Business Strategy and the Environment
Bus. Strat. Env. (2010)
Published online in Wiley Online Library
(wileyonlinelibrary.com) **DOI**: 10.1002/bse.691

Business Strategies and the Transition to Low-carbon Cities

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ABSTRACT

Cities are key drivers of global climate change, with the majority of greenhouse gas (GHG) emissions being tied to urban life. Local actions to mitigate and adapt to climate change are essential for stabilization of the global climate and can also help to address other urban ecological problems such as pollution, decreasing biodiversity, etc. Companies are important urban actors in the development of low-carbon cities because they provide a multitude of goods and services to city populations and directly influence urban carbon dioxide (CO_2) emissions. This is a new area of research. While studies on corporate sustainability are numerous, there is little, if any, existing research that examines the role of companies in climate change adaptation and mitigation within specific urban areas. Urban ecologists also have not examined how corporate activity affects urban systems. Taking a multi-disciplinary systems approach, we present a conceptual model of the role of companies in managing urban interactions with the climate system. We also present empirical findings illustrating how one company 'partners' with the city of Rotterdam to test electric vehicles as a pilot project for urban climate adaptation and mitigation. Copyright © 2010 John Wiley & Sons, Ltd and ERP Environment.

Received 12 November 2009; revised 16 June 2010; accepted 28 June 2010

Keywords: climate change; corporate strategy; cities; Rotterdam Climate Initiative; sustainability; electric vehicles

Introduction

The global population is now more urban than rural (World Resources Institute, 2005; United Nations-HABITAT, 2006). Urban systems are key drivers of global ecosystem changes, and vice versa (Folke *et al*., 1997). In particular, many large cities face significant threats from climate change, and cities are also major contributors to our climate problems. For instance, cities consume 75% of the world's energy, and produce 80% of all greenhouse gas (GHG) emissions (C40 Cities, 2008; United Nations, 2008). Cities

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also provide opportunities to enhance sustainability. The high concentration of people in a relatively small area may reduce the area of natural ecosystems that is required to support the growing global population and may provide efficiencies in transportation and other sectors that reduce per capita impact on carbon emissions (Grove, 2009). Sustainability at the city level is thus an important aspect of global climate stabilization and can also help to address other major socio-ecological problems such as pollution, decreasing biodiversity, and the decreasing level of human well-being due to degradation of green spaces etc. (Niemelä *et al.*, 2010)

The complexity of urban problems requires integrated interdisciplinary planning approaches to bridge the gap between ecology and the social sciences (Yli-Pelkonen and Niemelä, 2005; Niemelä *et al.*, 2010). While the concept of 'sustainable cities' is not new (e.g. Devuyst *et al.*, 2001), this is a new context for research in business management and organization studies. This is surprising, since companies are important urban actors: Companies provide a multitude of goods and services to city populations and thus interact with, and powerfully influence, urban societies and ecosystems. While studies on corporate sustainability are numerous (Bansal and Gao, 2006; Jermier *et al.*, 2006), to date there is little, if any, research that examines the role of companies and climate change within specific urban areas. This focus is also new for the field of ecology. Urban ecologists typically conceptualize the city as a dynamic social–ecological system but have not yet examined how corporate activity affects these systems (Yli-Pelkonen and Niemelä, 2005; Niemelä *et al.*, 2010).

In this paper, we argue that a more explicit understanding of the role of firms within cities adjusting to climate change holds great promise. We begin by positioning the city as an important social–ecological system for business studies of climate change. We then provide a synthesis of the largely separate literatures on urban ecology and 'business and the environment', and present a conceptual model of the role of companies in the degradation and/or maintenance of sustainable urban interactions with the climate system. We also present empirical findings illustrating how one multi-national company engages in (or disengages from) urban activities on climate adaptation and mitigation in Rotterdam. We end with a discussion of these results and present an agenda for future empirical research.

Low-carbon Cities and the Role of Companies

Cities are key drivers of global climate change, with the majority of GHG emissions being tied to urban life. Cities are also vulnerable to impacts of climate change in terms of water issues (shortages, floods, etc.), extreme events, changing biodiversity, and potential health impacts. Local actions to mitigate and adapt to climate change are thus essential for global climate stabilization and can also help to address other major urban socio-ecological problems such as pollution, decreasing biodiversity, human health and well-being, etc. (C40 Cities, 2008; Grove, 2009; United Nations, 2008).

Local municipalities have already recognized this problem and have begun to organize themselves on a global basis through initiatives such as the Large Cities Climate Leadership Group, also known as C40 Cities. Large cities such as New York, London, Beijing, and São Paulo, as well as smaller affiliated cities such as Rotterdam, have joined C40 Cities as part of their efforts to significantly mitigate and adapt to climate change. While many of these 'emergent organizations' (Kolk and Pinske, 2008a) have only an advisory function, their role in facilitating and triggering climate efforts in cities is intriguing, given that media reports suggest that multi-national companies and small and medium-sized enterprises are entering into partnerships with C40 Cities.

