THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Enabling sustainable development of urban freight from a local authority perspective

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“All you really need to know for the moment is that the universe is a lot more complicated than you might think, even if you start from a position of thinking it's pretty damn complicated in the first place.“

- Douglas Adams (Hitchhiker’s guide to the galaxy trilogy: Mostly harmless)

Enabling sustainable development of urban freight from a local authority perspective

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Abstract

On the path towards sustainability for the urban area, local authorities make decisions that affect freight transport. However, local authorities might not always be aware of the effect their decisions and policy making have on freight and its stakeholders – in many ways, urban freight transport is a neglected field. The purpose of this thesis is to contribute to the enabling of local authorities to include freight in urban transport planning for sustainable development.

In order to get urban freight on the overall transport planning agenda for the local authorities, there is a need to understand the urban freight transport of today and what sustainable urban freight transport is. The complexity can be illustrated through a description of the stakeholders and their interactions as well as the key mechanisms and the barriers and drivers that affect the outcomes of sustainable urban freight transport. In this thesis seven qualitative studies have been performed, based on case studies of cities in Northern Europe, in order to get a comprehensive picture of the situation as well as how to handle it.

The conclusion of this thesis is that in order for local authorities to include freight transport in the overall transport planning, there is a need for planning resources and information. There are several possibilities, where freight partnerships, information exchange and increased capacity in personnel at local authorities are some, but what is always necessary is to include relevant stakeholders in the process. To work with freight transport, a thorough transport planning process is essential, whereby urban prerequisites and stakeholder requirements are taken into consideration. Contributions from this thesis consist of four main areas: the development of a framework identifying and separating actors and stakeholders; the enhancement of mechanisms that influence the urban freight transport situation; the development of an assessment framework for the involvement of stakeholders through urban freight partnerships as a step towards the inclusion of freight transport in the overall transport planning; and, finally, the development of a transport planning process model in order to help local authorities to work with freight transport, highlighting the importance of defining the problem and taking into consideration the urban context and stakeholder requirements, evaluation and good dissemination.

Keywords: *urban freight transport, sustainability, local authorities, stakeholders, transport planning, freight partnerships, mechanisms.*

List of appended papers

This thesis is based upon the following six papers. The papers are appended in full and will be referred to in text by Roman numerals. The authorship of the papers is for all, except one, more than the author of this thesis. Hence, there is a need to explain the contribution from each author of the papers, which is made in this list below each paper. The percentage have been approximated and suggested as a joint conclusion between the co-authors of the papers.

Paper I

Behrends, S., Lindholm, M. & Woxenius, J. (2007) The impact of urban freight transport: A definition of sustainability from an actors' perspective. *Transportation planning & Technology,* 31 (6), p. 693-713.

My contribution to Paper I: 45%. The paper design, data collection and analysis were done in cooperation by the two main authors (Behrends and Lindholm). The secondary author (Woxenius) contributed with a model for the analysis and in the writing process.

Paper II

Lindholm, M. (2010) A sustainability perspective on urban freight transport: Factors and incentives affecting local authorities in the planning procedure. *Procedia Social and Behavioral Sciences,* 2, p. 6205-6216.

The author of this thesis is the sole author of Paper II.

Paper III

Lindholm, M. & Behrends, S. (2012) Challenges in urban freight transport planning – a review in the Baltic Sea Region. *Journal of Transport Geography*, 22, p. 129-136.

My contribution to Paper III: 50%. The complete work with the paper was done in cooperation between the two authors.

Paper IV

Lindholm, M. & Blinge, M. (2012) Assessing prerequisites for sustainable urban freight transport policy planning at the local authority level in Sweden. Under review for publication in *Transport Policy*. An earlier version of this paper was presented at the annual *Logistics Research Network (LRN) Conference,* Newcastle, UK, 2006.

My contribution to Paper IV: 80 %. The paper planning and design was done in cooperation between the first and the second author. The data collection was the responsibility of the first author. The first author was responsible for the larger part of the analysis and writing.

Paper V

Lindholm, M. & Browne, M. (2013) Cooperation among urban freight stakeholders: A comparison of partnership approaches. Forthcoming in *European Journal of Transport and Infrastructure Research*, 13 (1).

My contribution to Paper V: 70 %. The paper planning, design and analysis was done in cooperation between the first and the second author. The data collection was the responsibility of the first author. The first author was responsible for the larger part of the writing.

Paper VI

Ballantyne, E., Lindholm, M. & Whiteing, T. (2012) Due diligence: Improving the urban freight decision making process? (A short version is accepted for presentation at the LRN conference, 2012. Under review for publication in *Journal of Transport Geography*. An earlier version of this paper was presented at the annual *Logistics Research Network (LRN) Conference,* Cranfield, UK, 2012.

My contribution to Paper VI: 45 %. The paper planning, design and most of the analysis were done in cooperation between the two main authors (Ballantyne & Lindholm). Data collection was made individually but equally by the two main authors. All three authors contributed to the writing.

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It was a bit more than seven years ago since I started to work on this thesis. Much has happened during this time, and I am glad that freight transport in urban areas are more acknowledged now, than it was when I started! Writing a thesis is not something that I have done completely on my own. This thesis wouldn't exist if it weren't for some special people and organisations that have meant a lot during this process. I am very grateful to all of you and, to some I want to express my gratitude more explicitly.

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All my colleagues, and friends, at Chalmers, I am grateful for all discussions around the coffee table and in the corridors that have made everyday work enjoyable. Sönke – thank you for being a great friend and travel companion throughout our European tours, thesis writing and courses. Joakim – for being the perfect roomie, always with interesting, motivating, fun and sometimes provocative conversations across the desk and also for becoming a good friend! Anna & Agneta – always there to talk about the things that not necessarily is work, but nevertheless always inspiring! I am grateful to all of you! To my "old" colleagues at WSP: Thank you! To my new colleagues at Lindholmen Science Park & CLOSER: I am looking forward to develop interesting ideas with you!

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I am grateful for having a wonderful family and the best of friends supporting me when I need it! "LoB-gänget" – thank you for the, too few, good and valuable moments at Chalmers, during holidays

and weekends – I hope that I further on will have more time for you all ☺! My “VIP girls”– what would I do without you?! My parents - thank you for your never-ending love and support! My sister Anna - for being my best friend! My brother Magnus - for being supportive and around, but most of all, for being alive! My “extended family” – thank you for always bringing good laughter and support!

Finally I want to express my love and gratitude to the ones closest to my heart. Adrian, Gabriel and Edvard – you are the sunshine’s of my life and I love you more than anything! Viktor - thank you for constantly being loving, supportive and understanding – I couldn’t (and wouldn’t) have done it without you!! Ni är bäst i hela världen – Jag älskar er!

Maria Lindholm,

Göteborg, December 2012

Terminology

City vs. Urban

The terms *city* and *urban* are used more or less synonymous in the thesis. However, there could be differences in how the terms are used in relation to what is described. "City" could be specified as narrower than urban: city is used to describe the central business district and urban is used to describe the wider urban area, where the population density is high, but not including rural settlements or countryside parts of a municipality.

Logistics

The concept logistics deals with the process of managing the procurement, movement and storage of material and related information flow through organisations in an efficient way (Christopher, 1998). The concept includes not only what to do, but also how to do it: To do it in the right way (Lumsden, 1998).

Transport

The transport system is characterised by the persons and/or goods moved from one point to another in the supply chain.

Sustainability

Sustainability has three major issues, i.e. the triple-bottom-line: environment, economy and society also known as the triple-P: planet, profit and people. Freight transport affects the sustainability in all those three areas, including (Quak, 2008):

- Impacts on planet: pollutant emissions, the use of non-renewable natural resources, waste products and, the loss of wildlife habitat.
- Impacts on people: physical consequences of pollutant emissions on public health, injuries and death resulting from traffic accidents, the increase in nuisance, reduction in air quality and, damage of buildings and infrastructure.
- Impacts on profit: inefficiency and waste of resources, decrease in journey reliability and delivery punctuality, potentially resulting in less service to customers and lost markets, decrease in economic development and, congestion and decreasing city accessibility.

Urban freight transport

Freight is goods that are transported. The phrase is often used in literature as *freight transport,* but the word transport could be excluded since that is a duplicate word. In this thesis I have used the phrases 'freight transport' and 'freight' interchangeable due to their different uses in literature. The phrase *urban freight transport* is defined as all movements of goods in to, out from, through or within the urban area made by light or heavy vehicles, including also service transport and demolition traffic, shopping trips made by private households and waste (reverse logistics). Thus, excluding all person movements.

Actors and stakeholders

Stakeholders are all that have an **interest** in the system of urban freight transport (individuals, groups of people, organisations, companies, etc.), whereas *actors* are those that **directly affect** the system. Hence, all actors are stakeholders, but not all stakeholders are actors. In urban freight transport flows (and all other transport flows) the realisation of transport demands results from decisions taken by many different actors. Those actors often show a strong interdependence. In addition to the many actors, there are stakeholders that have an interest in the urban freight transport.

Measure

Measures is a term used in this thesis as to describe the different solutions or pilot actions that are carried out to test different physical solutions to urban freight transport, e.g. a consolidation centre, a time-window policy or an environmental zone. They could be implemented for a short period of time or permanently. They could be initiated by the EU, a local authority or a private stakeholder. Other terms used in literature for the same is: pilot action, policy measure, demonstration project and solution.

Municipality vs. local authority

A municipality is an urban administrative division and could also be the governing body of the municipality. A local authority could also be the governing body of the municipality, but could also be other levels of local governments, e.g. region or province authorities. In this

thesis the term municipality or municipal decision is used to describe the government of the municipality, and the term local authority could be used to describe the same or including other governments that have an effect on the urban freight situation.

Mechanisms Mechanisms in urban freight transport are in this thesis used as a term to explain how the activities and resources in an urban area could be co-ordinated and are referred to as how to handle the interdependence between activities or as the cogs and wheels that explains why one thing lead to another.

Abbreviations

BESTUFS	BEST Urban Freight Solutions (EC project)
BUSTRIP	Baltic Urban Sustainable Transport Implementation and Planning (EC project)
C	Consumer
CBD	Central Business District
CDWG	Commercial Delivery Group Westminster
CIVITAS	CIty-VITality-Sustainability (EC initiative for cleaner and better transport in cities)
CLFQP	Central London Freight Quality Partnership
CP	Component Producer
DC	Distribution Centre
EC	European Commission
FTE	Full Time Equivalent
FQP	Freight Quality Partnership
GHG	GreenHouse Gas
HGV	Heavy Goods Vehicle (sometimes referred to as Heavy Duty Vehicle, HDV)
HoReCa	Hotel Restaurant Café (establishments providing food and beverages)
KPI	Key Performance Indicator
LA	Local Authority
LGV	Light Goods Vehicle (sometimes referred to as Light Duty Vehicle, LDV)
LFNG	Local Freight Network Gothenburg
NICHES	New and Innovative Concepts for Helping European transport Sustainability towards implementation (EC project)
NMS	New Member State (of the European Union)
O/D	Origin/Destination
OECD	Organisation for Economic Co-operation and Development
OMS	Old Member State (of the European Union = EU15)
P	Producer
PPP	Public-Private Partnership
PCN	Penalty Charge Notice
PROSPECTS	Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems (EC project)
RMS	Raw Material Supplier
RQ	Research Question
S	Shop
SUMP	Sustainable Urban Mobility Plan
SUFT	Sustainable Urban Freight Transport
SUTP	Sustainable Urban Transport Plan
TURBLOG	Transferability of URBan LOGistics concepts and practices from a world wide perspective (EC project)
UCC	Urban Consolidation Centre
UFT	Urban Freight Transport

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1 Problem definition and scope of research

This chapter gives an introduction and problem background to the research performed and the key elements in the thesis. The purpose will be presented along with a description of the problem area, the research questions, scope of research and the outline of the thesis.

On the path towards sustainability for the urban area, local authorities make decisions that affect freight transport. However, local authorities might not always be aware of the effect their decisions and policy making have on freight transport and its stakeholders – in many ways, urban freight transport is a neglected issue and there is a general feeling that freight is not handled on a regular basis by local authorities. In 2003, the Organisation for Economic Co-operation and Development (OECD) set up an expert working group on urban freight logistics to collect experiences from solutions and pilot actions proposed and implemented in their member countries. According to the research results, there is a lack of awareness and knowledge by the general public and local authority, a lack of data and dissemination from pilot actions and solutions implemented, a lack of long-term perspectives and there is too little communication and co-operation between stakeholders and cities. Accordingly, an interest to understand how urban freight transport could be more effective and efficient (sustainable) became the main driver for the start of this research project. In this thesis, I address this issue with the aim of contributing to the enabling of local authorities to work with freight transport.

1.1 Urban freight and local authorities

Urban transport is not sustainable. The situation is serious and requires action by governments, communities and businesses (Low, 2003). Towns and cities in Europe generate 85% of the gross domestic product (GDP) in the European Commission (2007). In Sweden, 85% of the population lives in urban areas (so-called localities) (SCB, 2008). Congestion, noise, emissions and traffic menaces contribute to the total urban experience. The transport activities are increasing in urban areas, but they are also needed, since goods deliveries are needed to service businesses and persons in the urban area. Urban mobility is an important facilitator of growth and employment, because mobility of persons and goods is essential to the smooth functioning of the economy. However, increased traffic in town and city centres has a strong negative impact on sustainable development. A number of health researchers demand stricter restrictions on air quality in European urban areas, on the grounds that citizens are entitled to clean air (Brunekreef et al., 2012). Furthermore, one in three fatal accidents happens in urban areas (European Commission, 2007). Along with decreased possibilities to store goods in the shops for retailers, in line with more expensive costs for urban retail areas, the freight transport increases. At the same time, certain demands on the freight transport to deliver within a short time window could increase the risk that the same amount of goods are delivered on more vehicles.

According to several studies done in different cities, private cars outnumber light- and heavy-goods vehicles (LGVs and HGVs) (Schoemaker et al., 2006). While freight transport only represents from 10% to 18% of the vehicles in cities, it nevertheless accounts for 40% of air pollution and noise emissions (European Commission, 2006). The majority of products shipped into urban areas are produced outside these areas. These products consist of many different components, which are assembled from different areas around the world and shipped from various locations to customers in urban areas. There are also goods produced within urban areas that must be transported inside the area

or out from the area. Waste, bulk transport and service transport, i.e. transport activities in close relation to the provision of a service such as maintenance of products, are other goods flows that exist in the area (see Figure 1-1).

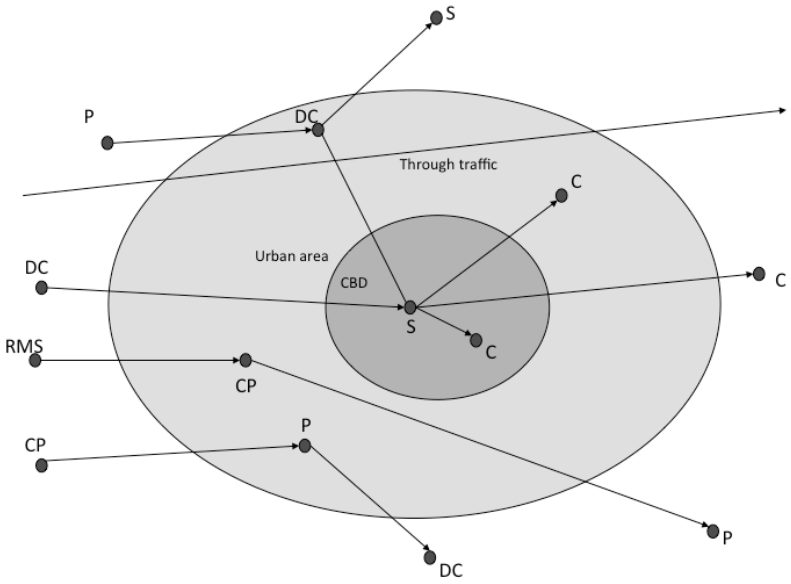

Figure 1-1 Examples of urban freight transport. C: consumer, CBD: central business district, CP: component producer, DC: distribution centre, P: producer, RMS: raw material supplier, S: shop.

Many measures have been performed within city centres with the objective of reducing the negative environmental impacts of freight transport (Patier & Browne, 2010; Quak, 2008; Zunder & Ibanez, 2004) but few have managed to fulfil a complete implementation. Quak (2011) concludes from analysing 106 different urban freight transport initiatives that there have not been any great breakthroughs towards improving the sustainability of urban freight transport. Some cities that are engaged in these questions have started to work with urban freight transport with different types of policy measures (see e.g. Anderson et al., 2005; Benjelloun et al., 2009; Bérnard et al., 2007; Browne et al., 2007a; Jonsson et al., 2009a; Muñuzuri et al., 2005; Quak, 2008). Nevertheless, urban freight transport solutions are not being investigated on a wider scale to cope with the long-term unsustainable trends. In addition, few of the project evaluations or dissemination activities show and explain what aspects have gone wrong with actions concerning urban freight transport. It is probable that the result is that the same mistakes are made time after time and that there is no "one-size-fits-all" solution. Since 2007, the Swedish Ministry of Enterprise, Energy and Communications has worked with a logistics forum ("Logistikforum" in Swedish) as an advisory board (Logistikforum, 2012). This group has presented a report that highlights the importance of working together on urban freight transport in order to reach sustainability (Näringsdepartementet, 2010). The same report also highlights the importance of looking at urban freight transport in particular. Due to the lack of results as well as the lack of successful implementations of freight measures in urban areas, there is a need to look closer into why this is so and focus on the authority transport planning process to understand how freight transport could be included as a part of this and put on the agenda.

During the period of writing this thesis (between 2005 and 2012), much has happened within the field of urban freight transport and it is now a bit higher on the agenda for many local authorities (e.g. Cherrett et al., 2012; Stathopoulos et al., 2012). Although the research regarding urban freight transport has increased considerably during the last decade and it is no longer possible to say not much is being done within the field, to a large extent, the research conducted evaluates single measures to

solve specifically occurring urban freight transport problems without taking a systematic approach. But, the fact remains that many of those do not last after external project funding, e.g. through EU projects, has ended (see, e.g. Quak, 2011). Local authorities do not know how to regulate and control freight transport, and the regulations implemented often increase the transport costs and environmental impacts without the local authority having an understanding of urban freight transport (Dablanc, 2007). The first known regulation on urban freight transport is recorded as early as the first century BC, by Julius Caesar, who banned commercial deliveries and pick-ups during daylight hours in the city of Rome (Quak, 2008). This meant that he implemented off-hours-delivery (OHD). However, this failed due to complaints of noise from the citizens and it could be noted that this is not a new problem (Holguin-Veras, 2012). Similar regulations, i.e. time windows, are still among the most common actions taken by local authorities in order to control or reduce the negative sustainable impacts of freight transport (Quak & de Koster, 2006). So, have we learnt nothing during all those years? That is a question that will be returned to in this thesis.

According to the OECD (2003), developing sustainable urban freight transport should be the main aim of urban freight transport policy. Therefore, taking into account the fact that research results are somewhat dispersed, not in agreement on the best ways of handling freight transport or sometimes focused too much on one single solution, there is a need to look into how the local authorities handle freight transport in their transport planning processes and how urban freight transport could be better included in those processes. City urban planning, political views, transport and infrastructure planning are important factors within the local authorities that affect urban freight, but the views of logisticians are rarely used in the planning process, which may be one reason freight can be difficult to tackle. A logisticians view of transport planning is lacking in the literature, but is important to consider since the local authorities are the drivers of policy measures. This current structure of the planning process for urban freight transport gives possibilities and prerequisites for the urban infrastructure but could also be a barrier and a hindrance for efficient urban freight transport when it does not take into consideration all aspects needed. There is a need for both people and goods in the urban area, which is why freight transport should be equally as important as the transport of people. Nevertheless, the fact is that the classic focus on city planning does not fully include goods (Sjöstedt, 2007) (see Figure 1-2), and often excludes part of the problem, which includes the demand for transport operations and accessibility to logistics facilities. Local authority transport planning often focuses mainly on public transport, but there is a big difference between freight and passenger journeys, which should not be neglected (Allen et al., 2012; Anderson Bomar & Becker, 2010).

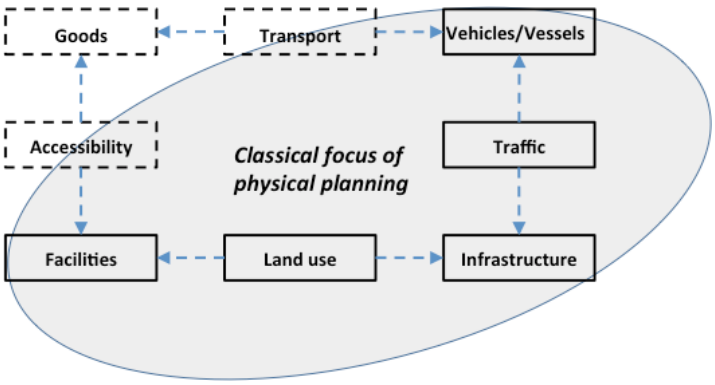

Figure 1-2 Classic focus on city planning (Sjöstedt, 2007).

Freight transport is, from a local authority side, seen as a "business problem" (Dablanc, 2007), which more or less fixes itself since there is an economic interest in doing so. This is partly true, since there

are no heavy vehicles or goods transport systems that are in the area just driving around for fun. There is an interest from the transport operator's side, amongst others, to have an as efficient transport as possible. But, the possibilities to perform an efficient transport are sometimes in conflict with, e.g. regulations on infrastructure or the transport of people. To avoid these conflicts, and to create an urban environment with good conditions for all types of necessary transport operations, the local authorities need to consider aspects of both people and freight in the planning processes. Furthermore, little attention has been given in the research to how specific policy measures are affecting goods movements (Allen et al., 2003), and it is not clear how the movements of urban goods should be developed into sustainability or how the system should be dealt with and changed (van Binsbergen & Visser, 2001). This is still true, and there is a need for more analysis in order to understand the implications of changing the practices and outcomes of urban freight transport measures (Patier & Browne, 2010).

1.2 The complexity of urban freight transport

Goods are important for the quality and liveability of the urban area, since without goods transport, there would be no shopping, no offices, no restaurants, etc. Goods transport is a driver of the urban economy but also an issue that is important from an emissions perspective, where statistics show that freight transport has an important role regarding sustainability, where Dablanc (2007) shows that goods movements corresponds to 16% to 50% of the emissions of air pollutants, depending on the pollutant considered, by transport activities in a European city. Furthermore, vehicles serving urban delivery operations are a well-established contributing factor to urban traffic congestion and increasing atmospheric pollution (Yannis et al., 2006). Four out of five European citizens live in an urban area and are therefore immediately affected by the quality of the urban environment (European Commission, 2005). An urban area, a city or a metropolitan area is not just a collection of buildings and sufficient infrastructure to support those buildings; each is very much dependent on the relationship between different stakeholders in the area or those somehow connected to the area. Cities that want to compete in the globalised economy need to have the right mix of assets and effective transport services in order to succeed (Docherty, 2004). Freight transport is a part of the many different transport operations performed. Cycling, walking, public transport and private car use are among the means in use. During a day, most of the transport operations performed involve moving people from one place to another. This is what we see and notice when we walk around in an urban area. However, both people and freight need to use the same infrastructure.

There are differences between urban distribution and other types of goods movements, since the prerequisites are different in the urban area compared to the infrastructure between terminals outside urban areas. The infrastructure is often different with smaller roads, barriers like one-way streets, possible regulations for HGVs, etc. There are also unbalanced flows in the urban area, where a high quantity of goods is transported into the urban areas, but much less is transported out – with ordinary distribution vehicles. Most goods are either consumed within the area or transported out from the area as garbage or by private cars or other ways by the consumers of the goods. But, there are also opportunities for distribution in urban areas that do not exist in other areas since distances are often short and the consignments often small, which makes it possible for distribution of goods by smaller vehicles, or even bicycles. There is also a possibility to use new types of specific urban consolidation centres and other types of innovative measures. Different measures will be discussed further on in the thesis (see Section 2.3.1).

Urban freight transport is not a static situation. New establishments constantly arise that need transport support within an area as well as external establishments, e.g. external shopping centres, which affect

the consumption and consumer behaviour within the city centre. Consumers change the behaviour in ways of shopping whereas e-commerce is taking a larger amount of the market share. There are as well developments in vehicle technology and the technology used to improve a single route or shipment, which affects the outcome of urban freight transport. Urban freight is affected not just by the size of the urban area, but also by the urban form: commercial and land use patterns; the strategic organisation of product supply chains in terms of the location of warehousing facilities; and the fact that the logistics management of road freight operations is affected by geographical location, land use patterns and trade imbalances (Allen et al., 2012).

A problem noticed during several years of study within the topic of urban freight transport is that there is a large variety of definitions of the topic. There are similarities between those concepts but little coherence in how they are used. In the following section, some of the most commonly used concepts will be presented with an explanation of urban freight transport, which is used in this study. An urban area consists of a city centre together with suburban areas. "Urban freight", "city logistics" and "urban distribution" are terms used for goods movements in a city or urban area. "Freight" is the carriage of goods and sometimes the term "goods transport" is used for the same purpose. The term "distribution" is used for the last part of the supply chain, where the goods reach the consignee. City logistics seem to be the main phrase used when coming to European Commission (EC) projects or authority-initiated projects, whilst urban freight and distribution terms are used more in research.

Hicks (1977) gave a very early definition of urban freight transport as "…all journeys into, out of, and within a designated urban area by road vehicles specifically engaged in pick-up or delivery of goods (whether the vehicle be empty or not), with the exception of shopping trips" (p. 101). This, which is the first definition to the author's knowledge, focuses merely on the pick-up and delivery operations but has little in the way of limitation regarding those. Lacking, though, is, as for most definitions used, the "hidden" logistics like services and construction deliveries that also have another purpose than only pick-up and delivery. To the author's knowledge, shopping trips by persons are excluded from most definitions.

Some decades later, the following definition of "urban goods movement" was even more simplified, and described as "…being concerned with the movement of goods (as distinct from people) to, from, within, and through urban areas" (Ogden, 1992, p. 14). This is a good and comprehensive definition. In contrast to the previous definition by Hicks, it could be possible to interpret the inclusion of shopping trips in the above definition, since that is movement of goods, even though performed by a private household. Later definitions have become more detailed and specific, depending on what perspective the author takes or how detailed they need to be for a specific context.

Eiichi Taniguchi, who is one of the founders of the concept of "City Logistics", defines the topic as follows: "City Logistics is the process for totally optimising the logistics and transport activities by private companies in urban areas while considering the traffic environment, the traffic congestion and energy consumption within the framework of a market economy" (Taniguchi et al., 2001, p. 2). This definition has some limitations, considering that only private companies are taken into account and therefore no transport activities performed by the authorities are included. Further, it does not concern emissions, just energy consumption. However, the main problem with the definition could be the word "city", which in many cases implies, or is by stakeholders interpreted as, the central business district of a city whilst in many cases it could be an adjacent area or the total urban area that is considered in urban freight transport or is of interest for measures.

Ogden (1992) acknowledged that the private sector accounts for a majority of the goods movements in the urban area, but that the public actors have an important role to play. OECD (2003) acknowledges goods transport as a fundamental component of urban life. Every day, citizens consume and use goods – food, clothes, furniture, books, cars and, computers – produced by people throughout the world. Urban goods transport enables citizens to have access to these products wherever and whenever they require. Several other authors also give the same explanation (e.g. Anderson et al., 2005; Ogden, 1992; Quak & de Koster, 2006). The OECD (2003) defines urban goods transport as "the delivery of consumer goods (not only by retail, but also by other sectors such as manufacturing) in city and suburban areas, including the reverse flow of used goods in terms of clean waste" (p. 19). This definition excludes considerable goods traffic flows in urban areas – such as goods transported through urban areas (through traffic), building and demolition traffic, the provision of industry with raw materials and semi-manufactured articles and the provision of wholesale trade – that are specifically excluded by the OECD, hence, limiting the urban goods movements to just a small proportion of the total urban freight movements. A more general definition of urban freight, which includes those flows, from an actor's perspective is given by Dablanc (2008) as:

> Urban freight is defined as "the transport of goods carried out by or for professionals in an urban environment". This definition does not include shopping trips made by households with their automobiles but it does include home deliveries made for them by professional delivery operators. Freight traffic crossing the urban territory without delivering goods (freight in transit) is also included, as are vans, which account for about half of the deliveries made in a city (p. 248).

With this definition, Dablanc (2008) states that the movement of goods represents approximately 10–15% of the vehicle kilometres made in the urban area. However, this definition also has limitations since it does not specifically include or exclude waste or building (including services) and demolition traffic. The delivery of consumer goods within the urban area is only part of the whole logistics chain and one identified problem with the understanding of freight transport in urban areas is that there is a lack of statistics and knowledge regarding goods movements (Cherrett et al., 2012). A UK study has taken some statistics from a number of surveys undertaken during a period of 15 years, showing amongst other factors that LGVs (vans) represent 42% of the delivery activity and that a high street business could get up to 10 core goods and 7.6 service visits per week during non-peak periods, concluding that service operations cannot be neglected (Cherrett et al., 2012). These numbers could of course vary between different countries as well as between cities, but still need to be taken into consideration in terms of how freight and service vehicles are handled.

The definitions used previously for goods movements, city logistics and similar concepts reflect a part of the problem that is being highlighted in this thesis: the field are looked upon as too narrow. Urban freight should be defined as the goods movements in the urban area, but should for a local authority be presented as representing much more in order to show the complexity of the field. Based on the discussion, a definition of urban freight transport has been developed for the purpose of this thesis:

> Urban freight transport is defined as all movements of goods (as distinct from people) in to, out from, through or within the urban area made by light or heavy vehicles, including also service transport and demolition traffic, shopping trips made by private households and waste (reverse logistics).

The purpose of this definition is to define urban freight transport from a local authority perspective, as used in this thesis. For this purpose, the definition needs to include as much of the goods movements

as possible, which the discussion above has shown to be valuable. There are goods movements that are quite homogenous, e.g. the distribution and pick-up of most retail goods in an urban area that could be more or less easily consolidated into more efficient transport through certain transport policies, but there are also plenty of heterogeneous goods that need other types of transport policies in order to become more sustainable. The definition includes both heterogeneous and homogeneous goods movements and has therefore the main purpose of acknowledging all goods movements to be included in the transport planning by local authorities. Service transport, demolition traffic and waste also includes maintenance, construction materials and other tasks that are performed in the urban area considering goods movements. The definition should exclude people movements, but an aspect that is included, and not specifically by any of the earlier definitions, is shopping trips. The main reason for this inclusion is that those trips are responsible for a large part of the total emissions for a product in the transport chain and comprise a part of the transport chain that is not very optimised and, as presented by Gonsalez Feliu et al. (2012), could represent as much as 50% of the goods movements in an urban area (with regards to vehicle-kms). However, those trips are hard to distinguish from people movement by private cars and are therefore hard to affect from the local authority perspective – except with, e.g. different kinds of public transport solutions. The inclusion in the definition of those trips highlights the importance of the consideration of the same by local authorities planning for transport, e.g. to be considered when planning external shopping centres. Obviously, not all aspects that are highlighted in the definition will be part of this thesis, since it grasps a large area of the aspects, but, nevertheless, it contributes to the understanding that urban freight transport is a complex field with many aspects that need to be considered in order to find an approach that fits into all requirements.

1.3 Purpose and research questions

The purpose of this thesis is formulated as:

> *The purpose of this thesis is to contribute to the enabling of local authorities to include freight in urban transport planning for sustainable development.*

An analysis model (Figure 1-3) will be used and developed throughout the thesis in order to structure the research questions and the thesis. The analysis model presented here is just the first step towards developing an understanding and an explanation of how urban freight transport could be included in local authority transport planning in order to become sustainable.

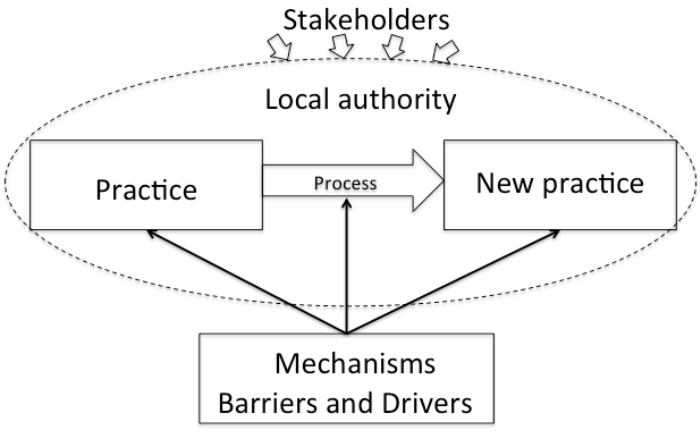

Figure 1-3 Analysis model.

The focus of this thesis is the local authority and their transport planning of urban areas. *Practice* represents the situation today – how freight transport is considered in urban areas by the local

authorities. This is to some extent covered by the background description to this thesis, but will be further developed in the thesis. The *new practice* represents where local authorities should be in the future, according to the OECD (2003), the sustainable urban freight transport situation whereby freight transport is included as a part of the overall transport planning of the local authority. In order to get there, there is a need for some kind of *process*, operations or an action to be able to include freight in the overall transport planning by local authorities. The system studied, the local authorities, are affected in their planning processes by *stakeholders*. The practice of today, the new practice and the process, are all affected by factors that in this thesis are defined as barriers and drivers of sustainability or different types of mechanisms. There are several mechanisms that need to be understood in order for urban freight transport to be sustainable and for the local authority decision-making process to be as efficient and effective as possible. Mechanisms in urban freight transport are in this thesis used as a term to explain how the activities and resources in an urban area could be co-ordinated and are referred to as how to handle the interdependence between activities or as the cogs and wheels that explains why one thing lead to another. Unexpected side effects and sub-optimisation could be the result of transport policies, when local authority decision makers lack the knowledge and long-time perspective of the urban freight transport activities.

The purpose of the thesis is divided into four research questions, which are positioned in the analysis model presented above; also, each question is presented in the figures below.

RQ 1a – What is the urban freight practice of today?
RQ 1b – What is future sustainable urban freight transport?

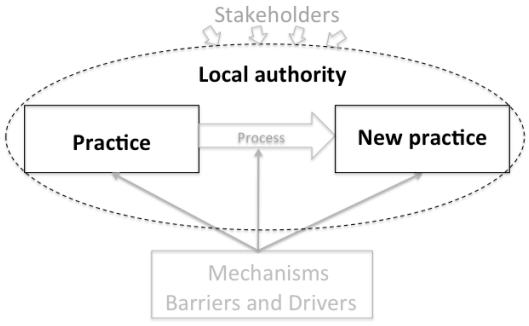

Figure 1-4 RQ 1a (practice) and 1b (new practice) in the analysis model.

The first question (RQ 1) approaches the setting of where we are today and where we want to be in the future and is divided in two sub-questions, in which 1a focuses on identifying the situation today, i.e. practice, and 1b focuses on the definition of sustainable urban freight transport, i.e. new practice. As reviewed in the background, freight transport has traditionally been more or less ignored by local authorities, and the major freight and logistics players are rarely involved in the planning process. Furthermore, most local authorities do not have a specific urban freight transport plan. Hensher and Golob (1999) acknowledged this in a study of attitudes towards freight transport policies of management responsible for logistics in a number of companies, and Kanaroglou and Builung (2008) emphasise the challenge for policymakers of the trade-offs between negative environmental externalities and the freight transport effect on the urban economy. Urban freight transport has been more and more in focus during the last decade, since the topic has been highlighted in, e.g. the white papers for transport (European Commission, 2001 & 2011). However, most of the studies made and literature reviewed focus on single policies or a transport actor perspective. Furthermore, there has been little attention related to cities of different context, e.g. small versus large cities, or Western versus Eastern European cities since most studies have reviewed rather large cities. In the EC project Best Urban Freight Solutions (BESTUFS) II (Allen & Huschebeck, 2006), it has been highlighted that it would be interesting to also focus on small- and medium-sized cities.

RQ 1a will focus on the situation today and what the local authorities in the studies are currently doing, and not doing, in terms of urban freight transport, i.e. if freight transport is sufficiently

addressed by the local authorities today. Previously, this has mainly been addressed by non-scientific reports and is acknowledged to a large extent as a "feeling" that urban freight transport is not sufficiently addressed.

RQ 1b will focus on the future scenario of sustainable urban freight transport and what is meant by that, i.e. if sustainable urban freight transport can be defined in order to know what the objective is to work against.

RQ 2 – Which are the key stakeholders and key mechanisms in the urban freight transport area?

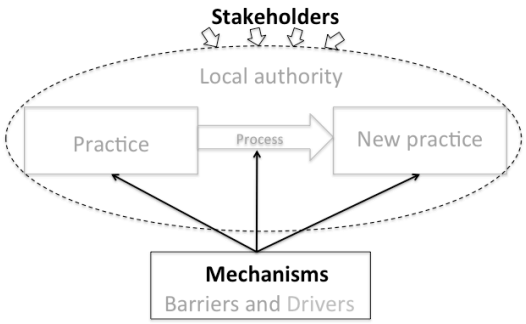

Figure 1-5 RQ 2 in the analysis model.

The second research question (RQ 2) focuses on the stakeholders and the mechanisms affecting the urban freight context. Having learned what the local authorities are currently doing and what the *practice* looks like today, it becomes interesting to look at the context of the urban freight transport and how it is affected by different factors. Urban freight transport is a complex system with many stakeholders as well as many factors affecting it. This research question aims at addressing the complexity by mapping and identifying the key stakeholders, but also to identify what constitutes urban freight transport mechanisms and identify the key mechanisms. There are several stakeholders that in a direct or indirect way affect or are affected by policy measures and other decisions that are taken by local authorities and municipalities regarding urban freight transport. In urban freight transport flows (and all other transport flows), the realisation of transport demands results from decisions taken by many different stakeholders. These stakeholders often show a strong interdependence. For the local authorities, it is not only important to be aware that there are stakeholders, but also who they are and how they affect urban freight transport.

Most studies take the perspective of a specific stakeholder or actor. These have previously mainly been focused on the transport operator (e.g. Browne et al., 2010a), but some also with the retailer's perspective (e.g. Quak, 2008). Few studies have a local authority perspective and the ones that do have mainly focused on evaluating one or a few specific policy measures, as discussed above. However, there are more stakeholders in the urban area that are affected by freight transport. Studies that have identified stakeholders have focused on those that have a direct effect on urban freight transport, but also stakeholders with an indirect effect could be interesting to consider in a stakeholder involvement process. These will be discussed in this thesis.

In this thesis, the term of mechanisms in urban freight transport is used as an attempt to start to address and handle the complexity of urban freight transport by describing e.g. how activities could be co-ordinated. Furthermore, the mechanisms could lead to a possibility to further develop what possible outcomes are of mechanisms and how that is affecting and are affected by stakeholders. By that, local authorities can possibly address transport planning more sufficient and thereby be able to make good decisions that have positive effects on the sustainability of the urban area.

The contribution from this research question will be to present a picture of the stakeholders and the interrelations between the different stakeholders in the urban freight transport context. This includes

describing the different stakeholder requirements and activities affecting the freight transport in the urban area. In addition, the result will be a presentation of a set of mechanisms.

RQ 3 – What are the main barriers to and drivers for making urban freight transport sustainable?

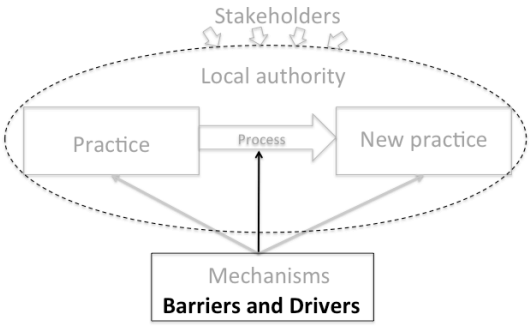

Figure 1-6 RQ 3 in the analysis model.

Research question number three focuses on another aspect that affect the urban freight transport practice. According to van Binsbergen and Visser (2001), barriers to and drivers for sustainable urban freight transport planning within that area have been researched only to a limited extent and no more recent studies of this have been found. The question deals with the understanding of the situation behind freight transport planning in the cities, by finding out the barriers and drivers towards urban freight transport. A barrier is an obstacle, which prevents a given action or policy measure being implemented or limits its possibilities. A barrier could be a part of a structure or a process. A driver is something that helps an action, measure or policy instrument to be brought forward and gives it a better potential to be implemented. The understanding of the stakeholders and the mechanisms from RQ 2 is important in order to choose the right type of measures and use the information to overcome barriers. It is important in relation to the difference between individuals and the organisation and how the organisation affects the individual to work (or not work) with freight transport. Not only are the positive and negative incentives to work with sustainability and freight transport of interest, but also the lack of incentives.

RQ 4 – How can local authorities include freight in urban transport planning?

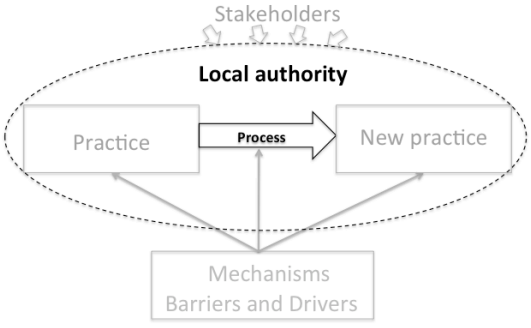

Figure 1-7 RQ 4 in the analysis model.

