## Track G

### Markets in Transitions

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Session g1
Creation of markets and consumers – linking supply and demand
Markets in Transitions
Linking supply- and demand-side innovation policies in supporting niche development – case electric traffic cluster in Finland.

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Abstract

Innovation policy in Finland (and elsewhere) has traditionally mainly focused on promoting the supply of innovations e.g. through R&D funding, but demand-side has lately been emphasized. Traditionally the descriptions of demand-side policies have emphasized regulation and public procurement, but the present approach of the Finnish Government amends the toolbox with indirect measures like knowledge and capability development and infrastructure improvements.

We study the development of electric traffic in Finland drawing on strategic niche management (SNM) literature, in which individual niche technology (like electric traffic) is considered to develop through transition experiments, first locally then gradually developing into trajectories in which generic knowledge is developed through aggregation activities, but the role of policy has not been emphasized.

We document the development of the Finnish electric traffic niche through the interplay of local experiments and policy measures to broader arenas, like R&D programs and aggregation activities, the actors of which serve as advocates for empowerment. We propose that the arenas play a strong role in creating demand through indirect measures, especially creation of knowledge and capabilities.
1. Introduction
The electric traffic development in Finland is at a very early stage, but it is an interesting context for research, because some novel innovation policy approaches have been applied for its support. The traditional R&D funding has been amended with demonstrations and gathering of user experience as well as support for extensive networking and knowledge flows. Electric traffic appears as a “test ground” for demand-driven innovation policies recently introduced in the Finnish policy toolbox.

We draw from the Strategic Niche Management (SNM) literature (Kemp et al., 1998, Schot and Geels, 2008, Raven et al., 2010), which discusses the development of new technologies like electric traffic through experimentation. Even if the role of niches as proto-markets is frequently mentioned, the creation of demand has not explicitly been described in the SNM literature. We propose that the electric traffic niche in Finland has developed as interplay between the actors and policy-makers rather than a top-down policy initiative.

This paper is arranged as follows. We first discuss the theoretical backgrounds of creation of demand for environmental innovations and strategic niche management and develop our research approach (section 2). In section 3 we describe the methodology. We then report the context and findings of our study: first the co-evolution of experiments and policy measures applied (section 4), then the linking of supply- and demand-side policies (section 5) and the development of the niche (section 6). In section 7 we discuss the contribution of our results to the literature of sustainability transitions and finally discuss the policy implications (section 8).

2. Theoretical framework

2.1. Societal demand for innovation
There is a societal demand for innovations that improve the sustainability of the transport sector. The negative externalities of transport include greenhouse emissions, toxic emissions of vehicles, land use pressures, congestion and accidents. As these innovations are directed to reducing these externalities and rarely bring direct benefits either to the producer or to the consumer, policy plays a significant role in articulating the demand (e.g. van den Bergh et al., 2011).

The main drivers for change in the transport sector are environmental policies, especially climate policies and the increasing price of the mineral-oil-based fuels (e.g. van Bree, Verbong and Kramer, 2010). In addition to the general climate policies the examples of these in the European Union are the binding objectives for CO2-emissions of cars (Regulation 443/2009/EC) and the mandatory shares of renewable energy and biofuels (Directive 2009/28/EC). These drivers have enhanced the development of alternative fuels for vehicles, such as biofuels and electricity. Electric traffic is sometimes considered “the ultimate sustainable solution for automobility” (Orsato et al., 2012, p. 205) even if this view has also been contested mainly by advocates of public transport and light traffic and reduction of private cars, because technical improvements of private cars tend to enhance rebound effect (Litman, 2005) and therefore fail to solve the problems of land use challenges and congestion (e.g. Nykvist and Whitmarsh, 2008).

Environmental policies, like regulation, fiscal incentives and public procurement, are traditionally mentioned as the tools for creating demand for sustainability innovations. The ability of environmental policies to enhance innovation has, however, been questioned, because policies are sometimes inconsistent, unpredictable, too prescriptive and not properly targeted to the potential innovators (Kivimaa,
In the transport sector few policies have been designed to enhance radical innovation: “Most environmental regulation stimulated incremental innovation of ICE’s, enforcing lock-in. California’s ZEV-mandate is an exception, indirectly stimulating R&D on ULEV’s [ultra-low emission vehicles]” (Dijk & Yarime, 2010, p. 1387).

In Finland demand-driven innovation policy has been promoted because the supply-side policies have not enhanced an efficient diffusion of radical innovations. The demand-driven innovation policy is based on the idea of lead markets described by Beise (2004): “the differences in regional and national demand create variation in adoption of innovations; the countries that first adopt an internationally successful innovation can be described as lead markets” (Beise, 2004, p. 997). The approach is also based on the differentiation between market pull and science push, which has been replaced by the idea of “coupling” new technology, practical knowhow and demand (Freeman, 1979) – linking supply- and demand-side measures.

One important target of demand-driven innovation policy is the promotion of innovations with societal demands like sustainability. A challenge of using environmental and fiscal policies in demand-creation is that they mostly target the domestic market and in a small country like Finland innovation policy aims at international markets. The framework of the Finnish Ministry of Employment and Economy states that Finnish solutions for societal problems are expected to develop global business possibilities for Finnish companies (TEM, 2010). The lead market approach assumes that home market is the basis also for international business. In addition, environmental policy is increasingly based on European Union legislation, which broadens the concept of home market.

The Finnish framework of demand-driven innovation policy uses a broader toolbox of measures than the traditional environmental-policy-related measures mentioned above. The “new elements” are indirect measures like development of competence and public sector operating models (TEM, 2010). Direct demand-side measures have been shown to have similar draw-backs as pure market-pull orientation and transport environmental policies – it tends to enhance incremental innovations and hamper radical or disruptive innovations (e.g. Christensen, 1997, Breznitz et al., 2009), which led Breznitz et al. (2009) to recommend to the Finnish policy makers a clear focus towards indirect measures in order to ensure intense end-market competition.

Supporting the supply of innovations can also be conceptualized following the evolutionary perspective as development of variety or novelty and affecting the demand as targeting the selection and diffusion processes of innovation (e.g. van der Vooren et al., 2012, Garud and Gehman, 2012). Strategic niche management literature, which builds on the evolutionary principle, therefore can sharpen the relatively vague discussion on the supply- and demand-side innovation policies.

2.2. Supporting individual technological niches in sustainability transitions
The transition approach builds on the basic assumption that the diffusion of radical systemic innovations (niche technologies, like electric traffic) is hindered by a stable regime (e.g. traffic based mainly on private cars with internal combustion engines, ICE), which gradually becomes destabilized by changes in the landscape factors (like climate change, fuel price) (see e.g. van den Bergh et al., 2011 for review).

The transition of automobility has been extensively reviewed recently (Geels et al., 2012) describing several potential niche technologies competing for attention. One of them is electric traffic (Orsato et al., 2012). The niche is still in the making, and the development has been “a bumpy ride” (Orsato et al., 2012, p. 205),
with the exception of hybrid vehicles which already have entered the commercial scale (e.g. Oltra and Saint Jean, 2009, Dijk and Yarime, 2010, van Bree et al., 2010, van der Vooren et al., 2012, Sierzhchula et al., 2012).

One of the approaches of transition studies is multi-level perspective (MLP) (summarized e.g. by Geels, 2011). MLP and the related policy view, strategic niche management (SNM) (Kemp et al, 1998, Schot and Geels, 2008, Raven et al., 2010), are based on the evolutionary perspective in which the niche technologies represent variety and the landscape and existing regime represent selection (Garud and Gehman, 2012).

In SNM literature individual niche technology (like electric traffic) is considered to develop through transition experiments first locally, then gradually developing into trajectories (Geels and Raven, 2006) in which generic knowledge is developed through aggregation activities, which are “social and cognitive activities that make knowledge flows possible”, like “standardization, codification, model building and circulation of knowledge through actors” (Geels and Deuten, 2006, p.p. 265 and 267). Niche development, however, is usually not smooth and gradual, but consists of alternating hypes and disappointments, failures and changes of course (Geels and Raven, 2006, Verbong et al., 2008) affecting the expectations.

An essential feature of SNM is formation of protected spaces – niches – for the emerging technologies in order to protect them from the mainstream selection pressures (Kemp et al., 1998, Smith and Raven, 2012). The various forms of protection have been conceptualized by Smith and Raven (2012) as shielding, nurturing and empowerment. The measures that keep the selection pressures of the existing regime at bay are called shielding. The regime dimensions, against which the niche technologies need protection are industry structure, technologies and infrastructures, knowledge base, user relations and markets, public policies and political power and cultural significance and associations of the regime.

Nurturing supports the development of the innovation to become more robust to meet the selection pressures. SNM literature describes nurturing as assisting the niche-internal processes, which are 1) articulation of expectations, 2) developing of social networks and 3) learning. The niches have been shown in historical studies to develop favorably if the expectations become converged, specific and based on experiments, the networks become broader and consist of many different actors, and the learning is reflexive (Schot and Geels, 2008, Raven et al., 2010). Nurturing is also discussed in the literature of technological innovation systems (TIS) through the TIS functions 1) knowledge development, 2) resource mobilization, 3) market formation, 4) influence on the direction of search, 5) legitimation, 6) entrepreneurial experimentation and 7) development of positive externalities (Bergek et al., 2008, Jacobsson and Bergek, 2011).

Empowerment aims at ensuring the competitiveness of the technology (Smith and Raven, 2012). Through empowerment the need for temporary protection comes to an end. The innovations can become competitive either in the existing regime (fit-confirm) or in a changed regime (stretch-transform) (Smith and Raven, 2012). In the case of sustainability transitions regime-change is mostly necessary. Empowerment is typically a political process, where the niche advocates play a role in developing solutions to the changed regime through discursive processes and narratives. “The objective in the stretching and transforming form of niche empowerment is to convince the wider social world that the rules of the game need to be changed.” (Smith and Raven, 2012, p. 1033).

SNM literature frequently mentions the creation of niche markets through proto-markets of the experiments as one way of making the path-breaking innovations more robust (Schot and Geels, 2008, Raven et al., 2010, Smith and Raven, 2012), but does not elaborate on demand or market creation.
2.3. Research approach

We study the emerging electric traffic niche in Finland, which until recently consisted only of a few local activities, but has since 2009 suddenly been a target of numerous innovation policy measures and activities. However, environmental policy measures for the direct support of electric traffic have not been implemented. Consequently, the creation of demand of electric traffic in Finland has not developed through public procurement, fiscal incentives or environmental regulation, the classical tools for demand-side policies. The opinions vary whether it should.

In our analysis of the policies for the support of electric traffic in Finland, we draw from SNM literature (Kemp et al, 1998; Schot and Geels, 2008; Raven et al., 2010), the discussion on protective space (Smith and Raven, 2012) and the concept of aggregation activities in which local knowledge is converted to more generic knowledge (Geels and Deuten, 2006) in order to gain understanding of the indirect creation of demand for electric traffic (Breznitz et al, 2009, TEM, 2010).

Research questions

Our main research question is: How do public policy measures support the creation of demand for Finnish electric traffic cluster? In addition to that we asked (1) How have the electric traffic niche and related policies co-evolved in Finland? and (2)What suggestions for future policies can be given?

3. Methodology

3.1. Sources of data

We use various sources of data on the electric traffic niche in Finland. We have studied the main reports on electric traffic commissioned by the government offices (Biomeri, 2009, SWOT, 2010, Nylund, 2011), we have observed four conferences (as described by Garud, 2008) related to the niche (TransEco annual conferences 2010 and 2011, TransEco e-bus-seminar 2012, PSL seminar on future electric city traffic 2012) and carried out seven interviews of the various actors of the activities studied (see table 1). The interviews were recorded and transcribed. In addition we carried out a three month media follow up of seven main newspapers and magazines in Finland in January-March 2012, and collected the press releases of seven main actors in Finland from years 2009-2012. In addition we build on our earlier reports on this subject (Rinkinen, 2010, Lovio et al., 2011).

