistakes in reviewing research literature. By searching for relevant data, the data collection process was less time consuming and more efficient.

Furthermore, data was collected from several different sources. Regarding the empirical findings data was collected from an academic, business and governmental point of view, enabling the establishment of a greater subjectiveness. When it comes to the theoretical studies most of the data was collected from scientific journals, dissertations and other publications related to construction logistics and urban freight transportation. Triangulation was used to guarantee validity (Golicic & Davis, 2012). That is, the data was collected either by telephone interviews or face-to-face interviews as well as through secondary data.

It is a fact that different authors and interviewees will have different insights and point of views, depending on for example academic background and previous experiences as well as nationality and geographic location (Bryman & Bell, 2011). Moreover, there is also a possibility of misunderstandings and human errors during the interview process. In order to limit such problems, the same questions were asked to several different interviewees within the same area and the question sheets were also sent to the respondents before the interview was conducted. When doing so the interviewee also becomes a greater understanding of the topic of the thesis, allowing for a greater chance of collecting primary data with a higher accuracy. During the interviews both the authors of this report were present, minimizing the risk of missing relevant data or misunderstanding the respondent.

4 AFFECTED STAKEHOLDERS AND THEIR RESPECTIVE REQUIREMENTS

The following chapter consists of the empirical findings of the report defining the concerned stakeholders as well as their requirements related to the freight transportation to and from construction sites in the densified city. Interviews with stakeholders from three different areas such as the academy, governmental authorities and independent businesses have been carried out.

4.1 AN ACADEMIC POINT OF VIEW

From an academic viewpoint several stakeholders as well as their respective requirements have been identified associated to urban freight transportation to and from the construction site. A common problem however, related to building in densified cities, is requirements entering the construction process far too late when the construction project has already started[1]. When seizing different demands and requests earlier on in the process, stakeholder requirements can more easily be met. However, it is often difficult to satisfy different contradicting requirements and demands at the same time, due to the trade-offs and conflicts between individual stakeholder objectives[2]. Hence, there are several conflicting goals and objectives of the different stakeholders regarding freight transports to and from the construction site such as environmental versus cost objectives[3].

Additionally, Lumsden mentions that some of the main actors regarding the construction site are the material suppliers as well as the resource providers providing with building equipment, machines and other types of assets. Furthermore is also the city involved with requirements regarding during what time spans the freight transports are allowed to drive as well as how to deliver the material in order to fulfill the demands of the tenants avoiding noise and air pollution.

The construction project when building in dense city environments is in general characterized by an increased demand for Just-In-Time deliveries due to narrow unloading areas where building material needs to be delivered at specific time slots within small time spans. Especially for certain building material such as concrete, it is important that the material will be delivered in the right time due to the risk of solidifying and waste. Arranging the freight transports to and from the construction site due to certain time slots is hence probably one of the most important requirements of the stakeholders associated to the construction site[4].

Rudberg discusses the criticism that has been stated towards the building industry during the last decade, due to the lack of efficient resource planning and logistics. Logistical solutions

[1] Maria Lindholm, Project Manager at Lindholmen Science Park, interviewed August 19 2014

[2] Sönke Behrends, PhD Division of Logistics and Transportation, Chalmers University of Technology, interviewed July 4 2014

[3] Kenth Lumsden, Professor, Technology Management and Economics Chalmers, interviewed September 9 2014

[4] Martin Rudberg, Professor Construction Management and Logistics, Linköping University, interviewed September 8 2014

associated to freight transports to and from the construction site are often being neglected by project leaders focusing only on the activities performed directly at the construction site. In the manufacturing industry, the requirements of production planning and Just-In-Time deliveries are much higher than in the building industry.

It is hence not common for the building material transported to the construction site to go through terminals and building logistic centers. According to Lumsden, in most cases the material travels directly to the point of consumption at the site. It is of great significance to try to take the planning of the freight transports into account, an approach that unfortunately is not that common within the building industry.

However, Lindholm explains that in Norra Djurgårdsstaden in Stockholm, a construction logistic center is located locally at the site. Such a logistic center operates a terminal where inbound and outbound transports as well as route planning and material handling are included. When taking the construction logistic center into consideration, requirements such as planning and control become of great significance. The logistic center puts a focus on optimizing not only the driving routes but also the building material being transported at the site. Furthermore, the stakeholders associated to the terminal also have requirements related to which type of vehicle that is being used in order to make a good fit between what is delivered and the vehicle dimensions[5]. According to Lindholm, when avoiding unnecessary waiting times, queues and delayed deliveries by using slot times, the entire construction process becomes much more efficient due to both time and cost aspects.

Furthermore Lindholm argues that, not only the delivery process becomes more efficient, but the risk of material thefts and losses decreases as well when using a logistic center. Furthermore does the terminal have requirements related to social and ecological aspects such as safety and security at the construction site. Thereby the responsibility of the vehicle drivers and the third party logistics service providers is limited. However, far from every construction project consults a construction logistic center, resulting in a shift of responsibility to the third party logistics service provider, an actor trying to optimize its own business.

It is a fact that all the different activities at the construction site generate a need for freight transports to and from the site. According to Rudberg, when planning for more efficient transports at the construction site, it would be possible to cut around 25% of the total costs associated to the construction project. One common problem is the lack of inventory space at the construction site, raising the demand for on-time deliveries. Also the value adding time among the workforce will increase when building material arrives within the right time span. Around 10 out of 40 working hours are actually generating value, resulting in an even greater demand for the freight transports to arrive on time.

[5] Anders Hagson, Artistic Professor, Chalmers University of Technology, interviewed September 3 2014

Rudberg discusses further that not only the building material needs to be in place at a certain time, but also the resources such as building equipment, machines and work force. When certain resources are not available within the required time span, this will result in waste. When material is not at hand, workforce, machines and equipment are waiting, as a result to the fact that only 35% of the freight transports show up in time.

Furthermore Rudberg emphasizes the importance of discussing how the different phases of the construction project emphasize different requirements concerning the freight transports. In the mid-phase of the project, a high consolidation of material is demanded, a requirement that is not present during earlier project phases, resulting in more frequent number of transports in the latter case. Due to molding, explosions and other building activities taking place early on in the construction process, it is not possible to have high-consolidated freight transports to and from the site at this point. Instead the time slots become of greater significance and the demand for material arriving Just-In-Time becomes a necessity. Later on during the construction project however, there is instead a focus on transporting the waste of material as well as building equipment, not more being used, away from the site and the filling grades is hence decreased.

4.2 A BUSINESS POINT OF VIEW

Regarding the businesses' point of view a number of different stakeholders and requirements can be identified. When identifying the stakeholders affected by the transports to and from construction sites, one can divide them into various circles[6]. That is, one have to consider both the impacts in a broader perspective such as the region and the city as a whole as well as the smaller perspective where focus is put on the specific area being built.

When interviewing representatives from construction logistic centers such as Bygglogistikcenter[7] at Norra Djurgårdsstaden in Stockholm, the importance and opportunities, of sustainable freight transportation were discussed. The construction logistic center consists of several different functions, constituting a supporting actor at the construction site. Furthermore, the collaboration between logistic centers at Norra Djurgårdsstaden and Hammarby Sjöstad results in the common objective of optimizing the urban freight transports to and from the construction site.

