Procurement of the vacuum waste collection systems

The cases of Hammarby Sjöstad and Stockholm Royal Seaport

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The thesis studies the role of public and private sector actors in the case of planning for vacuum waste collection systems in Hammarby Sjöstad and Stockholm Royal Seaport. Given the actuality of the topic, this thesis contributes to the debate with insights stemming from a governance perspective. Based mainly on semi-structured interviews with key respondents, the thesis describes the planning process of vacuum systems in the two environmentally-profiled areas and some of the innovative solutions experimented with. Key issues studied are the principal ownership of the facilities and the creation of competition in the vacuum market as a result of an ‘open system’, and how policies affecting the market are driven by actors from public as well as private sectors. Core arguments about the actors involved in the planning, their mobility and interdependence, the mechanisms used to drive sustainable development forward and the gap in expectations of the public sector’ role are put forward. The lack of municipal ownership is argued to push the responsibility for a vital part of the urban infrastructure from the public sector, via the private sector, onto private residents. This results in the paralysis of development and dire consequences on equity.

Key words: urban planning, governance, vacuum waste collection, procurement process, public and private sectors, steering mechanisms, technological development, mobile actors, sustainability

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1. Introduction

60% of Stockholm's inner city still doesn't have waste collection conditions that satisfy modern working environment standards. Instead, waste is collected in bin bags with heavy transport, with consequences on gas emissions, local attractiveness and working conditions for collectors (Dahllöf, 2013). For a city priding itself for its green reputation, these are serious objections to the claim. Vacuum waste collection systems address some of these issues, by installing underground pipe systems that transport waste to an easily accessible location, where collection by truck can be coordinated.

This is an example of the role which authorities on local levels can play in the development towards more sustainable societies. While cities stand for about 75% of the world's energy consumption and 80% of the greenhouse gas emissions, they also offer the potential to reduce per capita energy consumption. Indeed, it is in cities that the customer base is large enough for collective solutions such as district heating, public transport and waste collection. The city is thus both the focus of climate efforts as well as an important actor working to address these challenges (Andersson & Hermelin, 2012:79-81). In Sweden, municipalities have a particularly strong position given their planning monopoly, which increases their authority in planning matters (Boverket, 2012). Swedish municipalities are therefore responsible directly as well as indirectly for much of the management of environmental issues (Burström & Korhonen, 2001:37).

One of the ways to achieve these environmental objectives is through 'green growth', encouraging economic growth in environmental sectors such as cleantech. The private sector therefore plays a considerable role in transitioning to more sustainable societies. The research community uses governance theories to analyse this greater involvement of private actors and the process of collective decision-making, and the related issues of responsibilities.

This development follows a growing trend of using technical systems to resolve environmental challenges. The Delegation for Sustainable Cities thus claims that we are undergoing not a just period of technical innovation, but that IT will radically change our society. The vulnerability this entails requires profound changes in the way societal actors operate, to promote cooperation rather than competition in interactions between public, private and voluntary actors (Delegationen för hållbara städer 2012A).

The debate about encouraging cooperation and the consequent division of responsibility is exemplified by the one in the vacuum waste collection sector. As collection shifts from manual to mechanical, waste becomes part of the urban infrastructure, in the borderline between private and public. Waste management has long been a complex field, with unclear division of responsibility, where the result depends on users, producers and municipality to achieve reduced quantities of waste and recycling objectives.

Partly as a result of the recent emergence of the vacuum collection market, the sector has mostly been studied for its technical proficiency. Other aspects are of interests however. It is a sector that is dominated by a leading supplier, in Sweden but also abroad, where significant barriers to entry have made access to the market inaccessible. These barriers were structural, knowledge related and financial. Various actors, from the private as well as public spheres, have the capacity to shape this market. The manner in which the market has been subject to internal forces and external pressure is worth exploring, as the evolution of the market has a substantial impact on the technological development of the system.
1.1. Aim and hypotheses of the thesis

The aim of this thesis is to study the process of decision-making and the rationales of the actors involved in the planning of automated vacuum waste collection in Hammarby Sjöstad and Stockholm Royal Seaport in the light of governance theories. The thesis argues that while some of the principles of governance apply to the cases studied, several findings conflict with traditional governance literature.

The discussion of the implementation of the vacuum systems will enable the testing of the following three claims:

- Influential actors can no longer be confined to solely private or public sectors
- Technological development is driven by more than market mechanisms
- There is a gap in the actors’ perception of the role of the public sector

The first claim raises the question of who the actors involved in the planning of vacuum solutions in Hammarby Sjöstad and Stockholm Royal Seaport are. Having developed governance theory in Chapter 3, the thesis proceeds in the analysis to confront key propositions of the theory with the planning procedures described in the empirical case. The research seeks to identify elements that support the evidence of governance as a key planning paradigm, or on the contrary point to a move away from the leading theory. It will be demonstrated that the actors are less static than what governance theories posit.

The second claim is addressed in the second part of the analysis. The steering mechanisms used to drive the development of new technologies and environmental improvements forward are examined, linking the small topic of vacuum solutions to overall environmental objectives. Based on the findings in the first part of the analysis about the involvement of private actors in planning processes, steering mechanisms from both public as well as private sectors will be studied. It will be argued that the mechanisms available exceed the ones mentioned in traditional governance literature.

The third claim will be developed in the third part of the analysis, studying the role of the public sector and identifying a gap in stakeholder’s expectations of the public sector’s role. Municipalities arguably take on new responsibilities while abandoning others, which results in a transfer of obligations between public and private sectors. The three claims relate to three core elements of governance theory, namely actors, steering mechanisms and division of responsibilities.

1.2. Thesis delimitations

The cases studied are two urban development projects in Stockholm. Construction in Hammarby Sjöstad started in the late 1990s while that of Stockholm Royal Seaport started 10 years later. Although vacuum systems were installed in other developments in Stockholm prior to the construction of Hammarby Sjöstad, and thereafter, Hammarby Sjöstad and Stockholm Royal Seaport were chosen for this thesis as both were environmentally profiled areas as well as pilot projects. Hammarby Sjöstad was also a pilot project, where new technologies could be tested, including vacuum system trials. Stockholm Royal Seaport follows this line of thought and the lessons learnt in Hammarby Sjöstad were to be applied in Stockholm Royal Seaport. Ambitions are the neighbourhood will be a locus for innovation, a showcase for Swedish cleantech and a cooperation project between public and private actors (City of Stockholm, Stadsledningskontoret, 2009). While Hammarby Sjöstad introduces several of the key issues regarding vacuum systems, the main focus of current discussions will be explored in the context of Stockholm Royal Seaport, which is why larger amounts of data about the latter were collected and analysed.
Waste collection is related to a number of questions that were not considered in this thesis. These include going into details of the collection of organic waste, the treatment of waste after collection, and the debate about producer responsibility. Furthermore, only household waste collection is discussed, leaving out discussions about the collection of waste from commercial actors. While the principal ownership of the system forms an important element of study, the specifics regarding municipal financing of the facilities were not considered.

The thesis focuses on the main supplier of the vacuum systems, a Swedish based company called Envac. The company’s market share and historical dominance make it a key actor in the procurement processes, whereas competing suppliers are only briefly considered.

1.3. Relevance of the research

This thesis will be relevant for practitioners seeking an overview of the planning process for vacuum solutions and associated issues. Since much of the knowledge is locked with respondents, thereby making it hard to access, this is a compilation of the planning process over the years. It provides the reader with an overview of the current state of events as well as some indications about future developments. Additionally, it gives an insight into a specific example of urban planning processes, and of the complexity embedded in an issue that concerns not only a technical system, but current issues such as the collection of organic waste and the debate about producer responsibility.

Also, changes in the field might be seen within a comparatively short time frame. Vacuum solutions are an area that is gaining grounds and we are witnessing a trend away from manual collection methods to mechanical ones. This is linked not only to improved working conditions, but to the wider debate on environmental adaptation and on the need to transition to measures that are more lenient on our environment. The combination of improved working conditions for collectors, lessened environment impact and economic viability makes it an interesting case for the study of sustainability work in municipalities.

The case of Stockholm Royal Seaport is furthermore relevant as innovative solutions will be tried out, some for the first time, and lessons from previous projects applied and new ones taken forth to future projects. Some, such as the open system, might mark the end of the dominion of Envac and the successful creation by the municipality of competition on the vacuum market.

Researchers will also find in this on-going urban development project an illustration of the theoretical framework of governance applied on a local level, leading to findings about the relevance of the theory in present day planning. As regards the topic of the thesis, the automated vacuum waste collection systems have so far received little academic attention, despite becoming a vital element of urban infrastructure, something this thesis seeks to address.

1.4. Outline of the thesis

This section provides the reader with an outline of the structure of the thesis, as illustrated by Figure 1. The introduction has presented the aim, the hypotheses, the delimitations and the outline of the thesis. It gives an indication of the relevance of the topic and what will be achieved.

The second chapter describes and discusses the methods used to gather material and touches on some of the difficulties encountered. The main source of data was semi-structured interviews, which given their time-consuming nature restrict the number of interviews that can be conducted and may have resulted in a lack of representability.
In the third chapter, governance theories are presented to give an overview of the theoretical perspectives on which the empirical case is built. The contributions of governance theorists, and Stoker (1998) and Harvey (1989) in particular, are discussed, with an emphasis on the theory's relevance at local level. Mechanisms of governance and the division in responsibility between public and private spheres will be introduced and the governance model’s contribution to urban sustainability outlined.

The context of the topic of the thesis, that is the procurement of the vacuum waste collection systems in Hammarby Sjöstad and Stockholm Royal Seaport, is given in Chapter 4. The decisional framework of waste management in Stockholm is presented, as well as background information about the two areas of Hammarby Sjöstad and Stockholm Royal Seaport. The vacuum system and its leading supplier are also briefly presented.

The empirical material collected is presented in Chapter 5. This section is descriptive in nature, relating core findings provided by the interviewed respondents. The first part describes the process in Hammarby Sjöstad, the second the one in Stockholm Royal Seaport and the third sums up the cases and draws some conclusions about future developments.

Chapter 6 analyses the empirical material and is structured around the three statements outlined in the introduction. The case is discussed in light of the theoretical perspective of governance, and linked to broader concerns about sustainability. Finally, the findings of the thesis are summed up and conclusions drawn in Chapter 7.

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**Figure 1 Outline of the thesis (Source: own figure)**
2. **Methodological approach**

This chapter presents and discusses the choices that were made regarding the selection of the topic of study, of the theoretical framework used, the data collection method and the analytical approach.

2.1. **Choice of topic**

Finding a topic that combined personal interests, relevance in contemporary debates and academic expectations, as well as accepting the constraints resulting from the set time frame, proved challenging. Interestingly, the research hypotheses that seemed most interesting early on, yet were abandoned for being too elaborate, form part of the analysis, as providing answers to them proved more manageable once the empirical material had been collected.

Eventually the planning process of vacuum collection systems for waste was chosen as main topic, based on the cases of Hammarby Sjöstad and Stockholm Royal Seaport. The choice of topic emanates from a general interest in urban sustainability and how it can be achieved by means of smart solutions. Automated vacuum waste collection systems are an example of a system that reduce the environmental impact of current waste collection practices while at the same time improving working conditions for waste collectors, and lead to a more effective use of space. This can be seen as a small contribution to the efforts to deliver environmental objectives at local level, using technological advances as a mean and a variety of mechanisms as tools. This provided enough material to base a thesis on, and was considered as relevant for both research and practitioners as discussed in the introduction. Furthermore, the system has been implemented in Stockholm which made research for this thesis more accessible.

2.2. **Choice of theory**

The theoretical framework that was chosen was that of governance. While most of the governance theories were developed at the end of the 1990s, it is generally accepted among the research community as the most relevant theory for the study of modern politics and planning. Other theories were considered as complements, such as principal-actor theory, but would have focused too much on single actors. Instead, governance looks at interactions between stakeholders, collective decision-making and the division of responsibilities between the public and private spheres, and was judged more suitable for the purpose of the thesis.

2.3. **Method and approach**

The thesis is a case study, using a particular system currently in use as empirical base for research, which is especially common when knowledge is lacking in a field or when it is a very complex phenomenon (Gummesson, 2010:116). While case studies can have either an inductive or a deductive approach, this is a combination of the two. While following an inductive research design might have been time-saving. Indeed, it proved easier to use the case as starting point for the research, thereby learning about the points of contention in the vacuum waste management sector, than to think of potential key questions before gaining contextual knowledge and without prior understanding of the topic. However, combining with a deductive approach highlighted some key elements of analysis which helped shape the orientation of the research.

The case study follows a qualitative approach, as the empirical data almost exclusively consists of primary sources such as interviews conducted with stakeholders and text analysis of mostly official documents from the City of Stockholm. Practically all of these were gathered from the internet, including insyn.stockholm.se, though the archives of the Sanitation administration were searched and original documents such as faxes, emails and
reports recovered. This qualitative approach enabled a richer in-depth analysis than statistical analyses. The reason interviews were chosen as the main method is that while official records, such as procurement documents, land use agreements, environmental programmes or meeting protocols can be informative when it comes to facts and decisions, they rarely tell the story of how these decisions were taken. This thesis required information about who the actors involved were and what the alternatives might have been, as well as information about possible future developments, hence the decision to use interviews.

2.4. Identifying respondents and conducting interviews

While some researchers differentiate between interviews, dialogues and conversations, the interviews conducted for this research are a combination of attempting to achieve a transfer of objective knowledge from the respondent to the interviewer, as well as collecting subjective data (Gustavsson, 2010:238). The interviews were semi-structured, consisting of a set of open-ended questions, allowing interviewees to complement with additional information as they see fit. The advantage of this method, that is securing material that might not have been known to be needed, exceeds the disadvantage of not getting every respondent’s answer to the exact same questions.

Since the aim was not to generate standardised responses, suitable candidates were identified by going through official documents and contacting those that had been involved in the projects, as well as asking interviewees for suggestions regarding additional respondents. This so-called snowballing method is likely to have increased the legitimacy of the research and made later respondents more willing to share information (Valentine, 2005:117). The vacuum waste collection sector is relatively specialised, and the contacts which the respondents recommended for further information were in many cases those that had already been identified by studying official documents. This being said, some respondents were neither suppliers nor planners, which enriched the research with independent perspectives of the sector.