Table 1. Summary of interviewed informants

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<tr>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
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<tbody>
<tr>
<td>Saara Jääskeläinen</td>
<td>Ministry of Transport and Communications</td>
<td>Senior officer</td>
</tr>
<tr>
<td>Raimo Karhu</td>
<td>Technology Industries</td>
<td>Coordinator of electric vehicle group</td>
</tr>
<tr>
<td>Martti Korkkiakoski</td>
<td>Tekes</td>
<td>Program manager of EVE and coordinator of TransEco funding.</td>
</tr>
<tr>
<td>Juhani Laurikko</td>
<td>VTT research centre</td>
<td>Program manager of TransEco</td>
</tr>
<tr>
<td>Reijo Mäkinen</td>
<td>HSL (Helsinki Metropolitan Public Transport Services)</td>
<td>Director of purchasing</td>
</tr>
<tr>
<td>Elias Pöyry</td>
<td>Eera Consulting</td>
<td>Coordinator of PSL</td>
</tr>
<tr>
<td>Jussi Palola</td>
<td>Helsinki Energy</td>
<td>Head of R&amp;D</td>
</tr>
</tbody>
</table>
3.2. Analysis
Using all the data sources mentioned above we collected four main databases 1) all relevant events of the niche development since 2007. In this database we defined events as historical facts, which are most often used in narratives (Valorinta et al., 2011), 2) quotes articulating the expectations of the informants of the development of the electric traffic niche (110 quotes altogether), 3) actors participating in any activities in the electric traffic niche in Finland (described in the chapter on the networks), 4) learning events with reference to the technical challenges of EV’s listed in a report on electric vehicles commissioned by the Ministry of Transport and Communications (Nylund, 2011).

The findings of this study are structured as follows. We first describe the early development of the electric traffic niche in Finland showing many scattered local activities over time. Together with these activities then policy measures evolved influencing the emerging electric traffic niche and especially the creation of supply and demand for electric traffic technologies through R&D programs and aggregation activities. After that we report the findings on the development of the electric traffic niche in Finland using the three niche processes (Schot and Geels, 2008, Raven et al., 2010). The niche processes are considered as preliminary indicators of the development of the niche.

Based on the findings we propose that in Finland various local niche experiments and shielding activities enabled the establishment of policies and arenas, which support the creation of demand for electric traffic. They also develop into forums for advocacy for the empowerment of the electric traffic niche.

4. Co-evolution of emerging electric traffic field and related policies

4.1. Early development of the electric traffic field in Finland
As in many other countries, the Finnish industry first developed an interest in electric vehicles after the first and second oil crises. Haakana (2010) stated that companies like IVO (utility, today Fortum), the Finnish oil company Neste (today Neste Oil), producer of electrical devices Kymi-Strömberg (today part of ABB), contract car manufacturer Saab-Valmet (today Valmet Automotive) and a vehicle component manufacturer Leo Laine Oy were involved in small-scale experiments in the area in the 1980s. In the 1990s, IVO’s Elcat project manufactured some 200 electric vehicles and about 60 of them were in daily use in Finnish Post. Fortum closed the Elcat project in 2001 and Elcat Oy was acquired by its personnel.

Some years later, based on international development, the Finnish electric vehicle cluster started to re-emerge from various sources. In 2003, Finnish Electric Vehicle Technologies was established for developing battery technology. The company was later integrated to European Batteries, which was established in 2008. In 2007, the Sähköautot – Nyt! (The eCars – Now!) user community was organized with the idea to transform ordinary Toyota Corolla internal combustion engine (ICE) cars to electric cars. In 2008, Valmet Automotive and an American premium car company, Fisker Automotive Inc. signed a contract to manufacture Fisker Karma plug-in hybrid sports cars in Finland. Fortum re-established R&D activities in the area, followed later by Helsinki Energy. Also, Ensto, Efore and some other manufacturers of electric devices started to develop products for electric vehicles. In addition BIT Research Center in Aalto University coordinated the first large scale business oriented research project (www.simbe.fi) focusing on the EMobility value systems and giving a holistic approach to the emerging Electric traffic in Finland. Moreover, a group of teachers and students at Metropolia University of Applied Sciences in Helsinki
organized a project called Electric Raceabout for building an electric racing car for a competition in the USA in 2010. The first Electric Motor Shows were organized in Helsinki in 2009 and 2010.

Approximately 40 Finnish companies were estimated to be active in the area, and their net sales totaled 200 million Euros (Biomeri 2009).

### 4.2. Emergence of policy measures for the support of electric traffic niche in Finland (2009 -)

Based on the local initiatives, the Ministry of Employment and the Economy appointed Electric Vehicles in Finland Working Group to examine the prospects of electric vehicles in Finland and elsewhere in February 2009. This was an exceptionally strong commitment to a single technology by the Ministry, which usually defines policy on a general level and delegates the technology-specific measures to Tekes (The Finnish Funding Agency for Technology and Innovation). As a conclusion, the working group set a very ambitious target for Finland in 2020: "Net sales of the Finnish electric vehicle cluster in 2020 are 1-2 billion Euros and the number of employees several thousands. Society enhances the diffusion of electric and other energy efficient vehicles in Finland. The share of electric vehicles of all new cars sold in 2020 is 25% (of which 40% battery electric vehicles)" (TEM, 2009, p.7).

The policies have various impacts on the supply and demand of electric traffic. These impacts are summarized in table 2 and described in more detail in section 5.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Objective</th>
<th>Impact on supply or demand of electric traffic</th>
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<tbody>
<tr>
<td>EU automotive regulation (Regulation 443/2009/EC)</td>
<td>Set emission performance standards for new passenger cars to reduce CO₂ emissions.</td>
<td>Demand: medium term emission limits too strict for most ICE cars.</td>
</tr>
<tr>
<td>EU renewable energy directive (RES) (Directive 2009/28/EC)</td>
<td>Reduction of CO₂ emissions and promoting security of energy supply.</td>
<td>Demand: increasing the share of renewable electricity. Indirect impact on electric traffic.</td>
</tr>
<tr>
<td>Vehicle taxation reform in Finland 2012</td>
<td>Lower the taxation of cars with low CO₂ emissions.</td>
<td>Demand: Lowering of the price of EV's compared to ICE cars.</td>
</tr>
<tr>
<td>R&amp;D funding: TransEco program (Tekes, ministries, companies, 2009 -)</td>
<td>Improvement of energy efficiency and enhancement of the use of renewable fuels in transport.</td>
<td>Supply: Relatively few R&amp;D activities on electric vehicles. Demand: Cooperation and information exchange between actors, especially the different ministries. Impact of policies, e.g. fuel taxation.</td>
</tr>
<tr>
<td>R&amp;D funding: EVE program (Tekes, TEM and companies, 2011 -)</td>
<td>Create a community of electric vehicle and support system developers with close contacts to international research and business networks.</td>
<td>Supply: R&amp;D on electric vehicles. Demand: active enhancement of networks, demonstrations, market knowledge.</td>
</tr>
</tbody>
</table>

The environmental policy measures relevant for electric traffic niche include European Union and Finnish policies for reduction of greenhouse gas emissions of transport. The policies affecting the vehicles do not take a stand in relation to the technology of the vehicles, but electric vehicles as ULEV’s benefit from them in the long term. The EU renewable energy directive (RES) clearly mandates a share of biofuels and renewable energy in the transport fuel mix. R&D funding by nature takes a stand on the technologies
funded. TransEco (Research Programme on Energy Efficiency and Renewable Energy in Road Transport) has a general aim to improve the energy efficiency and share of renewable energy in transport but The Electric Vehicle Systems Program (EVE) explicitly supports electric traffic.

The regulation on automotive emissions sets increasingly strict targets on the emissions of new cars. The mandatory limits from 2015 are mostly reachable by ICE cars, but the real demand-creating factor for electric vehicles is the promotion of innovative technologies allowing ultra-low emission vehicles (ULEV’s).

The role of the RES-directive is very indirect. It promotes the production of renewable electricity, but how the electricity production impacts the treatment of electric vehicles in the short term is very unclear.

EVE-program is the most specific and large policy measure to support electric traffic in Finland. Its preparations started based on the recommendations of the Electric Vehicles working group (TEM, 2009). EVE is a five-year program between 2011 and 2015 with a budget of 80 million Euros. It’s five main demonstration platforms are shown in Figure 1.

![Figure 1. Structure and volumes of EVE program and its main consortia](image)

4.2.1. Policies and niche protection

Policies affect different aspects of the existing regime, and consequently shield the developing technology from its selection pressures (Smith and Raven, 2012). The policy measures and various activities of the niche actors offering active shielding to the emerging electric traffic niche are listed in table 3.

Table 3. Finnish mechanisms for the active shielding of the electric traffic niche against the selection pressures of the existing passenger traffic regime based on ICE vehicles.
<table>
<thead>
<tr>
<th><strong>Existing regime</strong></th>
<th><strong>Active shielding</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry structure</strong></td>
<td>Mass production paradigm of car industry. In Finland Valmet Automotive active in electric vehicles. Finnish oil industry active in biofuels.</td>
</tr>
<tr>
<td><strong>Technologies and infrastructure</strong></td>
<td>Gasoline stations have limited interest in charging.</td>
</tr>
<tr>
<td><strong>Knowledge base</strong></td>
<td>Repair and maintenance of ICE.</td>
</tr>
<tr>
<td><strong>User relations and markets</strong></td>
<td>Predictability of performance and price and value development. Performance when long distances, cold climate.</td>
</tr>
<tr>
<td><strong>Cultural significance and associations of the regime</strong></td>
<td>Car ownership is a status factor.</td>
</tr>
</tbody>
</table>

The charging infrastructure is one of the bottlenecks of electric traffic. Even if electric vehicles are mostly charged at home the lack of public charging in the cities and quick charging possibilities on the main roads is a main concern when distances are long. The investment support for charging stations connected to the demonstration projects like PSL, and the participation of the cities in the program may change the situation.

The knowhow is strong in Internal Combustion Engines supporting the repair and maintenance networks. However, the activities of e.g. the Polytechnics in teaching EV technology to engineering students help to build the knowhow base.

The car drivers are used to being able to drive more than 500 km between refueling. The concern about the range of EV’s especially in the winter conditions is one of the main fears of the users. The main hindrance for the penetration of EV’s is, however, the price of the cars. The investment support of TEM is targeted at this, but many practical details remain. E.g. purchasing EV’s for company cars is hindered by various detailed rules of their price and impact on the salary of the car user, which cannot be taken fully into account in the investment support scheme.

The transport-related climate policies are technology neutral, but give increasingly credit to the low carbon dioxide emissions of electric vehicles. EU regulation defined strict emission limits to vehicles from 2015 onwards. Finnish vehicle taxation changed in early 2012 and the tax of EV’s reduced.

Car ownership – and the size of the car - is still a strong status factor (Lane and Potter, 2007). Small electric vehicles still have a hard time in developing their status value. However, the active arrangement of EV shows and the recent active testing of electric vehicles in the automotive magazines gradually build an image of “a real car”.

For example Norway and Estonia have implemented stronger policies than Finland for enhancing electric vehicles. Estonian government has invested heavily in charging infrastructure and vehicle purchases and
Norway, especially the city of Oslo implemented strong incentives to user benefits, like use of bus lanes, exemptions of congestion charges and free parking.

5. **Linking supply- and demand-side policies**

After the ambitious vision on electric vehicle business was published (TEM, 2009), various common activities started to develop and publicity hype started in Finland (Rinkinen, 2010).