Especially does the construction logistic center emphasize the requirement of not disturbing the inhabitants living near the construction site and noise related the urban freight transports is hence of great significance to take into consideration. It is also of importance to prevent the residents from entering the construction site while aiming for high security and safety at the site. Ports, gates and fences are used in order to keep unauthorized individuals out of the construction site.

[6] Urban Hammarlund, Region Manager, Jernhusen, interviewed June 25 2014

[7] Fredrik Bergman, Project Leader, Bygglogistikcenter Norra Djurgårdsstaden, interviewed August 27 2014

Allocating for certain slot times for when the freight transports are allowed to enter and leave the construction site is another important action carried out by the construction logistics center. By doing so, congestion and accidents might be avoided and the building material can be handled in a more efficient way. The construction logistic center has furthermore put an explicit objective of material never being stored at the construction site, resulting in a high demand for Just-In-Time deliveries.

Christoffer Widegren at CW Logistikutveckling[8] mentions that other stakeholders associated to the building construction site are also independent companies, providing with logistical solutions for the urban freight transportation to and from the site. Such firms enter the building process when the building contractor has bought the construction project and strives for developing efficient freight transportation at the site. When building especially in densified cities, the requirements of keeping both noise and availability at appropriate levels become increasingly important.

According to this party, it is often the governmental institutions whose requirements and demands need to be taken into consideration and frequently environmentally sustainable logistical solutions are encouraged. Hence, there are requirements for certain vehicle dimensions and that the appropriate transportation vehicles are used at a certain situation related to material type and volume. The environmental demands related to fuel and different vehicle classes have become more important during the last decade. However, the independent firms providing logistical solutions for the freight transportation to and from the construction site are not involved in requirements regarding handling of polluted building material.

The real estate company Jernhusen[9] recognizes several actors connected to the new area RegionCity. These actors will all be affected by the transportation to and from the construction site and are therefore important to consider during the planning process. For example the tenants at Jernhusen will be affected by the construction due to the lack of parking lots. Additionally, Jernhusen mentions Trafikverket as one actor, which has significant requirements regarding the transportation. According to Jernhusen, organizations such as Västtrafik, a public transport operator, will also be affected because of the limitation regarding access to roads and railways. Furthermore, actors like Göteborgs Stad are very keen on creating an attractive city for employers and citizens. Therefore it requires correct vehicle length and weight to meet the standard dimension of the roads and avoid unnecessary annoyance.

Moreover, Mattias Hellner at Starke Arvid[10] discusses some of the main actors related to the construction project itself as well as the inhabitants living or visiting the area near the construction site. Requirements associated to the freight transports at the construction site often

[8] Christoffer Widegren, CEO, CW Logistikutveckling, interviewed August 29 2014

[9] Boldi Kisch, Business Developer, Jernhusen, interviewed August 18 2014

[10] Mattias Hellner, Managing Director, Starke Arvid, interviewed June 30 2014

enter the building process too late though. Another common problem is often that the shipper and third party logistics provider view themselves as independent parties, only trying to optimize their own businesses. When involving these actors in the entire construction process, it is easier to optimize the complete building process as a whole. Actors related to the topic might be identified as the shippers or producers of the building material as well as the distributors or third party logistics service providers.

Hellner also mentions that avoidance of congestion and queues in the city might be one of the most important aspects associated to the freight transports to and from the construction site. An important action according to this interviewee is to provide the third party logistics provider with a certain time slot for about 15 minutes, resulting in high accuracy Just-In-Time deliveries. It might also be a good idea to allocate those time slots to freight transports only during non-rush hours. However, when driving during the night, other problems and requirements related to noise might occur instead.

Also the residents in the close area of the construction project have requirements due to noise and air pollution. Hence the emissions of the vehicles are also significant to take into consideration. Parking spots need to be available and should not be restricted by freight transports to and from the site. This aspect is important to take into account since the freight transports demand space not only during the passage, but also during the un- and off loading activities. Moreover Hellner describes the importance of planning the construction project in different stages where public transport can be re-directed around the construction site might be a solution since the congestion and traffic jam might be minimized. Smaller vehicles might be good for availability in order to avoid congestion and traffic jam, but is however more expensive.

According to Samuel Lindén at Svensk Bygglogistik [11], the industry and manufacturing companies often plan the production process at a detailed level, trying to avoid every type of waste such as waiting times and inefficient operations. At building construction sites, however, it is uncommon for the project leaders to have the entire process precisely planned, even though a great complexity associated with the construction project. There is often a lack of communication and different actors trying to optimize their own businesses. One consequence of failing communication and inefficient route planning of the freight transports at the constructing site is ordering building materials much earlier than planned in case of late deliveries.

Until recently, logistical solutions for freight transportations to and from the construction site have not been a priority among construction projects. According to Lindén, relevant stakeholders have been identified as material producers, inventory holders and terminals, buyers as well as third party logistics provider and a common issue is different demands and requirements due to freight transports entering too late in the construction process. It might however be seen as an advantage when building in densified cities rather than building on the countryside. Narrow areas

[11] Samuel Lindén, CEO, Svensk Bygglogistik, interviewed July 3 2014

and route constraints, demand for efficient planning of the building process, resulting in shorter time spans and hence lower costs.

Moreover, Lindén mentions that some of the most important requirements occurring at the construction site are to receive the right building material properly packaged, in the right quantity and in the right time. Furthermore, keeping a good flow of the vehicle routes through and around the construction site is of great significance, avoiding congestion and traffic jam. Different types of building material such as windows or glass doors might also need different treatment due to the high risk of breakage. At this point booking certain slot times is of great importance in order to keep track of the building process and receiving the building material at the right time.

4.3 A GOVERNMENTAL POINT OF VIEW

When it comes to the governmental point of view also Stadsbyggnadskontoret in Gothenburg[12], mentions that the citizens, located near the site as well as in surrounding regions, will be affected during construction of new areas. This is an approach, which also was highlighted by Urban Hammarlund at Jernhusen. When it comes to the smaller perspective, Stadsbyggnadskontoret in Gothenburg emphasizes the importance of the people working in the area where a building process is taking place. In this case it is necessary to have a comprehensible communication to all businesses in the area and also in an early stage of the planning process consider how the workers will be able to reach their workplace.

Furthermore, Stadsbyggnadskontoret in Gothenburg is also an actor, which places high demand on the transportation in that sense that the organization care for the third party. Regarding the new area RegionCity, an important question to bring up is how to treat the variety of people who are exposed to the transportation both as visitors or citizens. Social, economic and ecological aspects are important. However, most of the time there is a larger focus on the social aspect instead of the environmental. Another important aspect to consider is the change in demand among the citizens in the long-term perspective.

Additionally, Miljökontoret[13] mentions the importance of meeting the requirements of the citizens. The department acts like a middleman and elaborates different type of policies regarding which roads to use when entering a construction site and what level of noise the vehicles are allowed to make. Furthermore, business owners, located in the area being built, are also described as a significant actor, whose requirements need to be taken into account. If their premises are affected by noise and littering it can prevent customers from reaching the area. Miljökontoret also brings up pre-schools as an actor, whose business is strongly influenced by construction projects. Therefore Miljökontoret puts high demands on the construction actors that

[12] Katja Ketola, Project Leader, Stadsbyggnadskontoret in Gothenburg, interviewed July 3 2014

[13] Maria Lööf, Strategic Planner, Miljökontoret Gothenburg, interviewed September 5 2014

they follow safety policies to ensure a safe environment for the children. Miljökontoret also points out the difficulties regarding conflict of aims, where the economic benefits, connected to the businesses involved in the construction, are put against the health of the citizen.