14 interviews were conducted: with planners involved in the Stockholm Royal Seaport project within the City of Stockholm’s City development and Traffic administrations, planners were involved in the Hammarby Sjöstad project, consultants and experts within waste and vacuum collection services, a developer involved in Stockholm Royal Seaport, an information officer in Hammarby Sjöstad, the chairman of a joint-property association in Hammarby Sjöstad, the former CEO of Skafab AB, a representative from the Property owner association in Stockholm (Fastighetsägarna Stockholm) and suppliers of vacuum solutions. The list of respondents figures in the list of references. One of the objectives was to collect information from actors involved in both projects, to be able to compare experiences and see whether the processes presented differences. Since the planning of Hammarby Sjöstad was conducted 15 years ago, some information may have been lost or skewed by time, and there may therefore be a difference in reliability between the two projects looked at in the study. Out of these 14 interviews, two respondents sent their answers by email, one interview was conducted over the phone, while the rest were face to face interviews. These latter were often in-depth discussions of the questions, most of them lasting over an hour. The answers that were provided during the phone interview made it more challenging to gauge the respondent's body language and interest, however the interview still gave ample information. The answers sent by email presented the main drawback of lacking the possibility to ask follow-up questions.

Several other stakeholders could have been able to provide valuable information, but given the time frame of the thesis the choice was made to contact those who work with the topic on a daily basis. Given the political nature of some of the issues raised in the thesis, further studies would benefit from including the views of political actors, or high level civil
Another segment of society that was not contacted was the users of the system, i.e., the residents of Hammarby Sjöstad and Stockholm Royal Seaport. Including user’s opinions about the system would have been valuable, however representability would have been difficult to ensure, as the experience of the collection system depends on several factors, such as whether a stationary or mobile system is in use or how the facility is managed. In an attempt to gain some insights in this, an interview was conducted with the Chairman of the Sickla Udde joint-property association in Hammarby Sjöstad; given the problems in that particular project, it can’t be seen as entirely representative, but does give an idea of the problems faced. Both of these groups would be interesting to include in further studies, for example by looking at the political motivations and the distribution of costs of the system on residents. Contacting those with everyday insights in the topic, such as planners or experts, instead enabled in-depth responses, at times of technical nature, while at others regarding the background, that users or decision-makers might not have been able to provide.

Additionally, the role as an interviewer is not passive, rather it is active in generating data and therefore potentially influencing it. Power-relations between the interviewer and the interviewee can shape the nature of the information being passed on (Gustavsson, 2010:240). While the interviews mostly started off with the two distinct roles of the expert and the student, as the interview went on the mode often shifted to a discussion between two people with similar interests. There was considerable curiosity from the part of the respondents about what the findings of the research pointed towards, which strengthens the claim that the topic of vacuum systems still needs considerable research.

A consequence of the slow early evolution of the thesis is that interviews were conducted over a period of over two months. This chronological spread was partly circumstantial, and in part due to a desire to have a clear idea of the aim of the thesis before conducting interviews. An incidental result was that the questions asked evolved during the research process, and later respondents were able to provide more specific input as the understanding of the topic increased. The questions also varied depending on whether the respondent represented a public or private actor, as well as which of the two projects they were involved in. The themes were therefore both very specific, when seeking an understanding of the design of the procurement processes, or considerably more abstract, when asking respondents about their views on the conditions necessary to encourage urban sustainability.

2.5. Prior understanding of the topic

Researchers’ prior understanding of the topic can shape the research design and the analysis of the research findings. Since some of the interviewees had been contacted in professional motives prior to the research for this thesis, the understanding of the case is informed both implicitly and explicitly by previous experiences. In a sense, this presents the risk of impeaching on understanding of the topic, by adding a bias to the interpretation of the findings. Conducting research thus necessitates the openness to include data and findings that contradict prior understanding, so that the interpretation of the topic is allowed to evolve (Ödman, 2010:77-79). Rather than to try to block out this bias and try to conduct unachievable objective research, the impact of this prior understanding on the research was acknowledged, leading to the adoption of a reflexive model seeking to understand the context in which data was gathered. At a later stage, the triangulation method has been used to minimise the bias in both researcher and respondent, using different sources to corroborate the findings (Valentine, 2005:112-113).

2.6. Research process and data analysis

The research process was far from linear and sequential; on the contrary, it fits the description of being iterative and dynamic, going from one stage to another over time and
then back again, a process described as a hermeneutic spiral (Gummesson, 2010:120). The planning of the research, that is choosing the research questions, the topic and the aim of the thesis, were influenced by decisions about the choice of the case and the sources accessible. There was also a desire to explore whether conclusions could be drawn between the planning process for vacuum systems and smart, sustainable solutions. A personal interest in the interactions between private and public sectors also guided the research design.

As had been described above, the main sources of data were interviews, but also official documents such as official records, archives, reports and investigations. Interviews were transcribed and written findings summarised, in an effort to identify the key points of contention. Information relevant to these was then regrouped to form separate paragraphs, which were ordered thematically or chronologically depending on the chapter. The topics that were included in the empirical chapter and later analysed were in some cases those which the respondents mentioned with particular emphasis, as well as topics which were deemed particularly interesting given the aim of the thesis and the theoretical framework chosen. As with any research, a number of interesting reflections by respondents could not be included, in an attempt to reduce the breadth of the thesis and instead have a richer in-depth analysis. These were however helpful in giving a better understanding of waste management issues and modern planning as a whole.

As the work proceeded, an argumentative approach was chosen. Rather than tentatively explore the topic, a more forceful position was chosen, which was better adapted to the interesting findings that were made. The hypotheses were adapted throughout the research process, at a point even put aside entirely, to focus on the empirical data. It was only once the empirical chapter was coherent that the hypotheses were finalised, in order to inform the analysis.

Waste management proved to be an intricate topic, more so than was expected. The sheer number and variety of actors, the different levels of responsibility and the multi-level involvement makes it an interesting case for studying governance. It cannot be excluded that the complexity was not always grasped, with ensuing misinterpretations of information. The objective of this thesis is however that it will serve to synthesise the findings and be a contribution to the understanding of vacuum collection solutions and embedded challenges.
3. Theoretical perspective
In this chapter, the theoretical framework of governance is elaborated and synthesised. The contributions of the theory to debates on a local scale are discussed, with a focus on shifts in responsibility from public to private actors, mechanisms available and the ability of private actors to influence public policy.

3.1. Fundamental changes in policy-making and failure of existing models
Around the mid-1980s, social scientists began to see fundamental changes affecting policy-making. These are democratisation, globalisation and international integration, typified by a rise in power of multinational companies and trends of privatisation of previously state- or municipality-owned companies and operations. These changes established power relations and gave a larger role to actors on local, regional, and supranational level (Jessop 1998:35).

Given these changes in institutional relations, the research community found that classic theories of government no longer had a satisfactory explanatory value. In the dominating model of thought (such as the Local Popular Government Model), citizens are represented by political parties, whose politicians establish a political programme. Decisions are then implemented by civil servants (Montin, 2000:5).

However, global trends are reshaping how policy is conducted. Decision-making no longer takes place primarily at national level, within the government, rather it has spread beyond the scope of government. Government services are contracted out to third parts, a process referred to as the hollowing-out of the state (Milword and Provan, 2000, in Ewalt, 2001:4). In the power vacuum created by this hollowing-out, new actors emerge.

As existing institutions fragment, civil society takes on a new role, as do private actors, cooperating across previous public, private and civil divides and creating new forms of partnerships and networks (Montin, 2000:8). Theorists are unable to translate this emerging set of complex relations within the frame of existing theories, and even less so the range of challenges that arise. Interactions that are faster, shorter and follow no hierarchical pattern thus lead to problems that cannot be resolved using traditional mechanisms (Jessop, 1998:32). Additionally, whereas classic models of planning assume a chronological and hierarchical relation between policy-making and implementation, in practice the two happen in parallel and influence one another (Louw, van der Krabben, & Priemus, 2003:357).

3.2. Emergence of governance as leading theory
Neither state nor market theories are able to fully explain the changes and these new trends prove the existing mechanisms of state and market to be insufficient and unable to avoid failure of the system. Reflecting social scientists’ dissatisfaction with existing theories’ inaptitude at describing the complexity of contemporary planning procedures, the term ‘governance’ becomes increasingly prevalent from 1985 onwards (Jessop, 1998:31). Although theorists have used the concept of governance to conceptualise these changed practices, they partly disagree on what aspects should be in focus.

While government is generally described as the traditional, institutional processes at national level aimed at organising and steering the nation state, governance is understood alternately as “a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or the new method by which society is governed” (Rhodes 1996, in Stoker, 1998A:17). It is seen by some as the new way of governing, a paradigm shift, in a context where state management is given a decreased role while the involvement of non-state actors in the public sphere is on the rise (MacLeod and Goodwin, 1999, in Louw et al, 2003:357). Others focus more specifically on the
changing processes rather than a change in outcome, and see it as a change in governing mechanisms, whereby market mechanisms replace authority and sanctions of government (Stoker, 1998A:17). Governance then becomes a way of conducting public policy using mechanisms inspired from the market. Others still see governance as the capacity to self-organise without external control, that is “the mode of conduct of specific institutions or organisations with multiple stakeholders, the role of public-private partnerships, and other kinds of strategic alliances among autonomous but interdependent organisations” (Jessop, 1998:30). Common to all of these is that governing styles lie in the grey field between public and private sector, and mechanisms of sanctions and authority are replaced (Ewalt, 2001:9).

Stoker lists five propositions describing governance, which this thesis will draw on heavily:

1. Governance refers to a set of institutions and actors that are drawn from but also beyond government.
2. Governance identifies the blurring of boundaries and responsibilities for tackling social and economic issues.
3. Governance identifies the power dependence involved in the relationships between institutions involved in collective action.
4. Governance is about autonomous self-governing networks of actors.
5. Governance recognises the capacity to get things done which does not rest on the power of government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide” (Stoker, 1998A:18).

The propositions list key elements of analysis which will guide the interpretation of the empirical material, and have guided the formulation of the research hypotheses and as a result the analysis. They synthesise the idea that actors engaged in decision-making have become more numerous and their interactions less hierarchic. New forms of management such as purchaser-provider relations, and the increased role in decision-making and service delivery of private and civil actors, change the political landscape (Stoker, 1998A:19). Stoker identifies a shift in responsibility, what he calls a "concern to push responsibility onto the private and voluntary sector, and more broadly, the citizen" (Stoker, 1998A:21). Finally, governance puts emphasis on governments’ new functions: rather than steer through sanctions, government now seeks to incentivise actors. It should be an ‘enabler’, a ‘catalytic agent’; government today, faced with governance, needs to adapt to changed expectations and adopt a new “operating code” (Stoker, 1998A:24). Negotiation thus becomes a key element of decision-making (Chhotray & Stoker, 2009). Indeed, what had previously been a clear divide between state and market is now blurred, on all levels and on a global scale, resulting in systemic interdependencies (Jessop, 1998:32).

### 3.3. Urban governance and the role of cities

Theoretical debates about governance at national level are echoed at local level, as more research is conducted on how the impact of global trends and changed institutional relations affect urban governance (Stoker, 1998B:126). In the European context this study is conducted in, external as well as internal factors impact local government’s field of action. These include urban governments’ increasing responsibilities, shrinking budgets and resulting need for joint action with private sector actors, combined with the consequences of EU legislation taking precedence over national jurisdiction (Healey et al, 1999:342). While some argue these developments allow local governments to play a bigger role given the hollowing out of the nation state, with the local level becoming the site for “economic development and intervention”, opponents of this view claim the local level retains less power as international private actors take over (Stoker, 1998B:126).
Much as a response to the social changes above, the role of cities evolves away from local governments’ traditional role of service providers to cities as agents seeking to encourage local development by attracting flows of capital, knowledge and production. Cities are said to have moved from a “managerial” or regulatory approach to an “entrepreneurial” attitude, entering into private-public partnerships as a means of boosting growth (Harvey, 1989; Healy et al, 1999:341). This urban entrepreneurialism can be undertaken in one or the combination of several ways: exploiting comparative production advantages, positioning the city as a place of consumption, attracting institutions or decision-making organs, or through support from the national government. All of these rest on the assumption of intra-urban competition for labour and capital (Harvey, 1989).

Urban entrepreneurialism can however been seen in the light of widening social disparities, as taking resources away from services to disadvantaged populations to favour the establishment of private actors and the provision of qualified employment. Harvey relates this to the dynamics of social change and economic development on a macro-level, drawing the link between the prevailing capitalistic approach based on chronic injections of capital in profile areas and the resulting duality of stage/backstage with accrued social divisions (Harvey, 1989). Given that resources are scarce, there will always need to be a choice between investments: social inequity is sometimes imbedded in the most trivial issues (Campbell, 2012:418).

Previously established relations between actors thus evolve, moving away from top-down decision-making. The range of actors is generally widened and characterised by collaboration. Similarly, greater coordination across sectors, often enabled by a common vision of territorial development, lead to better harmonisation of policies and the development of trust. Finally, planning processes evolve to become more negotiative. While engaging a greater variety of actors, specifically from the private sector, it poses questions of coordination and legitimacy. These three aspects point to a convergence of planning practice responses which by its intricacy reflects an adaptation to changing contexts (Healey et al, 1999:346-348). In a similar vein of thought, Harvey argues that "given the complexity of urban governance and its web of alliances and collaborations, it enables visionary individual actors to manoeuvre and shape developments" (Harvey, 1989).

As most other economies, these global trends also affect the public sector in Sweden. Local governments have as a result of merging municipalities in the 1960-70s and the power of taxation considerable autonomy, especially in the welfare sector but equally so in planning, what is referred to as the municipal planning monopoly. While the municipal sector has gained decision-making power from the national level, the implementation of policies and service provision is increasingly contracted out to private actors. These changes are described as a trend of "third decentralisation", corresponding to greater responsibilities being transferred to the private sector (Montin, 2000:2-3). The socialist history of Sweden makes governance and its focus on collective decision-making especially interesting, given the prevalence of state-ownership of economic resources and collective rather than individualistic solutions, such as district heating and public transport (Bäck & Larsson, 2006:237).