Based on the vision two major R&D programs (TransEco and EVE) were initiated. They have been able to link supply- and demand-side elements in their activities. In addition to support for technology development, they have engaged in demonstrations, enhancement of knowledge flows, networking and development of the business structure, e.g. the Technology Industry Group, which is a membership based network of organizations interested in business in electric traffic. The activities of TransEco, PSL (the largest consortium of EVE), and Technology Industry Group are summarized in Table 4 and described in detail below.

<table>
<thead>
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<th>Table 4. Summary of the main characteristics of the activities studied</th>
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<tr>
<td><strong>Type</strong></td>
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<tr>
<td>Research consortium based on different sources of funding</td>
</tr>
<tr>
<td>Objective</td>
</tr>
<tr>
<td>Actors</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>Linking of supply- and demand-side elements</td>
</tr>
</tbody>
</table>

5.1. **TransEco R&D program (2009-2013)**

TransEco program was initiated by VTT (Technical Research Centre of Finland) experts on vehicle technology and biofuels. It is more a network of research projects than one program. The broad participation and the dialogue between researchers, policy-makers, producers and users (especially professional users, like public transport operators) is the specific character of the consortium. The main results of all projects including company demonstrations are shared even if all partners do not participate
in the funding. The program actively organizes seminars and workshops both internally and for wider audiences.

Our informants stated that the interaction between all four ministries and other public offices decreases the silo effects of administration and links e.g. environmental policies and taxation to innovation policies providing an important link between supply- and demand-side policies. Indeed, TransEco has had a clear impact on policy-making in Finland, e.g. fuel taxation and biofuel targets.

The steering group is dominated by incumbent actors and the program is considered to concentrate on the development of biofuels rather than that of EV’s. However, the program director was selected to prepare a major report on EV’s to the Ministry of Transport and Communications. The program network has also offered important learning opportunities for professional students through the participation of the universities and the polytechnics. The project of Metropolia Polytechnic to build an electric car from scratch gets praise from a practitioner: “The ones who have the possibility to participate learn immensely from it. They can then grow the amount of experts in electric vehicle area.” TransEco program organized a national seminar on the development of hybrid and electric buses in early 2012 bringing together all major actors in public transport area.

5.2. PSL demonstration platform within EVE program (2011-2015)
By far the largest consortium within EVE-program is PSL (www.electrictraffic.fi), a demonstration platform within the Helsinki Metropolitan area (see figure 1). It aims at building an extensive charging network in the Metropolitan area and at organizing a user test of 500 plug-in electric vehicles within four years with the investment support of TEM. In addition it is involved in development of services, changes in buildings and traffic systems connected to electric traffic. In the Spring 2012 the purchasing of these test cars has started only in a very limited scale.

PSL concentrates on the user perspective of EV’s and collects extensive data on the use of the cars. The partners feel that this is the main difference to earlier programs, which usually have been technology-driven and coordinated by utilities, vehicle manufacturers and/or electronics providers. The research partners include Aalto University (electricity engineering and industrial management) and National Centre for Consumer Research and Metropolia University of Applied Sciences. The other partners include companies like utilities, electronics companies, vehicle importers, various service companies and governmental agencies.

PSL actors are active advocates for electric traffic, especially in urban areas. PSL organized a seminar on future electric traffic in cities in May 2012. Among other issues the roles of public transport and electric traffic in the climate actions of cities were discussed. The development of satellite centers in Helsinki Metropolitan area instead of development of the city centers was mentioned as one reason enhancing electric traffic, which is more flexible than public transport.

5.3. Electric traffic industry group within The Federation of Finnish Technology Industries
Electric Traffic Industry Group within The Federation of Finnish Technology Industries was founded in 2011 to enhance the cooperation and to improve the business possibilities of companies and organizations within electric traffic. The group is open to all organizations interested in electric traffic and has now (Spring 2012) 57 companies and other organizations as members. The members represent vehicle manufacturing, charging equipment and systems, software, smart traffic, smart grids, research and
education, legislation and standardization. The group is coordinated by the Federation of Finnish Technology Industries and aims at partnering with some European branch organization, but the choice has not been made yet.

Even if the group is an industry initiative, innovation policy plays a role in its development. Tekes favors the formation of this kind of industry groups in connection to major technology programs. The connections are very tight: the coordinator of electric traffic industry group is a member of the steering group of the electric traffic technology program EVE and the program manager of EVE is a member of the industry group board.

The group plans to invest in networking within the industry and with the authorities, build a common vision of the branch using scenario methods, produce a road map of the future for traffic and inform the decision-makers. The group – in its close connections to EVE program enhances EV demonstrations and openness of information exchange in the consortia.

The Electric traffic industry group actors do not primarily promote electric vehicles in Finland, but they promote developing an electric traffic industry in Finland for the international market. For this purpose they advocate for extensive demonstration projects in Finland in order to gather user experience, references and publicity.

6. Development of the electric traffic niche in Finland in the years 2009-2012

6.1. Niche processes
The electric traffic niche in Finland is at a very early stage. The three niche processes – articulation of expectations, network development and learning (Schot and Geels, 2008, Raven et al., 2010) that describe the development of the niche, can only give a very preliminary indication of the impact of the policies.

6.1.1. Articulation of expectations

The informants interviewed spoke about disagreements about the development of passenger traffic in Finland. Mostly they stated that there were very distinct groups of “EV proponents” and “ICE proponents”, of which the latter believed in the role of biofuels in solving the climate impacts of passenger traffic. The other disagreement concerned the main objectives of innovation policy in the field of traffic. Others spoke mostly about the (environmental) objectives of traffic in Finland and others about developing export business in Finland.

The “EV proponents” consider that the business potential of electric traffic is great for Finland especially in the fields of charging and services. They also stated that active support for the niche is needed in Finland in order to get the necessary user experience for better market understanding. They believed that car manufacturers would be allied with utilities rather than oil companies in the future.

The “ICE proponents” stated that there is too much hype about EV’s, and a long way before they would be a real option for present cars. They thought that there should not be too much support for the use of EV’s, because the benefits would leak to foreign automotive manufacturers. They did not believe that the incumbent automotive manufacturers could be overlooked and that the alliance with oil companies is too
strong to be broken. However, they also stated that demonstrations and user experience about EV’s would be needed.

Car users (represented by professional transport operators and automotive journalists) specified a whole list of practical difficulties of EV’s especially in the Finnish conditions, which would take some time to resolve. However, local testing of hybrid and battery electric vehicles was active, and also many advantages were reported – showing a generally open mindset for new technologies. The comparisons were invariably made against the existing ICE cars. The need for increased user experience was articulated.

The technology companies saw many business opportunities in alliance with big international automotive produces. They considered that domestic user experience was absolutely necessary for the development of global business in the components, charging and service businesses connected to EV’s. In addition the producers believe that new business models are gradually developing to allow the consumers to use different cars for different purposes.

Based on these views we conclude that in spite of the disagreements, the expectations are converging. The actors are unanimous about the need for large scale demonstrations, about to start in 2012, and they expect that the market will first develop in special uses, like distribution, industrial sites and city traffic. Our informants agreed that the aggregation activities served as discussion forums for the development of a joint vision for the electric traffic niche.

6.1.2. Networks

The electric traffic network in Finland is rather broad consisting of many different actors (see figure 2). It consists of different producers, users, governmental and non-governmental organizations. The aggregation activities studied in this project increased significantly the interactions between the actors during 2011 and 2012.

Producers

Most incumbent automobile manufacturers and importers are active in developing BEV’s and/or PHEV’s. However it is still very difficult to say, whether their activities are showcase products or serious projects to enter the ULEV market. The availability of electric vehicles on the small Finnish market is limited. Valmet Automotive, the only Finnish automotive company, has chosen to concentrate on contracting with electric vehicle companies.

Among “entrants” in the transport area are large incumbents in the electricity area: utilities (like Fortum, Helsinki Energy) and electrical equipment providers (like ABB). Therefore the concept of incumbents and entrants is not very clear in the area of electric traffic. The future role of the incumbent fuel distributors in the development of charging infrastructure is unclear.

Incumbent traffic system providers, like Siemens are active in developing charging systems and equipment. Increasingly also different actors having expertise in electrical systems or software are showing interest in the electric traffic area. However, also exits due to disappointments and lack of development resources have taken place. For example battery manufacturer European Batteries has closed down its production, Nokia Siemens Networks has withdrawn from the area, as well as software producer Logica.
Figure 2. Finnish electric traffic network and its international connections in early 2012

Users

Only a few electric vehicles have been acquired by private persons in Finland until now. At the end of May 2012 there were 76 electric vehicles in Finland. 33 vehicles were sold in 2011 (of altogether 71 000 passenger vehicles), and 20 in early 2012. However, there was active testing of electric vehicles in the mainstream automobile magazines in early 2012 and the statements were mainly positive. Car sharing of electric vehicles has been started in a small scale.

Among the professional users Itella (Finnish Post) has for many years used Elcat electric vehicles and electric bikes for mail distribution.

The international bus operator Veolia has been active in electrical bus testing in many countries and is now entering to a test in Finland. The Helsinki Metropolitan public transport organization (HSL) is actively following the experimentation and also testing hybrid buses in Helsinki.

Governmental and non-governmental organizations

The governmental participation in electric traffic development is mainly innovation policy—driven (with The Ministry of Employment and Economy (TEM) and Tekes as the active partners). The typical demand-side policy sectors (Environment and Transport) have been less active.
The Finnish Federation of Technology Industry and standardization organizations are actively participating in e.g. the charging system standardization and development of networks. Environmental organizations do not appear to participate in the discussion or activities around EV’s in Finland.

Arenas

Starting in 2009 the actors in the electric traffic area have gathered to several collective arenas. These vary from R&D programs to governmental working groups. One of the functions of the arenas is to allow knowledge flows, i.e. they are aggregation activities (Geels and Deuten, 2006).

R&D activities started to develop after the Ministry of Employment and Economy working group. TransEco program started in 2009. The Tekes technology program EVE and its five demonstration platforms started in 2011. Networking and standardization activities in the Technology Industry Group started in 2011. These three activities (see descriptions in section 4.2.2.) were shown to have most of the characteristics of aggregation activities (table 5).

Table 5. What makes the arenas studied aggregation activities?

<table>
<thead>
<tr>
<th>Geels &amp; Deuten, 2006</th>
<th>TransEco</th>
<th>PSL</th>
<th>Technology Industry branch group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardization, model building, writing of handbooks, formulation of best practices</td>
<td>Popularization of results</td>
<td>Gathering of user experience</td>
<td>Participation in standardization and advocacy on legislation development are core activities</td>
</tr>
<tr>
<td>Developing of knowledge for the use of others</td>
<td>Project results open for all participants</td>
<td>Project results open for all participants</td>
<td></td>
</tr>
<tr>
<td>Organized e.g. by industry associations, where “actors perceive themselves as part of an emerging community with collective interests”</td>
<td>Initiated and coordinated by a State Research Institute</td>
<td>Coordinated by a consulting company</td>
<td>Part of Federation of Technology Industries, membership based</td>
</tr>
<tr>
<td>Forums that enable and induce the gathering and interaction of actors</td>
<td>Broad consortium, steering group discussions, seminars</td>
<td>Broad consortium, various gatherings</td>
<td>Regular meetings, seminars</td>
</tr>
</tbody>
</table>

In addition two recent arenas have been founded. The Ministry of Transport and Communications started in February 2012 a working group to study the future fuels and propulsion mechanisms of vehicles (“Käyttövoimatyöryhmä”). The aim of the working group is to evaluate the greenhouse emission potential of different solutions, the cost of them, and to inform consumers about the pros and cons of the different fuels. The scenarios studied include electricity, gas/biogas, ethanol and wood-based fuels.