Companies are important urban actors in the development of low-carbon cities because they provide a multitude of goods and services to city populations and directly influence urban carbon dioxide (CO_2) emissions. This is a new area of research, one that has not been previously recognized in the literature (cf. Bansal and Gao, 2006). Nevertheless, corporate activities (in terms of production and consumption chains) create cross-scale linkages between one city and another, resulting in a complex set of local–global social–ecological processes and networks. A systems approach to sustainability has gained attention in the business literature (Guthey and Whiteman, 2009; Korhonen and Seager, 2008; Porter, 2006; Seager, 2008), but there is little previous research on the role of companies within the city system. While an early study by Pennings (1982) explicitly identified the geographic importance of the 'municipality' as a unit of analysis in economic and innovation clustering (e.g. Silicon Valley), the subsequent work on economic clustering has little, or no, recognition of the ecological services contributing to or

DOI: 10.1002/bse

being affected by business clusters within specific urban environments. Thus, Allen (1997, p. 19) argues that there is an 'unsustainable hidden reality to urbanization' such that 'decision makers are increasingly divorced from the reality of the natural system that really supports cities'. Nevertheless, climate change risk differs significantly between regions around the world (Romilly, 2007). For example, different topographies have different risks in terms of sea level rise, drought, flooding, and pollution-trapping inversions, so sustainability strategies must be compatible with the local context. Firms are also likely to face different physical risks and institutional pressures at the local level (Allen, 1997; Bradford and Fraser, 2008; United Nations-HABITAT, 2006). Urban climate change is thus a strategically relevant issue for companies for at least four reasons: (1) companies are key contributors to climate change through GHG emissions and cities are the main sites of emission; (2) companies will be increasingly affected by society's measures to adapt to and mitigate climate change, including governmental and voluntary initiatives and/or regulation; (3) companies face various operational risks from climatic changes, and; (4) climate change presents strategic opportunities in terms of innovation and new business opportunities (Hoffman and Woody, 2008).

Previous research also indicates that companies adopt different strategies for CO_2 reduction and lobbying (e.g. Jones and Levy, 2007; Hoffman, 2005; Hoffman and Woody, 2008; Levy and Kolk, 2002; Kolk and Pinske, 2005), and that these differences in corporate strategy are based upon country and industry sector (e.g. Jeswani *et al.*, 2008; Kolk and Pinske, 2008a). Research also identifies that firms adjust their national strategies given different institutional pressures and levels of uncertainty. For instance, Kolk and Pinske (2008a) show that multi-national companies adapt their climate change activities to the peculiarities of the different countries in which they operate. At the same time, the activities reflect a multi-national company's country of origin – companies that originate in countries with a more mature emissions market like the European Union (EU) show a higher level of involvement in market mechanisms than those from countries where federal regulation on climate change is absent or a high degree of uncertainty exists about its implementation. Companies thus adjust their strategies in order to generate firm-specific advantages (Kolk and Pinske, 2008b; Lash and Wellington, 2007) and in response to institutional pressures (Pinske, 2007; Hoffman and Ventresca, 2002). Yet, firms still focus more on reducing unsustainable firm-level behaviour than on increasing the sustainability of the system via adaptive change across actors and nested multi-level systems (Ehrenfeld, 2005). The next section discusses the importance of analysing firm behaviour with respect to climate adaptation and mitigation from an urban systems perspective.

The City as an Urban Social–Ecological System

The term *urban* is understood to refer to geographic areas, densely populated and 'characterised by industrial, business and residential districts' (Niemelä, 1999, p. 58). *Urban ecology*, according to Niemelä (1999, p. 59), is 'a diverse field of research that forms a continuum from "pure" ecology in the urban setting to a combination of ecology and social sciences to examine urban systems'. It considers both the natural science of ecology and the social sciences, as ecologists are becoming increasingly concerned about the impact of humans on ecosystems (Niemelä, 1999; Niemelä *et al.*, 2010). Among ecologists there has been a gradual transition from studies of the ecology *in* cities (e.g. distribution of plants and animals in cities) to the ecology *of* cities (e.g. the integrated role of urban gardens as sources of biodiversity and human well-being) (Pickett *et al.*, 2001; Colding *et al.*, 2006; Grove, 2009).

Urban resilience is the degree to which urban regions can tolerate change before reorganizing around a new set of processes and structures (Holling, 2001; Resilience Alliance, 2007). Metabolic flows, governance networks, social dynamics, and the built environment in cities play an important role in shaping urban resilience (see Figure 1).

A city is a complex, adaptive urban system that consists of social and ecological processes (Allen, 1997; Niemelä, 1999; Niemelä *et al.*, 2010). The level of resilience in a city can be determined by its 'ability to simultaneously maintain ecosystem and human functions' (Alberti *et al.*, 2003, p. 1170). Cities are thus highly dependent on an interconnected, global network of flows of materials, information, financial capital, and ecosystem services (Resilience Alliance, 2007).

Actions to reduce urban CO_2 emissions do not occur in isolation and have systemic roots and consequences. Social processes are integral for creating sustainable conditions within cities because '[i]t is not in the technologies

DOI: 10.1002/bse

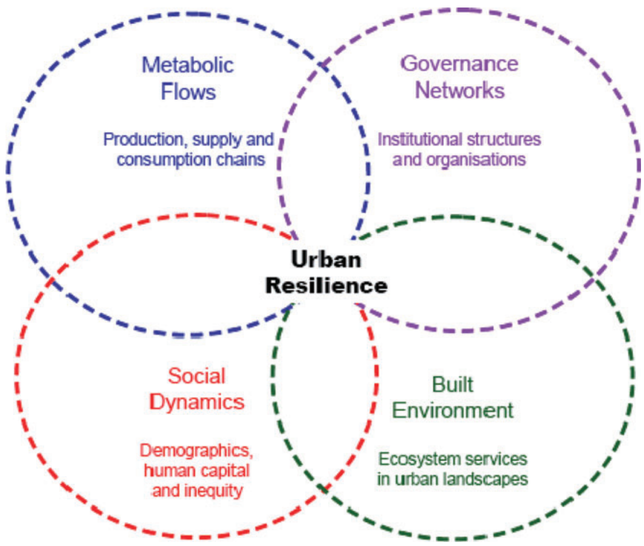

Figure 1. Urban resilience (source: Resilience Alliance, 2007)

that the answer lies but in the ways humans make choices, their willingness to seek out new connections, to invent new combinations, to explore the possibilities of the world around us' (Cohen-Rosenthal, 2000, p. 250). Companies have an integral role to play because they individually and collectively shape the built environment and control much of the metabolic flow entering and leaving city limits. Companies also affect social dynamics, particularly as they relate to urban consumption and lifestyle through advertising and the provision of goods and services. In addition, companies actively influence governance and decision-making at the city level through effects on planning, economic activity, and expansion (Yli-Pelkonen *et al.*, 2009).