3.4. Criticism against governance

Criticism about governance usually concerns not so much about general governance theory, but rather specific strands of governance theories. Since the theoretical framework is a very large one, different threads of theory have been developed, and an internal debate is taking place as to whether specific interpretations are generalisable (Chhotray & Stoker, 2009). These include the relative strength and power of the government, the accountability of actors or the role of institutions (Chhotray & Stoker, 2009).
This being said, governance’s ability to achieve desired outcomes has been the subject of debate. The main question concerns the impact of governance in terms of democratic legitimacy. Some consider the opening up of traditional forms of governance an improvement, while others posit that including actors that aren’t democratically elected takes power and decision-making away from citizens. “Private-public governance arrangements tend to privilege some parties, while others are still left out” (Van Huijstee et al, 2007:81). There is also the risk of a marked gap forming between representatives and citizens (Jessop, 1998:41), as well as between policy-making and implementation in non-hierarchical structures (Ewalt, 2001:5). Public opinion prefers decision-making to remain in the hands of elected councils: in the long-run, a lack of legitimacy undermines public support and hampers the implementation of policies (Stoker, 1998A:20). According to van Huijstee et al, these “debates are political and normative in character, and cannot be expected to come to an end soon” (Van Huijstee et al, 2007:81).

A concern is the public sector’s increased dependence on other actors, as a result of the shift in responsibility, making success dependent on successful cooperation and running the risk of partners behaving opportunistically (Stoker, 1998A:22). Traditional, hierarchic systems are considered more stable than networks, who might find difficulties in implementing the wide variety of tasks expected: coordination, monitoring, negotiation, and holding stakeholders accountable (Ewalt, 2001:5).

As regards outcomes, although governance partly emerges as a response to state and market failure, failure is equally an inherent element of governance. While market failure occurs when private interests aren’t able to allocate resources optimally, ie creating maximal utility, state failure is the inability to achieve policies that lead to greater good. In both cases, proponents of the systems advocate an intensification of the mechanisms already in use. Identifying governance failure is more difficult, since goals are compromises and constantly renegotiated. Governance may also fail if actors are unable to coordinate at any of the three levels, personal, organisational or systemic, ie if there is a lack of interpersonal trust (Jessop, 1998:38-40).

### 3.5. Governance as a means of achieving urban sustainability

Despite the criticism, governance has gained ground both as a concept and as a steering form. As a concept it helps explain governing processes and provides cues as to how to address governing challenges, while as a form of steering its strength lies in the possibility to share forces with private sector actors to achieve public good objectives. The rationality of governance is ‘reflexive’: it relies on dialogue and exchange of information, making partners interdependent so as to minimise risk and opportunism. Being heavily dependent on negotiation, networking and cooperating on shared interests, governance is well-suited for innovative methods, giving it an “evolutionary advantage”: it isn’t stuck in static agreements. Necessary elements of successful governance are developing interactive learning about partnerships, developing methods to coordinate actions, and establishing a common world view. Stability of relations means that lessons can be learned for future cooperation (Jessop, 1998:32-38).

Sustainability objectives are one such public goods for which achievement is deemed to necessitate governance, especially at local level. Public and private actors, research institutes and organisations need to cooperate to reach urban sustainability goals (Andersson & Hermelin, 2012: 92), making collective decision-making an essential element to consider. One of the main contributions of the private sector is through ‘green growth’, whereby transitioning to more sustainable methods is a way of encouraging economic growth. Being ‘green’ is thus viewed as a market opportunity, rather than an obstacle (Cronin et al, 2011:164).
Indeed, striving for growth can be an incentive to strengthen ecological sustainability and sustainable city development. An environmentally sustainable economic growth is therefore both possible and desirable, a strand of thought referred to as ecological modernisation. The increased demand for green goods and services and better utilisation of resources, as well as the design of cleantech, presume a positive synergy between environment, technological development, economic growth and employment. This debate is a counter-argument to calls for reduced consumption, by instead encouraging green consumption (Andersson & Hermelin, 2012: 84-85).

Researchers thus identify a shift away from focusing on sustainable development to a greater focus on promoting sustainable innovations, cleantech and ecological modernisation (Andersson & Hermelin, 2012:89). Improving environmental standards may thus be achieved by generating income that can be spent on green technology, a kind of “trickle-down environmentalism” (Campbell, 2012:419).

This being said, a criticism of the popularity of sustainability objectives is that "the current concept of sustainability, though a laudable holistic vision, is vulnerable to the same criticism of vague idealism made thirty years ago against comprehensive planning". The all-pervading argument of sustainability is thus for some critics a mark of its toothlessness, altering the discourse but not the actions. Others, however, see the prevalence of the concept as evidence of the consensus achieved as regards the urgency and necessity of transitioning to more sustainable practices (Campbell, 2012:413-421).

3.6. Summary

The central ideas forming the pillars of governance theory have been summarised and discussed in this chapter. Focus has been on the emergence of governance theory as a result of changed institutional relations and its validity for the study of urban planning processes. The aim of governance as a theory is to help “to better frame an understanding of how the processes of collective decision-making fail or succeed in our societies” (Chhotray & Stoker, 2009:5). Governance has also been described as a popular model for achieving public good objectives, such as urban sustainability. It serves as a useful framework to study private sector involvement in sustainability objectives, for example through ecological modernisation. In the analysis, three core aspects of the theory will be used to shed light on the empirical material. These are the emergence of actors outside of the public sphere in decision-making arenas, the use by public actors of market mechanisms to steer development and the blurred lines between public and private responsibilities, and how this affects the perception of each actor’s role.
4. Background of the empirical study

In this chapter, contextual information about waste management in Stockholm and the two cases is given and the history and technical description of automated vacuum collection systems are presented.

4.1. A world class Stockholm

The City of Stockholm has devoted considerable attention and resources to profile itself as a green capital. The City Council aims to reduce greenhouse gas emissions down to 3.0 tonnes CO2e per capita by 2015, from 4.0 tonnes in 2005. Measures that have already been applied and are contributing to driving down emissions are heating the city by district heating, introducing a congestion charge, encouraging public transport use and incinerating waste for energy recovery (City of Stockholm, 2008). The municipality's efforts have been recognised internationally, and Stockholm was for example the first city to be designated European Green Capital in 2010. Stockholm is also a booming city with a sharp increase in population in the past couple of years. To deal with this population influx and address coming challenges, the political parties in the City Council agreed on a common vision for the future development of the city in 2007, Vision 2030. Its main objectives are for the city to be a world class city: versatile and full of unique experiences, innovative and growing, and the citizen’s Stockholm (City of Stockholm, 2009). These forward-looking goals serve to raise expectations on all sectors, including planning, and the topic of this thesis, waste management.

4.2. Waste management in Stockholm

Waste management in Sweden is subject to a number of laws, the most important piece of legislation being Chapter 15 of the Swedish Environmental code. It specifies that the responsibility for waste collection is divided between producers, who are to handle packaging and newspapers, and municipalities who are responsible for household waste, organic waste, dangerous waste and batteries. It should be noted however that this division is currently under revision, which has bearings on this analysis. Municipalities shall ensure that household waste is transported to a waste treatment plant and recycled or removed (Environmental code Ch15 §8). They are also required to adopt a municipal waste management regulation (renhållningsordning) which specifies the rules applicable in the municipality and a waste disposal plan (avfallsplan) (Environmental code Ch15 §11). While the responsibility to collect waste is legally imposed on the municipality, the system used is set in the municipal waste management regulation (Lundkvist, 2013). Other steering documents that apply for waste management are the waste decree (avfallsförordningen), which is set by the government, but also development and environmental programmes and detailed plans adopted by the municipality. The legal framework is thus subject to a large number of regulations set at national as well as local level, making it complicated for users to understand.

Within the City of Stockholm, the responsibility for waste management has been transferred between different organisations over time. It used to be managed under the Street administration, which was privatised under the social-democratic rule in 1977. Up until the organisational changes in 1999/2000, the municipal responsibility for household waste was therefore held by the municipal company Skafab AB. It was responsible for waste collection, both contracting out and overseeing the services by contractors, and also offering collection services for about 10% of household waste. One of the reasons it was set up was the municipality foreseeing the growing importance of waste recycling instead of landfill use (Frändén, 2013). When the conservative majority gained power in 1998, the operations were reorganised. As a result of the political decision to privatise municipal companies, the collection services were sold off. The administrative units of Skafab AB were communised into the Sanitation administration to be in charge of waste
management, the municipal responsibility for household waste, the collection tax, coordination with producer responsibility, procurements, development and information (LIP-kansliet, Stockholm stad, 2000-10-06:21). Waste collection services were contracted out, where procurements last over a given time frame and cover a set geographical area. In 2006, the Sanitation administration was incorporated under the Traffic administration, becoming the Waste department, and is still to this day the organisation within the City of Stockholm that is in charge of waste management. The hierarchy of the administrations is represented in Figure 2, where the relevant actors in the studied cases are depicted. While the administrations are responsible for the implementation of policies, decision-making takes place in the political organisation. This is headed by the City Council, under which are the City executive board and a number of divisions. The Traffic and waste management committee and the City planning committee, both of which are relevant for this study, lie under the Traffic and labour market and City planning and sports division respectively (City of Stockholm, Executive office, 2011).

The waste department is economically independent from the rest of the Traffic administration, and is financed exclusively by collection fees. The City executive board does not finance it with any tax revenues. The collection fee is therefore set to cover the costs of the waste department for the coming year, must be approved by the City Executive board and satisfy the principles of equal fee for equal service and cost price. The department is not allowed to make profit, however contractors are allowed to sell their services for profit. The collection fee can be set to incentivise systems that are encouraged by the municipality, or to discourage practices the municipality doesn’t support, making it an important mechanism. Property owners connected to a vacuum waste collection system, for example, are charged a lower fee. The Traffic administration also makes sure it complies with the Work Environment Act (Lundkvist, 2013).

This being said, the Waste department within the Traffic administration can only recommend, not steer. It is a referral organisation, which can advocate the use of certain measures but cannot hinder developers or property owners from choosing a different system. Recommendations can for example be found in Projektera och bygg för god avfallshantering – på väg mot ett Stockholm i världsklass (Stockholms stad, Trafikkontoret, 2004).

“The City of Stockholm advocates stationary vacuum systems as first hand choice for the collection of waste. To install stationary vacuum systems provides several advantages such as reduced transports, increased traffic security, improved working environment for collectors and reduced noise disturbances in residential area. Stationary vacuum systems mean that waste
fractions are transported through underground pipes straight to containers.”
(Stockholms stad, Trafikkontoret, 2004:17, own translation from Swedish)

Another actor within the City with authority in the waste sector is the City development administration, who can use detailed plans and land use agreements to force the adoption of preferred waste system.

Every property owner has a contract with the City of Stockholm for the collection of waste. This service is procured by the City of Stockholm, and paid for by the collection fees. These collection fees are dependent both on the collection system chosen by the property owners, and on the expected quantity of waste produced for each customer, as expressed by the number and size of bins requested by the property owner and the frequency of collection (Lundkvist, 2013). Most of the waste is then transported to a heat and power generation plant where it is combusted, while organic waste is treated to produce biogas.

The general opinion about waste management has long been one of confusion and dissatisfaction. Especially the recycling stations are subject to complaint, as they are often located too far from households and badly kept (Dahllöf, 2013). A report from 2000 shows that the user perspective had largely been ignored at the time, resulting in confusing and contradictory information (LIP-kansliet, Stockholms stad, 2000-10-06:34).

The Waste department is nowadays eager to take into account the user perspective, and the municipal waste disposal plan has as one of its four goals the integration of the user perspective when planning for waste management (Stockholms stad, Renhållningsordning för Stockholms kommun, 2013). Substantial attention is therefore devoted to making it easier for residents to sort and recycle, such as official recommendations about what collection systems to use and setting maximum distances from the residences to inlets and recycling stations. Surveys and sample analyses are conducted, and communication activities arranged. It is considered crucial for the achievement of high recycling levels in Stockholm that all users understand the importance of recycling, and how to do it properly (Dahllöf, 2013).

4.3. Presentation of the cases

The most common way of collecting waste is through manual collection, whereby contracted waste collectors manually drag wheelee bins or bin bags to the collection trucks. It involves considerable physical effort for the collectors, frequent garbage truck traffic and can cause nuisance in the form of pests and odour. In an attempt to remedy these problems, various alternatives have been tried out. When planning the development of Hammarby Sjöstad, environmental requirements were particularly high.

Hammarby Sjöstad

Hammarby Sjöstad is a former industrial area located south of Stockholm, which is being redeveloped into a residential area. The project is marked on the map in Figure 3, together with Stockholm Royal Seaport, illustrating how centrally located these large projects are. The long planning process for the area started in 1990, and the first land allocation contract were signed in 1996 (Pandis & Brandt, 2009). The project has been popular among families, and when the final stages are completed in 2017 the entire area will house 11,000 apartments and 290,000 sqm of offices, commercial activities and light industries (Stockholms stad, 2013A). The brownfield area was to be redeveloped to house the Olympic Games in 2004 and plans were subjected to very tough environmental standards (Blix, 2013).
The planning of Hammarby Sjöstad was characterised by very high ambitions and the leadership, both political and of the various administrations, showed strong interest and involvement in the project. Hammarby Sjöstad was to be an international showcase for green building, and the Olympic Games in 2004 were an opportunity for all actors to promote the latest planning and building techniques. Reportedly, the already ambitious goals put forward by the planners were even doubled by the politicians (Blix, 2013). Critics complained these goals were unattainable, but it certainly served to show how ambitious the city was and forced all actors to surpass themselves.

One of the main innovations in Hammarby Sjöstad concerned the open dialog and the tough requirements set on developers at an early stage. This was a manifestation of the green party’s power and pivotal role in the city council (Millers-Dalsjö, 2013). Achieving a good cooperation between private actors and planners proved decisive. Existing materials and solutions were sent back to suppliers, with demands of improvements in energy efficiency, insulation or building materials, which resulted in the creation of innovative solutions. Developers initially rejected the high environmental requirements, but eventually decided that Hammarby Sjöstad was too important a project not to be a part of it, since the predicted gains from publicity would outweigh the higher construction costs incurred. According to the Head of environmental planning at the time, the developers rose to the challenge and laid the ground for technical and material innovations. The Olympic Games also played an important role in motivating the developers and acted as a common vision for the project (Blix, 2013). When it was announced that Stockholm had lost the bid for the Olympic Games to Athens, political attention cooled down, but the goals were maintained.

The targets in the environmental programme included reducing waste transport by heavy transport in the area by 60% (Hammarby Sjöstad, 2009). Significant reduction in waste transport had been achieved in other areas in Stockholm using vacuum waste collection and the system had been installed in Barcelona for the Olympic Games in 1992 (Dolk,
This sparked interest in the system, and, together with the system's potential for recycling, convinced planners to opt for the underground transportation of waste in Hammarby Sjöstad. The system was first developed by a Swedish company now called Envac AB, who also installed the system in Hammarby Sjöstad and currently remains the main supplier of the system worldwide.