Looking at the broader perspective the city as a whole is a main actor when it comes to those affected by transportation to and from construction site in densified cities. Moreover, Trafikkontoret[14] argues that the availability and traffic safety are main issues, which needs to be taken into account when building in cities. In combination with placed demands Trafikkontoret simplifies by creating new routes for the citizens to drive on. Other important requirements are related to noise and environmental issues. For instance, Stockholms Stad [15] mentions the environmental requirements as one of the most important perspective, which needs to be considered when driving in the city. Furthermore, using building logistics centers are highlighted as one way to minimize unnecessary transportation through consolidation. Skillbäck argues that the transportation in the city should be carried out as environmental friendly as possible.

When looking at the identified actor Trafikverket[16], it demands that the transportation to and from the construction sites follows the traffic rules and keeps the speed limit. It is also of importance that the dimensions of the vehicles are correctly adjusted to the conditions of the city. For example dump trucks are well suited in the rural areas whereas other types of vehicles are chosen for more densified areas since the roads are smaller and as a result can be destroyed. Additionally, there are always a lot of different activities going on and connections that are need to be taken care of. Therefore it is of high relevance that all stakeholders share their knowledge and are willing to compromise. Table 2 shows within which segment the different stakeholders were identified.

[14] Elin Engqvist, Transport Planner, Trafikkontoret in Malmö, interviewed September 4 2014.

[15] Martin Skillbäck, Project Manager, Development Department, Stockholms Stad, interviewed August 19 2014

[16] Anders Mikaelsson, Coordinator Västsvenska Paketet, Trafikverket, interviewed September 3 2014

TABLE 2. THE IDENTIFIED STAKEHOLDERS ACCORDING TO THE DIFFERENT INTERVIEW GROUPS

	Academic	*Business*	*Government*
Material supplier	✔	✔	
Stockholms stad/Göteborg stad	✔	✔	✔
Terminals/Inventories	✔		
Building logistic center (BLC)	✔	✔	✔
3PLs	✔	✔	
Tenants	✔	✔	✔
Logistic companies		✔	
Project		✔	
Public transport operators		✔	
Trafikverket		✔	
Trafikkontoret			✔
Miljökontoret			✔
Stadsbyggnadskontoret			✔
Business owners			✔
Workers			✔
Visitors			✔

5 STAKEHOLDER AND REQUIREMENT SEGMENTATION

This chapter will concern the analysis of the study. The purpose of this study is to form an understanding of the different stakeholders associated to urban freight transportation to and from the construction site as well as their respective requirements. In order to identify the actors and their requests, the results of the analysis are discussed according to the analysis model in chapter 2 and the empirical findings in chapter 4.

5.1 STAKEHOLDER CATEGORIZATION ACCORDING TO THE FIVE SEGMENTS

When identifying the stakeholders related to urban freight transportation, the analysis model presented in chapter 2.8 is used. Additionally the requirements of each individual stakeholder are presented and segmented into social, economic and ecological categories. Furthermore, an elaboration is also performed in order to identify the receiving actor of each requirement.

5.1.1 STAKEHOLDERS IN THE SHIPPER SEGMENT

From the theoretical and empirical findings, the shippers associated to urban freight transportation to and from the construction site are identified as *material suppliers*, building *project, logistics companies,* providing not only with logistical solutions, but also with resources such as machines and building equipment, and also *building logistics centers* as well as *inventory holders and terminals*.

5.1.1.1 MATERIAL PRODUCERS AND SUPPLIERS

The material producers and suppliers are identified as material manufacturers providing the construction project with materials such as concrete, rebars or windows. The economic objectives of the material producers include reaching the customer and the construction site at a low cost, resulting in a demand for high quality transportation operations performed by the freight transport operator. Another economical aim for the manufacturer is to create place and time utility in order to satisfy the customer needs in an efficient way.

Hence requirement of Just-In-Time deliveries are of great importance for the material producer to live up to since certain materials will not live up to its quality promises if it is delivered too late or too early during the construction project process, making sure that for example concrete do not solidify. Also the narrow unloading areas raise further issues of the building material being delivered at specific time slots within small time spans, an economical requirement established by the construction project to the material supplier in order to ensure availability at the construction site.

Furthermore, in order to live up to the economical project requirement of the material being delivered in the right quantity and in the right time by the material supplier, it is also significant that the building material is properly packaged. Such a requirement is also of high relevance when arranging freight transports consisting of fragile material such as windows or glass doors

that need special treatment in order to avoid damages. Hence the material supplier also has an environmental requirement on the freight transport operator to use appropriate vehicle dimensions for each situation taking material type and volume into account. Also environmental demands related to fuel and different vehicle classes have become more important, resulting in requirements from the material supplier to the freight transport operator to use environmentally friendly transport solutions.

5.1.1.2 LOGISTIC COMPANIES AND RESOURCE PROVIDERS

Due to the empirical findings it became clear that logistical planning and control is by far less established in the building sector as in the manufacturing industry, where Just-In-Time deliveries, material supply and manufacturing processes are highly accurate and precise. However, there exist companies involved in both planning the logistical solutions associated to the freight transports to and from the construction site, but also companies providing with necessary building equipment and machines.

The economic objectives of these stakeholders are high efficiency operations, but also competitiveness where short routes due to effective planning and control are highly emphasized. Low costs and high-quality transportation operations, as well as other economical requirements such as frequency and flexibility are of great significance to these actors who also put the price of the transport service as an important factor. Creating place and time utility is another important economical objective of this type of stakeholder since the transport service never can be stored.

Companies providing the construction site with the necessary building equipment and machines are operating earlier on during the construction project as logistical planning companies, providing with logistical solutions throughout the entire construction project. Companies responsible for freight transport logistics are hence more focused on having efficient and time-precise freight transports to and from the site. Keeping a good flow of the vehicle routes through and around the construction site, while avoiding congestion and traffic jam, is therefore identified as an economical important objective due to this stakeholder.

One type of firm operating as a shipper providing with logistical solutions at the construction site, is the building logistical center. This actor does also belong under this category and strives for developing efficient freight transportation to and from the site. This stakeholder also states the economical requirement of appropriate availability levels at the construction site, especially when building in densified cities. The building logistic center has another economical requirement due to the material suppliers and the freight transport operators that the material is properly packaged, in the right quantity and is being delivered at the right time.

By keeping a good flow of the vehicle routes to and from the construction site through efficient route planning at the building logistic center, congestion and traffic jam can be avoided. Since loading and unloading areas at the site often are narrow, the demand for the material to be delivered at the right time is emphasized as an economical requirement. The building logistical

center also has different demands on the material supplier depending on the type of material being delivered. Certain materials such as concrete are more critical and needs to be delivered within small time spans, whether Just-In-Time deliveries of other materials such as screws or rebars are not that critical.

The building logistical center also emphasizes the importance of keeping both noise and availability at appropriate levels, associated to more social dimensions of the different stakeholder requirements. Furthermore are also environmental factors such as vehicle dimensions where appropriate transportation vehicles should be used related to the material type and volume.