The fourth research question focuses on the future of how a local authority could include freight transport in the overall transport planning in order to reach sustainability of the urban area regarding freight. Research question number four mirrors the purpose of the thesis and, the gathered knowledge from RQ 1, 2 and 3 will be used to develop the result of RQ 4. The question addresses how local authorities could include freight in overall transport planning and what are the important factors that the local authorities need to consider. Modelling of urban freight transport has long been based on passenger transportation modelling. Those ideas are starting to be reconsidered and more focus has in recent research been on understanding the interactions between stakeholders and their complexities (Hensher & Figliozzi, 2007). Reviews of different types of concepts and transport policies have been made by a number of researchers (e.g. Allen et al., 2008; Black et al., 2002; Marsden & Stead, 2011), and van Binsbergen and Visser (2001) present a thorough institutional framework for how to address policy-making processes. However, none have analysed the way that the interaction between the municipal decision and the sustainable urban freight transport takes place. Nevertheless, unsuitable policies regarding freight transport could have a negative impact on cost and effectiveness of the urban freight transport operations (MDS Transmodal, 2012). The receivers' perspective and a multiple-policy approach have

been taken by Stathopoulos et al. (2012), whereby the study confirms that there is no "one-size-fits-all" solution, but also that the local authorities have an important responsibility to do the trade-offs between the different stakeholders' interests and to create a co-operative environment.

Quak (2008) concludes in his thesis that there is a knowledge gap between local authorities and carriers and vice versa (local authorities know little of the carriers' operations, but the carriers know little of the local authorities' policies). This last research question aims at filling a part of this gap through applying the research efforts to practice and suggesting to the local authorities how to work with urban freight transport. By this approach, the purpose is for the local authorities to gain more knowledge of freight operators' practices, but also the other way around – to inform freight operators of the goals and practices of the local authorities. How planners frame the problem does matter for the possibility to plan and see possible alternatives for solutions (Tennoy, 2010). To reach the aim of this question includes identifying methods on how to include freight in the overall planning by addressing the previous research questions: take a starting point in today's practice; address the stakeholders in the planning, mechanisms, barriers and drivers; and set the framework of prerequisites and requirements in order to plan for measures on urban freight transport.

1.4 Scope and delimitations

As described above, the purpose of this thesis will be covered by four research questions. These cover the analysis model presented earlier, as shown in Figure 1-8.

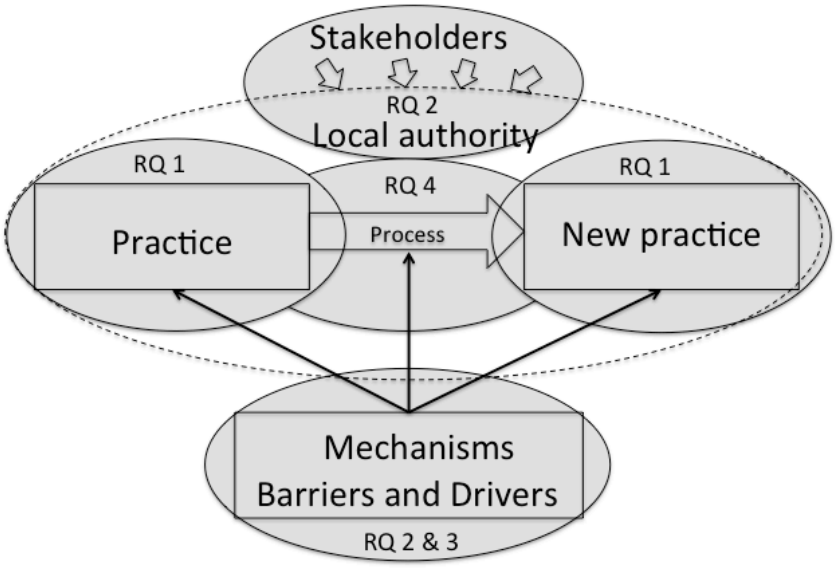

Figure 1-8 The research questions in the analysis model.

The focus of this thesis and the research described is the local authority perspective of urban freight transport. The main stakeholder studied and discussed will, therefore, be the local authority and their contact with other stakeholders and actors (transport operators, retailers, trade organisations and others that depend on freight transport, whom will be further developed in the thesis). The system studied is the local authorities, their transport planning and the urban freight context. Political interest or disinterest in this subject, as well as behavioural issues and business economics perspectives, may occur as parameters in the study and merit further discussion, but they will not be deeply analysed in this work. Institutional theory is interesting in connection to the different stakeholders, but also results in discussions that are peripheral to this thesis. The neighbouring field of urban planning (urban form)

is likewise important, but is also handled as a parameter but not deeply analysed. It is not the decision making, but the planning of activities towards including urban freight that is the main interest.

Focus is on how sustainable urban freight transport is affected by decisions and prerequisites created by the local authorities, i.e. the planning of how to handle freight transport that occurs to, from and through the urban area. The aim for each city is, or should be, to reach sustainability for transport in general and, for the purpose of this thesis, urban freight transport specifically. Two terms regarding sustainability are interchangeably discussed in this thesis: "sustainability" and "sustainable development". Whereas the term sustainability refers to the ultimate state of a sustainable society, environmentally as well as economically, the term sustainable development refers to the way forward and the policies and actions that are needed to reach sustainability for urban freight transport.

This thesis focuses on the transport chain but put into the complex context of an urban area. The freight transport operations carried out within the urban area (road bound) are affected by the local authorities and their freight transport planning processes and there will therefore be a discussion in the thesis how this system can be handled as efficiently as possible. The entire transport chain will be discussed. No goods type is excluded from the study. There will be connections with transport of people, since this is an important part of the transport operations taking place in the urban area, and therefore might be an important factor for the freight aspect. However, the transport of people by any mode of transport is excluded, as well as infrastructure, information technologies (ITS), vehicle type and fuel types. How to optimise transport or certain specific detailed solutions to urban freight transport problems (e.g. urban consolidation centres or environmental zones) are included as discussions, but are not integral aspects of this thesis and the aim is not to find *the* best solution to urban freight transport problems in the form of a specific measure. However, these aspects are important in the planning of urban freight transport. It is the *planning* of handling freight transport that occurs to, from and through the urban area from the local authority perspective that is researched here. Contributing factors to the urban environment (emissions, congestions, etc.) from freight transport are also discussed.

The geographical limitations consist of urban areas. In this thesis, an urban area is defined as the city centre areas together with adjacent areas, where the population density is high, but not including rural settlements or the countryside parts of a municipality. There are many suggestions on what constitutes or defines an urban area and this is discussed in, e.g. Allen and Huschebeck (2006), but inhabitant density seems to be an approach used by many countries. Suggestions and assumptions are based on the existing structure and optimised according to the physical and urban plans of each city studied.

Case studies have been performed in cities in Northern Europe, including very small, medium-sized and large cities as well as cities in both eastern and western Europe. Discussions of differences and similarities between various cities are an important part of the thesis, since earlier research has pointed towards mainly large cities. The "definition" of inhabitant number for small- and medium-sized cities in Europe varies from less than 10,000 up to around 1,000,000 when looking through earlier references and cities' frameworks. There is no consistency in Europe for defining what constitutes a small, medium or large city, but an example exists of a European network for medium-sized cities having between 50,000 and 250,000 inhabitants (Allen & Huschebeck, 2006). MDS Transmodal (2012) defines four types of urban area sizes, as follows: *metropolises* have over 3 million inhabitants; *other large urban* zones have more than 500,000 inhabitants, but exclude metropolises; *smaller heritage urban areas* are areas that are smaller, but have a sensitive environment in cultural or historical terms; and, *other small urban areas* are areas where the congestion and air quality issues are likely to be smaller. One idea could be that the differentiation in size depends on the amount and

diversity of city sizes in a country. A large Swedish city, e.g., represents approximately the size of medium-sized cities in mainland Europe. The discussion of city size and contextual differences will be further addressed in the thesis.

1.5 Outline of the thesis

The thesis is based upon six papers that are presented in the Appendix together with interview guides and questionnaire designs of the studies. However, the purpose and the research questions are not explicitly answered by the papers; rather, this covering paper makes a unique contribution to the urban freight transport research field and is structured according to the following:

Chapter 1 presents the introduction to this thesis by reviewing the background to urban freight practice of today, the purpose, research question and scope.

In *Chapter 2,* the frame of reference is described, thereby taking a start in putting the concept of urban freight transport in a wider context. Following the analysis model, the section continues with describing the aim of sustainable urban freight transport. Furthermore, the section presents the aim of including freight in local authority transport planning, and describes the factors that affect urban freight transport. The section ends with a synthesis of the frame of reference.

Chapter 3 describes the research process and the methods used. The studies of the research process are described. An explanation of research quality and a discussion regarding generalisability ends the section.

The appended papers upon which this thesis is based are presented in *Chapter 4* with a short summary and main contribution for each paper in relation to the research questions.

Results of the research questions are presented in *Chapter 5*.

In *Chapter 6*, the research conclusions are synthesised and presented.

Chapter 7 concludes the thesis with contribution to urban freight research and, implication for practice. The chapter ends with a concluding discussion and suggests further research.

2 Theoretical frame of reference

The theoretical frame of reference will put the research field for this thesis into its setting, based on the analysis model and the areas of practice, new practice, the process to get from practice to new practice and the stakeholders, mechanisms and drivers and barriers that influence urban freight transport. The chapter ends with a summary of the frame of reference as well as implications for the research questions.

The frame of reference will present the theories and models that are used and are applicable in different levels of the freight transport system as well as are useful for the purpose of this thesis, structured as outlined in the analysis model (Figure 2-1).

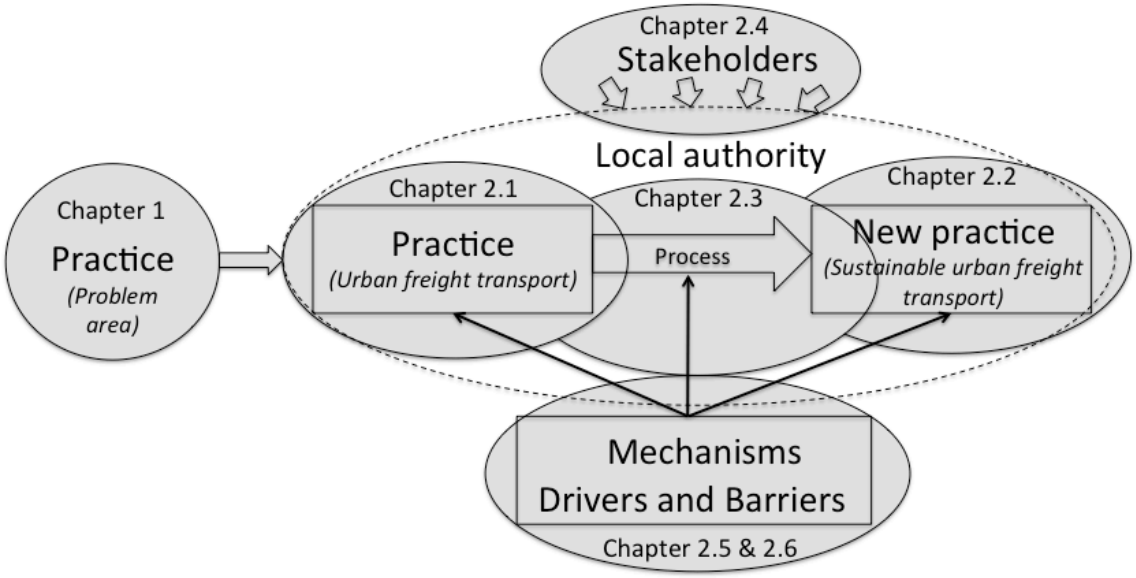

Figure 2-1 Analysis model used to structure the frame of reference.

The problem area of *urban freight transport* "practice" is described in the background of this thesis together with a definition of the concept, but put into a wider context in order to position the area in Section 2.1. The "new practice" in forms of *sustainable urban freight transport*, whereby freight transport is included in the overall *transport planning* activities by the local authority, will be considered followed by a discussion of its importance for urban development in Section 2.2. Thereafter, the "process" to go from "practice" to "new practice" will be developed in Section 2.3 through a framework analysis of concept measures that are implemented as a response to urban freight transport, as well as the possibility to work in a broad collaboration with different types of stakeholders. Furthermore, it is evident throughout the literature that evaluation and transferability of knowledge need to be more in focus, with an emphasis on why these issues have been developed as a part of the discussion around how to include freight transport in the transport planning, in Section 2.3. Following that discussion, a more detailed discussion about which *stakeholders* affect the local authority transport planning and urban freight transport performance outcomes will be discussed in Section 2.4. The factors that affect urban freight transport, i.e. the *mechanisms* and the *barriers* and *drivers* of sustainable urban freight transport, will be developed in Sections 2.5 and 2.6. The frame of reference will be summarised in Section 2.7 in order to highlight the most important parts that are valuable for the research questions.

2.1 The context of urban freight transport

Urban freight transport is, as partly described in Figure 1-1, a part of a larger system, and it is possible to give freight transport in urban transport better support if the wider context is understood. In introductions and papers from the 1990s, the lack of research in the field of urban freight transport is often brought up. From 1995, though, the research has increased considerably (Allen et al., 2007). It is often stressed that urban freight transport is associated with problems regarded as undesirable, hence, restrictions are introduced from the local authority. Those restrictions then hinder efficient goods delivery and create further problems (Anderson, 2000; Dablanc, 2007; Woudsma, 2001). Allen et al. (2007) summarises urban distribution problems as traffic flow/congestions problems, transport policy-related problems, parking and loading/unloading problems, customer/receiver-related problems, problems of freight transport and service companies' own making and other subjects that cause problems. These problems are further developed by Muñuzuri et al. (2009). Further on, overviews of the urban freight transport problems are given by, e.g. Andersson (2008), Gray et al. (2006) and STRATEC (2002). In an earlier study, the problem is described by Hesse as follows:

> According to the structural change within a rationalized supply and demand of logistics services, the future estimations for freight traffic are characterised by a growing diversity of products and distribution channels, increasing distances and vehicle miles travelled, and a growth in the volume of transported goods in total (1995, p. 40).

As described earlier, urban freight is often just the final leg of a much larger supply chain. Most supply chains start, end or bypass an urban area through the transport operations. Supply chains, logistics chains and transport chains are concepts commonly used in the literature. The concept of logistics deals with the process of managing the procurement, movement and storage of material and related information flow through being organised in an efficient way (Christopher, 1998). The concept includes not only what to do, but also how to do it: to do it in the right way (Lumsden, 1998). Ramstedt and Woxenius (2006) define a transport chain as narrower than a logistics chain, which is narrower than a supply chain. The differences between the concepts can be explained as (Ramstedt & Woxenius, 2006) follows:

> *A supply chain* focuses on a *product* and extends back over the integrated chain of actors, activities and recourses required for making it available at the place of consumption.
>
> *A logistics chain* focuses on an *item* and extends from when the article number is created until it is dissolved (article is consumed or becomes part of another article).
>
> *A transport chain* focuses on a *consignment* and extends over the movement of physical handling and activities directly related to transport such as dispatch, reception, transport planning and control.

The transport system is characterised by the persons and/or goods moved from one point to another in the supply chain. To make this system work, there is a need for resources. These resources should make the movement valuable for the person or the goods (increased value) in both time and location (Lumsden, 1995). The demand comes from the end customer, and customer service is an important part of the supply chain. Customer service creates and adds value to products (Christopher, 1998). The transport operation between different nodes and different consignors (the person/company that sends the goods) and consignees (the person/company that receives the goods) adds to customer service, depending on how it is performed.

Wandel et al. (1992) present a conceptual framework for how components in the transport system are related (Figure 2-2). The model shows the different perspectives of freight transport, different levels and different interests. The model can be seen as a good representation of the total freight transport system, but it has a spatial and not a geographical focus. However, a city could be applied as an imaginative fourth layer in the model, which could be useful to consider in order to understand the complexity of the urban freight transport operations. The focus of this thesis is though mainly on the society perspective, in regards to which, Wandel et al. have identified three areas of interest: competitiveness, infrastructure and sustainable development.

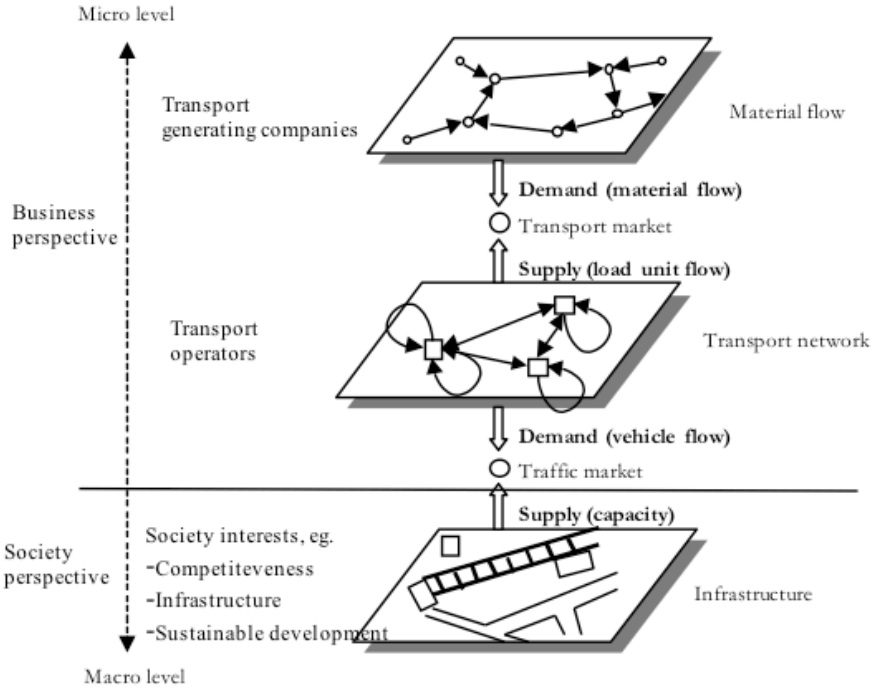

Figure 2-2 Three layers of freight transport (adapted from Wandel et al. [1992], p. 98).

Nevertheless, in order to understand the freight transport, it is not enough just to look at the layers per se. Efficiency of the freight transport regards to the interconnections between the layers (Bergqvist, 2007). Bergqvist states that total system efficiency is dependent on the interactions between public and private actors. With a good co-operation between public and private actors, the matches between layers would be improved. This thesis focuses on the transportation system and its interaction with the society perspective, and is not specifically looking at logistics systems with material flows, even though this is an area where a large number of the transport operations are generated. Even so, the transportation system is often presented as a part of the logistics system. However, Woxenius and Sjöstedt (2003) present a model where the transportation and logistics systems are rather complementary (Figure 2-3), and the logistics system is separated from the transportation system.

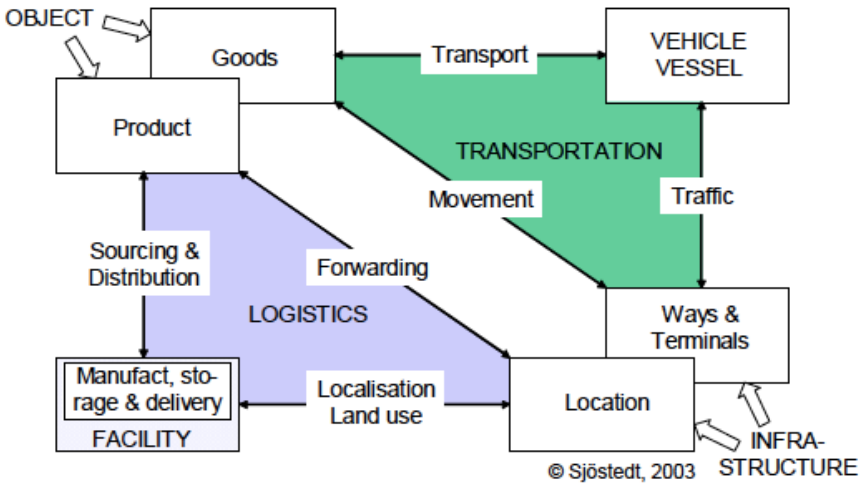

Figure 2-3 The complementary subsystems of logistics and transportation (Woxenius & Sjöstedt, 2003).

Comparing the figure above, with Figure 1-2, in the lower right part of the figure, we can notice the classic focus by local authorities on planning, including localisation, land use, infrastructure and traffic and, to some extent, the vehicles. The transport flows are affected by several parameters, e.g. the location of the supplier, vehicle type, type of goods, infrastructure, price structures and legal frameworks (Lumsden, 1995). Where the transport takes place is an important factor as well, for all of the parameters above, especially for the external effects and costs of transport. In many cases some of, or the complete, transport flow occurs in an urban area. Cities are dominant centres of production and consumption and most transport operations, for both passenger and freight, start and end in urban areas and furthermore often bypass several urban areas on their way. Urban areas generate transport between industries, warehouses and retail activities as well as to and from key gateways such as truck terminals, ports, rail terminals and airports (Rodrigues et al., 2006). Here, it is important to consider the urban area in interaction with long-haul transport and see how those affect the sustainability of the area (Behrends, 2011).

2.2 The aim of sustainable urban freight transport

Sustainable urban freight transport, or rather the sustainability of urban freight transport operations, are, or should be, the main aim for each local authority in their work with freight transport in the urban area. However, the greatest interest should be in the process of how to reach that aim. One way that is focused on in this thesis is how to get urban freight transport on the agenda for local authorities on as equal terms as public transport, cycling and walking as possible in the overall transport planning. Therefore, this section will handle both sustainable urban freight transport and how transport planning processes of today appear to local authorities when they identify within what areas there is a need to look deeper.

2.2.1 What is sustainable urban freight transport?

Historically, to work with logistics means mainly to consider minimising cost and maximising efficiency. Both of those aims can lead to minimising environmental impacts, but this is not given as a specific criteria. To reach sustainability, the parameter of minimising environmental impacts should be included. Logisticians have a good opportunity to work with environmental aspects, since they have the possibility to overview all the links in the supply chain (Murphy et al., 1994). The term sustainable development first gained major prominence in the report "Our Common Future", which is also known as the Brundtland Report, published by the World Commission on Environment and Development. Its definition of sustainable development is still widely used today: "Sustainable development is a

development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 54). The aim of a sustainable transport s trategy is "to answer, as far as possible, how society intends to provide the means of opportunity to meet economic, environmental and social needs efficiently and equitably, while minimizing avoidable or unnecessary adverse impacts and their associated costs, over relevant space and time scales" (UK Round Table on Sustainable Development, 1996). Reaching sustainability is often discussed in terms of the triple bottom line with the three dimensions, society, economy and environment, all three of which need to be considered equally to reach sustainability. This could also be referred to as the triple-P: planet, profit and people, and Quak (2008) summarises how freight transport affects the sustainability for those three in urban areas:

- Impacts on the *planet*: pollutant emissions, the use of non-renewable natural resources, waste products and the loss of wildlife habitat.

- Impacts on *people*: physical consequences of pollutant emissions on public health, injuries and death resulting from traffic accidents, the increase in nuisance, reduction in air quality and damage of buildings and infrastructure.

- Impacts on *profit*: inefficiency and waste of resources, decrease in journey reliability and delivery punctuality, potentially resulting in less service to customers and lost markets, decrease in economic development and, congestion and decreasing city accessibility.

Richardson (2005) identifies five consequences as indicators of transportation sustainability: safety, congestion, fuel consumption, vehicle emissions and access. There is a risk in approaching just one of these indicators with the belief that the others will remain constant, since they are interdependent and are affected by one another. However, with a lack of good guidelines of how to grasp the complexity, it is hard for the local authorities to do so. To reach sustainable urban freight transport, there are key factors that need to be taken into account. Allen and Browne (2010b) identify some key issues to be addressed as follows (p. 287):

- Vehicles making deliveries should impose as few social and environmental impacts as possible.
- Planners (from urban, city, municipal or local transport authorities), freight transport companies and other businesses must co-operate to ensure that these objectives are met.
- Urban planners may need to influence or control the movement of goods vehicles.
- Transport companies must optimise operational efficiency to reduce traffic congestion and environmental impact.
- The types of policy measures required depend on factors such as:
    - the economic, social and environmental objectives of the urban authority;
    - the level of freight transport and other road traffic; and
    - the size, density and layout of the urban area.

Urban freight transport plays an essential role in meeting the needs of the citizens, but at the same time contributes significantly to the non-sustainable effects on the environment, economy and society, as presented in the introduction to this thesis. Guiding principles are needed to handle this, and the three pillars of sustainability, mobility and liveability could constitute basic guidelines for providing a strategic basis for planning and managing urban goods movement systems (Taniguchi et al., 2004). If external effects are calculated, the social cost for emissions from freight transport in urban areas could be quite high due to the numbers of people that are affected. Sustainable development activities today mainly focus on passenger transport at the local authority level. Freight transport is considered a phenomenon exclusive to the private sector on both the supplier and user sides, and is driven by business economic parameters (Dablanc, 2011). According to Crainic et al. (2004), public authorities are not concerned about the operations of private firms. Consequently, they state that freight transport at the city level is still poorly understood, not quantified and lacks any methodology specifically aimed at the analysis and planning of freight movements. Since freight transport is mainly business-to-business (B2B), as mentioned, models cannot be worked out without a public-private understanding and co-operation. A combination of company-driven initiatives and public policies will be necessary in developing a sustainable urban freight system (Anderson et al., 2005).

Mori and Christodoulou (2012) discuss the development of a city sustainability index (CSI), whereby the definition of city sustainability is important. However, the bottom line is that cities are independently non-sustainable. One of the reasons is that cities depend on non-urban areas elsewhere through both direct and indirect trade and movements of physical materials, as discussed in Chapter 1. A definition of sustainable urban freight transport is developed and presented in Paper I appended to this thesis, as well as the answer of RQ 1b (see Section 5.1.5). However, to conclude this section, I would like to highlight a citation by Harding (2006) that I consider grasps the problem in a very comprehensive way: “Hence, at this time, it is best to urgently address the *un*sustainable nature of natural resource use, rather than putting this on hold while we argue endlessly about *exactly* what sustainability means!” (p. 230).

2.2.2 Transport planning

Freight transport should in the “new practice”, as described in Chapter 1, be included in local authority overall transport planning. But, what is the basis for transport planning as of today? The origins for transport planning are traditionally economics and engineering, with the aim of accommodating traffic and ensuring value for money. The next stage in the process is approaching a wider range of perspectives in the planning process. Sustainable urban development requires a rethinking of priorities, which is also discussed by Banister (2005). Transport policy change is a complex and difficult process in which politicians have a position of mandate and power – no matter how good the integration with stakeholders and the planning process are, the politicians have the possibility to “make or break” initiatives (Hysing, 2009).

Transport planning is traditionally the mainly quantitative method used by civil engineers for town planning and land-use, which leads to, or is a part of, prognosis-based traffic strategies. A classic transport planning process of a local authority is described in Figure 2-4. Banister (2002) presents a similar model that originates from half a century ago, and argues that most planners would use this model, or variations of the same, since they feel comfortable with it and there are not many other alternatives. The traditional predict and provide method on transport planning is not useful in today’s complex environment, where it is necessary to take the social situation into account, not just “simply to define how the work is to be done” (Kane & Del Mistro, 2003).

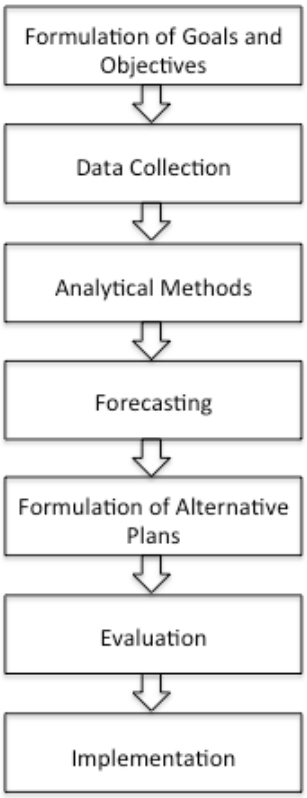

Figure 2-4 Systems approach to transport planning (Black, 1981).

The model presented above does not take any certain mode of transport into consideration, but can be applied to any type of transport. There are limitations to the planning model including a weak theoretical framework that might be too positivistic, as there is no attempt to understand the behaviour of people. Looking into the model and the discussions around the model by Banister (2002), it is also evident that the main issue addressed throughout the model is people transport, as also discussed previously, including different modes of transport for transporting people and not goods. Goods are mainly discussed in the context of how people will be transported to collect goods that they buy. In 1996, based on transport planning for infrastructure, Richardson and Haywood concluded that transport planning processes are likely to fail due to the fact that it is almost impossible to take into account the complexities regarding socio-political, economic and environmental aspects and, hence, there is a need for transport planning processes that can find suitable approaches for those aspects.

Zunder and Ibanez (2004) show the results of a questionnaire sent out to European cities, 25% of which had no one in charge of freight and another 44% had less than one half full-time equivalent (FTE) working on the topic. Half of the answering cities had no freight policy or planning at all, but the real figure of European cities that do not take freight into consideration is assumed to be much higher. Banister (2005) argues that there are possibilities for creating a sustainable urban area through transport planning. However, he mainly addresses people transport and states that there is simply no room for cars in the sustainable city, but there are alternatives like walking, cycling and good public transport, and mentions freight transport only in terms of, e.g. home deliveries of goods ordered through e-shopping. He argues that radical change is needed and all stakeholders and parties need to agree and be involved in order to reach sustainability. The same should be valid for freight transport. However, Falkemark (2006) presents the conclusion that an adaptation to sustainability of the (Swedish) transport system is not likely to occur, since the probability that the needed radical measures to break the road dependencies of transport are unlikely to occur. And, to include *all*

stakeholders needed and come to a consensus is a considerably problematic aspect (Banister, 2005; Falkemark, 2006). One of the biggest problems is the speed of the process. In many projects or policy processes, there is only time for limited facts to be considered and limited comparative analysis and limited time for different stakeholder groups to state their point of view. The most engaged businesses linked to lobbying groups are often the ones heard and taken into account, since smaller groups with fewer resources do not have the time or possibility to raise their voice (e.g. Falkemark, 1999a; Falkemark, 1999b).

The EC has set up several strategies to improve the *urban* environment as well as the transport development in the EU. European environment policies and legislation aim at supporting national and local authorities in their planning management. The first step taken to work with transport policy in the EC was a White Paper (European Commission, 2001), in which it was stated that a real change in common transport policy is needed and 60 measures to achieve it were presented. The thematic strategy on urban environment (European Commission, 2005) is one of the strategies presented by the EC that aims at encouraging local authorities to adopt a more integrated approach to urban management. Sustainable transport is one of the highlighted essential parts of this approach and the commission strongly recommends local authorities to develop and implement Sustainable Urban Transport Plans (SUTP,[1] see also Section 3.2.1). The Green Paper towards a new culture for urban mobility (European Commission, 2007) specifically addresses the problem of urban transport activities. It is emphasised in this report that nothing will happen if local authorities do not adopt an integrated approach towards transport – involving stakeholders, citizens and other planning departments as well as take into account national and European recommendations and legislations. Freight transport is explicitly mentioned as important when considering the overall transport activities taking place in the urban area. However, the question is how those could be incorporated in the overall planning. This is also followed up in the most recent White Paper for transport (European Commission, 2011), where urban freight is explicitly mentioned in one of the ten goals towards a competitive and resource-efficient transport system, as to "achieve essentially CO_2-free city logistics in major urban centres by 2030" (p. 9), which is an ambitious and encouraging goal. Nevertheless, also smaller cities should take up this goal. Furthermore, for an urban area it would be valuable to focus more also on other types of emissions, since it is the local emissions, such as, e.g. NO_X and particulate matter that mainly affect the inhabitants and the urban environment together with congestion, noise and vibration (even though, as acknowledged in the White Paper, also those types of emissions would be substantially reduced when addressing CO_2).

McKinnon (2003) has addressed the freight transport operations and presents six policy options to achieve the British sustainable distribution strategy (as presented in the White Paper by the UK Department for Transport, 1998). It is presented here to give an example of how to work with policy options in a city. The sustainable distribution strategy is as follows:

- improve the efficiency of distribution;
- minimise congestion;
- make better use of transport infrastructure;
- minimise pollution and reduce greenhouse gas emissions;
- reduce noise and disturbance from freight movements;

[1] The SUTPs have during the research process of this thesis been developed into Sustainable Urban Mobility Plans (SUMP), including the same parts as before but has a slightly different approach. This be found on www.mobilityplans.eu (12th mars, 2012).

- manage development pressure from the landscape; and,
- reduce the number of accidents, injuries and cases of ill health associated with freight movement.

The *policy options* presented by McKinnon (2003) to work with those are, e.g. to provide additional infrastructural capacity, restrain the growth of freight movement (measured in tonne-kms), improve the vehicle loading, reduce the ration of vehicle-kms and tonne-kms and raise the energy efficiency of freight transport operations. However, what is important in this thesis is not only to understand what these sustainable strategies should look like and what to do in order to reach this strategy, but to understand how this can be fulfilled. To deal with these options, there are several *policy instruments* that could be used (McKinnon, 2003). Those could be grouped into five categories: fiscal measures, financial incentives, regulations, infrastructure and land-use planning and advice and incentives. May and Crass (2007) present a list of policy instruments that cover infrastructure and management, technology, regulation, information and pricing. But, they also conclude that no one policy could make the transport situation sustainable. However, the list of policy options together with the policy instruments gives a good basis for the authorities to start the work of reducing the negative impacts from the transport sector. Road transport comprises a major part of the transport modes and this needs to be acknowledged in the frame for the policy options and instruments in order to create a good mixture of carrots and sticks. It is possible that the negative environmental impacts will be reduced for each moving vehicle, but this is not enough. Finding ways of reducing the need for transport and shifting the modal split through regulations and land-use planning, etc. is important.

In the EC project PROSPECTS,[2] three types of constraints regarding decision-making contexts in European cities were identified: lack of direct control, intervention of other levels of government and involvement of other stakeholder groups (May, 2005). It was also discovered that there are differences between different-sized cities, whereby small cities have more freedom, large cities have more power and medium-sized cities suffer most from the constraints mentioned above. That politics do affect the decision-making process is evident, but the political decision can also hinder the implementation of sustainable practices. This is confirmed by Prado-Lorenzo et al. (2011) who after a comprehensive case study conclude that competition among political parties positively affects the sustainability of cities. Decision-making contexts are complex, difficult to change and time consuming. Vision, plans and consensus are important prerequisites to succeed.

Policymaking or decision making within freight transport concerns "making choices regarding a system in order to change the system outcomes in a desired way" (Marchau et al., 2008) and requires an integrated view (Figure 2-5), wherein all interactions are regarded. There are numerous uncertainties in this system, but one important uncertainty should be mentioned, which is that the different stakeholder interests could result in conflicting desired outcomes of the system. To deal with these uncertainties, Marchau et al. (2008) suggest an adaptive approach whereby the vulnerabilities in policies are identified and the implementation reassessed and redefined in order to be ahead of the problems and avoid failure.

[2] PROSPECTS (2008) was an EU project with the aim of providing cities with the guidance that they need in order to generate optimal land use and transport strategies to meet the challenge of sustainability in their particular circumstances The durance of the project was 2000–2003.

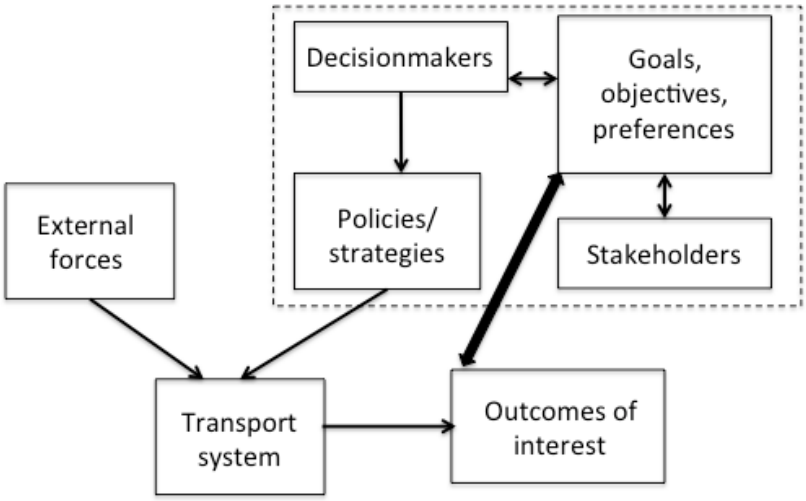

Figure 2-5 An integrated view of policymaking (adapted from Marchau et al., 2008).

Different models can be used in order to include freight transport in decision-making processes that are already developed. However, known models either focus on finding specific measures to implement (traditional approach to urban freight transport; see Section 2.3.1) or on transport in general (i.e. not specifically aimed at freight transport). For preparing a relevant and good decision-making process for local authorities, technical planners and management officers at the local authority must be aware of the processes in transport operations, and they also need to understand the complete picture. This knowledge is necessary for comprehending the complexity of transport operations, as well as knowing how to handle them from a social perspective. Good co-operation between vehicle industries, infrastructure industry, transport buyers, transport providers and others is needed in the planning processes.

2.3 Including freight in local authority transport planning

According to the discussion above, freight transport is only vaguely included in the transport planning research today, although there is a need to do so if the aim is sustainability for transport operations in the urban area. Five areas of interest are identified and approached in this thesis in the development of a process for how to include freight transport in municipalities overall transport planning: measures; evaluation and urban freight transport indicators; models and tools for urban freight transport planning; transferability and transfer of knowledge; and, stakeholder cooperation and freight partnerships. Most local authorities that consider urban freight transport would want to find a solution to the potential problem. These solutions are often considered to be so-called “measures”, e.g. a consolidation centre or a low emission zone and have become a traditional way of handling freight transport by local authorities. However, those measures have, as mentioned earlier, not always been successful when considering implementation and the long-term perspective. The field of city logistics is ever growing and it is impossible to set a certain fixed ontology (Anand et al., 2012). The research field needs to be continuously developed and improved in order to mirror the daily activities and therefore the frameworks and conceptual models will have to be flexible. Sharing and transferring knowledge (see, e.g. *Transport Policy* Vol. 18, 2011) as well as proper evaluation (e.g. Browne et al., 2010b; Muñuzuri et al., 2012a) of the actions taken have been increasingly discussed regarding urban freight transport. But, there is also a possibility to look into slightly non-traditional evaluation tools. A potential more long-term approach that has been raised in some cities consists of Freight Quality Partnerships (FQPs, in, e.g. London, Paris and Gothenburg). Those approaches are all possibilities to

include freight transport in the overall transport planning (OECD, 2003) and will be further developed below.

2.3.1 Measures – traditional approach to deal with urban freight transport

Several approaches towards changing the environmental performance of freight transport in urban areas have been experimented with in cities throughout Europe. Measures per se are not the most important part of this thesis, but rather *how* the cities work with measures. Nevertheless, in order to discuss this, there is a need to be aware of the possibilities that are available as of today. Several EC projects have been responsible for describing different possible measures, of which the BESTUFS[3] project has taken a leading role and identified more than 100 demonstration projects (e.g. Allen et al., 2007; BESTUFS, 2010; Schoemaker et al., 2006), but also others have played an important role (e.g. projects within the CIVITAS[4] initiative; the NICHES[5] project; and the TURBLOG[6] project). The UK national project Green Logistics[7] (2008) has also created several overviews, which are thorough and valid also outside the UK. In Sweden, the project called "Den Goda Staden"[8] has discussed several types of measures and possibilities for how to work with freight transport in urban areas (Tornberg & Cars, 2008).

In order to evaluate different measures for a planning process of urban freight transport, a summary of the concepts is made, generalising and categorising the measures based on an extensive literature review of more than 200 sources regarding urban freight transport.

Several references include works that review concepts and measures within urban freight transport (e.g. Anderson et al., 2005; Benjelloun et al., 2009; Bérnard et al., 2007; Jonsson et al., 2009a; Muñuzuri et al., 2005; Quak, 2008) and many others that specify single, or single types of, measures (e.g. Browne et al., 2005; Browne et al., 2010a; Ison, 2000; van Rooijen & Quak, 2010), all of which differ slightly but present the results and impacts from different approaches. The more academic a text becomes, the more focus there is on different stakeholders and the different interest groups; the impacts on different actors are more often discussed in academic papers. Hence, more complexity can be found around the measures. Two of the most extensive mappings of measures found are in Muñuzuri et al. (2005) and in Quak (2008), but many examples of measures are also presented by Goldman and Gorham (2006). Each of the references reviewed have slightly different categorisations and definitions of concepts and terms, and several of the concepts have synonyms in the references. Muñuzuri et al. (2005) compile and classify measures (or *solutions*) into four groups: public infrastructure (transfer points and modal shift), land-use management (parking and building regulations), access conditions (spatial and time restrictions) and traffic management (scope of regulations and information). Another classification is given by Benjelloun et al. (2009), which includes description, business model, functionality, scope and technology. One of the most recent

[3] The BESTUFS (2010) project was divided into two parts, I and II, wherein a large amount of different urban freight solutions were presented, discussed and evaluated. Best practices are collected and presented at a webpage.
[4] The CIVITAS (2012) initiative aims at supporting cities to introduce ambitious transport measures and policies towards sustainable urban mobility, including all modes of transport.
[5] The NICHES (2012) project and the following NICHES+ project aimed at finding innovative solutions for sustainable urban transport.
[6] TURBLOG (2012) had the purpose of developing a transferability model and to extend the research and knowledge dissemination between EU and Latin America.
[7] The UK project Green Logistics (2008) had the purpose to identify and evaluate a range of measures and technologies in the area of green logistics.
[8] Den Goda Staden (2012) ("The good city") was a project conducted in Sweden between the years 2005 and 2010 including three municipalities and several national governments with the ambition to develop a common knowledge and experience within the area of city development and transport.

classifications is made by Russo and Comi (2011), who incorporate material infrastructure (actions to optimise freight transportation), immaterial infrastructure (policies towards actors' knowledge and co-operation), equipment measures (development of sustainable devices) and governance measures (regulations) as the main headings. This classification is of interest since it considers not only actual physical measures, but also the policies regarding actor involvement. Similar to this, Stathopoulos et al. (2012) have classified urban freight transport policies into six groups: 1) market-based measures; 2) regulatory measures; 3) land-use planning; 4) infrastructural measures; 5) new technologies; and 6) management measures, where "soft" or "immaterial" measures could be found in the last category. For the purpose of this thesis, three main groups have been identified: infrastructure measures, restriction measures and consolidation measures; see Figure 2-6, which presents an effort to use the most common concepts and terms. Measures that regard innovative vehicles and ITS are not considered in particular in this thesis and are therefore not included in this figure, but are brought up in reference studies and by the project partners during the workshops in the study.