As a measure to support the transition towards environmental sustainability through investments, the Swedish Parliament set aside funds for local investment programmes (LIP) during the period 1998-2002. The LIP-secretariat for example organised competitions and research, and financed certain projects. One of them was Hammarby Sjöstad, for which the funding played a rather large part. The procedures were complicated however, and the administrative work required cumbersome. The joint-property associations were one of the recipients of the funding, entailing a complicated procedure of dividing the funds between the developers who had paid the initial costs (Svensson, 2013). Still, it served as an encouragement and showed support of the project (Blix, 2013).

Stockholm Royal Seaport

Stockholm Royal Seaport is a former industrial area in the north-eastern part of Stockholm which is being redeveloped as an environmentally profiled neighbourhood. In 2030 when construction is scheduled to be finished, it will house 12,000 new flats and 35,000 work places, making it one of Europe's largest urban development projects. Construction began in 2009 and the first residents were able to move in 2012. The project builds on experiences from Hammarby Sjöstad but will have even tougher standards, with lowered energy consumption and buildings consuming less than 55kvm/h, a high proportion of green areas to built surfaces and reduced parking lots to encourage the use of alternative transport modes. The high environmental standards have led to it being designated a Clinton Climate Positive Development Programme, along with 17 other projects in the world. It is to serve as a testbed for innovative solutions in urban planning and sustainable energy production, and be a showcase for Swedish cleantech internationally. It is hoped it will encourage the export of Swedish expertise and has received considerable international attention (Stockholms stad, 2013B).

Efforts mainly focus on the fields of energy consumption, environmentally friendly transport, climate adaptation, closed loops and encouraging sustainable lifestyles, all of which is to be accomplished by integrating the planning of the different aspects at an early stage. Since the city owns a large majority of the land, the project is financed through leasing or selling to developers after land use agreements have been struck. Developers are required to agree to all environmental requirements in order to get the contracts and a specific learning programme for sharing knowledge about environmental building has been set up by the City development administration. Cooperation between public and private sector is deemed necessary to reach the sustainability goals and the vision for the project states that the development of Stockholm Royal Seaport is to be conducted in partnership with influential companies such has Nasdaq OMX, Tallink Silja, Fortum Sverige, Vasakronan, Länsförsäkringarna and Envac (City of Stockholm, Stadsledningskontoret, 2009:4).

External funding was available in the planning of Stockholm Royal Seaport in a similar fashion to the LIP-funding in Hammarby Sjöstad. This time, it was the Delegation for Sustainable Cities which was appointed by the Swedish government to "promote the sustainable development of cities, urban communities and housing areas" during the period 2008-2012. While the main purpose of the organisation was contributing to knowledge development and the exchange of best practices, funds were also allocated to sustainable projects. These included Stockholm Royal Seaport, which received financial
support for some of its projects, including the study of closed loops, sustainable transports and ICT and smart grid projects (Delegation for Sustainable Cities, 2011).

4.4. History of vacuum waste collection

The original idea on which vacuum waste management is based came from the hospital setting. The owner of Centralsug AB, a company specialised in dust vacuum systems, applied existing vacuum techniques to waste management and designed a model to vacuum waste (Envac Group B). In 1961, the world’s first vacuum system for waste was installed in Sollefteå Hospital. Vacuum waste systems were later installed in residential areas, the first of which was in Sundbyberg, a municipality close to Stockholm. The system evolved over the years. Mobile stations, more flexible than stationary ones, were developed by a competing company called Avfallsteknik AB, which later merged with Centralsug AB. In recent years, litter bins have been connected to the pipes, a development which enables the system to be used in parks and pedestrian areas. In 2002, Centralsug AB changed company name to the internationally more pronounceable Envac AB, and was bought by Stena Adactum AB and thus incorporated into one of Sweden’s largest corporate groups. In 2002 Envac also purchased the company Optibag AB, a supplier of optical sorting systems (Envac Group).

4.5. Technical description of the vacuum collection system

Since Envac was the forerunner, and is still by far the leading supplier of automated vacuum waste collection systems worldwide, the following is a short description of their system. It provides an idea of how the technology works, but doesn’t account for the systems developed by competing suppliers. As shown in Figure 4, the technology is based on a system of underground pipes, which connect refuse chutes and storage valves at one end, and containers and fans at the other. In a stationary system, a negative air pressure is created in the pipes by the fans. When the storage valves are full, the control system automatically turns on the fans, creating an air flow which transports the solid waste from the valves to the closed container. The pipes can be up to 2km long, transporting waste at a speed of about 70km/h from the chutes to a container. Containers are typically located outside residential areas, where they are collected by lorries. The system can be installed in both new developments when construction is taking place, as well as in existing areas (Envac Group).

![Figure 4 Stationary system (Source: Envac Group)](image)

For smaller areas, a mobile vacuum system is preferable. In this case, the waste is stored in tanks in each building, connected through the pipe network to docking points. A vacuum truck connects to the docking points and creates a negative air pressure/vacuum in the pipe system, which sucks the waste from the storage tanks to the truck where it is
compressed. The waste from each storage tank can be measured using scales installed in the truck, enabling exact measurement of the volume of each building, which can be used to invoice individual property owners (Envac, 2008).

According to Envac, the biggest environmental advantage of the system is the reduced use of heavy transport compared to traditional systems. This lowers gas emissions and limits the risk of accidents, however the system is still dependent on heavy transport from the containers to treatment areas usually located outside the city. Additional advantages put forward by Envac is the improved working environment for waste collectors, who no longer have to lift bins or risk of injury from sharp waste items, and reduced traffic related incidents as the waste trucks do not have to enter residential areas (Envac, 2009). Since the system is automated, it requires very little manual assistance or supervision. The waste is kept underground in a closed system, which limits odours and makes it inaccessible to pests. By using underground pipes and containers valuable space is freed up at ground-level, and the waste being neatly kept out of sight improves the attractiveness of the neighbourhood.

This chapter has set the background for the empirical case, providing some contextual information for the data which follows. The main actors involved in decision-making and the regulations applicable to the studied cases were presented.
5. Case study and empirical material

This chapter tells the story of the planning for vacuum systems in the two areas Hammarby Sjöstad and Stockholm Royal Seaport. It is structured in three main parts, starting with the planning process for vacuum systems in Hammarby Sjöstad, which was mostly conducted in the late 1990s, moving on to the on-going planning process in Stockholm Royal Seaport before summing up and looking ahead at possible future developments. Within these sections, the text is divided in thematic subsections reflecting the main issues looked at.

5.1. Vacuum collection systems in Hammarby Sjöstad

This part will describe the procurement of the vacuum technology in Hammarby Sjöstad, presenting how the system was chosen, the procurement process, the organisational changes within the City of Stockholm and the principal ownership of the vacuum facilities.

5.1.1. Choosing vacuum systems in Hammarby Sjöstad

Deliberations about what waste management system to adopt in Hammarby Sjöstad were held early on, in the mid-1990s. Given the high ambitions for Hammarby Sjöstad and the expected high visibility of the project internationally, an outstanding waste management system was demanded. The three companies Stockholm Vatten, Stockholm Energi and Skafab AB, which at that time were all municipally owned, were given the task of together developing closed loop solutions for the new environmentally profiled district (Frändén, 2013). Waste management in Hammarby Sjöstad was regulated by the goals for transport and material flows, which included important measures concerning dangerous waste, landfill use, and convenient waste disposal. These goals were and remain visionary. What was missing however were comprehensive follow-up and monitoring measures (Millers-Dalsjö, 2013). One of the goals was that transport of waste should be reduced by 60%. While it wasn’t specified how this was to be achieved, giving planners free hands to come up with other solutions, this figure corresponded to the results achieved by vacuum systems in other areas (Cederquist, 2013).

The stationary vacuum system, developed by Centralsug AB, had existed since 1961 and several developments had already installed vacuum facilities. Reviews were mixed however, in part because of frequent pipe blockages resulting from unsuitable waste disposed of in the inlets. It wasn’t until 1998 that it was decided to install a vacuum system. What eventually tipped the balance was the possibility to sort waste at source, by having a separate inlet for each fraction (Blix, 2013).

Skafab AB initially suggested a stationary system, but the developers complained that the vacuum solution would be too costly. The mobile system developed by Avfallsteknik was eventually agreed upon as a compromise for the first part of the project, located in Sickla Udde, which turned out to be a poor solution, as will be shown later (Frändén, 2013). Opting for a mobile system was also partly a trial; planners thought it would be useful to try it out in Hammarby Sjöstad to see whether it could be used more extensively, especially in existing, already developed, neighbourhoods (Lundkvist, 2013). It was hoped it would be more flexible than a stationary one, some developers even believing that waste volumes would decrease enough to make regular waste collection superfluous. The decision to install a vacuum system was also agreed on late in the process: this resulted in a number of difficulties, such as finding suitable locations for the docking points, something residents still complain about today (Millers-Dalsjö, 2013).
5.1.2. Procurement of the mobile vacuum system in Sickla Udde

Since *Avfallsteknik AB* was by far the main supplier of the technology, the procurement process proved problematic. Only *Avfallsteknik AB* submitted a bid, thus winning the procurement in 1999 (SKAFAB, 1999). While the lack of competition was regrettable, planners however saw *Avfallsteknik*’s leading position as a guarantee of quality: the failure of the expensive system would have reflected upon the entire project, and it was deemed important to choose a reliable supplier (Blix, 2013). The supplier was to deliver the entire network of pipes, including storage containers, docking points, fans and the automated steering system, while inlets were charged separately. Fractions that were to be handled were organic waste, household waste and newspapers. An example of the design of the inlets is depicted in Figure 5.

![Figure 5 Inlets in Sickla Udde (Source: own photo)](image)

The procurement was divided in two parts: a main grid, procured by the City development administration, and smaller grids that connect the main grid, in streets and public land, to the inlets on private properties. These latter were procured by the individual developers, who had committed to installing vacuum pipes in the land use agreement. This system was only moderately popular among developers, who not only were forced to install a system they were partly suspicious of, since it wasn't well established, but on top of this obliged to use a monopolistic supplier (Andersson D. , 2013). The supplier is also responsible for the maintenance and operation of most of the facilities (Dolk, 2013), which may be the result of the system being built in a way that made it difficult for external actors to take care of maintenance. This situation has been problematic however, as it is generally agreed that competition is important, as it stimulates the actors and requires them to perform even better (Dolk, 2013; Frändén, 2013).

The ownership of the facility was discussed intensely, with several options put forward. One was for a company to be created and jointly-owned by *Skafab AB* and *Avfallsteknik AB*, which would be responsible for management and maintenance, waste collection in the area (of mobile vacuum systems as well as heavy waste and packaging). Eventually, *Avfallsteknik AB* merged with *Centralsug* and the changed political context led to the dismantling and communisation of *Skafab AB* and the decision for ownership of the facilities not to be within the city. According to a planner at the time, the City of Stockholm wanted the facilities to be managed at the most suitable level (Cederquist, 2013).
5.1.3. Dismantling Skafab AB

The dismantling of Skafab AB was a political decision, taken around the same time as the privatisation of Stockholm Energi, the municipally owned energy company which was sold to Fortum in 2001. The operations responsible for waste collection were sold, while the remainder of Skafab AB was communised and responsibility eventually assigned to the Waste department, incorporated under the Traffic administration. Politically, it was believed private actors would carry out the service more efficiently (Frändén, 2013).

However, while Skafab AB previously detained knowledge about collection and was able to challenge contractors, selling the operational division resulted in a loss of competence within the municipality. Skafab AB used to oversee the contractors as well as conduct its own waste collection, which enabled those in charge to learn about the operations and ensure that the contractors were doing what they had to. In effect, the municipality now no longer has the necessary competence in-house and is reliant on consultants when reviewing and managing the information provided by the contractors. This is especially relevant for bids and procurements, where access to information is unequally distributed (Frändén, 2013). Given the importance of knowledge in power relations, this point will be expanded on later on.

5.1.4. Principal ownership of the facilities

A key aspect of the vacuum system is related not so much to the system itself as to its ownership structure. As the municipality moved away from its previous role as waste collector and contracted out its services, it was also decided not to own the facilities but to let these be owned as joint-property by associations. These are a form of economic association, with statutes, participation shares and members consisting of housing associations and property owners. The joint-property association (samfällighetsförening) has a twofold mission: to charge members of the association for waste collection by dividing the municipality’s invoice according to members’ shares, and to be responsible for the operation and maintenance of the facility. The latter is usually contracted out to an external actor, as is the case in Sickla Udde where the association has a contract with Envac to do all maintenance work (Svensson, 2013). The joint-property associations are set up by developers before being taken over by property owners and housing associations. This complex ownership structure entails joint ownership of a rigid, expensive system by several different stakeholders. The property owners and housing associations that are members of the joint-property association each select a representative that sits on the board of the association. In most cases, these are laywomen or laymen without specific competence of the automated vacuum waste collection facilities. They are expected to agree on maintenance and reinvestment decision, despite informed decision-making requiring technical, economic and legal competence and foresight, as well as the ability to agree on joint decisions. According to several of the respondents, it cannot be assumed that all members possess this competence and cooperation between board members can be difficult to achieve (Cederquist, 2013; Karlsson, 2013; Landing, 2013; Svensson, 2013).

Because the decision to install vacuum systems was taken by the City of Stockholm, the supplier procured by the City Development administration, the facility owned and maintained by the joint-property associations, operated by Envac, and the users’ waste collected by a company contracted by the Traffic administration, responsibility is divided between a very large number of actors. When a problem arises, such as a blockage, identifying the actor most suited to deal with it is complicated, and each actor tends to put the blame on someone else (Svensson, 2013). Respondents agreed that this was an impractical solution, and that the joint-property association, although effectively the owner of the facility, had little control of it (Karlsson, 2013; Svensson, 2013).
A particularly telling example of the difficulties encountered can be found in the mobile systems in Hammarby Sjöstad, for example Sickla Udde which was described earlier. Having such a long network of pipes and a large number of containers to empty has been less successful than the alternative stationary systems. Trucks take too long to suck the waste, which causes significant noise disturbance, as well as at times blocking part of the street. Residents and businesses have filed complaints, and the Environment administration (yet another actor) sent an injunction to the Sickla udde joint-property association stating that the truck was not to be stationed longer than 40 minutes at a time. Since the trucks belong to a company contracted by the Traffic administration, there is little the association can do apart from telling them to interrupt the collection after 40 minutes and return at a later occasion, resulting in an additional service billed to the association (Svensson, 2013). Additionally, the mobile system relies on satisfactory performance on the part of the contractor responsible for collection, which has proved tricky to guarantee (Frändén, 2013; Höijertz, 2013). Envac, however, seems to have been very helpful in remedying to early problems, and are still very dependable (Blix, 2013; Frändén, 2013).