The presence of governance institutions and networks that share knowledge and best practices can help to strengthen urban resilience (Resilience Alliance, 2007). As cities explore new ways to become more sustainable, they embark on a significant learning process that requires long-term structural change. Research from the Netherlands indicates that '[i]mportant characteristics of transitions are that the change process is gradual and covers at least one generation (25 years)....Results from historical research on transitions indicate that the first "pre-development" phase of a transition is characterized by learning processes and developments in small niches' (Van den Bosch *et al.*, 2005a, p. 10; see also Loorbach *et al.*, 2009; Rotmans *et al.*, 2001). A key part of societal transitions and innovation is the emergence of 'bridging institutions that connect institutions across levels and scales to enhance their capacity to deal with change' (Folke, 2007, p. 15). The C40 Cities initiative is an example of new bridging institutions at the city level.

However, there are significant challenges in bridging social processes in practice. For instance, actors often have difficulty overcoming 'static issues' within system boundaries (Baas and Boons, 2004). That is, systemic problems require dynamic multi-stakeholder decision-making and governance; yet actors often are entrenched within organizational silos that block dynamic exchange of information and innovation. 'This makes it difficult to make a regional system more sustainable. Without some common problems/goals (which create dependency), the actors in the system deal with each other only on matters that are not strategic to their survival. To the extent that coordination mechanisms are present, they are not designed to deal with such problems; in fact, the actors are tied up in other networks that have that function (such as being part of a multi-national firm or global product chains). Making such systems more sustainable thus not only has to build upon relatively weak foundations; it also means dealing with other structures that are seen by actors as more important' (Baas and Boons, 2004, p. 1074).

Cities are thus open, cross-scale systems whose resilience is integrally connected to the resilience of areas outside the city and across a variety of actors. At the same time, social processes within cities are often static, which can weaken urban sustainability efforts (Baas and Boons, 2004). We believe this is an important area for research. In

DOI: 10.1002/bse

this paper, we present case study findings on the social processes and decisions surrounding urban transportation. This focus is relevant because '[t]raffic and transport are one of the major causes of environmental problems in urban areas. These problems can be summarized as: contribution to greenhouse gas emissions (CO_2) and local emissions (NO_x, VOCs, PM_{10})' (Van den Bosch *et al.*, 2005, p. 10). A major reason is that production, supply and consumption chains, which are referred to as metabolic flows, are not closed cycles within a city but components of these chains within cities are interconnected with components of these chains in other places (Resilience Alliance, 2007). Knowledge of metabolic flows 'can provide a means to determine potential linkages. But this does not link them; decisions by people do' (Cohen-Rosenthal, 2000: 245). Case study research on the decisions and practical actions within urban climate initiatives can help to reveal how actors influence social processes and to what degree they are able to build more sustainable and systematic linkages governing metabolic flows in and out of the city.

Methodology

In our paper, we examine how one company is trying to reduce its carbon footprint and help mitigate urban CO_2 emissions via a partnership with the Rotterdam Climate Initiative (RCI). We also ask how this type of action can contribute to the overall resilience of the city. To do so, we present qualitative research findings on the case study of a publicly listed Dutch multi-national company, known in this paper as 'TransLogis' (a pseudonym), and the launch of its electric vehicles (EVs) pilot project in Rotterdam. TransLogis is a company that, through the nature of its transportation business, produces significant amounts of GHGs and is a self-proclaimed leader in corporate sustainability. The city of Rotterdam also has its own ambitious commitment to reduce 50% of its CO_2 emissions by 2025. The EV pilot, launched as a cooperation between TransLogis and the RCI in the Rotterdam region, was a well-publicized private–public project introduced as part of Rotterdam's ambitious strategy to reduce urban transportation emissions.

The case study method (Yin, 2003) was used given the exploratory nature of this setting (Eisenhardt, 1989). Our empirical research design included detailed document analysis and 14 semi-structured qualitative interviews (Lofland *et al.*, 2006) to gather empirical insights into the EV pilot from combined social and ecological perspectives. At TransLogis, a total of five managers responsible were interviewed. These included the operational manager responsible for implementation of the EV pilot, the coordinator for the TransLogis projects with the RCI, as well as three managers at the corporate level responsible for TransLogis's sustainability program globally. Two experts responsible for sustainable mobility projects for the municipal government were interviewed, as well as the initiator and temporary chairman (*kwartiermaker*) of the RCI. Additionally, in order to understand the ecological interactions of the pilot, an air quality specialist at DCMR (the city's environmental agency) and urban ecologists in Rotterdam were interviewed.

Interviewees were solicited by e-mail and through snowball sampling, a technique by which interview participants nominate others to be interviewed (Patton, 1990). All quotes are anonymous and the company name has been changed. We used respondent validation, and all quotes have been reviewed by our interviewees. In addition, our case study incorporated document analysis of press releases concerning the launch of the EV pilot, annual social responsibility reports from TransLogis, press articles, TransLogis's website, the RCI's website, and environmental reports of the city of Rotterdam, and builds on participant observation. In the next section, we present more detail on the case-study context followed by our empirical findings.