5.1.1.3 INVENTORY HOLDERS AND TERMINALS

This type of stakeholder is associated to wholesalers and retailers due to its intermediary characteristics. Low costs and high-quality transportation operations, where the inventory should be kept to a minimum are seen as significant economical requirements belonging to this actor. Also the frequency and flexibility such as Just-In-Time deliveries when it comes to the freight transports to and from the terminal are other economical demands of this type of actor. The building logistical center might also be defined as an inventory holder or a terminal since this actor also has responsibility for providing the construction site with an efficient material flow as well as keeping the inventory at appropriate levels.

When the material is received from the shippers, the economical requirement of having the material appropriately packaged in the right quantity and dimensions raises. Terminals and inventory holders also demand keeping a good flow of the material from the receiving spot to the shipping spot. Also the loading and unloading spots at the terminals are often narrow, raising an economical demand for Just-In-Time deliveries from the material suppliers. Hence the terminals aim to make better use of the resources in order to increase customer satisfaction. Also the project itself could be seen as an actor within the shipper segment with the aim of optimizing the construction process. Requirements related to the project are for example low cost transport operation, Just-In-Time deliveries and good packaging. These requirements are often directed towards the material supplier.

5.1.2 STAKEHOLDERS IN THE CUSTOMER SEGMENT

According to the analysis model one of the main stakeholders connected to urban freight transportation is the customer. It is recognized as the source of urban freight transport demand and its satisfaction is therefore important. Regarding the stakeholders connected to the customer segment, actors have been identified such as *tenants and business owners* as well as *visitors and workers*. Depending on what type of customer the demand origins from the different requirements alter.

5.1.2.1 TENANTS AND BUSINESS OWNERS

These types of stakeholders are those living near the construction site or have a permanent location near the site. They are therefore affected by the construction in their everyday life. One of the main requirements for this group is the social aspect where minimization of difficulties connected to urban freight transportation is vital. When it comes to the tenants they demand such as sufficient parking lots in the area being built as well as less congestion and queues are of high significance. These demands often occur when the urban freight vehicles are not utilized enough, which results in more vehicles on the roads. Therefore it is important to have a stakeholder responsible for the route planning. Such a stakeholder could be the project itself, that is, the project leader or any other manager within the construction project.

Furthermore, the actors in the customer segment care for an attractive urban area. Particularly the tenants and the business owners located near the site want minimal effect from the vehicles entering the area and therefore it is important that a sufficient emission-and noise regulation is set and kept during the whole building process. In this case actors like the 3PLs have huge responsibility to follow EU emissions standards to meet such social and environmental requirements. Additionally, there are demands on the 3PL to drive with noise-regulated trucks to minimize the inconvenience for the tenants. Also the project itself should be aware of the noise trucks at the site can cause.

Moreover, the business owners have a need to keep the area around their shops free from littering and dirt since it can prevent the customer from reaching the area. This type of environmental demands is something the project itself has to consider. High congestion caused by insufficient route planning could also affect the business owners in that sense that the goods won't reach the shops on time. Reliability of urban freight transports is of great significance to have the ability to run the shops smoothly during the construction phase and something the 3PL has to look into.

5.1.2.2 VISITORS AND WORKERS

When it comes to the visitors and workers they constitute a group of stakeholders who wants an attractive urban area where the end destination, located near the construction site, is easy to reach. Issues related to this type of stakeholders are for example environmental issues as well as safety and cost efficiency. That is, economical, ecological and social aspects need to be considered. Regarding the environmental aspect visitors put high demands on emission regulation in order to prevent illness and discomfort. This is something the 3PL has to put great effort in to follow. Moreover, the visitors also want to avoid high noises from the construction project when strolling around in the area.

Furthermore, the visitors also have an economical requirement regarding minimization of the hindrance of freight transportation to easily reach the shop or similar destinations without standing in line or being hindered by machines or pavements that are out of order. In this case the project itself has to focus on creating a liveable area for the visitors. Additionally, the

workers apprehend this problem as one of their main issues and therefore put a great demand of having the ability to easily reach their workplace during a construction process. Moreover, another aspect the visitors often are concerned about is the economical requirements connected to low prices on products in the shops are frequently put on the business owners and crucial if the visitors will buy the products or not. That is, the business owners need to have reliable supply of goods to a low price to avoid unnecessary high prices on their products.

When looking at the actors within the customer segment one can see that the customers are the key stakeholders with the true source of urban freight demand. Since they have these characteristics they are the ones setting requirements on other stakeholders and not the opposite. However, demands can be made between the different actors within the customers segment.

5.1.3 Stakeholder in the Freight transport operator segment

The freight transport operator is another stakeholder identified as the third party logistics service provider, relevant for the freight transports to and from the construction site. The aim of this type of actor is to ensure appropriate route planning as well as efficient use of resources. The freight transport operator hence shares the objectives with the shipper of striving for developing efficient freight transportation to and from the construction site. Keeping a good flow of the vehicles through and around the site is another significant demand from the shipper the freight operator needs to live up to, while avoiding congestion and traffic jam. The transport operator including the driver of the vehicle must live up to the economical demand from the project of avoiding goods damages and thefts. It is also significant for the freight transport operator to be able to have a great accessibility to the construction site ensuring proper and safe loading and unloading areas.

Due to a social aspect, inhabitants and visitors in the near area demand both the noise and the availability to be kept to appropriate levels. It is therefore significant for the freight transport operator to use certain vehicle dimensions related to material type and volume, resulting in as little congestion and traffic jam as possible. When building in densified cities and near other residential areas, it is also for the freight operator to take up as little space as possible. Terminals and inventory holders are therefore keen on Just-In-Time deliveries due to narrow unloading areas. This is an economical requirement that has become a necessity.

Since the inventory holding costs at terminals and intermediaries are affected by the arriving and departing freight transports, it is significant for the freight transport operator to perform efficient route planning and control together with the shipper ordering the transport service. By making efficient route planning it is possible for the freight transport operator to deliver the right building material in the right quantity and at the right time. This actor also faces the demand of ensuring a safe trip of the material from the shipper all the way to the construction site. Fragile types of material such as windows need carefully treatment in order to avoid breakages.

5.1.4 STAKEHOLDERS IN THE AUTHORITY SEGMENT

When looking at the authority segment one can identify stakeholders associated to either local or national government. In the empirical study the following actors has been recognized; *Trafikverket* acting on a national level, *Stockholms Stad/Göteborgs Stad*, *Trafikkontoret*, *Miljökontoret* as well as the *Stadsbyggnadskontoret* operating on local level.

5.1.4.1 NATIONAL GOVERNMENT

The national government is focusing on minimizing external effects and maximizing economic advantages related to urban freight transportation. Trafikverket administration is acting on a national level to create efficient freight transport solution in urban areas. As an authority one is able to implement changes in the infrastructure due to transport planning policies. As a result optimal routes can be attained as well as less congestion on the roads.

Trafikverket puts different requirements on the 3PLs regarding the transportation to and from the construction site, which focus both on the social and environmental aspects. Firstly, the traffic safety is of high significance and concerns issues such as following the traffic rules and keeping the speed to avoid unnecessary accidents. This is especially connected to the 3PL driving the vehicles. Such requirements are perceived as social requirements since they are connected to enhancement of quality of life for the society. Moreover it is also essential that the dimensions of the vehicles are properly adjusted to the conditions of the city. Too large vehicles driving on small roads can result in accidents as well as destroyed roads, which is both dangerous for the people living in the city and expensive. Additionally, larger vehicles can also affect the people and animals' health since the emissions are more densified and reach the inhabitants easier. These requirements are therefore involving both environmental, social as well as economical aspects.