5.1.5. Summing up vacuum systems in Hammarby Sjöstad

As the Hammarby Sjöstad area expanded, several new waste vacuum facilities were built, stationary as well as mobile. While the mobile system hasn't always been satisfactory, and stationary systems are favoured in current developments, the mobile system in Sickla Udde is recognised to have been a useful trial. Lessons were learnt and subsequent projects were more successful (Svensson, 2013).

The choice of automated vacuum waste collection in Hammarby Sjöstad helped establish the system firmly as a suitable alternative to manual collection. It is however expensive, with need for reinvestments 20-30 years later, requiring commitment and knowledge about future investments, something which is problematic, as previously discussed (Bernvill, 2013; Blix, 2013; Cederquist, 2013; Haasmark, 2013).

The most important advantages of the systems are the reduction of heavy transport in residential areas and the consequent reduction of emissions and noise disturbances. Since regulations regarding waste management are continuously revised and toughened, future waste regulations are a risk factor for developers. As land becomes increasingly expensive and waste disposal rooms are required to be larger and capable of handling larger waste volumes, there is a loss of space for commercial or residential use (Haasmark, 2013). Although vacuum waste collection cannot handle all fractions and waste disposal rooms are still needed, the system does involve significant savings in valuable land.

This being said, the vacuum system is a very rigid one. The bulky pipes must to be arranged to guarantee access without digging into other cables and pipes, while sharp bends increase the risk of waste getting stuck and should be avoided. Changing an existing network is thus very difficult and costly, for example it is nearly impossible to add additional fractions, since tanks are usually located under the base plate of buildings. Planning and building the network therefore needs to be done at the very first stages of a project (Landing, 2013).

Several challenges remain however, such as the lack of competition and Envac's monopolistic position as well as the lack of in-house knowledge of the systems and resulting dependency on external sources of competence. The complex division of responsibility inherent to the ownership structure is furthermore a key point of contention. This section has also shown that the private sector, represented by Envac and the developers, is influential and able to exert significant pressure on public policies.
5.2. Vacuum collection systems in Stockholm Royal Seaport

This second part of the empirical Chapter will describe the decision-making behind the installation of the vacuum collection system in the thesis' second case, Stockholm Royal Seaport. Topics studied are the creation of competition on the vacuum market, how an 'open system' was achieved, the competing suppliers, the public-private partnership design of the contract and municipal dependence on external competence. A follow-up of the debate on principal ownership will be conducted, and a description of how the technology has developed be presented.

5.2.1. Creating competition in Stockholm Royal Seaport

When planning for waste management in Stockholm Royal Seaport, lessons from Hammarby Sjöstad were adapted and applied, for example making closed loops and environmentally sustainable waste management important elements of the planning (Bernvill, 2013). The environmental and sustainability programme for Stockholm Royal Seaport states waste management should be planned to be easy and convenient, which fits well with vacuum systems. Stationary vacuum waste collection systems were thus chosen, for their reduction of the need for heavy trucks with associated transport, and their compliance with working environment regulations. This being said, certain aspects of the vacuum systems in Hammarby Sjöstad were problematic, the most notorious one being the lack of competition on the market.

The facilities in Hammarby Sjöstad have generated a tremendous amount of publicity for Envac, both internationally and in Sweden, and as the leading supplier of the technology they have since won most procurements for vacuum systems in Stockholm. Envac has also been very active and seized every opportunity to partake in projects and demonstrate their system, much more than any other developer (Cederquist, 2013). This is problematic, as it can be interpreted as breaching the Municipal law Chapter 2 8§, which states that the municipality cannot favour any one company. The City development administration as well as developers have long wanted to achieve a healthy competition in the vacuum market. Encouraging competing suppliers to challenge the dominance of Envac has been identified as desirable and different solutions to achieve this have therefore been studied (Bernvill, 2013; Blix, 2013). The main aim of this competition is to stimulate innovation and competing ideas, as well as pressure prices (Landing, 2013).

Envac is aware of this situation and of the negative consequences linked to the lack of competition. When all other markets are competitive ones, the vacuum system market cannot be the only monopolistic one. Procurements require competing bids to be submitted, which has been difficult until now and outshining competitors is a stimulating challenge to embark on. This being said, being the only supplier has been advantageous in terms of enabling communication efforts to cover the entire system, as well as being profitable (Dolk, 2013).

5.2.2. Achieving an ‘open system’

In Stockholm Royal Seaport, it was therefore decided to trial a different procurement solution from that used in Hammarby Sjöstad. The area was divided into stages, within which the vacuum systems again consisted of a main grid procured by the municipality and smaller grids procured by developers. Given the complexity and size of the project, dividing the project into stages was also one way of getting around the risks coupled to the construction insecurity regarding the development of surrounding areas (Blix, 2013). Previously, the developers had no choice but to procure the services of the supplier contracted for the main grid, overwhelmingly often Envac. Instead, in Stockholm Royal Seaport, the contract for the main grid aimed for an 'open system' and was designed in such a way that developers could procure the services of competing suppliers (Landing,
Having an open system grid is a unique innovation, which so far has only been tried out in Stockholm Royal Seaport (Andersson D., 2013). According to one of the respondents, this will become more common, as developers involved in large projects will not want to commit to contracting a supplier that was procured 8-9 years earlier (Sundberg, 2013).

One of the prerequisites for this was for the steering system of the main grid to allow for competing suppliers to connect in the smaller grid units, and for pipes from different suppliers to be compatible. The City development administration has, with the help of an external consultant, drawn up specifications for the pipes (Bernvill, 2013). This would allow new actors on the market to compete for contracts, by reducing the size of the networks and making it easier for less established suppliers to challenge Envac. Envac was in effect forced to assist with information and technical specifications, but kept the responsibility for the steering system which operates the entire network (Sundberg, 2013). Splitting that would have jeopardised the functioning of the system (Andersson D., 2013). Since the main grid forms the bulk of the facility and is delivered with the steering system, another prerequisite is for the size of the smaller grid units to be large enough for them to be economically viable for competing suppliers to submit a bid (Höijertz, 2013).

The procurement for the main grid was held in 2008 and won by Envac. A criticism is that the procurement specifications were slightly too detailed, and might have counteracted competition (Höijertz, 2013; Millers-Dalsjö, 2013). Procurement specifications are a complicated task, where knowledge of the system is a prerequisite to write suitable and adapted specification details. In addition to acquiring the competence needed, an option would be to have functional procurements, that is specifying what the system should be able to achieve rather than how to achieve it, which might lead to more innovative solutions than detailed procurements (Höijertz, 2013).

Envac is thus responsible for installing the main grid in public streets in the first parts of the area, while separate procurements are held by developers. The goal of encouraging competition has been partly achieved, as for at least two of these smaller grids, the winning bid was by a competing supplier, Eleiko (Sundberg, 2013). Stage 1 is now in use, but since the location for the stationary terminal was inaccessible, a provisional terminal
has been installed (see the laying of the pipes in Figure 6). This provisional terminal functions just like a permanent one, and allows sorting in different fractions (Andersson D., 2013).

5.2.3. Competing vacuum system suppliers

Since Hammarby Sjöstad, new actors have entered the vacuum waste collection market and are becoming more important. These include competing suppliers such as Eleiko, Logiwaste, MariMatic among others, or consultancy companies such as Sopsugkonsulterra and Build Sweden AB. Most of these are still quite small, especially compared to Envac’s market share. Given the size and cost of the system, it is difficult for new suppliers to convincingly challenge established suppliers who have a solid reputation. It requires winning a catalytic large contract (Höijertz, 2013), or having determined owners with significant financial backing (Sundberg, 2013). As Envac was long the only supplier, many of the newer companies were started by former employees who decided to branch out. Since vacuum solutions are relatively advanced technologies, the field is quite small and the same actors tend to meet again, sometimes in changed roles. Envac is considered to be the vacuum ‘school’, as the largest supplier and a very dynamic one (Andersson D., 2013; Sundberg, 2013). While competition is rarely appreciated by market leaders, it is important for the competitors to produce high standard products, so as not to damage the reputation of the entire sector (Sundberg, 2013). These competing suppliers also have slightly different systems and solutions from Envac. Some of Eleiko’s products are reportedly superior to those of Envac, and Eleiko’s entrance on the market pressured Envac’s prices (Andersson D., 2013). Meanwhile, MariMatic has a circular system which enables pressure in both directions, which is particularly useful when waste gets blocked. They also have a testing facility, as opposed to many of the other suppliers who are frequently unable to test their products before sale (Sundberg, 2013). Competing solutions can thus be said to lead to a cross-pollination of ideas that enable the technology to develop.

An additional advantage of having competition within the field, as well as the increased use of the system in new developments, is that more stakeholders gain knowledge about the system. At the same time, this knowledge is a prerequisite for demand, and by extension competition (Höijertz, 2013). Knowledge, demand and competition can thus be said to form a positive spiral for the development of the system. When it is realised that this is an emerging business area even more actors will surface, both as suppliers or services providers within maintenance or collection (Andersson D., 2013). Established consultancy companies such as Sweco also branch out and start offering these services. Smaller actors, on the other hand, without large organisations to finance, are able to challenge market leaders by having more advantageous prices (Andersson D., 2013).

5.2.4. Public-private partnership – giving the municipality insight

The facility in Stockholm Royal Seaport was also procured as a type of public-private partnership (samverkansentreprenad). In a turnkey contract (totalentreprenad), a complete system or service is bought and then delivered without the procurer being involved in the building process. In this case, the procurers and contractors take decisions jointly, which enables the procurer to have complete insight in the contractor’s work (Sundberg, 2013). At this early stage of the process, this translates into weekly meetings where all expenses are reviewed, giving the City development administration’s representative detailed knowledge of the state of affairs. It is also a way of making sure that both parts share an understanding of priorities and expected results (Andersson D., 2013).

This was decided in a context where the principal ownership of the facilities was heavily debated, and can be interpreted as the City development administration keeping its
options open, and preparing for a potential municipal ownership of the facilities. The City development administration wanted insight in the construction of the facility, in case it would later be its owner (Dahllöf, 2013). This is an example of the need for planners to think long-term, especially when procuring services where the specifications set might have to hold for the coming 10 years. This requires considerable foresight, and numerous projects and studies are conducted to attempt to establish the consequences of decisions taken and allow for flexibility (Lundkvist, 2013).

5.2.5. Municipal dependence on external competence

As mentioned earlier, one of the consequences of Skafab AB's communisation was that the City of Stockholm lost in-house competence within waste management, and knowledge about vacuum systems that had been gained at the early stages of development. Since the technology is advanced and under continuous development, competence also quickly becomes out of date (Andersson D., 2013). Furthermore, while substantial parts of the knowledge about vacuum systems is available within the municipality, it is usually with people who hold other positions and do not have the time to manage the municipality's operations within this field (Andersson D., 2013). This asymmetrical information can leave the City of Stockholm in a vulnerable position towards suppliers. The power imbalance is partly addressed by recruiting employees who have worked on the supplier side (Lundkvist, 2013). Usually however, external input is needed for decision-making, but this must be vendor-independent, coming from more sources than the leading supplier (Millers-Dalsjö, 2013).

One way this was remedied was for the City of Stockholm to contact an expert in vacuum solutions, who had worked as a consultant for Envac, set up a competing company and later began working for Eleiko, a competitor (Sundberg, 2013). This expert started Sopsugkonsulterna and began working as a consultant for the City of Stockholm, using personal knowledge about the field to confront suppliers. This person was involved in the planning of Stockholm Royal Seaport and a strong advocate of the open system (Bernvill, 2013; Sundberg, 2013). When Sopsugkonsulterna were bought by a Finnish vacuum system supplier, MariMatic, a new procurement for consultancy services was held, which was won by Build Sweden AB (Andersson D., 2013). Having a contact with experience working on the supplier side representing the municipality during negotiations forces the suppliers to present good offers and solutions, which isn’t always appreciated. At the same time, this hopefully forces the supplier to develop even better solutions, and it can be helpful for them to have someone within the city with the competence required to provide answers to highly technical questions (Sundberg, 2013).

5.2.6. Current debate about principal ownership

A core element in the debate regarding the planning of vacuum systems in Stockholm Royal Seaport is the ownership structure. As has been described earlier, the principal ownership of the facilities tends to be held by joint-property associations, which is a cumbersome arrangement. Developers were determined to not only have an open system in Stockholm Royal Seaport, but to change the principal ownership of the facilities. When the land use agreements for the development of the first parts of the project were under elaboration in 2008, developers sent a joint letter to the political leadership of the City of Stockholm, raising some of the issues inherent to joint ownership and management of the facilities (Landing, 2013), which have been mentioned earlier. While generally positive to the vacuum systems, developers pointed at the large number of properties and flats sharing responsibility for the association, with for example 31 properties with 3500 flats in the association in Norra Hammarby hamnen. In Stockholm Royal Seaport, plans point to up to 100 property owners sharing the responsibility for a facility (Landing, 2013). An additional difficulty regards the successive deployment of the network, and admission of
new stakeholders, whereby the number of shares of each actor needs to be adjusted accordingly (Stockholms stad, Exploateringsnämnden, 2008).

The association, once formed, assumes unending responsibility for the facility. While the day-to-day management of the facility can be commissioned to a third part, the board of the association remains responsible for negotiations with the contractors. The owners of participating properties thus bear responsibility for reinvestment decisions. The association commonly consists of stakeholders with diverse character and interests, as well as competence in matters of property management. This may significantly impact the board’s ability to act and take decisions. The developers were therefore of the opinion that the joint property-ownership model was not a suitable one for vacuum facilities that are of complex character, and argue in favour of municipal ownership of the facilities (Stockholms stad, Exploateringsnämnden, 2008).

The Traffic and City Development administrations investigated the matter and gave an official answer in 2010. The report found several arguments in favour of the municipality having principal ownership of the facilities, showing that municipal responsibility of the facility would give stability to and promote long-term thinking in the projects. Having fewer actors would reduce costs and minimise disturbances by installing the network during road construction. The municipality would be able to promote the adoption of the system and drive development forward. In the cases where the system would be installed in new developments, the investments could be recovered through an initial connection fee with ensuing yearly charges, with no additional costs incurred compared to the present setup. When installing a pipe network in existing neighbourhoods, initial costs would be higher however these would be recouped when taking into account the costs related to the transition from manual to mechanised collection of waste. Predictably, the main drawbacks associated with municipal principal ownership of the facilities are financial, given the high investment costs at early stages of the project, and responsibility for operation and management of the facilities (Stockholms stad, Exploateringsnämnden, 2008). The cost division depending on the form of principal ownership is schematised in Figure 7.