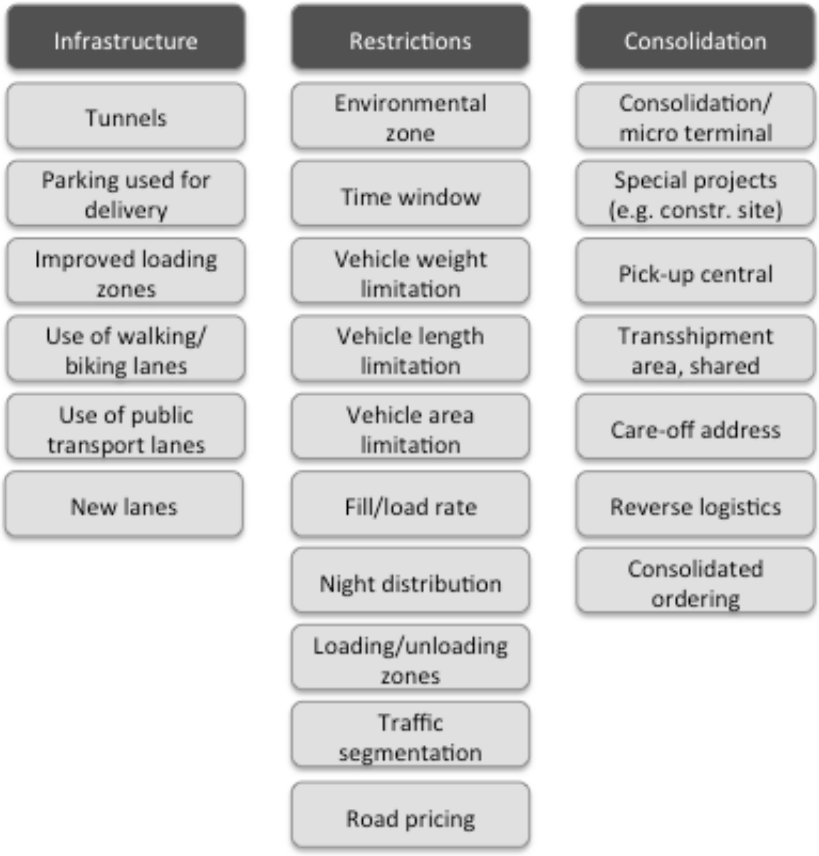

Figure 2-6 Categorisation of measures for urban freight transport.

The three categories in the figure above will be described below: infrastructure; restrictions; and, consolidation.

Infrastructure

The infrastructure of an urban area is rather hard, and costly, to alter and therefore most measures regarding infrastructure focus on how to use the existing infrastructure as efficiently as possible, e.g. using the *public transport infrastructure* or improving the *loading and unloading* possibilities, but also the use of *biking and walking lanes* or the use of *tunnels*. Quite a few studies have regarded intermodal opportunities for city logistics (Nemoto et al., 2005; Wild & Huschebeck, 2002; EXTRA Consortium, 2001; Shepherd et al., 2006). During the 1990s, a large research project was conducted in the

Netherlands aiming to find ways to develop an *underground distribution system*. Although the project did not continue, it is described in terms of both successes and failures in several reports and papers (Gordijn, 1999; Pielage, 2001; van Binsbergen & Bovy, 2000; Visser et al., 2008).

Restrictions

The restrictions (which also could be completed with incentives) include measures that local authorities can use for vehicles entering an area, street or similar area. Traditionally, the restrictions hinder freight vehicle in their work within the urban area, but lately these measures have been acknowledged to be used to assist freight transport (Browne et al., 2007b). Increased *weight limits* could increase the economic and environmental benefits (McKinnon, 2005), whereas the total time taken to complete the collection and deliveries could be doubled if the weight limits were lowered (Anderson et al., 2005). However, such difficulties are sometimes inevitable with restrictions, due to the infrastructure within the urban area. *Environmental zones* are in general described as being successful in terms of contributing to reduced emissions in urban areas (Allen et al., 2007; Rapaport, 2002); they could, however, have negative consequences for smaller transport companies (Anderson et al., 2005; Browne et al., 2010a). Based on the literature review, *fill rate restrictions* are not tested very widely, but have some fairly unsuccessful results (Becker, 2006; Ottosson, 2005a). OHDs, like *night distribution*, are analysed by, e.g. Anderson et al. (2005), Browne et al. (2007b), Taniguchi and van der Heijden (2000) and Yannis et al. (2006). Except for consolidation measures, the *congestions-charging* measures or *road pricing* are amongst the most common hits in the literature review regarding measures. Congestion charging (implemented for all types of transport) has been susceptible to several studies as the measure requires planning and large investments and often is perceived negatively by citizens. However, there is a change of level of acceptance from early studies wherein the literature shows a more negative standpoint (Raux & Souche, 2004; Schade & Schlag, 2003) to later studies like that of de Palma et al. (2006b), who conclude that acceptability is higher at least when limited to new links, or when the stakeholders get new services. Other overviews of congestion charging are presented by, e.g. de Palma et al. (2006a), Hensher and Puckett (2008), Ison (2000) and Santos (2004).

Consolidation

Consolidation is the most commonly discussed measure in the literature; the basic concept is that goods for a specific area are consolidated in one point instead of all consignees getting deliveries directly from many different consignors, in order to improve distribution efficiency, hence the sustainability. It is the same basic concept as used by freight forwarders for larger transport operations. Within an urban context on a smaller scale, the concept has been discussed during some decades (the earliest found are from Cadotte & Robicheaux [1979] and most commonly referred to as *urban consolidation centre [UCC]*), but also known as, e.g. *micro terminal, urban distribution centre, urban transhipment centre, co-operative delivery system, logistics centre* or *city terminal*. A common misunderstanding is that the local authority should run such a consolidation terminal, but that is just one of the scenarios. The most extensive report found about this type of measure is presented by Browne et al. (2005). The objectives of a consolidation centre can be different, but most involve environmental aspects. Social functioning and security are other fields in which an attractive urban area is one of the main purposes (Jonsson et al., 2009b). Browne et al. (2005) list the advantages as environmental and social benefits, better planning of logistics operations and better inventory control. The disadvantages could be a potential high set up cost, limited benefits due to the fact that most deliveries in an urban area already are consolidated in terms of difficulties for a single centre to handle a wide range of goods and an increase in delivery costs. Trials of consolidation centres show that there could be difficulties to convince customers to join the scheme (Eriksson et al., 2006; Marcucci &

Danielis, 2008). Lewis et al. (2007) report that there is a need for change management to succeed with an urban consolidation centre. Other critical factors for success or failure could be the organisation of the UCC, subsidies, number of users, vehicle types and location of the UCC (van Duin et al., 2010). According to the reports found, the most successful consolidation centres have been targeted on one commercial centre or one location. The principles are the same, but the organisation and the set-up might be easier to handle. The owner of the business centre may also set recommendations or restrictions, as in the case of Heathrow Airport where deliveries are forced to go through a consolidation centre (Campbell et al., 2010). The same principles are valid for *special projects*, e.g. construction sites (Andersson, 2008; Ottosson, 2005b). A *pick-up central* is mainly used by customers to pick up goods, instead of a transport company delivering the goods to the door. The main benefits of a pick-up central are the reduced failure rates for both delivery and redelivery (Edwards et al., 2009; McLeod et al., 2006), but a pick-up central also enables flexible pick-up time and place for the customer, which can be combined with other activities (Weltevreden, 2008). Consolidation could also be achieved through a *change in order patterns*. Ordering less frequently or co-ordinating the order from common suppliers in, e.g. an industrial area can decrease transport. The project "Godssamverkan in Lundby" (translated: freight co-operation in the Gothenburg city district Lundby) is an example of change in order pattern within companies (Axelsson, 2006). Another example of ordering consolidation is when, e.g. local authorities separate the goods from the transport and arrange for a separate call for tender for the transport operations (Johansson et al., 2008; Wetterwik et al., 2000). The uses of care-off addresses (e.g. a shop to uses a transport terminal as their delivery address) or different alternative reverse logistics solutions are other types of measures.

2.3.2 Addressing measures

The OECD (2003) suggested a pack of policy recommendations to deal with the increasing challenges in sustainable transport. It states that single measures by local authorities are not enough to cope with the need for sustainable development. National government initiatives are essential, goods transport is significant, public-private partnerships are necessary and inter-sectorial co-operation is of outmost importance. The extensive literature review by Quak (2008) of 106 unique urban freight measures shows that only a few of them are successful in implementation (after project period end). Environmental zones with emission restrictions for heavy vehicles and time restriction are among those that are the most common. Air quality improvements have been one of the main purposes with these actions, which seem to work out quite well. Weight and length restrictions are also common, but have mainly been introduced due to physical circumstances in the urban area like fragile historical centres and narrow infrastructure. However, other types of actions where policy innovations with, e.g. stakeholder agreements (such as with transport operators) have been set up do not seem to give the same results (Dablanc, 2008). Considering air quality aspects, Dablanc (2008) concludes that traditional "command and control" methods seem to be the most effective.

Based on a study of five of the most common urban freight transport measures, i.e. time windows, vehicle type restrictions, loading/unloading policies, fiscal policies and the promotion of transhipment and consolidation centres, Danielis et al. (2010) confirm that policies have differentiated impacts by type of goods and distribution channels. There is no policy that can fulfil all demands and features of urban freight transport, since they have different effects. Quak (2008) shows in his PhD thesis that for the example of time windows, municipalities should consider harmonising in order to reduce the risk of sub-optimisation, e.g. negative effects on cost and environment. Allen and Browne (2010b) suggest that strategies that are designed by the public and private sector to increase load consolidation and/or less frequent deliveries have the potential to reduce the number of freight vehicle kilometres substantially. Further, Allen and Browne (2010b) suggest that there might be a need to avoid

unnecessary use of weight and time restrictions in order to achieve higher consolidation – those restrictions should only be used where required by special situations. Further on, a study made by Ballantyne et al. (2011) shows that the vast majority of the initiatives and measures taken by the local authorities to deal with, or assist, freight transport are overlooked by the operators, e.g. freight delivery maps, provision of overnight lorry parking facilities and the possibility to attend FQPs.

A lot of projects, as presented above (for example CIVITAS, 2012; NICHES, 2012; BESTUFS, 2010), analyse and present "best practices" of city logistics measures. Those are of course important to discuss, but equally important are the "failures" – in order to learn from others' mistakes. Marsden and Stead (2011) acknowledge this as one important area for further research and that the search for policy lessons is important for the framing of the problem. Enforcement of regulations is one of the cornerstones in succeeding with the implementation of measures in cities. This is one of the main reasons for "failure" according to Muñuzuri et al. (2012a), who conclude that for at least Spanish cities no city logistics measures will work if the enforcement issues are not solved. However, it is not unlikely to believe that this a main reason for failure also in other countries.

The many failures have proven the difficulty of finding the business case that fits for urban freight transport. Aastrup et al. (2012) suggest that one reason might be that the transport operators that currently perform deliveries in urban areas will lose those activities. On the other hand, one can argue that this final leg of the transport chain is the most costly, due to inefficiencies, and therefore might not be as interesting for the transport operators. One of the few real, documented successes within city logistics is that of Binnenstadsservice.nl in Holland. This is the concept of an urban consolidation centre that has a business case (they only received a subsidy from the government for the first year to cover some of the costs and are now covering their own costs with the income from their services), driven by a private company and focusing on the retailers rather than the carriers (van Rooijen & Quak, 2010). Another successful concept is the "Cargohopper", also in Holland, with a similar business case as that of Binnenstadsservice.nl, but operated by one transport operator that has added this service to their ordinary services (Cargohopper, 2012). An analysis performed by Aastrup et al. (2012) suggests two key issues for a UCC in order to succeed: the main issue for the retailers would be the reduced number of daily deliveries resulting in easier store handling, but also to "keep it simple". Both Cargohopper and Binnenstadsservice.nl have worked according to those two issues.

2.3.3 Evaluation and urban freight transport indicators

In order to identify successful projects, but also to identify risks and potential problems, it is necessary to evaluate the measures. However, even though there have been a large number of measures carried out throughout Europe, there are still not many that are fully evaluated regarding their efficiency (Patier & Browne, 2010). How to evaluate, monitor and assess urban transport measures have been widely researched. Nevertheless, there is little consensus on what the process should look like.

Filippi et al. (2010) argue for the importance of not only ex-post evaluation, but also ex-ante evaluation. The ex-ante evaluation of measures is often forgotten or not thoroughly performed, which gives the results that the measure cannot be proven to be very effective in order to reduce negative impacts from freight transport. Russo and Comi (2010) also highlight the importance of ex-ante assessment, but argue that there is a need for *simulation* of the effects before an implementation in order to evaluate the potential impacts. This has an implication for transport planning activities, whereby it should be principally important to consider both ex-ante and ex-post evaluation. In addition, Ambrosini et al. (2010), argue that there is a need for a broad range of data collection methods in order to build effective and efficient models for decision making (e.g. traffic counts, roadside surveys, interviews with stakeholders, questionnaires to stakeholders, accompanied trips with

delivery vehicles). However, several studies have shown that collecting freight data as well as evaluation are lacking in many cities (Kanaroglou & Builung, 2008; Muñuzuri et al., 2012a). Browne et al. (2010b) conclude in their analysis of urban freight studies in the UK during the last 30 years that there is a need for a more consistent unit of analysis in order to gain better comparability between projects.

In order to evaluate and transfer knowledge about measures that have been implemented, there is a need for proper indicators of measure. There are many "models" presented, or step-by-step analyses for how to evaluate specific projects or overall urban freight status, e.g. Awasthi and Chauhan (2011), Eliasson and Mattsson (2006), Murphy and O'Cinneide (2006), Omrani and Gerber (2009), Patier and Browne (2010) and Taniguchi and Tamagawa (2005). According to Parris and Kates (2003), more than 500 sustainability indicator efforts are presented in the literature, of which almost 300 have an urban scope. These are not just regarding freight transport though. There are also several models presented for how to use these indicators, with computer modelling or other suggested calculation methods, e.g. Muñuzuri et al. (2010) and Muñuzuri et al. (2012b) who also state (2010) that the most valid sustainability indicator for urban freight transport is the ecological footprint,[9] even though this is not much used due to complex calculation processes. Modelling and simulation of urban freight transport demand and output are often used for short- and medium-term perspectives in planning processes (Comi et al., 2012). However, there is still no consensus on a sustainability definition or a general set of indicators to monitor these. Parris and Kates (2003) offer three reasons for this: 1) the ambiguity of sustainability development; 2) the plurality of purpose in characterising and measuring sustainable development; and 3) the confusion of terminology, data and methods of measurement. It is hard to find a model or computational process that would easily find the optimal solution for freight transport in an urban area, since the destinations and amounts of goods vary greatly over seasons as well as weeks. It is necessary to see the whole picture and to understand the effects of different actions in order to judge its relevance and importance.

A consistent data set for evaluation is presented by Patier and Browne (2010), who identify both core indicators and additional indicators for urban freight transport measures, which are based on all three aspects of sustainability (Table 2-1). Those indicators are tested on several implemented measures in both France and the UK and are presented as robust and general, wherein the core indicators should be used by all evaluation exercises while the additional indicator will add value depending on the context. Patier and Browne (2010) make a key point by stating that there is a need for as much data as possible regarding urban freight transport measures in order to create an understanding as well as be able to evaluate and exchange knowledge and experiences.

Taniguchi and Tamagawa (2005) focus on the many stakeholders in the urban freight context and make an attempt to present an evaluation model that takes into consideration the criteria for each stakeholder. With a focus on evaluating different measures, indicators for different stakeholder requirements are presented by, e.g. Awasthi and Chauhan (2011), Muñuzuri et al. (2005), Omrani and Gerber (2009), Patier and Browne (2010) and Russo and Comi (2011).

[9] The ecological footprint is defined as the amount of land (hectares, Ha) that the delivery activity corresponds to, i.e. how large a part of the earth it would take to produce the resources needed for the transport of the goods.

Table 2-1 Table of indicators (Patier & Browne, 2010)

	Core	Additional
Logistics data	Number of delivered or picked-up parcels	Length of the rounds
	Number of stops	Delivery time, constraints of deliveries (just in time)
	Duration of stops	
	Action zone	Time for loading/unloading
	Distance covered with thermic vehicles	Number of trucks on each link
	Distance covered with non-polluting vehicles	Filling rate of the vehicles
	Vehicle and handling equipment capacity	Speed of the vehicles
	Number of vehicles crossing the platform	Timetable in the platform
		Timetable for each stop for delivery
	Percentage using rate of the urban logistics space	
Economic and Commercial indicators	Investments costs	Subcontracting
	Exploitation costs	Safety of the freight
	Subsidy, aides, repayable advances…	Typology of concerned activities
	Price	Typology of involved goods
	Customers or user's satisfaction	Evolution of the turnover
	Visibility of the project	Evolution of the exploitation results
Environmental indicators	Energy consumption	Noise
	Pollutants emissions	
	Rate of deliveries within clean vehicles	
Social indicators	Working conditions/Ergonomic	Time of employees trips
	Employment/Number of deliverymen	Evolution of careers
	Formalisation/Insertion	Working schedule
		Mode of transport of the deliverymen
		Working safety
Specificity regulation	Authorised deliveries/not allowed deliveries	Conflicts between users of the space
	Road occupancy	
	Rime of "restricting parking"	

Building on the knowledge from the literature mentioned above, five areas of requirements are summarised: 1) accessibility, including transport work, traffic flow, easy access (into the area), easy delivery (goods) and good mobility (people); 2) environmental, including emissions reduction and energy use; 3) costs, including unchanged or reduced costs (running) and unchanged or reduced costs (initial); 4) life quality, including noise reduction, more green areas, more pedestrian areas, increased safety, increased security and aesthetics; and 5) delivery characteristics, including just-in-time delivery, frequent delivery, door delivery and special delivery (e.g. temperature, large size, bulk or others that require a special vehicle or special hygienic demands).

2.3.4 Models and tools for urban freight planning

As described earlier, models and tools for transport planning rarely include or take into account freight transport in the urban area. However, the Multi-Actor Multi-Criteria Analysis (MAMCA) methodology is a valuable and generally good tool for how to approach the decision-making process and is suitable to use also for freight transport. The methodology, which is developed by Macharis (2005), is an important input to the analysis that needs to be made and highlights the importance of including the stakeholders' views. The model includes seven steps: 1) definition of problem and identification of alternatives; 2) identification of key stakeholders and their objectives; 3) translation of stakeholder objectives into criteria; 4) construction of indicators for each criterion; 5) construction of an analysis matrix where each alternative is connected to the objectives of the stakeholders; 6) completion of multi-criteria analysis giving a ranking of the alternatives; and 7) implementation. The

sixth step in the MAMCA model could be made by, e.g. software tools. For the purpose of this thesis, it is of the most interest to show the steps in the methodology since it gives valuable input to the qualitative evaluation that is discussed here and, for the development of a freight transport planning process. Furthermore, as concluded by Macharis et al. (2010), even though the results of the analysis are a tool to help in understanding the possibilities, the final decision still lies in the hands of the decision makers and their "political courage".

Looking beyond traditional transport planning models and tools, the characteristics of the process of including freight transport in overall transport planning could be discussed comparably to the process of *Due diligence*.[10] In simple terms, due diligence terms could be described as "the investigation of one part by another, to gather information that will assist in decision making and risk analyses" (Carleton & Lineberry, 2004). The term due diligence has mainly been used to describe a company's financial situation during acquisitions and business mergers in order to avoid non-disclosure of information. Pack (2002) describes the process as "crystallised into a purposeful, systematic, professional investigation of business opportunity and risk on-going sale negotiations", and applying urban freight into this concept gives the due diligence a slightly different context (see Figure 2-7), at the same time as giving urban freight a more specific and detailed analysis situation.

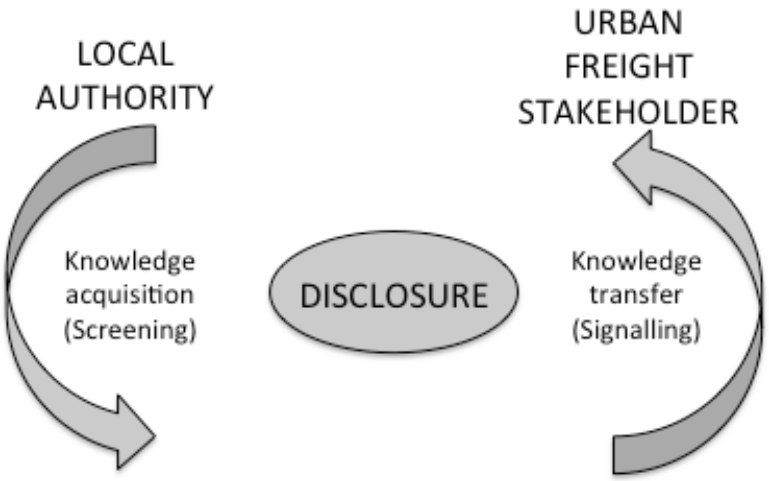

Figure 2-7 The due diligence process aiming at overcoming information asymmetries (adapted from Pack [2002] to the urban freight context).

Due diligence is basically a process of collecting information in order to reduce risks and could be described as a process to thoroughly assess a potential measure to be taken in the following steps (Rhodes et al., 2003): define the future plans for the collaboration; set metrics for the collaboration; identify the key areas of risk and suggest actions to address them; benchmark an organisation against an industry best practice; provide the basis for a deal that will balance the needs of all partners; bring the two parties together in a way that avoids surprises at a later stage; encourage the two parties to have more challenging and difficult conversations earlier in the relationship; and finally, increase the overall chances of success.

[10] Adapting the concept of due diligence into urban freight transport is in the work of this thesis done in co-operation with Erica Ballantyne, University of Leeds. See the affiliation in Paper VI. However, the due diligence work is not included as an appended paper to the thesis, since this is a work in progress, but is used in answering RQ 4.

There could be several benefits for local authorities to enhance transport planning through the use of a due diligence process for incorporating urban freight. Targeted discussions could lead to a more well-grounded disclosure. Hence, due diligence could be a valuable tool in ensuring trust amongst stakeholders (Foos et al., 2006). The evaluation and transfer of knowledge that are needed are further developed below.

2.3.5 Transferability and transfer of knowledge

The more different approaches are tested and new measures are implemented in cities, the more important becomes the possibility to share knowledge. Transferability and transfer of knowledge has therefore become a more important part of the urban transport field. In this literature review, transfer of knowledge regarding urban freight transport presents a limited amount of the literature. Most of the literature regarding transferability in the review discusses transferability of policies in other disciplines such as political science, public administration, organisational learning and management. Marsden and Stead (2011) state that "although there is only a limited amount of literature on policy transfer in this field, the findings suggest that transport has much in common with other fields of public policy in terms of the main aspects and influences on policy transfer". However, lessons learned from other cities are becoming more and more used, since it is a quick and cheap way of finding solutions without "reinventing the wheel" (Marsden & Stead, 2011). This is also noted through more and more workshops and conferences discussing urban freight transport in European cities. The most common definition of transferability is that of Dolowitz and Marsh (1996): "A process in which knowledge about policies, administrative arrangements, institutions, etc. in one time and/or place is used in the development of policies, administrative arrangements and institutions in another time and/or place" (p. 344).

Franzén et al. (2011) suggest that the basic assumption behind transferability is "what proved to be effective in one place may confirm to be useful again, in another place" but the translation of the concept into practice is more challenging and in some cases even tricky. Franzén et al. (2011) emphasise the differences between transferability and the selection of measures that could fit for a given situation. The former is just a kind of recommendation of how to transfer best or good practices, the latter deals with both the selection of measures/technical solutions to transfer plus an evaluation of the efforts and resources required for them to succeed (including also an analysis of the barriers to overcome). Hence, transferability requires the appropriate knowledge of both origin and receptor context about the institutional domain, the funding availability and the society. Based on this approach, transferability may involve more study fields from psychology to anthropology, public health to security.

Transport policy transfer researchers often base their evaluation of transferability on a framework developed by Dolowitz and Marsh (2000) consisting of a number of questions: Why do actors engage in policy transfer? Who are the key actors involved in the policy transfer process? What is transferred? From where are lessons drawn? What are the different degrees of transfer? What restricts or facilitates the policy transfer process? How is the process of policy transfer related to "success" or policy "failure"? A special issue of the journal *Transport Policy* (Vol. 18, 2011) included a number of papers with different interpretations of, and references to, this framework (e.g. Bray et al., 2011; Marsden et al., 2011; Timms, 2011); however, none of them focused on freight transport but rather transport policy in general or people transport of different kinds. Nevertheless, the frameworks presented and used are of great use also when focusing on freight transport in particular, even though, as Dolowitz and Marsh (2000) point out, policy transfer is, however, not by definition a certain explanation of policy development and success.

Timms (2011) examines and compares urban transport policy transfer processes, focusing particularly on the transfer of transport policy within the EU, with "bottom-up" and "top-down"perspectives. A "bottom-up" perspective considers the views of policy transfer from a city perspective. A "top-down" step considers the policy transfer questions from an EC perspective. Macário and Marques (2008) suggest a valuable ten-step process providing a logical framework for the transferability process, which is also used in the TURBLOG project (TURBLOG, 2011):

1. Diagnosis of the problems.
2. Characterisation of the city.
3. Analysis of the city context and implications of the problems identified.
4. Look around for similar contexts.
5. Selection of examples of source urban contexts.
6. Identification of measures with potential for transferring.
7. Packaging and dimensioning the measures for transferring.
8. Ex-ante assessment of measures to transfer.
9. Identification of the need for adjustment.
10. Implementation of measures and steering of results.

The above framework identifies the sequence and the interrelations between the various questions that should be addressed in order to assess the potential for success. Transferability is not as easy as some models suggest, but needs some degree of freedom. A model should include many options for alternative ways and should as well consider, e.g. the follow-up, evaluation and assessment steps of the measure in order to complete the transfer of knowledge to others.

2.3.6 Stakeholder co-operation and freight partnerships

A final aspect in the discussion of how to include freight in the local authorities' overall transport planning regards an increased co-operation with stakeholders, which has been mentioned earlier, but few studies acknowledge the possibility to involve them in regular discussions and meetings through different types of freight networks or partnerships. FQPs and other types of networking groups for stakeholder involvement are further discussed in Paper VI of the thesis (see also Section 4.5 for the paper summary and main contribution). The needs of the stakeholders have to be considered in order to reach long-term sustainability (Carlsson & Janné, 2012).

Håkansson and Ford (2002) suggest that no interaction can be understood without reference to either the wider network or the interrelations of which it is a part, since the total network structure is dependent on all interactions and it therefore could be precarious for one of the actors in the network to try to control the complete network. Integrated transport planning is a concept widely used and recognised today to describe, and as a prerequisite for, how to reach sustainable development, but the concept is hard to understand and use for many of those who need it the most (Bertolini et al., 2005; May & Roberts, 1995; Potter & Skinner, 2000). May et al. (2006) distinguish between three different forms of integration: operational integration, usually of public transport; strategic integration between transport policy and land use; and institutional integration within local, regional and national governments. They conclude that all kinds of integration are important. Bertolini et al. (2005) show a figure of interrelations between different stakeholders in the policy-making process (see Figure 2-8, which illustrates the complexity of the co-operation and communication needed). Tools are available, but the approach and analysis is demanding and has an uncertain outcome.

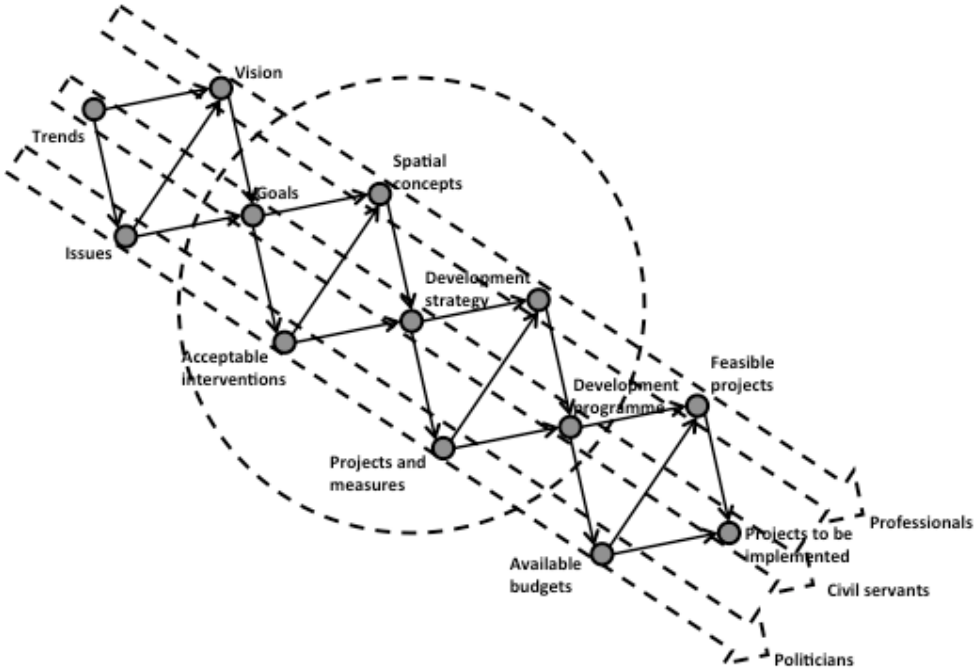

Figure 2-8 Policy making as a network of interrelated actions (Bertolini et al., 2005).

Hull (2005) found in a research study amongst UK local transport authorities that they feel hindered in their work by "short-termism" in political decision making, as well as by contradictions within policy objectives. More recently, Hull (2008) draws the conclusion that few persons working at the level of local authorities sufficiently understand the local structures well enough to find out how to work across them, but the responsibility for implementing sustainable transport solutions is placed on the local transport authorities. The paradigm of sustainability should be shared by all public sector actors, as well as key stakeholders. Successful partnerships require engagement, priorities and agendas. This is also confirmed by (Banister, 2002) who states that to reach a sustainable city, active citizen support, new forms of communication between citizens and experts and the involvement of all major stakeholders is needed. There must be a willingness to change, and the active involvement of all actors is the most effective way of achieving a change.

Collaboration between different actors is important in creating an efficient transport system and not only argued for by the OECD (2003) but also by, e.g. Tornberg and Cars (2008). Public-private collaboration in a triple helix context (the industry, the universities and the government or local authorities) is highlighted by Bergqvist (2007) as a necessity in achieving changes over a long-term perspective. The ability to succeed with this collaboration is dependent on the partners' skills and the ability to handle the complex situation with different perspectives on goals and desired outcomes. Nevertheless, stakeholder co-operation is one of the identified success factors of different projects (Hesse, 1995). Van Binsbergen and Visser (2001) suggest that policy makers should work with a concept of consultative planning whereby top-down long-term approaches are complemented with bottom-up implementation. This concept includes regular consultations for identification of problems and ex-ante and ex-post evaluations, generation of commitments whereby actors are convinced to be actively involved, concerted actions whereby actors are persuaded to adopt a certain policy and involvement in implementation whereby actors spend resources in implementation on certain policies. Van Duin (2012) argues that the perspective has recently changed, from a situation wherein logistics is a business problem handled by private parties, to a "more public logistics", with a better involvement

of public organisations. This is a perspective that needs to be further developed and realised to an even greater extent.

A Public-Private Partnership (PPP) most commonly has the meaning of the bringing together of private and public actors in a long-term partnership for the funding of a construction, maintenance or similar project (European Commission, 2004), whilst it is defined in a broad sense by Browne et al. (2003) to also include consultation and dialogue in the public decision making, which is more in line with what is discussed here. A success factor for urban freight transport could be the involvement of stakeholders (Browne et al., 2007a). To involve stakeholders from both the authorities and private business could be a challenge, considering the difficulty of harmonising different views and exchanged ideas and, when handling a changing and complex environment, there could never be *a* perfect solution regarding a freight strategy (Hensher & Brewer, 2001). Hensher and Brewer (2001) identify three factors that contribute to the inefficiency of developing a freight strategy connected to information and knowledge: the incompleteness, asymmetry and parochial nature. They suggest a collaborative process with a long-term perspective, whereby the interaction between key stakeholders is efficiently increased to handle the situation with complex issues such as freight strategies.

Freight quality partnerships are a way of including stakeholders in the discussion of urban freight transport. Hofenk (2012) confirms that it is important for different stakeholder groups, which might have different interests, that a planned measure be in line with each value at the same time as the initiator needs to provide good reasons to take part. A freight quality partnership has the potential to support these aspects and the stakeholder groups could have the possibility to share their prerequisites and requirements with other stakeholders to discuss. Collaboration with stakeholders through partnerships are discussed by some authors. Dablanc et al. (2011) identify three prerequisites that need to be fulfilled in public consultations of freight transport in order to succeed, as a result of a case study in the Paris region:

- There is a need to implement a dedicated consultation process, i.e. freight issues cannot just be included in ordinary "neighbourhood consultations", but need to be addressed to the right stakeholders.

- Freight consultations need to be implemented on a metropolitan or even a regional level, since the urban freight transport is part of a larger supply chain and therefore alone is not sufficient. The municipal decision needs to be integrated with regional consultations to guarantee effectiveness.

- The institution in charge of the consultations needs to have sufficient legal and political influence to enforce the decisions taken at the consultations.

However, earlier, Dablanc (2008) argued that local partnerships are not very useful, except for a limited number of cities, since representatives of all the varieties of actors participating in urban freight transport are not included in those partnerships. "Traditional command-and-control policies" would be more useful according to Dablanc, however, used in a more innovative way than is the fact today, with, e.g. better enforcement. Hofenk (2012) though, suggests, amongst other factors, that the retailers and carriers' willingness to improve urban freight transport through supporting initiatives is dependent on their perceived need for change and their trust in the initiative. To understand the need for change as well as to gain trust, there is a need to understand also other stakeholders' perspectives.

In the UK, FQPs have been implemented at various locations during more than a decade and were acknowledged already at the end of the 1990s by the government in the Department of the

Environment Transport and Regions (DETR) report (DETR, 1998). The FQPs have been shown to improve the co-operation between private and public stakeholders (Allen et al., 2010).

Three main references discuss and identify the factors needed to be considered when establishing and maintaining an urban freight partnership: CIVITAS (Breuil & Sprunt, 2009); TURBLOG (2011); and START (2009). The CIVITAS Initiative (Breuil & Sprunt, 2009), based on the experiences from several projects, has summarised that four areas are important to consider: 1) *Political Involvement* - they note that local political engagement is important and they argue this is especially so for medium-sized cities; 2) *Target Groups* - these must be identified clearly in order to facilitate the design and implementation of solutions by establishing consensus and to support the implementation among stakeholders; 3) *Methodology* - a strong and rigorous management methodology is important in order to establish milestones and objectives (in order to measure the progress of the project and to identify the barriers; and 4) *Modelling* - the design and adaptation of organisational and technical solutions must be based on reality. The TURBLOG project (2011) noted that there is a need to accept the complexity of urban freight transport, but also that there is a need to avoid seeking single solutions and that co-operation between stakeholders helps promote the understanding of each others' opinions. Finally, the START (2009) project identified a list of important success factors, including the following: focus and ambition, wherein the objectives should be decided in co-operation with the participants; an action plan; the inclusion of a broad range of stakeholders; a manageable number of participants (10–20); and regular attendance by stakeholders at meetings.

Based on the references above, with some more or less overlapping factors, a list of nine factors is compiled. Those nine factors have been grouped into three main areas of interest: *Formation of Partnership* (objectives, relevant stakeholders, political involvement); *Management* (action plan, manageable number of participants, regular attendance, strong project management); and *Outcomes* (accept complexity and avoid seeking single solutions, consider urban freight as business propositions).

2.4 The stakeholders of urban freight transport

By concluding in the previous section that a wider co-operation with stakeholders is important, it also becomes important to identify the stakeholders that need to be included in these discussions. In urban freight transport flows (and all other transport flows), the realisation of transport demands results from the decisions taken by many different stakeholders and these stakeholders often show a strong interdependence. Co-operation and communication are possibilities to reduce the barriers between different stakeholders. Transportation systems are complex and dependent on the existence and roles of different modes, regulatory and legislative bodies, service providers, builders, financing systems, technologies, land-use patterns and human behaviour (Richardson, 2005).

Russo and Comi (2011) identify three stakeholder classes that should be taken into consideration: 1) end-consumers, including inhabitants and visitors; 2) logistics and transportation operators, including the shipper, the transportation company and the receiver; and 3) public administration, including both national and local governments. Taniguchi and Tamagawa (2005) examine a methodology for evaluating city logistics measures based on the behaviour of several stakeholders associated with urban freight transport. They consider the five different stakeholders of administrators, residents, shippers, freight carriers and urban expressway operators. They assume that they behaved on the basis of their own criteria for evaluating the effects of city logistics measures. There is a need to understand the complicated relationship between stakeholders as well as their role in the urban transport system. It is not only the freight carriers that are affected by the city logistics measures implemented by, e.g.

local administrations. All stakeholders have different requirements on urban freight transport, wherein the inhabitants want as little disturbance from freight movements as possible, the transport and logistics operators want to fulfil their customers' needs and the public administration would like to minimise external effects and to create an attractive urban area. The stakeholder requirements could be monitored and evaluated with the help of different indicators.

According to Taniguchi et al. (2001), there are four key stakeholders involved in urban freight transport that interact with each other in some way or another: shippers (manufacturers, wholesalers and retailers), residents (consumers), freight carriers (transporters and warehouse companies) and administrators (national, state and city level). A similar division of stakeholders is used by Anand et al. (2012), who also adds a private stakeholder named "Deterministic private actor" including B2B shippers, 3PL service providers, retailers and inhabitants. All of these also have their own objectives, e.g. the residents who do not want to be disturbed during night hours. Looking again at Figure 2-2 (Wandel et al., 1992), it can be noticed that residents are not a part of that figure. However, they do affect the society's interest since this interest is originating from resident's need in an area like a city (or a country).

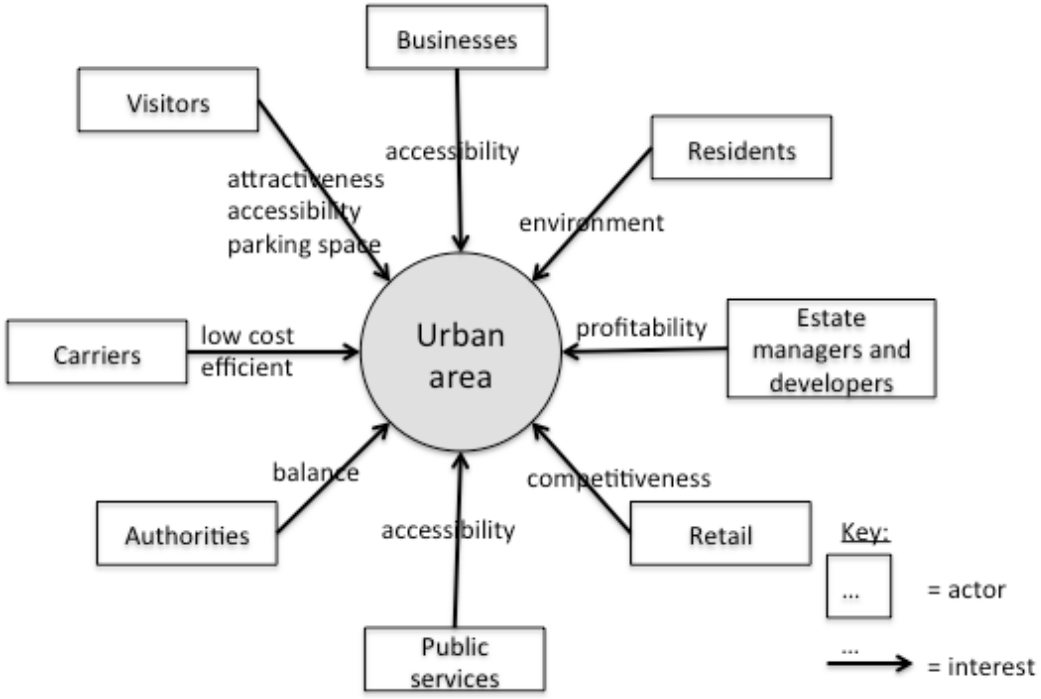

Figure 2-9 Urban goods distribution in inner cities influences the interests of different actors (van Binsbergen & Visser, 2001).