In order to evaluate and enhance licensing processes necessary for building infrastructure for electric vehicles City of Helsinki established in 2011 electric traffic steering group and decided to develop an administrational municipality borderlines crossing EV charging process. The electric traffic steering group is chaired by deputy mayor and pivotal objectives include designing the definition of city policy regarding EV charging infrastructure both short and long term. In addition the electric traffic steering group is coordinating the city of Helsinki participation and co-operation with electric traffic development program PSL.
6.1.3. Learning

We followed the events or indicators for learning using the EV report by Nils-Olof Nylund of early 2011 (Nylund, 2011) as a basis. Nylund listed the main problems of EV’s compared to ICE cars. They were mainly technical in nature, stating the well-known challenges of range, batteries, charging, standardization, price, availability and lack of user experience.

No technical breakthrough occurred during a little more than one year after the report. The well-known technical challenges of EV’s are still valid. Therefore it is not probable that the battery electric vehicle will become competitive within the existing automobility regime and within the paradigm of an “all-purpose car” for different users and uses.

The big change is about to happen in the field of user experience, as the demonstration platforms are starting during 2012. We do not know about their results yet, and a major disappointment is possible if the cars are not functioning to the satisfaction of the users. Early information, however, is positive. The launch of Nissan Leaf in Finland Spring 2012 was a success according to the tests of the automobile magazines – and a taxi driver uses Nissan Leaf in Helsinki and reports its suitability for taxi purposes. A battery electric bus will start on a short line in Espoo in 2012 (first just driving behind the normal bus). A test drive of small passenger vehicles in Helsinki on a very cold winter day in February 2012 showed that the EV’s worked well.

The EV business is beginning to develop in alliances between vehicle producers and utilities. A Finnish utility company Fortum already entered an alliance with Nissan to provide home charging equipment for Nissan Leaf owners in Estonia.

New groups of actors start to participate in the discussion through very practical questions about the future of EV’s. For example real estate managers started asking about investment plans and planning principles about apartment houses to allow for charging stations.

Initiated by PSL and large utilities a project to gather all the public and semipublic EV charging stations in the same register was launched in the Spring 2012. This database will be open for all the actors and the information will be open and available without any costs. The project is building a co-operation with Nordic venture EVRMAP funded by the Nordic Council of Ministers.

Our informants were all relatively specific about the market opportunities. As Nylund’s statement about EV not being a “general car” (Nylund, 2011) was originally considered a negative statement, both “EV proponents” and “ICE proponents” are unanimous that specified uses like driving on industrial areas (post office, airports etc.), replacement cars of garages, working vehicles of different service operators in city areas etc. are the ones where the market for EV’s will gradually develop. In the TransEco seminar on hybrid and electric buses Nylund stated “Future is not one technology but a multitude of technologies”.

Some of our informants expect that owning a car is not as important to the young generation as it is to the older generation. In the network of the electric traffic niche there are companies developing alternative business models like leasing and car sharing, which would partly solve the problems of high purchase price of EV’s. In some new apartment houses a shared EV and charging place has been leased for the shared use of all inhabitants of the house following a “reserve and use” principle.
In addition to getting domestic user experience the companies work on achieving business in other markets. The main “model” markets for the Finnish companies are Estonia and Norway in which the charging infrastructure providers already have started business.

7. Discussion
The development of the electric traffic niche in Finland has been rapid since 2009 and especially so in 2011 and the first half of 2012. The ICE regime, however, is still very strong and the penetration of electric vehicles on the market is very low.

We report the role of policy instruments in the development of demand for the Finnish electric traffic niche during a short period. EU regulation on emissions of new passenger vehicles develops demand for ultra-low emission vehicles mainly through support on innovative technologies, but apart from that the Finnish policy-makers debate whether electric vehicles should be directly supported e.g. through investment in charging infrastructure.

Creation of demand for innovations requires cooperation between different policy makers. The involvement of transport, finance, environmental and innovation policy makers in the discussions of the vision for sustainable traffic is one of the essential activities in TransEco program. TransEco program consisted mainly of transport incumbents, who have been relatively slow in supporting the electric traffic niche. However, incumbents with their established market presence and large resources (Schot and Geels, 2008) started to get interested in electric traffic in 2011. It may have increased the credibility of the niche among many stakeholders like users and policy-makers.

Electric traffic in Finland is mostly driven by innovation policy, i.e. the interest in developing business for the Finnish companies in the international market. The most powerful policy instrument appears to be a major R&D program (EVE) in which several features of demand-side elements have been included. The actors are unanimous that a lead market (Beise, 2004) is needed to the extent of large scale demonstrations for market knowledge, reference and publicity. These demonstrations are gradually beginning, but the start is not smooth. For example the development of the planned EV fleet is slower than expected both because of poor availability and because of many practical details in addition any negative experiences during the experiments, which have been started with great publicity and plenty of public funding, could turn the hype into a disappointment (Geels and Raven, 2006, Verbong et al., 2008).

SNM literature stresses the role of experiments and recognizes a tendency to stress the technical point of view (Schot and Geels, 2008, Raven et al., 2010), i.e. the supply-side of innovation. The development of technological trajectories and generic knowledge through aggregation activities are described as methods for making the technologies more robust and competitive on the mainstream markets (Geels and Deuten, 2006). In the case of electric traffic in Finland, we saw little evidence of technology breakthrough during the period studied. Instead, the networking and knowledge flows were directed towards creation of demand, like development of understanding the user needs (e.g. PSL demonstration), needs and possibilities for services (e.g. charging services) and information basis for policies (e.g. vehicle taxation).

In addition to the Technology Industry group, which is a classic example of intentional aggregation activities like standardization and lobbying (Geels and Deuten, 2006), we found that technology programs offer good possibilities for aggregation activities, taken that they invest in cooperation within the programs and with other programs and technology users, information sharing, and communication of the results to broad
stakeholder base. We conclude that aggregation activities are effective tools in developing demand for electric traffic, because they enable generic knowledge flows (Geels and Deuten, 2006) and consequently development of competence and various partnerships and understanding of user needs, which are components of demand-driven innovation policy.

We found that the concept of shielding (Smith and Raven, 2012) lends itself to the analysis of policy measures against the main regime properties. However, we found – like Smith and Raven (2012) also argue - that all shielding measures are not policy actions (see table 3). In Finland most types of shielding have been applied. This typology does not directly speak about the supply- and demand-side policy measures, but of affecting the selection pressures of the existing regime. Many of the selection pressures, however are related to demand, e.g. infrastructure, knowledge base, user relations and markets, as well as cultural significance (see table 3).

Nurturing describes mainly the niche internal processes and was used in this study as the measure of niche development rather than an activity of niche management. The niche processes – articulation of expectations, network development and learning - indicated that the robustness of the electric traffic niche is gradually increasing. We are not, however, aware of other studies attempting to use the niche processes as indicators of an ongoing niche development. Therefore it remains to be seen, whether the apparently increasing robustness really indicates the eventual success of the niche.

The networks in EV area are broad, consisting of different actors. The field is dominated by large incumbent companies, either the “actual incumbents” in the transport area like automotive companies and traffic system providers, or the “entrant incumbents” like utilities and producers of electrical equipment, who diversify to the vehicle, transport and charging service area. There seem to be “Greening Goliaths” (Hockerts and Wüstenhagen, 2010) both among the incumbents and entrants. The interaction within the networks increased significantly because of the founding of the new programs and arenas offering possibilities for aggregation activities (Geels and Deuten, 2006).

We saw a gradual convergence and increasing specificity of the articulations of expectations of the field even if the different actors expressed their general conclusions differently. There is common understanding that the Finnish business potential lies more within the electric traffic infrastructure and services than the electric vehicles themselves. The actors increasingly agree where the niche markets will gradually develop, which may be an indication of successful empowerment of the electric traffic niche (Geels and Schot, 2008, Smith and Raven, 2012) and allow for a successful creation of demand.

The articulations of expectations and the learning events question in some cases the underlying assumptions of the regime (Raven et al., 2010), e.g. the necessity of an “all-purpose car” and car ownership. They suggest a possibility for paradigm change, which could allow for a stretch-transform-type of empowerment (Smith and Raven, 2012). On the other hand it is also possible that a fit-conform empowerment model (Smith and Raven, 2012) develops through introduction and penetration of plug-in electric vehicles and extended range electric vehicles. The advocates of electric traffic are not unanimous whether this enhances the transition to electric traffic through development of an extensive charging infrastructure, or just prolongs the era of petrol-based regime.

We propose that interplay of local niche activities and the various policy measures (and other shielding) enhance the development of broader networks and aggregation activities. Aggregation enhances the creation of demand through development of common knowledge and capabilities, interactions between
policy sectors and infrastructure development. The various actors in these activities play an active role in enhancing the empowerment in different ways (Figure 3).

Figure 3. Mechanisms of the development of the electric traffic niche in Finland

The dynamics between “EV promoters” and “ICE promoters” suggests that the protective space for electric traffic is the result of active advocacy, like suggested by Smith and Raven (2012). These dynamics could be captured better if the development of electric traffic was studied in detail using an insider’s ontology (Garud and Gehman, 2012). This is an interesting and possible avenue, because the electric traffic development is still in the making.

8. Policy implications

We found that the Finnish policy on supporting the electric traffic niche is strongly driven by innovation policy, which aims at developing businesses for international markets. The policy-makers responsible for the domestic societal demands (in the areas Environmental and Transport policy) have not considered EV’s a sufficiently ripe technology to be strongly favored compared to other emission-reducing vehicle technologies. Indeed, there are altogether less than 100 electric vehicles and only a handful of public charging poles in Finland at the end of May 2012. The domestic market is, however, considered important for innovations targeted to international markets for reference, knowledge and publicity.

It remains to be seen whether the investment support is sufficient to catalyze the purchasing of the 400-500 EV’s planned for PSL. A small country like Finland is very dependent on international developments. For example the availability of electric vehicles may prevent the successful implementation of policies, which are effective as such. This suggests the need of demand-side policies on the level of European Union, which is a larger home market than individual member states.

Some of our informants believed strongly in technology neutrality of environmental policies. Somewhat similar view was expressed by the evaluators or Finnish Innovation Strategy (Breznitz et al, 2009), when they recommended demand-side policies, which are “impartial to the source, type and application domain
of innovation”, because “governments have a terrible track record at judging which industries are likely to be important” (Krugman, 1996). Technology neutrality principle has, however, been contested e.g. by Azar and Sandén (2011) and Jacobsson and Bergek (2011) as mainly promoting incremental innovation. This may favor the competing transport niches in Finland, like biofuels (ethanol as a component in petrol and renewable hydrocarbon diesel (HVO), as a replacement of mineral diesel oil).

Electric traffic is a very infrastructure-dependent technology, in which at some point the policies need to be more targeted to infrastructure development than to developing more variation in technologies (van der Vooren et al., 2012) in order to create demand for the technology and consequently business opportunities for the companies both in Finland and internationally. In Finland the working group of the Ministry of Transport and Communications, which discusses the future propulsion methods in transport, probably needs to take a stand on which technologies should be promoted in Finland.

The question of technology-neutrality is probably not “on-off”, but there are different situations where different types of policies are needed. The roles of technology-specific and technology-neutral policies in different stages of sustainability transitions should be studied in more detail.

9. References


Session g2
Business models, financing modeling and behavioral aspects of understanding transitions
Markets in Transitions
Investor motives vs. policies to promote investments in renewable electricity production: match or mismatch?

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Abstract

Recent energy policy literature have debated the advantages and disadvantages of policy instruments aimed at stimulating investments for an increased renewable electricity production, e.g. emissions trading systems, tradable green certificates (TGC), feed-in tariffs and investments subsidies (e.g. del Río and Gual, 2004; Jacobsson et al., 2009). A perspective that is missing in the debate is that of the individual investors. Investors are implicitly assumed to be traditional utilities and regional energy companies acting as energy planners, driven primarily by economic motives and, thus, responding well to economic policies (e.g. Fleiten et al., 2007; Kangas et al., 2011; Söderholm et al., 2007). It has also been underlined that the actors who invest in renewable electricity production are a heterogeneous set of actors and that such “non-traditional” investors may be driven by other motives and follow other investment logics that those previously described in the literature (cf. Dinica, 2006; Bergek et al., 2012). This implies that they might not respond the same way to economic policies as most traditional actors.