5.1.4.2 LOCAL GOVERNMENT

The local government focuses on the ability to create an attractive city for the citizens. Municipalities such as Stockholms Stad and Göteborgs Stad are therefore interested in reducing noise connected to the construction project. It is therefore necessary to put requirements on the 3PL to use correct vehicle length and weight to meet the standard dimension of the roads and as a result prevent needless annoyance. Furthermore, other requirements could involve transportation during nights to avoid congestions or enough parking spots for the inhabitants affected by a construction process. That is, they should not be restricted by freight transports to and from the construction site. On the other hand, driving during the night could lead to discomfort due to noise. This is something the Project itself including different managers should discuss with the 3PL to come up with a suitable solution. All these demands are related to the quality of life for the citizens and the health and safety for those being around the construction area, as a result they can be included the social dimension of the three pillars.

Miljökontoret also puts focus on the noise restriction as a way to create a good environment for the citizens. Additionally, the choice of routes to and from the construction site is also of great importance to protect the environment and citizens. As a complement to Miljökontoret's requirements, Stadsbyggnadskontoret looks at the variety of people who are exposed to the transportation. Such demands are mostly identified as social and environmental. Furthermore, Trafikkontoret perceives traffic safety and availability as main aspects, which need to be considered when building in densified cities. Both included in a social aspect since it improves the quality of life. The traffic safety aspect as well as the noise restriction is questions the 3PL needs to focus on but when it comes to availability it is up to the project leader to create an optimal environment during the building process. Regarding what kind of stakeholders that set requirements on the authorities the customer segment can be identified as one of them. They are the ones having demands when it comes to creating a liveable environment with minimal disturbance from the transportation.

5.1.5 Stakeholders in the Additional stakeholder segment

The additional stakeholder segment includes those actors not mentioned earlier but still have an impact on the urban freight transportation such as vehicle manufacturers, landowners and public transport operators. During the empirical findings the public transport operator *Västtrafik* was recognized as one of these actors influenced by the transportation to and from the construction site.

5.1.5.1 PUBLIC TRANSPORT OPERATOR –VÄSTTRAFIK

Through the empirical findings *Västtrafik* has been identified as one significant stakeholder affected by the transportation to and from the construction site. According to theory the movement of passengers is often prioritized before the urban movement of freight and therefore a more efficient public transport is of high importance. When looking at Västtrafik, limitation regarding access to roads is a concerned when building in densified cities. A requirement from public transportation is therefore minimized congestion and traffic jam and a suitable re-direction of the traffic. This can be seen as an economical requirement due to the revenue loss when not being able to giving the passengers a comfortable and reliable travel. To achieve this Trafikkontoret should put focus on functional roads in combination with a good route planning from the project itself. A typical stakeholder with requirements on Västtrafik could be actors within the customer segment because of the need of good transportation for the citizens.

5.1.6 Summary of the new stakeholders

During the previous analysis 16 different stakeholders have been identified, which are affected by the transportation to and from the construction site in the densified city. They have all been categorized in five different segment and their respective requirements have been identified as social, economic or ecological. Figure 4 depicts the first and second layer of the analysis model and explains the different stakeholders and their respective requirements.

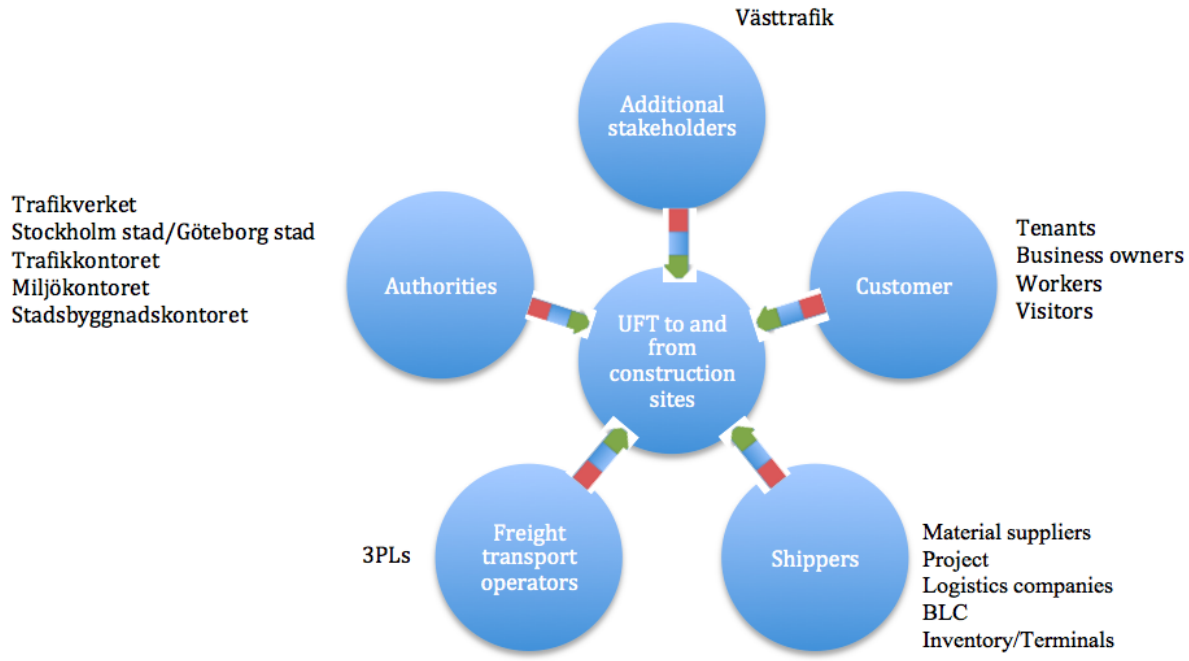

FIGURE 4. THE IDENTIFIED STAKEHOLDERS AND THEIR REQUIREMENTS ACCORDING TO THE ANALYSIS MODEL

In table 3 a summary of the empirical findings can be seen. Looking at each specific segment, one can observe that the academic and business segment emphasized the stakeholders belonging to the shipper segment. That is, stakeholders mostly focusing on profit optimization. On the other hand, when looking at the governmental segment most of the identified stakeholders were connected to the customer and authority section.

TABLE 3. THE DISTRIBUTION OF IDENTIFIED STAKEHOLDERS ACCORDING TO ACADEMIC-, BUSINESS- AND GOVERNMENT INTERVIEWEES

	Shipper	Customer	Freight transport operator	Authorities	Additional stakeholders	Nr. of identified stakeholders
Academic	3	1	1	1		6
Business	4	1	1	1	1	8
Government	1	4		5	1	11

5.2 SEGMENTATION OF REQUIREMENTS ACCORDING TO THE CONSTRUCTION PHASES

When identifying the different requirements it is interesting to see when the different requirements might occur. By looking at the different characteristics of the three construction phases; *Pre-construction*, *Construction* and *Post-construction* one can draw conclusions about when the specific request enter the building process. Most requirements can be noticed at the actual construction.