Residents are included though in another identification of stakeholders that is made by van Binsbergen and Visser (2001) (see Figure 2-9), whereby a more comprehensive picture of stakeholders is identified with their different interests in the urban area. For this identification, it is highlighted that different actors have sometimes-conflicting interests. Sjöstedt (1994) presents models that highlight interactions and show important actors affecting freight transport. Figure 2-10 shows a combination of models from Sjöstedt, wherein the presentation is more complex and the number of stakeholders is more extensive than the ones previously presented, even though the stakeholder group "Consumers" is excluded here as well as in the one by van Binsbergen and Visser (nevertheless, in that model, likely to be recognised in the group "Residents"). The Sjöstedt model is system oriented around three basic elements: *goods* that demand transport, *vehicles* being used and *infrastructure*. The elements interact

in pairs in three different subsystems. The *activity system* comprises all activities that require movement of goods. In the *transport system*, vehicle operators match the demand for transport services. In the *traffic system*, finally, actual movement of vehicles is realised in physical networks in which traffic units absorb infrastructure capacity (Sjöstedt, 1996).

It is at the final link of the causal chain, labelled "Activities - Transport - Traffic", on the traffic system level that negative impact on the environment occurs. But, since it is a chain of activities with many different stakeholders behind this link, not only the stakeholders of the single traffic link are responsible for the impacts. The stakeholders in the rest of the system are equally important and need to be included in sustainable development strategies. The lack of arrows from "Academia" and "Policy" could indicate that they have no direct effect on the planning agencies. This further enhances the importance of extensive co-operation through, e.g. partnerships in order to ensure that wider stakeholder perspectives are taken into account.

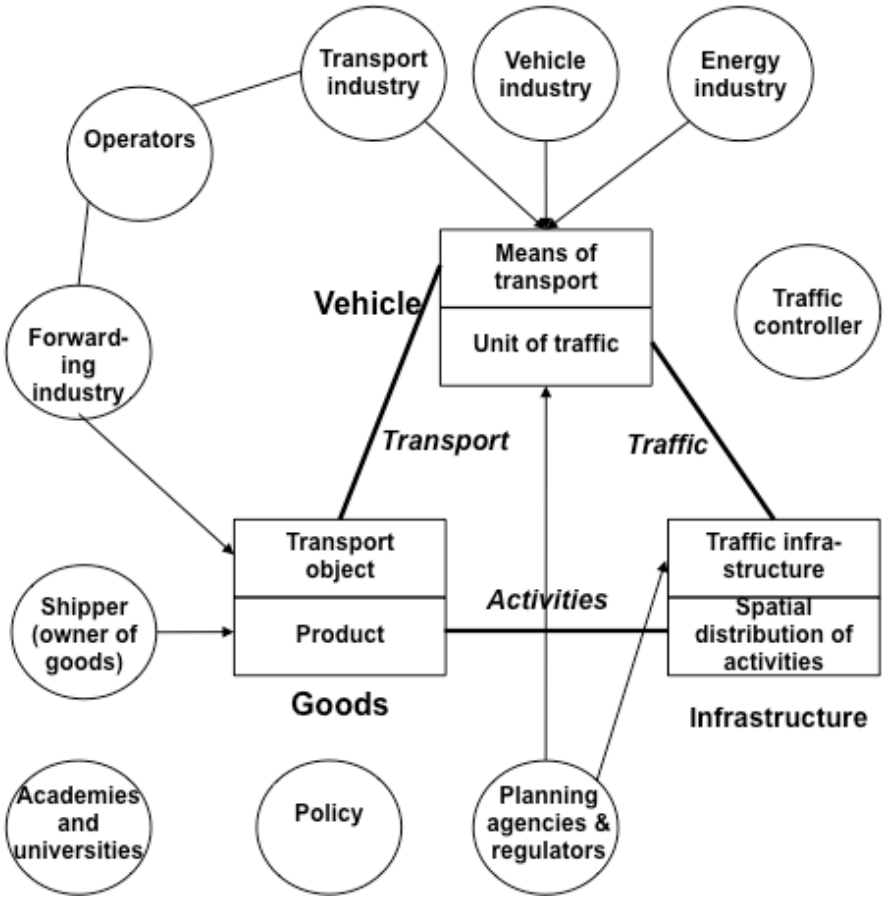

Figure 2-10 An actor-based model of a transport system (adapted from Sjöstedt (1994).

For the purpose of this thesis, four main groups of stakeholders, with a direct and important impact on urban freight transport, have been drawn from the above discussion and used in the analysis: city administrations/local authorities; consignor/consignee; freight forwarder; and transport operator. However, a further discussion of stakeholders and their relationship is considered to be essential and is therefore included in Paper VI and as a discussion of the second research question.

2.5 Mechanism approach to urban freight transport

Besides the many interactions between stakeholders in the urban freight transport system, there are also problems and possibilities created by stakeholders or local authorities through for example

regulations, that have an effect on urban freight transport, or are imposed due to an effect by urban freight transport. A way to bridge between practitioners and researchers, might be as suggested by Anderson et al. (2006) to understand mechanisms. Mechanisms have long been used in for example organisational theory to explain how one thing leads to another. The purpose of this section is therefore to make an attempt to address mechanisms in order to make urban freight transport easier to understand as well as to be further developed.

Mechanisms could be described as presented by Hedström and Swedberg (1998), as a simple figure (Figure 2-11), which explains that the relationship between two situations, variables or activities "I" (input) and "O" (output) is linked with the mechanism "M".

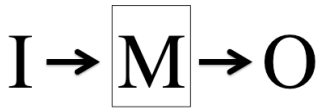

Figure 2-11 The relation between input and output, through a mechanism

Several authors presenting work on different types of mechanisms inspire the development of urban freight mechanisms in this thesis. In organisational research, mechanisms could be explained as (Anderson et al., 2006) *"the cogs and wheels that explain how and why one thing leads to another"*, which seem as a very good way of putting it. Furthermore, they state that (p.105) *mechanisms enable us to understand how the individual pieces ultimately result in the collective outcome*. Mechanisms in urban freight transport are in this thesis used as a term to explain how the activities and resources in an urban area could be co-ordinated and are referred to as how to handle the interdependence between activities.

As discussed previously – the urban freight transport issue is complex. The complexity is mirrored by a large amount of stakeholders with interdependencies and requirements that are not always understood, an urban area that have prerequisites and possibilities that are unlike other parts of the transport chain as well as a competition in transport planning issues with other modes of transport that often are prioritised. As a way of starting to understand the complexity of urban freight transport, there is a need to understand the interdependencies between stakeholders. Muñuzuri et al. (2005) suggests that a clash of interest between different stakeholders could be one of the main reasons for failure of urban freight transport. Furthermore, Marchau et al. (2008) suggests that it is important to handle uncertainties and vulnerabilities regarding stakeholders. The interactions between stakeholders will lead to certain outcomes that have an effect on urban freight transport, as discussed previous in this chapter. Håkansson and Persson (2004) argues for coordination of interdependencies within and between organisations, where for example two activities need to share a common resource or when one activity have an effect on another activity.

Many different descriptions of mechanisms have been found in literature. Mintzberg (1983) structure co-ordinating mechanisms in three main categories as: mutual adjustment (adjustment to regulations, etc.), supervision (e.g. enforcement of regulations) and, standardisation of work (by both individuals and organisation). Scott and Davis (2007) describe social mechanism as environmental, cognitive or relational, where it is mainly the relational mechanisms that are of interest for this thesis as a result of the interactions between actors and stakeholders in the system, both as organisations but also as individuals. However, the individual level is not closely observed here. Malone and Crowston (1994) concludes that the approach of co-ordination, as in *managing dependencies between activities*, can help structure and sort a variety of needs and, enable people to work together more effectively. Different levels of mechanism could be evaluated in for example forms of (Malone and Crowston,

1994): Which processes are least expensive?; Which processes are fastest?; and, Which processes are most stable?

Looking in the field of logistics, or supply chain management, there are several authors that have addressed mechanisms in one way or another. As discussed by Aastrup and Halldórsson (2008), mechanisms affect the logistics performance. Romano (2003) presents three elements that need to be considered: the drivers; the co-ordinating mechanisms; and, the integration mechanisms. This could be true also for a part of the supply network and that it is necessary to understand those parts when looking at a specific context like the urban area transport. When addressing urban freight and, its stakeholders, it is mainly the different types of co-ordination that have been addressed in this thesis. Co-ordination mechanisms could, in supply chains, be divided into four areas (Arshinder et al., 2008): supply chain contracts, information technology, information sharing and joint decision making. Without discussing the word mechanism, some authors have referred to policy instruments that are needed in order to make urban freight transport sustainable. McKinnon (2003) and May and Crass (2007) describe several policy instruments that could be used to deal with different options of how to reach sustainability regarding freight transport. May and Crass present a list of policy instruments that cover infrastructure and management, technology, regulation, information and pricing. McKinnon grouped into the instruments in five categories: fiscal measures, financial incentives, regulations, infrastructure and land use planning and, advice and incentives. Three areas to consider in order to make urban freight transport sustainable are identified by Abassi and Johnsson (2012) to be: information (educating stakeholder and sharing information), integration (cooperation, coordination and collaboration among stakeholders) and innovation (new types of measures).

With the exception of "advice" those are also presented as measures in Section 2.3.1 and, with the purpose to characterise mechanisms they would be presented as regulation mechanisms, whereas advice would be an information mechanism. The mechanisms discussed above are somewhat overlapping and in order to focus the discussions regarding urban freight transport, three main issues will be further addressed in this thesis: regulation; information; and, adjustment.

2.6 Barriers and drivers of sustainable urban freight transport

The second group of "factors" in this thesis consists of the barriers and drivers of sustainable urban freight transport. Barriers and drivers to sustainable urban freight transport or policy planning processes are researched only to a limited extent (van Binsbergen & Visser, 2001). A barrier, or an impediment, is an obstacle, which prevents a given action or policy measure being implemented, or limits its possibilities. A barrier could be a part of a structure or a process. A driver is something that helps an action, measure or policy instrument to be brought forward and gives it a better potential to be implemented.

Minken et al. (2003) grouped barriers into four categories: 1) legal and institutional barriers; 2) financial barriers; 3) political and cultural barriers; and 4) practical and technological barriers. Nonetheless, a policy implementation should not be disregarded due to barriers. Instead, there should be policy instruments to help overcome the barriers, at least for long-term strategies. Institutional barriers, process barriers, political and acceptability barriers, information and skills barriers, financial barriers and legislative and regulatory barriers are another division of barriers presented by May and Crass (2007), who analyse four different studies and recommend for authorities to have clear objectives, set up aims in order to fulfil those objectives and to have a good consultation process as the way of overcoming the barriers.

The drivers of urban freight transport sustainability could be the mirroring aspects of the barriers and the same categories that are used for barriers are therefore used in order to categorise drivers.

2.7 Summary of the frame of reference

The frame of reference follows the analysis model presented in the introduction and focuses on the areas of practice, new practice, process, stakeholders, mechanisms and drivers and barriers. In this section the frame of references is summarised and connected to the research questions. Furthermore, Figure 2-12 presents the analysis model developed based on the frame of reference.

The "practice" of today was put into a wider context of logistics and transport operations in this frame of reference. In those sections, "*urban freight transport"* and how local authorities' handle it today were discussed. Urban freight could be goods movements performed entirely within the urban area, but are mostly just a small part of a transport or supply chain. It can be concluded that the field of urban freight transport is complex and that there is a lack of understanding of the field, but also that it is not considered in the local authority transport planning of today. There is a need for a more systematic and holistic approach in order to grasp the complexity that covers many different types of transport operations, in order for local authorities to get a wider understanding.

Freight is an acknowledged contributor to the unsustainability of the urban area. The "new practice" is what should be strived for, the *sustainability of urban freight transport*. To reach this for an urban area it is necessary to include freight transport in the overall transport planning, but also a need for a long-term perspective and a development of current transport planning methods in order to include freight. The existing models, frameworks and tools focus on transport planning in general, or for specific measures. Awareness of how environmental aspects could be considered in different areas is also important.

- RQ 1a will address the practice to get an understanding of what the urban freight practice is today in the local authorities of the case studies, identifying the main areas of interest to address further.
- RQ 1b will address the issues of sustainable urban freight transport, by defining the concept.

However, before working with freight transport in the urban area, there is a "process" to get the topic on the agenda for local authorities. Four main areas are identified throughout the literature in order to work in a more structured way with urban freight transport for local authorities: measures; evaluation; transferability; and stakeholder involvement. Working with *measures* is the most common approach for local authorities to tackle singly occurring problems. There are three main types of measures that are trialled in many cities, but single measures are not enough to reach sustainability and there are few measures that have a good business case. Evaluation becomes important in order to understand the effect of the measures implemented. *Monitoring and evaluation* (ex-ante and ex-post) based on *performance indicators* (accessibility, environmental, costs, life quality and delivery characteristics) are shown to play an important role in the development of actions regarding urban freight transport. Evaluation is in turn important for the dissemination and *transfer of knowledge* between different cities/local authorities. Finally, it could be concluded that *stakeholder involvement* increases the possibilities for long-term successful results.

As concluded, urban freight transport is complex to understand. However, in this thesis, two areas have been highlighted to attempt to clarify the issue: mechanisms and drivers and barriers. To identify *mechanisms* is a way of addressing the complexity of urban freight transport in the path towards

sustainable urban freight transport. Three types of mechanisms have been identified in this frame of reference with the purpose of providing a structured characterisation that can be useful for the understanding of urban freight transport. The *barriers and drivers* are other factors that need to be considered in order to understand the complexity of urban freight transport and serve the purpose of acknowledging areas where the local authorities are hindered or motivated to work with urban freight transport.

- RQ 2 will address both stakeholders and mechanisms. Stakeholders need to be further developed and identified in order to help the local authorities choose how to address them. In line with that, the mechanisms of urban freight transport will be developed as a way of understanding the complexities.
- RQ 3 further develops the understanding of urban freight transport through a identification of barriers and drivers divided in categories as defined in this frame of reference.
- RQ 4 has two levels, where it is first of all important to understand *how* to include freight in overall transport planning (through measures, stakeholders and knowledge transfer) and then provide a tool for how to work with freight when acknowledged (development of a transport planning process).

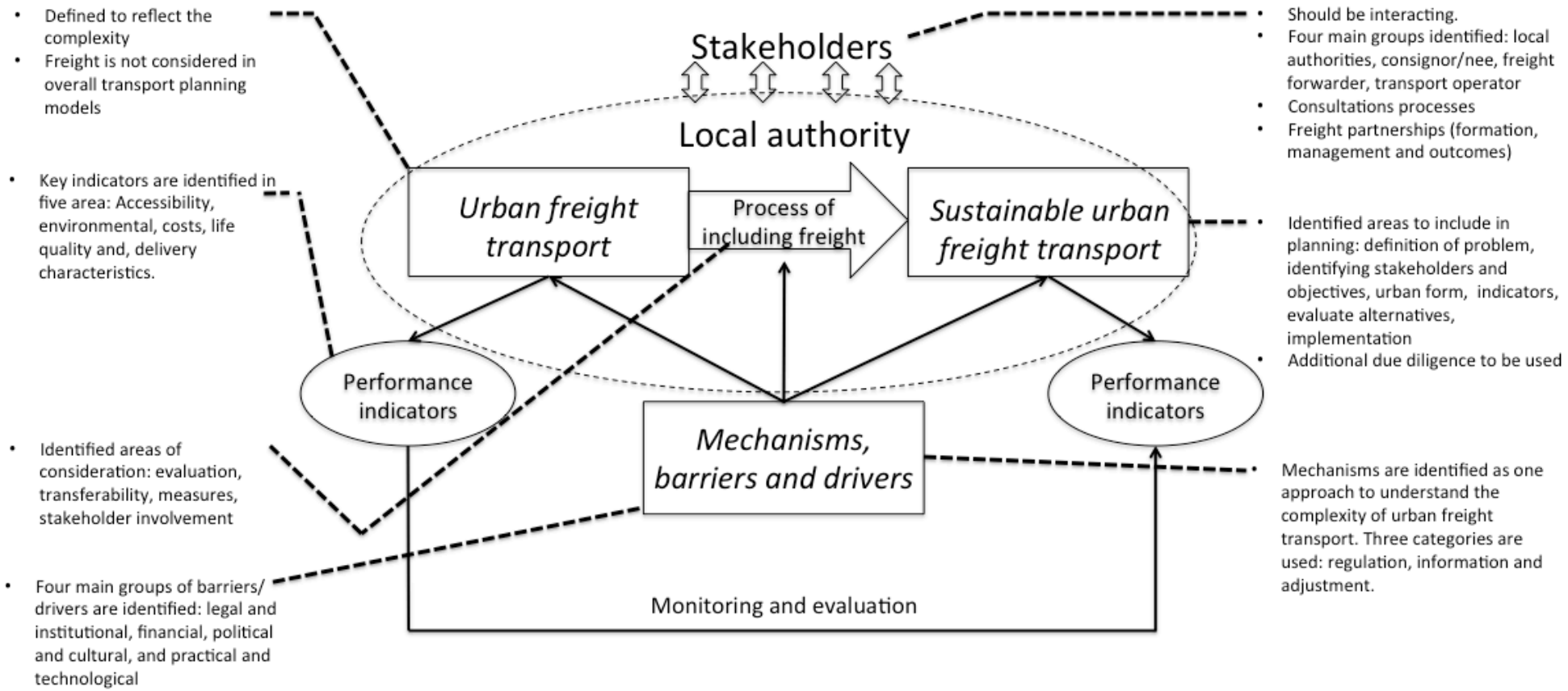

Figure 2-12 Analysis model

3 Research methodology

This chapter will discuss the methodological approach as well as the methods used in the studies in order to reach the purpose. The chapter starts with a discussion of the research approach, creating an understanding of the methodology strategy, followed by a short introduction to the research process, showing the relationship between studies, research questions and the appended papers. Then the research design with its seven studies and data collection methods are presented followed by a discussion on research quality and lastly a discussion on the generalisability of the results.

3.1 Research approach

The purpose of this thesis is to contribute to the enabling of local authorities to include freight in urban transport planning for sustainable development. In order to answer the purpose, there is a need to make choices, choose a research approach and to design studies that are suitable as a research method. According to Arbnor and Bjerke (1997) and Gammelgaard (2004), there are three different methodological approaches that are applicable in logistics research: analytical, systematic and actors' approaches. The methodological approach used in this thesis is the systematic approach, since the relations between the parts are essential to explain the reality and therefore we must consider the synergies in acknowledging the analysis model (Figure 2-12) wherein there are several factors that affect urban freight transport. The system studied is the local authorities' freight transport planning. Arbnor and Bjerke (1997) also distinguish between an open and a closed system, wherein the open system is studied in the context of its environment. In this thesis, the environment is the urban area and the research approach is to look at this as an open system, wherein both internal and external relations affect the components of the system and the system is changeable.

The problem background to this research has appeared from the observations and curiosity of the researcher and not a given hypothesis or theory, which could imply an inductive approach to the research in the first phase of the study. With an inductive approach, the research aims at generating theory from observations of different phenomena (Hellevik, 1996). However, the research is more similar to an abductive approach when both inductive and deductive methods are combined in an iterative process (Kovács & Spens, 2005), wherein the aim is to understand a phenomenon and to suggest a new theory or build knowledge. Dubois and Gadde (2002) describe the abductive process as "systematic combining" (Figure 3-1) and have found that going back and forth between empirical data and observations increases the understanding of the results. However, they stress that systematic combining does not so much build new theory as it develops existing theory thus is more similar to the research that is performed in this research process. Connecting my research to the figure below reveals that the case consists of the cities studied (see further discussion below), the empirical world is the urban area, the theory is the previous research within the area (as presented in Chapter 2) and the framework is the analysis model that is continuously developed throughout the research process.

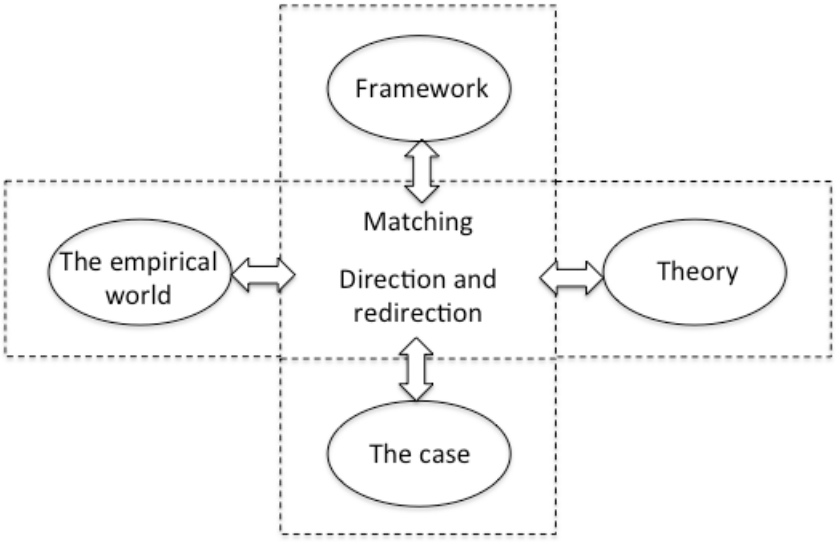

Figure 3-1 Systematic combining (Dubois and Gadde, 2002).

This thesis is not about theory testing, but rather to *explore the theory* within the frame of the research questions and frame of reference. To explore theory (theory building) should be built on an a priori theory or assumption and have the value of permitting a "wider range of observations and inquiry than the more traditional theory testing does" (Flynn et al., 1990). However, it is important for the researcher to be as unbiased as possible and avoid considering specific relationships and thinking (Eisenhardt, 1989). As a basis for this theory building, the researcher needs to have a pre-understanding of the research topic that will establish the basis of a very tentative assumption upon which the theory is explored and developed. The pre-understanding of the topic is based on participation in several EC and national projects regarding city logistics as a researcher and as a consultant in various formations and is formulated as the following:

> *There is somewhat of a lack of interest for freight transport in urban areas by local authorities and this is the reason that attempted measures are unsuccessful.*

The author's willingness for a deeper understanding of the problem noted in pre-research observations, and became the main reasons for the start of this research project. To fulfil the purpose of this thesis through the research questions, the main research method has been qualitative studies of case cities in order to through an abductive approach to develop existing theory.

3.1.1 Case studies

Case studies are argued to be an ideal method in system analysis (Arbnor & Bjerke, 1997; Churchman, 1979; Gammelgaard, 2004). A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and is, according to Yin (2003), the most appropriate research method for studying the complexity of organisations when "how" and "when" questions are being posed. In this research process, the fourth research question (RQ 4) constitutes a "how" question and does build on knowledge gained from real case experiences from the earlier research questions. Case study research is further argued to be well suited for new research fields and theory generated from case studies has important strengths like novelty and empirical validity (Eisenhardt, 1989).

For this thesis, considering the purpose and the research questions, the case study approach seemed to be an appropriate method. Case studies are often in logistics research synonymous with studying a specific company; however, in this research process, the case studies have been of cities, i.e. local

authorities and their work with freight transport, but also the prerequisites that an urban area offers. The case studies have been performed to explicate the transport situation in general, the transport planning processes and the level of the freight transport approach. Aastrup and Halldórsson (2008) discuss the use of the case study method in logistics research and suggest that the justification for doing case study research lies in e.g. the ability to reach the causal depth required for revealing the real domain of logistics activities and performance and revisit the notion of generalisation. Multiple case studies are considered to be more robust than, and have substantial analytical benefits over, single-case studies, according to Yin (2003). Multiple case studies also give the possibility of ensuring the external validity, hence the generalisability (Ellram, 1996).

All of those mentioned aspects are valuable in this research process, since one of the starting points for the research was that there is a notion that there are differences in the urban freight transport approach in cities of different sizes. Therefore, it has been necessary with a variety of different city sizes and context in this research process to ensure the possibilities to achieve valid results. The case cities were selected within the framework of the research projects that have been the basis for this research process (see further Sections 3.2.1 and 3.2.2.). The process, which consisted of seven studies, and the choice of case cities as well as the methods used to conduct these studies are presented below.

3.2 Research process

The research in this thesis is based on studies over seven years of an iterative process. The research has been divided into seven studies of different depths and lengths, based on two research projects (the EC project Baltic Urban Sustainable Transport Implementation and Planning – BUSTRIP, and the Swedish project Sustainable Urban Transport – SUT). The studies have been covering the research questions either in a broad way with the purpose of finding the contributions to all research questions, or focusing on just a few or a single one of the research questions. The studies have led to the papers that are appended to this thesis. In the figure below (Figure 3-2), the coverage of the studies in relationship to the research questions is shown. A case study approach has been used in four of the seven studies, whereas the other studies have been a literature review, a workshop study and a comparative analysis study.

To base the research in this thesis on the two projects of BUSTRIP (Studies 2 and 3) and SUT (Study 6) brings both possibilities and problems. The focus in those two projects on the field of urban transport and the dedicated participants is positive, though this could create some unbalanced views on urban freight transport since the participants already have an understanding of the topic to some extent. This leads to some possible bias in the results (i.e. the participants might be more aware of freight transport in urban areas than other local authorities due to the involvement in this project). However, since an increased knowledge and awareness is also something we would want to achieve it is also good that the local authorities increase their freight knowledge through the participation in this study. The two projects did not have the research questions stated in this thesis, or the purpose, as main aims, and the scope has been somewhat different from the scope in this thesis, which creates some problems that needed to be dealt with.

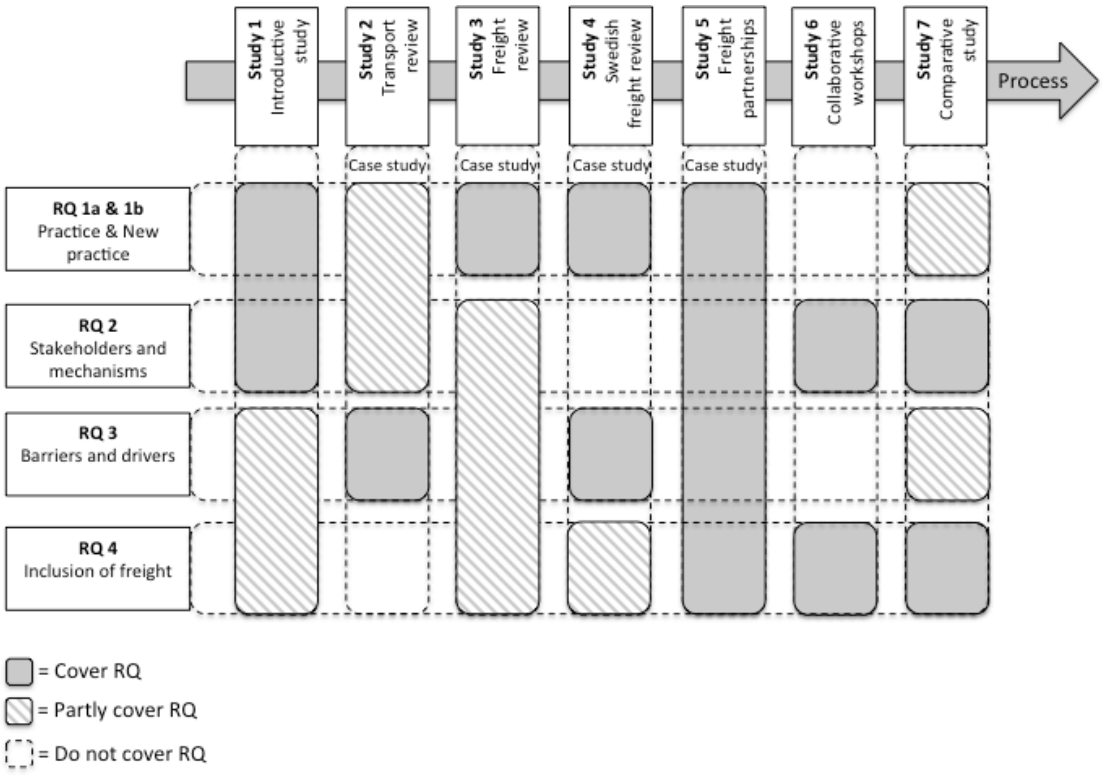

Figure 3-2 A matrix showing the relationship between studies and the research questions in this thesis.

The division of the research process in seven studies, not particularly following the research questions on a one-to-one basis, have been a way to handle the two overarching projects and their aims and at the same time find ways of handling the research questions of this thesis efficiently. The research questions have been cross-cutting the studies and in that way gaining as much input as possible through different research methods and cases.

3.2.1 BUSTRIP (Baltic Urban Sustainable TRansport Implementation and Planning)

Sustainable Urban Transport Plans (SUTPs)[11] have been strongly recommended by the EC as a foundation for a new approach to transport in urban areas (Wolfram, 2004). The SUTP preparations and adoption comprise a process that requires somewhat new ways of thinking when cross-departmental co-operation and integration of transport, urban and economic planning are important prerequisites. An expert group was put together by the EC in the context of preparing the Thematic Strategy on the Urban Environment (European Commission, 2005), with the purpose of giving recommendations on SUTPs as well as suggesting processes, instruments and measures needed for a SUTP (Wolfram, 2004). The work of the expert group formed the basis on which further work with SUTPs has been built.

The EC project BUSTRIP addressed the process of preparing and implementing SUTPs in different cities. The author of this thesis had an active role in the writing of the application for the project and was given the main responsibility of handling freight transport during the project period, partly as work package leader for "demonstration projects" (i.e. measures) within the project, partly as peer review team expert participant (see Study 2 below). The project was ongoing between the years of 2005 and 2007 (UBC Commission on Environment, 2007). One region and 11 cities in the countries

[11] Now SUMP, as mentioned in Section 2.2.2.

bordering the Baltic Sea participated in the project, and have been a major source of information and data for this PhD study. The main outcome of the BUSTRIP project was a toolbox providing guidelines for the SUTP process. This toolbox was based on the experiences from the project, as well as the developed SUTP concept. The SUTP concept was also tested simultaneously in the EC project PILOT (2012).[12] The SUTP process is described in Figure 3-3. The preparation and implementation of a SUTP requires co-operation and the integration of different policy areas. In the figure, the outer circle and the block arrow to the right show the planning part of the path towards sustainable urban transport (SUT). The inner circle shows the SUT plan process. The purpose of the figure is to show the complex relations between all the parts that need to be included in the process as well as the need for regular update and feedback to the organisation in the progress to reach SUT – including freight. The *planning* considers the on-going process of integration and co-operation between different departments and stakeholders to reach SUT. The *plan* considers the tool to provide ways of meeting the needs of the people and goods in the urban area. It was concluded in both projects (PILOT and BUSTRIP) that to succeed with sustainable urban transport, there is a need for good co-operation both between different stakeholders and between different planning departments in the municipalities together with a clear vision of the future. Collaboration, integration and exchange with other professions and policy sectors are important.

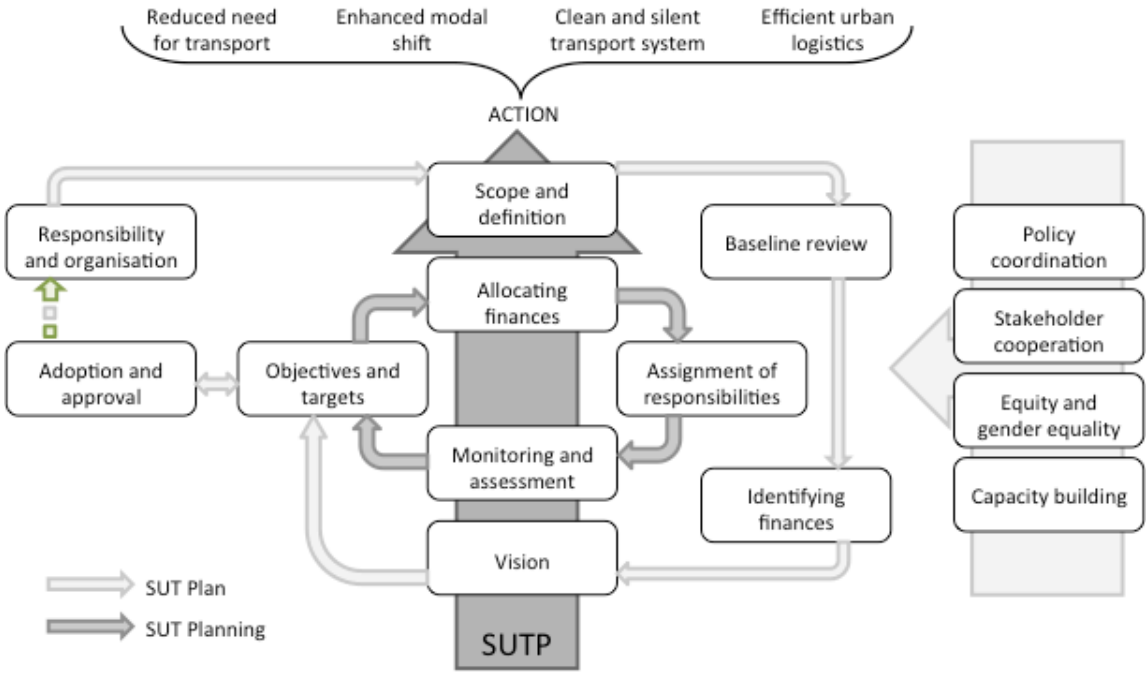

Figure 3-3 The process cycle of a SUTP (UBC Commission on Environment, 2007).

The BUSTRIP project was built on the basis of communication and shared experiences. Each city conducted a self-assessment in which the own organisation and transport situation (for both people and goods) was critically analysed. This assessment was followed by a peer review, wherein groups of experts spent a week in each city for an even more critical audit. Feedback was given and information between cities shared. The goal for each participating city was to implement or improve an existing SUTP. The input from the BUSTRIP project to this thesis has been to provide case studies for several of the studies performed, as well as a profound knowledge of the complete transport planning processes of the project cities.

[12] PILOT (2012) was a European project, which demonstrated the preparation of Sustainable Urban Transport Plans (SUTP) in four European cities. It also proposed tools and guidelines for how to use SUTP.

3.2.2 SUT (Sustainable Urban Transport)

Sustainable urban transport (SUT) was a project funded by Swedish VINNOVA (2012),[13] on-going between 2010 and 2012. The project addresses sustainable city development and sustainable transport through new concepts for city distribution for goods and passengers. The purpose was to create new knowledge by bringing together the different and often separated perspectives of city planning, transport and logistics and vehicle technologies, and to make it applicable for both existing city centres and for new urban areas. The objective was to provide guidelines for deployment of new solutions by integrating the different perspectives on transport development and planning in cities. The two main areas of the project can be summarised as:

1. Defining and developing urban transport concepts and a vision for sustainable urban transport solutions for goods and passengers.
2. Presenting a pilot demonstration of a new and/or extended existing collaborative urban transport solution based on the micro-terminal concept including both goods and services.

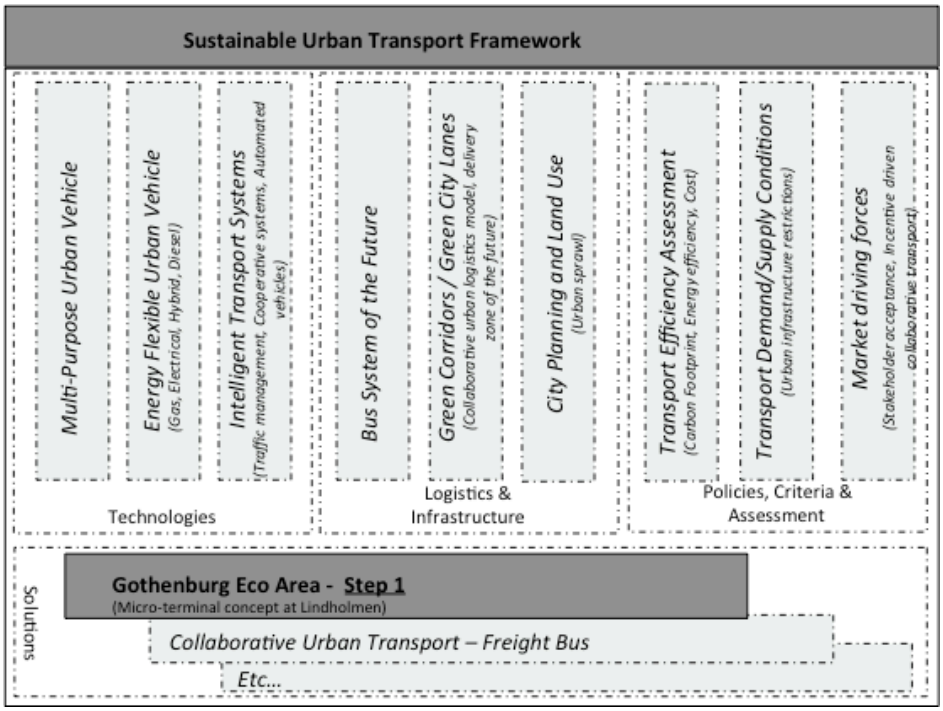

Figure 3-4 Illustration of the work packages in the SUT project.

The concept and the visions for sustainable urban transport were developed with a cross-disciplinary approach whereby the state-of-the-art vehicle and ITS technologies (Volvo) were combined with the state of the science in the transport and logistics fields (Chalmers Logistics and Transportation/Northern LEAD) and with a city planning and land-use perspective (Chalmers Architecture/Urban Transport and Land Use Planning) (see Figure 3-4). In order to be able to test, demonstrate and validate new concepts, the project engaged Göteborgs Stad Trafikkontoret, Älvstranden Utveckling AB and Lindholmen Science Park.

The author's role as a PhD in the project was to find efficient solutions to the urban distribution of goods via the development and creation of an adaptive and integrated model for transport planning that should be robust and flexible. An assessment model should take different actors in the urban

[13] VINNOVA (2012) is the Swedish Governmental Agency for Innovation Systems and invests in research and strengthens Sweden's innovative capacity for competitiveness, sustainable development and growth.

distribution system into account as well as the factors and criteria affecting the system. Stakeholder involvement is important as well as is studying the demand and supply conditions for material flows. The work in the project was carried out in close interrelation with all partners, but most importantly with Chalmers Architecture and Volvo Technology.

3.3 Studies in the research process

The research in this thesis consists of seven studies, as shown in Figure 3-2. This section will describe the basic methodology approach used in the studies, as well as give the design of the seven studies in more detail. Table 3-1 presents the methods used in the seven studies and how those have been contributing to the four research questions. The methods used to gain data in the case studies of this research consist of a review of the literature, questionnaire studies, interview studies, observations (and participation), document analysis and workshops. The three studies (Study 1, 6 and 7) that did not have a case study approach have been based on the literature, document analysis, workshops and a comparative analysis of earlier conducted case studies. The results of the studies are presented partly in the appended papers (summarised in Chapter 4) and in the Analysis (Chapter 5). Studies 1 and 2 focus mainly on a range of general knowledge within the field of freight transport in urban areas and could therefore be seen as a step in getting prior knowledge for the following studies. Studies 3, 4 and 5 are the main studies for collecting empirical data for the thesis. Studies 6 and 7 mainly validate previous studies in order to bring the knowledge together, form the results and make contributions to this research.

Table 3-1 Methods used in the studies.

	Case study approach	Literature	Document analysis	Interviews	Observations	Questionnaire	Follow-up interviews	Comparative analysis	Workshop	
Study 1		X								RQ 1, 2
Study 2	X	X	X	X	X					RQ 3
Study 3	X	X	X	X	X					RQ 1
Study 4	X	X				X	X			RQ 1, 3
Study 5	X	X		X	X	X			X	RQ 1, 2, 3, 4
Study 6		X							X	RQ 2, 4
Study 7		X						X		RQ 2, 4

The empirical data in the thesis is based on 2 questionnaires and the results of 152 interviews, of which the author of this thesis conducted 70 (Table 3-2); the remaining 82 interviews were performed by co-researchers in the different studies (see Appendix VIII). These interviews, however, have been included as a basis for this thesis, since they have been part of the analysis. The interviews have been fairly divided between local authority representatives and freight stakeholders. Local authority representatives are represented by deputy mayors, freight planners, traffic planners, environmental officers, economy or strategic planners of authorities. The freight stakeholders have in turn been divided between transport operators, haulers, trade associations, service transport operators (e.g. laundry services for HoReCa), property owners and freight terminal operators.

Table 3-2 Total number of interviews, in total as well as the ones performed by the author personally.

	Germany	Sweden	Lithuania	Poland	UK	Holland	Estonia	Sum
Local authority – total	4	11	16	14	16	1	9	71
Freight stakeholder - total	4	8	24	16	14	1	14	81
Sum – total	***8***	***19***	***40***	***30***	***30***	***2***	***23***	***152***
Local authority – author	2	11	7	8	4	1	3	36
Freight stakeholder – author	1	8	8	9	6	1	1	34
Sum - total	***3***	***19***	***15***	***17***	***10***	***2***	***4***	***70***

Interviews have been used as a basis for empirical data in study 2, 3 and 4 as well as follow-up interviews in Study 5.

3.3.1 Study 1 – Literature review

One of the main goals in the beginning of Study 1 was to find and/or develop a definition of sustainable urban freight transport. However, the results from the first study have been used as input when answering all the research questions and have been a literature review that has been continuously revisited throughout the research process. The purpose of a literature review is to condense the existing literature in a field and from this identify areas in which further research would be beneficial (Rowley & Slack, 2004). A synthesis of existing knowledge, to highlight important references in the topic area have been important to be able to develop existing theories and to get a broad understanding of the topic. The aim was to find relevant literature in the field of sustainable urban freight transport, but also regarding neighbouring aspects in order to compare and discuss the field with a broader perspective due to the complex nature of e.g. stakeholder involvement in processes.

Table 3-3 Example of number of hits in one search of (sustainable) urban freight transport[14].