In this paper, through a study of new actors of the Swedish electricity market, we show that TGC, as an economic incentive, is not the only institutional factor influencing new actors. Some other institutional forces, e.g. norms, values and regulation, affected the actors of our sample. Within the group of new actors, different actors are influenced by different institutional factors and their response also differs depending on the driving-force that led them to join the market, i.e. profit, interest in the technology, need of a solution or efficiency. Finally, our results underline that most investment decisions cannot be expected to lead to long-term system-cost efficiency. There is, thus, a considerable mismatch between policy-makers’ assumptions on the TGC system and actors’ responses to this policy instrument.

Introduction

The transformation of energy systems toward a low-carbon economy requires large investments in renewable electricity production capacity, in terms of new power plants as well as conversion from fossil fuels to renewable fuels such as biomass. In order to stabilize atmospheric CO2 concentration at 450 ppm, global cumulative investments of about 10,000 billion euro (in 2005 year prices) will be needed in the period of 2011-2030 (IPCC, 2011). In consequence, targets for an increased renewable electricity production have been set on European and national levels and countries have developed and implemented a large variety of policy instruments to stimulate investments, e.g. emissions trading systems, tradable green certificates (TGC), feed-in tariffs and investments subsidies. The advantages and disadvantages of these instruments have been debated in recent energy policy literature (e.g. del Río and Gual, 2004; Haas et al., 2011; Jacobsson et al., 2009), based on criteria such as effectiveness and cost-efficiency. In this debate, it has been argued that market-based systems, such as TGC, are good at reaching set targets in a
A perspective that is largely missing in the debate is that of the individual investors. Investors are implicitly assumed to be traditional utilities and regional energy companies that act as energy planners, are driven primarily by economic motives and, thus, respond well to economic policies. Similar assumptions are found in the energy economics literature, where investors in renewable energy are described as a homogenous group of actors following a profit-maximizing strategy and choosing freely between different types of power plants and different locations in order to find the most profitable investment opportunities (e.g. Awerbuch, 2000; Fleten et al., 2007; Gross et al., 2010; Kangas et al., 2011; Koo et al., 2011; Neuhoff et al., 2008; Pettersson and Söderholm, 2009; Söderholm et al., 2007).

However, recent research has found evidence that the actors who invest in renewable electricity production are a heterogeneous set of individuals and companies and that many, if not most, of them have little or no previous experience of the energy industry (Bergek et al., 2012). It has been suggested that such “non-traditional” investors may be driven by other motives and follow other investment logics that those previously described in the literature (cf. Dinica, 2006; Langniss, 1996). This implies that they might not respond the same way to economic policies as more traditional actors. In order to design effective policies to support the deployment of renewable energy technologies, more knowledge is therefore needed about these actors and their investment decision making processes (e.g. Agterbosch et al., 2004; Enzensberger et al., 2002). The purpose of this paper is to add to our knowledge about new actors, i.e. understand how they are affected by economic policies by mapping factors that influence their investment decisions as well as analyze their response to present economic policy, and to discuss the implications of these findings for the effectiveness and efficiency of current policies.

Through a study of new actors of the Swedish electricity market, we conclude that TGC, as an economic incentive, is not the only institutional factor influencing new actors. Some other institutional forces, e.g. norms, values and regulation, affected the actors of our sample. Our findings show that within the group of new actors, different actors are influenced by different institutional factors and the nature of their response also differs depending on the driving-force that led them to join the market, i.e. profit, interest in the technology, need of a solution or efficiency. Finally, our results show that most investment decisions cannot be expected to lead to long-term system-cost efficiency. There is, thus, a considerable mismatch between policy-makers’ assumptions on the TGC system and actors’ responses to this policy instrument.

1. **Policy-makers’ assumptions vs. investors’ responses: an overview of the literature**

1.1 **Factors influencing investment decisions: economic and institutional perspectives**

Since the beginning of the 2000s and the development of clear environmental objectives, policies have been developed to support the deployment of investment in renewable electricity production. The use of economic policies has been advocated before regulatory means and in the latest years, two main types of economic instruments to stimulate increased renewable electricity production have become dominant: quota-based tradable green certificate (TGC) systems and fixed-price/tariff feed-in systems (FIT) (Menanteau et al., 2003). Policy-makers generally aim at designing such systems so that they are both effective, i.e. lead to increased renewable electricity generation and achieved deployment targets, and
cost-efficient, i.e. keep system costs down and avoid overcompensation to producers (Berger and Jacobsson, 2010; Haas et al., 2011).

With regard to effectiveness, policy makers tend to emphasize the importance of reaching set targets, e.g., the renewables directive. In the energy policy literature, researchers however emphasize the need to take a long-term perspective when considering policy goals: the ultimate goal is not to reach national targets but to obtain a full transformation of the EU power sector by 2050, which requires more investments, more production and a larger and cheaper portfolio of technologies to choose from (Jacobsson et al., 2009).¹ In order to achieve the required amount of new renewable electricity production in the short and long term, the literature emphasizes the importance of improving the economic conditions of renewables, i.e. the potential profits for investors (e.g. Khan, 1986; Madlener et al., 2005; Pettersson and Söderholm, 2009; Söderholm and Klaassen, 2007): “Only if the proper incentives are provided the proper investments will be made” (Haas et al., 2011, p. 2188). An implicit assumption here is, thus, that investors are primarily driven by economic motives.

With regard to cost-efficiency, the literature generally encourages policy-makers to take full social and consumer costs into account (Awerbuch, 2003; Berger and Jacobsson, 2010; Haas et al., 2011; Hazilla and Kopp, 1990).² However, policy documents tend to focus on achieving deployment targets at the lowest possible energy system cost (cf., e.g., European Commission, 1999). Following this line of thought, policies should be designed to influence investors to invest at the lowest acceptable margin (e.g. del Río, 2005; Menanteau et al., 2003) and choose the best projects, i.e. the best wind sites or the best technologies (Voogt and Uytterlinde, 2006). In the energy economics literature, this is a main argument in favor of economic incentives in comparison with administrative instruments (e.g. regulation): economic incentives are assumed to stimulate actors to invest where their cost of pollution abatement is lowest (Berger and Berggren, 2012). Implicitly, the assumption is that investors follow a profit-maximizing logic.

From this discussion, it is clear that policy makers as well as much of the energy economics literature consider the deployment of renewable electricity primarily from a neoclassical economic perspective. Investors are expected to invest as long as the economic conditions are good enough and they are assumed to behave according to a profit-maximizing logic. However, this economic-rational approach to investment decisions has been heavily criticized. For example, Wüstehagen and Menichetti (2012, p. 6) challenge the economic-rationality assumption: “We live in a world of bounded rationality, and therefore, perceptions matter, and policy needs to take such perceptions into account.” It has also been argued that economic-rational models of organizational behavior are too simplified since they ignore the influence of social forces on decision making (Granovetter, 1985) and neglect the presence and power of other types of institutions than codified regulative elements (Scott, 1995). Thus, a broader institutional perspective is called for in order to understand how investors act and respond to policy.

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¹ A similar line of thinking is found in the environment policy literature, where targets are set in terms of environmental benefits, e.g. keeping temperature change under a 2°C limit (e.g. Flavin, 1990; Nordhaus, 2007; Pearce, 1991).

² For example, electricity cost reductions resulting from policies can sometimes be larger than the costs of the support scheme (Sáenz de Miera et al., 2008) and the effect of a higher demand of renewable electricity technology may have an effect on, e.g., unemployment levels, which may reduce the overall social cost of a country (del Río and Gual, 2007; Hazilla and Kopp, 1990).
The institutional literature contests the idea that agency is unbounded (Heugens and Lander, 2009); even though people and organizations can and do act in their own self-interest and to the purpose of achieving set goals, their behavior is heavily influenced by internal and external institutions (Munir, 2002b; Oliver, 1997; Parkhe, 2003; Scott, 1995; Zucker, 1987). The institutional context includes factors at the level of individual actors (e.g. decision-makers’ norms and values or organizational culture and politics) or collectives of actors (e.g. public and regulatory pressures) (Oliver, 1997). Three main sources of institutional pressure are emphasized in previous literature:

- **Regulative institutions** refer to rules, such as regulations and laws, customs and traditions (Scott, 1995). They include institutionalized understandings of government policy, infrastructural constraints, bureaucratic requirements and so on (Munir, 2002b) and are related to monitoring and sanctioning activities (Scott, 1995). Actors conform to them because they fear punishment or because it is in their self-interest to do so (Hoffman, 1999; Wicks, 2001).

- **Normative institutions** include values and norms that define what is preferred or considered proper and how things are to be done respectively (Scott, 1995; Wicks, 2001). They “introduce a prescriptive, evaluative and obligatory dimension into social life” (Scott, 1995, p. 37; see also Munir, 2002)). Actors conform to normative institutions because of a social (or moral) obligation to comply (Hoffman, 1999; (Wicks, 2001)) or because it is simply expected of them (Karakaya, 2003; Scott, 1995).

- **Cognitive institutions** are “the rules that constitute the nature of reality and the frames through which meaning is made” (Scott, 1995, p. 40). They include wider belief systems, cultural frames and evaluation routines that influence how actors select and interpret information (Munir, 2002a). Actors follow the rules of the cognitive institutions largely because they cannot conceive of any other alternative (Karakaya, 2003; Scott, 1995), and not because they expect the decisions they make to result directly in a positive outcome, such as a better corporate image or an increased profit (Oliver, 1991).

### 1.2 Responses to policy: a combined economic-institutional approach

Comparing the economic-rational policy perspective with the institutional perspective, we have on the one hand the assumption that actors are motivated primarily by economic factors, including economic policies, which in principle implies that investors will respond well to economic policies as long as these provide high enough profit margins in comparison to other investment options. However, it is also generally acknowledged that actors’ responses to economic incentives are conditioned by the long-term stability of the support system; uncertainty about future prices can raise the risk level for investors and make investments in renewable electricity production less attractive (Finon and Perez, 2007; Söderholm et al., 2007) and policy stability is therefore crucial in order to reassure investors of their ability to make a profit (Agnolucci, 2007; Söderholm et al., 2007). According to this perspective, policy effectiveness is, thus, primarily a question of providing high enough and stable economic incentives.

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3 For an extensive literature review, see Zucker (1987).
The institutional perspective, on the other hand, argues that in organizational fields such as energy, the institutional environment can be just as influencing as the task-oriented environment from which actors source information and resources in order to achieve their direct goals (Scott, 1992). The institutional environment shapes actors’ interests and goals (Scott, 1987), which implies that what they consider to be in their self-interest or what goals they set up for themselves can be other things than what for an external observer seems like the economically rational thing to do (Selznick, 1996; Zucker, 1987). It also influences how actors interact with their task environment. For example, individuals and organizations generally have to comply with, e.g., regulations and societal norms, in order to secure legitimacy, resources and power (Carroll and Delacroix, 1982; DiMaggio and Powell, 1983; Oliver, 1991; Scott, 1995; Zucker, 1987) and institutions also influence what information people select, how they interpret it and what criteria they use to evaluate different action alternatives (Munir, 2002b). This implies that for a potential investor, the legitimacy of a new project in the eyes of relevant stakeholders can be of more importance than a formal evaluation of its return on investment (Munir, 2002b; Zimmerman and Zeitz, 2002; Zucker, 1987).