Case Study Context

Rotterdam and the RCI

Rotterdam is the second largest city in the Netherlands, with a population of 585,000 in 2007 (Gupta *et al.*, 2007). The port of Rotterdam is Europe's main transit point for the distribution of goods between Europe and the rest of the world. Rotterdam is thus a key logistics distribution centre and a global hub for the transportation of 420 million tonnes (Mt) of goods in 2008 (Port of Rotterdam, 2009). In order to facilitate good access to inland Europe, Rotterdam is surrounded by four motor highways. This has a strong impact on the natural environment in

DOI: 10.1002/bse

Rotterdam as the city is facing serious problems with air pollution in the form of particulate matter (PM_{10}), nitrogen dioxide (NO_2), and ozone (O_3). According to the air quality specialist at the DCMR Environmental Agency, Rotterdam is not expected to meet the 2010 limits for NO_2 because of 'the growth of the motorised (freight) traffic'.

In 2005, the city of Rotterdam and its harbour were responsible for 29 Mt of CO_2 emissions compared with 24 Mt in 1990 (DCMR, 2008). These emissions make up over 16% of total Dutch emissions.[1] The Rotterdam–Amsterdam urban area has the highest CO_2 concentrations of a large region known as the 'Rhine–Main area' that is generally characterized by significantly elevated CO_2 values and covers large parts of the Netherlands, Belgium, and central western Germany (Figure 2). Even with a significant reduction in urban CO_2 emissions, the city will have to deal with a number of serious consequences of climate change including increased storms, rising sea levels, changing river streams, increasing rainfall, and droughts.

Previous research indicates that Rotterdam was considering how to build a common vision for sustainable transportation among stakeholders, including the commercial sector. Interviews by Van den Bosch *et al.* (2005a,b) suggest that while stakeholders from various sectors are supportive of sustainable innovation in the city's transportation system (e.g. with fuel cell technology), respondents argued that the lack of commitment at the national level was a major barrier. Thus, city-level initiatives involving companies require national incentive structures (including rules and regulations) that facilitate local innovation. In addition, 'stakeholders emphasized that short-term actions ("proving that it works"), supported by a long-term action plan, are necessary to start off system innovation processes' (Van den Bosch *et al.*, 2005b, p. 13).

In 2007, the spectrum of sustainability projects widened when the city of Rotterdam launched the RCI with the objective of reducing its emissions by 50% by the year of 2025 compared with 1990 levels (RCI, 2007). The RCI is a cooperation between the municipality of Rotterdam, the Port of Rotterdam, the city's environmental agency (DCMR), and Deltalinqs, an organization that represents all logistical and industrial companies in the Port of Rotterdam. Rotterdam was the first Dutch city to become affiliated with the international C40 Cities initiative. The RCI is led by a Board and a Council. The Chairman of the RCI Board at the time of the case study was Rotterdam's mayor, Ivo Opstelten, and the Chairman of the RCI Council was an important former senior governmental official. It is important to note that the CEO of TransLogis is also a member of the Council of the Climate Initiative in Rotterdam.[2]

Rotterdam's strategy to reduce its CO_2 emissions by 50% is to be achieved by focusing on the following five pillars: sustainable city (introduction of energy neutral technologies), energy port (e.g. carbon capture and storage),

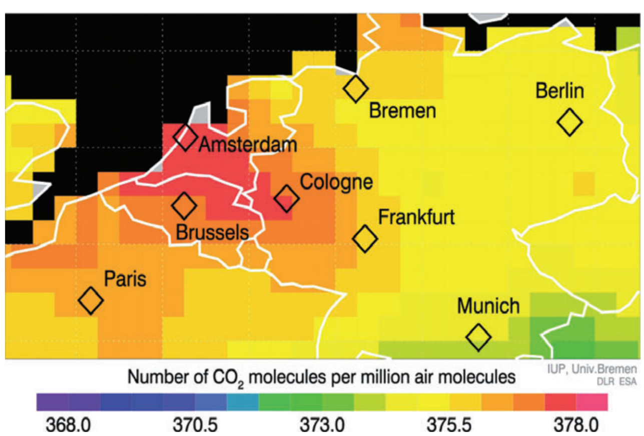

Figure 2. Carbon dioxide levels in the Rhine–Main (Rotterdam) region. (source SCIMACHY/ENVISAT 2003–05; Schneising *et al.* (2008, p. 3847)

[1] Total emissions in the Netherlands in 2005 were 175,900 kt, or 176 Mt (EmissieRegistratie, 2008).
[2] Other members of the RCI Council are from the following organizations: Lyondell Chemie Nederland, UNFCC, Ministry of Economic Affairs, Eneco, Province of Zuid-Holland, Woonbron, Clingendael, Milieufederatie, Havenbedrijf Rotterdam [Port of Rotterdam Authority], Ministry of VROM [Ministry of Housing, Spatial Planning and the Environment], and OVG Project Development.

DOI: 10.1002/bse

sustainable mobility (reduction of CO_2 emissions by 50%), energizing city (e.g. change the behaviour of citizens), and facilitate innovation (e.g. eco-innovation lab). Our case study examines one of the corporate partnerships of the RCI in the sustainable mobility pillar that takes place in the city – the launch of a pilot project concerning EVs at TransLogis.