Search engine	Search term	Hits
SCOPUS	Urban freight transport	238
SCOPUS	Sustainable urban freight transport	38
SCOPUS	"Sustainable urban freight transport"	2
SCOPUS	"Urban freight transport"	24
SCOPUS	"Sustainable freight transport"	43
Abi Inform	Urban freight transport	219
Abi Inform	Sustainable urban freight transport	4
Abi Inform	"Sustainable urban freight transport"	0
Abi Inform	"Urban freight transport"	1
Abi Inform	"Sustainable freight transport"	2
Emerald	Urban freight transport	219
Emerald	Sustainable urban freight transport	37
Emerald	"Sustainable urban freight transport"	0
Emerald	"Urban freight transport"	2
Emerald	"Sustainable freight transport"	2

Multiple channels were used to find relevant literature regarding urban freight transport planning, urban freight and sustainability connected to urban freight. For academic papers and reports, searches

[14] This table represents a search made in autumn 2010.

within academic databases were performed; Science Direct (www.sciencedirect.com); Scopus (www.scopus.com), Emerald (www.emeraldinsight.com) and Abi Inform in ProQuest (www.proquest.com). To reach broader, Google scholar (scholar.google.com) was used as well as reviewing references of relevant papers. Books, reports, journals, conference proceedings and theses available on the Internet were used in the literature review. Links within CORDIS (cordis.europa.eu), literature and Google were used to find Internet pages for projects and consultancy reports. Books and scientific papers that are not in full published or in other ways unavailable online have been ordered through a library.

Search terms were obtained primarily from the research questions and purpose of this thesis. Some search terms were used in combination with other terms related to the subject. Some keywords from related references were also used to reach the appropriate references (e.g. transport planning, city logistics, urban distribution, vehicle restrictions, transport policy, policy measures, urban freight demonstration project, transport + urban form, urban transport solutions, evaluation urban freight, indicators urban freight, goods movements). Table 3-3 presents a sample from the result of the search for (sustainable) urban transport during the literature review. Results from Study 1 are used throughout the papers and the covering paper of this thesis.

3.3.2 Study 2 – Transport review

The first three research questions are addressed in Study 2 of this thesis. The aim of the study is used to draw general conclusions about relevant factors that should be considered when planning and adopting SUTPs and to identify the scope for freight transport in urban areas. Study 2 and Study 3 are very closely related, since they both use cities from the project BUSTRIP as case studies. Table 3-4 gives an overview of the 11 cities and 1 region that are used as a basis for both the studies. All of the participating cities in the BUSTRIP project undertook a self-assessment and a peer review. The reports from these are used as input in Studies 2 and 3, although the cities in the studies are researched in greater depth. The reports that exist for all of the 12 cities and regions in BUSTRIP comprehensively present the case cities used in this research, and are published but not included in this thesis. However, the self-assessment guide, on which the description of the case cities is based, is appended to the thesis (see Appendix II) together with the peer review schedule (see Appendix III).

Study 2 consists of three case studies in three cities (Kaunas, Tartu and Gdynia). Those cities were assigned to the author of this thesis as a part of the BUSTRIP project, where the task was to participate in a number of peer reviews (see description in the following paragraph). The peer reviews were conducted through a process whereby the cities first of all wrote a report of their performance within sustainable transport in the city, i.e. a “Self-assessment Report” based on a template that was the same for all the cities in the project. In this report, they had to answer questions regarding the municipality profile (geography, administration, political issues, etc.), drivers (factors that imply actions for sustainability), plans and, policies that could affect the SUTP (Appendix II). When this report was finalised, the group of experts (“peer review team” – including the author), which was assigned to each city, read the report, reflected on it and, thereafter, visited the city for about a week. During this week, the peer review team conducted interviews with city representatives, stakeholders and politicians, etc. to confirm the contents of the self-assessment report and find missing pieces, as well as help the cities find relevant factors to act upon when planning and adopting an SUTP (Appendix III). The peer review team concluded their work for each city with a report about the results.

Table 3-4 Case study sample (X: cities visited by author or co-researcher (X): complementary data via reports, projects meetings and workshops).

	BUSTRIP Self- assessment	BUSTRIP Peer review	Transport review (Study 2)	Freight review (Study 3)
Old EU-Member States				
Bremen (DE)	X	X	Co-researcher	Author, Co-researcher
Gothenburg (SE)	(X)	(X)		
Kouvola Region (FI)	(X)	(X)		
Örebro (SE)	X	X	Co-researcher	Author, Co-researcher
Sundsvall (SE)	(X)	(X)		
Turku (FI)	(X)	(X)		
New EU-Member States				
Gdynia (PL)	X	X	Author	Author, Co-researcher
Kaunas (LT)	X	X	Author	Author, Co-researcher
Liepaja (LV)	(X)	(X)		
Pärnu (EE)	(X)	(X)		
Tartu (EE)	X	X	Author	
Vilnius (LT)	(X)	(X)		

Transport in urban areas in general was included in this review. The surveys are based on the desire to collect information from a sample of respondents from a well-defined population. The results should be used to answer specific research questions (Czaja & Blair, 2005). In this thesis a survey process and planning process have been followed as described by Czaja and Blair (2005): 1) survey design and planning; 2) pretesting; 3) final survey design and planning; 4) data collection; and 5) data analysing. Both the "self assessment" and "peer review" guides have been developed in previous projects and tested through those and in this project are adapted to the prerequisites defined by the project and developed through workshops in the BUSTRIP steering group.

Document analysis is often used as a way to collect background material in qualitative research. The information and data collected from the document analysis are often rich and accessible (Silverman, 2001). The document analysis in this study was performed partly as an analysis of policies and plans in the studied cities, and partly as an analysis of reports, presentations and statistics from other projects of interest. The value of the document analysis in the study is to learn more about the cities that take part in the study and how they establish plans and policies, as well as being able to perform better in-depth interviews. With an extensive document analysis before interviews, the researcher is likely to get a better response during the interviews since it is possible to ask relevant questions as well as equally relevant follow-up questions and to gain a better understanding of the answers.

There are two types of observation possible for research: field observations and laboratory observations (Hellevik, 1996). Studies where situations are observed in their natural, social context (field observations) can be both participatory and non-participatory, as well as either explorative or hypothesis testing. Observations make it possible to discover problems and phenomena that would not be included in the further research study without observations. In this research, explorative field observations of both a participatory (Study 2 and Study 5) and non-participatory character (Study 3) have been used. The non-participatory observations in this study were not used as a direct source for

data, but mainly to find interesting "phenomena" for further studies and in order to understand how stakeholders of interest for the study handled different situations.

Interviews have been an important data collection method in Studies 2, 3 and 5. Interviews are the basis for Study 7 as well, but then as a comparison with another researcher with no new interviews, and therefore in Table 3-1 are mentioned only as a comparative analysis. The interviews are of a semi-structured type in all three studies. The results from the interviews consist of facts about behaviour and attitudes, as well as of structures. To get comparative results from the interviews, certain questions needed to be answered in all interviews (see Appendix II, III and IV). The interviews were conducted as personal interviews, face to face, and the respondents were aware of the purpose of the study. This could be called direct and unstructured type of interviews (e.g. Halvorsen, 1992; Hellevik, 1996). With unstructured interviews, the questions are open-ended rather than multiple-choice alternative answers. Since I was looking for reasons behind problems, it was necessary to have open-ended questions. Kvale (1997) highlights the importance of thoroughly planning the interview and presents seven stages of an interview survey, which have been followed: 1) thematic description of the survey – how and why?; 2) planning of all stages, considering the knowledge aimed for; 3) interview carried out; 4) transcription of the material; 5) analysis of the material; 6) verification of the generalisation, validation and reliability of the results; and 7) reporting of results and methods used.

In Study 2, a total of 84 interviews were conducted, divided between the 3 cities (Kaunas, Gdynia and Tartu) as well as between different types of stakeholder (32 with local authorities and 42 with freight stakeholders), of which the author personally participated in 17 interviews (see Table 3-5), but participated in the analysis of all interview results during the peer review analyses respectively.

Table 3-5 Interviews in Study 2 (author's in brackets)

	Kaunas	**Gdynia**	**Tartu**
Local authority	12 (3)	11 (5)	9 (3)
Freight stakeholders	19 (3)	9 (2)	14 (1)

The interviews were prepared by the peer review team as well as during the development of the BUSTRIP project. The interviews during the peer reviews were the main focus during the research project and therefore were well prepared. The material from the development and descriptions of the interviews are well documented in the BUSTRIP project. The interviews were planned in accordance with the same structure in all cities (see Appendix III) and the interviewees were all well prepared for the interviews, partly through a description of the BUSTRIP project and its purpose, partly by being presented as part of the interview guide before the interviews took place, when interviewees were informed about the topic and the main questions in order to prepare them as much as possible. The questions dealt with all types of transport operations and planning by the authorities as well as other stakeholders in the city. As a consequence, the issue of freight transport was raised in all interviews performed as one of the question areas. The purpose of the interview sessions in Study 2 was not to discuss freight transport per se, but to look at the entire transport situation in the municipality of study. For the purpose of this thesis, this was interesting in order to identify the awareness of freight transport as one of the topics of discussion as well as to look at how urban freight transport is handled in those cities, both from the perspective of the local authority but also from that of a stakeholder.

The interviews performed by the author had the most obvious linkage to freight transport, but the analysis of the interviews were for all three cities made as a joint effort by the peer review team as the conclusion of the peer review week, in order to have all the results in fresh memory with the advantage that the analysis was carried out in the city of study, therefore making it easier to complement with follow-up interviews and questions if necessary. This created an opportunity for also taking up the results from the other interviews performed within the cities. Regarding the transcription of the material, the interviews were not recorded, which, according to Silverman (2001), could be an obstacle. He argues that interviews need to be recorded to validate the result. But, in some of the interview situations, the interviewees did not want the conversation to be recorded, and for the rest of the interviews it was regarded as too time consuming to handle the information from the recordings afterwards, since this would not add significant value to the factual results compared to taking notes. In order to validate the results, most of the interviews were conducted by more than one researcher (two or three), and notes were taken by all of them, but also cross-checked with interviewees. Those steps were all a part of validating the results from the interviews.

The results were reported orally to the city and its stakeholders of transport by the last day of the peer review week with the possibility for direct reactions and thereafter summarised in a report published by the BUSTRIP project. Study 2 has contributed to the overall understanding of the role of urban freight transport at the local authority level and also contributed to Papers I and II. The results are further developed in Chapter 5.

3.3.3 Study 3 – Freight review

To address research question 1, but also to some extent the other three research questions, i.e. to understand why freight transport has a minor role in urban areas, as well as understand how to overcome this barrier, in Study 3, a case study approach has been used involving four European cities (Kaunas, Gdynia, Bremen and Örebro). A case study approach was considered the most suitable approach, with interviews as the main data collection method, since this would give a good possibility to get an accurate scenario of urban freight transport. The selection of the case studies was made based on the peer reviews in Study 2, discussions with the co-researcher of this study and the fact that logistics and freight transport activities play a strong role in those cities. In addition, the local authorities were willing to share information, and they accepted significant interviews with authorities as well as local business regarding freight transport in the city. The four cities differ in size as well as in economic and social circumstances. As the study includes cities from both the old and new member states of the EU, a substantial difference is the “political and administrative culture”. The level of transport planning experience varies among the participating cities from almost non-existent to quite high. A series of 34 in-depth interviews has been conducted in the four cities (Table 3-6), of which 20 were freight stakeholders (transport customers, research institutes, freight forwarders and transport operators) and 14 were local authority representatives. The interviews have also have been complemented with information from peer reviews and self-assessments made in the BUSTRIP project (see Appendix IV, for an interview guide). The interviews were performed in person by the same two researchers (the author and a co-researcher) in all four cities, ranging from one to two hours each. The same types of questions were asked of all interviewees.

Table 3-6 Conducted interviews in the in-depth freight review.

	Bremen	Örebro	Kaunas	Gdynia
City administration	4	3	4	3
Transport customer		1	1	1
Freight forwarder	2	2	1	1
Transport operators	1	1	2	4
Research institute	1		1	1

The interviews were prepared and developed by the author and the co-researcher of Study 3. The basis for the interviews was the "peer review" report from Study 2 and the focus was to find the missing aspects of freight transport. The interviewees were selected in co-operation with the local authority representative in the BUSTRIP project in order to find the most relevant stakeholders. The interviewees were prepared for the interviews with a description of the purpose of the study as well as presented to the interview guide prior to the interviews. The interviews were carried out similar to the process of Study 2, during a couple of days spent in the case city with the possibility to complement the interviews depending on the outcomes. The interviews were not recorded in Study 3, with the same argument as in Study 2, but also with the same possibilities to validate the results by asking follow-up questions and checking the transcribed interviews with the interviewees. The results from the interviews are summarised, analysed and published in Paper III.

3.3.4 Study 4 – Swedish freight review

After the three first studies, research questions 1 and 3 was considered to need more input for the results, which is why Study 4 was introduced. With this study, the aim was to get a more comprehensive view of a larger selection of cities in order to get a view of the situation today and what the main barriers and drivers are at local authorities (municipalities). The focus of Study 4 was on Sweden. To gain more empirical data on the knowledge and awareness of urban freight transport amongst local authorities, a questionnaire was sent to all Swedish municipalities during spring 2008 about their work with freight transport. The decision to choose Sweden as the study area for the questionnaire was based on the fact that the language barrier of the respondents would be less.

Sweden is not as densely populated as many other European countries. There are just fewer than 9.5 million inhabitants in Sweden with a population density of 23 persons per km^2. The country consists of 290 municipalities (SCB, 2008), of which some consist of several urban areas. From a European perspective, one limit that is used to describe large cities is 100,000 inhabitants (see also discussion in Section 1.4 – Scope). From the KOLADA database (Swedish Association of Local Authorities and Regions, 2011), it is possible to retrieve data about the municipalities and, in 2009, there were 13 municipalities with more than 100,000 inhabitants, 202 municipalities with between 10,000 and 100,000 inhabitants and 75 municipalities with less than 10,000 inhabitants. The vast majority of municipalities in Sweden are thus small- and medium-sized and 55% of the population lives in those areas. For this study, in order to divide the results of the questionnaire into more equal groups, the responses were divided into three sub groups: small cities (less than 10,000 inhabitants; total of 75 cities), medium-sized cities (between 10,000 and 50,000 inhabitants; total of 170 cities) and large cities (more than 50,000 inhabitants; total of 45 cities).

The term city does not exist in Sweden as a concept and the correct term for the administrative body is municipality, although many municipalities use city in their profile, e.g. the City of Göteborg

(Gothenburg). However, the term city is used throughout the paper (IV) since it is a common phrase from a European perspective.

Two questionnaire studies are included in the research process of this PhD study (in Studies 4 and 5), and both have been following the planning process described by Czaja and Blair (2005) in Study 2 above. In this Study (4), the questionnaire was based on a direct and mainly structured method (Hellevik, 1996), with mainly multiple-choice questions but also some follow-up questions with an open-ended response possibility to get a more holistic view of the situation in different cities. The questionnaire was sent to *all* municipalities in Sweden. The questionnaire was addressed to an in-advance identified person responsible for freight transport. In order to find the relevant person, a lot of time was spent on identifying the right respondent. Telephone calls were made to all municipalities in order to identify a person responsible for freight transport in order to get as valid responses as possible. However, according to those telephone calls, only three municipalities had a specific person handling freight, and for all other municipalities the questionnaire had to be sent to a person responsible for traffic or transport planning in general for the urban area. In many municipalities, those responsibilities only represented a small part of the general technical planning. This fact is further discussed in Section 5.1.1.

The questionnaire consisted of 34 questions and was introduced with a letter explaining the purpose and focus area of the survey (see Appendix V, in Swedish). The questions were grouped into five categories: 1, facts about the municipality (number of inhabitants etc.); 2, facts about traffic and transport within the municipality (Full Time Equivalent [FTE] working with transport planning, FTE working with freight transport planning, co-operation between departments, etc.); 3, environmental aspects of transport (factors of importance in transport planning); 4, questions of freight transport specifically (problem areas, barriers, drivers, restrictions, co-operation, available statistics, etc.); and 5, questions regarding the respondent (sex, age, education, etc.). The questionnaire was pretested on both colleagues and civil servants at municipal offices before being sent out to the respondents.

The questionnaire was sent out by email to all respondents and was conducted through a web survey, making the tracking of respondents, collection and summarising of the results easy to handle. The decision was based on the convenience of this method in case of limited resources in time, since web surveys are quick and cost-effective (Czaja & Blair, 2005). Results could easily be compiled from a web survey and no extra time was needed to code the answers from questionnaires compared to if sent in paper format. Another positive argument for this method was the advantage of easy access to the survey via email, which could generate quick response and easy follow-ups. The disadvantage of a web survey could be the answering frequency, which in some cases are argued to be lower, resulting in potential response bias (Czaja & Blair, 2005). Another argument against web surveys is that low knowledge of Internet use could result in low response rates. But, in general, Internet use has increased in recent years and for all municipalities it was possible to find an email address for a person whom the survey was addressed. The survey was conducted in Swedish, and the results presented in this paper are therefore translated. The questionnaire included many questions, and with hindsight it would have been more efficient to ask the questions in a way that would have been more suitable for a quantitative analysis. Nevertheless, the qualitative nature of the results from the responses gives a good insight into the status of the awareness levels.

The response rate was 32.4%. For small cities, the response rate was 24.7%, for medium-sized cities it was 27.9% and for large cities it was 44.4%. Three percent of the respondents declined to respond to the questionnaire. The remaining non-response is quite evenly distributed amongst the three groups. However, additional telephone calls were made after the survey ended, to a sample of the non-

response respondents in order to recall the reasons for not answering. Lack of time was a problem in the larger cities. Many of the small cities have no one at all working within the area and do not see freight transport a problem and therefore did not respond to the questionnaire. The results of Study 4 are analysed and published in Paper IV.

3.3.5 Study 5 – Freight partnerships

Study 5 aims at a deeper understanding of what local authorities can do in terms of urban freight transport, i.e. addressing research question number four, but also adding to the understanding of today's practice in research questions 1-3. The existence of different types of stakeholder co-operation in forms of freight networks or public-private partnerships was studied here, since this was a subject encountered during interviews in earlier studies. The case studies were made in London, UK and Gothenburg, Sweden, but were also complemented with interviews of representatives from similar networks in Utrecht, Holland, and in Lidkoping, Sweden, as well as of a literature review of the topic. The study was conducted in co-operation with the University of Westminster in London.

In total, five cities that have implemented public-private urban freight partnerships were studied: Paris, Utrecht, Lidkoping, Gothenburg and two different groups in London (Central London Freight Quality Partnership, Central London Freight Quality Partnership [CLFQP]; and Commercial Delivery Group Westminster, CDGW), at various levels of detail (see Table 3-7) during a two-year period (2010–2012). The cases represent cities of different size and structure, wherein London and Paris are European mega-cities (although only central parts of London are included), Gothenburg and Utrecht are middle-sized cities and Lidkoping is a small city (considering a European perspective of cities' size).

Table 3-7 Urban freight partnerships that have been studied.

	Paris	**Utrecht**	**Lidkoping**	**Gothenburg**	**London – CLFQP**	**London – CDGW**
Secondary data – reports etc.	X	X	X	X	X	X
Primary data - interviews		X	X	X	X	X
Primary data – participation			X	X	X	X
Primary data - Questionnaire				X	X	

The study consists of both secondary data, based on governmental and project reports written about or to support the freight partnerships or networks that have been studied and primary data, which consists of interviews, a comparative questionnaire survey and (observer/researcher) participation. A combination of methods has helped to get background data and information as well as participants' views of the partnerships and establishing factors that should be considered in the formation and continuation of partnerships. The interviews were important in order to understand the different partnerships, whilst the questionnaires enabled a wider number of participants to express their views in

a structured way. Furthermore, the participation during partnership meetings has helped in our understanding of the relationship and interactions between participants both formally and informally.

A total of 24 interviews were performed in Utrecht, Lidkoping, Gothenburg and London with a selection of participants of the different freight partnerships, in order to get an understanding of the initiation, structure, problems and possibilities in the different areas. The interviews were of a semi-structured type, wherein the interviewees were given the opportunity to speak freely about their perception of the freight partnership in which they participate (see Appendix VI for an interview guide). The interviews were prepared together with the co-researcher and the questions were developed based on a relevant literature framework (see Paper V). The interviewees were prepared for the interviews through an introduction of the purpose of the interview via email. The selection of respondents was made in co-operation with representatives from the cities or responsible persons from the freight quality partnership. The interviews were face-to-face interviews conducted by the author of this thesis. The interviews were not recorded (see previous discussion), but transcribed directly after the interview session and then cross-checked with the interviewee if any additional questions occurred. The interviews were essential in order to understand the nature of the partnerships, how the participants viewed the partnerships, the organisation and its usefulness.

The researchers (the author and a co-researcher at University of Westminster, London, UK) have also participated in a number of meetings for several of the cases studied. The most active participation has been in the cities of London and Gothenburg where both researchers have been involved in the freight partnerships – in the London (CLFQP) case chairing the quarterly meetings (co-researcher), in Gothenburg by regular attendance at meetings during a 12-month period (author) and also a workshop in which both researchers of this study participated. The workshop was held during one of the partnership's regular meetings and was introduced with a short presentation of similar partnerships existing in Europe, and thereafter the participants were divided into smaller groups of 6–8 persons, discussing freely under the topic "the future of the local freight network", aiming at developing the partnership in terms of structure, members, topics discussed and possible outcomes.

Participation in these meetings has given the researchers a wider understanding, valuable insights into the interaction and relationship between participants and the formal and informal structures of the partnerships as well as providing contact with interviewees. Both the interviews and the participation at the freight quality partnership meetings have provided insights into and identification of a list of questions that it would be beneficial to get a with a wider coverage of. This list was transformed into a questionnaire, which was handed out to all the participants available at an ordinary partnership meeting in Gothenburg as well as in the CLFQP, during one of the respective groups' ordinary meetings (see Appendix VII for the questionnaire design). The questionnaire was handed out at the beginning of the meeting and collected at the end, resulting in a very high response rate. The questionnaire, which was prepared and developed together with the co-researcher, contains seven open-ended questions regarding the participant's perception of the network/partnership, their work, the outcomes, successes and failures. The questions were tested on a representative from the Gothenburg freight network. In Gothenburg, all the participants present at the meeting (18) completed the questionnaire and a further two stakeholders who were not present at the time completed the questionnaire by email. Therefore, a total of 20 responses were received (the network consists of approximately 25 participants). In London, a total of 11 responses were received from a total of 25 circulated. Twenty-nine responses forms the basis for the analysis together with the interviews and the observations made during participation at meetings. The analysis was based on a structured assessment matrix, developed in Paper V.

3.3.6 Study 6 – Collaborative workshops

The SUT project gave the opportunity to address research question 4 in depth, but also contributed to research question number 2, through collaborative workshops in Study 6. The workshops were held as regular meetings of a project group, consisting of representatives from the project partners (see Section 3.2.2). Ten workshops were held in order to develop a framework model for how to consider all aspects of urban freight transport when finding a suitable measure that could contribute to a reduced negative impact from freight transport in the urban area. The framework development workshops were an iterative process, where each meeting was concluded with a draft version of a framework model. The participants thereafter had the possibility to rethink and redevelop the input between meetings in order to further develop and improve the model during the next meeting.

The input to the workshops has consisted of literature studies (Study 1) as well as results from the interviews in the previous studies (Studies 2, 3 and 5), in order to take into account previous research in the field as well as the views of stakeholders. The sixth study has mainly contributed to Paper VI, even though the framework model is presented only in this covering paper of the thesis. The results of the workshops will also be presented in the SUT project report in mid-2013.

3.3.7 Study 7 – Comparative study

Research question 4, as well as research question 2, were also addressed in Study 7, which is a comparative study between research performed in my earlier studies (mainly Study 3, but also Studies 5 and 6 to some extent) and the very similar research performed by a co-researcher at University of Leeds, UK. Interviews that were conducted in five Northern European countries, with representatives from local authorities and the freight industry were addressed in this study. No *new* interviews were performed in this study, but already performed interviews in Studies 2, 3 and 5 were used as a basis together with 22 interviews performed in the UK by the co-researcher of this study. A total of 74 semi-structured interviews (see Appendix VIII for a full overview of all conducted interviews in this thesis) were therefore considered in this study, conducted over the period of study, 2008–2012 (Table 3-8). The purpose of the study was to compare the results of interviews conducted with freight stakeholders and local authorities in two different studies.

Table 3-8 Interviews analysed for the comparative analysis

	Germany	**Sweden**	**Lithuania**	**UK**	**Poland**
Local authority	4	9	4	16	3
Freight stakeholder	4	8	5	14	7

The interviews of Study 3 and Study 5 were to a large extent very similar to the ones performed in UK by the co-researcher why those were chosen to be compared in this study. The selection of interviewees was done in similar ways for both research processes (see Paper VI for detailed presentation).

In order to compare the studies made by both researchers, the interview questions were grouped under two main/overarching themes, firstly general perceptions of urban freight and secondly the relationships between local authorities and the freight industry. Questions under the first theme were aimed at determining the following perceptions of:

- the importance of freight in the urban economy;
- the extent to which local politicians and the general public recognise the role of urban freight; and,
- the nature of urban freight problems.

The second theme examined the following aspects of relationships and interactions between the freight industry and policy makers based on the raised issue in the frame of reference (see Section 2.3.6):

- consistency of approach towards freight issues both regionally and nationwide;
- the level of involvement with the freight industry (willingness of both parties to interact with each other); and,
- suggested ways for the freight industry to become more engaged in policy decision making.

The analysis was performed as a joint discussion between the two researchers in the Study, where the interview results were compared and structured according to the two themes above. The results of the comparative study are presented in Paper VI. Even though the results from the earlier studies in this research have not changed through this comparative study, these have led to a further development of the contribution from the results.

3.4 Research quality

This section of the thesis addresses the quality of the research and, addresses validity and reliability. Validity implies reliability, but reliability does not necessarily imply validity. A reliable study may be measuring something correctly, but not necessarily what it was supposed to be measuring (Silverman, 2001). Both validity and reliability are important for developing relevant theories and models. However, Halldórsson and Aastrup (2003) discuss the need for a slightly different approach to the research quality discussion of qualitative research, wherein trustworthiness plays an important role. Hence, a discussion on the research quality is valuable to show that the research is performed in an accurate and rigorous way in order to argue for credibility and trustworthiness. This section will therefore discuss both the traditional validity and reliability context followed by the trustworthiness discussion suggested by Halldórsson and Aastrup (2003).

Over the last several decades, logistics research and the methods used within the research topic have been more and more discussed by a number of authors (e.g. New & Payne, 1995; Gammelgaard, 2004; Halldórsson & Aastrup, 2003). A traditional technical research approach with quantitative methods is not always the most appropriate, depending on the research questions asked and the problem setting. New and Payne (1995) argue that sometimes a more unusual and novel method could be more suitable when addressing "soft" issues within the logistics research. It is about telling a story and to explain a certain complex issue, when it is valuable to use combinations of soft studies in order to understand the nature of, in this case, the urban freight transport in the context of local authority transport planning processes. Hence, in this thesis, several different methods have been used and, throughout this section, these are explained as thoroughly as possible to better enable the reader to follow the process and by that judge the reliability and trustworthiness of the research results.

There is always a risk of bias in qualitative research. A researcher is biased through a pre-understanding of a topic, plus the respondents of the research surveys are biased in their perception of the topic. Through preparing surveys, both interviews and questionnaires, thoroughly and testing the questions before conducting the surveys, as well as by analysing the results based on several sources of information, the author has tried to remain as unbiased as possible in interpreting and presenting the results.

3.4.1 Validity

A valid measure is one that measures what it is supposed to measure (Kvale, 1997). This originates from quantitative research, but could also be applied to qualitative research. A good theoretical base together with a dialogue with the research group to ensure a common view of definitions and concepts are important factors to increase validity (Halvorsen, 1992). Triangulation and respondent validation are two methods that are appropriate for validation according to, e.g. Yin (2003). Silverman (2001) argues that this is not appropriate, though, since it does not take into account the social perspective or discuss problems with aggregation of the data that can occur. In this research, both triangulation and respondent validation have been used as a method to validate the research, since the aim was to develop theory, and not study the social perspective in a deeper meaning. Triangulation has been used to obtain different views of the same topic (several different case studies), and respondent validation has been used to confirm that the interviewees were understood correctly.

3.4.2 Reliability, credibility and trustworthiness

Testing reliability is made through comparing different studies of the same phenomena (Hellevik, 1996). With interviews, e.g., the reliability can increase if the same question is asked of several interviewees. According to Silverman (2001), standardised methods for writing field notes, analysing data and comparing the same data by several researchers are good ways of increasing reliability. Several researchers have been engaged in the subject, interviews and data analysis. With such types of studies, there is always a risk that information gained during the work will reflect the cities and countries' overall political influences as well as behavioural issues. The biases from the researchers, the city representatives and the other stakeholder representatives may influence the results and should be considered before constructing the theory. In the BUSTRIP project, there was an understanding that the cities would work in co-operation with the researcher to develop transport plans and also to increase freight transport knowledge, which helped create an effective collaboration and an insight into the cities' work for the researcher, which has been high.

During the part of the research study wherein earlier studies in my research were compared to the UK, Study 7, regarding local authority decision-making processes as well as working with networks, identical studies were performed in both the countries, which has increased both the validity and reliability of the results. Study 7 was created when an opportunity arose to compare the research results from the previous studies, with the research results from a researcher in UK. Unaware of each other, studies that were similar and in some parts identical were performed at different sites during the same period of time (see Section 3.3.7). This developed as a unique way of approaching the credibility of the research results. When a study is conducted at several sites and the results are comparable, the results are credible, but if several investigators study the same phenomena at different sites, with different methods and get comparable results, this gives a very high credibility to the results (Johnson, 1999) – this is known as investigator triangulation. In this case, two researchers that have performed individual studies at the same time, at different sites, have gotten comparable results; however, using the same method (interviews). Nevertheless, this gives solid results and creates good opportunities for a valid analysis and significant conclusion. Discussions have confirmed a similar interpretation of concepts and interview topics between the researchers.

Trustworthiness of a study could, from a logistics perspective of qualitative research, be discussed from the views of "truth-value", "transferability and contextualism" and "trackability and explicity" instead of the more traditional quantitative research approach of reliability and validity (Halldórsson & Aastrup, 2003). If we consider this research from these perspectives, the truth-value would be high if the credibility is high, which has been shown above through the comparative study with the UK researcher. Another aspect of high truth-value would be that the number of interviews performed is high with very coherent results, which would indicate that the respondents have interpreted reality in a similar way. The transferability and contextualism are specifically addressed in this thesis, since, to a high extent, the focus has been on "best practices". Given these prerequisites, this is highlighted as a risk, as is the fact that every city has its own certain prerequisites that need to be considered in order to find suitable solutions. Further discussion will follow in the results and conclusion sections. Considering trackability and explicity, this method section and the appended interview guides and questionnaire designs attempt to be as specific as possible in order to show the research performed.

3.5 Generalisability of results

The generalisability of the results is discussed in order to put forward the context in which the results are valid. Given the pre-understanding of the topic to be a very general statement, it is interesting to discuss the results of the thesis to see if it is possible to generalise the results beyond the case cities studied.

The frameworks developed in the thesis as well as the studies performed are based on the previous literature, which implies that they are valid for several contexts, not only those studied in this particular thesis. The results of the studies in this thesis are based on the case studies and surveys performed and are, therefore, related to the cities that have been studied in Sweden and Northern Europe. This has given a possibility to compare small cities with large cities, and there are no reason to doubt that the results from the studies can be used to generalise for other Northern European cities since the results aim at exploring the freight transport situation in different cities and the framework of the suggested model to work with freight transport in urban areas is of a general character. The comparative study in Study 7 has confirmed the validity of the results and the generalisability by comparing two individual studies of several case cities. Study 7 and the discussion regarding the empirical data of this thesis in Paper VI also suggest that at least in the context of Northern Europe, not much difference exists between small and large cities in how freight transport is considered and successfully included in the transport planning processes. This by considering that every solution is context specific and it is not always the whole city that should be considered, but just a certain area. Southern Europe might give other results for main issues to consider, since the culture of the region is somewhat different from the north, as well as containing more densely populated regions. In addition, one author goes as far as suggesting that city logistics might never work in Spain (Muñuzuri et al., 2012a). However, Wang (2010) suggests that ideas and possible solutions are also transferable between very different types of cities regarding cultural as well as historical aspects, but it is then necessary to be aware of the contextual differences and to adapt the experiences to the prerequisites and requirements of the area of interest. The model presented in this thesis takes into account such differences and should therefore be possible to use also in very different contexts, but it is important to perform a thorough search for the applicable measures.

4 Summary of appended papers

Six papers are appended to the thesis. The papers present the results of the studies performed in the research process and summarised in this chapter.

The basis for this thesis consists of the seven studies performed in the research process in order to answer the research questions. The core analysis for this thesis, based on the results from the studies, has been presented in the six papers that are appended to this thesis. Figure 4-1 shows the relation between each paper and the performed studies as well as their relationship with the research questions. The results of the research questions are not explicitly answered in the papers, as is indicated in the figure. Therefore, the results of the research questions are presented explicitly in Chapter 5. Equally, the connection between the studies and the papers are the *main* links, but some papers have used input from other studies as well (in particular Paper II, therefore this is highlighted in the figure below). Study 6 is an overall study that has not contributed in particular to any of the papers, but mainly to the covering paper of this thesis as a general understanding, but above all to RQ 1b and RQ 3.

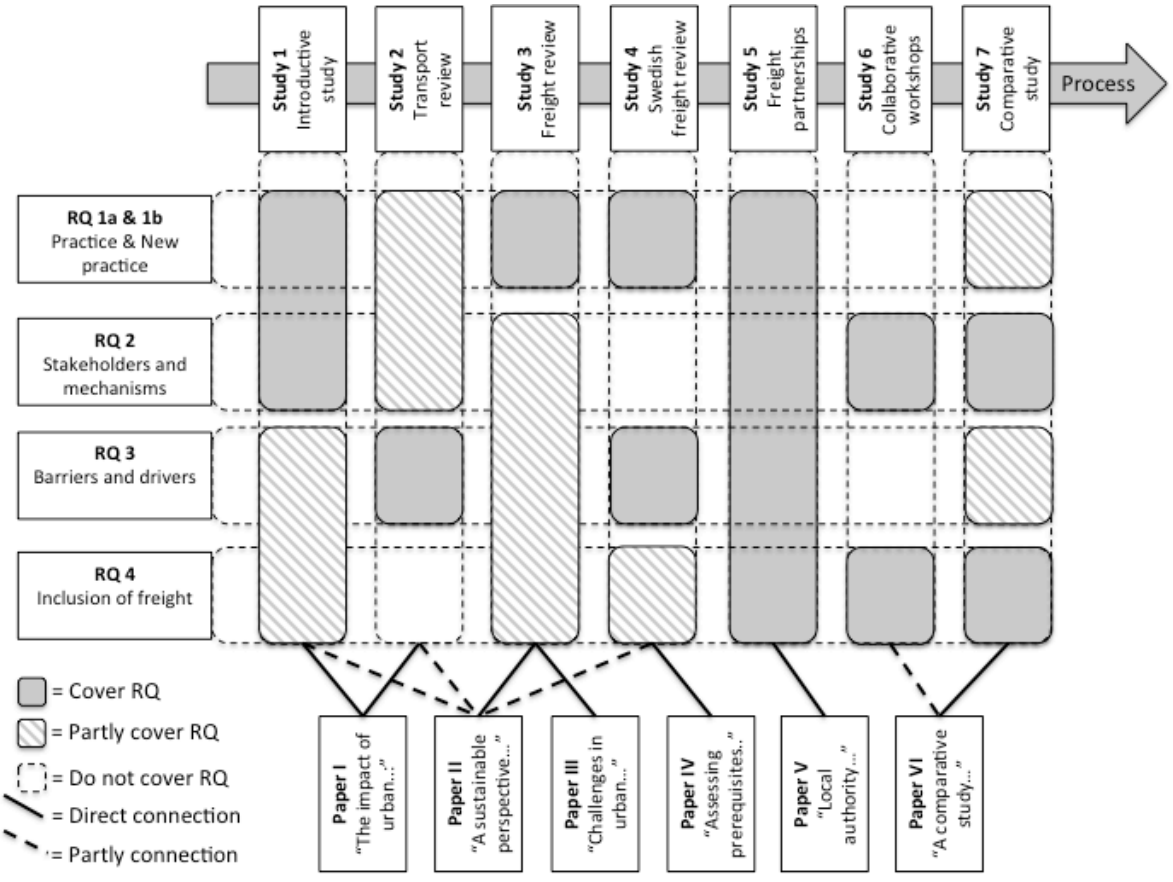

Figure 4-1 The papers and their relation to the studies in the research process.

Each paper will in this chapter be summarised in this section, focusing on the purpose and the results. The methods used have been presented in the previous chapter (each study).

4.1 Paper I – The impact of urban freight transport: A definition of sustainability from an actor's perspective

The primary aim of Paper I is first and foremost to contribute to the answer of RQ 1b, but also RQ 1a and 2, i.e. setting the scene for urban freight transport. Two studies are the basis for the paper, Study 1 and Study 2, but the results have also contributed to RQ 3 and to some extent RQ 4.

4.1.1 Purpose and outline

Paper I approaches urban freight transport with the purpose of reviewing the definitions of sustainability, freight transport and other relevant concepts and consolidating them into a definition of sustainable urban freight transport. In order to make the definition more accessible for policy makers as well as other stakeholders, a matrix with a suitable set of indicators is presented.

The paper is outlined in two main sections. Firstly, there is a section about the main findings from a literature study (Study 1) made in the field of sustainable urban freight transport, where the basis is the project in the second study (Study 2). Definitions and previous work in the fields of sustainability, sustainable urban transport, urban freight transport and sustainable urban freight transport are studied and discussed. Based on this account, the section concludes with the development of a definition of "sustainable urban freight transport". Secondly, an indicator set is developed with the help of a matrix that connects actors and impacts. The indicator set consists of two levels: 1) impact indicators, which describe how urban freight transport violates the principles of sustainability and 2) performance indicators, which describe different categories determining the characteristics and performance of the urban transport system. The paper closes with a discussion of the implications and conclusions.

4.1.2 Main contribution from the paper

Paper I presents the results of a literature review conducted to define what constitutes sustainable urban freight transport. The basis of the literature review consists of five questions: *What is sustainability?; What is sustainable transport?; What is sustainable urban transport?; What is urban freight transport?;* and *What is sustainable urban freight transport?* Based on the results of this literature review, the following definition of sustainable urban freight transport is put forth. A sustainable urban freight transport system should consider all stakeholders involved and the requirements and interests put forward, while contributing to the sustainable development of the urban area. Hence, a sustainable urban freight transport system fulfils the following objectives:

- To ensure the accessibility offered by the transport system to all categories of inhabitants, commuters, visitors and businesses, in line with the objectives below.
- To reduce the negative impact of the transport system on the health, safety and security of the citizens, in particular the most vulnerable ones.
- To reduce air pollution and noise emissions, greenhouse gas emissions and energy consumption (including contributing to meeting legislative requirements on air quality and environmental noise, e.g. EC directive 2002/49/EC).
- To improve the efficiency and cost-effectiveness of the transportation of persons and goods, taking into account the external costs.
- To contribute to the enhancement of the attractiveness and quality of the urban environment.

The definition put forward in the paper gives the objectives of what a totally sustainable system would look like. It is a pathway approach combined with an end state vision approach, which implies that this might not be possible to fulfil completely, but gives a hint of the trajectory to fulfilment.

A key problem for implementing an achievable sustainable strategy is determining the parameters of measurement (monitoring and evaluation). Existing indicator sets either fail to reduce the complexities and interdependencies in urban freight transport (pathway policies) or are not applicable to the actors involved (impact indicators of an end-state vision). Hence, there is a need for a tool for decision makers. An indicator set for different actors to use in the monitoring and evaluating the effects of actions taken as therefore been developed (see Table 4-1).

Table 4-1 Indicator matrix for distribution of consumer goods.

Involved actors	**Transport intensity**	**Traffic intensity**	**Technical capability**
City administrations/ Planning agencies	*Land use planning* urban sprawl	*Infrastructure* length of traffic network (road, rail, etc.) number of loading/unloading zones location of loading/unloading zones *Regulations* congestion charge access restrictions	*Regulations* low emission zone
Consignor/ Consignee	*Shipment* number of shipments average size of shipment frequency of delivery		
Freight forwarder		*Mode choice* modal split *Terminal location (excl. City consolidation terminals)* average distance between terminal and city centre	
Transport operator		*Route planning* average distribution distance number of distribution trips total distribution km	*Vehicle choice* vehicle size load factor engine technology fuel type
Impacts		*Accessibility* *Accidents* *Land use*	*Air pollution* *Greenhouse gas emissions* *Energy use* *Waste* *Noise*

The purpose of the matrix is to show functionality, so the complexity has been kept low. The matrix shows that the impacts originate at the traffic level and the level of technical capability. It also shows that mainly one actor group influences each sector in the causal chain – the consignor/consignee determines the demand, the freight forwarder determines the traffic and the transport operator determines the technical capability. Each actor is not only limited to their "own" column to contribute to sustainability, but has the possibility to influence the actions downstream of the causal chain by setting requirements. The matrix shows that the city administrations/planning agencies can influence all segments and thus play an important role in designing sustainable development strategies.

Nevertheless, the matrix shows that they alone cannot solve the problem. All actors need to be involved in an integrated approach to reach sustainability.

4.2 Paper II – A sustainable perspective on urban freight transport: Factors affecting local authorities in the planning procedure

Paper II, together with Paper III, presents the results from Study 3. Studies 1, 2 and 4 contribute somewhat to this paper as well. The results in the paper mainly contribute to RQ 3 by identifying barriers and drivers for sustainable urban freight transport. However, the paper also contributes to RQ 1 and 2 to further develop the insights in the context of urban freight transport.