Combining both these perspectives allows us to ask the following research question:

**RQ1:** *What is the relative importance of different types of institutional factors -- economic incentives vs. other types of regulative institutions vs. norm/values -- on decisions to invest in renewable electricity production?*

There is also plenty of evidence that actors respond in different ways to the same institutional pressures and stimuli. Branzel and Vertinsky (2003) distinguish between two main types of responses to policy: reactive and proactive. In a study of eco-sustainability in China and Japan, they showed that reactive firms comply with policy requirements only when they are sure that other firms will also comply because they do not want to lose their competitive advantage. In contrast, proactive firms decide to benefit from the economic incentives and regulations and turn them into a competitive advantage, e.g. by investing early or by developing products or services resulting from those policies. The drawback with policies leading to reactive responses is that it restricts actors’ freedom of action. As explain by Oliver (1991), actors may try to find ways to avoid complying with that kind of policies and the consequence may be that they, in the future, tend to react defensively to institutional initiatives. Therefore, policies which result in a proactive behavior are to be prioritized because they stimulate more firm-level environmental initiatives leading to a quicker and more effective impact on the environment (Branzeli and Vertinsky, 2003). Firms tend to adopt a proactive strategy when governments use a more liberal approach and use “carrots” and a reactive strategy when governments use “sticks” (e.g. Ashford, 2002; Sharma, 2000).

However, responses to policy also depends on actors motives, background and characteristics (e.g. their ties to the public sector and their relative power) (Davidsson et al., 2006; Zucker, 1987). Policies to stimulate the deployment of renewable electricity production therefore have to be adapted to their intended target groups (Dinica, 2006; Langniss, 1996). An interesting aspect of renewable electricity production in this respect is that the individuals and organizations who invest in, e.g. wind power plants, to a large extent are different from traditional actors in the energy industry. For example, Bergek et al. (2012) show that investors constitute a heterogeneous set of actors and that a majority of them have no or little experience in the energy industry, e.g. farmers, associations, diversified companies, project developers, IPPs, public non-energy organizations. This implies that they belong to different organizational fields, with different norms and values, interaction patterns etc. (cf. DiMaggio and Powell, 1983). It has also been suggested that investors in renewable electricity production might have other motives than economic ones,
such as a wish to induce social or environmental change (e.g. Hockerts and Wüstenhagen, 2010; Schaltegger, 2007; Zahra et al., 2009). As noted in previous literature, there is a need for more knowledge about these investors to be able to understand their responses to policy (Dinica, 2006; Wüstenhagen and Menichetti, 2012), which leads us to ask the following research question:

**RQ2** What are investors’ responses to current policies and how do responses differ between different types of actors?

With regards to the overall policy goals of system effectiveness and cost-efficiency, it seems to be implicitly assumed in the literature that economically rational investment decisions at the individual level will result in high cost-efficiency at the system level as well as goal attainment and long-term system effects. This in effect implies that investors are assumed to have a system perspective and to plan large portfolios of electricity production plants based on comparisons of different investment opportunities (e.g. different locations and energy technologies) across the entire electricity system, in order to minimize the costs of electricity generation at the level of a local, regional or national energy system (cf. Awerbuch, 2006; Bhattacharya and Kojima, 2012; Carlson, 2002). Considering the differences in motives and backgrounds among investors in renewable electricity production, the extent to which this assumption is realistic is unclear. We therefore ask our third, and final, research question:

**RQ3**: To what extent do investors in renewable electricity production contribute to long-term system effectiveness and cost-efficiency?

2. **Methodology**

The study focuses on the Swedish market for renewable electricity production, which is relevant to the question about the response of new investors to economic policies in two main ways. First, since 1996 the Swedish electricity market is completely liberalized, which implies that there is a large freedom for new actors who want to invest in renewable electricity production (Bergek et al., 2012). Second, since May 2003 a TGC system provides economic incentives for investment in renewables such as biomass-based power, hydro power, wind power and solar power; renewable electricity producers can not only sell the electricity they produce to trading companies or directly on the Nordic spot market, but also trade the certificates they receive on a separate certificate market.

In the paper, the words ‘investor’ and ‘actor’ are used interchangeably. These are individuals, companies or organizational sub-units, who have invested in new renewable electricity production plants, e.g. a wind turbine, mobilized resources to realize the idea and taken ownership of the plant once it was in place. We consider them to be ‘new’ if their main area of business before the investment in renewable electricity production was not energy-related. In the Swedish context, this definition excludes state-owned and privately owned utilities and energy companies (Bergek et al., 2012). In July 2011, new actors owned about 70 percent of the renewable electricity plants in Sweden and about 55 percent of the installed capacity (Bergek et al., 2012).

Data were collected through semi-structured interviews. We selected our interviewee sample from a database containing all plants in the Swedish electricity certificate system as per July 2011, supplied by the Swedish Energy Agency. This database includes a total number of about 1,400 unique new actors who own at least one renewable electricity production plant. These are distributed across seven organization types. i.e. independent power producers (IPPs), farmers, diversified companies, project developers, sole traders,
publicly owned non-energy companies and associations, and four energy sources, i.e. wind power, biomass-based power, hydro power and solar power. Ideally, all the resulting 28 new actor categories should be included in our study. However, the database does not include the names and addresses of sole traders, which means that we have no way of identifying or contacting new actors of this type. Moreover, the database does not contain all categories of new actors. For example, none of the hydro power plants is owned by a project developer and no biomass-power plant is owned by an association. We also decided to exclude solar power from the study, because of the low number of solar power plants in the database. The study covers the remaining 15 categories of new actors.

The total number of new actors in the database varies substantially between categories. The largest category, i.e. wind power IPPs, contains 252 unique new actors, whereas the smallest categories only contains 1 unique new actor. This is to some extent reflected in our sampling strategy, but the selection of new actors to include in our study is not based on a strict statistical sampling logic. Instead, we aim at achieving a representative sample based on maximum variation, where the number of new actors interviewed in each group category is decided based on the amount of new information that comes out of each interview. In total, we aim at including about 40 investors in our study. However, at this point in time, the study is still on-going, which implies that this conference paper is based on a more limited empirical material. So far, we have included 22 investors, distributed between investor categories as described in Table 1.

The interviewees were people who had been actively involved in the investment process for at least one of the investor’s renewable electricity production plants. Interviews were recorded and transcribed after the interview. The interviewer also took notes during the interview. The interview transcripts were coded independently by two researchers, using a semi-structured approach where a number of pre-selected themes were complemented by emerging themes. Each researcher then did her own synthesis of the transcripts, collecting statements related to each theme and analyzing them within and across investor categories. These syntheses were used as a starting point for a joint analysis of the material, which forms the basis for the results presented in this paper.

Table 1: Overview of actor categories and interviewee sample (number of interviews and share of total number of actors in each category)

<table>
<thead>
<tr>
<th>Category</th>
<th>Wind power</th>
<th>Biomass-based power</th>
<th>Hydro power</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPPs</td>
<td>5 (2%)</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>6 (2%)</td>
</tr>
<tr>
<td>Farmers</td>
<td>3 (4%)</td>
<td>1 (50%)</td>
<td>0 (0%)</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Associations</td>
<td>1 (1%)</td>
<td>-</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Diversified companies</td>
<td>1 (2%)</td>
<td>4 (12%)</td>
<td>1 (1%)</td>
<td>6 (3%)</td>
</tr>
<tr>
<td>Project developers</td>
<td>3 (8%)</td>
<td>1 (100%)</td>
<td>-</td>
<td>3 (8%)</td>
</tr>
<tr>
<td>Publicly owned, non-energy</td>
<td>0</td>
<td>1 (5%)</td>
<td>0 (0%)</td>
<td>1 (3%)</td>
</tr>
</tbody>
</table>
3. **New actors investing in renewable electricity production: driving forces and investment behaviors**

3.1 **Driving force patterns: 4 actor types**

When coding and analyzing the interviews, five quite distinct actor types were identified, each characterized by a particular investment driving force. In the following, we will structure the empirical description according to these four types. We named them after what drove them to invest in renewable electricity production: profit, technology, problem solution and efficiency. Each type is illustrated by an empirical example.

3.1.1 **Profit-driven actors**

In our sample, one group of actors consists of ‘speculators’, who were driven exclusively by the profit that they could gain from investing in renewable electricity production. These actors had a clear economic motive for investing and were aiming at profit-maximization. The latter was clear both from how they evaluated the investment, e.g. taking into consideration the potential evolution of TGC prices and electricity prices, and from how they went on with their investment processes, e.g. comparing different banks to get the best interest rate.

The profit-driven actors in our sample started their investment process by scanning the market for profitable investments matching their resources, e.g. knowledge and experience, and they invested because they thought that it would generate economic value. In addition to Example 1, which describes the investment process of some people who wanted to start their own company, we can mention the example of a farmer who was not satisfied about the overall profitability of the farming business and therefore looked for new ways of earning money. He had access to land and considered wind-power as good and time-effective way of earning money.

These actors were very rational in an economic sense when they made their investments. They usually recognized several opportunities and evaluated them before choosing the most profitable and resource-matching opportunity. For example, many large IPPs gathered large project portfolios in order to pursue the projects that were the most profitable at that particular point in time and their particular institutional context. To choose which projects to pursue, they had a number of assessment criteria where both potential production, e.g. wind situation, and potential costs, e.g. average time to develop the project including potential obstacles from the municipality, played a role. This was in stark contrast to the other four types of actors, who did not really consider any alternative investments. The profit-driven actors also made a detailed investment calculation and most of them made a complete technical investigation before choosing technology supplier and equipment. Since they regularly invested and planned new investments, they continuously followed the evolution of electricity and TGC prices as well as the political decisions related to the electricity sector. The actors that we interviewed were clear with the fact that they would not have considered investing in renewable electricity production if economic incentives, i.e. TGC, had not existed.
Example 1: A profit-driven investor

This wind-power production company was founded in 2006 by four people. Among them, one had prior knowledge of the energy industry through his previous job position as the energy manager in a pulp and paper company, and the others had business experience. After working for some time in the energy sector, they decided to start their own company. They were all interested in energy issues and, in particular, in renewable energy. Overtime, they have gathered a portfolio of potential projects to be developed through continuously scanning the market for new projects. They accessed natural resources by taking contact with owners of land with high wind potential or they got directly contacted by land-owners interested in selling or renting their land, or willing to own a share in a wind power project. At the start of their business, they hired key competences to get access to technological knowledge and since then, they have continued to develop their resources in term of knowledge and experience by developing new in-house company activities, e.g. through the creation of subsidiaries managing project development or maintenance. For each project that they developed, they had clear investment criteria that they used to evaluate each project before making the investment, for example wind conditions, electricity prices, tradable green certificate prices, potential institutional obstacles. To be pursued further, a project had to generate a return of investment of at least ten percent. Financial resources, i.e. investment capital, were accessed through share offerings, bank loans and internal capital. They cooperated with several banks and signed contracts guaranteeing the delivery of wind turbines of on-going projects. In total, the company owns approximately 250 MW in operation or under construction.

3.1.2 Technology-driven actors

The investment processes of technology-driven actors started with a strong interest in technology combined with an interest in renewable energy. They were among first-to invest in renewable electricity production, often at a time when current economic policies had not yet been developed. They did not see their investment as a financial investment but more as a commitment or a hobby.

Most project developers belong to this actor group. They were initially driven by an interest in technology, but during their own first investment they realized that knowledge about renewable electricity project development was in shortage in the market. Seeing this as a market potential, they decided to develop a new service, i.e. the development of turn-key projects, targeted at those who were willing to invest in renewable electricity but who lacked the knowledge required to develop projects on their own. In Example 2, we describe a pig farmer who developed biogas technology to use at his own farm, which he later sold to other farmers together with a project development service.

Technology-driven actors did not have much of an economic motive to start with and they were certainly not following any kind of profit-maximizing logic. Instead, they were driven by the personal satisfaction of developing a technical project. The clearest evidence of this was that they did not consider spending their own time on the project as a cost. The actors that we interviewed were all aware of the economic incentives for investments in renewable electricity production but they were also clear that they would have invested even without them.

