LUND UNIVERSITY

School of Economics and Management
Department of Business Administration

FEKN90
Business Administration-
*Degree Project Master of Science in Business and Economics*

Spring term of 2013

# Firm Strategy and Sustainable Cities

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## Abstract

**Title:** Sustainable Cities: A Strategic Approach

**Seminar date:** May 30th 2013

**Course:** FEKN90 Master Thesis in Business Administration, 30 ECTS

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**Keywords:** Sustainable cities, strategy, stakeholder theory, innovation, public-private partnerships, business model and sustainability.

**Purpose:** To examine how firm strategy is formulated when firms participate in building sustainable cities. By increasing the understanding and knowledge in this field, firms can make better decisions regarding strategy for sustainable cities.

**Methodology:** Case study with semi-structured interviews, pattern matching between the expected pattern and the empirical found pattern.

**Theoretical perspectives:** Stakeholder theory, sustainable development, sustainable cities, resource based view, transaction cost economics, innovation, systems of innovation, business models, and external factors.

**Empirical foundation:** Semi-structured interviews with representatives from E.ON, Ericsson, MKB Fastighet and Masdar Institute of Science and Technology.

**Conclusions:** The findings in the study demonstrate that there is a high degree of complexity, and that multiple factors affect strategy when firms participate in building sustainable cities. In accordance with how multiple stakeholders have to collaborate when building sustainable cities, multiple theories have to be integrated and interact in order to comprehend and explain the strategic aspects of sustainable cities.

## Acknowledgements

We would like to express our sincere appreciation for the support from our supervisor Dr. Thomas Kalling at Lund University School of Economics and Management, who has always offered valuable assistance and been helpful in his guidance.

Furthermore, we would like to express our gratitude to Mattias Örtenvik at E.ON, Jonas Selén at Ericsson, Janna Jonborn at MKB Fastighet, and Dr. Scott Kennedy at Masdar Institute of Science and Technology. Many thanks for your assistance and support.

Pelle Högnelid & Ena Drljevic
Lund, Sweden & Dubai, the United Arab Emirates, May 22 2013

# 1. Introduction

## 1.1 Background

Sustainability has taken a firm grip on the third millennium. Environmental and ethical aspects of lifestyle and consumption have become prominent subjects at the center of global politics. The classic definition of sustainable development is a development "which meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987). Furthermore, a sustainable development can be categorized into three different segments; economic development, social equity, and environmental protection (United Nations [1], 2010).

To meet the challenges of sustainability, cities with an ambition to have a high degree of sustainability have started to emerge. In the emergence of these "sustainable cities", a number of elements are of great importance. Buildings make up one third of global energy consumption, through demand for heating, ventilation and air conditioning, and are consequently one of the largest contributing sectors to greenhouse gas emissions worldwide (UNEP, 2012). Waste management in urban cities contributes not only to greenhouse gas emissions but also add high costs through landfill operations (UNEP, 2012). Public transportation can contribute to sustainability, and significantly increase mobility and productivity in an urban area (UNEP, 2012). Therefore, sustainable urban transportation systems are vital in order to reduce air pollution levels, congestion, and dependence on the energy sector (UNEP, 2012).

The economic incentives for cities to engage in sustainability are convincing. Lack of sustainability can hold back economic growth for cities, and research suggests that a delay in stabilizing climate change will be both dangerous and more costly than it would be to act today (Stern, 2006). In addition, advantages from a higher degree of social equity could benefit cities that invest in sustainability.

Social and political factors have tremendous influence on sustainable cities (Gillespie, 2007). By setting performance standards that takes climate changes into account for facilities and infrastructure, governments can affect the extent of investments in sustainable development (Stern, 2006). Supranational organizations such as the EU and the UN are adding extensive regulation to achieve ambitious climate and environmental goals (European Commission [1], 2013).

The adoption of sustainable development in the political agenda has influenced public opinion. Citizens do not solely care about consumption in everyday life, but have started to

change how they live their lives and to what extent they contribute to sustainability. This has led to an increased demand for products and services that live up to customers, citizens, and clients expectations on sustainability (European Commission [1], 2013; European Commission [2], 2013).

Cities and infrastructure involve a vast scope of activities, goods, and services, such as buildings, transport, ICT, and energy generation and distribution. Governments and local authorities have traditionally been responsible for infrastructure and city planning, as the magnitude of such projects has a number of implications for the responsible body. However, the increased demand for sustainability among citizens and inhabitants has increased the demand for innovation and firm involvement in the building of cities and infrastructure.

Due to the vast scope of cities, it is unlikely that a single firm can deliver all the components of a sustainable city, at least with a competitive advantage in all its undertakings. Specialization in building sustainable cities by its own is thus assumed to be beyond unlikely for both private and public entities. These limitations have resulted in a stakeholder-oriented approach to sustainable cities, in which cities form public-private partnerships with stakeholders. Such examples include Västra Hamnen in Malmö, Sweden, Hyllie in Malmö, Sweden, Stockholm Royal Seaport in Stockholm, Sweden, and Masdar City in Abu Dhabi, the United Arab Emirates (Stockholms stad [1], 2013; Malmö Stad [3], 2013; Energimyndigheten, 2011; UNEP, 2012). In addition, this new phenomenon also seems to induce collaboration between firms, and between firms and NGO's.

From a firm perspective, participation in building sustainable cities can both be a source of revenue, or an investment in obtaining resources (Barney, 1991). Motivation to participate in building a sustainable city may vary between firms, depending on how value is distributed within the public-private partnerships, and how the firm can benefit from participating. Asset specificity may influence how value is distributed, and public-private relationships may provide opportunities to alter firm boundaries (Williamson, 2007)

The distribution of power among stakeholders is hard to interpret, and varies between individual cases (Mitchell, Agle & Wood, 1997). Firm-stakeholder relationships determine which stakeholder influence strategies are used (Frooman, 1999). Either way, it involves an underlying strategic process, where the firm decides which strategy it should adopt in order to maximize the benefits of participating.

Public-private partnerships also affect the direction and diffusion of innovations. It is when systems evolve around new technologies that the impacts from innovations are extensive (Johnson & Suskewicz, 2009). Understanding the complexity of firm-stakeholder

relationships is therefore important to enable a systemic shift towards sustainability. (Johnson & Suskewicz, 2009; Frooman, 1999)

To understand the underlying systemic nature of technological shifts is important in order to comprehend how public-private partnerships should be designed (Stern, 2006). Major infrastructural shifts happen when new systems replace old systems, to think in a grand scale, and to understand how innovations interact is therefore relevant (Johnsson & Suskewicz, 2009).

An aspect of firm participation in public-private partnerships is that it has been argued that firms exist to serve their shareholders, and to maximize profits (Coase, 1937; Friedman, 1962; Friedman, 1970). This could make collaborations problematic since parties may act opportunistic, especially if there is a high degree of specificity involved (Williamson, 2007). In order to extract value, firms use different strategies when composing a business model (Johnson, Christensen & Kagermann, 2008). Stakeholders can affect which interests a firm has to comply with when maximizing profits for the owners of the firm (Johnson et al., 2008; Mitchell et al., 1997)

Sustainable cities are a highly complex and a fairly new phenomenon. Individual theoretical paradigms, such as the Resource Based View and Transaction Cost Economics, can describe how factors affect strategy in general (Barney, 1991; Williamson, 2007). However, these theoretical paradigms do not individually entail all understanding needed to fully understand how factors affect strategy when building sustainable cities.

There is an absence of an integrated framework that describes the influence of multiple factors on strategy when building sustainable cities. This framework would have to include both formal and substantive theories in order to be relevant (Glaser, 1978). Thus, there is a need to increase the level of understanding in this specific field, to specify the factors that affect strategy, and to understand how strategy is formulated.

## 1.2 Purpose

The purpose of this study is to examine how firm strategy is formulated when firms participate in building sustainable cities. By increasing the understanding and knowledge in this field, firms can make better decisions regarding strategy for sustainable cities.

## 1.3 Research Question

When firms decide to participate in building sustainable cities; which factors affect firm strategy and how is firm strategy affected by those factors?

## 1.4 Definitions

### 1.4.1 Sustainable cities

The notion “sustainable cities” refers to a district, a part of a city, or a city that has committed itself to sustainability. “Sustainability” and “sustainable development” are discussed thoroughly in chapter 2.2.1 Sustainability, and 2.2.2 Definition: Sustainable cities.

### 1.4.2 Participate in building sustainable cities

Participation in building sustainable cities refers to the engagement of a public or private entity to initiate, deliver a good or a service, or in any other way contribute to the building of a sustainable city.

## 1.5 Limitations

The study does not investigate outcomes or the performance of sustainable cities, nor implications regarding individual consumption of goods or services in sustainable cities. The study did not in-depth examine or discuss the implications on environment, citizens or policy from firm involvement in the building of Sustainable cities. The empirical data in the study will be limited to data from five cases: Masdar City in Abu Dhabi, Hyllie in Malmö, E.ON, Ericsson, and MKB Fastighet.

# 2. Theoretical Framework

In this chapter, theories that explained aspects or factors that were expected to affect strategy were discussed. Factors were derived from theories and research, and each sub-chapter ends with a summary of factors expected to affect strategy. Chapter 2. Theoretical Framework ends with the sub-chapter 2.7 Proposed framework, where all of the factors were integrated into a framework for managers and decision-makers on how to approach strategic decisions when participating in building sustainable cities.

## 2.1 Stakeholder theory

### 2.1.1 Background and definitions

The relationship between a firm and its stakeholders can be described as a two-way relationship. Literature has therefore been divided in two main dichotomies; towards the firm’s management of stakeholders, and the influence that stakeholders have on a firm and its strategies. Early theories leaned more towards examining the ability of stakeholders to influence the firm, such as the work of the theorist Freeman, while the issue of how much

attention managers give to different stakeholders was developed later by Mitchell, Agle & Wood (Freeman, 1984; Mitchell et al., 1997). (Parmar et al., 2010)

The traditional definition of a stakeholder was defined by Freeman, as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984).

Stakeholder theory can be derived from ethics. Freeman referred to the philosopher Sartre's idea about that we as humans at some point need to justify our lives to others and ourselves. First and foremost, stakeholder theory is not about markets, how they work, or a theory of the firm. To Freeman, stakeholder theory is rather about how people create value for each other. (Freeman, 2008)

### 2.1.2 Approach to stakeholders

Mitchell et al. separated stakeholders from non-stakeholders. Freeman's "principle of who or what really counts" has two questions that need to be addressed: Who counts and who managers should pay attention to (Freeman, 1994; Mitchell et al., 1997). Whom or what is a question in need of a descriptive theory, a theory that can explain why stakeholder should be a managerial concern and under what type of conditions that managers considers different entities as stakeholders for their business (Mitchell et al., 1997).

According to Minoja, the firm and the management of stakeholders must consider whether, when and how to meet a stakeholder's demand. Whether to meet stakeholder's demand is a simple yes or no decision. When to meet a stakeholder's demand is a question of time-horizon, i.e. in the short-term or the long-term. How to meet a stakeholder's demand is complex and has several dimensions embedded. Fundamentally, the firm can choose between two approaches: heterogeneity and homogeneity. The firm can decide to meet a stakeholder's demand in a customized way or in a standardized way. Each approach will have different consequences on how demands are met, and will have different costs. (Minoja, 2012)

Mitchell et al. addressed stakeholder theory in terms of identification and salience. They chose to identify stakeholders as primary or secondary stakeholders, and turned away from the broad meaning that anyone and everything that is affected by an organization's actions is a stakeholder. Salience referred to the degree managers choose to prioritize claims from competing stakeholders. (Mitchell et al., 1997)

### 2.1.3 Stakeholder attributes

Mitchell et al. defined three significant stakeholder attributes: power, legitimacy and urgency. Power can be understood as the means for a party in a relationship to impose its will in the

relationship. Power can be both acquired and lost, as access to means that give power is not steady, but variable. This aspect makes power transitory, it transforms as conditions in the relationship change. (Mitchell et al., 1997)

To define legitimacy, Mitchell et al. accepted Suchman's definition of legitimacy, which recognized that legitimacy is attained in a social system (Mitchell et al., 1997). Suchman consequently defined legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions" (Suchman, 1995, p. 574). With this definition, it was implied that legitimacy is a desirable social good (Mitchell et al., 1997).

Power and legitimacy helped to describe stakeholder identification and salience, but did not fully capture the dynamics of interactions between stakeholders and managers. Mitchell et al. argued that the attribute urgency could make the model more dynamic. Furthermore, it was argued that urgency is based on two attributes: time sensitivity and criticality. From these two attributes, urgency was defined as "the degree to which stakeholder claims call for immediate attention" (Mitchell et al., 1997, p. 867)

Common for the three stakeholder attributes are that they "are variable, and not a steady state", that they "are socially constructed" and "not objective, reality", and that "consciousness and willful exercise may or may not be present." (Mitchell et al., 1997, p. 868).

### 2.1.4 Stakeholder classification

From the three stakeholder attributes, Mitchell et al. suggested a classification for stakeholder classes (Mitchell et al., 1997).

Mitchell et al. proposed that stakeholder salience would be low where only one of the stakeholder attributes is perceived to be present by managers. "Latent stakeholders" are defined as dormant, discretionary, and demanding. When stakeholders are perceived by managers to possess two of the attributes, stakeholder salience will be moderate. These stakeholders - dominant, dangerous, and dependent - are defined as "expectant stakeholders". Consequently, stakeholder salience is at its highest when all three of the stakeholder attributes are perceived to be present by managers, these stakeholders are defined as "definitive stakeholders". Since these attributes are socially constructed and variable, stakeholders can acquire missing attributes or loose existing attributes, which makes the model dynamic. (Mitchell et al. 1997)

1. Dormant (Power) - Possess power, but the power remains unused due to lack of legitimacy and an urgent claim.
2. Discretionary (Legitimacy) - Possess legitimacy but lack power to influence the firm and urgent claims.
3. Demanding (Urgency) - Have urgent claims but only pass by in the management's attention, without power or legitimacy to be more than irksome or bothersome.
4. Dominant (Power and Legitimacy) - Will matter to managers as their attributes power and legitimacy assures their influence in the firm.
5. Dangerous (Power and Urgency) - A stakeholder that lacks legitimacy will be "coercive and possibly violent", why having power and urgency make the stakeholder dangerous to the firm.
6. Dependent (Legitimacy and Urgency) - Depend on managers or other stakeholders to carry out their will, due to lack of power.
7. Definitive (Power, Legitimacy and Urgency) - Mitchell et al. proposed that stakeholder salience will be high when all three stakeholder attributes are perceived to be present by managers. Dominant stakeholders are most likely to become definitive, as they are already a part of a firm's dominant coalition. Managers will have a clear and immediate mandate to prioritize the dominant stakeholder, if the claim is urgent. (Mitchell et al., 1997 p. 877)

### 2.1.5 Stakeholder influence strategies

Frooman described how open systems theories could be used as a starting point for understanding stakeholder influence strategies (Frooman, 1999). Open-systems theories examine how the surrounding environment affects organizations; an example of such a theory is resource dependence theory.

The resource dependence theory focused on how a focal organization is affected by social actors within its environment, and assumed that the focal organization could respond and interact with its environment. Resource dependence in the relationship with a stakeholder exists when a resource is marked by concentration, controllability, non-mobility, non-substitutability, or essentiality. (Frooman, 1999)

Frooman considered the resource dimension of a relationship (Frooman, 1999). In contrast with Mitchell et al.'s definition of power, which treated power as an attribute of the individual stakeholder, Frooman viewed power as an attribute of the relationship between the actors (Mitchell et al., 1997; Frooman, 1999).

#### *2.1.5.1 Stakeholder influence strategies and firm-stakeholder relationships*

Frooman generated four types of stakeholder influence strategies from resource dependence theory: withholding, usage, direct and indirect. A definition of withholding strategies was to discontinue providing a resource, with the intention of changing certain behavior. Usage strategies aimed to attach conditions to the supply of a resource. Direct strategies were defined as when a stakeholder manipulates the flow of resources to a firm. Indirect strategies are defined as strategies where the stakeholder uses an ally manipulate the flow of resources (Frooman, 1999).

Frooman used resource dependency theory to derive four types of firm-stakeholder relationships: low interdependence, firm power, stakeholder power, and high interdependence. From the four types of firm-stakeholder relationships, Frooman proposed 4 different proposals on how stakeholders chose an influential strategy, in order to influence the firm's decision-making. (Frooman, 1999)

*"Proposition 1: When the relationship is one of low interdependence, the stakeholder will choose an indirect withholding strategy to influence the firm.*

*Proposition 2: When the relationship is marked by firm power, the stakeholder will choose an indirect usage strategy to influence the firm.*

*Proposition 3: When the relationship is marked by stakeholder power, the stakeholder will choose a direct withholding strategy to influence the firm.*

*Proposition 4: When the relationship is one of high interdependence, the stakeholder will choose a direct usage strategy to influence the firm."* (Frooman, 1999, p. 202)

### 2.1.6 Institutional logic

Moss-Kanter argued that great companies approach business and stakeholders from another point of view than the rational approach. If firms are perceived merely as being money-generating machines, as in traditional theories of the firm, firms are disconnected from society. In contrast, Moss-Kanter argued that great companies "invest in the future while being aware of the needs of people and society" (Moss-Kanter, 2011, p. 69). (Moss-Kanter, 2011)

Leaders have to think of themselves as builders of social institutions in order to master the challenges and changes of today. Short-term financial sacrifices can be justified, as they can be necessary to achieve the firm's long-term corporate purpose, and to endure over time. (Moss-Kanter, 2011)

Formation of public-private partnerships may also be important to ensure long-term success. By considering societal interests, the firm can justify a concern for public issues that goes beyond the current boundaries of the firm. If firms aspire to understand and contribute to the public agenda, the firm may be able to influence public policy in favor of the firm. (Moss-Kanter, 2011)

### 2.1.7 Inter-organizational networks

Brass, Galaskiewicz, Greve & Tsai argued that networks could benefit the generation of innovations, and induce stakeholders to adopt similar attitudes. However, even if stakeholders trust each other and have mutual goals, problems can occur during collaboration. (Brass, Galaskiewicz, Greve & Tsai, 2004)

Network structures can help to prevent disputes, by strengthening reciprocity norms. Prior collaborations or close ties between organizations are factors that can contribute to trust and reciprocity, but they can also be a source of risk. (Brass et al., 2004)

There are also risks associated with networks, including the risk to become overly embedded in the network. Hence, there is a risk that firms are missing opportunities to lower costs, or to find new sources of revenue. There are therefore both positive and negative externalities associated with collaborations in networks, for stakeholders in the network and for outsiders. (Brass et al., 2004)

### 2.1.8 Factors expected to affect strategy

**i) Stakeholder influence**

Stakeholders influence firm strategy on multiple levels. Stakeholder influence affects how to approach sustainable cities, external factors, internal factors, innovation, and business model. Hence, stakeholder influence will be used as a principle for all sequences in the proposed framework, and is suggested to influence all factors that affect firm strategy when building sustainable cities.