TransLogis

TransLogis is a global transportation and logistics company with an annual revenue in 2008 of more than €10 billion. The company operates through two major divisions: TransLogis division A, responsible for express delivery services, and TransLogis division B, responsible for regular mail shipments. Through their daily operations, transportation and logistics companies like TransLogis have a negative impact on the environment. In 2006, TransLogis was responsible for emitting 825.6 kilotons (kt) of CO_2, which rose to 1019.2 kt the following year, excluding major acquisitions. The operational vehicles of TransLogis are responsible for 23% of these emissions.

In 2004, the company had a poor environmental performance. However, under the lead of its CEO, TransLogis publicly stated a commitment to reduce its carbon footprint, and the company has been identified as a leader in corporate sustainability by the Dow Jones Sustainability Index three times since 2007. The goal of TransLogis is to become the first zero-emission global transportation and logistics company. This goal has been developed by the CEO and explicitly identifies the need to green the company's road fleet.

Case Study Findings

TransLogis division A had previous experience with EVs, including a successful pilot project in London. The London project was initiated partly because EVs in London are exempted from the congestion charge in the city, which is approximately £1750 per vehicle annually, and they incur no road taxes in the UK.

On 21 August 2007, TransLogis division A launched a pilot with two EVs in Rotterdam in cooperation with the RCI, the focus of this study. TransLogis's press release explained the initial plan and environmental advantages of electric vehicles:

> The Edison will be operational around the center of Rotterdam and will make an average of approximately 40 stops for pick-up and delivery of documents and small parcels. The Newton will operate in and around the center of Rotterdam and make 15 to 20 stops when in operation.[3] It is in these stop–start conditions where the electric trucks have a great advantage over conventional combustion engines which are at their most inefficient and most polluting [...] Both trucks can be recharged in 8 hours and have a top speed of 80 km/h. The trucks are almost totally recyclable and produce a low noise level.

The pilot was launched by the CEO of TransLogis and the Mayor of Rotterdam. Publications suggested close cooperation between TransLogis and the RCI. For example, newspapers (*Algemeen Dagblad*, 21 August 2007) stated that:

> The Mayor praised the shipping-agent for its test in Rotterdam: 'Our climate initiative is becoming more attractive. More and more companies are connecting.'

Similarly, on the TransLogis website: 'The pilot is a significant step to contribute to the objective to reduce CO_2 emissions by half in Rotterdam by 2025 compared to 1990'. In the same press release, the mayor was quoted again: 'This is an excellent example of how innovative entrepreneurship combines environmental profit with economic profit' [...] 'The Rotterdam Climate Initiative offers support to this type of pilots and a platform to test their business cases. We are proud that TransLogis chose to team up with us and welcome them as our latest business partner.'

[3] The Edison is an electric driven delivery van, equipped with three battery packs resulting in a payload of 800 kg and a range of 120–220 km. The Newton, a larger type of electric driven truck, is equipped with six battery packs, has a range of 140–200 km and a payload of 3000 kg.

DOI: 10.1002/bse

The direct influence of TransLogis's CEO and the Mayor of Rotterdam on the decision to launch the EV pilot was confirmed by numerous interviews. According to a former senior politician and now chairman of the RCI Council:

> I recall the Mayor saying to me: 'You should ask the TransLogis CEO for the Advisory Board'. I am the Chairman of the RCI Council, the Mayor is Chairman of the [RCI] Board. So how did it start? Through the Mayor.

The project leader for carbon management at TransLogis stated that:

> The vision of the CEO is that we have to become environmentally active in the cities of the Clinton Climate Initiative. Rotterdam, where we are very strong, was the first choice for the CEO at that time. The reason was that we have a good operation there and connections with the RCI, so that was simply the choice we made at that time.

In addition, the CEO has strong personal ties with the city and holds a degree in business economics from Erasmus University, Rotterdam. Rotterdam is also an important urban hub for TransLogis's global delivery system. Due to the high density within large cities, express and mail delivery companies can achieve efficiency gains. In addition, from a business perspective, managers at TransLogis understand the cross-scale linkages between cities and non-urban areas both from a logistics and sustainability perspective:

> We have 14,000 vehicles and we aim to have the 'green' part as large as possible. That means that we have to make choices. That means that we mainly look at electrical vehicles for the inner city, but that also means that we have to find other solutions for outside of the cities or even for complete lines within Europe or Asia. Because at the moment it does not look as if electrical transportation is the way forward there. That is actually the status of the overall project.

TransLogis also began exploring how it could use its EVs in partnership with other businesses at the urban level. For instance, TransLogis is developing a new logistics concept called 'City Distribution' in conjunction with the city of Rotterdam and two waste management firms.

Cooperation Within the Social System

However, interviews demonstrate that the operational implementation of the new EV pilot in Rotterdam was problematic, for a variety of reasons. First, TransLogis division A is functionally separate from the TransLogis division B with little information passing between managers, or between other organizations like RCI and Public Works Rotterdam (PWR). While each TransLogis division operates in Rotterdam, their depots are located separately. In this pilot, the EVs were located in the TransLogis division A depot in Dordrecht, a nearby city, but their delivery area was in Rotterdam, 20 km away. The EVs therefore had to drive from Dordrecht to deliver in Rotterdam. This choice of geographic location became highly problematic for the EVs that have lead-acid batteries using the same technology that was used 100 years ago (Cowan and Hultén, 1996) and that are characterized by high weight and low storage capacity. The implications of this were not adequately identified by TransLogis in advance of the pilot. The operational manager, responsible for the implementation of the pilot, explained:

> We took an existing route, removed the regular vehicle and replaced it with the Edison. However, soon it appeared that [it] is not replaceable 1-to-1 in the current conditions. One of the biggest challenges is that [there is] almost no torque in the vehicle which you do have with internal combustion vehicles, especially with a diesel. As a result, the EV, especially with [an] adverse wind, it hardly was able to pass the [Brienenoord] bridge to reach the inner city of Rotterdam. That is, however, a crucial connection on the delivery route.