Technology-driven actors who became project developers after their first investment had some degree of market-orientation and also stated that they had in mind from the beginning that the technology was likely to become more profitable over time and that they would not have invested if it had implied a net cost, even if it had created environmental value. Nevertheless, they did not choose a profit-maximizing strategy in the same way as the profit-driven actors. This was demonstrated in several ways in our interviews. For example, most of them did not want to expand their project development service business, in spite of the fact that this was generating most of the company’s revenues and profits. Instead, they insisted that
electricity production was their main business and that project development was just something they were doing because there currently was a demand for it.

Example 2: A technology-driven actor

When he invested in biogas the first time in the 1990s, this pig farmer had no prior knowledge in the energy market and no technical knowledge related to biogas. What he had was a very strong interest in biogas and in mechanics in general, and the idea that biogas could be a way for him and his energy-craving farm to save money on energy costs. He started looking for information about the technology, e.g. by visiting other biogas farms in Denmark and in Germany, and decided to build his own plant. The technology did not work at first. He therefore looked for more information and support. With the help of two people with large knowledge and experience in building biogas plants, he and one of his friends were finally able to restart the plant, almost ten years later (in 2006). During this process, he realized that the biogas technology available on the market was too complex and not appropriate for people or companies with no access to technical knowledge, e.g. other pig farmers. He therefore decided, together with the friend that helped him to finish his own investment, to start a business providing project development services to those interested in building biogas plants. The development of this business did not require external resources, since his clients paid for the project development costs and the two entrepreneurs handled their own administration. They developed five projects before deciding to sell the company when the demand grew so much that they could not handle both their main business (pig farming) and their project development firm at the same time.

3.1.3 Solution-driven actors

The solution-driven actors in our study were pressured to invest by a problem that they had to solve. This was the case for the majority of the diversified companies, but also for some of the IPPs and some of the farmers. In several cases, problems were caused by a change in the institutional environment, for example changes in regulation, legitimacy challenges related to corporate image, or reduced demand for the companies’ core products. In other cases, problems were more directly related to company-internal situations that needed to be handled, such as tax issues resulting from high profits, an overflow of raw material or a generation change. These external and internal pressures led to a situation where the company or the individual had to look for a problem solution. They scanned the market for alternative solutions and decided to invest in renewable electricity production since it was an economically sound option.

Pulp and paper companies are overrepresented in this group. In Example 4, we describe how an institutional change influenced the decision of one of these companies. Some other companies mentioned tax issues as the problem triggering investments in renewable electricity production. For those companies, investing in a renewable electricity plant was a way to re-invest the large profits coming from their main activity: investing in real estate, such as a wind-power plant, allows the investor to deduct the depreciation of their investment from the annual tax. This is the reason why an auditing firm and a farmer, among others in our sample, decided to make the investment.

In a few cases, the environmental impact of the investment was a very important feature as well. However, the environmental motive was primarily related to corporate image and not to environmental value as such. This was the case for one of the pulp and paper companies in our sample, which was presented in the media as a particularly bad example of chemical management. The company needed to restore its image and therefore looked to the energy area for large enough investments to get media attention. For that reason, they transformed the production to stop the use of polluting chemicals, invested in a boiler
maximizing the production of steam and electricity, and recently invested in an innovation for electricity production generated through low-temperature steam.

The solution-driven actors had a clear economic motive for investing, but the investment did not have to be profitable in its own right. Instead, the main interest of these actors was to find a way to solve their problems while keeping the cost of the solution down. By investing in renewable electricity production, most of them could actually turn their problem into profit generation, but that was more of a bonus. Since the economics of the investment as such were not that important, most of the solution-driven actors did not look for ways to maximize their profits from it. For instance, most of them did not make a detailed investment calculation or consult several banks in order to discuss and get the best interest rates. They tended to rely on advice from their network or from a project developer when it came to strategic choices such as technology supplier, size and type of plant or electricity buyer. Also when such choices were made by the actor, other logics than profit-maximization were applied. For example, one of the solution-driven actors in our sample chose to invest in a smaller wind turbine than economically efficient in order to avoid losing his majority share in the plant.

Example 3: A solution-driven actor

For this paper-pulp company, the process was triggered by a change in the regulation regarding use of landfills in 2005. The information that this change was coming was communicated already in the mid-1990s. At that point of time, the company started looking for solutions to handle their waste, i.e. the residue left from recycled paper fiber. They evaluated different kinds of solutions, such as cement production, but they finally decided to invest in a high-pressure boiler for recycled fiber sludge with a high enough bar pressure to produce both electricity and steam. It was a really important investment, worth approximately 30 million Euros, and it actually provided them with solutions to several problems: they could dispose of their waste by burning it and, at the same time, minimize their oil and electricity bill by using the energy value of the residue fibers in a different way. They cooperated with the municipality and applied for external funding to finance a part of their investment as well as a part of the district heating system which was able to use the low-temperature steam left from the company’s production process. The rest of the investment was financed at the corporate group level. The company hired services from a project developer. Several boilers were evaluated in order to find a plant matching their capacity need as well as their investment capital. Selling the electricity production was not a goal at that time, since electricity prices were really low. They instead focused on maximizing the production of steam and electricity to use in their own process. The investment decision was made at the beginning of the 2000s and the production started in 2005. Today, they only produce 10% of their own electricity use, but they save a lot of energy by producing all of the steam they need in their production process and they earn money by selling low-temperature steam through the district heating system. They also hope that the investment will have an impact on the number of CO2 allowances that they will be granted in 2013.

3.1.4 Efficiency-driven actors

The last subgroup that we identified were actors who had initial access to a natural resource, for example land, water or biomass, which became valuable due to an external incentive or pressure, e.g. rising electricity prices, information from project developers, municipal wind power planning processes or the implementation of the TGC scheme. As described in Example 5, the main share of this subgroup is the group of farmers: they had access to land or water and, through network, e.g. information meetings organized by project developers or recommendations from their auditor, they realized the value of their resource. Another example is a grain mill owner, who had a stream running over his property. He knew that
there was enough water in the stream to produce electricity, because there was an old, non-operational hydro power plant in the mill, but the main reason he started to consider reconditioning or replacing the old turbine was that his customers, i.e. the farmers coming to use his grain mill, kept asking him why he did not use the water.

The efficiency-driven actors did not evaluate several projects. Instead, they based their decision on the natural resource that they owned, and designed the investment around that natural resource and their individual situation. The main motive of the efficiency-driven actors was economic, but in terms of resource efficiency rather than profit generation: they did not like to see a valuable resource go to waste. In a sense, this could be seen as a sustainability motive, but these actors did not see themselves as part of an environmental movement or ideology and they made it very clear that they would not have invested in electricity production if it had involved a net cost for them. Similar to the solution-driven actors, they did not always make economically rational decisions when developing and exploiting the opportunity; most of them did not make a detailed investment calculation, consult several banks in order to get the best interest rate or compare different equipment suppliers. They also tended to reinvest all profits into amortizing their loans much quicker than required by the banks, despite very low interest rents. This leads us to conclude that they prioritized security, or at least their perception of a secure investment, over profit-maximization.

From a policy perspective, it is especially interesting that these actors did not have much knowledge about policy incentives prior to the investment. Even at the time of our interviews, when the investment had been made and the plant was in operation, they did not follow the evolution of the TGC prices or mention that they were affected by decreasing certificate prices.

**Example 4: An efficiency-driven actor**

This egg farmer was very skeptical to wind-power production, but this changed when he read in the local newspaper that the municipality was going to appoint areas where wind-power plants would be allowed in the future. He could not stand letting someone else decide over his land and did not want to let a potential opportunity go to waste. He therefore applied for a building permit for a wind-power plant before any decision had been made on the municipality level. When he got the permit, he was still not sure that he was going to invest. However, the egg production activity had been going very well that year, and his auditor therefore recommended him to invest in depreciable assets, such as a wind-power plant or real estate. He through that building a wind power plant was a good way to diversify the company, so he hired a project developer. When he saw the project developer’s calculations, the project looked very profitable and he therefore decided to invest, even though his lack of prior technological or market knowledge in the field made the investment seem uncertain. He received a 15% investment subsidy from the government and took a bank loan to finance the rest. The supplier and turbine were chosen based on the recommendation from the project developer. Today, he sells his electricity to a local electricity supplier and is discussing with an IPP to let some of his land to the construction of a new plant.

3.2 Institutional pressures and actor responses

3.2.1 *Profit-driven actors*

As previously described, the profit-driven actors reacted unquestionably to economic incentives. They wanted to invest in an activity that could maximize their profits and scanned the market in order to spot the most profitable ones. For that reason, it is clear that the extra incomes coming from TGC made an
important difference and led profit-driven actors to invest in renewable electricity production instead of any other profitable activity.

In the way they designed their investments, profit-driven actors reacted almost exactly the way policymakers expect them to: they invested in large projects (often wind parks), gathered project-portfolios and made economic rational calculations in order to invest in the most efficient projects. It should be acknowledged, however, that actors also took into consideration the cost of potential institutional obstacles, e.g. delays in permit processes and potential municipal veto, in their calculations. In some cases, this led to prioritizing projects with higher chances to get approved over projects with higher production potential but higher risks of institutional obstacles.

Despite their strong reaction to policy, the profit-driven actors behaved in a very proactive way, which implies that even under the TGC they would have invested in other activities if they were more profitable than renewable electricity production. This also holds for future investments; the profit-driven actors clearly stated in the interviews that without TGC, or with low certificate or electricity prices, it would not be worthwhile for them to invest further in renewable electricity.

3.2.2 Technology-driven actors

The technology-driven actors did not respond to policies at all. As previously explained, they did not have economic motive to begin with, but were driven by the self-satisfaction that they could get from developing their project and from working with their hobby. However, they were clearly influenced by norms and values, which gave them a positive feeling about investing according to their interest. These norms were to a large extent shared in the actors’ networks, which were designed their interest. The technology-driven actors who later on decided to become project-developers were also driven by the will to spread the technology, to answer a market need and to improve the system. They, thus, took on some responsibility for long-term system change, driven by a combination of internal values and economic possibilities.

The level of proactivity of this actor-type was very high. They were often first-movers on a market that, at the time of the investment, was not very profitable. They invested in renewable electricity because they wanted to and because it gave them satisfaction; not because they were driven by the economic value or because they were forced to by any regulation. The fact that when they decided to become project-developers also shows their level of proactivity: they turned the market need and the political goals into their advantage.

3.2.3 Solution-driven actors

Solution-driven actors were in general very reactive to institutional pressures: they would not have invested if they had not been pressured to do so. A majority of them were affected by regulations, e.g. new laws or taxes. They would not have invested in renewable electricity production if they had not been forced to solve a problem created by policies, but it was just one solution among other alternatives. These actors chose renewable electricity because other alternatives were too expensive, required too much work or were not interesting enough.

Economic incentives were, thus, not a very influential factor at the time of the investment. Nevertheless, solution-driven actors are now benefitting from them, which increases their profit. For example, one of the actors was a pulp and paper company that was forced to solve a problem initiated from a change in landfill
regulations. Their solution was renewable electricity production. This large investment, e.g. 30 million euros, was justified in comparison with the potential cost of not complying with regulations combined with the revenues from electricity and steam generation. When the TGC system was introduced in 2003, this plant was included in the system, although all investments had already been completed and the plant was profitable.

Some of the solution-driven actors were primarily affected by norms and values. This was for instance the case of some farmers who were facing the challenge of managing a generation change, i.e. leaving or selling the family business at an advantageous price to one of their children. For these actors, investing in a wind-power plant and donating them to one of the other children was a way to be fair. Here, values such as fairness influenced actors. Companies, who were confronted with image problem or bad reputation due to environmental issues, were also pressured by norms and values. Investing in renewable electricity production was a way to conform with, for instance, customers’ environmental norms and therefore to (re)gain legitimacy.