## 2.2 Sustainable cities

From a sustainability perspective, cities are complex entities. While cities have great potential to reduce humanity's ecological footprint, cities account for more than 70 percent of global carbon emissions and energy consumption. Cities occupy approximately 2 percent of all land available, and populate approximately half of humanity, around 3,5 billion people. By 2055, percent of humanity is estimated to be living in cities. (Sustainable Cities, 2012)

### 2.2.1 Sustainability - Background and definition

There were a number of meanings to sustainability in terms of cities. In general, the sustainable in "sustainable cities" relates to the term "sustainable development". The notion of sustainable development was first was popularized in a report by the World Commission on Environment and Development in 1987 called *Our Common Future*. The classic definition of sustainable development in the report was a "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (The World Commission on Environment and Development, 1987; (United Nations [1], 2010).

Sustainable development was specified further in The United States Environmental Protection Agency's definition: "Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations" (USEPA, 2013). Sustainable development can be divided into three main aspects: economic development, social equity, and environmental protection (United Nations [1], 2010).

Schumpeter distinguished between economic development and economic growth; economic growth is a quantitative measure while economic development represents the qualitative changes of the economic process (Thanawala, 1994). Economic development is defined by IEDC as "a program, group of policies, or activity that seeks to improve the economic well-being and quality of life for a community, by creating and/or retaining jobs that facilitate growth and provide a stable tax base" (International Economic Development Council, 2013). Porter defined economic development as the "long-term process of building a number of interdependent microeconomic capabilities and incentives to support more advanced forms of competition." (Porter, 1990)

Fredrickson argued that social equity should be considered to be "the "third pillar" for public administration, holding the same status as economy and efficiency as values or principles to which the public administration should adhere" (Fredrickson, 2005, p 209). According to UN-Habitat, poor can spend as much as 30 percent of their wage on transport in

some cities (Sustainable Cities, 2012). Sustainable urbanization can lower the costs and encourage public-private partnerships, why social equity can be considered important for economic development and environmental protection (Sustainable cities, 2012).

The challenges of incorporating sustainability will be difficult where inequalities are a subject of tension and where growth is most rapid (UNEP, 2012). Regarding environmental protection, there is a risk that developing countries will purely focus on growth and generation of wealth (UNEP, 2012). Exhaustion of natural resources is a real threat, but sustainable development can address this issue by converging economic, social and environmental concerns. (United Nations [1], 2010)

### 2.2.2 Definition: Sustainable cities

In this study, sustainable cities were defined as cities that had the ambition to converge the concerns of sustainable development, meaning economic development, social equity, and environmental protection, when building or updating properties of a city, district, or part of a city. Hence, the formula for this process, how to build a sustainable city, is that cities should be built in accordance with the definition of sustainable development: with consideration for "the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987).

### 2.2.3 Climate change – research and approaches

Cooperation, political vision and leadership are needed to transition from old, non-sustainable systems to systems that have sustainability at its core (UNEP, 2012). To support this transition, mechanisms for integration of technologies into new systems could be established. UNEP suggested three broad strategies for this transition:

"1. thematic and iconic programs and projects

2. the establishment and support of strategic intermediaries

3. establishing multi-dimensional measurement and monitoring programs." (UNEP, 2012, p. 11)

To increase its understanding about the economic factors, the British Government appointed the economist Nicholas Stern to lead a commission, and to produce a report on the effects of global warming on the global economy. This report was called the Stern Review. Stern claimed that a delay in stabilizing the climate would be dangerous, and much more costly than it would be to act today. Preventing climate change the coming 20 or 30 years is not possible, but the impact on societies and economies can be reduced. (Stern, 2006)

When published, the Stern review claimed that the level of CO2 equivalent (CO2e) was 430 parts per million (ppm). The level is rising by more than 2ppm each year, and in order to prevent critical impacts from climate change, the level would need to stabilize between 450ppm and 550ppm. Reductions of current emissions by at least 25% before 2050 are needed to stabilize within that range. To stabilize the CO2e levels at 450 ppm would require a peak in CO2e levels within 10 years, and a decrease of 5% per year to reach 70% below the current level by 2050. (Stern, 2006)

Stern argued for four main ways to cut greenhouse-gas emissions:

- "Reducing demand for emissions-intensive goods and services
- Increased efficiency, which can save both money and emissions
- Action on non-energy emissions, such as avoiding deforestation
- Switching to lower-carbon technologies for power, heat and transport"

(Stern, 2006, p. xii)

Sustainable cities can address all four ways of decreasing emissions. Though it is necessary to adapt to climate change, the issues is neglected by many countries. To ensure that investments in infrastructure and buildings take climate change into account, government can set performance standards and plan use of land to encourage sustainability. Governmental policies will ultimately affect climate-sensitive public goods and resources, such as natural resources and coastal protection. (Stern, 2006)

The Stern review argued that governments would not be able to meet the challenges of climate change individually. To face these challenges and to formulate an effective response, the Stern review called for international and collective action. (Stern, 2006)

Accepting the global perspective and providing finance to programs and policies that reduce emissions in developing countries will accelerate the transition towards a low-carbon economy. Stern argued that multilateral frameworks were a mean to enable co-operation and alignment of interests between developed and developing countries. (Stern, 2006)

Technological innovations are important, and international co-operation can accelerate the pace of innovation, and boost diffusion. Governments can promote and arrange public-private co-operation and partnerships, which enables stakeholders to share risks and rewards, and to co-ordinate priorities. This ensures that the direction of innovation is toward matters of climate change and sustainability. (Stern, 2006)

Subsidization could be part of the solution, but part of the problem if not designed correctly. Subsidies alter entry and exit conditions for industries, and it is therefore crucial that subsidies target the core of the problem. Otherwise, profitability could be artificially maintained for firms with adverse impact on sustainability. (Georg, 1992)

Standardization can be a part of the answer to public-private partnership, but it can also cause market failures. Even though it could benefit both public and private interests to switch to a new standard, changes in market conditions may lead to lock-in effects in inferior technological paradigms. Such transition failures can be partly explained by the complexity of systems. (Swann, 2010)

### 2.2.4 Climate change – Firm's attitude toward sustainability

According to Nidomolu, Prahalad & Rangaswami, there is a notion among firms that sustainability comes at the expense of an eroded competitiveness. Firms and executives associate efforts to be more sustainable with additional costs, and no immediate financial benefits. However, it did not have to be a choice between sustainable innovations and lower costs. (Nidomolu, Prahalad, Rangaswami, 2009)

In a study with 30 large companies, it was demonstrated that sustainability was an integral part of innovations, and that this increased returns in the bottom-line. Hence, there does not have to be an underlying conflict between sustainability and results for companies. (Nidomolu et al., 2009)

As the global population is projected to grow to 9 billion by 2050, practices have to change even if things are to remain unchanged. Chouinard, Ellison & Ridgeway argued that it is not "a question of whether business will radically transform, but only of when and how" (Chouinard, Ellison & Ridgeway, 2011, p. 62). To enable a system in which less harmful products are also less costly, Chouinard et al. argued that there has been a lack of three key elements in the past: data, vision and will. (Chouinard et al., 2011)

Chouinard et al. considered that global initiatives can help to bridge the gap, in terms of lack of data. Such initiatives included the Global Reporting Initiative, in which two thousand companies voluntarily provide a report each year on their environmental, social, and economical performance, and the Carbon Disclosure Project, which aims to give insight in corporate practices and results. (Chouinard et al., 2011)

If systems can be created, by bringing stakeholders and business to the table, in which the true cost of goods and services are reflected in their price, progress will be faster. If enough key stakeholders voluntarily adopt global standards in this direction, this would result

in a political will for policy measures that would change conditions and ensure that prices would reflect the true costs. (Chouinard et al., 2011)

Since it is in fact possible to gather accurate data, and that initiatives around the world demonstrates that there is a will to radically transform, this, according to Chouinard et al., only leaves a lack of vision. (Chouinard et al., 2011)

### 2.2.5 Factors expected to affect strategy

**1a) Approach to sustainable cities**

This factor relates to how a firm or city defines sustainable cities and sustainability, as well as related notions, such as smart cities and digital cities. Strategy will be affected by aspects that make involvement in sustainable cities attractive, and by what firms, cities, or countries are looking to get out of participating in the building of sustainable cities. The factors affect relationship with stakeholders, and imply that the approach to sustainable cities at some point has to converge or be compatible with other stakeholders approach.

**1b) Direct or indirect impact on sustainability**

How a contribution to sustainable cities impacts sustainability is of great importance when deciding strategy. A contribution can either have a direct impact, meaning that implications of the contribution are causal results of implementation, or an indirect impact, meaning that the implications of the contribution enables and enhances the impact of other contributions to sustainable cities. Contributions with indirect impacts require more from the system it is part of. Contributions with direct impacts also rely on other factors in order to be implemented, such as stakeholder influence, but have a direct impact on sustainability when implemented.

**1c) Degree of impact on sustainability**

No matter if a contribution to sustainable cities has a direct or indirect impact on sustainability; the degree of impact can vary. The degree of impact will affect the relevance and importance of a contribution to a city. A contribution with a low degree of impact is implied to be less important for stakeholders than a contribution with a high degree of impact. Thus, solutions and contributions with different degrees of impact on sustainability should be addressed with different strategies.

## 2.3 External factors

Before engaging in any kind of project, firms should assess the environment in which they are operating to identify opportunities and to mitigate risks or threats (Mindtools, 2013). There are a number of reasons to examine external factors. Technological developments and an increased degree of globalization have resulted in more interaction between countries and people (Global Envision, 2013).

Consequently, international competition has intensified (Yüksel, 2012). The rapid change in the global environment and the erosion of borders between countries and people influences how firms undertake activities and formulates strategy (Gillespie, 2007).

### 2.3.1 Political factors

Political factors consider legal factors, governmental regulations, directives, rules and laws (Gillespie, 2007). The two main categories of political factors are regulations and resource allocation, how investments are decided and in which direction resources are directed. Political decisions have a significant impact on business in industries with high government involvement, such as infrastructure and labor (Gillespie, 2007). In order to engage in and work towards sustainability, firms must comply with laws and regulations, though they may differ between countries, regions and states (Nidumolu et al., 2009). Customer demand is also affected by political factors, as legal changes can alter market conditions and induce new needs among consumers (Gillespie, 2007).

### 2.3.2 Economical factors

Factors that impact business from a financial perspective are referred to as economical factors. These factors include macro-economic aspects, such as fluctuation of taxation rates, interest rates, exchange rates, economic growth, aggregated demand and subsidies. Changes in the above mentioned aspects alter market conditions and the environment in which a firm operates (Gillespie, 2007).

Empirical studies on economic growth suggested that the quality of inputs is of greater importance than the quantity (Epstein, 2001). Since innovation is a quality factor, innovation is important in order to understand economic growth (Epstein, 2001). Moreover, economic activities are regarded as sustainable when they are carried out to have a long-term focus, i.e. whether they have a positive impact on an organization over time (Brebbia & Beriatos, 2011).

### 2.3.3 Socio-economic impact

Socio-economic factors are social and economic elements that will have an impact on the business environment, such as GDP, education level, demographics, and health of individuals (Gillespie, 2007).

Philanthropy can contribute to sustainability, but the long-term socio-economic objectives are seldom in balance with the short-term cost that philanthropy incurs. A license-to-operate approach is more pragmatic and offers the firm a concrete method to identify social issues that are urgent to its stakeholders (Porter & Kramer, 2006). To keep the firm's license-to-operate intact is highly important among firms that are dependent on states and governments (Porter & Kramer, 2006).

Firms that treat their socio-economic impact and CSR as a way to defend the firm from pressure groups may find that this approach result in few strategic benefits, and even less value to society (Porter & Kramer, 2006)

### 2.3.4 Technological factors

New technologies create new possibilities for companies when they engage in doing business. Developments in the technological field can lead to reduced costs, improved quality or increased opportunity of innovation (Gillespie, 2007). Technological solutions need to be present when building sustainable cities (Stern, 2006). Thus, it is relevant to examine technological sophistication and to assess if technological specialization can lead to a higher degree of sustainability.

### 2.3.5 Environmental factors

Environmental awareness has become more important during the recent years (Gillespie, 2007). Each individual has to acknowledge his or her personal responsibility in order to become a productive steward for the environment. The Stern Review highlighted the challenges that humanity face, and consequences not stabilizing CO2e between 450ppm and 550ppm (Stern, 2006). Reducing emissions from a value chain perspective can also be a source of financial gain, rather than a cost to benefit the environment (Nidumolu et al., 2009) If working together, it would be possible to answer the difficulties of the growing populace with innovation and invention (Brebbia & Beriatos, 2011).

Hence, environmental factors are important in order to protect society from the climate changes occurring due to global warming, which makes the environmental factors important factors for companies to consider when conducting business. (Gillespie, 2007; Stern, 2006)

### 2.3.6 Factors expected to affect strategy

**2a) Influence of political factors**

To formulate a strategy, firms have to evaluate how the firm's profitability is affected by regulations and public investments. Favorable conditions may lead to another strategy than if decisions are made under troublesome circumstances, and the influence of political factors could be substantial for a variety of aspect. Different degrees of influence of political factors should be addressed by different strategies.

**2b) Ability to influence political factors**

This factor refers to the ability of a firm to affect political factors. The importance of this factor is thus to a large extent related to the influence of political factors. The importance of having the ability to influence political factors increase if political factors are influential for a firm's profitability. Moreover, factors that increase the firm's ability to influence political factors, can in turn affect profitability, and be important to consider when formulating a strategy.

**2c) Reputation**

To obtain and retain a license-to-operate, reputation among stakeholder are important. This factor can influence a variety of factors, such as ability to influence political factors, and could be considered an outcome of factors such as degree of impact. Either way, the reputation can affect strategy as it can both facilitate and complicate public-private partnerships when building sustainable cities.

**2d) Socio-economic impact**

Socio-economic factors are highly important to consider when firms decide to participate in building sustainable cities. If a higher degree of sustainability is achieved, it may render benefits for cities and inhabitants. The size and degree of this impact will affect the relevance on the firm's participation, and thus its ability to appropriate value. A large impact will likely benefit the firm's strategic position, and a small impact will probably impede the firm's ability to make a profit from participating in sustainable cities.

**2e) Technological sophistication**

If the technology is highly sophisticated, it affects strategy in multiple dimensions. It may be more costly or demand more resources to develop innovations if the technology is demanding

and has a high level of sophistications. Sophistication will also decide to what extent collaboration with other stakeholders will be beneficial from a system and technology perspective. Additionally, the factor helps to determine whether and how technologies can be integrated into systems. If the technological sophistication is fairly limited, other factors become more important

**2f) Technological specialization towards sustainability**

The level specialization towards sustainability can affects how firms approach sustainable cities. Whether the technology is targeting sustainability directly or indirectly matter to in terms of collaboration with stakeholders, and how the firm contributes to sustainable cities. If the technology is specialized towards solutions that have direct impact on sustainability, the firm will likely approach innovation differently compared with when supplying a generic solution or contribution with a low degree of specialization.

**2g) Environmental impact**

When firms decide to undertake activities linked to the building of sustainable cities, the environmental impact of the activities is crucial for decision-makers to consider. It is of importance to assess whether the firm's contribution benefits the environmental, or if there are indirect effects of the contribution that improves a sustainable development. Thus, environmental impact will depend on context, and likely be a function of decisions regarding other factors.

## 2.3 Internal factors

### 2.3.1 Resource Based View

#### *2.3.1.1 Definition of Firm Resources*

According to Barney, firm resources are all firm attributes, assets, organizational processes, information, knowledge, assets etc. controlled by a company which are used to enhance or to improve a company's effectiveness and performance. Furthermore, Barney suggests that a firm can obtain a sustained competitive advantage by utilizing strategies that are neutralizing external threats, and by implementing strategies that avoid internal weaknesses. In addition, it is essential to respond to environmental opportunities while exploiting internal strengths. (Barney, 1991)

#### *2.3.1.2 Competitive Advantage and Sustained Competitive Advantage*

The definition of a firm having a competitive advantage is "when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors" (Barney, 1991, p. 102). A company can obtain a sustained competitive advantage by first gaining the competitive advantage, and if current or potential competitors are not able to duplicate the benefits of the strategy. (Barney, 1991)

However, it is important to keep in mind that even if a particular corporation achieves a sustained competitive advantage it does not imply that the particular advantage will last forever. Hence, a company can only hope that the advantage will not be duplicated by other firms and thus not be outrivaled for that reason.

Dierickx & Cool argued that additional factors could have an impact on sustained competitive advantage. With all else being equal, if a firm has been engaged in a business or industry longer than other firms, the time of utilizing the resource will be the attribute leading to a sustained competitive advantage, which is defined as time compression diseconomies (Dierickx & Cool, 1989). Owning a high level of an asset increases the likelihood to obtain more of the same asset later on, which is referred to asset mass efficiencies (Dierickx & Cool, 1989).

#### *2.3.1.3 Competition with Homogeneous and Perfectly Mobile Resources*

In order to examine the impact of resource immobility and heterogeneity on sustained competitive advantage a company can explore the degree of competition when resources are mobile and perfectly homogenous. (Barney, 1991)

It is of higher importance to discover conditions under which resources can lead to a sustained competitive advantage rather than studying entire industries. In addition, companies cannot sustain a competitive advantage with resources that are highly mobile, or if the resources are equally distributed across the industry. (Barney, 1991)

If all competing firms in the same industry would possess identical resources, and thus incorporate the same strategies, the firms would improve their effectiveness and efficiency in the same way. This implies that there is no chance of obtaining a sustained competitive advantage under these conditions. (Barney, 1991)

#### *2.3.1.4 VRIS-criteria*

If there are strong entry barriers or if the degree of mobility for a specific resource is very low there is a possibility for a company to sustain a competitive advantage. (Barney, 1991)

Thus, in order for a company to sustain a sustained competitive sustainable performance an asset should meet the four VRIS-criteria. An asset is valuable when it is exploring opportunities and neutralizing threats in the external environment. In addition, the asset should be rare, that is not being available by potential or existing competitors. Furthermore, the resource should be imperfectly imitable, and lastly, there should be no strategically equal substitutes. (Barney, 1991)

##### 2.3.1.4.1 Valuable

Assets are valuable if it provides strategic worth for the company and increases effectiveness and efficiency. Value is provided by resources if it assists companies in applying market possibilities or helps in decreasing market risks. There is not any benefit of possessing a resource if it doesn't include or improve value of the business. (Barney, 1991)

##### 2.3.1.4.2 Rare

Resources that are rare can contribute to strategies that can lead to a competitive advantage for a specific company under the condition that the resource does not exist by current or potential competitors. (Barney, 1991)

##### 2.3.1.4.3 Imperfect imitability

There are three conditions under when a resource is considered to be imperfectly imitable: the unique historical conditions that gave rise to imperfect imitability, causal ambiguity that refers to an unknown coincidence that made the composition of the resource imperfectly imitable and lastly, and social complexity which refers to a very complex social phenomena that is beyond a particular company's ability to grasp and influence. (Barney, 1991)

##### 2.3.1.4.4 Non-substitutability

Sustainability of an asset depends on if it easily can be imitated or substituted (Dierickx & Cool, 1989). Non-substitutability of resources indicates that resources cannot be replaced by an alternative resource. If several companies have substitutes for a particular resource, that could be a source of competitive advantage, then no particular company could obtain a sustained competitive advantage. (Barney, 1991)

## 2.4.2 Transaction Cost Economies

### *2.4.3.1 Firm Boundaries*

Coase defined that firms exist since they are able to reduce transaction cost that could arise during exchange and production in comparison with individuals that would independently interact and do business with each other. Moreover, according to Coase firms would not exist if markets were costless to use. Since markets are costly to use, the most effective way of producing needed components could be inside a firm. (Coase, 1937)

There are three critical factors, which are relevant for assessing firm boundaries: the capability to utilize the resource, the firm specificity of the resource and the asset specificity of the resource. (Amit, Zott, 2006)

### *2.4.3.2 Asset Specificity*

In terms of transaction cost theory there are critical factors, which are relevant a role in terms of the degree to which such assets are specified to an exchange (Amit & Zott, 2006). Three factors can be used in order to determine the critical dimensions of transactions uncertainty, frequency and the degree to which transaction-specific investments are required that is asset specificity (Williamson, 2007).