4.2.1 Purpose and outline

The main stakeholder studied and discussed in Paper II is the local authority, with a focus on the planning procedure of how to handle freight transport that occurs to, from and through the urban area. The purpose is to contribute to the understanding of how freight transport affects the urban environment and how the awareness and knowledge in the local authority have an effect on the urban freight transport situation.

The paper starts with a discussion on research methods as well gives as a frame of reference for the research studied (based on Study 1 as in Paper I, but further developed). Thereafter, the results from the studies are presented followed by a discussion of the findings and conclusions. The results and discussions are summarised below.

4.2.2 Main contribution from the paper

The main contribution from Paper II is the matrix of barriers and drivers, sustainability aspects and the knowledge and awareness aspects of urban freight transport (see Table 4-2). In the matrix, a summary is offered of the identified aspect for different factors: law and regulation; infrastructure and land use; financial; political and cultural; practical and technological; and impacts. The factors are the results from a literature study, wherein a framework model has been presented (see also Paper III, where this model is presented in more detail). The results in the matrix are mainly the outcome of Study 3, but with some input from the questionnaire in Study 4, as well as the literature in Study 1. By presenting this picture, I would like to indicate that the problem of sustainability in urban freight is not an isolated problem that can be solved simply by approaching local authorities – the consignor/consignee, the freight forwarder, the transport operator and the research institutes amongst many others are equally important. Information and knowledge from performed actions should be shared from both "failed" and "successful" actions to reach a sustainable urban transport system with possibilities for long-term improvement. The problems are: knowing what to monitor; what indicators to use; and how to perform a good and useful dissemination of all parts of the performed actions. Trying different methods of improving freight transport (from an efficiency and sustainability aspect) is a big part of the total handling and planning of freight transport in cities.

Table 4-2 Summary of findings of Paper II. (Superscript numbers within brackets indicate the source of the results, where [(1)] is from an interview and questionnaire studies and [(2)] is from literature studies.)

	Sustainability	Knowledge and awareness	Barriers	Drivers
Laws and regulation			Hard for local authorities to set own regulations if not supported by national governance[(1, 2)]	Emission standards [(2)] Maximum emissions for urban areas (European legislation)[(2)]
Infrastructure and land use	To ensure the accessibility offered by the transport system to all categories of freight transport[(2)] To contribute to the enhancement of the attractiveness and quality of the urban environment, by avoiding accidents, minimising the use of land without compromising the mobility of citizens[(2)]		Insufficient infrastructure[(1)] Insufficient knowledge of knowledge of logistics in land use planning[(1, 2)] Focus on passenger transport in planning[(1, 2)]	Lobbying from transport operators and other stakeholders (not necessarily with an sustainability perspective)[(2)]
Financial			Lack of funding[(1, 2)]	Financial instruments (e.g. EC projects)[(1, 2)] Engagement from local businesses[(1, 2)]
Political and cultural		Insufficient support from politics and general policies[(1, 2)]	Business problem ("the market will solve the problem")[(1, 2)] Focus on passenger transport[(1,2)] Lack of interest[(1)] Lack of knowledge[(1, 2)] Lack of stakeholder involvement[(1, 2)]	Obvious needs (e.g. weight restriction in sensitive areas of old towns)[(1, 2)] An engaged person working with the issue[(1,2)] Stakeholder co-operation[(1,2)]
Practical and technological		Insufficient personnel resources[(1 ,2)] Relatively high awareness of possible activities[(1)] Insufficient knowledge of *how* to start activities[(1)]	Lack of known solutions[(1, 2)] Lack of communication[(1, 2)] Lack of dissemination of earlier activities[(1, 2)] Unwanted side effects of activities performed[(2)]	Best practices that show a good result[(1, 2)] Knowing how to handle problems[(1, 2)]
Impacts	To reduce the air pollution, GHG emissions, waste and noise levels without negative impacts on the health of the citizens or nature[(2)] To improve the resource- and energy efficiency and cost-effectiveness of the transportation of goods, taking into account the external costs[(2)]	Low awareness of freight transport impacts[(1, 2)] Lack of statistics[(1)]	Lack of statistics and facts of impacts[(1)] Lack of incentives to deal with impacts[(1, 2)]	Ed for reduction of emissions[(1, 2)] Ed for safety improvements on streets[(1, 2)]

There is a need for the local authorities to be aware of the existing problem, what the priorities are for solutions and to increase the necessary knowledge. But, there is also a need to involve all stakeholders in the process of reducing the negative impacts from freight transport.

4.3 Paper III – Challenges in urban freight transport planning – A review of the Baltic Sea region

Paper III is the outcome of the interviews made in Study 3 and contributes mainly to the answering of RQ 1 but also to some extent RQ 2 and RQ 3. The study included a high number of interviews of various actors and stakeholders, which is why the results of the study have contributed to more than one research question.

4.3.1 Purpose and outline

The purpose of Paper III is twofold, and is stated in the introduction as "first, to analyse the current state of freight transport in urban areas; and second, to identify possible shortcomings of current urban freight transport planning practices". This paper is based on a multiple-case study analysing the current state of urban freight transport and current planning practices in cities around the Baltic Sea. While the cities differ in size, economy and political and cultural frameworks, the transport sector plays a strong role in all cities.

With the purpose as stated above, the paper aims at laying the groundwork for designing strategies and solutions to overcome the challenges involved in securing the mobility of goods and reducing the unsustainable impacts from freight transport. The paper is outlined with the start in a literature review on urban freight transport and integrated planning. Based on the review, a framework on integrated urban freight transport is presented (as discussed in Paper II above), followed by a discussion on the research methodology and the empirical results from Study 3. The analysis is structured based on the framework developed. Implications of the research, conclusions and future research sum up the paper.

4.3.2 Main contribution from the paper

The framework developed is based on Sjöstedt (1996) and constitutes the basis for the analysis of the results in the second part of the paper (see Figure 4-2). The framework is based on four basic elements: *facilities* where the economic activities take place, *goods* that demand transport to and from these facilities, *vehicles* that provide transport services and *infrastructure*. These elements interact in pairs in four different subsystems, which are accessibility, land use, transport and traffic. Together, the interaction of the subsystems determines the performance of the transport system. Industrial production facilities and shopping centres are usually located within city borders as are transport infrastructure facilities like seaports and rail terminals. As a consequence, logistics facilities like warehouses and terminals are established in the vicinity of commercial centres and transport infrastructure. Since economic activities require the movement of goods, a prerequisite for a functioning urban economy is the *accessibility* of goods to these facilities. Providing this accessibility is the main function of urban freight transport and it is the need for accessibility that drives the whole urban freight transport system. The *land use* subsystem comprises the supply of transport infrastructure as well as the location of the facilities in relation to the traffic infrastructure, which are both crucial factors for accessibility. In the *traffic* system, actual physical movements of vehicles are realised in physical networks in which traffic units absorb infrastructure capacity. In the *transport* system, the demand for goods movements to and from the facilities is matched by transport services, which require vehicles to be moved. The framework has also been developed to include: 1) the external factors that influence the urban freight transport system; 2) the SUTP concept and its planning

principles as integrating element (from the BUSTRIP project); and 3) the unsustainable impacts as an outcome of external factors and urban freight transport planning and measures.

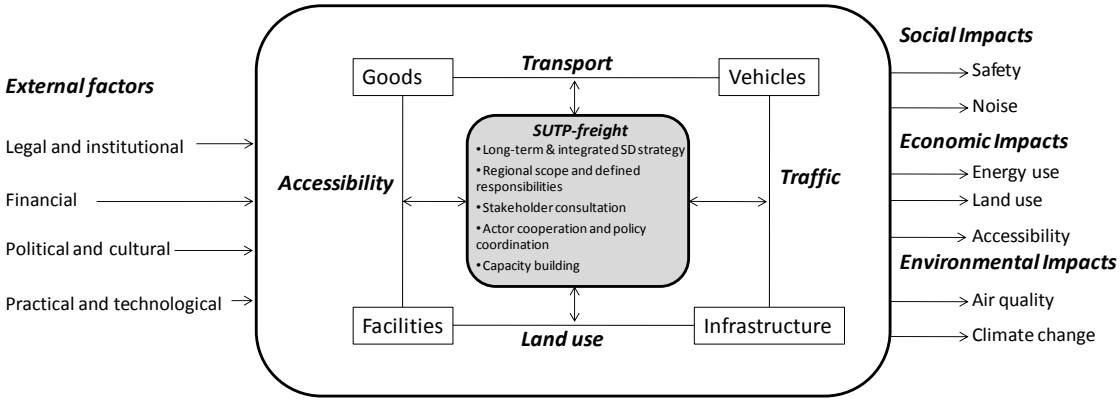

Figure 4-2 The relations between factors affecting SUTP-freight (adapted and developed from Sjöstedt, 1996).

The second outcome of Paper III is a matrix with the summary of the results from the interviews. The matrix is based on the actor-based model of a sustainable urban freight transport system developed in Paper I. The matrix shows the complex relations between different actors, how they relate with different factors and hence the need for an integrated approach that involves all actors. The matrix visualises the actors, their responsibilities and the possible measures that can be taken as a result from the freight transport review in the study (see Table 4-3).

The results from the case study show that freight transport is increasingly important for regional competitiveness while freight traffic is a growing threat for urban sustainability. In turn, the urban context is a barrier for efficient freight operations. However, both local authorities and transport operators neglect the problems that arise from freight in urban areas. An overall awareness is needed to understand that a deeper integration of freight transport and urban sustainability strategies can be beneficial for both the efficiency of freight transport networks and for local sustainability. City authorities need more logistical competence to facilitate the required integration between private and public actors.

This paper identifies shortcomings in urban freight transport planning. How urban freight transport should be included in the overall transport planning to overcome these shortcomings remains still to be developed. One part of a solution must be an integrated planning procedure, wherein all types of transport are included – from walking and cycling, cars and public transport to freight transport. There is a lack of role models along with inadequate monitoring, evaluation and dissemination of performed studies and projects, which makes it hard to follow good experiences as well as to avoid the bad examples. Sets of indicators do exist as well as planning methods, but the next step needs to be the development of implementation guidelines and conceptual models.

Table 4-3 Key issues: Potentials (+) and shortcomings (-) of urban freight transport planning.

	City administration/ Local authority	Consignor/Consignee	Freight forwarder	Transport operators
Planning principles	*- Lack of freight transport competence (knowledge)* *- No long-term sustainable freight transport strategy* *- Lack of freight data* *- Lack of co-operation with neighbouring* +/- Stakeholder consultation is good, but the co-operation is lacking + Awareness is growing			
Land use (Infrastructure – Facilities)	*- The spatial planning to reduce urban sprawl does not include freight transport*	*- Localisation of facilities, not considering connections to transport infrastructure* *- Localisation of facilities, limited by city spatial planning*	*- Localisation of terminal, limited by city spatial planning*	
Accessibility (Facilities – Goods)	+ Cities improve prerequisites for logistics connection to interregional networks	*- Lack of awareness how to affect transport via shipments (size, frequency, number, etc.)*	*- Lack of alternatives to standard high quality service level (short lead times)*	
Transport (Goods – Vehicles)	+ Ideas for load factor regulations	*- Lack of co-operation with neighbouring facilities*	*- External consolidation (lack of co-operation with competitors)* + Internal consolidation	*- External consolidation (lack of co-operation with competitors)* *- The modal split is low* + Internal consolidation
Traffic (Vehicles – Infrastructure)	*- Insufficient infrastructure capacity* *- Lack of loading space* *- Freight transport actions limited to achieve traffic optimisation* +Alternative fuel infrastructure strategies + Heavy vehicle regulations (Low emission zones, weight, time, etc.)	*n/a*	*n/a*	*- Old vehicle fleet* *- Lack of alternative fuels*

Focus areas for further research can be summarised as follows:

- How to co-operate and communicate between and within city authority departments as well as with private stakeholders and other cities.

- How to inform about possible actions for different actors and what steps need to be taken to cope with the increasing problem and to understand the improvement potential.

- How to increase logistics knowledge in order to understand the factors affecting urban freight transport and to be able to cope with the problems in order to understand the complex nature of urban freight and its difference from passenger mobility.

4.4 Paper IV – Assessing knowledge and awareness of sustainable urban freight transport among Swedish local authority policy planners

Paper IV is based on Study 4, which puts the focus on Swedish local authorities and their knowledge and awareness of urban freight transport as well as identifying barriers towards the sustainability of urban freight transport. Hence, the paper contributes to the answer of RQ 1 and RQ 3, but the conclusion also gives a hint towards RQ 4.

4.4.1 Purpose and outline

With the base in a presumed lack of knowledge and awareness of urban freight transport, the purpose of Paper IV is twofold: "Firstly, it is to present the results of a study of the state of policy and planning in the area of urban freight transport among Swedish local authorities. Secondly, to compare those results with existing research in a European context in order to find possible links between the freight transport awareness and knowledge and the successes or failures of measurers within the urban freight transport area".

The paper is based on a questionnaire survey given to all Swedish municipalities, to determine the state of policy and planning within the freight transport area as well as the knowledge and awareness in the area (Study 4). The paper begins with a frame of reference on freight transport planning at the local authority level followed by a description of the questionnaire survey made and a presentation of the main results, analysis and conclusion.

4.4.2 Main contribution from the paper

Paper IV addresses the problems of a lack of knowledge and awareness in freight transport-related issues as well as a lack of personnel in administrative bodies. Local authorities (mainly) are responsible for managing the traffic within the urban area. The research that this paper is based upon confirms that a lack of knowledge exists within the area of urban freight transport. The questionnaire concludes that little time and personnel resources are allocated for freight transport in Swedish cities (almost 45% of the cities do not have any dedicated time for freight transport at all and just a little bit more have 10% dedicated time for freight transport. Almost no cities work more than 20% on freight transport). This picture does not mesh well with the sustainable development of today and the future of increasing demands on fewer emissions and less congestion. Considering that 65% of the respondents consider freight transport to be a problem area in the city (mainly regarding noise and safety), definitely more time should be spent on this topic. There is also a lack of co-ordination and common long-term goals; without these, there is a risk of postponing urban freight for too long, creating cities that are even more unsustainable.

There is a lack of data regarding freight transport in urban areas. Extended surveys of goods movements could increase the awareness of the problem, and serve as a basis for strategies on how to handle it.

The literature survey shows that there is much information about possible solutions to urban freight transport problems (e.g. environmental zones, urban consolidation centres, and positive incentives) and there is a huge potential for improving the sustainability of urban freight transport. But, it is evident from most of the literature studies and surveys performed within the area that little is done, and the results are poorly evaluated. If the knowledge and experiences gained from failures were presented side by side with the successes, many of the future failures could be avoided. A combination of experiences of earlier projects, awareness of the occurring problems, knowledge in how to handle the problems and good stakeholder co-operation could improve the outcomes of urban freight transport and it would be possible to work more efficiently with transport management and the European objective of more optimised freight transport in urban areas.

Four steps towards action for freight transport inclusion in the planning processes are suggested:

- focus more on collecting statistics about freight transport in the urban area together with proper evaluation, monitoring and dissemination of urban freight transport measures;
- raise awareness and build knowledge regarding urban freight transport within local authorities;
- initiate stakeholder co-operation from the local authorities; and,
- establish a process for urban freight transport policy and planning to be adopted.

4.5 Paper V – Local authority cooperation with urban freight stakeholders: A comparison of partnership approaches

Paper V was done in co-operation with the University of Westminster in Study 5, with a study of public-private partnerships in various levels of depth. The results of the paper contribute to all research questions in the thesis, since the level of involvement in the partnerships have been of a type that gives a very good insight.

4.5.1 Purpose and outline

Private companies perform transport operations in urban areas and the public sector regulates these operations and is responsible for much of the transport infrastructure. Nevertheless, until recently there has been little involvement of private companies in the local authority decision-making process. Freight quality partnerships have been acknowledged in the UK as a way of including urban freight stakeholders in the transport planning process and there are other examples in Europe of similar networks. However, there are limited references to be found on the topic and little understanding of the importance of these interactions. The purpose of this paper was to identify, describe and compare the way a number of these partnerships work and to consider the successes and possible shortcomings of the arrangements in a systematic way. Six examples are given, which are studied in different levels of detail using both secondary and primary data. Two of the examples include participatory research – CLFQP and the Local Freight Network in Gothenburg (LFNG).

Paper V seeks to address some of these questions including the main determinants of success, whether common principles can be observed between different cities and countries. The second section of the paper draws together some of the literature about urban freight partnerships and networks and some

country-specific aspects, as well as develops an analytical framework for the assessment. This is followed by a brief discussion of the methodology used for the more detailed research concerning six case study examples of urban freight partnerships. Each of the partnerships studied are discussed in more depth and then assessed in order to identify similarities and differences of the cases. The conclusions pull together the lessons learned from the assessment.

4.5.2 Main contribution from the paper

Not surprisingly, the results show similarities and differences amongst the six partnerships. Table 4-4 shows the basic attributes of the six partnerships studied. Three main differences are indicated in the table: the number of participants, the governmental status and who is managing the partnership.

Table 4-4 Characteristics of the six different cases of PPP studied.

City/area	Initiated by	Year of start/end	Funded by	Managed by	Participants (No./meetings)	Governmental status	Regularity of meetings (No./years)
Paris	Local authority/ recommendation after public-private collaboration	2006/ 2009	Local authority	Local authority	47[1]	Formal advisory committee	2 +[1]
Utrecht	Local authority/advice from private sector	1993/on-going	Local authority	Local authority	7–8	Formal advisory committee	8
Lidkoping	Local authority/ recommendation after public-private collaboration	2006/ 2010	Local authority	Local authority/ Industry		Informal advisory committee	-[5]
Gothenburg	Local authority/EU project	2005/on-going	Local authority	Local authority	~25	Informal advisory committee	3
London CLFQP	Government/ recommendation after public-private collaboration[4]	2005/on-going	Local authority/ Industry	University	~20–30[2]	Informal advisory committee	3–4 +[1]
London Westmin.	Local authority	2007/on-going	Local authority	Local authority	10–20	Informal advisory committee	4

[1] 47 persons have signed the charter. Unclear how many regularly attend meetings.
[2] Extra meetings for special issues.
[3] Including the steering group of 12 persons. The number of participants is unlimited, but normally 20–30 attend meetings.
[4] Due to a specific reason about high levels of PCNs (Penalty charge notes).
[5] No meetings at the moment due to lack of chairman.
Note: In the case of Utrecht, Lidkoping, Gothenburg and London, CDGW funding of the activities is provided by the local authority. In the case of London, CLFQP funding of the work of the secretariat/management is jointly provided by local authorities and the private sector. In the case of Paris, the financing of the committee related to the charter is unknown.

The assessment framework for the partnerships studied is developed from three EU initiatives and projects: CIVITAS (Breuil & Sprunt, 2009); TURBLOG (2011); and START (2009). The points made in those references overlap to some extent and have therefore been reduced to nine main factors that need to be met by urban freight partnerships and against which the partnership case studies can be assessed. Furthermore, the nine factors have been grouped into three main areas of interest: formation of a partnership, management of a partnership and the outcomes of a partnership. The partnerships have thereafter been assessed in terms of the level of evidence found for the factors in the partnerships

respectively. The assessment is based on a review of published documents together with the interviews and questionnaires and summarised in Table 4-5.

Table 4-5 Assessment of the partnerships studied according to the nine partnership criteria (x = no evidence, v = some evidence, vv = evidence).

	Paris	Utrecht	Lidkoping	Gothenburg	London CLFQP	London Westminster
FORMATION						
Objectives need to be related to the members of the partnership	vv	vv	vv	vv	vv	vv
Relevant and varied stakeholders should be involved	vv	v	v	vv	vv	v
Political involvement	vv	vv	x	x	x	x
MANAGEMENT						
There should be an action plan	v	vv	x	x	v	x
Number of participants needs to be manageable (10–20)	x	vv	x	vv	v	v
Regular attendance by the same participants is necessary	x	vv	v	vv	v	vv
Strong project management	v	vv	x	vv	vv	v
OUTCOMES						
Accept the complexity of the situation and avoid seeking single solutions	v	v	x	v	v	x
Consider urban freight measures as business propositions	x	vv	v	vv	vv	v

The research has highlighted that there is not a single model for an urban freight partnership and that cities have found a range of approaches according to the particular circumstances that prevail. Nevertheless, there are some clear insights into what needs to be encompassed within a partnership. To be credible and effective, the partnership must bring together a range of relevant participants from both the public and private sectors, confirming earlier research about partnerships. No explicit differences between partnerships regarding the size of the city or area that they cover have been discovered, albeit other aspects have been of higher importance. Some key points that we have found evidence for through the research could be highlighted as:

- there is a need for strong management and organisation;
- having relevant as well as a variety of stakeholders is important;
- not only objectives are important, but also the dissemination of outcomes in order to enhance political involvement;

- outcomes and effects are not just physical objects and projects, but equally important is the relationship and knowledge exchange between participants in order to create a good urban freight situation; and,

- a focus on long-term possibilities is important.

A local partnership could not alone solve freight transport in urban areas. It is just one piece of the puzzle that is needed. A variety of measures and regulations are needed, and enforcement of these, but discussed and developed through the consultation process of the local partnership. The outcomes of a partnership are not valuable just for the public authorities but also for private stakeholders, who get early information as well as the possibility to affect the development and future implementation of policies. The analytical framework developed could be applied to a wider range of cities, helping further development of freight partnerships in urban areas.

4.6 Paper VI – A comparative study of urban freight transport planning: Addressing stakeholder needs

Paper VI is the final appended paper to this thesis, and is based in Study 7, which is a comparative study, validating the research conducted by two individual research processes and further developing the research results retrieved. The outcome of the paper mainly contributes to the answer of RQ 2 and RQ 4, since the focus of the paper is stakeholders and how the transport planning process at local authorities could be improved through their inclusion.

4.6.1 Purpose and outline

Local authorities are slowly beginning to acknowledge the need to consider freight transport in their overall transport planning and, over the last decade, research in the field of urban freight transport has increased. However, most studies to date consider specific urban freight solutions and measures, as opposed to ways in which local authorities perhaps ought to consider this aspect in the transport planning. Interview data from Sweden, the UK and the Baltic Sea Region have been analysed to draw out the factors that influence local authorities and freight operators' perceptions of freight transport in urban areas and the purpose of Paper VI is to demonstrate that by including a wider variety of freight stakeholders in urban transport planning discussions; in addition, the urban freight transport could be improved.

Paper VI is outlined starting with an introduction to the topic and a frame of reference regarding urban freight transport planning. Thereafter, the research approach with a description of the selection and number of interviews together with the topic of the interviews are described. This is followed by the results of the interviews, which are analysed under the topics of perceptions of urban freight transport and relationships between local authorities and urban freight stakeholders. The paper concludes with a discussion on urban freight transport planning, presents a picture of urban freight transport stakeholders and gives some final thoughts on how this can be used and further developed.

4.6.2 Main contribution from the paper

The findings show that despite local authorities having begun to acknowledge freight transport more often, the issues faced by the freight industry are still not fully understood. Paper VI presents a comparison of countries in Northern Europe, focusing on how local authorities could and should consider urban freight in overall transport planning. It contradicts earlier research results that reveal differences in the ways that local authorities manage freight transport, and demonstrates that the problems faced by local authorities are not unique to one country or specific to one individual urban area. This research shows that in reality, many of the similarities and perceived problems are mirrored

across urban areas in Northern Europe. With this paper, the intention has been to persuade local authorities of the benefit of including freight stakeholders in their overall transport planning by contributing to a better understanding of who the urban freight stakeholders are.

Through the interviews we have identified several factors to ensure the consideration of freight in urban transport planning processes. Four key factors have been identified:

- there is a need to identify the relevant stakeholders;
- there is a lack of awareness, knowledge and statistics about freight transport activities;
- there is insufficient knowledge of possible policy measures (with the present focus strongly on the traditional approach through the use of regulations); and,
- there is a lack of interaction between stakeholders.

Urban freight transport needs to be acknowledged as the complex issue it is, and can only be addressed successfully if all relevant stakeholders understand the elements involved. Based on the interviews, we have reconsidered the identification of actors and stakeholders in urban freight transport and, therefore, the main result from the paper is the identification of a wider group of urban freight stakeholders that local authorities could consider for inclusion in the policy-planning process (see further developed discussion and Figure 5-4 in the Results section, 5.2.1). Urban freight transport is not always perceived as a problem in urban areas, but one of the underlying reasons for this might be that very few involved parties have any knowledge of urban freight transport and there is a need to understand the problem in order to perceive it, and hence there is a need for a thorough process in order to include urban freight transport in the daily work. In Paper VI, we recommend local authorities to rethink urban transport planning and to include urban freight stakeholders in the process.

4.7 Structured summary of the appended papers

The appended papers and their individual contribution to the research questions are summarised in the table below (Table 4-6), to give an overview. Urban freight transport is shortened to UFT; subsequently, *sustainable* UFT is shortened to SUFT.

Table 4-6 Summary of the appended papers and their contribution to each research question respectively.

Paper	RQ 1	RQ 2	RQ 3	RQ 4
Paper I	Literature shows a lack of UFT involvement from local authorities. The paper defines SUFT.	The paper contributes by identifying four main groups of actors with direct impact on UFT. Actors are interdependent in a causal chain – important as input to mechanisms.	A lack of monitoring and evaluation tools to address UFT is identified as a barrier.	The indicator matrix presented in the paper is a start towards a strategy to address the issue of UFT.
Paper II	As above, but confirmed by case studies.	No additional stakeholder or actors are identified. The barriers and drivers that affect the interrelation between different actors and stakeholders are	A wide range of barriers and drivers are identified and presented, divided into categories of: law and regulation, infrastructure and land use, financial, political and cultural, practical and technological, and,	n/a

Paper	RQ 1	RQ 2	RQ 3	RQ 4
		identified.	impacts	
Paper III	As above, and developed based on case studies.	The same actor groups are used in this paper. Mechanisms indirectly addressed through actors' co-operation and adaptation to regulations.	Potential and shortcoming are presented in a matrix, developing the barriers from earlier papers further.	n/a
Paper IV	As above, and developed based on case studies.	n/a	As above, and developed based on case studies.	The paper summarises results by suggesting four steps of action towards inclusion of UFT in transport planning processes.
Paper V	As above, mainly confirmed by case studies.	More stakeholders and actors are recognised in this study. Mechanisms are identified as knowledge transfer between stakeholders, information sharing and the mutual adjustment to UFT when co-operating.	As above, mainly confirmed by case studies.	An assessment model for freight partnerships is developed.
Paper VI	n/a	A comprehensive figure of stakeholders and actors are developed to get a broader understanding of how the interactions between different groups are conducted. The need to understand which the stakeholders are, the interactions between them and the need to understand UFT are highlighted and used as input to mechanisms.	n/a	A confirmation of that the stakeholder requirements are important for the approach of urban freight transport.

5 Analysis

In this section, the results of the research are brought together in a concluding synthesis, structured according to the research questions of the thesis.

The purpose of this thesis has been to contribute to the enabling of local authorities to include freight in urban transport planning for sustainable development. Four research questions were set up in the beginning of the research process, formulated as:

RQ 1a *What is the urban freight practice of today?*

RQ 1b *What is future sustainable urban freight transport?*

RQ 2 *Which are the key stakeholders and key mechanisms in the urban freight transport area?*

RQ 3 *What are the main barriers and drivers for making urban freight transport sustainable?*

RQ 4 *How can local authorities include freight in urban transport planning?*

The results from the studies have been presented in the papers in the previous section and the contribution to the research questions has been synthesised in Table 4-6. The results are in this chapter structured and answered according to the research questions.

5.1 Urban freight transport practice (RQ 1)

The question is divided into two parts: a) What is the urban freight practice of today? And b) What is future sustainable urban freight transport?

It has been concluded in many research projects that there is a problem with freight transport in urban areas (e.g. Behrends, 2011; Browne et al., 2007b; OECD, 2003; Quak, 2011; Zunder & Ibanez, 2004). However, goods are an important facilitator of everyday life and the economy of urban areas (Anderson et al., 2005; OECD, 2003; Ogden, 1992; Quak & de Koster, 2006). Derived from the framework of the thesis, it is obvious that there is a need for action within the topic. Four main issues identified in this thesis' research process (based on analysis of both literature and empirical data) will be discussed under the first part of the question (RQ 1a): the neglect of freight in urban transport planning; urban freight handled as restrictions or response to complaints; urban freight as single measures; and contextual differences between cities. The fifth subsection is dedicated to a definition of sustainable urban freight transport as identified in Paper I (RQ 1b).

5.1.1 The neglect of freight in urban transport planning

> "We don't know much about freight transport, only that they are in our way transporting passengers" (person working for an organisation responsible for both freight and public transport).
>
> "We never thought of handling freight issues" (person from transport planning department).

The above quotes from interviews during the research process illustrate the lack of awareness of urban freight transport. Throughout the interviews that form the empirical data basis for this thesis, it was evident that urban freight transport is not a field that is handled to any appreciable extent in any of the cities of the study, and that the awareness is low. In 2004, Zunder and Ibanez showed through their survey of self-selecting respondents in EU projects that few local authorities in Europe have any person dedicated to work with urban freight transport. Those results are confirmed by the studies in this thesis. Of the local authorities interviewed or being part of the questionnaire (i.e. all empirical data), only one had personnel working full time with freight transport in the urban area, while a handful of cities had someone working part time with freight. Urban freight transport does not have a proportional part of the transport planning in local authorities compared to other types of transport like walking, cycling and public transport. This could be exemplified by Gothenburg where there are ten times as many persons working with cycling aspects than with freight at the local authority (Jäderberg, 2012). Furthermore, even though freight operations in most cities are recognised as an important driver of the urban economy, these is rarely handled on other occasions than when complained about, through restrictions or for solving a specific occurring problem (see the following two sections). Despite this fact, from the results of the Swedish questionnaire (Study 4), the results showed that 65% of the respondents acknowledged freight as a problem in urban areas (see Figure 5-1). The results of Study 4, as presented in Section 3.3.4, were divided into three respondent groups depending on the city size with the purpose of looking at potential differences in the answers between small and large cities. However, no differences between the city sizes could be proven by the study,[15] even though this does not prove that differences do not exist.

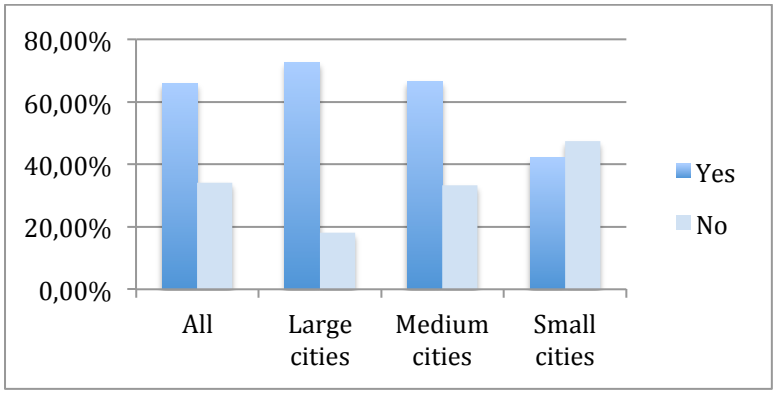

Figure 5-1 Diagram showing results from the questionnaire study of Swedish cities: "Do you consider freight transport to be a problem in the urban area?"

There is a lack of data (statistics) for urban freight transport, why the use long-term planning tools similar to the ones used in public transport planning are not used. The lack of data is partly due to the resistance from transport operators to share information of their operations, with the argument that they do not want their transport operation data to be public – i.e. to share it with competitors, partly due to the local authorities' incapability to know what kinds of data are needed and, therefore, not being able to perform, e.g. traffic counts of surveillance of transport operations in the urban areas. Data collection on freight transport is not done in any of the cities in this research on a regular basis. This could explain the short-termism in any understanding of what the outcomes of, e.g. imposed regulations might imply for the freight transport situation in urban areas. As discussed in the appended papers and in Chapter 4, there is a need for the local authorities to be aware of the [supposed] existing problem, what the priorities for solutions are and to increase the necessary knowledge. However, there

[15] Chi-square tests on a cross tabulation show no significant difference between the different-sized cities.

might also be other reasons that freight does not appear to be a problem in some urban areas, since it is actually not a problem as of today. Nevertheless, collecting data could also help authorities to begin improving freight transport operations through the imposition of positive incentives and not necessarily just aiming at addressing a so-called problem.

Looking at earlier research considering urban freight transport, much focus is on Dutch, French, Italian and British cities. The field of urban freight is now also recognised in some Scandinavian and large Northern European cities. However, it is still the case that many local authorities in Northern Europe have still not approached the field of urban freight transport at all and have no plans or policies that include freight transport. This is shown in the results from the Swedish questionnaire survey (Study 4, Paper IV), wherein all Swedish municipalities were addressed, which revealed that there are very few personnel resources dealing with freight transport. Only one of the cities has a full-time employee working with freight transport and 43% indicate that they do not work with freight at all (see Figure 5-2). As for Figure 5-1, no differences between the city sizes could be proven by the study.[16]

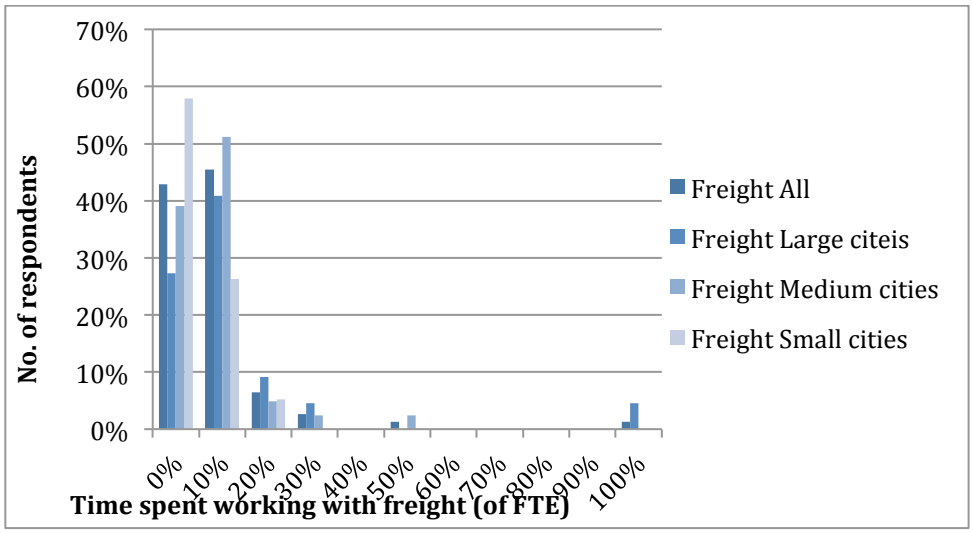

Figure 5-2 Diagram showing results from the questionnaire study to Swedish cities: "How much of your time do you spend working with freight transport?"

Prior to the distribution of the questionnaire through telephone calls to all municipalities, the researchers identified that only three municipalities had a specific person handling freight. For all other municipalities, the questionnaire had to be sent to a person responsible for overall traffic or transport planning for the urban area. However, in many municipalities, those responsibilities were a small part of the general technical planning. This fact alone shows the lack of inclusion of freight transport in the local authority planning processes of Swedish municipalities. Furthermore, similar to the survey by Zunder and Ibanez above, the reasons non-response have been shown to be, through telephone calls to those municipalities, "not seeing freight as a problem" or "there is no one responsible for the issue".

The cities in the transport peer review process (Study 2, see 3.3.2) show that this is a common fact also in those Baltic cities, and, to a large extent, none of the interviewed local authorities took freight transport into consideration, and, in general, did not consider freight in the urban area to be a problem. In Tartu, a small Estonian town, for instance, freight transport was not at all an issue discussed

[16] ANOVA testing shows that there is no significant difference between the three different groups of city size.

previous to the interviews. There is a lack of co-ordination between strategic plans and different transport plans and, furthermore, the transport plans do not include wide-ranging policies for management of freight transport operations. Since freight was not specifically the main topic of the interviews of Study 2, but just included as a part of the overall transport planning in the urban area, it became obvious during the peer reviews that none of the three cities (Kaunas, Gdynia and Tartu) had urban freight transport operations on their agenda.

The results from the interviews show that the interest for capacity building of freight transport is low. However, there is some awareness of possible activities or measures for dealing with freight transport, but the dissemination from earlier activities in other cities is often insufficient to make it possible for new cities to test those activities without remaking past mistakes. The support from politics and general policies to include freight in the overall transport planning is low both in the Swedish cities and in the personnel of the cities interviewed during the research process.

5.1.2 Urban freight handled as restrictions or response to complaints

Freight is commonly recognised by local authorities in local transport plans as an important factor in terms of "economic development of the urban area", but scarcely handled in other ways than as a disturbance factor in actions and measures, e.g., in the City of Westminster's Core strategy (Westminster City Council, 2011, p. 127), which specifies that "Developments must demonstrate that freight, servicing and deliveries required will be managed in such a way that minimises adverse impacts…especially where the quality of the public realm, local pollution and/or function and reliability of the transport network would be otherwise compromised". Similar quotes could be found in almost all the case cities of this research process. Actions are often specified to reduce the negative impacts of urban freight transport, e.g. noise and damaging of road pavements, as discussed in Paper VI. However, no local transport plans have been found with specified actions that are connected to the actual performance of freight transport operations and how they could be more efficient through, e.g. co-operation and a combination of measures.

Some cities, however, show somewhat of an interest in freight transport in general, and two examples are Kaunas and Gdynia (Study 2), both of which see themselves as logistics nodes in a larger context. Nevertheless, the focus is then on logistics in a wider perspective and *not* on urban freight. Kaunas emphasises that they are one of the few cities that can offer five modes of transport for freight (the fifth mode being the Russian railway gauge since Kaunas is a bordering city, where the European gauge railway transport changes mode into Russian railway gauge). Gdynia on the other hand has a large proportion of port activities. The local authorities in the case studies are well aware of the importance of logistics activities to maintain economic activity in the city and the region to which they belong. However, the main aspects discussed when it comes to this is that there is a need for good supporting infrastructure and terminals servicing the logistics activities. Despite this awareness, the urban side of the freight transport is more or less neglected.

Results from the interviews show that the interviewees' perception of how and when urban freight is acted upon in urban areas are when complaints are registered, either by citizens due to, e.g. noise disturbance, or by transport operators due to a lack of loading space, high parking penalty charge notices (PCN), etc. It is mainly restrictions for heavy vehicles that are present as a part of the transport planning processes at local authorities. As expressed by a local authority representative in London, "It is more about what you *cannot* do here, then what you *can* do!".

5.1.3 Urban freight as single measures

The focus in existing literature and research (see Section 2.3.1) is on how to solve specific single problems that occur in the urban area (e.g. introducing a new loading zone for freight, or, the opposite, removing a possibility to stop at one spot due to complaints from one or several stakeholders) or focusing on the measure itself before thinking about what the exact problem really is and the literature review of urban freight shows that the majority of scientific publications handle specific measures (e.g. consolidation centres). For local authorities this fact helps to bring inspiration for new solutions, but at the same time it creates a problem when the focus becomes the measure itself and not the problem that the local authorities should approach or what the prerequisites are, i.e. the local authorities could take a decision to implement a consolidation centre in the urban area, without considering what kind of result to aim for. This could be exemplified through e.g. some interviews where it was noted that local authority representatives were "thinking of implementing a weight restriction" without seemingly having a good reason to do so other than that it would be "good with fewer heavy vehicles". Furthermore, Quak (2011) have shown that there have been numerous failures of city logistics measures conducted throughout Europe during the last decade, and the results from the interviews in this thesis show a somewhat disappointing attitude towards urban freight transport in the cities, in that several local authority representatives imply that they do not want to start certain initiatives due to the risk of failure.

An important part of the work with measures is proper evaluation and dissemination in order to both see and understand the measures' results, as concluded from Section 2.3.3, but also to learn from others' successes and failures. During the interviews of this thesis, some freight stakeholders emphasised that potential problems with initiated measures from the local authorities could lead to unintended negative effects elsewhere, e.g. the case that implemented time windows are the same in two adjacent small cities could lead to transport operators needing two half-filled trucks to serve both those areas, whereas before they could use one truck more efficiently. Furthermore, as also noted by van Duin et al. (2010), most of the literature in the field of urban freight transport is non-scientific and consists of various reports from EU projects and could benefit from more accurate advice from research findings. Measures in projects that are conducted without EU funding are often not disseminated at all outside the own country or even the city where it is performed.

5.1.4 Contextual differences between different cities

The cities that have been studied are all situated in Northern Europe, but have been of different sizes, cultures and history. An initial idea was that there is a big difference between different-sized cities in the way they handle freight transport and this question has also been raised in the BESTUFS project, where the question was raised about if there are any differences between small and large cities of the EU on how they perceive freight (Allen & Huschebeck, 2006). Through Studies 6 and 7 (see 3.3.6 and 3.3.7), the results point at the conclusion that there is not any large difference between small and large cities regarding the types of measures that can be implemented – all measures need to be adapted to the area where they are implemented and most are scalable (see Section 1.4 for a discussion regarding what constitutes a small- or large city). The Swedish freight review (Study 4) could not prove any differences between different sized cities answering the questionnaire. However, through the interview studies a somewhat difference could be noticed in small and larger cities. The difference between the cities is mainly that small and to some degree medium-sized cities do not have as much knowledge and awareness of urban freight transport at all, why they do not address the problem and find suitable solutions, whilst for larger cities, where, as indicated by the interviews, the awareness seems to be a bit higher. A reason could be that those cities are rather small and might not yet have perceived freight transport as a problem in the urban area.