5.2.1 REQUIREMENTS RELATED TO THE PRE-CONSTRUCTION PHASE

During the different phases of the construction project various requirements can be found. When it comes to the pre-construction phase a significant amount of the requirements are presumably coming from the governmental organizations, which are often part of the planning stage. In this stage planning, budgeting and permitting is carried out and a suitable place for the construction site is chosen. In this phase it is important to plan regarding accessibility to the construction site. Miljökontoret puts high demands on what roads to use to protect the environment and the citizens. They are also keen on minimizing disturbance such as noise, which can be avoided if the route is planned according to where the citizens are living. Additionally, Stadsbyggnads-kontoret acts as the middleman between the citizens and the construction project. That is, they care for the third party and how to treat the variety of people exposed for the transportation to and from the construction site. It is therefore important to be part in an early stage to prevent unnecessary discomfort later on in the construction process.

Furthermore, the access to roads to and from the construction is also of importance and something that needs to be considered at an early stage. Logistics companies as well as 3PLs are interested in short routes and efficient vehicle routes through and around the construction site to avoid congestion and traffic jams. Additionally, accessibility to the construction site to ensure proper and safe loading and unloading is also a requirement that needs to be reflected early and something Trafikkontoret puts a lot of effort in realizing. Additional actors such as Västtrafik will therefore highlight the significance of redirecting its traffic to avoid congestion. When it comes to the situation for the tenants and visitors, actors like Stockholms Stad set requirements on the 3PL to ensure parking spots near the site. Therefore such demands should come at an early stage in accordance with choice of suitable place for the construction.

5.2.2 REQUIREMENTS RELATED TO THE CONSTRUCTION PHASE

The construction phase includes managing the process, minimizing accidents and risks as well as creating a good communication among the different stakeholders. During this phase the actual construction is taking place, which involve several different stakeholders. Both the customer as well as the shipper segment and authority segment is represented in this phase due to their different requirements. Regarding the shipper segment a lot the requirements can be connected to managing the process. The material suppliers have demands on itself both from freight transport operators and the project itself concerning subjects related to the actual construction. Firstly, low cost and high-quality transportation operations need to be carried out during the whole process as well as Just-In-Time deliveries. Some materials, such as concrete, need to be delivered at the

specific time to avoid solidifying. Furthermore, the inventory holders and terminals also want low cost and high-quality transportation operations. During the construction phase it is also important for these stakeholders to become Just-In-Time deliveries to decrease the inventories. Additionally, narrow unloading spots at the terminals need to be avoided.

Furthermore, the project wants the delivery of the material at specific time slots within small time spans because of narrow unloading areas and as a result avoiding congestion. They are also concerned about the packaging when distributing fragile material, which could be windows or glass that need special treatment. On the other hand, the material supplier has requirements on the freight transport operator to use appropriate vehicle dimensions to allow the specific volume on the product as well as emission regulation. Furthermore, the building logistics center requests the material to be properly packed in the right quantity, delivered at the right time.

When it comes to the customer segment stakeholders like tenants are often not personally involved at an early stage, as in the pre-construction phase. Instead they recognize the problems during the construction phase. That is, effects such as emissions and noise from the trucks and the construction site can be perceived as striking when living near the site. Lack of parking lots and congestion are also side effects, which the tenants experience as difficult during the actual construction phase. Moreover, the business owners won't actually recognize the problem until the construction project has started. That is, noise and littering are not a physical problem for the business owners during the pre-construction phase but during the construction phase.

Regarding the visitors the same issues are visible specifically during the construction phase. They want an attractive urban area but problems like emissions, noise and hindrance can make it difficult for the visitors to act in the area being built. The visitors want low prices on the products sold in the shop near the construction site regardless if it is in the pre-construction phase or the construction phase. Therefore, the business owners need to minimize the hindrance to allow cost efficient freight transportation to their shops during the construction phase.

Additionally, the workers are interested in reaching their workplace during the construction and this is something Stockholms Stad as well as Göteborgs Stad try to support during the process. Stockholms Stad and Göteborgs Stad are also keen on what time spans the transportation is allowed to drive to avoid congestion and other discomfort. Another request is the correct vehicle length and weight to meet the standard dimensions. Trafikkontoret and Trafikverket put a lot of effort in the traffic safety during the construction phase. The drivers should follow the traffic rules and keep the speed.

5.2.3 Requirements related to the Post-construction phase

This phase is characterized by the stages, which are important when wrapping up the construction project. The finalization can be seen as a process since the project doesn't end at a specific time. This phase includes finalizing items, final inspection as well as gathering the knowledge attained during the construction project. In this phase most of the actual construction

is already made and the impact from the transportation to and from the construction site has decreased. However, business owners can still be affected by the noise and littering connected to the operations that are left. Moreover, the tenants can still be exposed to annoying noise when the finalization is made.

Furthermore, the city put requirements on the project even during the post construction phase to meet the noise and emission regulation. The workers also have a need to reach their workplace regardless if the construction project is finished. In this phase there can still be machines and construction workers causing noise and hindrance. Therefore the visitors' demands on the project and business owners to easily reach shops and buy products at low prices are still relevant. A selection of the different requirements related to the various phases can be seen in Figure 5.

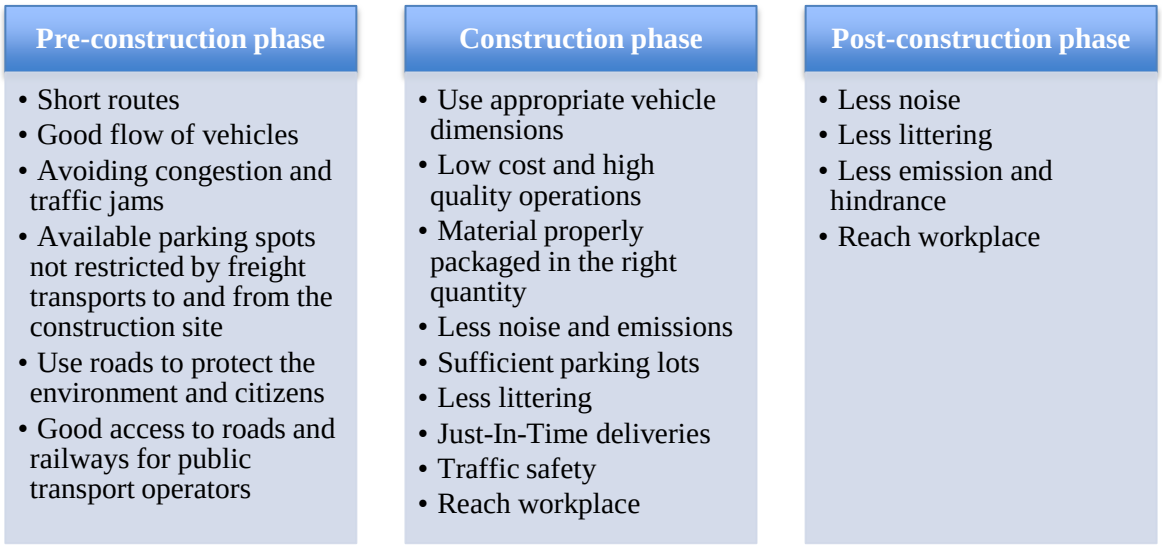

FIGURE 5. A SUMMARY OF THE SPECIFIC REQUIREMENTS RELATED TO THE VARIOUS PHASES OF THE CONSTRUCTION

5.3 SUMMARY OF THE ANALYSIS

The previous analysis has been carried out according to the analysis model developed in section 2.8 and showed in Figure 6. By looking at the different stakeholders and segmenting them into the five segments, an elaboration of the current study regarding urban freight stakeholders have been made and developed into adapting the prerequisites of the urban freight transportation to and from the construction site. Most of the stakeholders could be found in the shipper as well as the authority segments. Moreover, the requirements related to the stakeholders could all be define according to social, economic and environmental aspects, where some could be found earlier in the construction phase and others later on. The analysis shows that most of the requirements will occur during the actual construction phase and less in the post-construction phase.