This error resulted in the relocation of one EV to another city, Eindhoven. For the other EV, a different route was scheduled from the depot in Dordrecht to the delivery area in Rotterdam.

DOI: 10.1002/bse

Secondly, our findings demonstrate that information flows and coordinated action between TransLogis, RCI, and other municipal agencies were ineffective. Findings suggest that the actual level of cooperation between RCI and TransLogis within the EV pilot was more symbolic than substantive. In an interview at its headquarters:

> I think it is more in consultation with, than in cooperation with [the RCI]. We did speak with the RCI, but this is just a TransLogis pilot.

Our research also shows that there was little cooperation between TransLogis, RCI, and the Environmental Policy Department at PWR, a key municipal agency. According to a manager at PWR:

> Besides the kick-off for the pilot with RCI, they [TransLogis] operated completely independently. So independently that we did not even gain insights into the end evaluation of the pilot. . .

This had a direct impact on the implementation of the EV pilot, because it truncated important information flows and did not facilitate multi-party governance structures. Importantly, PWR had worked with TransLogis and other organizations on a similar EV pilot 8 years earlier in Rotterdam. TransLogis division B was a participant in this earlier EV pilot, called ELCIDIS (Electrical Vehicle City Distribution; ROM, 2003). The project was subsidized by the European Commission (EC) to test the feasibility of city distribution with the use of EVs. Other cities included Stockholm, La Rochelle, Erlangen, Milan, and Stavanger. The results of the project indicated that the use of EVs with ZEBRA batteries is feasible, but only if the distribution centres are located near the inner city because of the limited battery range and low maximum speed. This information was not utilized in the current EV pilot project. While our interviews suggest that the manager at PWR did try to contact TransLogis to share his knowledge, this was not effective. He also indicated that TransLogis 'even has a distribution centre in the city' of Rotterdam. There is indeed another TransLogis distribution centre in the city of Rotterdam, but is operated by TransLogis division B and not by TransLogis division A. The manager at PWR argued:

> That doesn't fit in their logistical thinking, because the one in Dordrecht is built especially for package distribution and the distribution centre is intended for a different part of their work.

Information about the earlier pilot was also not consistently disseminated across the two TransLogis divisions. When asked if he knew of a previous project with EVs by TransLogis in the city of Rotterdam, the operational manager, responsible for the implementation for the EV pilot, at division A answered: 'Could be. I am not aware of that'. This is a surprising given that the project manager of sustainable business at division B was aware of the earlier pilot: 'Yes. Those were the same type of vehicles'.

Thirdly, while environmental considerations for Rotterdam and for TransLogis appeared to be important at the launch, once the pilot project was implemented, the financial business case became critical. While EVs are cheaper to maintain, the purchasing costs are significantly higher: an Edison costs about four times more than a traditional vehicle with a combustion engine. In addition, most vehicles are leased by TransLogis. The terminal value of the EVs is unknown and therefore the vehicles are amortized to zero by the lessor, which makes the costs of leasing expensive for the lessee, in this case TransLogis. According to a TransLogis manager:

> All in all, it cannot be more expensive than a conventional vehicle because that is bad for our competitor position. Thus, we do not operate based on a type of ideology in which we say it can cost us more than ten percent extra. That will not be the case.

Corporate press releases also consistently emphasize the financial advantages of EVs. Yet the financial case differed by city location, with the strongest business case being in cities with a congestion charge (like London). According to the strategic manager at TransLogis head quarters:

> In England, there is [a business case]. For all other countries we have to recalculate. The first financial results in the Netherlands were not favourable. Therefore, we have to see if maybe with a different car, or a different model, different financing, other pay-back periods, there still is a [profitable business] model.

DOI: 10.1002/bse

Thus, TransLogis's evaluative framework focused primarily on whether or not EVs made financial sense for the company, and not the potential value in CO_2 reductions for the city. During a meeting with a number of TransLogis managers at the headquarters, this point was raised by the authors of this paper:

> TransLogis wants to become the first company in its industry to reduce its emission to zero. Cities are held responsible for 75 percent of emissions, as illustrated by a quote of the mayor of New York. The same holds true for Rotterdam. In the case that TransLogis wants to achieve 'zero emissions' and cities consume the largest parts of these emissions, we ask ourselves: what is TransLogis doing in cities, such as Rotterdam to adapt to and mitigate the effects of climate change?

The reaction of the TransLogis managers was one of surprise. The room was silent for 7 seconds. After that the strategic manager at the head quarters said: 'Yes…'. He paused and then said:

> Road transportation takes partly place within cities, but also for a large part outside of the cities. Due to the nature of our business, being a network-company, we drive with our vehicles through the whole of Europe and the largest part will be outside of cities. Most importantly, the largest part of all of our emissions of TransLogis are emitted…in the sky [by airplane delivery]… Of course we also look at 'the bigger picture', but our impact is primarily in CO_2, so that is where we focus on. Also, it is not the case that the ecological problems are not of interest for us, but our approach would be to look together for solutions for a common problem.

Discussion

Our case study illustrates how a company pilot project on climate change is heavily dependent upon social and ecological dynamics at the urban level. We first discuss how the TransLogis pilot was targeted at reducing urban metabolic flows, and how it depended upon the built environment in Rotterdam. We then discuss the social dynamics of the EV pilot in terms of governance networks and other social and institutional dynamics.