It is large cities that have implemented measures, e.g. restrictions in order to handle the emissions from freight transport through low emission zones, following directives from EU legislation to keep emission levels under a certain limit. Furthermore, it is also mainly large cities that are approached in European initiatives and guidelines, as, e.g. the *White paper – Roadmap to a single transport area* (European Commission, 2011). However, as discussed above, the larger cities also have an unawareness of urban freight transport. The scale of the problems is smaller in small- and medium-sized cities due to the fact that the numbers of goods movements and numbers of people affected are less than in larger cities – but, since the statistics are lacking, it is impossible to say to what extent. Freight quality partnerships, on the other hand, have been implemented by both small and large cities, as seen in Paper V (Study 5). It should here be noted that London is a collection of many boroughs and that the city cannot be counted as one large city regarding local authority transport planning, but rather many medium-sized cities (although very closely situated), since every borough has their own authority handling such issues, even though they get some support from Transport for London[17], which has an overall advisory role when it comes to freight transport.

Regarding if there are any differences in freight flows and transport-related problems of small versus large cities – it is not possible to say. The implication from the questionnaire of Swedish cities is that there is no difference in the perceived problem area even though interviews show some minor differences. In order to know what the real differences are, there is a need for statistics and good data collection from small as well as large cities. This research however has produced some evidence that the difference between small and large cities is not as was expected. It is not differences in size that have proven to constitute the biggest difference regarding how urban freight transport has been included in transport planning by the local authorities. The results from the interviews have instead illustrated that the level of engagement from specific persons that have interest in freight has the biggest influence on how the local authorities handle freight: The cities of this study that have succeeded in getting urban freight somewhat on the agenda have all had a person who has been a driving spirit of freight. The importance of an individual has also recently been noticed in other aspects of environmental logistics (Maack, 2012). However, the level of inclusion of urban freight on the local authority agenda is low in both the small and large cities of the studies. This is the case even though some evidence of differences in traditional and cultural approach has been found between old and new member states of the EU, as seen in Paper III.

To conclude this section: there are contextual differences between cities, but they are not necessarily related to the size of the area. There is a differentiation between cities depending on the prerequisites available, no matter their size. But, the only thing that has been clear from the results of this thesis is that cities that have a person (or more) responsible for freight transport succeed to work with it to a higher degree than those that do not have anyone responsible. Furthermore, local authorities that have not just a person responsible for freight, but where this person also has logistics knowledge makes it easier to understand different aspects and therefore work with it on a daily basis more easily.

5.1.5 Sustainable urban freight transport

Research question 1b addresses sustainable urban freight transport, as the "new practice". In Paper I, a literature study is presented that forms the basis for the presented definition of sustainable urban freight transport. Sustainability has been thoroughly discussed in the literature and is also handled in this thesis in Section 2.2.1. Several definitions exist and are accepted in the field, but a generally adopted definition of sustainable urban freight transport has not been found. Via discussions of sustainability, sustainable transport and sustainable urban transport, a concluding figure was presented

[17] Transport for London (often shortened TfL) on www.tfl.gov.uk.

to give important concepts and principles that need to be regarded in a definition (Figure 5-3), whereby the key concepts of sustainable development (Brundtland, 1987) form the basis, followed by principles of sustainable development and principles of sustainable urban transport.

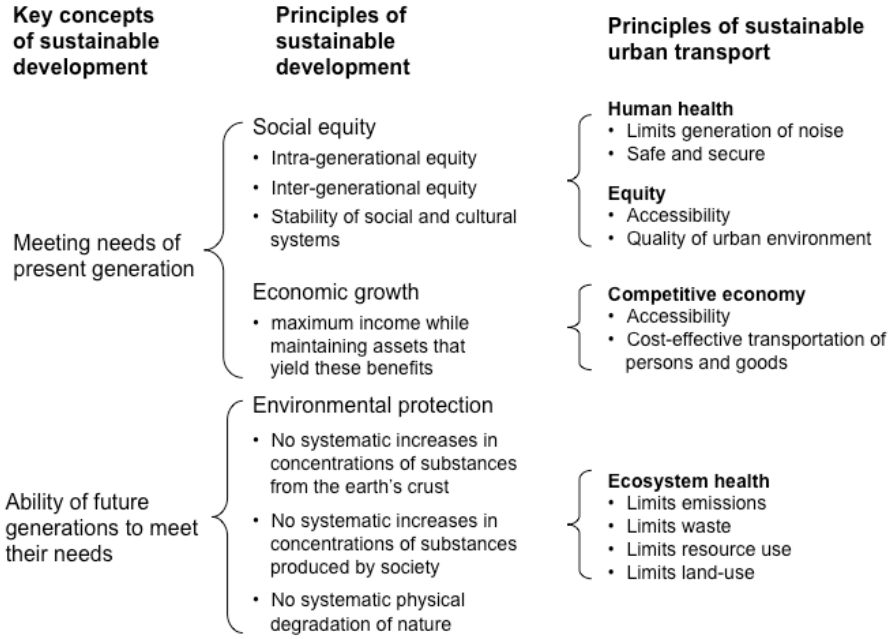

Figure 5-3 Principles of sustainable urban transport systems (see Paper I for development).

However, to further focus on the *freight* transport of urban areas, the concepts presented in the figure above were also further developed with a discussion on definitions of urban freight transport based on the OECD (2003) and Dablanc (2007). The definition that is presented below is to be looked upon as an objective for a process, which is striving for improvement, i.e. towards total sustainability. Therefore, sustainable urban freight transport is defined to fulfil *all* of the following objectives:

- to ensure the accessibility offered by the transport system to all categories of freight transport;
- to reduce the air pollution, green house gas emissions, waste and noise to levels without negative impacts on the health of the citizens or nature;
- to improve the resource and energy efficiency and cost-effectiveness of the transportation of goods, taking into account the external costs; and,
- to contribute to the enhancement of the attractiveness and quality of the urban environment, by avoiding accidents, minimising the use of land and without compromising the mobility of citizens.

As discussed above, it has to be noted that this is a pathway approach to sustainability, i.e. there is a need for a process and a methodology in order to reach the defined end state vision. This definition contains all parts of the requirements for a sustainable development according to the figure above, and gives the objectives of what a totally sustainable system would look like and a hint of the path to fulfilment. In logistics, there is always a focus on quality and service aspects (e.g. the right product in the right place at the right time), which is not explicitly included in the definition, even though to ensure quality of life and attractiveness of a city, there is also a need to take into account that goods

need to be where they should be according the stakeholders' requirements – implying also that a business model is important to find in order to succeed with, e.g. implementing measures.

The new practice of sustainable urban freight transport is accordingly dependent on a process to move towards the aim. The urban freight transport definition, as presented in Section 1.2, shows the complexity of urban freight transport and together with this definition of sustainability, provides a knowledge of what needs to be included in that process. Consequently, it is also necessary to work with appropriate tools towards this, and it becomes important to use evaluation indicators in order to monitor the improvement (see Section 2.3.3), but also an approach with solutions on how to tackle problems occurring in the urban area, in forms of different ways of including freight transport in the overall transport planning of authorities (see 2.3).

5.2 Stakeholders and mechanisms (RQ 2)

The second research question is formulated as: *Which are the key stakeholders and key mechanisms in the urban freight transport area?* However, it has been noticed throughout the research process that there is not possible to give a direct and simple answer to those questions. Urban freight transport is complex and there are many stakeholders that are of interest and could be the "key" ones. Nevertheless, the fact is that who they are depends on the context of the urban area that is considered. Furthermore, the concept of mechanisms is a possibility to use to approach the complexity of the stakeholder interdependencies, but much more could be done within this area. Two ways of attempting to sort out the complexity are identified as follows: 1) identify the direct and indirect stakeholders as well as what their interest are in urban freight transport; and 2) identify mechanisms that are affecting urban freight transport and how this concept could be further developed as a tool for handling the complexities of urban freight.

5.2.1 The complexity of urban freight stakeholders

Stakeholders of urban freight transport have been addressed in previous literature by numerous authors (e.g. Anand et al., 2012; Russo & Comi, 2011; Taniguchi & Tamagawa, 2005; van Binsbergen & Visser, 2001). In this section, the frame of reference in the field have been addressed and adapted through the results of the studies in this thesis and, Figure 5-4 presents a stakeholder framework that are further developed in order to help local authorities to further grasp the complexity of their relationships.

The local authorities are an important stakeholder of urban freight transport and according to the results of the interviews, the interaction with [other] freight stakeholders is from the local authorities' side often stated as quite good. Nevertheless, only 20% of the Swedish cities in the questionnaire survey performed have any kind of regular activities for stakeholder involvement and co-operation. Furthermore, the interviews with freight stakeholders have raised the issue of a need for the local authority to understand who the stakeholders are and what their roles are regarding urban freight – the results from the interview studies show a very weak involvement of freight stakeholders (from the freight stakeholders' perspective) in the transport planning activities throughout Northern European cities, with the exception of the cities that have some kind of regular freight partnership (see Section 5.4.2). There are obviously different views of the stakeholder involvement, and one reason for the lack of interaction with freight stakeholders from the local authority side could be the fact that it is hard for the authorities to know who the stakeholders are, except from the obvious large hauler and transport operators, which is also indicated in the results of some interviews. It is therefore of interest to further develop and identify different types of stakeholders and their interest.

The stakeholders have in previous research mostly been addressed through a general division into stakeholder groups, i.e. four general groups of main stakeholders with a direct impact on freight transport (i.e. authorities, consignor/consignee, freight forwarder and transport operator). However, Flodén (2007) categorised actors into four sub-groups depending on their effect on freight transport (p. 50): influencing actors (actors trying to influence the system without any direct power, e.g. lobby groups); framework actors (actors setting the framework, e.g. government); system actors (actors in the transport system, e.g. terminal companies); and system output receivers (e.g. transport customers). System boundaries and situation determine if the actors are included or not as well as if an actor is included in several of the groups (Flodén, 2007). In a similar way, what has been done in this thesis is to divide the stakeholders into two sub-groups, those who have a direct interest or effect on urban freight transport (actors) and those who have an indirect interest or effect on urban freight transport (stakeholders), which gives the possibility for local authorities to be more precise in the understanding of the interactions between stakeholders. For the purpose of this thesis, the difference between actors and stakeholders is defined as the following:

> *Stakeholders* are all that have an interest in the system of urban freight transport (individuals, groups of people, organisations, companies, etc.); whereas *actors* are those that have a direct influence on the system. Therefore, all actors are stakeholders, but not all stakeholders are actors.

The purpose of a proper identification of the stakeholders is for the local authorities to be aware of the different types of stakeholders that exist and for the research arena to consider the wide range of stakeholders in research studies. This is important since different stakeholders have different requirements and prerequisites in relation to the urban freight transport. Danielis et al. (2010) confirm that different distribution channels are affected by policy measures in different ways depending on their goods type, and hence on the stakeholder. In the diagram (Figure 5-4), actors and stakeholders (as defined above) are presented based on the identification and analysis of interviews, as presented in Paper VI.

The actors are divided into four groups, in line with previous identifications as discussed above: shippers; customers; freight transport operators; and authorities. All of these have a direct impact on urban freight transport through direct operations or regulations. The *shippers* (consignors) are those who send the goods, hence mainly are the ones ordering the transport operation. But they can also sometimes perform their own transport, hence the "own transport" category within this group of actors that have not been included previously. These often do not see themselves as vehicle operators or companies handling transport operations, since their main business is something completely different (e.g. retail store chain or grocery stores). The shippers are looking for efficiency and competitiveness. The *customers* could be both the consignees in forms of, e.g. offices, shops or restaurants, or these could be residents and visitors (end-consumers) in the urban area who, e.g. buy something and therefore affect the need for the goods in the urban area, but will perform the last link of the transport operation by private mode (either public transport, car or other modes of transport). Examples of home deliveries could also occur, hence there will be another transport operation due to a purchase made by someone in the urban area, either via the Internet or ordered in the urban area with home delivery as an option. The consignees in the forms of shop-owners have been highlighted to play an important role in, e.g. freight quality partnerships (Study 5) due to the possibility to affect the ordering of goods or create an understanding of goods movements on the streets outside their shop, but have at the same time been shown to be difficult to attract to take part in those stakeholder co-operation activities – with the main reason that they need to be in their shop during opening hours and struggle to attend other activities. The customers/consignees have several different aspects of freight transport in their interest,

e.g. attractiveness of the urban area, cost efficiency, environmental issues, safety and security or reliability. The *freight transport operators* in the forms of, e.g. third-party logistics operators or hauliers are responsible for the transport operations that take place in the urban area, the routing, the vehicle and the efficiency of that operation. The drivers of the vehicles are the ones who actually perform the transport operation through driving the vehicle in the urban area (the driver of the vehicle could also appear in all other three actor groups, but mainly in this one), and are affecting the actual transport operation on a day-to-day basis, why they are very important to consider. Furthermore, another group of transport operators that are often forgotten are the maintenance and service transport operation (e.g. linen service for HoReCa or window-cleaning services) as well as construction logistics (with a great variety of materials for construction sites), which have also been placed in this category, since these are freight transport operations that are often "hidden" or forgotten. As recognised by Cherrett et al. (2012), different kinds of service transport could represent as much as 43% of the total number of arrivals to an high-street shop during an ordinary week. Freight transport operators are mainly concerned about accessibility and efficiency. The *authorities* could be both local authorities that set regulations on the local road network and create possibilities (and sometimes barriers) towards efficient urban freight transport with, e.g. infrastructure changes and transport planning policies. The regional or state governments also affects the urban freight through overall policies and regulations that the local authorities need to consider, as well as there are, e.g. national road networks in some urban areas that are the responsibility of regional or state governments, since the main concern is to keep the urban area attractive and increase the quality of life, while simultaneously attempting to attract businesses and visitors.

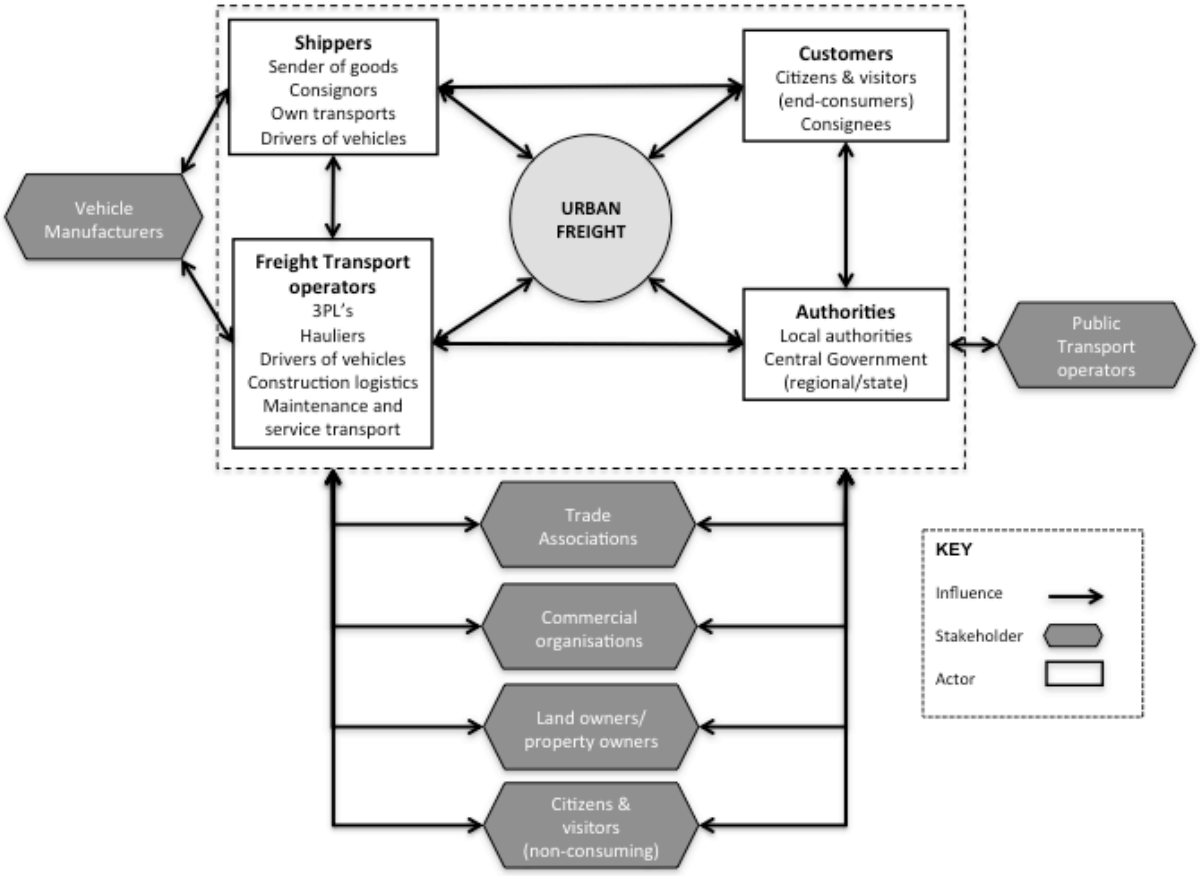

Figure 5-4 Urban freight actors and stakeholders and their relationship.

The actor groups presented above are mentioned by most researchers who are considering urban freight stakeholders, as noticed in Section 2.4, even though some additional actors have been identified in the diagram. However, there are also actors that do not have as strong a direct impact on the actual transport operation that takes place in the urban area and its outcome, as identified in the studies. In this thesis, these are called "stakeholders" according to the definition presented above. During the interviews in Studies 2, 3 as well as 5, which are confirmed by Study 7, it is also important to understand the indirect impact of stakeholders on urban freight transport operations in line with understanding the complexity of urban freight. Stakeholders have an indirect impact on urban freight transport through their actions and frameworks, as indicated in Figure 5-4. The *vehicle manufacturers* have an indirect impact on the urban freight transport through the design and technologies behind the freight vehicles: they are interested in building (and selling) vehicles that are suited to the urban freight transport operations. The *public transport operators* have an impact on the local authorities (or are a part of the local authorities) and have an indirect impact on urban freight transport through the fact that passengers are mostly prioritised over freight. This is the case both when it comes to the planning personnel at local authorities and in everyday practice in the urban area whereby the public transport operations has priority over other vehicles (e.g. trams in Gothenburg are always prioritised in junctions controlled by traffic lights). *Trade associations and commercial organisations* could have an impact on urban freight transport operations through, e.g. lobbying towards a certain direction, whilst *land and property owners* have an impact on their properties by adjusting them to efficient freight reception or by setting demands on their tenants for how and when freight should be accepted by, e.g. shops and restaurants in urban areas. This last group of stakeholders could be defined as actors, since they do have the potential to have a direct effect on the outcomes of urban freight transport, but the reason they are identified as "just" stakeholders is that it is noted through the interviews that they firstly often do not see themselves as actors of urban freight transport, and, secondly, are not included in such discussions on a wider scale by any other actors or stakeholders. Nevertheless, there is a large potential in moving the land and property owners from the stakeholder category to the actor category. Finally, stakeholder groups that are rarely considered in freight contexts comprise the "non-consumers", which could consist of work commuters, residents or tourists that are in the area, but for another purpose than consuming goods. These have an indirect interest in freight transport through their interest in an attractive urban area in which to live or visit.

Freight actors and stakeholders have been separated in this section. The purpose of this has been to further highlight the complexity of their interactions, but most of all to show that the stakeholders with an indirect interest in freight transport of the urban area also have an important role in the transport planning processes, since something that has been raised by freight stakeholders in all cities is the fact that freight transport operations in urban areas are not always understood. Moreover, when measures are implemented in the urban area regarding freight, the local authorities do not always make sure to evaluate the potential unintended effects of the single measures. Feedback is vital, and the communication must be equally effective both ways. Furthermore, it is essential to understand that most of the time activities affect more than one stakeholder and could cause effects of an unexpected nature. It is important not only to understand what the stakeholders can do for you (and together with you) but what they can do against you. The conclusion from this is that there is a necessity to include a variety of both actors and stakeholders in the local authority freight planning processes, but also to further develop and to understand the stakeholders' interdependencies and what kind of activities that they are connected through, e.g. the mechanism of urban freight transport.

5.2.2 Mechanisms of urban freight transport

Mechanisms are referred to as how to handle the interdependence between activities or as the cogs and wheels that explains why one thing lead to another. The concept of mechanisms are not previously discussed in the field of urban freight transport (even though indirectly addressed by researchers as e.g. policy instruments, as presented in Section 2.5), but have been addressed previously in logistics and supply chain management fields (e.g. Aastrup and Halldórsson, 2008; Arshinder et al., 2008; Romano, 2003).

For urban freight transport, the mechanisms identified in this thesis are mainly related to the interdependencies of stakeholders and actors and to different situations that appear as a problem in the urban area. Throughout this thesis it has been evident that the actors and stakeholders of urban freight transport need to be considered and involved in transport planning processes. Mechanisms can occur on several different levels simultaneously, where it could be interpreted or handled differently depending on the system level (e.g. macro or micro, as well as business or social perspectives) and the stakeholder. One example, as identified during this research process, is given in the figure below (Figure 5-5). On the macro level, the situation (input) is described as that e.g. the European commission have a general knowledge of that freight is being addressed in several urban areas in different ways. This knowledge can be transferred as information to local authorities in other urban areas and by that get an output of an overall better knowledge of urban freight transport. Local authority, on the midi level, see a possible safety issue where goods movements clash with people movements, that will be handled through a regulation mechanism of an imposed time window and get the desired output of no vehicles in the urban area while the people are shopping. The transport operators (for example) need to handle this new regulation and will adjust to the time windows by getting information, but then need to perform deliveries in a shorter time, hence possibly needing two vehicles. Looking at the urban area as a whole, the output is general: no vehicles on the high street during shopping hours, but an increase in emissions during other hours due to more vehicles. The output that was the aim of the local authority was fulfilled, but the overall output might not have been as the initial plan was. In the example given, it would be relevant for the local authority to consider the effect of the mechanism and adapt it in order to avoid unintended consequences.

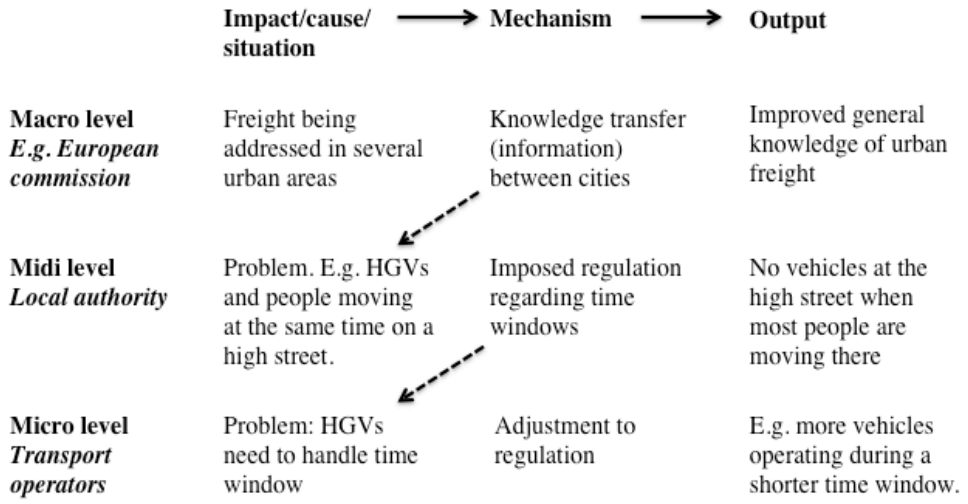

Figure 5-5 An example of mechanisms in three levels of the urban freight transport system (dashed arrows indicating that one mechanism have an effect on the activity on the level below).

Mechanisms have been condensed into three main areas that are considered to be important for urban freight transport, based on the frame of reference (see Section 2.5) and also presented in the example above as a first step towards a categorisation and identification of possible mechanisms: regulation; information; and, adjustment. Regulation is a co-ordinating mechanism that here are described as different types restrictions and regulations that could be imposed by e.g. the local authority in an urban area (fiscal measures, financial incentives, infrastructure regulations etc.), but, also the enforcement of regulations is included in this category. Information mechanisms could be identified as advice, education of stakeholders, sharing information and transfer of knowledge and, could also be seen as a co-ordinating mechanism. The adjustment mechanisms are mainly regarding how individuals or groups of stakeholders or actors are adapting to imposed regulations and, therefore represent another type of mechanism of more social mechanism character, as described as of relational nature. Within each area, mechanisms for urban freight transport have been identified as relevant through the research process, and are exemplified with some examples and, will be presented below.

Regulation:

- Imposed regulations from European Commission regarding emissions in the urban area (e.g. emission regulations).
- Imposed regulations from the local authorities regarding infrastructure, restrictions or consolidation e.g. time windows, weight limitations, loading and unloading zone regulations, walking speed areas.
- Imposed regulations from the local authorities regarding emissions and traffic situaions, e.g. low emission zones and congestion charging.
- Financial incentives.
- Supervision of regulations.

The different types of regulations that are highlighted here have all been discussed during interviews in the research results of this thesis. Local authorities sees regulations as a natural response to how to handle freight transport in the urban area, due to a need to reduce HDV movements during certain hours or as a response to complaints by stakeholders in the area. Freight stakeholders are sometimes aware of the need for a certain regulation due to outer circumstances as e.g. weak infrastructure that need a weight restriction. What has been recognised though, is the difficulties that appear when a regulation is imposed by the local authorities that creates additional vehicle movements by the transport operators which leads to less efficient transport operations, or when e.g. loading zones or other types of facilities that are needed are reduced or localised on the wrong spot. Supervision of imposed regulations is important in order for the regulation to get the wanted effect. In Gothenburg a great increase in supervision have led to a very high compliance of regulations and, also a positive response from the freight stakeholders regarding this supervision. An effect (outcome) of lack of supervision within an urban area could be e.g. that a driver of a vehicle do no bother to try to find a certain unloading zone for the deliveries due to his/her knowledge of that they are most likely occupied by private cars, and therefore instead stops in the middle of a street where the vehicle will be blocking display windows.

Information:

- Leaflets and other types of written information distributed to stakeholders.
- Information through press releases.
- Information meetings at special occasions for public consultations.
- Workshops regarding specific issues.
- Freight partnerships.
- Knowledge transfer on different levels: between stakeholders, between cities, between countries etc.

There are many types of information that could be a mechanism for the handling or addressing of urban freight transport. One transport operator said that: "The parking guide for loading and unloading activities have been the best thing that happened to us. We haven't got a single PCN since!". Information can be used to address specific problems or as a way to move towards joint decisions where a broad representation of stakeholders are involved. Some of those mechanisms are rather easy to use whereas others demand a high effort of work from both local authorities and the stakeholders. Discussions regarding the usefulness of the different types of information are important and, there could be arguments for using a broad involvement of freight stakeholders when urban freight transport is first being addressed in a city due to the better possibilities of making more adequate decisions.

Adjustment:

- Adjustment to a regulation.
- Mutual adjustment to urban freight transport through co-operation (e.g. two drivers of different vehicles that daily arrive to the same loading zone at the same time, make a day-to-day adjustment to each other by agreeing on a sequence).

Adjustment is, as mentioned above, in this thesis mainly regarding the possibilities of, or how, individuals or groups of stakeholders are adapting and adjusting their different activities. It could be e.g. the response to an imposed regulation or it could be that a driver of a vehicle adjusts the planned route due to the fact that he knows that the receiver of a certain goods delivery will not be in his shop until later that day.

The mechanisms approached here are just a small part of the different mechanisms that connects situations, activities or stakeholders in the urban area connected to freight transport. Understanding complex interactions between stakeholders is difficult and, approaching mechanisms are a way to structure the interactions in order to make it easier for the local authorities to know how to address urban freight. However, the concept of mechanisms also raises further questions, as how those mechanisms interact or why they occur, which is not addressed in this thesis and subsequently need further research as to be fully understood. It is not only the mechanisms that need to be understood but also, the input and the output of the complete chain. The highlighting of the mechanisms in this thesis imply further the importance of having a well established and regular stakeholder involvement in order to gain knowledge of the input to and outcomes from mechanisms in the urban area regarding freight transport.

5.3 Barriers and drivers (RQ 3)

The third research question aims at understanding why local authorities are, or are not, working with urban freight transport, through identifying barriers and drivers. The question, which is mainly dealt with in Paper II, is: *What are the main barriers and drivers for making urban freight transport sustainable?* The question deals with the problems from the local authority perspective and leaves aside other aspects such as the transport operators' perspective. It is important to recognise the difference between individuals and the organisation and how the organisation affects the individual to work (or not to work) with freight transport. It is not only the positive and negative incentives to work with sustainability and freight transport that are of interest, but also the lack of incentives.

Based on the grouping of barriers presented by Minken et al. (2003) and May and Crass (2007), a table is presented in Paper II (Figure 3), where barriers and drivers are presented together with sustainability and knowledge and awareness. Here, that table is adapted to include just barriers and drivers, which have been identified during all research studies of this thesis, based both on empirical findings and logical reasoning, divided into six groups: laws and regulations; infrastructure and land use; financial; political and cultural; practical and technological; and impacts (Table 5-1). The results could be compared to those presented in Paper III (Table 4-3), which are based on the same structure. However, the results from Paper III are divided into different actor groups, whereas the ones above are focused on the local authority. The table above indicates the barriers and drivers identified during the research process. As shown in the table, some results are based on results from the empirical data ((1)), which means that these issues haven't been explicitly mentioned in the previous literature to my knowledge. The facts that have been noted in the previous literature are however in some cases supported by the results of the interviews ((1, 2)) and in other cases merely identified in the literature and not brought up as a result of the interviews ((2)).

Laws and regulations is a category of barriers where it is highlighted in both literature and from interviews that the main barrier is that it is hard for local authorities to work with implementation of certain regulations if not supported by national government. The most striking result regarding the category just identified in the literature consists of the drivers in this category (European legislation regarding emissions), which weren't brought up by any of the interviewees, indicating that the awareness is low among local authorities on those issues. There are a number of possible explanations for this result, but one could be that the small cities of my studies do not consider this issue as relevant mainly due to the fact that such problems rarely exist there. For larger cities, one possible explanation could be that the laws and regulations regarding emissions are addressed to another department of the authority (e.g. environmental) and that these workers do not see the direct connection to freight transport operations. Further possible explanations could be a lack of sanctions.

By both the literature and results of interviews, *insufficient infrastructure* is mainly connected to a lack of sufficient curb space or delivery areas for loading/unloading activities or the barrier of actually moving a vehicle into the urban area due to congestion or narrow roads (e.g. Ambrosini & Routhier, 2004). However, this is something that is mentioned only by the freight stakeholders, and not by the local authorities of the interview studies, which is why it is indicated as just noted in the barrier list as from the literature only. The issues brought up by local authorities regarding infrastructure and urban freight transport are instead derived from other modes of transport perspective, wherein freight vehicles are blocking infrastructure or similar.

Lack of funding is brought up in both interviews and the previous literature as a major barrier, within the area of *financial* barriers. However, the funding issue should not be considered as important as it does from the interviews, since results from the literature review show that most measures fail to

continue after project funding ends (see Section 2.3.1). This motivates the discussion of the importance of finding a business case for each measure that are implemented and by that not being dependent on external funding to a large extent. Nevertheless, funding is almost always necessary in a starting phase.

Table 5-1 The barriers and drivers of urban freight transport affecting the local authority (superscript numbers indicate the source of the result, where [1] is from empirical data and [2] from literature studies.)

	Barriers	Drivers
Laws & regulation	Local authorities need support by national government to set own regulations [1, 2]	Emission standards[2] Maximum emissions for urban areas (European legislation)[2]
Infrastructure & land use	Insufficient infrastructure[2] Insufficient knowledge of logistics activities in land-use planning[1, 2] Focus on passenger transport in planning[1, 2]	Lobbying from transport operators and other stakeholders (not necessary with a sustainability perspective though)[2]
Financial	Lack of funding[1, 2]	Financial instruments like EC projects[1, 2] Engagement from local businesses[1, 2] Finding a business model[1, 2]
Political & cultural	Business problem (e.g. "the market will solve the problem")[1, 2] Focus on passenger transport[1, 2] Lack of interest[1] Lack of knowledge[1, 2] Lack of stakeholder involvement[1, 2] Insufficient support from politics and general policies[1, 2]	Obvious need (e.g. weight restrictions in sensitive areas of old towns)[1, 2] An engaged person working with the issue[1, 2] Stakeholder co-operation[1, 2]
Practical & technological	Lack of known solutions[1, 2] Lack of communication[1, 2] Lack of dissemination of earlier activities[1, 2] Lack of knowledge of *how* to start measures[1] Unwanted side effects of activities performed[2]	Best practices that show a good result[1, 2] Awareness of possible measures[1, 2] Knowing how to handle problems[1, 2]
Impacts	Lack of statistics and facts of impacts[1, 2] Lack of incentives to deal with impacts[1, 2]	Need for reduction of emissions[1, 2] Need for safety improvements on streets[1, 2]

In the *political and cultural* category, issues of knowledge and involvement are brought up. The local authority organisation contains individuals and it is to a great extent the individuals that affect the situation in general. Knowledge of how logistics and freight transport are working is low and the personnel working at the local authority offices have none, or little education on this subject (dealing with "issues"/solve the problems that occur). The lack of knowledge and awareness is mainly concerned with the factors of political and cultural, practical and technological and impacts. The problems that arise involve insufficient support from politics and general policies, insufficient personnel resources, relatively high awareness of possible activities, insufficient knowledge of how to start activities, low awareness of freight transport impacts and a lack of statistics. There are very few cities that have a person working with freight transport and even fewer that have personnel working

solely with this question (see RQ 1). Something that has not been found in the literature (at least not in those words) is the lack of interest. That was raised, or implicated, by many local authorities. This could be explained by several other barriers, like the "market will solve the problem" or the lack of knowledge – hence, expressed as a lack of interest. The lack of interest, as well as many of the other barriers, could also be strengthened by the barrier, "lack of support from politics and general policies". However, there has been a noticeable difference during the period of this research study and urban freight is beginning to come to be more acknowledged on a wider scale.

When it comes to *practical and technological* barriers and drivers, it is the measures that are brought forwards. The research of measures as well as reports from projects has reported several barriers and drivers (see section 2.3.1), which also have been supported by the interview results. The literature reports of unwanted side effects of urban freight measures as a barrier towards sustainable urban freight transport. Freight stakeholders of the studies in this thesis have also highlighted that, although the local authorities have not. As found by both interview studies and the literature (e.g. TURBLOG, 2011), a possible driver is for the local authorities to be aware of possible measures. Therefore transfer of knowledge between cities become important, to share both successes and failures that could help other local authorities to overcome the barrier. This could also help the local authorities to overcome the barrier reported from the interviews that there is a lack of knowledge from their side of how to start a measure.

Finally, the *impacts* of urban freight transport, either from specific single measures, or as a whole, act as a clear barrier when it comes to the available data. Drivers need to reduce emissions (e.g. NO_X, particulate matter and noise) but also congestion and safety are important issues that are often raised together with quality of life and attractiveness of the urban area. However, the barriers are large in this area and the lack of data is noticeable both in the literature and during interviews.

Regarding the different factors presented in the table above, the barriers are by far more relevant to consider than the drivers since it seems like the lack of interest and knowledge most affect outcomes and, are a potential reason for the few activities made regarding urban freight transport from the local authority side. It is not as simple as saying that the drivers are the opposite of the barriers. Some cities lack (in a positive sense) some of the barriers and have become more successful, due to the greater availability of drivers. Cities that do have an engaged person working with freight transport are the cites that have demonstrated the greatest effort in finding solutions to reduce the negative impact of freight transport taking place in the urban area. A good example of this is the case of Gothenburg, where the one person responsible for freight has succeeded to improve the stakeholder involvement resulting in a good dialogue and understanding of different issues, as well as outcomes in terms of an improved freight transport situation in the urban area. Here it has been shown that a "driving spirit" is very important.

Hence, barriers are somewhat connected and likewise so are the drivers. Further, they have a positive or negative effect on other drivers and barriers through this interconnection. As exemplified, when one driver is in place (e.g. "a driving spirit"), he/she also gains knowledge and awareness and can possibly bring about a good business and stakeholder co-operation. This in turn reduces the barriers that include the phrase, "lack of…". In this manner, the drivers can diminish the barriers in a positive spiral, or the barriers can be strengthened by additional barriers in a negative spiral.

5.4 Inclusion of sustainable urban freight transport (RQ 4)

The fourth research question focuses on the future and how a local authority transport planning process could, or should, be developed to encourage a sustainable urban area considering freight

transport. It is formulated as: *How can local authorities include freight in the urban transport planning?* This research question has been based both on the results from studies dedicated to the question, but also on the results from the three previous questions. The results from the previous research questions have been very important in the analysis of the result and development of the process for local authorities' inclusion of freight in the transport planning processes. In the thesis, it has been shown that, all too often, long-term planning as well as an integrated transport plan where all types of transport (i.e. including freight) are included, is lacking. Nevertheless, the thesis has demonstrated that when a long-term aspect is included in the planning, in the forms of the local freight networks and partnerships presented, e.g. for Gothenburg and London, there is a high level of successful outcomes in the freight transport area.

In the discussion of the previous research questions, a number of problems have been identified regarding urban freight transport and how local authorities do, or do not, include this in their overall transport planning. In this regard, three areas to be considered have been identified and will be further developed as the response to RQ4: increased knowledge and awareness; freight quality partnerships; and a thorough transport planning process.

5.4.1 Increased knowledge and awareness of urban freight transport

Based on the three previous research questions, in order to move towards sustainable freight transport in urban areas, there is a need to overcome the barriers and to increase the knowledge and awareness of urban freight. In order to do so the results of this research, both based on the literature and the empirical data, have been condensed into two main areas and, suggest that there is a need for:

- *resources*, which are not necessarily just financial possibilities through budget allocation, but also through employing persons with freight and/or logistics competence in order to reach a behavioural change; and,

- *information*, which includes involving stakeholders of urban freight transport in the decision-making process (see Section 5.4.2 below), but also to include freight transport in evaluations of the transport situation and collect statistics on goods movements and heavy vehicle operations.

If freight is included in the overall transport evaluations, and in addition to that statistics on freight transport are also collected on a regular basis, the knowledge of the freight transport situation in the urban area will increase. Besides basic statistics on the urban freight transport situation (vehicle movements, goods types, times of day, etc.), there is a need for proper evaluation and a common set of indicators to use for ex-ante and ex-post evaluation of measures (e.g. Browne et al., 2010b; Patier & Browne, 2010). Then it will become easier to address the (potential) problem and to know the impact by this type of transport operations. But, to know how to handle the information as well as know what kind of information is needed, it is valuable to have a person dedicated to work with freight transport at the local authority. Small cities might not need this competence, at least not on a full-time basis, but for this it is a good idea to have co-operation between several neighbouring cities or a regional co-operation. For all cities, no matter the size, it is important to have a good communication with the actors and stakeholders of urban freight transport. For the small cities, this is important as a substitute for having the competence in-house at the local authority, but for large cities, it is important in order to understand the complex situation, the problems and the possibilities. A freight partnership is one possibility (see next Section). Furthermore, an issue that is not further addressed by the interviews or results of the studies in this thesis, but nevertheless highlighted as relevant in theory, is that there is a

need for proper business models for measures (as discussed in 2.3.1) in order to get successful implementations.

5.4.2 Freight partnerships

Delponte and Ugolini (2011), based on experience from a number of projects in Italy, suggest that in order to reach transport sustainability, it is necessary to have well-integrated networks of competence, educational approaches and funding from cities and to reach synergistic effects from the presence of both public bodies and universities. Based on the studies in this thesis of urban freight networks and partnerships, it can be concluded that the same holds true for urban freight transport sustainability development. According to Hesse (1995) and Browne et al. (2007), stakeholder co-operation is one of the identified success factors of different projects, and nine factors were identified based on the frame of reference. Paper V, in order to assess the establishment and management of a urban freight partnership, addresses three of these factors: *formation of partnership* (objectives, relevant stakeholders, political involvement); *management* (action plan, manageable number of participants, regular attendance, strong project management), and *outcomes* (accept complexity and avoid seeking single solutions, consider urban freight as business propositions). The freight partnerships studied in Study 5 were assessed according to the assessment framework, with the results presented in Table 4-5.

Marsden et al. (2011) present a result that points to the possibility that transport policy transfer and learning are a process "built around curiosity, exchange and trust". That trust is important for stakeholders was also confirmed by Hofenk (2012) and is further confirmed by the studies made for this thesis, the results of which strongly point to the fact that there is a need for an individual who will drive the development towards policy development within the field of sustainable urban freight transport. Curiosity is one of the components that are needed for this individual (or group of individuals) in order to take part in the partnership, enabling him or her to find the interest to go further and develop new possible ideas for how to handle the situation. But, the trust and exchange of ideas is equally important. The exchange of ideas is currently happening in, e.g. the LFNG or the CLFQP, but it has been evident through the interviews that there is a need for trust between the partners in the networks in order to exchange ideas, sometimes with competitors, which could be a sensitive matter. Trust is developed in the partnerships through regular attendance at meetings and good discussions, which create common understandings of problems and possibilities as well as understandings of each other's prerequisites, as highlighted by several respondents in the Gothenburg partnership. However, no matter how good the integration with stakeholders and the planning process is, in most cases, the politicians have the final word in decision making (Hysing, 2009).