<table>
<thead>
<tr>
<th>Joint-property associations</th>
<th>Municipal responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial investments</strong></td>
<td>Covered by the municipality</td>
</tr>
<tr>
<td><strong>Running costs</strong></td>
<td>The joint-property association receives a bill from the municipality, which is divided up between the members of the association</td>
</tr>
<tr>
<td><strong>Reinvestments</strong></td>
<td>Agreement by the joint-property association board</td>
</tr>
<tr>
<td><strong>Installation in existing developments</strong></td>
<td>Require digging up streets and the setting up of a new association</td>
</tr>
</tbody>
</table>

*Figure 7 Cost division depending of principal ownership (Source: own table)*

Based on these findings, the Administrations recommended that the municipality assume principal ownership of waste vacuum networks in both new and existing urban developments. It was also stated that the city should encourage competition in the vacuum waste collection market. Existing facilities were to retain the current form of ownership.
The recommended proposition was approved by the City development and Traffic and Waste management committee, presided by the conservative vice-mayor for Transport, and the case handed over to the City Council for approval (City of Stockholm, Traffic & City Development administrations, 2010). At this point, developers and planners had assumed this matter would be resolved, given the general consensus among stakeholders (Sundberg, 2013).

The case was debated by the City Council in November 2010, when the City development administration was endowed with the permission to procure a stationary waste collection system in the first stage of Stockholm Royal Seaport. Contrary to hopes, the conservative Mayor stated that the vacuum facilities were not to be considered a matter of municipal concern and were to be owned and operated by property owners. The ownership structure should be similar to that of Hammarby Sjöstad, with property owners forming joint-property associations who jointly own and run the facility. For practical reasons, it is desirable for the City to initially invest in the facility, thereafter transferring the responsibility to and getting retribution from the developers (Stockholms stad, Exploateringskontoret, 2010). The group leader for the opposition argued that the facilities should be publicly owned, but the final decision followed the Mayor’s opinion. Refusing defeat, the developers have sent a second letter to the politicians, but so far no progress has been made (Sundberg, 2013). The task of lobbying the politicians has been taken over by the developers’ association, Byggmästarföreningen (Landing, 2013).

The developer interviewed found the reasoning behind this attitude to be inconsistent with previous decisions taken by the municipality. For instance, private developers are usually never allowed to put private pipes in public land. Eventually, a situation will arise where a pipe is blocked in a section located on public land and this will be very difficult to resolve. This would be even more complicated if the street in question has a tram line, which is one of the favoured transport modes in Stockholm Royal Seaport. The board of the joint-property association would first need to agree on how to proceed, then go to the municipality for permission to dig in the street in order to repair a privately owned pipe. During that time waste collection cannot be carried out by automated systems, conventional collection would need to be arranged and compensation would have to be paid to the public transport provider for not being able to provide the tram service and instead use replacement buses. The municipality also usually refuses to form a joint-property association together with private actors, whereas in Stockholm Royal Seaport this would in effect be the result of the municipality bearing responsibility for inlets located on public land, such as in parks or in the streets (Landing, 2013).

The developers’ argument is essentially that the vacuum pipes should be considered as part of the urban infrastructure in the same way as sewage or district heating pipes, which are under municipal responsibility (Landing, 2013). The responsibility could, as it is does for the former, lie under a separate company, or under an existing administration. An additional argument is that having municipal ownership of the facilities would restrict the developers’ power to interfere in the decision on what system to procure, as happened when a mobile rather than stationary system was chosen in Sickla Udde (Dolk, 2013). As the developers, property owners and associations are heavily opposed to this decision, the current status of the case is still under discussion and the outcome is unclear (Blix, 2013; Haasmark, 2013; Landing, 2013). Despite the consensus among stakeholders, with which they mostly agree, planners within the City of Stockholm continue their planning and interpret the current directives as responsibility for the systems remaining with joint-property associations (Andersson D., 2013; Bernvill, 2013).
5.2.7. Research and development

Vacuum waste collection systems have existed for over 50 years, and have in that time developed considerably. Tougher legal regulations on working environments have been crucial in driving the shift from manual to mechanical collection and the improvements of the systems, and it is likely this trend will continue (Andersson D., 2013). Stronger environmental concerns from the procurers have translated into new demands being placed on the supplier, which have impelled the development of new technologies. The Stockholm Royal Seaport environmental programme is a document which has served as steering tool, by setting goals on the energy consumption of the facilities, for example (Andersson D., 2013; Dolk, 2013). Improved steering system, reduced energy consumption, redesigned inlets, locks on the inlets, tags, weighing systems are all examples of how Envac has responded to market demands (Millers-Dalsjö, 2013). Municipalities’ planning monopoly makes them very important actors and huge customers, and the requirements they set for the procurement are an effective tool to steer suppliers and innovation. These requirements drive research and development, and sometimes results even go beyond the requirements (Blix, 2013).

The system is also being developed jointly by the municipality and suppliers. A large number of projects are on-going looking at how the vacuum systems can be improved and made more effective. The Waste department is for example studying the parameters that need to be considered when converting mobile systems into stationary ones, which requires cooperation from Envac in providing necessary technical information (Dahllöf, 2013; Svensson, 2013). Since the mobile system’s performance has been unsatisfactory, the City of Stockholm is working together with the cities of Olso and Copenhagen in an effort to improve the system (Sundberg, 2013).

Several project groups have been formed, often including representatives from the municipality, the private sector and academia, for example developing a communication platform which will include the residents. Linking the vacuum system to recycling and waste reduction, and by extension to environmental concerns, could be done more effectively. Introducing fees coupled to the weight of the waste might help this (Haasmark, 2013). It is hoped it will enable private individuals to gain awareness of and reduce the quantity of waste they dispose of, maybe even think about their consumption choices (Andersson D., 2013). Stockholm Royal Seaport will be a pilot project for this weighing and feedback system in apartment blocks, and these systems were projected and installed when it was still believed that the municipality would assume principal ownership. Difficulties are now arising due to ownership still being fragmented between joint-property associations and the complexity of setting tough requirements when principal ownership is divided is becoming apparent to planners (Dahllöf, 2013).

5.2.8. Summing up vacuum system in Stockholm Royal Seaport

As was the objective, many of the lessons learned in Hammarby Sjöstad were applied in the planning process for Stockholm Royal Seaport. Vacuum systems are more established and the market has undergone significant changes, although Envac is still by far the most established supplier. The lack of competition was in part remedied, by changing the procurement design into an open system. The procurement is now furthermore designed as a public-private partnership, giving the municipality greater insight in the construction process. Several competitors have emerged, and the municipality’s dependence on external competence has partly been resolved. Key aspects of the planning process are the attempt by private actors to influence public policies, sometimes succeeding as in the case of achieving an ‘open system’, while at other times failing, as with the lobby to have municipal ownership of the facilities. In the latter, political ideals and priorities conflict with what many stakeholders view as a more convenient solution. The procurement
process has evolved in parallel to that of the technological development of the system, both driven by private as well as public forces.

5.3. General findings and future developments

This final part of the chapter will summarise the empirical findings of the research, as well as consider the consequences of a lack of municipal ownership of the system and look at potential developments in the waste collection market.

5.3.1. Municipal ownership of the facilities

The current state of affairs of waste management is complex, as politically there is a clear refusal to assume the responsibility for the facilities. However all respondents agree that the current situation is impractical. According to one of the respondents, for there to be a world class vacuum collection, the system needs to be under municipal responsibility (Andersson D., 2013). It also poses normative questions about who should be responsible for vital infrastructure. According to some, the current set-up puts the responsibility on private actors sat in housing associations, which is considered irresponsible (Landing, 2013). This debate is also echoed in other municipalities in Sweden, where convenience and costs are weighed against each other. For example, a report written by Järfälla municipality, located close to Stockholm, concluded that letting the municipality remain principal actor might be more convenient, although considerable funds would have to be made available (Järfälla kommun, 2009:24). In that particular case, the political leadership took the decision to be principal owner of the facilities, and the procurement held in 2012 was won by Envac (Envac, 2012). The arguments in favour of municipal ownership were that the latter would make decision-making, administration, procurement and operation of the system more convenient, and the municipality would have more competence about the systems than the board of the joint-property association, as shown in Figure 8 (Järfälla kommun, 2009).

<table>
<thead>
<tr>
<th>Joint-property association</th>
<th>Municipal ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision-making</td>
<td>-</td>
</tr>
<tr>
<td>Administration</td>
<td>-</td>
</tr>
<tr>
<td>Competence</td>
<td>(-)</td>
</tr>
<tr>
<td>Procurement process</td>
<td>-</td>
</tr>
<tr>
<td>Operation</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 8 Comparison of forms of principal ownership (Source: Järfälla kommun, 2009:25)

Among the possible reasons for why the political leadership has refused to budge are political values. A main principle of right-wing ideology is the belief that the public sector should let the market reach equilibrium without public intervention. Developers however worry that the decision-makers have failed to understand the complexity of the project resulting from combining private actors and pipes in public streets. Developers are of the opinion that the consequences of the decisions have not been understood by the politicians and that these have instead been overshadowed by political fundamental values (Landing, 2013). Another possible explanation is that the political leadership is unwilling to have principal ownership due to the lack of in-house knowledge. Lack of understanding of the system and its requirements among the political leadership has resulted in a reluctance to be responsible for the complex facilities. Yet this argument does not hold, as knowledge about automated waste collection system hardly lies with developers (Sundberg, 2013). Further research with more qualified respondents would be needed to find a clear answer.
The lack of municipal ownership is at times a hurdle in the attempt to build the most sustainable system in the long run; private actors tend to choose more affordable options, installing what is immediately necessary rather than thinking long-term (Dahllöf, 2013). This makes it difficult to drive development forward, at least until users become more demanding than they currently are (Höijertz, 2013). If the municipality was responsible, stronger and more radical measures could be taken. The municipality would be able to invest fully, for example in the inner city where conditions for collections are backward. 60% of the waste in Stockholm’s inner city is still collected manually in bin bags, a situation the Work environment authority finds unacceptable (Dahllöf, 2013), and which is deplorable for a city like Stockholm (Dolk, 2013). An alternative would be for a private company to invest in the facilities. Waste having become a profitable sector, it is not unlikely that a private actor would decide to invest in power generation, taking over the whole systems as well as the waste collection and selling the energy recovered from combustion of the waste (Andersson D., 2013). This being said, ownership of public infrastructure by a single private actor has led to problematic situations before; the municipality for example lacks control of the energy grid, which is hampering the development of smart grid solutions (Lundkvist, 2013). Furthermore, it is generally worrying to let a private actor own such a vital part of public infrastructure (Dahllöf, 2013). The report mentioned earlier by the municipality of Järfälla also pointed at the difficulty associated with writing contracts spanning over a long period of time and the embedded insecurity this would entail (Järfälla kommun, 2009:25). Principal ownership of public infrastructure by a private actor is thus viewed with reservation.

5.3.2. Alternatives to vacuum systems

Several of the respondents were careful to point out that although vacuum waste collection is an interesting solution, especially faced with the increasing toughening of the Work environment act, no perfect solution exists, and there might be alternatives more suitable depending on the size and density of the areas and developments (Haasmark, 2013; Karlsson, 2013). Vacuum facilities being inflexible, tunnel vision should be avoided and planners stay open to other alternatives. Using garbage disposers in kitchen sinks is one way of reducing waste volumes by disposing of organic waste and the effect of the solution on the sewage pipes is being tested in Stockholm Royal Seaport, among other places.

Another alternative is optical sorting, which is carried out by using coloured bags for the different fractions. These are then collected together, the sorting taking place at the waste disposal plant by optical recognition of the colour of the bags. Optibag AB is a subsidiary of Envac which supplies this solution, which could be interesting once the system has been further developed. If used in conjunction with vacuum networks it could make sorting less space-consuming and more efficient. MariMatic has invented yet another system, whereby stickers containing an electronic code are attached to the bags, recognised by robots at the plants and sorted according to the contents (Sundberg, 2013). This latter system is still under development but could be a more convenient system than optical sourcing using coloured bags. One could also see developments in technology where no sorting of waste at individual level would be needed, rather sorting would be done by mechanical sensing, after collection. As a respondent pointed out, the important thing is that waste is recycled, not by who or when (Karlsson, 2013).

5.3.3. General summary

As shown in this empirical chapter, the sector of waste management has undergone numerous changes, and future developments will be interesting to follow. The principal ownership of the facilities remains a major point of contention, and three different
scenarios have been outlined: status quo, municipal ownership and ownership by a strong private actor.

It is also evident that the solution chosen in Hammarby Sjöstad heavily influenced the choice of waste collection system in Stockholm Royal Seaport. Although a lot of attention has been devoted to vacuum waste collection in this analysis, it is only a small element of waste management (Svensson, 2013). Policies should strive, above and foremost, to encourage citizens to reduce their waste production (Haasmark, 2013). The closed loop concept that has been striven for in both Hammarby Sjöstad and Stockholm Royal Seaport is in many ways more important than the technical system used to achieve it (Cederquist, 2013).

Several respondents have called for an open dialogue with planners to be able to submit suggestions and findings. The planning process being complicated and often long, respondents feel their contributions would be needed at an earlier stage (Haasmark, 2013; Landing, 2013). This being said, this communication problem is difficult to address, due to the insecurities associated with the preliminary decisions and the large number of stakeholders involved (Landing, 2013).

The municipality has taken responsibility to keep the public space attractive, while also taking the opportunity to inform the public about the technology. This informational role is considered very important by several respondents (Andersson D., 2013; Dolk, 2013). As with the introduction of any new technology or system, the users need to learn about the new market which has opened. With the vacuum system, the municipality has endorsed a relatively unknown technology and marketed it as a solution to the public, acting as a customer by procuring the system and creating a market for it. It is a role the municipality can shoulder, which private actors most likely wouldn't (Andersson D., 2013).

The City has also played a role in the development of the technology in various research and development projects. A recurring comment is that those who do not develop won’t survive, which is a valid explanation both for the behaviour of the City of Stockholm and its desire to be competitive and attractive, and for private actors, where suppliers of the systems as well as developers constantly try to improve their products. The City has therefore continuously been trying to improve its environmental work, reducing levels of energy consumption and transports for example, and has really put waste on the political agenda (Andersson D., 2013).