The critical and most important factor is formally referred to as asset specificity (Williamson, 2007). With assets being valuable for firm's competitive advantage on the market, asset specificity is not to be viewed only as an exchange attribute but also as a resource property. More specifically a resource property that indicates the grade of the resource's potential in terms of affecting transaction costs. (Amit & Zott, 2006)

In a business environment actors will by nature behave opportunistic and with a higher degree of specificity, Williamson states that the transaction cost will tend to go up (Williamson, 2007). In accordance, a high degree of uncertainty can lead to internalization of resources within the company instead of using outside labor (Williamson, 2007). The theory of transaction cost states that asset specificity is critical in combination with bounded rationality, uncertainty and opportunism. A higher degree of asset specificity can results in a decreased level of redeployability of the specific asset (Amit & Zott, 2006).

To assess its role in terms of reaching a decision on how to govern an activity, the firm is highly dependent on precise understanding of asset specificity. With that being said there are two conditions to have in mind regarding asset specificity. Firstly the salvage worth of the resources when deployed in another context is less than the difference between revenues and

operating costs of the asset when deployed in the supposed context. With that being said, the quasi rent from the asset becomes positive. (Amit & Zott, 2006)

On the other hand, if the quasi rent was zero the asset would no longer be particular for the bilateral exchange. Secondly, there could be a scenario where another exchange partner offers a lower willingness to pay in contradiction to the original exchange partner. This condition is critical because that will result in acceptance of a positive quasi rent by an exchange partner. (Amit & Zott, 2006)

### 2.4.3 Factors expected to affect strategy

**3a) VRIS-resources**

An assumption in this study was that no single firm or organization can have a competitive advantage in all components of a sustainable city. A firm's resources affect competitive advantage when building sustainable cities. Depending on firm resources, the firm can formulate a strategy for which activates the firm should purse a competitive advantage, and which activities it should not perform within the firm.

An assumption in the study is that no individual firm can have all VRIS resources needed to have a competitive advantage in all activities of a sustainable city. The resource base affects which innovations the firm can pursue and develop. The prospect of obtaining a VRIS resource by engaging in sustainable cities might be factor that affects strategy. There will be an underlying dependency on other stakeholders in the firm's resources. The level of dependency may differ between resources, but the decision-maker will no less have to consider the RBV to be a factor when choosing strategy.

**3b) Firm Boundaries**

In order to determine to what extent the company is limited to its own core business and whether the participation in building a sustainable city can lead to a broader scope within the firm or not, firm boundaries should be assessed by decision-makers before participating in building sustainable cities. The boundaries of a company will be highly dependent on the business model for the specific company.

**3c) Asset Specificity**

Asset specificity should be considered when formulating strategy, since high degrees of asset specificity may erode profitability and thus benefits of participating in the building of sustainable cities. Other factors may require asset specificity, why this factor has to be accounted for in a broad array of decisions regarding strategy.

## 2.5 Innovation and the Systems perspective

### 2.5.1 Innovation

#### *2.5.1.1 Definition*

The definition of innovation has evolved over the years, from a more traditional, narrow definition to a more complex definition. The traditional view of innovation was that innovation could be defined as the process that refines and translates inventions to usable products. With this product-specific view of innovation, the traditional innovation process becomes linear. After being invented, the product is developed, packaged, and distributed to the market before it is used. As a result, many theoretical models that described and predicted the ramifications of adoption and diffusion of products have been based on the assumption of linearity in the innovation process. (Tuomi, 2006)

With a broader interpretation of innovation, the linearity of product development can be replaced by a more descriptive and including explanation of the innovation process (Damanpour, 1991). Damanpour included more than products in his definition of innovation:

*"An innovation can be a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members."* (Damanpour, 1991, p. 556)

Tuomi distinguished innovations from ideas. An innovation is subject to diffusion and adoption, whereas ideas and inventions are but conceived or created, not necessarily used or spread.

An alternative interpretation of innovation could be to focus on the user, rather than the inventor. A promising idea is only an idea if not users adopts the idea, and social practice actually change (Tuomi, 2006). The matter of social practice and user perception can indeed be an important part of innovation. Dewar & Dutton even defined innovation as an "idea,

practice, or material artifact perceived to be new by the relevant unit of adoption" (Dewar & Dutton, 1986, p 1422).

The linear model of the innovation process has often been criticized of being to simplified. According to Tuomi, innovation is an often a complex and iterative process, where social interaction, communication, and learning are integral elements. Instead of thinking in terms of pipeline-development for existing customers and purposes, innovation can be viewed as demand articulation for potential users needs. In practice, this would mean to integrate potential users' needs into the emerging concept, and to develop individual components to the innovation with this agenda. (Tuomi, 2006)

#### *2.5.1.2 Properties and typologies*

The concept of innovation included several innovation typologies, in addition to products and processes (Salge & Vera, 2012). Damanpour considered that distinctions can be made between radical and incremental, and technical and administrative innovations (Damanpour, 1991).

Technical innovations are innovations that change and improve the performance of an organization's technical system. Distinguished from technological innovations, technical innovations are associated to primary work activities in the organization, and can be both implementation of a product, a service, or a new element in a process (Damanpour & Evan, 1984).

Innovations that are indirectly related to primary work activities were defined as administrative innovation. Administrative innovations are associated with the management of the organization, and involve administrative processes and organizational structures. (Damanpour, 1991)

Whether an innovation is radical or incremental is determined by the degree of novelty in the technological process content of the innovation, and to what extent new knowledge is embedded in the innovation (Dewar & Dutton, 1986). Radical innovations were defined as significant modifications that represented revolutionary change. Incremental innovations were defined as adjustments or improvements in current technology that did not represent a clear difference from existing practice (Dewar & Dutton, 1986)

Further, the concept of innovation related to both outcomes of innovation, and the process of innovation itself (Salge & Vera, 2012). Knight suggested that the organizational innovation process has two phases: "(1) the creation of the idea and its development and (2) the introduction and adoption of the idea" (Knight, 1967, p. 480). Innovative activities could

also be divided into activities that are innovation-adopting, and activities that are innovation-generating (Salge & Vera, 2012).

### 2.5.2 The System Perspective

#### *2.5.2.1 Background - Edison's insight*

To make the incandescent lamp competitive, Thomas Edison understood that a new system of innovations had to be developed in order to be competing with the existing system of innovations. Around the invention of incandescent lamps, he therefore invented seven system elements that were critical to make the incandescent lamp practically viable, such as the parallel circuit, the underground conductor network, the devices for maintaining constant voltage, and light-sockets with on-off switches.

In addition, Edison understood the importance of stakeholders in a capital-intensive project, and therefore involved investment banks, such as J.P. Morgan, at an early stage. Edison's system approach for the incandescent lamp rendered extreme success, and became the starting point for General Electric. (General Electric, 2013)

#### *2.5.2.2 A transformation framework*

Diffusion can be even more demanding than invention. To focus on parts rather than having a holistic perspective can be a fundamental error that obstructs the adoption of clean-tech innovations (Johnson & Suskewicz, 2009). To perceive innovations from a system perspective, Johnson & Suskewicz created a transformation framework consisting of four interdependent and mutually reinforcing components:

- An enabling technology
- An innovative business model
- A careful market-adoption strategy
- A favorable government policy

(Johnson & Suskewicz, 2009)

Johnson & Suskewicz's opinion was that there has been too much focus on technology and governmental policy, and not enough attention on how to approach market adoption, and how to successfully commercialize innovations. How to coordinate all four components into a coherent framework has received even less attention. (Johnson & Suskewicz, 2009)

#### 2.5.2.2.1 An enabling technology

The emergence of new technologies is often a root-cause behind systemic shifts, and an invention can be a catalyst for a new system to emerge. For advances in technology to become viable, components need to work together, and be a part of a complex, interdependent system. This was exemplified by how the steam engine was the starting point for the era of the railroad. (Johnson & Suskewicz, 2009)

#### 2.5.2.2.2 An innovative business model

When innovations and systems emerge, they require a business model designed for the specific context. Innovative business models can be an important in order for an innovation to gain momentum. An offer that solves a customer's problem at the same time that afirm can make a profit by delivering that offer are the main components of successful commercialization. (Johnson & Suskewicz, 2009)

#### 2.5.2.2.3 A careful market-adoption strategy

According to Johnson & Suskewicz, the complexity of clean-tech systems makes it hard to predict how to best integrate a system's parts in advance. Thus, it is reasonable to test the concept, in the smallest possible experiment, with the smallest possible investment. Johnson et al. suggested an emergent approach that focuses on quick and inexpensive ways of conducting tests when there was a high degree of ambiguity. (Johnson & Suskewicz, 2009)

#### 2.5.2.2.4 A favorable government policy

To advance the development of next-generation technologies, governmental involvement has historically been central. However, with governmental support comes a variety of risks. Supporting market-ready technologies that lack the ability to be delivered profitably to the market can be a recipe for disaster. Since it is hard to predict which new technology that is going to prevail, governmental involvement can induce in lock-in effects in inferior technologies. (Johnson & Suskewicz, 2009; Swann, 2010)

Johnson & Suskewicz argued that the government is at its best when it directs its attention to nascent business models, in addition to nascent technologies. In addition to funding, the government can have a great impact on the market by amending regulation, to support sustainable development. (Johnson & Suskewicz, 2009)

### *2.5.2.3 Framework for sustainable innovations*

Nidomolu et al. suggested a framework to increase the number or sustainable innovations, and the system perspective was an integral part of their arguments (Nidomolu et al., 2009).

Nidomolu et al. argued that most companies go through five different stages on their way to become more sustainable:

- Viewing compliance as an opportunity
- Making Value Chains Sustainable
- Designing Sustainable Products and Services
- Developing New Business Models
- Creating Next-Practice Platforms

(Nidomolu et al., 2009)

#### 2.5.2.3.1 Viewing compliance as an opportunity

As norms change, Nidomolu et al. considered that a central challenge for companies will be to make compliance with norms an opportunity to innovate. To face this challenge, working with other companies to implement new solutions, and to anticipate and shape regulation will be important competencies for companies. If handled the right way, the company and its partners can use the compliance to induce experiments with technologies and processes. (Nidomolu et al., 2009)

#### 2.5.2.3.2 Making Value Chains Sustainable

To make value chains more sustainable is a broad concept that involves stakeholders. If efficiencies throughout the value chain were realized, it would create opportunities for the company to become more sustainable. If companies learn to build mechanisms that link sustainability-initiatives to financial gains, positive financial impacts of higher efficiency in the value chain will be unveiled. Thus, the system could be redesigned to reduce waste, emissions, and use of water and energy. (Nidomolu et al., 2009)

#### 2.5.2.3.3 Designing Sustainable Products and Services

For this to happen, companies need management know-how on how to scale supplies, and how to manufacture more sustainable products. Nidomolu et al. also considered public opinion to be important. If the company is not able to generate support for its effort, the effort may be considered as greenwashing, rather than an actual effort towards sustainability. (Nidomolu et al., 2009)

#### 2.5.2.3.4 Developing New Business Models

To develop new business models can be important to disrupt competition, and to achieve a change towards sustainability. However, if managers approach to business models only n terms of rethinking how to deliver a new customer value proposition, the firm can miss out on

the opportunity to capture revenues, and to deliver goods and services in collaboration with stakeholders in the system. (Nidomolu et al., 2009)

##### 2.5.2.3.5 Creating Next-Practice Platforms

To develop innovations that change existing paradigms, executives must question assumptions behind current practices. In order to create Next-Practice platforms, expertise and competence are important to synthesize business models, regulations and technologies in multiple industries. (Nidomolu et al., 2009)

Smart grids are such an example, where digital technology is used to optimize the relation between consumer demand and power generation, transmission, and distribution. This intersection between internet and energy management can lead to lower costs, while being more energy efficient. (Nidomolu et al., 2009)

#### *2.5.2.4 Systems of innovation - a stakeholders perspective*

Understanding the potential of collaborations and building a collaborative capacity is important in order to optimize the firm's innovation strategy. To develop innovations with a large impact can be difficult unless the firm has a capability to form alliances with other businesses, NGOs, and government. To be successful, firms depend on the ability to create mechanisms not only for developing products but also distributing them and sharing revenues in the value chain. The stakeholder perspective is therefore highly represented in this view on innovations and systems. (Nidomolu et al., 2009)

### 2.5.3 Factors expected to affect strategy

**4a) Degree of disruption**

As innovation is an important part of building sustainable cities, defined as "a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members", innovation will likely be a factor that will affect a firms choice of strategy (Damanpour, 1991 p. 556). More specifically, a factor that affects the firm's decision on strategy will be the degree of disruption that the innovation causes. As diffusion is affected by how incremental or radical the innovation is, the degree of disruption is reasonable to consider when formulating a strategy.

**4b) Degree of collaborative R&D**

Sustainable cities are built and operated by networks of stakeholders. Thus, it is important to question to what degree research and development is conducted within the network of

stakeholders. There are different degrees of collaboration and synergies within a system of innovations. To optimize the development of new innovations, firms should consider which innovations to develop within the firm, and which innovations to develop together with stakeholders.

It is reasonable to assume that different degrees of collaboration in R&D will yield different outcomes in terms of stakeholder influence, and how value is captured within the network of stakeholders.

**4c) System dependence**

Innovations can be developed individually or collaboratively, and can have different degrees of disruption. It has to be questioned whether an innovation is competitive by itself, or only as a part of a system. There is definitely a degree of redundancy in this factor, since a higher degree of disruption likely increase the innovation's dependence on being a part of a competitive system. A collaboratively developed innovation may not reach diffusion or benefit the developers, if it is not used in the specific network of stakeholders that developed the innovation.

Thus, it is importance to assess the degree of system dependence of innovations when building sustainable cities. The dependence on a system can both be an advantage, if the capability to organize the innovation is a resource of VRIO-character, and a disadvantage, such as if relation specificity erodes profits.

**4d) Reproducibility**

Sustainable cities are a result of collaboration on many levels, and this affects reproducibility of innovations. Reproducibility of innovations may be somewhat redundant with 4c) System dependence, and will likely be a function of many variables, such as 4a) Degree of disruption, 4b) Collaborative R&D, and i) Stakeholder influence.

Nonetheless, importance of reproducibility to economies of scale and the ability to reach a sustained competitive advantage makes it an important factor by itself. Advantages of scalability, and how dependent an innovation is on other stakeholders and on the system of innovations, are likely to influence strategy. Factors at a later stage of the sequence in the proposed framework, such as business model, will probably be important as well, since different innovations may have different revenue potential, depending on if it was a one-time project or a scalable solution.

## 2.6 Business Model

### 2.6.1 Business Model

A business model consists of four prominent factors that together create the structure of the business model, which are the following: Customer Value Proposition, the Profit Formula, the Key Resources and the Key Processes. In addition, the authors propose a three-step guide to reinvent a business model. (Johnson et al., 2008)

#### *2.6.1.1 Creating a Customer Value Proposition*

The first element and step is to formulate the Customer Value Proposition (CVP). Since the aim of every company should be to deliver value for its customers, a CVP is essentially what a company is offering its customers and what need is being fulfilled. This element of the business model is not only about satisfying a particular need for the customers, but it is also a matter of solving problems for the customers and targeting the customers in the right way. (Johnson et al., 2008)

One of the greatest flaws with delivering a CVP is that solutions in general do not have flawless precision since companies tend to focus on different products. The result of having focus on different solutions instead of having all attention on one solution is that all the solutions tend to be fairly good, but neither one is of excellence. When designing a solution, successful companies have the four most common barriers in mind, that being: access, skill, insufficient wealth or time. Having those factors in mind is of great significant when it comes to generating a precise customer value preposition. (Johnson et al., 2008)

#### *2.6.1.2 Creating Profit Formula*

The next step in a successful business model is to create a profit formula. A profit formula includes four components: revenue model, cost structure, margin model, and resource velocity. In this step, the business model is determined and outlined in terms of how much money can be made, how costs are allocated, how the margin model should be structured, and to what extent and how quickly resources need to be utilized in order to support the target volume. (Johnson et al., 2008)

#### *2.6.1.3 Identifying Key Resources and Processes*

After a profit formula has been created, key processes and key resources, which together creates the CVP, has to be formulated and obtained. The key resources and the key processes differ industries and businesses. For example, the key resource for a firm that sells a service

will likely be related to an immaterial resource, whereas the key resource for a firm that sells a product is more likely to be a material resource. (Johnson et al., 2008)

However, it is not necessarily the company with the best resources or processes that will gain a competitive advantage; it is rather the relation between both the processes and the recourses that will be a source of a competitive advantage. With good integration of key processes and key resources, the firm is more likely to achieve customer satisfaction. Thus, great integration of key resources and key processes can result in better solutions for customers, and can create a competitive advantage for the company. (Johnson et al., 2008)

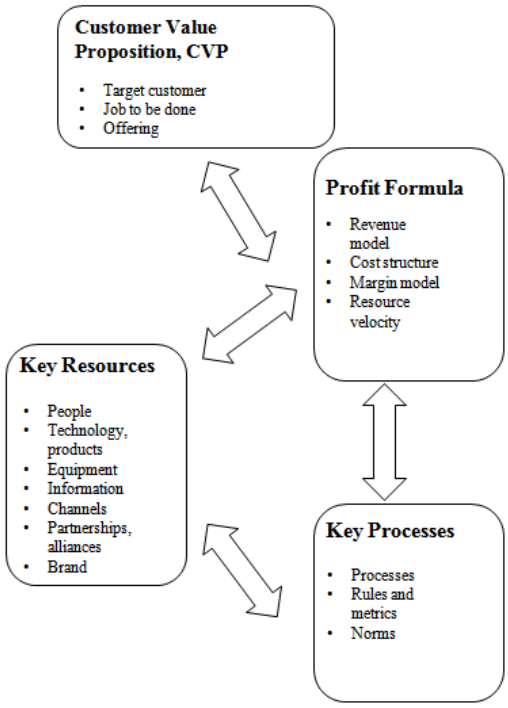


*Figure 1. The Elements of a Successful Business Model (Johnson et al., 2008, p.54)*

### *2.6.1.4 Additional theories*

Resources and processes have been discussed earlier by Porter in his Value Chain-concept. In this theory, he stated that firms have to analyze the activities supporting the product or service in order to gain a competitive advantage (Porter, 1985).