The TransLogis EV pilot was publicly presented as a way to help Rotterdam address problems with urban metabolic flows such as CO_2. In addition, the EVs would help reduce other metabolic flows such as particulate matter in air pollution.

However, the small number of EVs launched (two) was in reality a drop in the ocean for Rotterdam's air pollution issues. The pilot was not part of a long-term plan for sustainable transition within Rotterdam and was not supported by national (or even regional) rules and regulations as was the case in London (Van den Bosch *et al.*, 2005).

In addition, due to the technology of EVs, the pilot depended upon the specifics of the built environment (especially the bridge between Rotterdam and Dordrecht, where the EVs were located). Yet our interviews illustrate a surprising lack of awareness amongst TransLogis managers of the realities of the built environment or of the ecological challenges facing the city. They did not evaluate the EV pilot in terms of ecological impacts on Rotterdam and were increasingly concerned about financial impacts for the company in isolation. In addition, managers were not particularly concerned about the impact of the batteries on the metabolic flows within the city. Despite their symbolic partnership with Rotterdam, our results illustrate that decisions and internal governance of TransLogis were largely decoupled from the rest of the urban system and had little effect on improving the resilience of the city (see Figure 1). In addition, these results show that that TransLogis did not take a nested systems approach to their pilot, but instead were largely focused upon company-specific economic processes.

Our research confirms the importance of institutional pressures to climate programs (Hoffman and Ventresca, 2002), and our interviews also identify different kinds of institutional pressures across countries and within Rotterdam. For instance, the EV pilot in London appeared to have been motivated by institutional pressures such as the new congestion charge established by the local municipality. In contrast, the EV pilot in Rotterdam emerged from both internal isomorphic and normative pressures from within TransLogics, as well as external institutional pressures via weak ties and network effects between the CEO and the Mayor of Rotterdam. Yet our findings also suggest that TransLogis did not adapt their EV pilot to the peculiarities of Rotterdam or the Netherlands, and therefore did not, during the pilot phase, access firm-specific advantages (Lash and Wellington,

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2007) partly because it was a top-down decision by the CEO. Despite support from the CEO, pressure for financial viability within TransLogics mounted over time, and created doubt over the future viability of the pilot at the managerial level. These results add nuance to our understanding of how firms launch and evaluate climate change programs over time given dynamic institutional pressures at different levels of the firm and in different urban locations.

Our findings also support previous research that demonstrates the importance of corporate champions for sustainability (e.g. Schaefer, 2004; Westley, 2002), of personal networks (Porter and Powell, 2006), and of social embeddedness (Granovetter, 1985). Yet, to be effective, sustainability pilots must become organizationally and ecologically embedded and not dependent solely upon the original champion. For instance, the strong social embeddedness of the mayor and the CEO of TransLogis did not encourage the integration of a systems perspective into the pilot project – that is, the social embeddedness between these powerful actors was strong enough to create a pilot project in Rotterdam, but not strong enough to embed the pilot with other key actors from Rotterdam, or TransLogis, or to embed the pilot within the local ecosystem.

At the EV launch, press coverage and corporate documents stated that the pilot was in part driven by the needs of the urban climate in Rotterdam. Thus, TransLogis and the RCI actively stated that they were engaging on this pilot project in partnership due to common interests in helping to address climate issues locally in terms of adaptation and mitigation. Thus, at the symbolic level, these actors appeared to be loosely coupled (Orton and Weick, 1990). However, our results indicate that the urban ecosystem processes and geographic conditions in Rotterdam were in reality largely decoupled from the social processes in terms of decision making and implementation. This became extremely problematic for the pilot project because TransLogis did not understand how local geographic realities interacted with the technological limitations of the EV batteries and driving torque, despite the fact that they were a Dutch multi-national (and were not foreign nationals). TransLogis chose to locate their EVs outside Rotterdam despite the distance between Rotterdam and Dordrecht and demands of the topography (e.g. the EVs had serious trouble driving over the large bridge and in fact resulted in the relocation of one EV to another Dutch city). TransLogis chose the location of Dordrecht because this was the location of one of its host divisions. Thus, TransLogis followed an organizational logic as opposed to an ecosystem or geographic logic, and the pilot's success was limited because of this non-systemic approach to decision making (Baas and Boons, 2004).

Our results also illustrate significant coordination problems within social processes within TransLogis and external organizations. This supports previous research which warns that significant problems will occur because of 'static issues' in governance and decision-making (Baas and Boons, 2004). Throughout the pilot 'partnership' there were inadequate information flows within TransLogis divisions and between its 'partners' (such as RCI) and external stakeholders (like DCMR) who held important information about the feasibility of the pilot but were unable to convey this effectively. None of these actors actively sought to overcome their own organizational boundaries (silos) and were not able to develop new decision-making structures and actions that better reflected system boundaries and needs. While knowledge of the potential benefits of EVs and of geographic constraints existed within individual actor groups, this essential information was not shared across groups. This is an example of what Cohen-Rosenthal (2000) calls 'a walk on the human side' of sustainable practices – success or failure at the system level depends upon the degree to which the network becomes a learning organization. In the case of TransLogis and RCI, this type of learning network did not emerge.