Some respondents consider the adaptation to a new system must be through coercion. But when high capital investments are needed, the public sector must shoulder the initial costs, mostly due to a lack of alternatives. This is particularly the case for environmental solutions, or for products at an early stage of development and which need the security of a market to be able to further develop (Dahllöf, 2013). In a sense however, the costs will always be borne by residents and users: both when the municipality uses tax money to pay for investments, and when developers or suppliers transfer their investment costs to rents or selling prices (Lundkvist, 2013).

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1 This is for example what was done when creating a market for clean vehicles in Stockholm (Stockholms stad, 2010).
6. Analysis

In this chapter, the empirical data presented in Chapter 5 will be interpreted in light of the theoretical framework of governance. Using an argumentative approach, the chapter has been structured in three parts, each demonstrating one of the following statements:

- Influential actors can no longer be confined to solely private or public sectors
- Technological development is driven by more than market mechanisms
- There is a gap in the actors’ perception of the role of the public sector

The first part will describe the actors involved in the process. Stoker (1998A) describes governance as the emergence of new actors in planning, coming from public, private and civil spheres. The first statement will look at whether this is true in the cases studied and whether the interdependence between actors has increased. It argues that not only do new actors emerge, but these no longer fit in traditional descriptions of private or public.

The second statement studies the mechanisms and steering tools used in the planning process and compares them to principles of governance theories, which predict the use of incentives as opposed to sanctions by the public sector towards private actors (Stoker, 1998A). These mechanisms are inspired by the market, such as profitability and competition. This thesis argues that there are more mechanisms available, as well as barriers, than has hitherto been suggested in governance literature.

The third statement looks at whether there is a blurring of boundaries between the public and private sector, whereby the public actor may take on typically private behaviours, while private ones may shoulder responsibilities previously borne by the public sector. A “concern to push responsibility onto the private and voluntary sector, and more broadly, the citizen” (Stoker, 1998A:21) is identified, as is a gap between the expectations placed on the public sector by the private and public actors.

6.1. Influential actors can no longer be confined to solely private or public sectors

6.1.1. Established and emerging actors

In the planning process for vacuum waste management, many of the actors have been involved in both Hammarby Sjöstad and Stockholm Royal Seaport. However, some have disappeared, new ones have joined, and some have seen their roles change. The public actors are still mainly the City of Stockholm’s administrations. The Waste department is now integrated with the Traffic administration, the City development administration still holds the same role, while to a certain degree the Work environment agency has become a more important player.

The private sector is in this thesis mostly represented by Envac, the developers and newcomers. Envac is an influential actor, whose leadership in the vacuum market has given it an unusually strong position. It has made itself indispensable, in providing advice about the installation of the system, supplying it and caring for its maintenance. Although Envac was forced to open up the system in Stockholm Royal Seaport, it was able to keep ownership of the steering system. Aware of the difficulty associated with its monopolistic position, it is strategically diversifying its operations. It has thus taken on novel roles, exemplified by its bid to collect waste, as well as providing a complementary system to vacuum solutions, optical sorting, which tacitly reinforce its leadership of the market. As a commercial success, and a leading representative of Swedish cleantech expertise, it is an important actor not only in Stockholm but also at national level. The second category, the developers, is a proactive group, who works actively to influence public policies. This is the case of both pushing for municipal ownership and enabling competition between
suppliers. Finally, newcomers designate the actors that have emerged on the market in the wake of Envac’s success. These are both competitors, desirous to get a share of Envac’s market, and consultancy companies that see the increased interest in vacuum solutions as a business opportunity for their services. They are no game changers yet, but are examples of the flexibility of the actors.

The plurality of actors results in a dispersion of responsibility. In the views of some respondents, this trend is unlikely to reverse, instead the number of actors will continue to increase. The trend is symptomatic of processes common in a number of other branches, with increasing specialisation of knowledge, and where contractors in turn have a number of external suppliers. The result is a blurring of responsibility and a lack of accountability. The desired effect of competition on prices, on the other hand, is often offset by the increase in number of intermediaries.

While the private sector is very present, and there is considerable contact between private and public actors, the civil sector appears to be more helpless. In the cases studied, the civil sector is represented by residents and joint-property associations, who are left with little control of the system, and future residents in Stockholm Royal Seaport who have not yet moved in when decisions are taken. The way residents are involved is instead by being at the heart of planning documents and through regular surveys. The environmental programmes and plans of action have been developed based on users’ needs, according to the principle that doing the right thing should be convenient. Still, the user perspective could do with better integration in planning.

### 6.1.2. Increasing interdependence between actors

Interdependence between actors is visible in matters regarding decision-making and maintenance of the facilities. Enabling competing suppliers to submit bids for the smaller grids in Stockholm Royal Seaport was dependent on Envac providing the system’s product specifications to the City development administration. The municipality is also reliant on external resources in the form of consultants with enough expertise and dedication to manage the City’s involvement in vacuum systems. Importantly, for correct decisions to be made, the external input needs to be impartial to redress the information asymmetry, and limit the risk of suppliers behaving opportunistically. The emergence of new actors, both competitors and consultants, is a welcome additional source of competence and advice. The suppliers, on the other hand, are dependent on the success of their systems and the continuing investment of the municipality in the vacuum solution. The quality and reliability of competitors’ systems are a precondition for the future demand for the technology, as if a supplier delivers a failing system, the reputation of the entire branch may be undermined. The private actors are also subjected to even tougher regulations than they were in Hammarby Sjöstad, both as regards to environmental goals and the work environment regulations.

Several of the respondents that were contacted for this thesis had been involved both in the planning of Hammarby Sjöstad and of Stockholm Royal Seaport, thereby possessing competence and a valuable reputation that gave them influence and business. Several of them also referred to each other during the interviews, which is evidence of the limited size of the vacuum sector, and of the many interactions between stakeholders. Indeed, actors organise themselves in working groups, steering committees, networks to exchange on ideas and suggestions for innovative developments. These research networks also have a collective decision-making role, and usually include representatives from the various municipal administrations, suppliers, consultants and other stakeholders. In some cases, the head of the group is a representative of the municipality, but in other cases the initiator of the cooperative projects are actors outside of the public sphere, such as the report on principal ownership commissioned by Avfall Sverige.
The two findings about the breadth of actors and their interdependence support the research community’s principles of governance, as is clearly shown when looking back at Stoker’s list (1998). The actors involved in the planning process have diversified and none of them can autonomously take decisions, rather their actions are intertwined, reactive as well as proactive, and follow no clear hierarchy.

6.1.3. Individuals as driver of change

In the words of Harvey (1989), governance enables persons of “vision, tenacity and skill to manoeuvre the web of coalitions and alliances and shape development”, which has clearly been happening in this case. Actors within Envac have done extensive lobbying and affected policy, while a prominent actor was able to influence how vacuum systems were managed – while working for Eleiko, developers were convinced to get together to lobby the City development administration to have an open system, which was then elaborated when the same administration contracted “impartial” consultancy services. This is an example of a case where a single individual has had significant impact on policies and market, by switching sides between public and private sector, and attempting to achieve a more accessible market.

The mobility of the individuals is not expressly stated in traditional governance theories, but is remarkable in this case. As the employment market becomes more flexible, individual actors to a greater extent than ever before tend to change professions and employers. Structures aren’t as static anymore, which is particularly evident when looking at the employees of Envac. Since they are the leading supplier, they are also the ‘vacuum system school’ (Sundberg, 2013). There is great mobility both within the corporation, which has numerous international subsidiaries, and from Envac to competing suppliers or consultants. Several of Envac’s former employees have taken on roles for the City development administration, essentially crossing the border from the private sector to the public one, bringing with them knowledge about the system and forcing suppliers to up their game. This is also reflected by the Waste department’s recruitment policies, which seek to attract employees from the operation sector with practical competences. Similarly, there is at least one case where Envac has recruited employees with a public sector background (Dolk, 2013).

This would need more attention and further research, as it conflicts with the idea of set actors and raises questions about role conflicts, loyalty to employers, accountability and the view we have of what typifies public and private actors. It also poses the question of whether this is a phenomenon typical to planning at local level, or whether the specialised nature of the sector would lead to similar patterns at national level for example. In a sense, we could talk of a development where individual actors have come to play a bigger role, and are reminded of the need of see each organisation not just as its functions but as the conglomerate of driven individuals with own agendas.

The emergence of new actors is thus evident in the planning for vacuum collection, as is the various actors’ mergers and adoption of roles with novel features. The increased visibility of vacuum systems is likely to encourage more actors to try their luck in the market, as has been seen with the number of consultancy companies, either specialised in vacuum solutions or branching out, that are offering their services. These are evidence of the market’s perceived profitability as well as predicted prevalence over alternative solutions.
6.2. Technological development is driven by more than market mechanisms

This section studies the use of mechanisms and steering tools in the planning for vacuum systems in the environmentally-profiled areas Hammarby Sjöstad and Stockholm Royal Seaport, and which by extension could be used in driving change and environmental improvements forward. In the theoretical part we saw that Jessop (1998) and Stoker (1998) acclaim governance as well-suited for innovative methods, and predict the use of market mechanisms by the public sector. This section argues however, that the range of mechanisms available go beyond market tools and therefore lists nine mechanisms identified during the research for this thesis as aiding or hampering the transition to sustainable solutions.

6.2.1. Linking vacuum solutions to sustainability

When talking about vacuum systems it should not be forgotten that these are a means to an end, a way of achieving reduced heavy transport, encouraging recycling and improving working conditions for waste collectors. Vacuum waste systems are a small part of transitioning from manual to mechanical collection, and a more sustainable waste management. One could say vacuum collection is addressing sustainability concerns on a small scale, as an element of addressing environmental challenges at the local level. Vacuum systems were chosen to facilitate the collection of the elements of the closed loop concept; the organic waste was to be turned into biogas, the household waste combusted to provide heat and power. These underlying goals should be remembered when the systems are reviewed, suppliers controlled and alternatives considered, to make sure that maximum utility and environmental efficiency is achieved. Path dependence has clearly occurred in the choice of collection system and advice framework, and planners need to continue their efforts to encourage the emergence of competitors, rather than to conveniently rely on a trusted monopolistic supplier. It is for example useful to remember that what matters is that waste is sorted and recycled, not by whom nor where. In the future we may see a situation where sorting at individual level has been disregarded in favour of mechanical sensing in sorting plants. This would reduce the need for several inlets in the vacuum systems and weaken one of Envac’s key selling points.

We can talk of a paradigm shift, as while Stockholm Royal Seaport was a project with a unique environmental focus in the late 1990s, nearly all urban projects under development in Stockholm today devote considerable attention to achieving high sustainability standards. Establishing this common world view of the challenges ahead has been important in motivating stakeholders to shift towards sustainable waste management. Developing smarter, more sustainable technologies has served as a common ground of cooperation for developers, suppliers and planners, as has the ambition of developing environmentally profiled areas that will become international showcases. The vacuum system has therefore been developed over the years, to become an even better alternative to manual collection. This technical development is bound to continue, and available mechanisms driving this evolution are listed below.

6.2.2. Mechanisms of change

In this study, nine mechanisms of change have been identified, involving suppliers, competitors, regulations and the municipality. These are mechanisms that act as steering tools, influencing development in a desired direction. When used improperly however, they may also act as barriers to development. The first one described above is the creation of what Jessop (1998) refers to as a ‘common view’ concerning the need for a reviewed impact on the environment. It is a soft measure grounded in ethics and environmental concern, exemplified by the Vision for Stockholm Royal Seaport.
A second soft mechanism driving environmental change is the setting, by the municipality, of goals in its environmental programmes. The orientation on the part of the municipality to shift to vacuum systems is for example stated in the municipal waste plan as well as in the environmental programme for Stockholm Royal Seaport, which is now to be adapted and applied to all new urban developments. A difference between the goals in Hammarby Sjöstad and those in Stockholm Royal Seaport is that the latter are geared towards resident’s lifestyles, rather than merely technical. There is a vision of how residents should live their lives that comprises more than technical aspects, but on the downside the goals lack measurability and comparability. These are key elements, as only by understanding and measuring results can the efficiency of policies and systems be evaluated. The manner in which the goals are set, and the indicators and follow-up methods used, are therefore crucial and need considerable thought. For example, in Hammarby Sjöstad it was a requirement for the property owners to build a room suitable for waste disposal in the properties, but since it was not expressly stated that these should be used as such, some of these have instead been used for other purposes (Karlsson, 2013).

A third mechanism consists of regulations and requirements set in various laws and programmes, which are hard measures from the legal and municipal side. Regulations concerning the working environment of collectors are constantly sharpened and are one of the main drivers of the shift from manual to mechanical collection. Expectations of future constraints lead developers to plan ahead and opt for solutions such as vacuum collection, rather than manual collection which the work environment agency may not find satisfactory. The municipality also forces developers to commit to installing vacuum systems in new developments in the land use and development agreements.

A fourth set are market mechanisms, such as costs and incentives. This is mainly done through costs and cost alleviations. The collection fee is reduced for properties with vacuum systems compared to properties using manual collection, in an attempt to encourage property owners to switch and compensate for the investment cost of installing the system. Another example of steering behaviour through costs is linking fees to the weight of the waste disposed of by each individual user.

In a perfect market, competition is an additional market mechanism developing technical solutions, improving the sector’s overall efficiency as well as driving down prices. It forces suppliers to outbid each other, and offer the best solutions. Given how quickly the technology develops, suppliers must adapt to these external pressures for fear of losing their market. Planners therefore strive to fulfil the preconditions for a healthy competition on the markets, to avoid a situation where a monopolistic supplier feels safe enough not to further develop its products. Perfect competition will however never be achieved, and given the specifics of the case with significant barriers to entry, competition in the vacuum sector so far seems to have required access to considerable financial resources as well as ambitious owners.