From a strategic cost perspective, it is relevant to break down the chain of activities undertaken by a firm into strategic segments. This made it possible to understand both sources of differentiation and costs. (Shank, Govindarijan & College, 1992)

Furthermore, Hedman & Kalling outlined a conceptual business model in which three "paradigmic" perspectives on strategy integrated: the strategy process perspective, the industrial organization perspective and the resourced based view. (Hedman & Kalling, 2003)

The conceptual business model consisted of customers and competitors, the offering, activities and organization, resources, and factor market interactions. The model had a holistic approach to strategy, and portrayed how the different strategy theories interacted and complemented each other. (Hedman & Kalling, 2003).

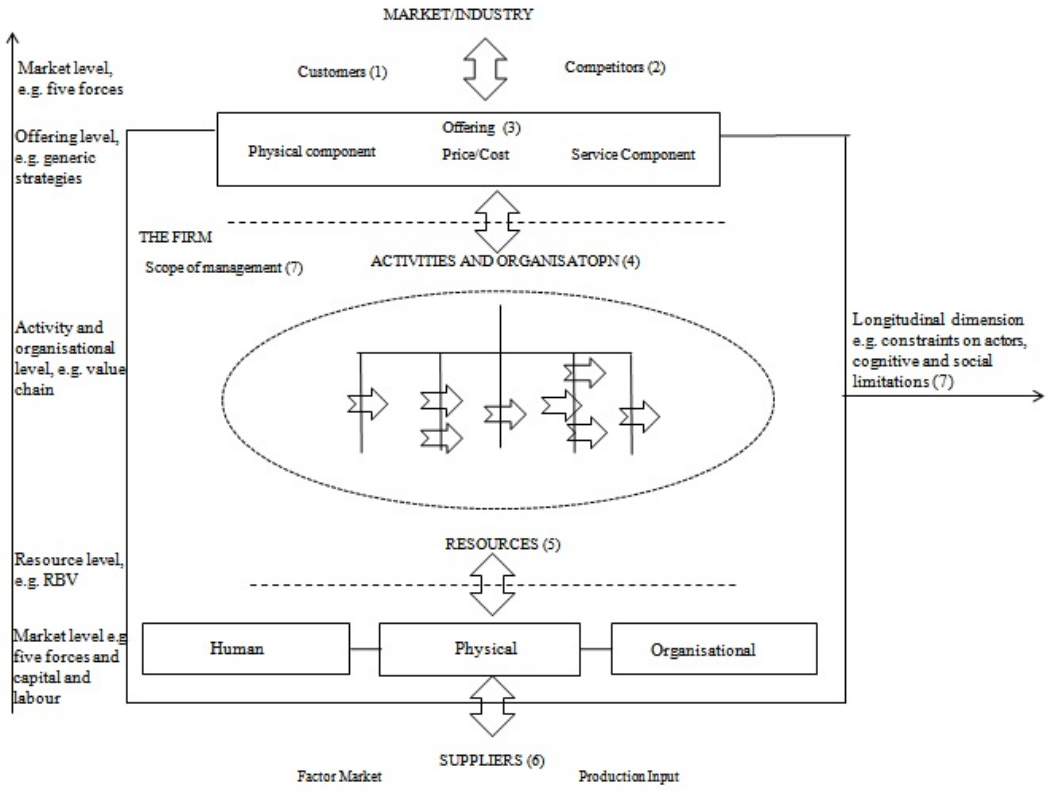


*Figure 2. The components of a business model (Hedman & Kalling, 2003, p. 53)*

### 2.6.2 Factors expected to affect strategy

**5a) Revenue time-horizon**

The revenue time horizon is referring to both the time horizon and expected revenue that a firm expects when engaging in a certain project. A shorter time-horizon induce other decisions than a longer, and affects strategy and how a firm approaches other factors outside the business model.

With a longer time-horizon, the expected pattern is that the importance of stakeholder influence will increase. With a shorter time-horizon, stakeholders will likely not influence firm decisions to the same extent.

**5b) Source of revenue**

Firms will likely approach a source of revenue differently depending on if it is an individual customer, another firm, or a public body. To understand different perspectives is integral in a business model when determining how to approach the customers, clients or citizens. The distribution of power in the firm-stakeholder relationship is also important, as the salience of customers and clients varies between context and industry. Fewer sources of revenue will generally make the firm more dependent on the stakeholder. However, if there is a limited number of firms that are able to deliver what is in demand, the client or customer can be very dependent on the firm. Thus, the nature of the source of revenue affects profitability and strategy in multiple dimensions.

**5c) Degree of exclusivity**

Exclusivity refers to the degree a firm or a city desires to handle it affairs with a limited amount of stakeholders. If a city becomes dependent on a single supplier, it can create lock-in effects in technologies and systems. The firm will likely increase its revenues if the business model is built on a high degree of exclusivity, but this likely incurs costs and responsibility on the firm. If stakeholders are highly dependent a firm, the firm have to adopt strategies to deal with

Thus, the approach to exclusivity will have a huge impact on not only the business model but also for strategy when committing to a certain project.

## 2.7 Proposed framework

The proposed framework summarizes the factors that were defined for each chapter of the theoretical framework. The factors are categorized into five steps, ordered in a horizontal sequence that goes from 1 to 5. Firm strategy is affected by many factors, and the proposed framework is an attempt to visualize how factors affect strategy and how decisions regarding strategy are made. The sequential structure displays the order in which factors are considered.

The framework suggests starting with the approach to sustainable cities, and factors that affect a firms approach. Secondly, analyzing external factors is the next step in creating a strategy as this step may enable or obstruct firm profitability, and can erode benefits from well thought-out strategies regarding how to asses internal factors, innovation and business model. The third step is to assess how available resources and boundaries should affect strategy. From the internal factors, a strategy for innovation should then be formulated. Fifth

and last, the participation in sustainable cities will ultimately be dependent on factors that affects the business model, why this is the last part of the sequence.

In this framework, all steps of the sequence, and all factors are affected by i) Stakeholder influence. This is why i) Stakeholder influence is horizontally present in all steps of strategy formulation.

We are aware that the choices we have made to create this framework have both benefits and drawbacks. Through pattern-matching on our empirical data, we have tried to expand our knowledge on factors that affect strategy. We have also looked for observations that can develop our framework, thus further explain how strategy should be formulated when participating in building sustainable cities.

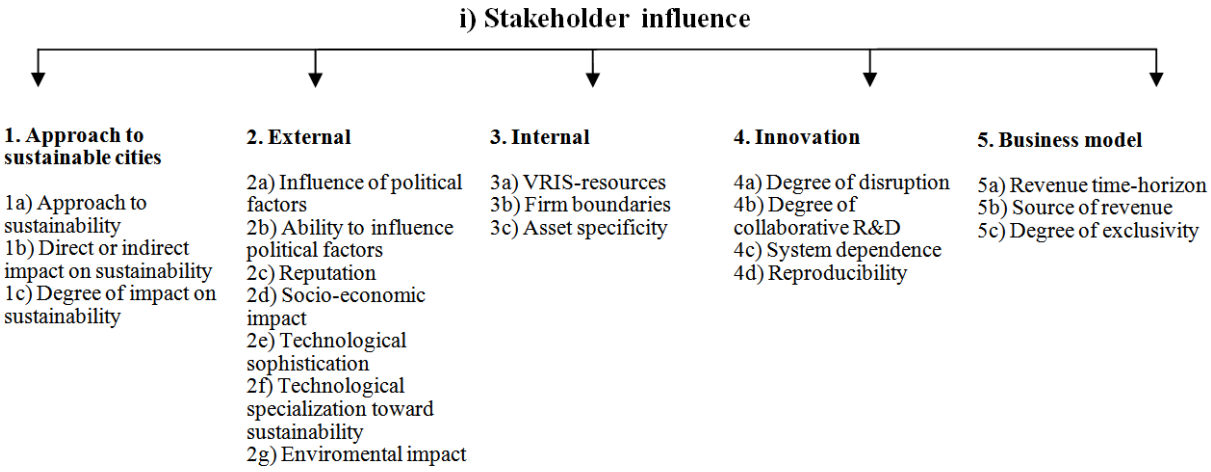


*Figure 3. Proposed framework for formulation of firm strategy when building sustainable cities*

# 3. Methodology

## 3.1 Research design

To study how factors affected strategy when building sustainable cities, the study used a qualitative approach (Bryman & Bell, 2003). As decisions regarding strategy for participation in building sustainable cities were highly complex, a quantitative approach was not considered to be as likely to increase the knowledge on how strategy was formulated. A proposed framework was derived from formal and substantive theories, from which empirical data could be interpreted, and decisions regarding strategy understood. To quantify this

contextual and multidimensional process was challenging, thus a qualitative approach was chosen (Backman, 2008).

A case study method is an empirical study that studies a phenomenon in its actual context. This method is especially relevant when boundaries between the phenomenon and the context are blurred (Yin, 2009). By using a case study method, it was possible to describe the relation and boundaries between the phenomenon and the context in descriptive ways (Yin, 1989). A case study method was appropriate to use when exploring research questions that required a qualitative approach (Bryman & Bell, 2003).

According to Yin, circumstantial and contextual questions such as "why" and "how" benefited from being studied in a case study (Yin, 2009). It was not sufficient to observe frequencies and incidences to understand a phenomenon (Yin, 2009). Instead, patterns and relations had to be examined (Yin, 2009). Multiple sources of information was therefore examined, and sources included both primary and secondary data (Bryman & Bell, 2003).

The method pattern matching was used to compare patterns found in the empirical study with the expected pattern in the proposed framework (Yin, 2009). A deductive approach was mainly used in the study (Bryman & Bell, 2003). However, there were inductive elements in the study as well, as the proposed framework in the study was generated not only from formal and substantive theories, but from the authors pre-existing knowledge, and empirical observations as well. Findings in the study were used to generate an improved framework, which also was an inductive element in the research design.

## 3.2 Case selection

The purpose of the study was to expand the existing knowledge on firm strategy and sustainable cities. However, the study was confined by limitations that affected how well the purpose could be achieved. Time, access to information, and budget were such limitations.

More time could have resulted in empirical data that could explain the phenomenon better. Better access to information could have increased the validity and reliability of our study (Bryman & Bell, 2003). It was possible that representatives from different levels in a private or public organization perceived strategy differently, including which factors they consider to be important. Thus, access to information from several layers of an organization was a factor that was considered when the number of cases was selected. As of the budget factor, better economical conditions could have enabled more time to spend on the study, and visits to sustainable cities, could have resulted in better access to empirical data.

Ultimately, an amount of cases was selected that would make the most out of the circumstances in terms of time, access to information, and budget. The nature of the study influenced this decision. The research question was fairly complex, as the study aimed to increase the knowledge on which and how multiple factors affect firm strategy. Hence, the level of richness made it natural to choose a fewer amount of cases, and to focus on portraying the complexity of the research question. Yin also stated that when there is a low need for statistical certainty, and theory is straightforward, two or three cases are sufficient (Yin, 2009).

A risk of including several cases was that possible findings from individual cases could be ignored. A large number of observations would limit the possibility to excerpt knowledge from each case, as less time to analyze each case could have resulted in more focus on common features between cases, than on analyzing the data for each case (Miles & Huberman, 1994). It could have been sensible to include a high number of observations in the study if the research question or purpose had displayed less complexity.

With a large number of cases, it would have been difficult to ensure the validity and reliability of the empirical data. Therefore the decision regarding number of cases did not entirely concern the time, access to information, and budget, but was also a matter of a balance between relevance, and the study's reliability and validity. The decisions between higher richness in the empirical data, and better conditions to excerpt knowledge from each case reflected this balance.

As a result of above-mentioned factors, the case study involved and examined five cases. This number of cases made it possible to examine the cases in a structured and methodical way. Access to information definitely influenced the decision of how many cases to include in the study, in order to have an acceptable level of reliability and validity.

## 3.3 Data collection

Yin argued that access to potential data, such as interviews and documents, was an important factor to consider when selecting cases and collecting data (Yin, 2009). When collecting data, primary data was distinguished from secondary data. Primary data was collected through interviews, and the method used for the interviews was semi-structured interviews (Bryman & Bell, 2003). In the semi-structured interviews, a set of questions was used as a framework for a discussion (Bryman & Bell, 2003). The discussion was not restricted to a chronological order in the set of questions. Rather, the questions were used to induce the interviewee to

explain its view on the dimensions and factors that affect choice of strategy.

A benefit with this approach was that it enabled findings that were not expected in the pattern (Bryman & Bell, 2003). The interviewee was not bound to only answer questions that were asked, and expected to be of importance (Bryman & Bell, 2003). A drawback with semi-structured interviews was that without enough structure, the interviewee might provide empirical data that was neither relevant to the research question, nor helped to increase the understanding of the empirical phenomenon.

Interviews were recorded and transcribed. There was a risk to misinterpret the interviewee's answers when transcribing the interviews. This was mitigated by having more than one person go through, and thus triangulate the data. In addition, the empirical data from E.ON and Ericsson used in the study was sent to E.ON and Ericsson for approval.

The case study included both cities and firms. Even though the research question aimed to examine when firms decide to participate in building sustainable cities, empirical data from cities was likely to help to increase the understanding for how factors affected firm strategy.

Three firms were included in the case study: E.ON, Ericsson and MKB. Two sustainable cities were included in the case study: Masdar in Abu Dhabi, the United Arab Emirates, and Hyllie in Malmö, Sweden. All five cases included secondary and primary data. Interviews were conducted with:

- Dr. Scott Kennedy, Dean of Research at Masdar Institute of Science and Technology
- Mattias Örtenvik, Director of Sustainable City, E.ON Sverige
- Jonas Selén, Director Business Development and Consumer Insights, Ericsson
- Janna Jonborn, Environmental and Quality coordinator, MKB

The interview with Scott Kennedy was conducted over Skype for a duration of 30 minutes. Janna Jonborn received instructions, the research question and purpose, and the questions in writing. Janna Jonborn replied with answers in writing from MKB. Mattias Örtenvik was interviewed during an hour at E.ON Nordic's headquarter in Malmö. Jonas Selén was interviewed on two occasions, both at the Institute of Economic Research at Lund University School of Economics and Management. The first interview lasted for an hour, the second for twenty minutes. Primary data was thereby collected to a larger extent from E.ON and Ericsson, than Masdar, Hyllie and MKB.

The cases Masdar and Hyllie relied heavily on secondary data. Drawbacks of secondary data were that it could be incorrect, corrupted, or unreliable. Further, it was difficult to assess whether the source was reliable or not. The benefits of secondary data were that it was very

accessible, and thus was an efficient way to use available time and resources. In addition, secondary data could be more credible than primary data, if it was collected with high reliability and validity, and if the authors had access to more relevant information.

## 3.4 Empirical data presentation

The theoretical framework was summarized into a proposed framework of factors that was expected to affect strategy when building sustainable cities. With the factors in the proposed framework as a structure, the empirical data was presented by factor. This decision had implications on the method for analysis, as pattern matching was used to analyze the differences between the expected pattern and patterns found in the empirical data. Thus, presenting the empirical data by factor reduced discrepancies in the structure between chapter 4.2 Empirical data presentation, and 5.1 Analysis. An alternative approach could have been to present the empirical data by case, instead of by factor.

## 3.5 Method for analysis

Pattern matching was used to analyze the empirical data (Yin, 2009). As the study had a deductive approach, the expected pattern was made up by factors derived from substantive and formal theories in the theoretical framework (Glaser, 1978).

The pattern in the empirical data was compared with the expected pattern to analyze if the factor was important for strategic decisions, and how the factor affected strategy. When empirical findings displayed that best practice was not used, or when the empirical pattern was the same as the expected pattern, the academic contribution was insignificant. However, when an empirical observation deviated from the expected pattern, it had the potential to increase the understanding for how factors affect strategy.

The method for analysis had an inductive element, as findings from the pattern matching was used to develop a new framework. The factors were analyzed in several dimensions and perspectives. Factors could be insignificant for strategic decisions, or redundant with other factors. Moreover, there could be causal relationships between factors that the proposed framework did not explain. It was also possible that the proposed framework lacked important factors that affect strategy when building sustainable cities sustainable cities.

## 3.6 Reliability and validity

According to Bryman & Bell, reliability is a measure of consistency in results when repeating trials (Bryman & Bell, 2003). To be able to draw conclusions from our findings, reliability

was accounted for when creating the framework of questions to the semi-structured interviews (Bryman & Bell, 2003). Reliability was increased in the study by asking additional questions to the interviewee, thereby pursuing in-depth arguments with a narrow scope. Seniority and insight in strategy was important criteria when choosing interviewees, the best possible access to information was thereby prioritized to ensure that the empirical data was reliable.

Several cases were chosen, and the cases were both cities and firms. Including different types of cases reduced the uncertainty of measuring data incorrectly. Reliability in the study was very dependent on the factors in the proposed framework. If the factors were insignificant, or if the framework displayed a high degree of redundancy or causality between factors, it would decrease both the reliability and validity of our findings.

According to Bryman & Bell, validity is defined as the extent that the data measures what it was intended to measure (Bryman & Bell, 2003). Validity was increased by including both primary and secondary data in the study (Bryman & Bell, 2003). Large variance or apparent discrepancies between different sources was thereby easier to detect, thus increasing the validity of data that was not discarded in this process.

In case studies, Glaser argued that validity depends on three main factors (Glaser, 1978.). Firstly, validity is higher if the framework has a high level of integration. Secondly, validity will also be affected by the framework's ability to explain the phenomenon, strategies for sustainable cities, relatively better than alternative theories. Finally, relevance was also an important factor for the validity of a case study. If the relevance for decision-makers is limited, and findings in the case study are difficult to generalize or to use, the validity is compromised.

In contrast to quantitative research, which is assessed on the basis of validity and reliability, qualitative research can be evaluated from four aspects: credibility, transferability, dependability, and conformability. These notions are closely related to internal and external validity, and internal and external reliability. Credibility relates to the extent the empirical data was presented and interpreted in accordance with intentions of the source. In the study, more than one researcher handled the empirical data, which limited the effects of how words can be perceived differently, and how intentions can be distorted by personal opinion and experience among the researchers. (Bryman & Bell, 2003)

Transferability concerns whether the findings of the study are possible to generalize and to apply in other contexts. The study increased its transferability by choosing several cases that were fairly different. Data from cities and firms, as well as various industries, such as ICT, electric utility, and construction and real estate, were included in the study. There were

however obvious limitations to the study's transferability, as sustainable cities is a very narrow context to study. (Bryman & Bell, 2003)

Dependability concerns how the result was affected by contextual factors (Bryman & Bell, 2003). Formal theories that were used in the study mainly originated in other countries than the cases in the study, this can have effects on the validity, in terms of dependability. Substantive theories, which were highly contextual, affected the formulation of the proposed framework.