Our results illustrate the use of symbolic decoupling (Meyer and Rowan, 1977) between the public press statements by TransLogis and RCI that emphasized 'partnership', yet the reality of implementation showed almost no continuous interaction between the parties. Despite promises of a multi-party partnership (and governance structure) between TransLogis and RCI, in reality this was a company-focused pilot that was limited in its effectiveness. TransLogis's decision making on the pilot project was also not systemic in nature. TransLogis's managers were focused primarily on the business case for the firm, despite the CEO's global commitment to the climate 'cause'. Although there was some awareness within TransLogis of cross-scale systemic linkages between one city and the rest of the world at the logistics level, there was very little systemic understanding of how a local urban climate system has important cross-scale linkages to the global climate system, and the role of a multi-national firm within this local–global system. Instead, TransLogis continued to enact a firm-centric approach to CO_2 reduction and was surprised by our questions on the potential role a firm could play within a city's strategy for climate adaptation and mitigation.

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Our case study also questions the role of RCI as an effective bridging organization dealing with urban climate issues. Given that RCI's role quickly became symbolic, decision-making on corporate climate strategies were done in isolation by the firm. RCI did not effectively act as a bridge between TransLogis and other municipal departments like DCMR which held valuable information about the on-the-ground feasibility of the pilot. There was little, if any, multi-party governance, and information flows were severely limited as a consequence. This also negatively affected the success of the pilot for all parties. Organizations like the RCI can be conceptualized as 'emergent institutions' – a term that has been used in the business management literature for those 'arrangements that lack "taken-for-grantedness" and are surrounded by uncertainty about their permanence' (Kolk and Pinske, 2008a, p. 420). Part of the problem for emergent organizations is to develop effective multi-party governance mechanisms and effective information flows. We also did not find a great deal of bridging activity within TransLogis: managers were not adept at sharing company knowledge from one pilot to another (the current EV pilot and the earlier EV pilot in Rotterdam), and from one division to another (TransLogis A to TransLogis B to TransLogis head office in the Netherlands).

Conclusions

In general, the business literature on sustainability rarely adopts a social–ecological systems perspective (Guthey and Whiteman, 2009; Korhonen and Seager, 2008; Porter, 2006; Seager, 2008) and has yet to recognize the importance of the urban context for research in practice. A key contribution of our paper is to argue for a systems perspective in research on companies and climate change especially as it relates to large cities. Cross-scale and cross-city spatial linkages are essential features of systems thinking (Allen, 1997; Folke, 2007; Gunderson and Holling, 2002), and companies play pivotal yet often unrecognized roles in urban climate systems. Companies significantly affect and are affected by the built environment, urban metabolic flows, institutional arrangements, and social dynamics and networks (Figure 1). Our case study highlights some of the difficulties that occur when multi-national firms like TransLogis experiment with urban climate change pilot programs, particularly when they do not utilize a systems approach to planning and implementation and remain decoupled from the urban ecosystem.

We also present the C40 Cities as one example of a new local–global approach to climate adaptation and mitigation, and it is encouraging that an emergent organization like the RCI is actively engaging (to some degree) with local multi-national companies like TransLogis. Yet, our case study also highlights the danger of symbolic decoupling (whether intentional or unintentional) between emergent organizations like RCI and multi-national firms. We also identify the danger of not taking a systemic approach to pilot projects – the success of the EV pilot in Rotterdam was unnecessarily limited due to ignorance of the demands of the local ecosystem and built environment and a firm-centric approach to decision making that truncated information flows. Corporate policies, decisions, and strategies that look primarily at social dimensions without integrating the demands and constraints of specific ecosystems are unlikely to enhance system sustainability (Folke *et al.*, 2005). In addition, Korhonen and Seager (2008) argue that eco-efficiency in isolation (e.g. by introducing zero emission trucks) only very rarely results in improved diversity or adaptability and may even have unintended consequences regarding sustainability.

A key outstanding issue is the problem of fit between institutions and the changing needs of an adaptive social–ecological system like a city. According to Folke *et al.* (2007, p. 30): 'The problem of fit is about the interplay between the human and ecosystem dimensions in social-ecological systems that are not just linked but truly integrated. This interplay takes place across temporal and spatial scales and institutional and organizational levels in systems that are increasingly being interpreted as complex adaptive systems'. This is particularly relevant as cities attempt to plan and prepare for climate mitigation and adaptation.

In order to develop innovative systemic solutions to urban climate problems, firms must move beyond a firm-centric approach to governance and decision making and actively build information flows across multiple actors to ensure that important data about the local ecological system and built environment effectively enter into decision making. Our case provides insight into why things went wrong, which implicitly identifies guidelines for more effective business engagement in climate change and sustainability initiatives. We suggest the following traits for effective business engagement in addressing major urban problems such as climate change:

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- Integration of a social–ecological system perspective that identifies the important linkages between a proposed business initiative and the city or broader region and that quantifies the potential impact of the proposed initiative.
- Effective communication between the city climate/sustainability leaders and leadership within a company or collection of firms.
- Effective vertical and horizontal communication within the company (particularly when it is a large multinational firm) to assess feasibility and develop an action plan.
- Effective networking between the company and the city at the operational level (e.g. between the people implementing the EV project and relevant city agencies).
- Development of a resilient business plan that provides flexibility to learn and adapt.
- The co-evolution of more effective bridging functions within organizations like the RCI in order to ensure that firms better understand local realities of the built environment and of the urban landscape.

Without effective institutional entrepreneurship from emergent organizations like the RCI, firms will not easily move towards a systems perspective, and the problem of institutional fit (or lack thereof) is likely to remain (Folke *et al*., 2007). Further research is needed to better understand the conditions that encourage effective bridging activity by emergent organizations like the RCI and within different divisions of a multi-national firm in order to facilitate stronger ties between system actors and to more tightly couple information flows on climate adaptation and mitigation needs of cities. Future research is also needed to empirically describe the impact of a collective of firms within specific urban centres and across networks of cities engaged in climate adaptation and mitigation.

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