This brings us to a fifth mechanism, the specifications of the procurements. So far, procurements were of such size that newcomers found it hard to win the bids, and the high costs of the systems served as structural barriers to entry. The open system in Stockholm Royal Seaport, however, may signal a change, as competing suppliers are now able to enter the market by winning bids for smaller grids. The open system thus complies with official recommendations on the part of the City of Stockholm as regards procurement procedures, which should encourage small and medium enterprises as tenderers (Stockholms stads kommunfullmäktige, 2007). Procurements can be designed in several ways, either functionally or detailed. While functional procurements may lead to innovative solutions, requirements in detailed specifications can also force contractors to comply to certain rules, as is observable in public sector’s procurements where ‘green’ criteria are increasingly siding with costs as evaluation criteria.
A sixth way of driving innovation is through cooperation, reports and research. As seen in the previous chapter, there are several projects under way studying waste, collection systems and efficient organisation structures. In these networks, IT and digital solutions are one of the main potentials for improvement, and herald radically new possibilities for waste management. Cooperation between actors, with the input of procurers, suppliers and users, enables to identify sub-optimal systems, and come with improved solutions to problems. Hammarby Sjöstad and Stockholm Royal Seaport can be said to be geographical concentrations of these cooperation projects. In these developing urban areas, innovative solutions are tried out, both technical, such as the weighing system and the open grid system, and contractual, such as the public-private partnership. More importantly, the entire area is a testbed, and the common vision of the area as technologically excellent helps drive ambitions upward and stimulate creative solutions.

Marketing the system forms a seventh mechanism. As understanding of the vacuum system by developers and property owners improves, and the system is established as not only a good alternative, but as the leading system in the future, the demand for the system increases. This encourages property owners to shift to mechanical collection. Being present in Hammarby Sjöstad and Stockholm Royal Seaport already generates a tremendous amount of publicity. In Hammarby Sjöstad, developers were initially reluctant to comply with the high material and building standards, claiming these were unachievable. Eventually, the development project became too interesting not to be a part of, and the costs incurred due to the higher requirements were considered inferior to the marketing value of showing off the actor's products in the profile area. And as the first developer was able to deliver construction materials that complied and passed the criteria, it triggered others to be even better. Much the same is happening in Stockholm Royal Seaport, where innovative thinking permeates the planning of the area. And since its aim is to be a showcase for Swedish cleantech, gaining similar levels of international attention that Hammarby Sjöstad received, the actors clearly stand to gain from this conceptual marketing.

Financial mechanisms are an eighth mechanism. Relevant ones for our cases are the LIP-funds, later replaced by the funding allocated by the Delegation for Sustainable Cities. While the sums aren't necessarily very large, they act as leverage, giving the project support at the national level, attracting additional funding and acting as a reward for innovative thinking.

Finally, strong leadership and clear directions are constitute a ninth way of driving development. Municipal ownership of the system would act as a forceful mechanism to implement change, however in our case, the principal ownership structure on the contrary acts as a serious hurdle to a widespread expansion of the use of the system. Development is thus faced with a structural barrier which will only be overcome when the political leadership changes orientation. Strong leadership may also, as was argued in the previous section, come from driven individuals.

The market leadership of the incumbent company has thus been aided by several barriers to entry and efforts are now made by the municipality and competitors to open the market. We therefore find a clear link between the development of the market and the development of the technology, as when competition challenges the monopolistic security of the market leader and the market opens up, further technological advances can be expected.
6.3. There is a gap in the actors’ perception of the role of the public sector

This section argues that there is a gap in the perception of the role of the public sector in the cases looked at. Indeed, while private actors are of the opinion that the public sector should take on more responsibility, drive the transition from manual to mechanical collection, and be more forceful in its steering, the public sector sees many of these as the role of the market. Consequently, there can also be said to be a gap in expectations in the role of the private sector. Contrarily to what governance literature predicts, in this particular case private actors thus want the public sector to play a larger role, rather than to give the market greater autonomy and power.

6.3.1. Private actors’ view of the role of the municipality

Nowhere is this conflicting view of the respective goals of the actors more visible than in the debate about principal ownership of the vacuum facilities. During the planning process for the waste collection system in Stockholm Royal Seaport, it was expected that the role of the municipality would be altered, by assuming principal ownership of the vacuum facilities. Since many consider the current form of ownership as an impediment to achieving development, it was argued the municipality should take its responsibility for its visions by also assuming financial ownership. Principal ownership would have changed the mandate of the municipality, by involving it more actively in the attempt to achieve a shift. Setting requirements such as weighing would have been possible without fear of complications. The transition from manual to mechanical collection could have been aided by pushing for the installation of vacuum systems in existing neighbourhoods, such as in the inner city. As the initiator and project owner, the municipality would have been able to set the tone, digging up public streets and investing in the system. The municipal waste management regulation could also state that vacuum systems is the way waste is collected in Stockholm, thereby forcing property owners to comply and endowing the Waste department with more power. In the current situation, the City development administration can force developers to provide vacuum facilities in new developments, but not in existing ones. Without a change in principal ownership, it is unlikely that this transition in existing development will be driven in any large scale by private actors.

Another role suppliers wanted the municipality to shoulder is that of spreading information about and endorsing the system. Having the municipality as a client makes the system more credible and the systems in Hammarby Sjöstad and Stockholm Royal Seaport result in considerable publicity for the system. This is a role the municipality has endorsed, and Stockholm Royal Seaport is to serve even more as a showcase.

Many respondents referred to the role of the municipality as driver of change, stating that the municipality had a unique possibility and responsibility to drive change (Andersson D., 2013). This normative view of the municipality’s role thus seems to conflict with that of the political leadership in Stockholm.

6.3.2. The public sector’s view of its role

In the empirical data assembled, it appears that the vision for Stockholm Royal Seaport is for it to be a showcase for Swedish cleantech, actively marketing sustainable solutions. This is more obvious than it was when Hammarby Sjöstad was planned. One could for example compare the information centre GlashusEtt, in Hammarby Sjöstad, with the Innovation centre in Stockholm Royal Seaport. The latter is geared towards the private sector, reflecting a desire by the municipality to consider the economic viability not just of Stockholm Royal Seaport, but of the city and country as a whole. Since Stockholm Royal Seaport is the city’s latest flagship development, the vision for the area reflects how the municipality envisions its own future. This also fits with the emphasis put on growth,
attractiveness and innovation in the city’s overarching vision for future developments, Vision 2030 (City of Stockholm, 2009), and in the City of Stockholm’s event strategy (Stadsledningskontoret, Kommunikationsstaben, 2011-06-27).

The City of Stockholm thus sees one of its role as marketing the city. Indeed, Stockholm Royal Seaport is used not only to market Swedish cleantech, but also to market Stockholm internationally as a green capital, building on the brand of Stockholm as a world class city. This echoes the shift in the role of cities which was foreseen by Harvey (1998), by tying into the principles of urban entrepreneurialism. The environmentally-profiled areas, Swedish cleantech and to a point even the vacuum systems position the city as a green leader. This serves to strengthen the position of Stockholm internationally and makes the city more competitive when seeking to attract residents, businesses and tourism.

This is evidenced by the changed role of the municipality from service provider at the time of Skafab AB, to service procurer, instead focusing on the role of attracting flows of capital, knowledge and production. Another example in our case is not only the regulation of the vacuum market, but also the creation of a market for vacuum systems. By endorsing the vacuum systems and forcing developers and property owners to install them in new developments, the municipality is essentially acting as a guarantor of the system, even if it refuses to have the principal ownership. The municipality thus creates a demand for vacuum systems, as well as encouraging property owners in existing developments to adopt the system.

6.3.3. Gap between the political leadership and the rest of the municipality

Although the political leadership seems intent on municipal ownership remaining with joint-property associations, planners agree with the rest of the stakeholders that a more convenient solution would be for the municipality to have principal ownership of the facilities. Since the gap in orientation persists within the municipality, it seems that this cleavage is caused by political ideals that conflict with what many view as the most practical option. Traditional governance literature (Ewalt 2001, Jessop 1998, Van Huijstee et al 2007) predicts that this gap may be the result of governments forming partnerships with strong private actors. Yet in this case the argument is flawed, as it seems the said gap is a consequence of a lack of inclusion of both user and private actor perspectives. In this case, the opinion of the political leadership thus conflicts with that of all other stakeholders.

6.3.4. Conflicting views about the role of the private sector

While the municipality refuses to be the owner of the vacuum systems, it doesn’t require developers or suppliers to assume responsibility for it. Rather, financial costs and principal ownership are passed on to the joint-property associations. While developers and suppliers mention the importance of sustainability objectives as motivational arguments, and the sector is becoming increasingly profitable, the mechanisms outlined in the previous section still do not seem to be enough to convince the private sector to take on the associated costs. It seems private actors only want responsibility when they also have influence. In the case of the ownership of vacuum systems, the responsibility and decision-making is divided between too many actors, which acts as a hurdle to decision-making processes and a disincentive to ownership.

The private actors mention environmental concerns and the vision of the sustainable city as rationales for their activities and orientations. The developer who was interviewed indicated that environmental concerns were included in daily operations much more than ever before, and that it was important for them to make sure that for example their construction materials complied with high standards (Landing, 2013). Yet no mention was made of going beyond the requirements set by the municipality. While the question wasn’t
asked directly, it seems private actors will comply to requirements, willingly, but have no intention of driving this development forward. Rather, several stated that this was the role of the municipality (Andersson D., 2013; Landing, 2013). Similarly, the Envac representative that was interviewed spoke of the importance of reducing our environmental impact in the waste collection sector, and that the vacuum system was one way of achieving this reduction (Dolk, 2013). The private sector is thus happy to provide solutions, however none of the respondents saw the private sector as able to pressure the municipality into sharpening its environmental regulations.

At the initial stage of research for this thesis, a correlation was sought between private sector involvement and the environmental goals set by the municipality. A hypothesis was that environmental champions from the private sector not only enabled the setting of ambitious goals but also exerted pressure on the municipality to sharpen the said goals. Disappointingly, no such link was found. Rather, the respondents seemed to agree with the view that development should be driven by the municipality, and was not the business of companies.

6.3.5. Result of diverging expectations

Especially the conflicting expectations on the municipality have long-term as well as short-term consequences, besides having a distributional impact on resources and equity. In the short-term, they act as a barrier to the transition from manual to mechanical solutions. The insecure climate, as well as the complexity, costs and responsibility of the system result in the reluctance of developers and property owners to adopt the system. In the long-term, joint-property associations are likely to find reaching an agreement on the maintenance and reinvestments needed to be challenging, which will result in increased costs and significant cooperation problems. Governance theories predict actors will organise in networks, but that these may find difficulties in organising and coordinating tasks, which seems to be the case in this study.

With the long planning processes, planners are required to think ahead and design long-term solutions. The scenario of municipal ownership is therefore included in their planning. The procurement of the system in Stockholm Royal Seaport was a public-private partnership, whereby the municipality is to gain the knowledge necessary about the system to be able to run it in case it suddenly becomes the owner. The insecure decision-making climate requires twice the planning, which results in increased costs, and extended decision-making processes.

The municipality is unwilling to assume ownership of the system, arguing that vacuum facilities are not a matter of municipal concern. Instead, ownership costs are currently transferred to joint-property associations, and further onto the residents. On top of this, the division and transfer of responsibilities and related risk result in added costs, in budget, time and organisation, which would have been limited in the case of municipal ownership. While a municipal ownership of the system would eventually result in costs borne by the taxpayers, who will always end up paying, regardless of the project, the cost distribution would have been different. The investment in vacuum technology would have been borne collectively by all citizens in Stockholm. One could say, with some caution, that with the current set-up the residents in areas with vacuum waste collection are bearing the costs of the City of Stockholm’s advanced waste management systems and its reputation as a world class city.

The residents are a less vocal, less powerful, and especially less organised group than developers and suppliers. This is to a large part due to decision-making taking place before residents move in, as well as to their insufficient knowledge of the system. The consequences of this issue will be evident in the future, as the facilities suffer from a lack
of reinvestment and management, which may in turn jeopardise the municipality's ambitious goals. Exactly how the residents are affected is however hard to determine. On the one hand, the future residents of Stockholm Royal Seaport are expected to be an affluent group, able to afford the high rents and prices in the area. They are thus likely to be one of the groups within the municipal borders to also be able to afford the added costs of the facilities. At the same time, spiralling prices have an effect on the social composition of the area, and might in the long-run reinforce predicted patterns of segregation. Considerable research would be needed to draw any conclusion about how the cost burden would be distributed between residents and citizens.

The research community, including Stoker (1998), lifts the capacity of actors to get things done without requiring the need for government to use its authority. This thesis however argues that not only is the municipality's authority required to encourage the installation of the facilities and their organisational set-up, but that this is regarded as insufficient, and a greater share of responsibility on municipalities called for. By neglecting to shoulder its responsibility, the status quo will have a disappointing effect on environmental objectives as well as equity for residents, once again prioritising the economic aspects of the system over sustainability goals.
7. Conclusions

This thesis has looked at the procurement process in Hammarby Sjöstad and Stockholm Royal Seaport. It has given readers an overview of the process and been presented as an example of applied governance theories at local level.

Several differences are identified between the two cases, the most important being the emergence of competition on the vacuum waste collection market and the trial of an ‘open system’. A change which was expected by many stakeholders, but didn’t occur, was the municipal ownership of the facilities. This unresolved issue results in a number of costs for planners, suppliers, developers and joint-property associations alike. The thesis has shown that the vacuum field is a complex and dynamic field, characterised by significant insecurity. This requires stakeholders to adopt long-term strategies that are flexible and can adapt to changes resulting from shifted political prioritisations.

In the analysis three statements were formulated and argued. The first is that evidence exists of significant power by private actors, interdependence between stakeholders as well as dependence on individuals acting as strong leaders. These are found to be mobile, which may result in role conflicts. A second finding is that the cases looked at exhibit a wide variety of mechanisms used, far more so than traditional governance literature suggests. These are sanctions, incentives, market mechanisms as well as ways of overcoming structural, systemic and knowledge barriers. The third finding concerns the divergent perceptions of the role of the municipality. As the city assumes an entrepreneurial role, private actors are expected to take over previous responsibilities, such as financing public infrastructure. The costs and responsibilities are instead passed on the residents in the two areas studied, with consequences on equity and jeopardising development.

In conclusion, several findings are seen to comfort governance as a valid theoretical framework for the study of the procurement process of vacuum solutions. Governance is applicable to local level processes and is useful in highlighting the variety of and interplay between stakeholders. Governance has also seen its field of application broadened to encompass the study of environmental discussions, as well as existing social and economic ones. This thesis however adds perspectives that have not yet been mentioned in traditional literature, such as the mobility of actors and the risk of paralysis of development. One of the main findings is that contrary to general beliefs, private actors in this case want less power, rather than more, and lobby for municipal responsibility over urban infrastructure. A convenient system with undiluted responsibility under the municipality is seen as preferable to free markets and freedom of choice. This illustrates the difficulty of creating conditions that encourage fruitful cooperation between the sectors, where the political leadership may have conflicting views of how to drive development forward. Achieving sustainability goals will thus, to a large part, depend on the actors’ ability to reach an agreement on how to share responsibility for our common goals.
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