Conformability relates to the influence of subjective opinion by researchers, and to what degree the results can be confirmed by other researchers (Bryman & Bell, 2003). This aspect affected the validity of the proposed framework used in the study (Bryman & Bell, 2003). If the formal and substantive theories were misinterpreted, the factors in the framework would not necessarily measure the factors that affect strategy. In the study, the research question, and the theoretical framework was thereby approached as objectively as possible.

# 4. Empirical Data

## 4.1 Presentation of cases

### 4.1.1 E.ON

The merger between two of Germany's largest industrial groups, VEBA and VIAG, resulted in the establishment of E.ON in June 2000 (E.ON [6], 2013). (VIAG and VEBA were originally established in the 1920's, and were operating as holding companies for industrial corporations owned by the government. Later on, after the 1960's both enterprises were listed on the stock index in Germany. Today, E.ON is one of the world's largest private energy companies with a specialization in energy solutions. E.ON Sverige's net sales in 2012 were SEK 38 721million (E.ON [7], 2012).

E.ON has a global presence with eleven regional units in Europe, as well as five global units. (E.ON [6], 2013). The company currently has 30 million customers across the globe (E.ON [8], 2013). The responsibilities of the regional units include managing regional energy networks, sales and operations, and distributed-generation businesses (E.ON [6], 2013). The five global units consist of: Generation, New Build & Technology, Global Commodities, Exploration & Production and Renewables (E.ON [6], 2013).

### 4.1.2 Ericsson

Ericsson has a long history that goes back all the way to year 1876, which was the year when Lars Magnus Ericsson opened a repair shop for telegraphs. Today, Ericsson is a world leading company in information and communication technology (ICT). Ericsson builds infrastructure in the largest cities and in the most remote areas of the world. Ericsson is present more than 180 countries and has delivered equipment or services to more than 1000 networks globally. Ericsson net sales in 2012 was SEK 227,8 billion. (Ericsson [7], 2013)

### 4.1.3 MKB

MKB Fastighets AB (MKB) is the largest real estate company in the City of Malmö with more than 22 500 apartments and 1000 business premises. Founded in 1946, MKB owned and governed by the City of Malmö. The city council in the City of Malmö appoints the board of directors, and the board reflects the distribution of power between the political parties in the city council. In 2012, MKB had a revenue of SEK 1 749 million, and an EBIT of SEK 183,7 million. (MKB Fastighet, 2013)

### 4.1.4 Masdar City

Masdar City is located in Abu Dhabi, United Arab Emirates, and covers an area of 7000 hectares and will have the capacity to accommodate 40 000 residents and provide a work place for 50 000 commuters when completed. (Masdar City [2], 2013). Masdar City is the physical embodiment of the Masdar Initiative, which consists of 4 elements: research, energy, investments and city. (Beriatos, Brebbia 2011; Masdar City [2], 2013). The Masdar Initiative is powered by the Abu Dhabi Future Energy Organization, which is a wholly owned subsidiary of the Mubadala Development Company (Beriatos, Brebbia 2011).

### 4.1.5 Hyllie

Hyllie is located in the City Malmö, Sweden Malmö Stad [4], 2013). In 2009, Hyllie committed to an environmental program with the aim of becoming the most climate smart city district within the Öresund region, and to become a world leader in sustainable urban development by year 2020. By 2030, Hyllie's goal is that all energy systems should be empowered by renewable energy. (Malmö Stad [4], 2013) When completed, the district will have a capacity to accommodate 9 000 residents and provide 9 000 work places. (Hållbar stad, 2013). The initiative to project was taken by the City of Malmö (E.ON [3], 2011). p. 4), and the main stakeholders involved in the project was VA Syd, E.ON and the City of Malmö.

E.ON and MKB had previously collaborated with the City of Malmö in the building of another sustainable city in Malmö, the Western Harbor (E.ON [3], 2011).

## 4.2 Presentation of empirical data

### 1a) Approach to sustainable cities

In general terms, Mattias Örtenvik (E.ON) defined a sustainable city as "a city that utilizes its resources in an efficient way with all parts of the value chain embedded, and that extracts synergies from the different infrastructural parts". Örtenvik was cautious to present a too standardized definition of sustainable cities. The reason for this was that E.ON needed to be flexible and able to capture the view of its main stakeholders when they defined a sustainable city.

According to Örtenvik, E.ON's perspective on sustainable cities involved two more components: digital cities and smart cities. E.ON's idea is that a smart city is a merger between a sustainable city, and a digital city. By integrating smarter technologies, such as demand-response solutions, consumption can relate better to fluctuations from intermittent generation from sustainability-oriented technologies, such as wind power. Thus, a sustainability-oriented innovation benefits from embedded digital elements, why these two components consequently make up the components of a smart city.

Jonas Selén (Ericsson) said that environmental problems should be addressed by new technologies. Ericsson contributes to sustainable cities by addressing the technology, instead of environmental and ecological factors. In Selén's opinion, a sustainable city is about the smartness of the ICT, which can affect sustainability in a multitude of dimensions. This idea is the foundation for Ericsson's vision "Networked Society", that "connectivity will be the starting point for new ways of innovating, collaborating and socializing" (Ericsson [1], 2013).

Engagements in sustainable cities were however dependent on if there was a sound business case in it for Ericsson, and Selén described the three main ways Ericsson had approached business cases and sustainability. The first was through Ericsson's normal business, mainly with operators in telecom. Secondly, Ericsson managed private projects where they tried out new technology, and took on more of an entrepreneurial risk. Finally, Ericsson studied the effects ICT can bring in a social and economic dimension to the base of the pyramid, e.g. through the Millennium Villages project (Ericsson [3], 2013).

Janna Jonborn (MKB) defined a sustainable city as a diverse city, built with an emphasis on human needs, with consideration to ecological conditions, and that had a sustainable approach to resource utilization. The idea of a smart city was integral in the

development of sustainable cities. Smart cities utilized ICT to add value for the city in terms of sustainability, according to Jonborn.

Masdar aspired to create the first carbon neutral, zero waste town in the United Arab Emirates (Gulf News, 2013). The aim of Masdar is to provide its citizens with the highest standard of living with the lowest possible ecological impact (Masdar City [2], 2013)
Hyllie aimed to become the most climate-smart district in the Öresunds area. (E.ON [3], 2011 p. 4). The goal of this engagement was to become a world leader in sustainable urban development by year 2020. (Malmö Stad [1], 2013)

E.ON's primary role in Hyllie was to provide it with solutions with impacts on energy consumption. Siemens was the technology supplier, and provided Hyllie with technical modules that enabled interaction between facilities and the local infrastructure – smart grids. (Malmö Stad [1], 2013).VA Syd managed and implemented sustainable of handling water, sewage and waste management. (E.ON [2], 2013)

### 1b) Direct or indirect sustainability impact

E.ON contributed with integrated energy, transport and waste solutions. In order to realize a city's ambitions on sustainability in general, Örtenvik described that energy and other solutions that E.ON delivers can be a substantial part of achieving those targets. E.ON's partnerships with local authorities regarding sustainable cities directly targeted sustainability. Hence, E.ON's solutions and involvement in sustainable cities had a very direct impact on sustainability.

Selén described had an outspoken attitude towards Ericsson's impact on sustainability; there are direct effects and indirect effects. Ericsson is trying to prove how ICT can have an impact on social, economic, and environmental factors in sustainable cities. Selén described ICT as a multi-purpose tool to achieve a higher level of sustainability. Hence, ICT, and the Networked Society-vision, is more oriented towards enabling an indirect impact on sustainability, through implications of introducing ICT. Selén suggested that replacing materials, to minimize the ecological footprint in the supply chain, and to produce devices that use less electricity were activities that could have a direct impact on sustainability.

Both Masdar and Hyllie aimed to have a very direct impact on sustainability. Masdar addressed sustainability directly by addressing energy efficiency and climate change (Masdar City [1], 2013). In Hyllie, direct impacts are realized by using systems for enabling energy-efficient and resource-efficient solutions, as well as allowing green areas around the district, and use of one hundred percent renewable energy (Malmö Stad [1], 2013).

### 1c) Degree of impact

Örtenvik said that the degree of impact increased if the E.ON was involved early on in the project, especially concerning new-build projects. E.ON engagements in thematic projects, such as Western Harbor and Hyllie in Malmö, affected its degree of impact.

Selén described ICT as a tool with implications on sustainability, thus the degree of impact from ICT will largely be defined by the extent of which the tool is used. In 2011, there were only 1 billion people with access to broadband. In 2016, this number is projected to increase to 5 billion people (Ericsson [2], 2013). As the benefits from ICT increase with increased connectivity, it is possible that the impact will increase as ICT evolves further.

Ericsson investigated the impact of ICT on economy, and one study showed that doubling the broadband speed increased GDP by 0,3% in the OECD countries which were included in the study (Rohman & Bohlin, 2012.). The Millennium Villages Projects showed that every ten percent increase in broadband penetration, results in an average growth of 1 percent in GDP (Ericsson [2], 2013).

According to Selén, the benefits from ICT vary depending on the context. Installing a top-notch system in an economy and population that is very immature will not render the same effects as implementing the same system in a mature economy.

Through its immediate and direct impact on sustainability, the aim of Hyllie was to have a very high degree of impact. Also, Masdar was built with the aim to have a high degree of impact in research and cluster development and it is shown that efforts in clean-tech impacts the environment directly as well as indirectly (Masdar Institute, 2013).

### 2a) Influence of political factors

The urgency to adopt sustainability measures is higher in cities than on a national level, according to Örtenvik, as consequences of not being sustainable are difficult to ignore on a city level. He also stated that focus on primary energy can lead to one decision, but if political focus is directed towards system efficiency it may lead to another. In Örtenviks view, national energy efficiency targets focused too much on purchase energy, and did not that take system benefits or system efficiency into account. In addition, policy measures on the system side have no link to consumption, which also has negative consequences for E.ON.

Örtenvik described three political factors E.ON was influenced by: the economic stage of each individual country, the cultural point of view, and the role of the local authorities. Regarding the economic stage of each individual country, massive urbanization without city planning can lead to very difficult challenges for cities in emerging economies. Local

authorities have a key role in solving these issues for cities. If it is not capable of mobilizing stakeholders, Örtenvik considered it unlikely to happen any other way.

The cultural point of view related to the public-private partnerships, more specifically how they are set up. From a corruption perspective, Örtenvik considered it fair that it is questioned whether it is natural for a public body to enter into a partnership with a private player, and how that could be done with honest intentions of creating value for the inhabitants.

A trend that Örtenvik had experienced was that the building regulation sector and local authorities to a larger extent decided themselves on preconditions that influence E.ON's choice of strategy. Political factors influence on E.ON's strategy goes beyond national bodies, such as The Swedish Energy Agency, according to Örtenvik, and the Sweden Green Building Council is a testament of this development. SGBC aims to increase the competitiveness of Swedish technology in the building industry, e.g. through certifications (SGBC, 2013). Since they in part decide what characterizes a sustainable solution, Örtenvik described SGBC and similar actors as important for E.ON.

*"It is part of our eco-system to handle political and regulatory affairs."*
(Jonas Selén, personal interview, April 23, 2012)

Selén described that political factors has a prominent role in telecom, due to the scarcity of an important resource: the radio spectrum. Political intentions, laws, and regulations were therefore important to Ericsson.

Business was usually not conducted directly with governments, but was according to Selén affected by the political agenda, such as when Ericsson conducted business with ministries and authorities connected to a ministry.

Politics influence two main factors: regulations and investments. At the moment, Selén claimed that Ericsson primarily has the ambition to address cities. This is a strategy that relates to political factors, since regulations and policies often are formulated on a country-level, but investments and actions are more often taken by cities, according to Selén.

Masdar is a focused on being a part of the international efforts to battle climate change. The Emirate's leadership has the ambition to become part of joint worldwide initiative to reduce the amount of greenhouse gas-emissions through improvement of green energy, clean-tech, reduction of demand for energy, and handling carbon-emissions from businesses, resources and transportation.

Political influence in both the case of Masdar and Hyllie is obvious. The authorities of Abu Dhabi are dedicated to create and reinforce four key areas of political concern: economic development, social and human resources development, infrastructure development and environmental sustainability, and optimization of Government operations.

The Abu Dhabi Urban Planning Council was established by Emiri Decree number 23 of the season 2007, and is responsible for Abu Dhabi's future urban conditions, and is the authority behind the Plan Abu Dhabi 2030 Urban Structure Framework Plan, released in Sept 2007. Abu Dhabi Urban Planning Council's mission is to initiate, generate and help Abu Dhabi in its urban development strategy.

Hyllie was supported financially by national authorities as well as local authorities, which had implications on investments in innovation, and stakeholder collaboration (Energimyndigheten, 2013). In addition, the Swedish law in general favors environmental friendly approaches (Miljöbalk, 2013).

### 2b) Ability to influence political factors

Some large-scale issues, such as politics and demand, are too vast for E.ON to influence. However, Örtenvik considered steering mechanisms for sustainability to be important in order to influence political factors. To transfer partnership engagements and the E.ON's resources into actual value for E.ON, Örtenvik said that it is crucial that E.ON can describe its contributions, and that municipalities understand how E.ON can contribute to energy efficiency targets, climate targets, and economic targets.

As cities approach to projects is dependent on the platform of steering mechanisms, Örtenvik argued that the design of these mechanisms has obvious consequences for E.ON. Thus, the ability to influence SGBC, local authorities and other actors could have potentially large repercussions for E.ON.

Ericsson is engaged in the International Telecommunications Union, a United Nations agency specialized in telecom. Through this engagement, Ericsson ensured exposure toward governments, industry leaders, and regulators. Selén also said that Ericsson engages directly with specific telecom ministries.

According to Selén, Ericsson has attempted to display how ICT can help a country or a city to be more sustainable (Ericsson [3], 2013). Ericsson produced large scale cases to demonstrate how its technology can help countries to reach targets on sustainability (Ericsson [3], 2013). Ericsson has participated in thematic projects, such as Royal Seaport in Stockholm, Sweden (Ericsson [6], 2013).

Masdar's and Hyllie's ability to influence political factors depends a lot on the outcome, and on the actual impact. Scott Kennedy concluded that support from the leadership is extremely important in the case of Masdar. If Hyllie becomes a best practice-example for a sustainable city, Hyllie can influence politics in the region (E.ON [5], 2011).

### 2c) Reputation

*"It is really obvious that the reputation that we gain from the flagship projects, and from the general sustainable cities activities that we have, can be a potential entrance tickets to a new city."*

(Mattias Örtenvik, personal interview, April 9, 2013)

Trust and reputation among partners and stakeholders influenced strategy in multiple dimensions. Örtenvik argued that the public's perception of E.ON had potential influence on E.ON's strategy.

Örtenvik stated that E.ON's strategic position will ultimately be built through good execution. In addition to affecting strategy today, Örtenvik considered stakeholders to be important in a longitudinal perspective as E.ON's license to operate could be partly derived from expectations and outcomes from previous projects.

Örtenvik also stated that it was in the scope of E.ON's agenda to approach sustainable cities as an opportunity to be acknowledged as more than a supplier of bulk energy. Rather, he said that E.ON wanted to have a reputation and to be perceived as a very capable player that can deliver sustainable solutions in general terms. If E.ON is considered a trusted partner for sustainable cities, E.ON will naturally be engaged in the early planning stages. Early involvement, in turn, was very important in order to realize the profit potential of sustainable cities.

*"We have been around for a while, so yes, I guess that we have been able to meet our customers and stakeholders requirements"*

(Jonas Selén, personal interview, April 5, 2013)

Ericsson has built its network and experience over the course of 130 years, and have both a local and global presence today. The network extended from local networks of players to partner with, to a global network of people that Ericsson can reach out to. As influence from

political factors was important to Ericsson, reputation among stakeholders becomes important in those dimensions as well.

An ambition with Masdar was to improve Abu Dhabi's reputation in the international community, regarding sustainability and clean-tech. Masdar's initiatives in green energy and sustainable systems will allow the emirate of Abu Dhabi to prepare its people for a future without oil. Reputation is a factor in this transformation. (Masdar City [1], 2013)

With Hyllie, the City of Malmö wanted to integrate many elements in its sustainable development, such as bicycle transportation, renewable energy and smart-grids (E.ON [3], 2011). Reputation can therefore affect the outcome, as expectations can affect behaviors, such as transportation by bicycle. (E.ON [3], 2011)

### 2d) Socio-economic impact

E.ON's license-to-operate was affected by its socio-economic impact when building sustainable cities, according to Örtenvik. E.ON's solutions did not mainly enable social aspects of sustainable development. However, this did not mean that socio-economic impacts of energy, transport and waste solutions were irrelevant, or non-existing. Örtenvik pointed out that in emerging economies, lack of sustainable solutions can affect living quality through a variety of factors. If E.ON can contribute to mitigating some of these issues, Örtenvik concluded that E.ON's involvement in sustainable cities can bring socio-economic benefits to the city's inhabitants.

Selén described how Ericsson through ICT contributed to socio-economic factors; ICT is a multi-purpose tool that enables many kinds of efficiencies. Through studies and projects, such as the Millennium Villages Project, Ericsson demonstrated how mobility and connectivity brought variety of benefits to health and education (Ericsson [3], 2013). Being a multi-purpose tool with inducing, direct, and indirect effects, ICT have the potential to contribute to social and economic development (Ericsson [3], 2013)

By engaging in Masdar, Abu Dhabi the United Arab Emirates hoped to make a statement that their dependence on hydrocarbons, which contributes to 70 percent of the GDP, will not be reflected in how they build infrastructure and cities. Reducing this dependence, and creating a clean-tech cluster, can have long-term socio-economic impact (Masdar City [5], 2013).

Jonborn described MKB's political mandate to address socio-economic factors when formulating its ambition with Hyllie. MKB's initiatives to be sustainable in terms of

environmental and economic factors had effects on socio-economic factors, according to Jonborn.

### 2e) Technological sophistication

Örtenvik stated that E.ON used engagements in sustainable cities as test-beds, and opportunities to roll-out innovations. To benefit from infrastructural synergies, Örtenvik said that E.ON developed and executed many of its solutions on its own, but also worked closely with stakeholders that own or operate infrastructure. E.ON's partnerships with stakeholders increased the sophistication, in terms of how technologies are integrated into a system of technologies that make up the infrastructure.

Örtenvik said that external players, such as consultants, participated in projects and contributed with competence that was not available in E.ON's collaborations with its stakeholders, which implies a high level of sophistication in some of the solutions that E.ON delivered.

The level of sophistication varied for Ericsson, as it delivers different types of solutions in hardware, software, and services, with potentially different levels of sophistication.