Freight partnerships have been proved to work regardless of contextual differences in a city, and might therefore be one of the best ways of approaching urban freight transport. Through such partnerships, possibilities exist to consider a wide range of views and requirements from different actors as well as stakeholders, not only to solve certain problems occurring in the urban area, but also to get a long-term perspective on how to handle and include freight in the overall transport planning at local authorities. One objective for freight partnerships should be to reduce the barriers as well as enhance the drivers for urban freight transport. However, as the results from the study (5) show, the following points are emphasised:

- The management and organisation of a partnership should be strong.
- It is important to have a variety of relevant stakeholders.
- In some partnerships, political involvement is important.

- In addition to objectives, in order to maximise the opportunity for identifiable policy impacts, outcomes should be disseminated.

- As outcomes are not just physical objects and projects, the relationship and knowledge exchange between participants is equally important, since these provide the foundation for further improvement in the urban freight situation.

- It is important to focus on long-term possibilities.

With the involvement of academic actors, the knowledge of foreign ideas could be introduced, and, through invitation of external lecturers, ideas from other cities could be presented in these partnerships. The studies performed for this thesis have not revealed any learning activities between cities to any great extent; however, the stakeholders and actors within the local freight partnerships are learning from each other and through that developing the basis for policies.

5.4.3 Framework model and transport planning processes

Tennoy (2010) discusses that one explanation why urban land use and transport systems are still planned ineffectively is the way planners are framing the problem. In accordance with this note, and given the way decision makers in the interviews of the studies in this thesis are framing the problem with urban freight transport as an infrastructural problem or even as a non-existent problem, little likelihood exists that the congestion and noise will decrease. Further, without a thorough framing of the problem and understanding the assessment of alternatives for solution, there are risks of sub-optimisation. With the fact that many local authority decision makers refer to freight transport as a private interest rather than a public responsibility and the optimisation of transport as a business-driven interest, they fail to see the possibility for improvements regarding, e.g. regulations and other policies that are related to freight transport. For local authorities, the way to manage and affect urban freight transport is through good policies and regulations. If transport policies take into consideration urban freight transport and set a good framework for the regulations of freight transport movements, which correspond to stakeholder possibilities and city prerequisites, there is a good opportunity for the development of a healthy and sustainable freight transport situation.

Since there is an abundance of different possible solutions to reach sustainable urban freight transport as well as numerous different prerequisites for different cities, it could be very difficult for local authorities to know what to do and where to start. Timms (2011) concludes that the "world of information" is growing more and more complex and that there are several factors that need to be considered regarding policy transfer in order to make it easier and more accessible. Language is one example when considering the transfer of knowledge between countries. Furthermore, an important factor is to identify the actors and stakeholders involved in knowledge transfer and understand what different roles the different actors could play, as mentioned above. Decision makers need to consider combinations of data collection methods in order to figure out the best way of tackling freight in their city (Ambrosini et al., 2010). It is also a fact that many solutions to reduce or make urban freight transport more efficient have been implemented in cities without a thorough ex-ante evaluation (Filippi et al., 2010).

The SUTP is a recent strategy for approaching transport by the EC, and is developed partly by the result of Study 2 (see Figure 3-3). The SUTP is a way of integrating different strategies and policies in the transport area (now referred to as SUMP, as noted in Section 3.2.1), and it also addresses the need for having both a continuous *planning process* together with a *plan* for how to address transport. This approach is mainly a strategic integration approach. To integrate different policies when working with

transport planning, it is important to deal effectively with any sustainability aspects that are being raised (May et al., 2003). This is confirmed by the work in Studies 2 and 3 and further developed in Study 6. To enhance sustainability, the important arenas in policy making to consider are transport, food, housing and urban form, energy, waste and water (Fitzgerald et al., 2012). With those arenas as a basis, Fitzgerald et al. (2012) developed a quantitative method for the evaluation of 40 candidate policies for enhanced sustainability. This method brings together several major pillars of sustainability in order to give the whole picture, but also shows the complexity of putting a value and weighting to indicators in order to get a quantitative result. One problem is that to deal with fields other than transport (land-use planning, strategic planning etc.), and integrate planning strategies with the transport field, there is a need to first understand transport. As concluded in this research, freight transport is often neglected in overall transport planning within the urban area. Integration between different strategic fields is, therefore, also important to integrate with policies between different transport fields. However, the urban form is rarely considered together with transport planning (Allen & Browne, 2010a). Size, density and layout of urban areas are identified as important factors when deciding on different measures (Allen et al., 2010b). In the SUT project, the urban form became an important part of the planning, and the model presented in Figure 5-6 below shows a simplified framework for how urban freight could be addressed from the local authority perspective.

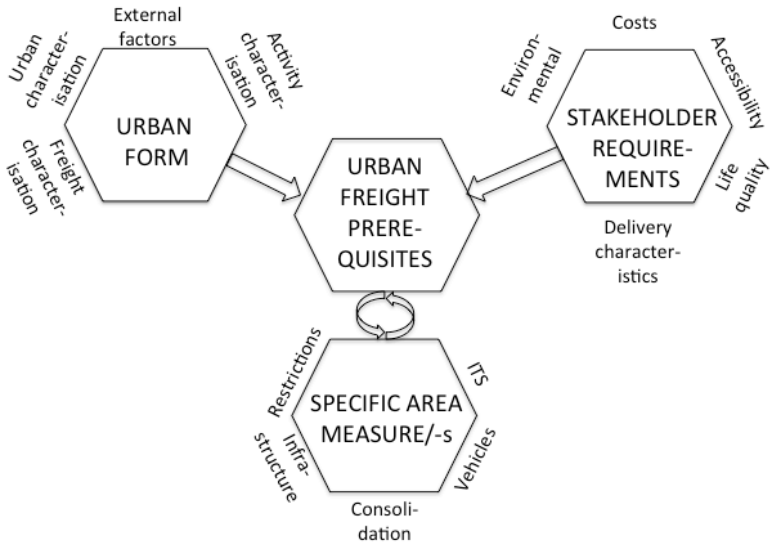

Figure 5-6 Framework model – how to address urban freight from a local authority perspective.

The model contains four main blocks: 1) urban form; 2) stakeholder requirements; 3) specific prerequisites for the area; and 4) specific area measures (for urban freight transport), and highlights that urban form (i.e. the status quo of the urban area considering infrastructure, existing regulations, activities and freight types) and stakeholder requirements (considering, e.g. environmental aspects, costs, accessibility and life quality) are equally important in evaluating the urban freight transport prerequisites. And, it is not until both those areas are considered that the planning of specific area measures or activities can take place. Taniguchi and Tamagawa (2005) highlight the importance of including the factor of stakeholder criteria in the evaluation process and, together with the results from the FQPs, it has been shown that the stakeholder requirements are important to consider through involvement.

The model is to be used as an iterative process, where there is a difference between "absolute requirements" and requirements that could be adjusted and compromised. The figure above is meant to show an overview of the basic features. In order to work with the freight on a day-to-day basis, there is

a need for a process model, in which different parts are identified and put into a sequence (see Figure 5-7).

The process model, which is a result from Study 6, is based on a traditional transport planning process as described in Section 2.2.2 (Black, 1981), whereby traffic strategies consist of prognosis-based documents at the local authority. The process presented below has been adapted from the TURBLOG (2011) process model for transferability as well as the "due diligence" processes that have been discussed in Section 2.3.4. The model takes into account the framework presented above, with the aim of explaining the complexity of the transport planning, also concluded by Richardson and Haywood (1996), that transport planning often fails due to the incapability to comprehend the complexities. Stakeholders, urban prerequisites risks and vulnerabilities need to be addressed. Uncertainties need to be dealt with, and Marchau et al. (2008) suggest an adaptive approach whereby vulnerabilities are identified and the implementation reassessed and redefined in order to be ahead of the problems and avoid failure; therefore, this step is included in the process. This could therefore be seen as an input to more volition-based traffic strategies, including contextual requirements and prerequisites of the urban area and stakeholders.

The model (Figure 5-7) takes the starting point of analysing the situation (which could be the identification of a problem, or, potential to reduce impacts), which is the main issue for every specific area. The starting point does not need to be to solve a negative problem, or respond to complaints, but instead should be a way of working towards a more attractive urban area taking all aspects and modes of transport into consideration. The urban form and the stakeholder requirements are handled in parallel based on the framework model presented in Figure 5-6 above and uses the same background as the framework model – even though vehicle solutions are added in the transport planning process. Stakeholders need to be identified as well as their requirements, which are suggested to be based on a framework of generic requirements based on the discussion in Section 2.3 (environmental, costs, accessibility, quality of life and delivery characteristics). The urban form prerequisites need to be investigated (urban characterisation, external factors, activity characterisation and freight characterisation) for the specific area of interest. It is thereafter possible to crosscheck these characteristics with possible measures and vehicle solutions that could be applicable. Measures are presented in Section 2.3.1, but vehicle solutions are excluded from the scope of this thesis. However, both need to be a subject for transfer of knowledge from other cities. Possible measures then need to be evaluated and compared in order to choose a measure that fits all requirements sets. The risks and vulnerabilities could be handled according to the due diligence process as discussed above. Both ex-ante and ex-post evaluations are important parts that need to be addressed more thoroughly by local authorities in order to show the effect of each implemented measure. The key performance indicators (KPIs) for the generic evaluation requirements are excluded from the scope of this thesis and therefore not addressed specifically here, but the KPIs are an important part of the process model and are discussed also in 2.3.3 as suggested key indicators by Patier and Browne (2010). Once the measure is implemented and properly evaluated, it is important to disseminate the project and transfer knowledge to others (both positive and negative experiences).

By presenting this model, this research has contributed to an improved understanding of how freight transport could be addressed in the transport planning processes of local authorities. The model gives the possibility to in a structure way identify and evaluate potential measures and give the local authority a well grounded decision for what to do. In this thesis, the purpose has been to show the process of how to include urban freight transport in the overall transport planning by the local authority. However, it is important to highlight that this is a model to be used once freight transport is acknowledged, and not a process of how to include freight in the overall transport planning.

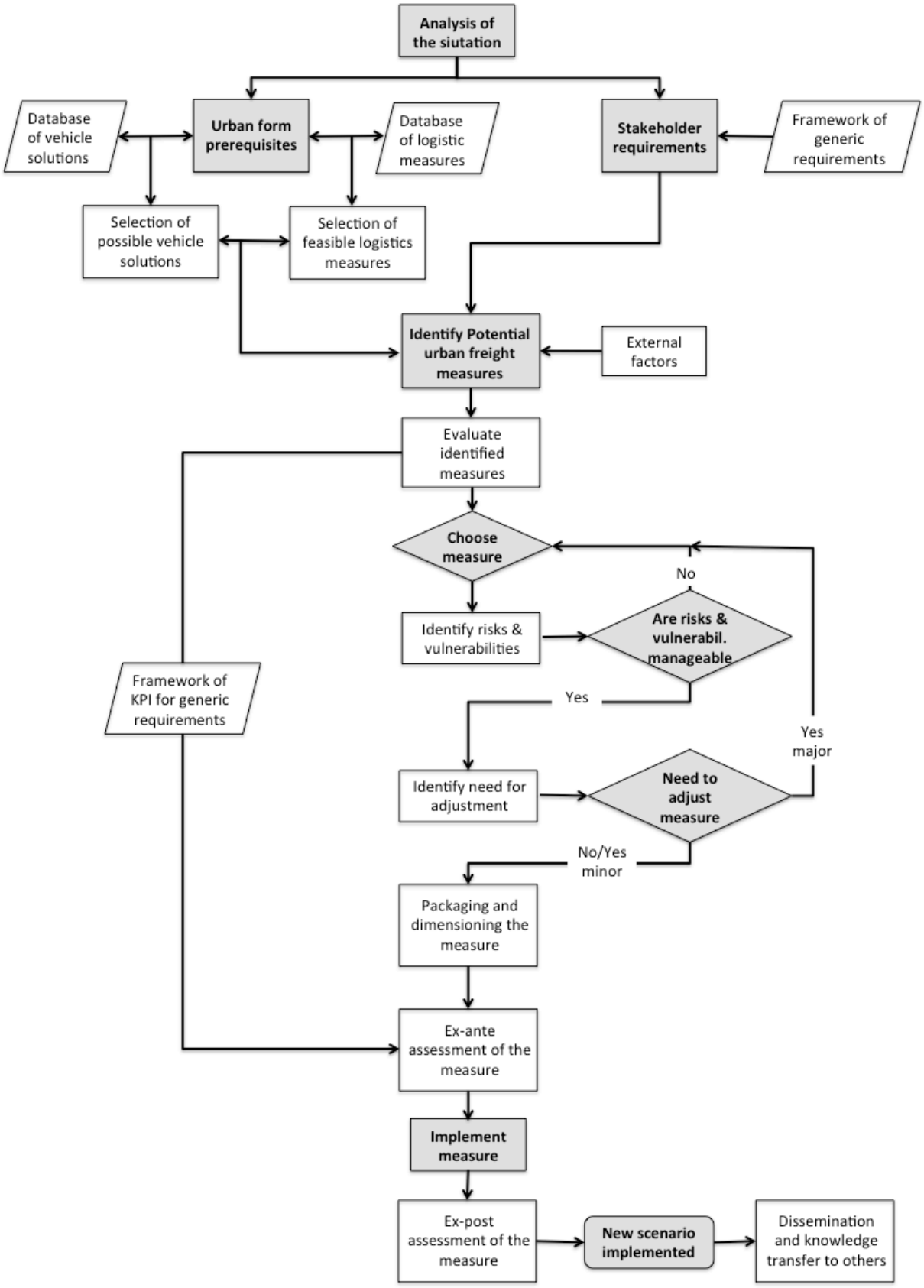

Figure 5-7 Sustainable urban freight transport planning process (adapted after the processes and planning models described in Sections 2.2.2 and 2.3.4).

6 Conclusion

In this chapter, the purpose will be addressed followed by a synthesis of the results of the research questions. The conclusion will be brought together combining the parts of the analysis model developed throughout the thesis.

The research has focused on sustainable urban freight transport from a local authority perspective. Urban freight transport is not sustainable, and there is a need for local authorities to handle freight transport as a part of overall transport planning. The purpose of the thesis was formulated as follows: "to contribute to the enabling of local authorities to include freight in urban transport planning for sustainable development".

> The overall conclusion of this thesis is formulated as: *in order for local authorities to include freight transport in the overall transport planning, there is a need for planning resources and information. There are several possibilities, where freight partnerships, information exchange and increased capacity in personnel at local authorities are some, but what is always necessary is to include relevant stakeholders in the process. To work with freight transport, a thorough transport planning process is essential, whereby urban prerequisites and stakeholder requirements are taken into consideration.*

The conclusion is illustrated through five main points in Figure 6-1. First (1), a stakeholder identification is presented where the actors and the stakeholders are separated and show the connections between them and their connection to urban freight, in order for local authorities to be able to identify which actors and stakeholders to address in the transport planning process. In (2), mechanisms are identified as well as barriers and drivers that affect urban freight and, the knowledge of those three aspects makes it possible for local authorities make decisions regarding freight transport towards sustainability. Mechanisms, barriers and drivers and, stakeholders are connected, as shown (3), since the mechanisms identified in this thesis are based on the need to address the interdependencies of stakeholders together with the barriers and drivers identified. The stakeholders are thereafter shown to play an important role (4) in the process of including freight in urban transport planning by the local authorities, whereby they play an important role of contributing to the increased knowledge and awareness through, e.g. urban freight partnerships and developing business cases for measures. Through the involvement of stakeholders there is a possibility to identify stakeholder requirements that together with the contextual prerequisites of the urban area, are an important part of the transport planning process model as presented (5) in order to plan for the development of sustainable urban freight transport.

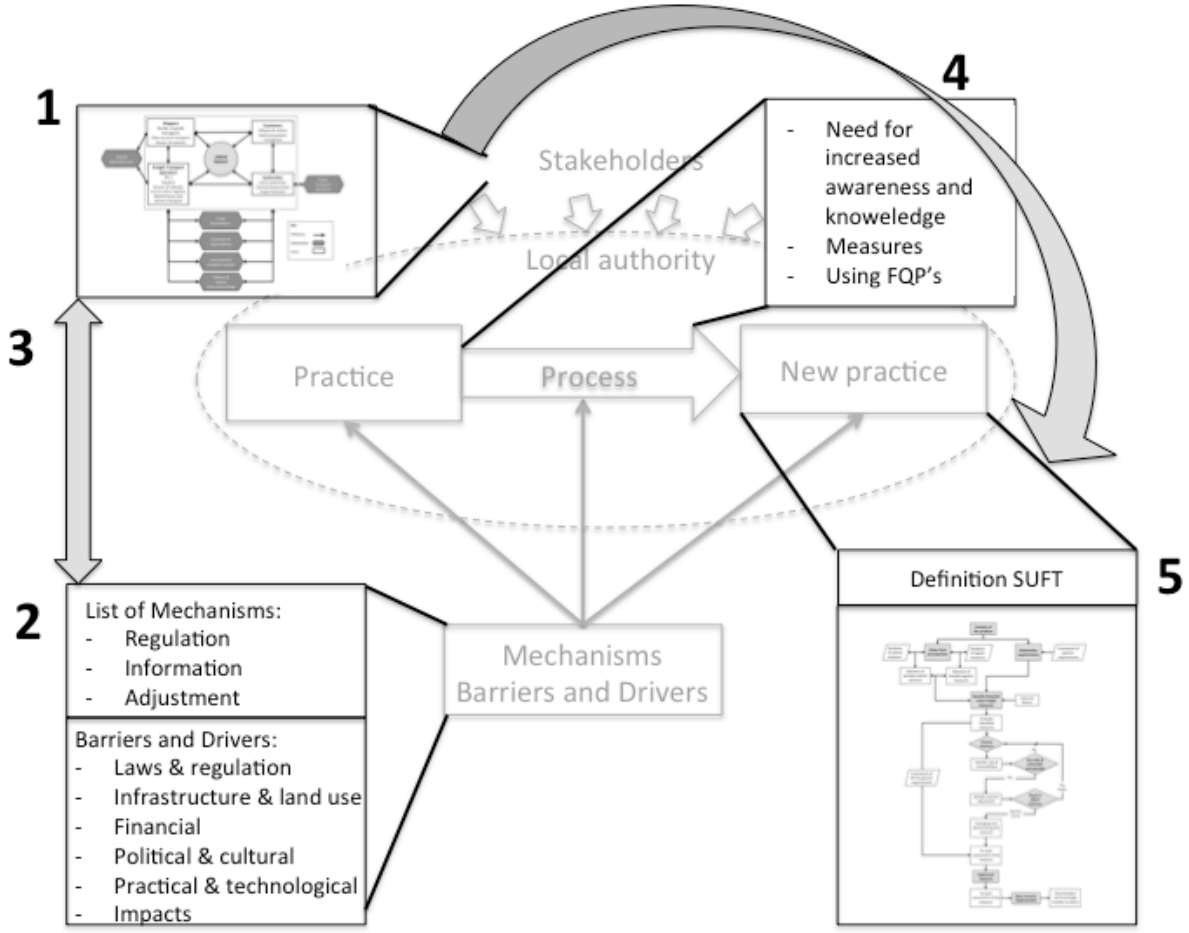

Figure 6-1 Synthesis of results in the analysis model.

The research was divided into four research questions, which have been dealt with in the analysis (Chapter 5). The first three research questions (RQ 1-3) do show the problems and some possibilities of the situation today and what affects the sustainable development of urban freight transport and the local authority transport planning. The results of RQ 4 present a framework whereby the aspects are included as well as a process model.

Freight is an acknowledged contributor to the unsustainability of the urban area. Therefore it is necessary for the local authorities to address freight transport as a relevant aspect in the overall transport planning. However, urban freight transport is a complex field with many different stakeholders, interest and prerequisites that have an effect on the outcome. Out of the research a relevant definition of urban freight transport was introduced to broaden the understanding of what constitutes urban freight transport:

> Urban freight transport is defined as all movements of goods (as distinct from people) in to, out from, through or within the urban area made by light or heavy vehicles, including also service transport and demolition traffic, shopping trips made by private households and waste (reverse logistics).

Results from RQ 1a conclude that the "practice" is that urban freight transport as of today does not have a proportional share of the transport planning, but nevertheless is acknowledged as a driver of the urban economy. Four main issues of urban freight transport were brought up as a result of the studies:

- there is a neglect of freight in urban transport planning (lack of knowledge, partly due to the lack of statistics, of goods movement);

- urban freight is today mainly handled as restrictions or response to complaints;

- sustainable urban freight is often addressed through single measures as a result of project funding; and,

- there is a contextual (tradition, culture, urban prerequisites etc.) difference between cities that need to be considered. Results show a somewhat dispersed picture, though, of whether freight transport is perceived as a problem in small vs. large cities similarly.

The results of RQ 1b present a definition of sustainable urban freight transport as a vision to aim towards.

Sustainable urban freight transport should fulfil the following:

- ensure the accessibility offered by the transport system to all categories of freight transport;

- reduce the air pollution, green house gas emissions, waste and noise to levels without negative impacts on the health of the citizens or nature;

- improve the resource and energy efficiency and cost-effectiveness of the transportation of goods, taking into account the external costs; and,

- contribute to the enhancement of the attractiveness and quality of the urban environment, by avoiding accidents, minimising the use of land and without compromising the mobility of citizens.

Trying different methods of improving freight transport (from an efficiency and sustainability perspective) is a big part of the total handling and planning of freight transport in cities, i.e. implementing different kinds of measures in order to address a problem. But, there is a short-termism in understanding the outcomes of imposed regulations. The results in the thesis have identified and structured the urban freight actors and stakeholders, in order to firstly acknowledge who the actors and stakeholders are, and, secondly to understand how they interact and could have an interest in urban freight transport. The result from RQ 2 could be concluded as*:* in order to reduce the knowledge gap and raise awareness of urban freight transport for local authorities, there is a need for both actor (stakeholders with a direct impact of urban freight) and stakeholder involvement (stakeholders with an indirect impact of urban freight), but also to increase the trust between different stakeholders. The division of actors and stakeholders in two groups help the directions of the planning process by local authorities and highlights the possibilities to also include those that do not have a direct effect on urban freight transport, since their actions could have an important outcome on the total sustainability as well.

Stakeholders and actors in urban freight transport have strong interdependencies, and therefore, as a result of RQ 2, mechanisms have been presented in this thesis as one approach for local authorities to handle activities and the outcomes. Mechanisms in urban freight transport are in this thesis used as a term to explain how the activities and resources in an urban area could be co-ordinated and are referred to as how to handle the interdependence between activities or, the cogs and wheels that

explains why one thing lead to another. Three groups of mechanisms are identified: regulation, information, and, adjustment.

Furthermore, the barriers and drivers to sustainable urban freight transport are identified and described in RQ 3, grouped into six categories (laws & regulation, infrastructure & land use, financial, political & cultural, practical & technological and, impacts). The lack of knowledge and awareness was identified as an important barrier, which gives an additional reason to strive for a more thought-through process of including the freight transport in the local authority transport planning, and an important driver is a "driving spirit" for urban freight transport. It was also concluded that it is possible to diminish barriers through one or several strong drivers, or the opposite, that additional barriers can even negatively strengthen other barriers.

Considering transport planning, there are clear differences between people movement and goods movements within local authorities and, most focus today is regarding the movement of people. There is a need to include freight transport in local authority transport planning, and hence to understand how urban freight transport could be more effective and efficient (sustainable). The research presented in this thesis shows that in order to do so, there is a need for better knowledge in the field of freight by the local authorities (which could be gained by, e.g. data collection of goods movements, more personnel working with freight transport at local authorities, involvement of stakeholders in different ways) as well as to know how to handle freight transport in the planning process, for which a planning process is presented. The result of RQ 4 could then be summarised as the "new practice" of sustainability of urban freight transport could only be reached if the knowledge and awareness of urban freight transport is raised, relevant stakeholders are involved and the factors affecting the process understood.

One actor alone will not be able to solve the impacts related to freight transport and, an integrated approach that involves all actors is necessary, as shown already in the earlier research questions. Yet, by analysing the results and considering the answers from all the research questions, it could be stated that the interaction between the local authority and the actors and stakeholders of urban freight transport is very complex. As of today, considering the sustainable urban freight transport of the cities studied during this research, there is not, with some exceptions, much interaction at all between local authorities and the actors and stakeholders of urban freight transport. And, where there is an interaction, the local authorities are not entirely clear about the importance of this interaction. The frame of reference shows that earlier research has focused on the important bits and pieces that contribute to solving parts of the urban freight transport problem. However, this thesis implies that a part of the lack of awareness and knowledge in the field could be due to a lack of a systematic view of the complexities of urban freight transport. This thesis then presents an overall picture of urban freight transport and the different pieces that can increase the possibilities for local authorities to know how to address the issue. Furthermore, with an increased awareness of urban freight transport there is also a possibility for cities without a perceived problem to start working with the aim of sustainable urban freight transport – before it becomes a problem.

7 Contribution and further research

This final Chapter will present the contribution to urban freight research and the implications for practice of this thesis. Thereafter, the thesis is ended by a concluding discussion regarding the implication of the research as well as a discussion on further research.

This thesis contributes to the understanding of how local authorities consider freight transport today and how urban freight can be considered by local authorities in order to move towards the sustainability of urban freight transport. The contribution of this research is twofold: a theoretical contribution within the research field of sustainable urban freight transport and a practical contribution that does and could enable local authorities to handle freight transport in a more effective and efficient way.

7.1 Contribution to urban freight research

Four main areas of contributions to the research field of urban freight transport are presented in this section:

- the development of a stakeholder framework;
- the enhancement of the mechanism concept within the field of urban freight transport;
- an assessment framework for formation and evaluation of freight partnerships; and,
- the development of a urban transport planning process including freight.

The first contribution concerns the development of the stakeholder framework presented in Figure 5-4. The framework is based on the identified stakeholders in Section 2.4. The research has identified the key actors and stakeholders that have a direct or indirect interest in urban freight transport and its path towards sustainability. The splitting of stakeholders into those with a direct interest and effect on urban freight transport sustainability (actors) and those with an indirect interest and effect on freight (stakeholders) is one part of the contribution and, further, there has been an identification of additional stakeholders, including the vehicle manufacturing industry, the public transport companies, the drivers of the vehicles, property owners and non-consumers – all of which are indirect stakeholders, but have an important role to play in the urban freight transport field. It has been concluded that stakeholders could have very complex interests in urban freight and it is almost impossible to describe them with just a couple of words. Instead, the second part of RQ 2 focuses on the mechanisms that occur as a result of the interconnections between stakeholders. Those mechanisms together with the framework model identify several stakeholder requirement areas that are important to take into consideration for urban freight transport planning by local authorities.

Therefore, the second contribution of this thesis is to enhance the concept of mechanisms. The concept of mechanisms in the context of urban freight transport has not been previously used, which is why the concept has been developed from the existing literature within business strategies and organisation theory as well as from a wider logistics and supply chain perspective. In this way, this thesis has contributed to urban freight research by suggesting the use of a concept in order to help local

authorities to handle the complexity of urban freight transport, but also to start the discussion of urban freight transport mechanisms as a topic for further research. Interdependencies between stakeholders in the urban area are shown to be complex and how their activities could be co-ordinated through regulations or information mechanisms as well as how the stakeholders, individually or by stakeholder group, adjusts to the regulations and the possibilities created by the local authorities. Hence, the mechanisms: regulation, information and adjustment are highlighted as relevant for local authorities to consider regarding urban freight transport.

The third contribution concerns the freight partnerships and the development of an assessment framework, into a comprehensive and easy-to-use concept, as presented in Table 4-5. The framework is based on three EU initiatives and projects: TURBLOG (2011), CIVITAS (Breuil & Sprunt, 2009) and START (2009). Several factors to consider for a successful outcome of freight partnerships were presented, and, in this thesis (Paper V), condensed into nine factors that need to be met in order for a successful freight partnership. This assessment framework was tested on the six different freight partnerships of Study 5 and could be further used both for evaluating existing partnerships, but also by local authorities to form new partnerships in order to include freight in a more comprehensive way in transport planning.

The fourth contribution is the development of a transport planning process to include freight in a comprehensive and useful way, in two steps. The first step consists of a framework model that aims at putting urban freight into the context of both stakeholder requirements and urban form prerequisites in order to find measures for a specific problem – and by that not just to start a process with a defined measure that should be implemented (as many seem to do), but to find a suitable measure based on the requirements and prerequisites that exist, based on discussion by, e.g. Allen and Browne (2010a) and Taniguchi and Tamagawa (2005). This framework model is, though, in need of a process on how to address transport planning by the local authorities. Therefore, the second step is the development of a proposed process of urban freight transport planning as presented in Figure 5-7, which is based on ideas in models presented by Marchau et al. (2008) in Figure 2-5, the MAMCA methodology presented by Macharis et al. (2010), the TURBLOG and START projects' views of a transferability process presented by Macário and Marques (2008) and, finally, the due diligence approach developed in Paper VI based on Rhodes et al. (2003). This model could, from a theoretical point of view, serve as a good framework for further studies on how to handle urban freight transport, with the basis in the problem that need to be solved, instead as of often the case now – with the basis in a pre-defined measure.

7.2 Implications for practice

Research is important in order to develop theories and knowledge within this given field, but the basis for this research is to a high degree practical day-to-day problems that need to be solved. There is a need to act, and as given by the EC's white paper on transport, action cannot be delayed, since the decisions we make today will affect the future of transport (European Commission, 2011). Even though the scientific literature and reporting within the field of urban freight transport have increased during the last decade, the importance of considering freight transport in decision-making processes at local authorities has not been realised with the same effect.

Freight matters. However, it is not necessary to look down upon these issues negatively. Freight is needed in the urban area, and the potential to find a good approach to make it more efficient exists. Freight is difficult to incorporate in overall transport planning, but it is possible, and the message from this thesis to decision makers at local authorities consists of the following:

- There is a need to accept the complexity of urban freight transport and consider all parts of freight transport in the urban area.

- There is a need for a person who is responsible for, or with an interest in, freight ("driving spirit").

- There is need for capacity building within the field of urban freight.

- There is a need for a strong recommendation to identify and include stakeholders. FQPs are useful, but they also need to be "entertained" and managed well.

- There is a need to collect the data of freight transport on a regular basis to map the possibilities or problems.

- There is a need to include freight transport in the overall transport planning on equal terms with other modes/types of transport.

The process model shown in Section 5.4.3 can be used in the planning process in order to guide decision makers in the process towards sustainable urban freight transport. However, first of all, freight needs to be included in the overall transport planning. This thesis can help local authorities to do so through the frameworks of identifying stakeholders and actors of urban freight transport, guidance on how freight stakeholders could be included in the transport planning process through freight partnerships and an understanding of the complexities of urban freight transport through a developed definition together with the identification of barriers, drivers and mechanisms.

7.3 Concluding discussion and further research

This thesis presents a planning process model for how to work with freight transport by local authorities. However, this model is not enough, if local authorities do not first of all understand the importance of considering freight transport at all. In theory, there are ideas on frameworks and formats for policy-making processes and these guidelines are needed (van Binsbergen & Visser, 2001). However, the interview results in this thesis show that these are not always followed and, furthermore, that local authorities do not necessarily want a model that shows them what to do, but rather need information on how to approach urban freight on a more general level to start with. Freight transport is not just a problem; it is a necessity for the life of the city. It is not possible to remove all goods movements but there is a great potential to make them more efficient. The distribution vehicles, HGVs and service vehicles that are moving into, out from and through the urban area all have specific tasks – there is a customer that will receive the goods, a customer sending goods or a service needed to be performed. Therefore, an underlying reason for the difficulties local authorities have with affecting the outcome of urban freight actions is that the volume of goods to the area will be the same no matter what (it is difficult to change the consuming behaviour of residents and businesses), and the goods must be somehow transported to their final location. A definition of urban freight transport was developed in this thesis and, the development of the definition in itself has been an important factor in the process of understanding that the aspect of urban freight transport needs to be included in the overall transport planning for local authorities.

If restrictions of different kinds are implemented, transport operators will find other solutions to complete their services to the customer. Those actions are sometimes counterproductive, e.g. a weight or time restriction could result in more vehicles delivering goods in the area since the same amount of goods needing transporting in less time or with smaller vehicles, which also could affect the fill rate of

vehicles. This will create more emissions, which was not the initial idea. The local authorities need to understand the problem so they may also understand the response to differently implemented restrictions or other measures. Single measures might not be enough, but a sequence of multiple actions to tackle a complex problem might be required.

A local authority has departments responsible for the planning of activities in the city concerning, e.g. environmental aspects, strategies and land use. Transport planning is a part of these planning activities. However, freight is rarely included on a regular basis in overall transport planning and the main focus is instead on the transport of people. I do not claim that it is a problem that the cities prioritise the movement of people, since this is a very important aspect for all cities. However, what I do claim is that local authorities need to acknowledge freight as an important issue *and* start to work with. In order to reach sustainability, or strive to reach sustainability, there is a need to consider several aspects during the transport planning process. First of all, freight transport needs to be included. Secondly, certain frameworks and national/international regulations need to be followed. One of the problems in local authority transport planning is that their mandate only covers the municipality and the regulations that regard the local street networks. The local authorities have no, or very limited, ability to affect consignors, consignees, property owners or other actors and stakeholders within the urban area. Evidence from the interviews supports the idea that a way forward involves a wide inclusion of stakeholders as well as improved competence of freight transport at the local authority level. The comprehensive identification of stakeholders presented in this thesis is a start, together with the characterisation of the mechanisms presented.

Mechanisms could be a prerequisite, or the cause, for an interaction between two stakeholders, but mechanisms could also be used as a response to the outcomes of stakeholder interactions, or to the influence that those outcomes have on urban freight transport. Local authorities have a reason for imposing e.g. regulations for freight transport which could be requirements set by certain stakeholders, but, if not *all* stakeholder requirements or urban prerequisites are taken into consideration it will be hard to avoid unintended consequences of decisions made. However, if it is possible to further develop the mechanisms and identifying important stakeholder interdependencies it could be possible to develop better strategies based on more accurate decisions in order to handle the complexity of urban freight transport. This could for example be to handle issues regarding cost, stability and swiftness of the mechanisms in order to compare and judge the most appropriate mechanism. The discussion of mechanisms in this thesis has been of a descriptive nature, whilst they should be of explanatory nature in order to be fully acknowledged and understood.

In the cities' interviews, only one had personnel dedicated to working with freight transport in the urban area. However, it might be a fact that the small- and medium-sized cities do not "need" a person fully dedicated to freight, where the problem is not very big (yet). Most Swedish and Northern European cities or localities are still small. Nevertheless, the knowledge and awareness is low, and a possible way to handle this issue could, e.g. be to better include freight and logistics already in the civil engineering education. Furthermore, I do believe that it is important to also include the stakeholders in the small cities, to avoid the occurrence of possible problems. The FQPs are highly important in large cities, in order to understand and address the complexity of urban freight transport, but for the small- and medium-sized cities, the FQPs might be the *only* way of understanding urban freight transport. For those cities, the regional co-operation becomes important as well, in order to develop common strategies and ideas on how to address urban freight transport.

Amongst others, the start of this thesis was based on the preliminary assumption that many measures have been unsuccessful on a long-term basis or full-scale implementation. The possibility to identify

reasons for failures was not addressed deeply in the thesis since it has been shown to be almost impossible to find data regarding finalised projects that did not continue towards a full-scale implementation. However, in interviews, the question was asked if the stakeholders interviewed could identify any reasons for the failures and successes of demonstration projects. And, with the exception of economic reasons, the main aspect often focused on the lack of sufficient interest from stakeholders, but it also seems to be a resistance to talk about the issue. With a long-term perspective, it is necessary to create possibilities for measures that have a commercial potential for full-scale implementation. In the frame of reference, evaluation is highlighted as important and this is also included in the suggested planning process in the results of this thesis. However, I believe that it is important to stress that for future projects; proper evaluation and dissemination of results regarding *both* successes and failures are a necessary prerequisite.

As stated at the beginning of this thesis, urban freight transport has, during the last decade, and during the research period of this thesis, become higher on the agenda for many local authorities (e.g. Cherrett et al., 2012; Stathopoulos et al., 2012). I would agree, since I have noticed a greater interest as well as more knowledge of the topic in recent years. However, I would equally argue that even though more cities pay attention to urban freight transport, these are mainly the larger cities or cities included in some kind of EC project regarding urban freight transport or mobility management. There is still a widespread *un*awareness of urban freight transport and it is still not sufficiently acknowledged in small- and medium-sized cities. Also, in the larger cities there are very few persons dedicated to work with freight transport at local authorities, and the stakeholders are not involved in the decision-making process to the extent that their knowledge and experiences are taken into account on a regular basis. Furthermore, knowledge exchange could be a possibility to increase the possibilities for successful measures. The research on transferability that has been initiated by Macário and Marques (2008) and through the TURBLOG project that have been adapted in a transport planning process in this research both in the SUT project and presented in Figure 5-7 need to be further developed and researched through, e.g. case studies. Research about policy transfer has been started by transport policy researchers around the world, e.g. by Bray et al. (2011), Marsden et al. (2011) and Marsden and Stead (2011), but the work is not yet widespread, and is especially not much specified in freight transport – this needs to be intensified and adapted to urban freight transport in particular.

In line with this, it would be valuable to adopt a multidisciplinary approach to the topic, whereby, e.g. more traditional civil engineering topics and architecture could be integrated with urban freight transport. The urban form has an influence on what aspects of logistics need to be considered as well as gives prerequisites for what type of logistics solutions could be applicable in an urban area. As concluded in the thesis, the system of urban freight transport is affected not just by stakeholder groups, but by individuals in the system that have different interests in the system as well as an interest in changing the system. Those individuals affect the outcome of the system but have not been studied in detail during this thesis. This will need more research, maybe from a human factors point of view whereby individual interest affects a system in a wider perspective. Likewise, it would also be valuable to broaden the now used systems approach with an actors' approach to get a wider perspective of the topic.

The research in this thesis has concluded that there is a need for improved logistics competence within local authorities, in order to understand the complex nature of logistics and the difference from passenger mobility. But there is also a need to further develop the ways of integrated transport planning to include freight transport. One aspect of this is the household shopping trips. These have been included in the definition of urban freight transport in this thesis to show that they are also something that needs to be taken into account when it comes to freight transport. However, they are

not particularly handled in the thesis, as they should be included in the overall transport planning. This needs to be further developed. In like manner, there is a need for service transport to be more efficiently included in the overall freight transport planning. The framework model for a comprehensive transport planning process needs to be tested and evaluated through real cases. The use of Delphi studies or focus groups would be helpful to thoroughly examine the use and benefits as well as further develop the framework model.

No specific techniques for collecting data of urban freight transport have been presented in this thesis, since that has been out of scope for this research. However, the theoretical framework highlights the importance of more data collection and the results of the interviews show that currently there is not much focus on freight transport in the transport data collection. There are indicator sets presented in the literature and models to be used. Nevertheless, to be practical, they need to be simplified and I believe that more research can be made within this field in order to make a more practical contribution. It would also be interesting to perform a quantitative study of different decisions and their effects on the environmental impacts, similar to the one done by Quak and de Koster (2006) on time windows. It would be interesting to compare, e.g. the Swedish regulations of "walking speed areas" on different roads and the quantitative effect of those decisions on freight transport and air quality as well as softer indicators, e.g., which could be of interest for an inner urban area.

The local authorities that have a better knowledge of urban freight transport, through, e.g. a person with logistics competence that is employed to handle freight transport, have a higher success rate of measures implemented. However, is this proof enough that if freight transport is handled on a more regular basis and with a better knowledge, the outcomes of measures are more successful? Well, based on the results of this thesis, there is good reason to believe that this is the case. But, there is also a need to involve stakeholders in the process in order to understand the problem situation for each city. There is a need to understand the specific situation, problems and possibilities that exist in a certain area – and that could be reached by including as many of the stakeholders as possible, as early as possible and with as long-term a perspective as possible. Coming back to the first regulations by Caesar some thousands of years ago, have we really not learnt anything during all those years? Well, in some aspects we might not have, but in others we have. Regarding the type of restriction, with time-windows and OHD, those are still of interest but with other aspects that need to be considered. However, people are still people and tend to do and act on the issues that are closest to their heart or attract the most attention at the time. It will probably be impossible to find "the" perfect solution for freight transport in urban areas to reach sustainability. It is impossible to say that one single action or measure is the solution everywhere – there is a need to find a good *combination* of measures that fits the specific problem of a certain urban area. It is the question of how to find those multiple measures, and what to do in order to succeed to implement them that needs to be raised. Measures are combinable!

With the results of this thesis, further research are suggested to:

- identify factors for failures: of measures, of freight partnerships etc.;
- develop the concept of mechanisms to be explanatory, for urban freight transport as a way to structure the issues that need to be dealt with in the process of understanding the complexity;
- further develop transferability possibilities of knowledge of urban freight transport activities, taking into account comparability of different contexts;

- test and evaluate the planning process model for urban freight transport;

- develop ideas and techniques for comprehensive data collection of freight transport operations in urban areas in order to better use evaluations tools; and,

- develop guidelines that ensures possibilities also for small and medium sized cities to take freight transport into consideration in the local authority transport planning.

Finally, there might not be a difference in the way small or large cities handle or acknowledge freight, even though some implications tend to show that it is mainly the larger cities that implement different kinds of measures. But, it is my opinion that it is not only the large cities that should be the focus of e.g. EC recommendations and guidelines, but effort should also be put into the work with recommendations and guidelines that suit the small-scale work of smaller localisation that might have another focus than emissions (e.g. putting a higher value on safety and noise issues). All cities have their own prerequisites, their own stakeholders with certain requirements and their own set of problems. But, they also have their own possibilities to find solutions that are suitable for their city, and including freight as a natural part of the transport planning together with a good stakeholder involvement will enable the local authorities to move towards sustainable urban freight transport!

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