Earlier studies have shown that urban freight transportation does raise complexity issues due to the fact that it needs proper route planning and mode choice. Additionally, the stakeholders connected to urban freight transportation have unique needs and requirements, which need to be considered. They also have different relationships to each other and interact in various ways. In this case it is important to create a good communication to avoid the complexity among the stakeholders.

Many of the requirements identified during the analysis will occur during specific time spans and be expressed by different stakeholders on other stakeholders. There are always trade offs, as mention by Behrends[17], which makes it hard to meet all the stakeholders' different requirements. By creating matrices including the different stakeholders, their requirements on each other and when the requirements occur, stakeholders related to the construction site can become an easier overview and as a result act in a preclusion way to meet the needs of the stakeholders involved.

[17] Sönke Behrends, PhD Division of Logistics and Transportation, Chalmers University of Technology, interviewed July 4 2014

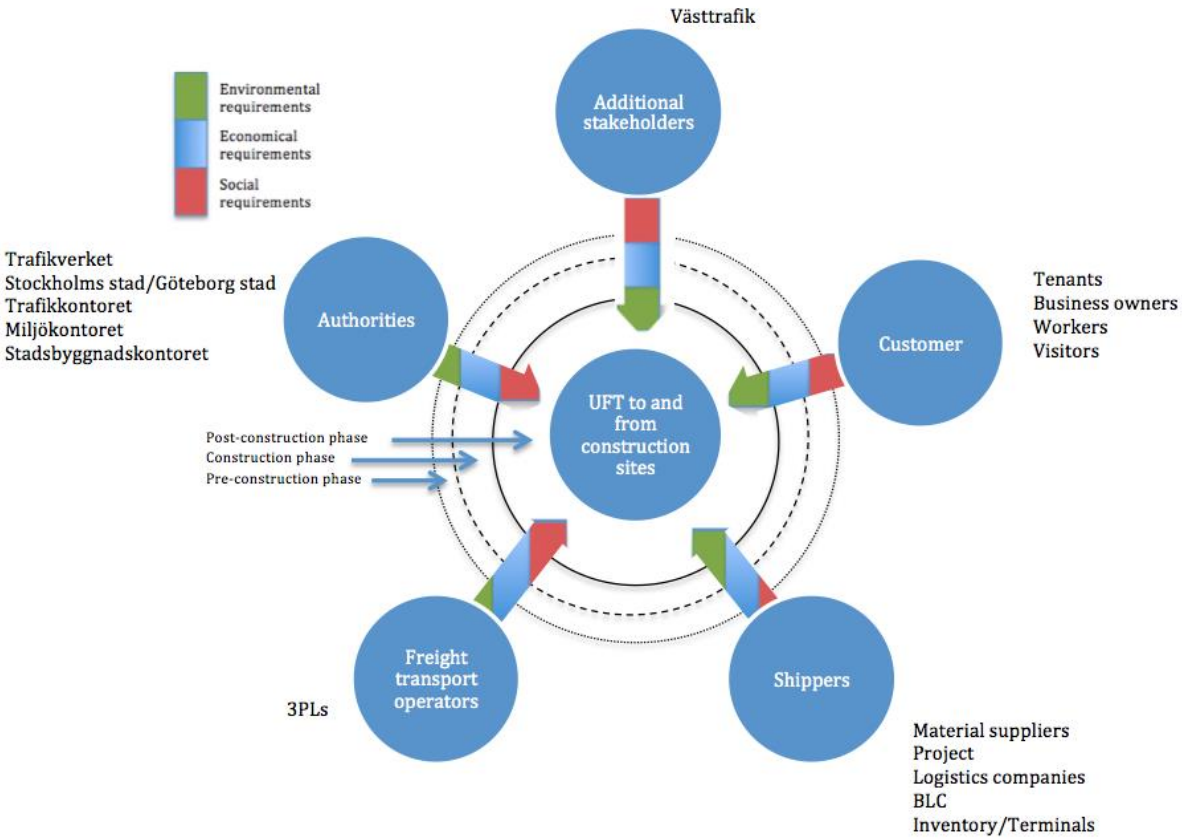

FIGURE 6. ANALYSIS MODEL COMPLETED WITH IDENTIFIED STAKEHOLDERS ASSOCIATED TO URBAN FREIGHT TRANSPORTATION TO AND FROM THE CONSTRUCTION SITE TOGETHER WITH THEIR REQUIREMENTS AND THE DIFFERENT CONSTRUCTION PHASES

6 DISCUSSION AND RESULTS

This chapter explains the analysis findings in different matrices to get a good overview of what requirements there are and when they occur during the construction process. Additionally, five different matrices will be presented to show the dependencies between the stakeholders.

6.1 THE TIME MATRIX

The time matrix illustrates when each requirement from a specific stakeholder occurs. The different stakeholders, belonging to shipper, customer, freight transport operator, authorities or additional stakeholder, will state their respective requirements during different time spans. When looking at the matrix it is possible to see that the majority of requirements occur during the actual construction phase. According to the analysis made in chapter 5, the authorities state most of the requirements during the pre-construction phase due to their early planning involvement. Furthermore, regarding the post-construction phase a large part of the requirements belong to the visitors and actors associated to the urban areas closely located to the construction project. Each requirement is segmented according to the three pillars and will have the following denotation:

☺ - social requirement

♊ - ecological requirement

$ - economic requirement

	Shipper					Customer				Freight transport operators	Authorities					Additional stakeholders
	Material Supplier	**Project**	**Inventory/ terminals**	**Logistics comp-anies**	**BLC**	**Tenants**	**Business owners**	**Visitors**	**Workers**	**3PLs**	**Stock-holm Stad etc.**	**Trafikkontoret**	**Miljökontoret**	**Stadsbyggnads -kontoret**	**Trafik-verket**	**Västtrafik**
Pre-construct-ion phase				Short routes through and around the construct -ion site $						Short routes and efficient vehicle routes through and around the construct-ion site $	Ensure parking spots near the site ☺	Availability☺	What roads to use to protect the environment and the citizens. Minimizing disturbance such as noise, ❀☺	Care for the third party and how to treat the variety of people exposed for the transportation to and from the construction site☺		Important to redirecting the traffic to avoid congestion☺
Construc-tion phase	Use appropria te vehicle dimens-ions to allow the specific volume on the product as well as emission regulat-ion $❀	Low cost operat-ions Just-in-time deliver -ies. Good packag ing $❀	Just-In-Time deliveries. $ Narrow unloading spots at the terminals need to be avoided.$		Proper-ly packed mater-ial $ Less Noise ☺	Less emissions and noise from the trucks ❀ Sufficient parking lots☺	Less noise and littering ☺	Less emission, noise and hindrance ❀☺ Low prices on products $	Available to reach their workplace ☺	Access-ibility to the constructi-on site to ensure proper and safe loading and unloading $	Avoid congestion ☺ Correct vehicle length and weight to meet the standard dimension ☺	Traffic safety during the construction phase. ☺ The drivers should follow the traffic rules and keep the speed.☺			Traffic safety during the construct-ion phase. ☺ The drivers should follow the traffic rules and keep the speed.☺	
Post-construct-ion phase						Less noise☺	Less noise and littering ☺	Less emissions noise and hindrance ☺ Low prices on the products $❀☺	Available to reach their workplace ☺		Meet the noise and emission regulation ❀☺					

FIGURE 7. MATRIX INCLUDING THE DIFFERENT STAKEHOLDERS' REQUIREMENTS AND IN WHICH PHASE DURING THE CONSTRUCTION THEY OCCUR. EACH REQUIREMENT IS SEGMENTED INTO ECOLOGICAL, SOCIAL AND ECONOMIC PRINCIPLE.