*"When it comes to telecom equipment and radio equipment, it has to be standardized. Otherwise, you are not able to deploy it. And the fiber is fiber."*
(Jonas Selén, personal interview, April 5, 2012)

Selén emphasized that scalability of solutions was instrumental to enable efficient production. Thus, hardware was rather undifferentiated. Hardware and software could be combined in order to make the solution more sophisticated. Selén argued that services were more sophisticated, and could involve different levels of sophistication; from supplying spare parts, to managing whole operations.

The technological sophistication in Masdar was very high, as the ambition was to become a cluster that further pushed the limits of clean-tech and sustainable development. The Masdar Institute of Science and Technology, collaboration with the Massachusetts Institute of Technology, was installed to secure the benefits from the large-scale experiment of Masdar City, and to enable even higher degrees of technological sophistication. (Masdar Institute, 2013).

Technological sophistication in Hyllie is quite advanced in its four main areas: energy consumption, infrastructure with smart distribution between systems and facilities,

transportation solutions, and recycling from consumption. (Malmö Stad [2], 2013 p. 5). In both Masdar and Hyllie, several stakeholders supplied the technological solutions (Masdar City [5], 2013; Masdar City [3], 2013)

### 2f) Technological specialization toward sustainability

Örtenvik described E.ON portfolio of modules as broad. These modules were used to make tailored solutions, with combinations of modules for the specific project. According to Örtenvik, solutions involved both general solutions, and technologies specifically developed to contribute to sustainability, such as demand-response and smart grids (Smart Grid News, 2013).

For sustainable cities, Örtenvik argued that it is natural that the specialization toward sustainability is high, due to the nature of the project and the demand from the initiator of the project, the local authorities and the municipalities.

*"The ICT system as such isn't that different depending on if it is a sustainable city or a non-sustainable city. It is rather the implications of it. ICT is a tool to achieve a higher level of sustainability"*
(Jonas Selén, personal interview, April 20, 2013)

Though ICT can have a potential impact on sustainability, direct and indirect, Selén did not describe the technology as being constructed only to contribute to sustainability. Rather, sustainability can be an outcome of adopting more advanced ICT in a city or country.

In Masdar and Hyllie, as these cases aimed to address sustainability, the specialization towards sustainability was evident.

### 2g) Environmental impact

Being an owner, provider, and operator of infrastructure, Örtenvik concluded that E.ON's business naturally affected the environment it operates in. To a large extent, the level of environmental impact was not decided by the firms in the study. Örtenvik stated that in practice, local authorities decided how sustainable the infrastructure should be, and consequently what level of environmental impact the infrastructure resulted in. Selén had a similar argument for Ericsson, as Ericsson had devices that demanded different amounts of energy.

E.ON had access to technologies and competence that can make cities more sustainable.

Both Selén and Örtenvik expressed that their firms had limits to its scope of responsibilities, and had to balance potential environmental impact with business logic.

Selén considered environmental impact to be a potential outcome of increased connectivity. Selén stated that the degree of environmental impact varied depending on the context where ICT was implemented. Implications on sustainability could be direct or indirect, depending on how developed the country was, according to Selén. Thus, environmental impact depended on the economic stage of the country, and to which extent potential indirect effects were realized in the country or city.

The leadership in Abu Dhabi had previously recognized the relevance of ecological sustainability.

"*We cherish our environment because it is an integral part of our country, our history and our heritage. On land and in the sea, our forefathers lived and survived in this environment. They were able to do so only because they recognized the need to conserve it, to take from it only what they needed to live, and to preserve it for succeeding generations*." Sheikh Zayed Bin Sultan Al Nahyan (Zayed Future Energy Prize, 2013).

Jonborn described MKB's efforts in Hyllie to have the ambition to have a positive impact on the City of Malmö and its environment, surroundings, and citizens. Jonborn stated that MKB had to consider and comply with national environmental targets and environmental targets in the City of Malmö.

Jonborn discussed risks with sustainable cities and the infusion of digital elements in buildings and infrastructure. She considered that the potential environmental impact could be compromised if too many new products constantly were added to the concept, when digital elements were developed and implemented. Simple systems, with a low degree of technological sophistication, was therefore important consider as well when building sustainable cities according to Jonborn.

### 3a) VRIS-resources

According to Örtenvik, prerequisites, such as existing infrastructure, and relationships with stakeholders, were important to consider when E.ON approached sustainable cities. E.ON's previous experience in developing modules in collaboration with other stakeholders had according to Örtenvik resulted in guidelines on how innovation measures should be decided, and in turn how the innovation can be used again at another project. Örtenvik stated that

though E.ON actively strived to reduce its dependence on other stakeholders, the systemic nature of E.ON's industry still imposed a level of dependence.

The capability to successfully reproduce systems dependent on other stakeholders can therefore be an important resource, when dependence cannot be avoided. Örtenvik argued that if E.ON is considered to be a trusted partner, then E.ON naturally will be engaged in the early planning stages. Örtenvik described early involvement as attractive, thus the reputation was a resource that was valuable to E.ON.

In the Telecom industry, especially in hardware, Selén considered scalability to be a factor that both could reduce cost, and to make it easier to manage the technology. Size and economies of scale was therefore expressed to be an important resource. When the scarce resource, the radio spectrum, is regulated to Ericsson's advantage, the technology aspect, and how it is regulated, can become a competitive advantage as well.

By having a global presence and a history of 130 years in telecom, Ericsson has access to networks of stakeholders, and a local presence that is hard, or costly, to imitate. Ericsson invested heavily in research and development, and economies and scale could make this less costly in relative terms. Thought leadership and service leadership are outspoken ambitions and competitive assets for Ericsson. (Ericsson [4],2012)

### 3b) Firm Boundaries

Örtenvik explained that there is high complexity involved in delivering any sustainable energy solution. In order to take capitalize on the demand for integrated, more complex energy solutions; Örtenvik considered that E.ON needs to have a broad scope. Örtenvik stated that participation in sustainable city-projects can broaden E.ON's scope, and alter its boundaries. In the sense of breaking out from being a pure commodity player, and become a broader energy-service player, Örtenvik expressed that sustainable cities made sense.

But just because it is natural, Örtenvik said that it is not necessarily the path that E.ON decides to take. Örtenvik said that this choice depends on if business value can be generated from the capabilities that E.ON has. In its strategy, Örtenvik stated that E.ON focused on whether E.ON owns and operates the infrastructure within a city, or not.

From Örtenvik's point of view, having a business presence today, through e.g. a district heating grid or and electricity grid, is the foundation from which E.ON can work to secure, develop and evolve the profitability base. As other players have competitive advantages in some activities within the project, E.ON focused on its strengths when broadening its scope.

Selén also stated that participation in sustainable cities was an opportunity for Ericsson to expand its scope of activities. With sustainable cities, Selén stated that Ericsson want to handle the operations of infrastructure over a period of time. This goes beyond hardware, as the infrastructure business can be expanded with a service component, such as service integration or managed services.

An approach Selén described was to engage in private projects, where Ericsson took on more responsibility and entrepreneurial risk. Broadening the scope of activities can take many forms when participating in sustainable cities. Selén emphasized that some boundaries remain however, such as the business-to-business part of Ericsson's business model.

### 3c) Asset Specificity

There is a high degree of asset specificity in infrastructure, which increases the importance of making collaborations work. Because of the lack of a good regulatory set-up, Örtenvik considered that E.ON considers have to invest a lot of time and resources into agreeing with cities and key stakeholders.

However, Örtenvik mentioned that there is a positive side of regulation. Due to a process where regulation has to be complemented with individual project parameters, E.ON often becomes involved at an early stage. Agreeing early upon a shared target among stakeholders, on what to achieve together, makes the collaborations gain momentum and can increase the benefits of E.ON's participation.

In order to realize the benefits of ICT in sustainable cities, Ericsson's indirect approach increases Ericsson's dependence on other devices. Selén referred to operators as Ericsson's main customers. In this firm-stakeholder relationship, asset specificity affects the relationship in both directions.

Selén described that when ICT was deployed, it was sometimes synchronized with deployment of other infrastructural elements. This did not increase asset specificity however, it was rather a method to reduce costs and disruptions associated with deployment.

According to Scott Kennedy, there is always a risk of creating lock-in effects when you invest in a greenfield project with a long-term perspective. Any infrastructure investment typically has a certain degree of risk to become locked-in. Kennedy considered transportation to be a good example; it is hard and often costly to change from railway to subway, or other means of transportation.

In order negative externalities of lock-in effects from infrastructure, the City of Malmö evaluated different suppliers and stakeholders before engaging in collaborations (Malmö Stad [2], 2011).

### 4a) Degree of disruption

With regards to the degree of disruption Örtevink claimed that in E.ON's case the degree of disruption depends on the type of segment that the disruption relates to, and in E.ON's case there were three main segments: new-build, retrofit or industry.

According to Örtenvik, in the new-build segment, adopting new innovations are more likely as there is more flexibility to collaborate on an early stage, and there is practically a low degree of disruption. In the retrofit segment buildings and districts already exist, and the degree of disruption depends on how E.ON can increase energy efficiency given conditions in the individual case. Industry presence in a city or an urban area can be a segment where E.ON has to take other factors into account when formulating their strategy. Thus, Örtenvik outlined that in the retrofit and industry segments, the degree of disruption varies depending on the case.

Furthermore, Örtenvik stressed the fact that E.ON takes macro trends into consideration when future energy systems are being designed. In addition, Örtenvik claimed that E.ON considers it to be probable that the future energy systems to a larger extent will interlink the parts of the value chain, especially generation and consumption. According to Örtenvik E.On also believes that generation of energy will be closer to consumption in the future; consequently citizens are ultimately important stakeholders.

Therefore, Örtenvik argued that developing innovations for the distribution part, the generation part, and the consumption part of the energy system is based on the insight that the energy market as a whole will develop itself closer to the end-customer's consumption. He also stated that cities consequently would be the natural arena to roll out and try new solutions, such as demand-response and smart grids. To conclude, the degree of disruption in this development will according to Örtevink therefore depend on mentioned factors, such as pre-existing conditions, segment, macro trends and political factors.

For Ericsson, Selén argued that the degree of disruption was first of all highly dependent on the context and the environment where ICT was deployed. Secondly, it was a matter of availability of platforms and utilization of ICT, rather than disruptions in citizens' daily lives. Furthermore, Selén distinguished between retro-fit and green-field projects within Ericsson's business s. When Ericsson built infrastructure from scratch, Selén explained that

deploying ICT was easier compared with installing ICT in a complex project, such as Rome, or other cities with old buildings.

With regards to the level of disruption, Selén affirmed that it also varied depending on the approach, what Ericsson referred to as a surgical versus a more horizontal approach. The surgical approach was described by Selén and referred to build a model, a thematic project that could be a guiding star on what you can achieve for other parts of a city or a country. In a horizontal approach, however, Selén explained that ICT was put everywhere in the city, to induce effects that follows of connecting people. This horizontal approach had a less advanced system with a less ambitious agenda regarding impacts from ICT, but was broader and more distributed. Selén concluded that the disruption was surely larger in terms of direct effects in the surgical approach, but he also claimed that the indirect effects of connecting many people across a city have the potential be vast as well.

### 4b) Degree of collaborative R&D

According to Örtenvik, E.ON is very active in co-operation in matters of innovation. Also, Örtenvik argued that working with local authorities ensures that E.ON's license to operate is intact, that is if E.ON can manage to deliver competitive and sustainable solutions. Örtenvik claimed that it was important for E.ON to enter collaborations with stakeholders very early in the planning stages, especially when developing and implementing specific energy solutions for a new-build area. Örtenvik explained that the reason for this was that innovations and solutions would not become as cost efficient, competitive, or as sustainable as the city or customers demanded if the collaboration did not started early in the planning stages. Örtenvik concluded that E.ON has a high degree of collaboration in their research and development when engaging in sustainable cities.

Örtenvik highlighted the Hyllie-project as an excellent example of how E.ON gathered 12 million Euros in external funding, together with other stakeholders in order to support different innovation measures, and push the market over the threshold to execute tests together with the stakeholders involved in Hyllie. To enable this kind of collaboration, Örtenvik emphasized how E.ON considered it urgent to adopt sustainability measures on national and international level that takes system efficiency into account. There is thereby a political factor embedded in the degree of collaborative R&D and a political focus on the system perspective benefits E.ON's operations, Örtenvik concluded.

Ericsson invests heavily in R&D, in 2012 Ericsson invested SEK 32,8 billion (Ericsson [4], 2012). These investments represented more than 14,4 % of net sales, and involved more

than 24 000 employees (Ericsson [4], 2012). Consultants are used to add expertise, but collaborations are also formed with other stakeholders in sustainable cities. In the Royal Seaport project in Stockholm, Ericsson partnered with a number of stakeholders in partly VINNOVA-funded R&D projects, such as the City of Stockholm, the building company NCC, and the operator TeliaSonera (Stockholm Stad [4], 2013).

### 4c) System dependence

When engaging in sustainable projects Örtenvik explained how E.ON addressed system dependence by prioritizing independence and by choosing a business model that is non-exclusive in its handling with local authorities. He highlighted how the structure of the networks of stakeholders is tremendously important in order to extract value from investments in sustainable cities; the real key player in E.ON's opinion is the municipality.

Örtenvik further explained how E.ON develops new innovation when working with other stakeholders, the research and develop process is strictly controlled by avoidance of lock-in effects with suppliers or partners but nevertheless E.ON is not looking for local authorities to take responsibility for E.ON's involvement in sustainable cities.

ICT connects people, but is part of an eco-system of devices that enables people and objects to be connected. The context where ICT is installed is important, direct effects on sustainability are more prevalent in developing countries, and indirect effects are more prevalent in developed countries. Regardless of the context however, the impact on sustainability from ICT is very dependent on the system it is part of.

### 4d) Reproducibility

To solve the issue of standardization and scalability, Örtenvik explained that E.ON chose to direct its focus in the direction of developing independent modules. With a large number of modules, E.ON can pick pieces of the puzzle, and put them together into a concept, designed for the individual prerequisites appropriate for a specific project. The three main segments, meaning new-build, retrofit and industry-city linkages therefore have rather standardized approach with clear generic elements.

These generic elements can be transferred from previous projects to existing engagements, but also from city to city depending on segment. Regarding what can be transferred between different projects; Örtenvik stated that E.ON is able to transfer how it approaches the projects, in terms of competence and know-how compared with its ability to transfer the sophisticated technical solutions from one project to another. Furthermore, Örtenvik explained that it therefore was more important for E.ON to obtain the actual

competence, through intellectual properties of e.g. optimization algorithms, in terms of reproducibility in the R&D.

According to Selén there is overall a higher degree of homogeneity and standardization in the hardware-segment, in the business environment in which Ericsson operates.

*"The scale is always of interest, we like scale. From a business perspective, and a technology perspective. We like scale."*
(Jonas Selén, personal interview, April 5, 2013)

Regarding solutions and innovations for sustainable cities, there is a higher degree of heterogeneity in the services and software that Ericsson delivers, according to Selén. When the solution is co-developed with other stakeholders, the reproducibility of the solution as a whole may decrease, as more elements make up the final solution. The Urban Smart Grid in Ericsson's involvement in Royal Seaport in Stockholm could be such an example (Stockholm Stad [2], 2013).

However, Selén emphasized that since Ericsson only develops part of the infrastructure for sustainable cities, its contribution is still rather independent, in terms of reproducibility and scalability. According to Selén the intention of Ericsson's own private projects as well as collaborations with other stakeholders is definitely in the direction of scalability, that is to be able to use the solution in another context, in another part of the world.

With regards to reproducibility, Kennedy argued that there are rather modules of the Masdar Initiative than the concept as whole that can be transferred to other cities. In his point of view there are technology techniques that can be used in other projects, for example there is a particular feature of a wind tower that collects cooler air for its inhabitants. In addition, Kennedy stated there are useful learning outcomes within the field of setting up supply chains with regards to new types of materials. However, Kennedy implied that specific project management techniques would not necessarily be reproducible in different countries or continents due to governmental differences and approaches to engaging in sustainable cities.

In the case of Hyllie the project is fairly new it is hard to say if there will be an opportunity to replicate the concept of the sustainable district. However, as in the case of Masdar City there might be modules or parts of the projects, which can be transferable to other cities. There is an indication that some modules or stakeholders are able to use their knowledge and equipment in other projects, for example E.ON (Malmö Stad [3], 2013)

### 5a) Revenue time-horizon

According to Örtenvik, E.ON's the engagement in sustainable cities lies in a variety of purposes; however the underlying business logic of investments is a main factor to consider for E.ON when it comes to decisions regarding strategy. The collaboration with cities rarely results in economical transactions however, Örtenvik argues that the opportunities for E.ON rather increase to build and evolve its existing profitability base. Örtenvik continued to describe that in this type of revenue model, where revenues are building up over time, combined with citizens' and customers' dependence on reliable infrastructure, E.ON's time-horizon becomes fairly long-term.

Selén argued that the project which Ericsson undertakes lead to massive increase of connections in the future. In his opinion everything that benefits from being connected eventually will be connected. Furthermore, Selén said that engagements in different projects will not only result in an increased demand for better ICT in terms of hardware, but also more opportunities for services and software. The business models for these two segments are quite different however, which affects the time-horizon for revenue.

Selén explained that hardware investments are traditionally made with a capital expenditure approach. Software can have other business models, such as licensing or pay-as-you-go, where revenue is spread out over time. Services can be either of the approaches, to either reach service agreements with Ericsson over a period of time, or to buy a specific service. Furthermore, Selén explained that customers of Ericsson therefore approach Ericsson differently depending on whether it regards the hardware, software, or a service the investment concerns. Altogether, as hardware make up half of Ericsson's revenues, Ericsson has a mixed approach to its revenue time-horizon.

Masdar City was explained by Kennedy to be a long-term project, which was initiated from centralized authorities ruling the city. Kennedy also stated that there are no direct revenue incentives to be generated from this project. The goal of the project is rather to build a completely sustainable community and to be able to complete a project of that kind, it is important to have a long time-horizon. The construction started back in 2007 and was initially being planned to be completed in year 2016 (Masdar City [4], 2012). After the completion the residents of the community are going to be able to live in a city that has a quarter of the energy consumption of a non-sustainable city with the same amount of residents (Masdar City [4], 2012).

The commitment of Hyllie is a long-term project, which will need to be evaluated after a certain amount of time (Malmö Stad [2], 2011). Also in this case the initiative was taken by

the city with the main aim to develop a sustainable environment for its citizens (Malmö Stad [2], 2011).

### 5b) Source of revenue

When it comes to companies engaging in sustainable cities the relationship between the firm and its clients is somewhat easier to specify and describe. E.ON has for example a very broad scope of revenue sources as it participates in all parts of the value chain: generation, distribution, and retail (E.ON [4], 2013; Soliditet, 2013).

According to Örtenvik, E.ON has the ambition to become more than a supplier of bulk energy. Consequently, moving from consumers to companies, cities, and municipalities has implications on how the business model is constructed. Furthermore, Örtenvik states that E.ON complements its business model with supporting, or strengthening, activities that reduce cost, expand current revenue streams, or increase the market share, by increasing the competitiveness of E.ON's offer. Örtenvik exemplified such activities by saying that they in general include energy efficiency, distributed services and generation services. Test-beds are then used to roll-out and scale up solutions E.ON develops for sustainable cities.

Selén described how Ericsson conducts business with ministries and authorities connected to a ministry even though Ericsson's customers normally are operators. As ICT is a tool-box enabling sustainability, Selén explained how Ericsson's customers or clients can be as diverse as the solutions Ericsson supplies. Ericsson had a wide range of vertical engagements that included Maersk, Volvo and Swedish TV4 according to Selén.

*"If you are looking to our customers' business case, one key thing is energy cost."*
(Jonas Selén, personal interview, April 5, 2012)

According to Selén, the offer has to be adapted to the needs of the customer, and its stakeholders. He states that the energy cost and use is an important factor for sustainable cities, and to fit different needs Ericsson supplies e.g. base stations with different output effects. When analyzing the specific scenario, factors such as range and the amount of calls the station can handle at same time has to be balanced with the total energy consumption of the whole system, or per unit or minute. Moreover, Selén argued that it is hard to find a balance between performance of the ICT and drawbacks.

*"You can build a base station with a very high output effect, it has a long reach and it can handle a lot of people and calls at the same time. But that unit will use more energy than a unit that has lower range, or a lower output power."*
(Jonas Selén, personal interview, April 5, 2013)

For whole cities or districts it is generally harder to determine. Since Masdar City was a recent greenfield investment the outcome and opinion of customer, citizens and users is hard to determine. In addition, there are currently no residences except students. The same logic goes for Hyllie since the first inhabitants will move into the district beginning of the autumn 2013 (Hållbar stad, 2013).

**5c) Exclusivity**

*"We don't want the municipality to have a lock-in effect of the collaboration that we have with them. That is so extremely important over time, how this could be questioned from cities inhabitants, or market players in the city, or just a general public opinion point of view."*
(Mattias Örtenvik, personal interview, April 9, 2013)

When it comes to exclusivity, Örtenvik explained that E.ON's aim is to be non-exclusive when engaging in business with local authorities. Furthermore, Örtenvik outlines how E.ON adopts a long-term perspective and is positive if the city wants to collaborate with additional energy companies or partners. Moreover, Örtenvik described that there are rarely any economical transactions involved when E.ON approaches cities but that it is rather from a more indirect point of view that business comes into play for E.ON, when the profitability base is built up over time. As a result, Örtenvik concluded that E.ON has a low need of having exclusivity in its involvement in sustainable cities.

Selén claimed that in Ericsson's business model, exclusivity was highly desired due to the interrelationship between exclusivity and scale. According to Selén, Ericsson increases its likelihood of gaining competitive advantage and also the degree of impact in a specific project by gaining. Also, Selén stated that as the radio spectrum is limited, managing a large part or all of this scarce resource has benefits for technology, as a higher degree of exclusivity makes the technology easier to manage, and thus can enhance quality. Thus, the offer has to be adapted to the needs of the customer, and its stakeholders.

However, energy cost and use is an important factor for sustainable cities, and Selén declared that in order to suit different needs Ericsson supplies its customer with different solutions, such as base stations with different output effects, and energy efficiency.

Furthermore, Selén argued that Ericsson is a business-to-business company and that operators, public authorities, or other clients or customers therefore also may benefit from exclusively working with Ericsson in the field of ICT. For a city, or a country, the benefits of standards are evident, Selén claims. However, for firms, too much dependence on Ericsson may be costly, but firms may also benefit from Ericsson's global thought and service leadership within ICT (Ericsson [4], 2012).

# 5. Analysis

## 5. 1 Analysis of factors

### 1a) Approach to sustainable cities

According to Selén and Örtenvik both E.ON and Ericsson considered digital elements to be an important part of their approach to sustainable cities. Salient stakeholders had obvious influence on E.ON how approach stakeholders (Mitchell et al., 1997), and how value is created and perceived by stakeholders was integral in E.ON's approach to sustainable cities (Freeman, 2008). As Örtenvik stated, E.ON's main stakeholders were local authorities and municipalities, and as its opinion was important for E.ON the three aspects of sustainable development were naturally embedded in E.ON's definition of sustainability (United Nations [1], 2010). However, Örtenvik's definition of E.ON's view on sustainable cities did not straightforwardly relate to mainstream definition of "sustainable development" (The World Commission on Environment and Development, 1987).

Comparing Örtenvik's and Selén's answers regarding the respectively companies' approach to sustainable cities, it was distinct that Ericsson did not deal with the same level of stakeholder influence on its definition of sustainability compared with E.ON. If sustainability was the ambition, as per Selén's explanation, Ericsson considered ICT and smarter technology to be the tool through which sustainability can be achieved. Thus, Ericsson's approach to sustainable cities had a large impact on its strategy, displayed by its vision "Networked Society", and its own projects in Stockholm and the Millennium Villages Project. (Ericsson & Ericsson [1], 2013)

Kennedy explained Masdar City's approach to sustainable cities, which demonstrated similarities with UNEP's three broad strategies for a transition towards sustainable development. Subsequently, the engagement in a thematic project that embodied the agenda of sustainability was a statement by the United Arab Emirates that its dependence on hydrocarbons would not be reflected in how infrastructure and cities were built. A strategic intermediary that could support the transition to new systems of innovations was established, the Masdar Institute of Science and Technology (Masdar Institute, 2013). The Masdar Institute of Science and Technology also enabled monitoring and multi-dimensional measuring mechanisms (UNEP, 2012).

### 1b) Direct or indirect sustainability impact

The cases in the study displayed different level of impact on sustainability. In its approach towards sustainable city-projects, Selén stated that E.ON had partnerships with the public, which ensured a direction toward sustainability (Stern, 2006). According to Kennedy, the main target of sustainable cities is to have a direct impact on sustainability. This was achieved in Hyllie and Masdar by the development of energy-efficient and resource-efficient solutions (Stern, 2006).

In contrast to the above, Selén described Ericsson's contributions as generally having a more indirect impact on sustainability. According to Selén this was a consequence of Ericsson's approach to sustainable cities, which in turn was a result of the nature of Ericsson's expertise namely the ICT.

Supported by Selén and Örtenvik both Ericsson and E.ON were affected by the economic stage of each country impacted by their contributions regardless if they ware indirect or direct. Solutions that were deployed and implemented in developing countries had a more direct impact on sustainability in both of the cases. When operating in a developed country, Selén described Ericsson's impact on sustainability to be more indirect than in developing countries. One reason for this phenomenon could be that system dependence was more sophisticated in developed countries, and that ICT was a tool to achieve a higher degree of sustainability in the system of innovations.

### 1c) Degree of impact

In all cases that were studied, the degree of impact on sustainability affected strategy. In general, it was possible to establish that the degree of impacts was both causality related to decisions regarding a number of factors in the framework, and an outcome of those strategic decision.

The factor had similar effect on strategy in all five cases, but the ambition for degree of impact varied between cases however. The cities Hyllie and Masdar were in general more ambitious than the firms. Among the firms, the scope of the firm's activities and the size of its operations influenced the degree of impact.

According to Örtenvik, E.ON's engagements in thematic projects, such as Western Harbor and Hyllie in Malmö, helped to increase the degree of impact on sustainability (UNEP, 2012). Cities enabled mechanisms that support a transition to systems with sustainability at its core (UNEP, 2012). Thus, as Örtenvik, Selén and Jonborn argued that all three firms, E.ON, Ericsson, and MKB, prioritized to contribute to the sustainable development of cities, rather than on a national level.

The City of Malmö gathered a number of stakeholders in its thematic project Hyllie (UNEP, 2012). This ensured that the direction of the project was toward an impact on climate and sustainability (Stern, 2006). As described by Örtenvik, the thematic projects made it easier for stakeholders to acquire common funds, which were used to develop common systems of innovations in the cases Hyllie and E.ON (Johnson & Suskewicz, 2009). This increased the degree of impact, as it supported a transition toward sustainability.

Without common funds, stakeholders would have been dependent on individual funds to develop innovations to the system. With differences in urgency, dependence and power, it could have been difficult to negotiate how to divide possible synergies from the collaboration between the stakeholders (Mitchell et al., 1997). Common funding mitigated this issue, and was an aspect that contributed to the degree impact.

As Selén implied Ericsson's degree of impact towards sustainability relied on diffusion and use of ICT. Furthermore, Selén stated that Ericsson is taking the point of view that sustainability should be addressed by technology since Ericsson had proved that its technology contributed to economic development (United Nations [1], 2010). Both Örtenvik and Selén argued that the economic stage of each country was an important aspect of degree of impact for both E.ON and Ericsson. They argued that in developing countries, improved infrastructure had a large impact on sustainability, mainly through environmental factors and economical factors. However, in developed countries, Örtenvik and Selén supported that the context also affected the degree of impact, and to what degree depended on cities ambition and political factors.

### 2a) Influence of political factors

The cases displayed that political factors were very influential, and that they deeply affected strategy. As Örtenvik and Selén explained the global firms E.ON and Ericsson were affected by political factors to a large extent, however Jonborn implied that MKB was not equally affected due to its limited geographical scope. As some of the factors in the framework were affected by laws and regulations, the global presence of Ericsson and E.ON resulted in that political factors had implications on factors affecting strategy, such as 4d) Reproducibility and 5a) Revenue time-horizon (Yüksel, 2012).

Lack of sustainability in a city's infrastructure could impede a city from further economic growth. Örtenvik argued that this created incentives for cities to adopt sustainability measures, and accordingly, sustainability was perceived to be more urgent in cities than on a governmental level (Mitchell et al., 1997). Thus, Örtenvik and Selén stated that E.ON and Ericsson had a noticeable focus on cities. Also and Jonborn shared the same focus regarding MKB.

Focus on primary energy led to other decisions than if political focus was directed towards system efficiency. Since systems had great importance for diffusion of innovations, Örtenvik explained that the aim of E.ON advantageous if the system perspective was adopted in politics to a larger extent (Johnson & Suskewicz, 2009).

Governmental initiatives that promoted and arranged public-private partnerships enabled a co-ordination of priorities that ensured a direction toward solving matters of climate change and sustainability (Stern, 2006). Also, public-private partnerships were a mean to find a balance between short-term yield for Ericsson, MKB and E.ON, and long-term societal objectives for Hyllie and Masdar that were beyond the scope of interest for the firms in the study (Stern, 2006).

### 2b) Ability to influence political factors

If political factors had a large influence on strategy, the ability to influence political factors became more important.

The firm-stakeholder relationships had influence on the cases ability to influence political factors (Frooman, 1999). Örtenvik described that E.ON was highly dependent on political factors, but did not possess the power necessary to influence all factors it was affected by (Mitchell et al., 1997). Thus, Selén and Örtenvik expressed how vital it was for E.ON and Ericsson to demonstrate how significant their involvement could be in terms of sustainability, in order to influence political factors.

This factor was causally related to several factors in the framework, as the ability to influence political factors could have been a result of other factors, such as 2c) Reputation, 2d) Socio-economic impact, and 4a) Degree of disruption.

### 2c) Reputation

The reputation among partners and stakeholders influenced strategy in multiple dimensions. The study showed that reputation affected firms' relationship with stakeholders. As choice of stakeholder influence strategy depended on firm-stakeholder relationship, reputation affected the firms' stakeholder influence strategy (Frooman, 1999). In addition, Örtenvik confirmed that reputation increased power, and power increased the firm's ability to impose its will on its relationships (Mitchell et al., 1997).

Hyllie's and Masdar's reputation is to a large extent yet to be determined, as they have not existed for a very a long period of time, compared with Ericsson, E.ON and MKB (E.ON [1], 2013; Masdar City [1], 2013).

### 2d) Socio-economic impact

The firms in the study worked together with local authorities to ensure that targets for sustainability, such as economic development, environmental protection, and social equity, were considered (Stern, 2006; United Nations [1], 2010). However, to achieve a high degree of socio-economic impact was not the main target for any of the cases except for MKB in the study. Jonborn explained how MKB displayed a more explicit ambition to contribute to social equity compared to Ericsson and E.ON. Rather, the impact was generally directed toward economic development and environmental protection in the cases (United Nations [1], 2010).

Nonetheless, the cases indirectly contributed the socio-economic factors as well. A higher degree of sustainability in general could also have indirect impact on socio-economic aspects. As Selén described Ericsson demonstrated this in its Millennium Villages Project, where a number of socio-economic targets, such as health and education, was affected by the implementation of ICT (Ericsson [3], 2013).

### 2e) Technological sophistication

The firms and the cities in the study collaborated with partners, private and public, to deliver technological solutions to sustainable cities. Common for all cases were that sustainable cities involved activities and solutions with various degrees of technological sophistication. Örtenvik described E.ON's concept as a set of modules that were put together for a specific

purpose, whereas Selén described Ericsson's approach as adjustable to technological sophistication of its solutions to its client's demands.

All cases displayed that test-beds were used to experiment with innovations; this implied that sophistication was high. Finally, digital elements were incorporated in solutions in all cases, which increased the technological sophistication and were a tool to achieve higher efficiency (Nidomolu et al., 2009)

### 2f) Technological specialization toward sustainability

A wide range of technological solutions are necessary to increase the level of sustainability (Stern, 2006). Örtenvik explained that E.ON developed solutions that both directly targeted sustainability and solutions that had an indirect impact on sustainability. Selén on the other hand, stated that Ericsson considered its solutions to be fairly general, and not specialized toward sustainability or sustainable cities.

Hence, this factor was somewhat redundant with the factor 1b) Direct or indirect impact on sustainability, as they entailed similar implications on strategy.

### 2g) Environmental impact

The study showed that it does not have to be a divergence between firms and the public in terms of environmental impact. Collaborations among stakeholders had a positive environmental impact in all cases. According to both Selén and Örtenvik the cities benefited from increased efficiency and a switch to lower-carbon technologies, and the firms in the study delivered solutions that enabled cities to reach those targets (Stern, 2006). The environmental impact that the firms in the study had through sustainable cities was therefore likely to be aligned with the interests of citizens, cities, clients and customers.

### 3a) VRIS-resources

Both Örtenvik and Selén expressed the importance of resources in strategy formulation.

By having developed many modules over the course of time, E.ON has a competitive advantage to provide solutions to cities compared with outsiders without modules. As each module would add cost to develop, E.ON had economies of scale that were valuable and could be difficult to imitate or replace with a substitute, such as a leap-frog innovation (Barney, 1991). The case of Ericsson expressed similar findings, where Ericsson's economies of scale made research and development less costly in relation to its size. Economies of scale were thereby resources that met the VRIS-criteria (Barney, 1991).

In addition, a firm may not develop all the modules it needs in just one project. As each project may reach over several years, time-compression diseconomies and asset mass efficiencies can thereby lead to a competitive advantage for E.ON and Ericsson (Dierickx & Cool, 1989).

In all cases in the study, stakeholder influence had a very substantial affect on firm's resources. Firm-stakeholder relationship affected both how resources were used and how resources were obtained (Frooman, 1999). E.ON's applied an institutional logic in its long-term perspective on how value was generated from resources, by working with stakeholders in private-public partnerships (Moss-Kanter, 2011). The scarcity of the radio spectrum made stakeholders such as governments and regulators important to Ericsson, in order to influence political factors, and to obtain a competitive advantage in the specific country or city (Barney, 1991; Mitchell et al., 1997). The factor 2c) Reputation could be considered to be a VRIS-resource for both Ericsson and E.ON, and a factor that in combination with other the VRIS-resources could affect factors such as reproducibility and firm boundaries.

### 3b) Firm Boundaries

Sustainable cities affected firm boundaries for Ericsson and E.ON. Ericsson performed private projects and took on more risk than normal in those projects. Both Selén, regarding Ericsson, and Örtenvik, regarding E.ON, expressed that the firm was not limited to its core business. Instead, both firms approached sustainable cities as opportunities to become broader service players. When broadening the scope of activities, E.ON and Ericsson were very focused on its strengths, and not on performing activities without a good business case.

When stakeholders had a competitive advantage in its solutions, cooperation made more sense than competition (Coase, 1937). Urgency, power, ad legitimacy thereby affected strategy in terms of firm boundaries, as decisions on which activities to perform within the firm depended on the collaborations (Mitchell et al., 1997). Ultimately, the factor firm boundaries was interrelated to 3a) VRIS-resources, as resources that are VRIS are needed in order for a new activity to lead to a competitive advantage (Barney, 1991).

### 3c) Asset Specificity

This factor had high relevance for choice of strategy. The case of Ericsson showed that indirect contributions to sustainability can lead to high asset specificity. Direct contributions such as in the cases E.ON, MKB, Masdar, and Hyllie also had high asset specificity, due to the nature of infrastructure and buildings.

As a result of the obvious lock-in component in infrastructure, stakeholder influence strategies were important. Transaction costs could be reduced by early cooperation, which can be seen as an effort to reduce uncertainty and opportunism (Williamson, 2007). This factor is certainly interrelated with a variety of factors in the proposed framework, such as 3a) VRIS-resources, 4b) Degree of collaborative R&D, and 4c) System dependence.

### 4a) Degree of disruption

The degree of disruption was a factor that affected decisions in the cases in a variety of ways. Both Selén and Örtenvik considered existing conditions important when deciding on strategy, different contexts would generate different degrees of disruption.

The stakeholder perspective was very apparent in choice of methodology for conducting tests. Örtenvik argued that the generation of energy will be closer to consumption in the future, this changes the relationship between E.ON and citizens, in terms of urgency, power, and legitimacy (Mitchell et al., 1997).

Ericsson had different approaches, horizontal and surgical, depending on conditions in the specific project, but overall caused disruption more indirectly than E.ON. Both radical and incremental innovations were observed in the five cases (Damanpour, 1991). Classification can be difficult, and depends on the technological process content. The introduction of ICT could be perceived as radical, as the possibility to speak with someone 100 miles away should be considered revolutionary. Improvements of ICT could be considered to be incremental however, as e.g. increasing the speed is not a clear difference from existing practice (Dewar & Dutton, 1986)

In Masdar, the degree of disruption was considerably higher than in Hyllie, as elements with a high degree of disruption, such as driverless cars, were integrated in Masdar's concept. This factor may thus be causally related to, and a result of, other factors, such as 1a) Influence of political factors.

### 4b) Degree of collaborative R&D

In Hyllie, mutual funds for innovations were an important to securing that competitive solutions were developed, according to Örtenvik. Technical innovations can have an important role in solving problems in cities, and the collaborations around innovation can contribute to solving these problems (Stern, 2006).

Ericsson's engagement in Royal Seaport displayed that a provider of technological solutions with indirect impact may also benefit from collaboration with stakeholders. All

cases displayed that embedded digital elements was a part of the strategy to become more sustainable.

Örtenvik argued that focus on energy performance measured in isolated entities, e.g. individual buildings, obstructed the establishment of constellations attempting to solve system efficiency issues. This pattern is very similiar to Johnson & Suskewicz analysis of common errors in clean-tech adoption (Johnson & Suskewicz, 2009). Collaborative R&D, with funds directed towards measures for system efficiency, can thereby affect strategy as well as support the emergence of sustainable cities.