6.2 THE RELATIONSHIP MATRIX

The following matrices show how the stakeholders state requirements on each other. The matrices are divided into the five different segments of shipper, customer, freight transport operators, authorities and additional stakeholders. On the x-axis the stakeholders putting the actual requirement is specified and on the y-axis one can find the receiver of the requirement. Figure 8 illustrates that most of the requirements stated by the stakeholders within the shipper segment are directed towards other stakeholders within the same segment. Additionally, most of the requirements are concentrating on the material suppliers and the 3PLs. Furthermore, many of the demands are relating to the economical principle.

The same tendency can be seen in Figure 9, where the stakeholders within the customer segment often put their requirements on the stakeholders in the shipper segment. The customers find the social and ecological aspect of high significance. Regarding the authority segment, Figure 10, the social and ecological principles are important. In this case most of the receivers are found in the shipper segment and the demands concern aspects such as correct vehicle length, less noise and emission. Figure 11 depicts the demands set by the freight transport operators where the receiver is the project itself. Frequently the requirements involve economic perspectives such as short routes to reach the construction area efficiently. Finally, Figure 12 shows the importance of finding sufficient redirection of traffic to avoid congestion. Stakeholders in the additional stakeholder segment such as Västtrafik put high demands on Trafikkontoret to assure a pleasant journey for the commuters.

	Material suppliers	Project	Logistic companies	Building logistic center	Inventory holders and terminals
Material suppliers		Just-In-Time deliveries, not delivered too late or too early $ Building material delivered at specific time slots within small time spans because of narrow unloading areas $ Material properly packaged $		Material properly packaged in the right quantity $ Delivered at the right time, dependent on the type of material being delivered (for example concrete is critical) $	Material appropriately packaged in the right quantity and dimensions $
Project				Noise and availability at appropriate levels ☺	
3PLs	Low cost and high quality transportation operations $ Appropriate vehicle dimensions ⏄		Short routes $ Low costs and high quality transportation operations $ Price of the transport service $ Good flow of the vehicle routes $	Vehicle dimensions where appropriate transportation vehicles should be used related to the material type and volume ⏄	Low cost and high quality transportation operations, where the inventory should be kept to a minimum $ Frequency and flexibility such as Just-In-Time deliveries $

FIGURE 8. SHIPPERS' REQUIREMENTS ON OTHER STAKEHOLDERS

	Tenants	Business owners	Visitors	Workers
Business owners			Latest products to lowest prices $	
Project	Enough parking lots, less congestion and queues ⏄	Less noise and littering in front of shops ⏄	Minimize hindrance to reach end destination $ Less noise ⏄	Reach the workplace ☺
3 PL's	Less emissions and noise from vehicles ⏄	Less noise ⏄		

FIGURE 9. CUSTOMERS' REQUIREMENTS ON OTHER STAKEHOLDERS

	Stockholm stad/Göteborg stad	Trafikkontoret	Miljökontoret	Stadsbyggnadskontoret	Trafikverket
3PLs	Vehicle length and weight to meet the standard dimension of the roads ☹ Certain time spans the transportation is allowed to drive to avoid noise and congestion ☺ Available parking spots ☺	Traffic safety ☺	Less noise from transportation and what roads to use to protect the environment and citizen ☹	Meeting the requirement from the variety of people exposed to the transportation ☺	Follows traffic rules and keeping the speed ☺ Correct dimensions of the vehicles ☹
Project	Noise and environmental issues, keen on creating an attractive city for citizens and employers ☹	Availability ☺			

FIGURE 10. AUTHORITIES ' REQUIREMENTS ON OTHER STAKEHOLDERS

	3PL
Project	Accessibility to the construction site ensuring proper and safe loading and unloading areas ☹ Short routes and efficient vehicle routes through and around the construction site $

FIGURE 11. FREIGHT TRANSPORT OPERATORS' REQUIREMENTS ON OTHER STAKEHOLDERS

	Västtrafik
Trafikkontoret	Important to redirect the traffic to avoid congestion ☺

FIGURE 12. ADDITIONAL STAKEHOLDERS' REQUIREMENTS ON OTHER STAKEHOLDERS

7 CONCLUSION

The main purpose of this study was to identify stakeholders and their requirements related to construction projects in residential areas in the increasingly densified city, with focus on urban freight transportation. When undertaking the master thesis questions of identifying the different stakeholders due to the analysis model, the biggest segments included the shipper as well as the authorities. The shipper segment included material suppliers, building project, logistic companies, building logistic center as well as inventory and terminals. Due to the freight transport operator the 3PLs where presented as a stakeholder. Authorities included Trafikverket, Stockholms Stad/Göteborgs Stad, Trafikkontoret, Miljökontoret and Stadsbyggnadskontoret whereas additional stakeholders presented Västtrafik. The customer segment included tenants, business owners, workers and visitors as important stakeholders.

Moreover, most of the stakeholder requirements enter the process under the actual construction process, where examples might be demand of less congestion and traffic jam as well Just-In-Time deliveries, less noise and emissions. It can also be concluded that a majority of the requirements are being put on the shipper, a stakeholder that most often has economical demands. The authorities state the requirements earlier during the pre-construction phase than other actors such as for example the customers who highlight their demands not until the post-construction phase. These actors also have a higher focus on social as well as environmental demands.

Hence, a common problem is stakeholder requirements entering the building construction process too late, resulting in inefficient freight transport operations. Thereby, it is significant for all the different stakeholders affecting urban freight transportation at the construction site to embrace the matrices and in advance take notice of the different requirements. By doing so, it is possible to clearly identify and get an overview over the different actors as well as their respective requirements. The communication between different stakeholders associated to the construction process will be facilitated, resulting in less complexity as well as a more efficient build process relating to the freight transports.

This report has emphasized the mapping of stakeholders associated to urban freight transportation to and from the construction site in the city as well as when during the construction process the different stakeholder requirements occur. Thereby, a suggestion of future research might be to explore when during the building process the demands should enter in order to make the construction project more efficient. Hence, recommendations for when the stakeholder demands should enter the process might benefit not only the construction project at the local site, but also provide with social benefits to the society as a whole.

Furthermore, while other industries such as manufacturing have developed highly accurate and precise scheduling and material handling operations, the building and construction industry has

been neglected due to this part. Instead of efficient and well-planned urban freight transportation operations, lacking efficiency due to long lead times and inefficient handling operations is a fact. Hence, this industry faces significant challenges, but also great opportunities to create more efficient working places and operations resulting in more efficient urban freight transportation operations as well as more pleasant and livable residential urban areas in the future.

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