### 4c) System dependence

Impacts from innovation increase as systems evolve around new technologies (Johnson & Suskewicz, 2009). Örtenvik emphasized the importance for E.ON of enabling a systemic shift towards sustainability in cities (Johnson & Suskewicz, 2009).

Johnson & Suskewicz framework-components were highly represented in E.ON's approach to innovation and execution of clean- tech innovation and implementation (Johnson & Suskewicz, 2009). By co-developing technologies, E.ON ensured that they could deliver technology and innovations to cities that wanted to take steps towards sustainability (Johnson & Suskewicz, 2009). Örtenvik emphasized the importance of E.ON's license to operate, E.ON avoided lock-ins and preferred to build on present cash-flows when adding new innovations to their business model (Johnson&Suskewicz, 2009; Nidomolu et al., 2009). Government policy was present, but was not as important as local authorities for E.ON, according to Örtenvik (Johnson & Suskewicz, 2009). The market-adoption strategy was highly sophisticated, and actively pursued stakeholder involvement (Johnson & Suskewicz, 2009). This strategy ensured that risks for end-customers were mitigated, and that the new system got a push over the market threshold.

E.ON and Ericsson were dependent on the system to extract value from their resources; this made strategies to reduce system dependence important. Thus, E.ON actively sought to decrease its dependence on stakeholders. This involved reducing stakeholders' dependence on E.ON, to avoid situations where the firm-stakeholder relationship was vulnerable to stakeholder influence strategies (Frooman, 1999).

The collaborations were also important in terms of benefits from coordination of innovation, from a system perspective (Johnson & Suskewicz, 2009). Co-operation between public and private interests enables stakeholders to share risk and reward, and ensures that the pace of innovation is accelerated (Stern, 2006). In the cases of Masdar and Hyllie, this

therefore proved that systems were important in order achieve a higher degree of impact, but also meant that dependence on stakeholders would likely increase due to increased power and legitimacy (Mitchell et al., 1997).

### 4d) Reproducibility

In the cases of Hyllie and Masdar, reproducibility was both part of the ambition and a political factor that affected the emergence of the cities. For the firms, reproducibility could be dependent on other stakeholders. Thus, E.ON's and Ericsson's strategy to increase reproducibility was to decrease its dependence on stakeholders. If there was a high degree of 4c) System dependence, reproducibility could thus be compromised, if the system was not reproduced with the same stakeholders and pre-requisites.

There was a relationship between reproducibility and 4b) Degree of collaborative R&D in the empirical data. E.ON was involved with several stakeholders when developing innovations, such as E.ON's collaboration with the technology supplier Siemens, and Ericsson was involved with other stakeholders in the project Royal Seaport (Stockholm Stad [3], 2013); E.ON [1], 2013). 3c) Asset specificity was therefore also redundant with reproducibility, since high asset specificity decreased profitability of reproducing solutions.

The cases displayed a higher degree of homogeneity in the physical aspect of solutions. E.ON's modules and Ericsson's hardware had a high degree of homogeneity, while services had a higher degree of heterogeneity according to both Selén and Örtenvik. Örtenvik claimed that E.ON had even more transfer between projects in terms of competence and know-how, than on the technical solution. Thus, reproducibility can therefore also be considered a capability, and a possible resource that can be VRIS (Barney, 1991).

### 5a) Revenue time-horizon

All cases displayed that revenue time-horizon affected strategy. Selén described how Ericsson approached hardware and service differently, by having different business models that could both build revenue over time, or have a capital expenditures-approach. According to Örtenvik, E.ON rarely received initial transactions from public bodies, but relied on sustainable city-activities to strengthen its existing profitability base.

Örtenvik described how E.ON actively avoided lock-in effects, despite that E.ON was aware that this could result in short-term profits. This kind of financial sacrifice can be explained and justified by institutional logic, if the sacrifice contributes to E.ON's long-term purpose. Also, consideration regarding stakeholder influence strategies could explain this behavior by E.ON (Frooman, 1999). Differences between Ericsson's and E.ON's approach to

stakeholders and customer value proposition can partly be explained by the revenue time-horizon in the business models (Johnson et al., 2008).

### 5b) Source of revenue

In our study, customer value propositions were apparently affected by the nature of the source of revenue. For cities, revenues could be described as reduced costs, as a result of a higher degree of sustainability, and the targets for cost reductions were citizens. For firms, the source of revenue varied between the cases. Sélen and Örtenvik both expressed that this affected strategy and approach. If public investments were important, the factor 1b) Ability to influence political factors grew in importance, and overlapped with 5b) Source of revenue.

Stakeholder salience affected E.ON's and Ericsson's strategy, as definitive and expectant stakeholders had higher bargaining power than latent stakeholders (Mitchell et al., 1997).

Selén concluded that performance had to be balanced with costs, as energy costs were a main concern among customers. Both Selén and Örtenvik described how test-beds were used to roll-out and scale up solutions for sustainable cities by E.ON and Ericsson. Firm-stakeholder relationship thereby influenced business model, exemplified by E.ON's methodology for creating test-beds in collaboration with cities, rather than customers (Frooman, 1999).

Thus, public-private partnerships, in terms of 2c) Reputation, 4c) System dependence, and 4d) Reproducibility, could be considered to be a resource with potential to lead to a competitive advantage when formulating a strategy for 5b) Source of revenue (Barney, 1991).

Source of revenue and 3b) Firm boundaries could be causally related in terms of the potential for firms to alter its boundaries. Both Selén and Örtenvik emphasized that this was only an option with a viable business case, which normally should include a source of revenue. If a yet unexploited source of revenue demonstrates a need that the firm can satisfy competitively, the firm should respond by addressing that need. Thus, there is a causal relationship between the factors, that decisions regarding business model can affect previous decisions in previous steps of the proposed framework

### 5c) Exclusivity

According to Örtenvik, it was extremely important for E.ON and to be non-exclusive in its handling with local authorities. This viewpoint in E.ON's business model is affected and related to many factors in the proposed framework, such as i) Stakeholder influence, 1a) Influence of political factors, 4d) Reproducibility, and 2c) Reputation.

As for 5a) Revenue time-horizon, and contrary to short-term profit logic, E.ON avoided lock-in effects that made a local authority become dependent on E.ON. E.ON adopted a long-term perspective and did according to Örtenvik not ever say no if the city wanted to bring in additional energy companies or partners. The degree of exclusivity could potentially be explained by institutional logic, as well as stakeholder salience and identifications theories Mitchell et al., 1997; Moss-Kanter, 2011).

The degree of exclusivity was however a divider between Ericsson and E.ON. Selén expressed that Ericsson strived to handle the entire ICT infrastructure. This had practical reasons, that it was easier to manage the technology with exclusivity, but also a business component to it. The degree of exclusivity could thus be a key process or a key resource in the business model (Johnson et al., 2008).

Selén emphasized that Ericsson's used of a business-to-business model. This may have enabled Ericsson to have this approach to exclusivity, as the dynamics of urgency among expectant and definitive stakeholders are one step farther from Ericsson, compared with E.ON, whom is more directly engaged with its consumers (Mitchell et al., 1997). 5a) Revenue time-horizon could be a factor that partly explains how exclusivity is perceived by firms, thus implying that institutional logic and firm-stakeholder relationships are highly relevant for the degree of exclusivity in the business model (Frooman, 1999; Moss-Kanter, 2011).

## 5.2 Analysis of the proposed framework

The aim of this study was to expand the current knowledge regarding which factors and to what extent these factors affect strategy when firms engage in building sustainable cities. In order to examine this, a framework for decision-makers was proposed, based on research and insights from the theoretical framework.

Chapter 5.1 Analysis of factors indicated that there were weaknesses in the proposed framework that should be addressed in order to increase the understanding for how strategies are formulated. There were also strengths in how the proposed framework approached different factors. Thus, these findings could be used to better understand how strategies are formulated.

Due to the sequential approach, a high degree of causality between factors was observed in the proposed framework. Several factors in the later steps of the sequence were affected by factors in previous steps of the framework. This was demonstrated by the factor 2a) Influence of political factors, which influenced several factors such as 3a) VRIS-resources and 4b) Degree of collaborative R&D.

Likewise, the proposed framework displayed an element of redundancy between factors. In addition to causal relationships, some factors showed signs of overlapping each other. The factors 2c) Reputation and 3a) VRIS-resources showed such a relationship, as reputation was considered to be an important resource if it could benefit the firm.

These findings, that causality and redundancy existed between factors, suggested that the sequential approach did not consider that strategy formulation can encompass iterative elements.

The proposed framework contained an element that was suggested to affect all steps and all factors in the sequence: stakeholder influence. The study showed that stakeholder influence indeed was present in all factors of the sequence. It was possible that other factors, that may or may not be included in the proposed framework, could have affected some or possibly all factors in the framework.

If more factors and categories were included in the framework, it could explain more dimensions of how strategy was formulated. Factors that portray how external industries forces affect manager's decisions could improve the framework, such as Porter's industrial organization perspective. Cluster development could also be a factor that affected strategy, both from a private and public perspective.

To improve the framework, it was also important to analyze the benefits of the proposed framework. The limitations of a sequential approach to strategy formulation also entailed an inherent strength. The relevance might be higher for a simplified framework than a correct framework with extreme complexity.

The pareto principle could be considered, that it is possible that the proposed framework captured 80% of the relationship between factors and strategy by explaining 20% of the causes correctly. Though it was a simplification of reality, the sequential element contributed with enough benefits to be maintained when the revised framework was formulated.

To include many factors had negative implications on the model, but also included benefits. Though some factors were in part redundant or causally related, they still contributed with aspects that the framework would have lacked if some factors were removed. If factors were pooled into broader notions, several aspects would be lost in the process. Suggestions for such notions could be "context" instead of 2a) Influence of political factors, 4a) Degree of disruption, 4c) System dependence and 5b) Source of revenue, and "conditions" or "prerequisites" instead of 1b) Direct or indirect impact on sustainability, 2c) Reputation, 3a) VRIS-resources, and 3b) Firm boundaries. In total however, the benefits of having a large

number of factors was larger than the drawbacks. Thus, the factors from the proposed framework were preserved and incorporated into the revised framework.

## 5.3 Revised framework

The revision of the proposed framework was based on the findings from the study. The revised framework included the sequential structure of the original framework, but considered the flaws of a structured sequence. A more holistic approach to strategy formulation was therefore proposed, similar to how Hedman & Kalling integrated three paradigmic theories into their conceptual business model (Hedman & Kalling, 2003; Figure 2. Hedman & Kalling, 2003, p. 53).

In this holistic approach, the factors were preserved from the proposed framework and categorized into the same categories of theories. In the revised framework the theoretical categories of factors could follow a sequence, from 1 to 5, but also divert in all directions of the sequence. All theoretical categories of factors could affect decisions in all directions, and were thus no longer confined to only be a step in a sequence. This reflects that strategy can be an iterative process, where decisions in the last step of the sequence have repercussions for previous steps. Stakeholder influence was assumed to be able to influence all factors and steps in the framework, without an emphasis on any particular step or factor in the sequence.

Hence, all factors in the revised framework were interrelated, and had the potential to affect some or all factors in the revised framework. This was done in accordance with findings in the study, which suggested that i) Stakeholder influence influenced all factors that affect strategic decisions when engaging in building sustainable cities and that many factors shared this trait.

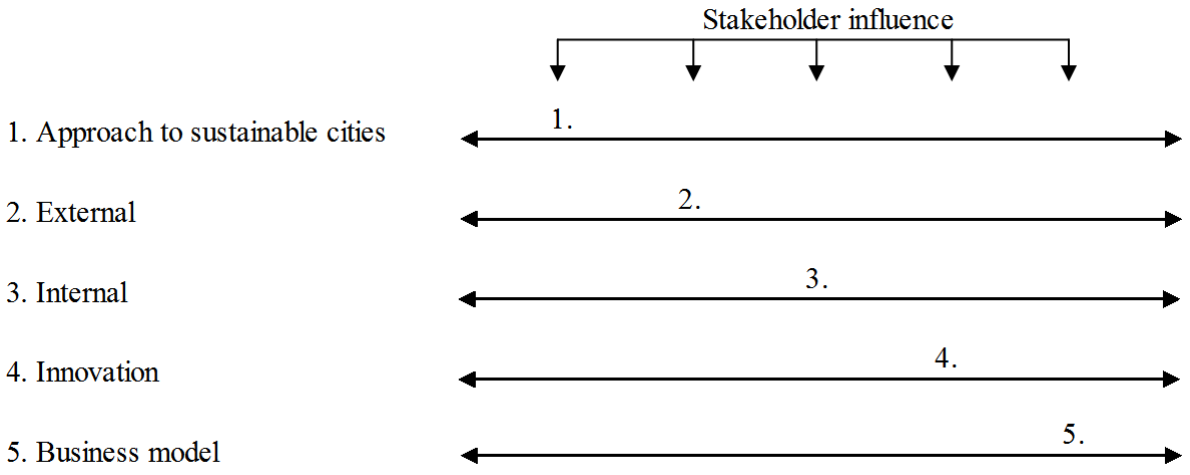


*Figure 4. Revised framework for formulation of firm strategy when building sustainable cities*

## 6. Conclusion

The purpose of the study was to examine which factors affected strategy, and how strategy was affected by those factors when building sustainable cities. An assumption in the study was that the scope of activities that constituted a sustainable city was too vast and complex for a single firm to have a competitive advantage in all activities that constitute the building of sustainable cities.

The findings in the study demonstrate that there is in fact a high degree of complexity, and that multiple factors affect strategy when firms participate in building sustainable cities.

Prior studies and research on sustainable cities had not integrated formal and substantive theories to a unified framework. By integrating theories from multiple fields of research into a proposed framework, the study contributed to increase the understanding for how strategy is formulated when participating in building sustainable cities.

Findings show that the emphasis in sustainable cities was more toward economic development and environmental protection than social equity. In order to address social equity with the same ambitions as for economic development and environmental protection, sustainable cities commitment to social equity have to become more explicit. MKB and Hyllie had a larger emphasis on social equity than Masdar, Ericsson, and E.ON. This pattern is surely complex, and would likely only be explained by multiple factors.

Several factors in the proposed framework implied differences between the expected patterns, and the empirically found patterns in the case study. The factor 5c) Exclusivity stands out, as E.ON displayed a considerably different approach than the expected pattern suggested, and than other cases in the study demonstrated. Another key finding is that i) Stakeholder influence was suggested to influence every step in the framework, and that this element is indeed present in all strategic considerations.

The proposed framework had strengths, such as the sequential approach and the use of a broad variety of factors, and confirmed that all the factors in the proposed framework affected strategy to a relevant degree. However, the proposed framework did not consider redundancy and causality between factors to a sufficient degree. Some factors, such as 2a) Influence of political factors and 3a) VRIS-resources, had a very broad influence on many factors in the proposed framework, similar to i) Stakeholder influence.

If more theoretical paradigms are included, the validity of the framework will likely increase. However, the relevance of the framework for decision-makers will likely decrease if further theoretical paradigms and factors are added to the framework. A framework with

multiple theories will therefore involve a trade-off between validity and relevance for decision-makers.

Further research in the field could further attempt to create a framework for how firm strategy is formulated. In the specific context of sustainable cities, many theories were studied to explain how strategy is formulated. However, studies that interpret individual theoretical paradigms in this context could be important as well. Especially the work of Michael E. Porter regarding the industrial organization perspective, and cluster development could entail knowledge and insight that theories in the proposed framework did not contribute with. It is also likely that additional time and better access to information could increase the validity of findings from studies in the field.

Finally, it is somewhat poetic that no single theoretical paradigm can describe how to approach sustainable cities, in the same way that no single firm can be specialized in building sustainable cities. In accordance with how multiple stakeholders have to collaborate when building sustainable cities, multiple theories have to be integrated and interact in order to comprehend and explain the strategic aspects of sustainable cities.

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# 8. Appendix

Appendix 1. Interview questionnaire

**1. How would you define a Sustainable City?**

a) What is your view on Smart cities?

b) What is your view on Sustainability?

**2. How does your firm contribute to the emergence of Sustainable cities?**

a) What is your role in establishing new systems of innovations?

b) What is your motivation to participate in the building of a sustainable city?

c) How did your firm approach the project? (Did you use best practices from previous or similar projects or research?)

d) What type of risks did you face? (Which risks were you willing to take?)

**3. How does your firm look at investments in innovation for Sustainable cities?**

a) Is your main agenda profitability or do you have other motivation factors that influence your agenda in the specific project?

b) Do you want to deliver solutions or innovations that are differentiated for every Sustainable city or are you interested in standardizing your solutions and innovations?

c) Regarding solutions and innovations, what is your view on heterogeneity versus homogeneity?

d) Is reproducibility an important factor when you deliver solutions or innovations innovations for Sustainable cities?

e) What type of conditions is required to enable reproducibility of your solutions or innovations? Are you dependent on stakeholders outside the firm? If yes, who or what?

**4. How do you work with network development in order to deliver competitive and high-quality products or services for Sustainable citites? Describe your view on the importance of networks to create competitive systems of innovations.**

a) Which stakeholders have you cooperated with when delivering solutions or innovations for Sustainable cities?

b) Which other external actors have been involved in the projects?

c) Do you think that the cooperation with other stakeholders has been satisfactory? If yes, describe specifically how cooperation has been satisfactory? If no, describe specifically how the cooperation has not been satisfactory?

d) What types of obstacles have you faced when cooperation in these networks? E.g. financial, time, utilization of resources, practical, legal, pressure from shareholders

**5. What is your view on stakeholders?**

a) How do you approach stakeholders when building Sustainable Cities? When do you prefer reciprocity versus contract enforcement?

b) Can your cooperation with stakeholders be a source of competitive advantage? If yes, how do you share benefits from possible synergies?

c) Do you have previous experience of working with stakeholders in networks when you deliver solutions or innovations to sustainable cities/deliver mega-products?

d) If yes, what are the learning outcomes from these previous experiences?

**6. Internal factors inside the firm: How do investments in innovations for Sustainable cities affect:**

a) Your value chain?

b) Your position in the project specific value chain for the Sustainable city? Is it essential to posses a scarce resource or patent when engaging in building sustainable cities?

c) Your competitive advantage?

d) Do your firm have extraordinary capabilities that enables your firm to deliver better solutions or innovations than i) competitors and ii) other stakeholders in the project?

**7. How do you approach Sustainable cities in terms of value capture?**

a) Do you prefer to capture the margins by being upstream or downstream in the project's value chain?
b) Does Sustainable cities question your firms' boundaries? Have your participation in these projects stimulated vertical integration or outsourcing?

**8. External factors outside the firm:**

a) What political factors influence your choice of strategy?
a) What legal factors influence your choice of strategy?
a) What environmental factors influence your choice of strategy?
a) What social factors influence your choice of strategy?
e) How has the projects you have been involved in been received by the public?