3.2.4 Efficiency-driven actors

Efficiency driven actors were strongly affected by norms and values. As previously mentioned, farmers were overrepresented among this type of investors. From our interviews, it was clear that they shared norms and values which led them to invest in renewable electricity production. Many efficiency-driven actors mentioned that it was important for them to make the best use of the resources available to them and that they took pride in the fact that they were making a living from their own resources. Independency was indeed something that they worked for and they did not want to be controlled or pressured by institutional decision-makers. To illustrate this value, we can once more refer to Example 4, where the farmer actually apply to a building permit even before the decision to build was taken, strictly motivated by the fact that he did not want the local municipality to decide over his land. Despite long-time efficiency thinking, the efficiency-driven actors were not driven by sustainable or environmental motives. However, they felt that it was their responsibility not to compromise the livelihood of themselves and future generations of farmers.

Networks were very influential for these actors. In most cases, they had someone, in their networks, e.g. a neighbor or a fellow farmer, who had invested in renewable electricity production before them. This is often what triggered them to see an opportunity in doing so themselves. Without the influence of their network, they would probably not have seen the potential value of the unexploited natural resources that they owned. In that sense, efficiency-driven actors can be considered as reactive. Networks also played a crucial role in making the project possible: information regarding technological knowledge, institutional contacts, etc. was provided by actors’ network, often through project developers whose services had previously been used by network members.

Economic incentives did not affect efficiency-driven actors much. Most of the actors that we interviewed followed the development of electricity prices, but were not aware of important details of the TGC scheme, such as how long they were entitled to receive certificates or that a common Norwegian-Swedish market for TGC was planned. They did not compare different projects, e.g. locations or technologies, but instead designed the whole investment around their natural resource. Investing in another location than their own would not have made much sense to them, since their main interest was to make best use of their own resources.
4. **Investors’ responses to economic policies: match or mismatch?**

4.1 The relative importance of different types of institutional factors

From the actor type analysis in Section 4, it is clear that economic incentives developed by policy-makers influenced few of the new actors investing in renewable electricity production in Sweden. Indeed, economic incentives were decisive only for one type of investors: profit-driven actors. Economic incentives also had some influence on the solution-driven actors, in that they induced them to produce more electricity or to save electricity or steam in their own process. However, economic incentives were not what influenced these actors to invest in the first place. Instead, they were pressured to invest by regulation related to other business areas. The other types of actors, i.e. the technology-driven, the efficiency-driven and some of the solution-driven actors, were not pressured at all by policies (see Figure 1). They were instead influenced by norms and values, e.g. technological values or influences coming from their network.

This implies that the assumption that market-actors design their investments driven by economic motives and in a rational way to maximize their profits (cf. Lauber and Schenner, 2011) is largely wrong, at least in this actor group. Most of the actors in our study were influenced by other factors, such as a strong interest or values. In addition, some actors, i.e. the solution-driven actors, were influenced somewhat by economic incentives, but they still did not aim at maximizing their profits from that particular investment since regulations were efficient enough to get them to comply and invest.

Another implication is that norms and values play an important role in influencing some types of new actors to invest, i.e. the efficiency-driven actors, the technology-driven actors and some of the solution-driven actors (see Figure 1). This is in accordance with what has been claimed by institutional scholars (cf., e.g., Munir, 2002b; Scott, 1995; Zucker, 1987), but what has not been fully acknowledged in the energy economics and policy literature.

4.2 Proactive and reactive responses to institutional factors

As could be expected, different actor types responded in different ways to the same basic institutional incentives and pressures. In accordance with the work of Branzei and Vertinsky (2003), both proactive and reactive responses were identified among the investors. For example, profit-driven actors responded proactively to policy by recognizing an investment opportunity, whereas solution-driven actors responded in a reactive way; they did not invest in renewable electricity production on their own initiative, but were largely forced to comply with regulation or other external pressures. However, in contrast to what was described in the literature, these two types of behaviors could also be seen among actors who responded to normative institutions rather than policy (see Figure 1). For technology-driven actors, the influence of norms, values and cognitive frames was an encouraging driving force, leading to personal satisfaction, but for efficiency-driven actors it was more of a pressure to take on the responsibility to preserve their resources for future generations. This implies that actors who respond to normative institutional incentives and pressures are not necessarily passive, but can demonstrate real agency.

As described in the literature, proactive behavior was associated with economic incentives rather than with regulation for actors who were responsive to policy, i.e. profit-driven actors (cf. Ashford, 2002; Sharma, 2000). For actors who responded more to normative incentives and pressures, proactive behavior was also
associated with ‘positive’ stimulus, e.g. in the form of self-interest or shared interests within a community of peers, whereas reactive behavior was associated more with ‘negative’ pressure to do what was right in the eyes of some stakeholder. This implies that what has previously been written about ‘carrots’ and ‘sticks’ can also be applied to norms and values. However, an interesting observation is that both proactive and reactive behavior has actually resulted in new renewable electricity production, which to some extent contradicts Branzei and Vertinsky’s (2003) statement that policies that encourage actor proactivity should be preferred over policies that force actors to comply and therefore only leave them the chance to respond in a reactive way.

![Figure 1: Actors’ responses to institutional influences](image)

4.3 Investor responses vs. effectiveness and cost-efficiency

Economic incentive in the form of TGC has clearly induced proactive behavior of profit-driven actors, who entered the renewable electricity market largely because of these incentives. The policy assumption that actors who respond to economic incentives will choose the most effective projects has been partly true in this case. Their profit-maximization strategy indeed led them to gather project portfolios and to compare projects in order to get the most efficient projects in terms of costs and production (see Figure 2a). However, they do not only consider ordinary investment costs in their comparison of alternative investment options, but also institutional costs, such as the costs resulting from institutional obstacles. This implies that they might consider a non-optimal project – from the energy system point of view – if the institutional obstacles related to a better project are too big.

There is also a limit to these actors’ involvement in the renewable electricity market. Just as their proactive behavior led them to invest in renewable electricity production, it can quite easily lead them to become attracted to other opportunities appearing in other markets. Since they are very responsive to external influences, they are likely to respond quickly to uncertainties in the renewable electricity market by abandoning their current activity for one that seems more attractive, as they did when they made their
investment in this case. In addition, since they are only driven by economic motives, they will also most likely stop investing when their certificates are phased out or if there is a risk of price changes in the electricity or certificate markets. We therefore would argue that profit-driven actors are unlikely to make a large contribution to long-term system change and overall system effectiveness (see Figure 2b).

Solution-driven actors responding to regulation also considered different investment options and alternatives before investing in renewable electricity production and are therefore likely to contribute to system cost-efficiency (see Figure 2a). Due to the large-scale nature of their investments, they are likely to have a more long-term focus than profit-driven actors, but they are still very much dependent on regulation and economic incentives to justify their investment. If regulations were withdrawn they would lose the problem that pressured them to invest, and if they would not receive any economic incentives other options would become more attractive. Their long-term commitment can, therefore, be questioned (see Figure 2b).

The two types of actors who do not respond much to regulation or economic incentives, but instead follow norms and values, did not make a thorough investment analysis to get the best results, but instead considered whether their specific project’s premises were good enough for the project to be worth developing. They neither considered any other investment alternatives than renewable electricity production, nor made an active choice of location or technology. Efficiency-driven actors, for instance, tended to design their whole investment around the natural resource that they had access to and technology-driven actors planned their investment based on their interest in the technology. Neither of these actors is therefore likely to choose the most cost-efficient projects from a system point of view (see Figure 2a).

From a system-change perspective, the strength of technology- and efficiency-driven actors is that they have a long-time perspective. Since they are not affected much by policies, they are unlikely to quit the market suddenly if the economic incentives are phased out. They also tend to be part of networks sharing the same norms and values, which imply that they can contribute to spreading those norms and values to others, contributing to a long-term system change (see Figure 2b). A good example of that is the larger group of technology-driven actors who decided to become project developers after their first investment and who now share their experiences with other potential investors and, indirectly, contribute to a system-change.
Figure 2: Actors responses to economic incentives vs. actors’ contributions to cost-efficiency and system effectiveness

5. Conclusions and policy implications

The purpose of this paper was to add to our knowledge about non-traditional investors and how they are affected by economic policies by mapping factors that influence their investment decisions and their response to current economic policy and discussing the implications of these findings for the effectiveness and efficiency of current policies.

Our first research question concerned the relative importance of different type of institutional factors on decisions to invest in renewable electricity production. The results showed that new actors initially invested in renewable electricity production influenced by many different institutional factors: economic incentives, regulations, norms and values. Despite policy-makers’ focus on economic incentives, it was most often other factors that triggered actors’ decision, e.g. regulation, norms and values.

This implies that policy-makers should consider other mechanisms than the strictly economic incenting ones in order to encourage new actors to invest in renewable electricity production. Making investments attractive may, for instance, be a matter of information or networking resulting in investors recognizing the value of their natural resources, as it has been illustrated in the case of the efficiency-driven investors. Moreover, the impact of policy combinations, i.e. regulatory policies combined with economic incentives, is questionable. Rewarding actors who would have made the decision to invest anyway, because of regulatory imperative, is neither cost-efficient nor has any great impact on system change.

Our second research question regarded the influences resulting in investors’ decision to join the renewable electricity market and whether new investors in renewable electricity production responded differently from each other. We showed that different actors responded different ways to different influences. Some of the actors were proactive in their response to policy, but others were reactive. Likewise, some of the actors were reactive to norms and values, whereas others were proactive. Proactive responses could primarily be seen among those who either had a clear market-driven behavior (profit-driven and diffusion-driven actors) or a strong personal interest in the technology (technology-driven actors). Reactive responses characterized solution-driven and efficiency-driven actors.

This implies that policy-makers should acknowledge that investors in renewable electricity production are not a homogeneous group reacting the same ways to policies. Policy-makers should not only use economic
incentives to encourage investments and most of all, policies should be designed differently to target specific groups of actors.

Finally, our third research question concerned the contribution of investors in renewable electricity production to long-term system effectiveness and cost-efficiency. A first conclusion here was that very few of the investors acted according to the profit-maximizing logic assumed by policy makers and, in consequence, investments were not always made in the best projects from an energy system point of view. This implies that the assumption that TGC systems will lead to high cost-efficiency was not supported in our study. The study also identified a clear dilemma between cost-efficiency and effectiveness. Actors who were affected by economic policies reacted in a cost-efficient way, but at the same time could not be expected to contribute to long-term system change since they proactively seek for new opportunities and are likely to diversify out of renewable electricity production if and when the economic conditions change. In contrast, actors who were not very much affected by policies but rather by norms and values had a long-time perspective and are therefore more likely to contribute to long-term system change, but these actors did not behave in a way that will lead to system cost-efficient. An implication of this is that if a real change of the energy system is the goal, then the focus on the cost-efficiency of policies should be minimized and policies should target actors who are influenced by their norms and values instead of profit-maximizing actors. Finally, the elimination of institutional obstacles, e.g. slow and complicated permit procedures, is crucial to reach a change in the energy system. Even actors who answer policy-makers expectations in terms of response to economic incentives are likely to choose less efficient projects due to costs generated in administrative procedures.

To sum up, we our main conclusions are that only one type of investors – the profit-driven actors – has been substantially influenced by the current TGC system. Since these actors follow a profit-maximizing logic, they can, however, not be expected to contribute much to long-term system changes. Due to the influence of other institutional forces, e.g. norms, values and regulation, most investment decisions in our study have not been driven by profit-maximizing ambitions and cannot be expected to lead to long-term system cost-efficiency. There is, thus, a considerable mismatch between policy-makers’ assumptions about the effectiveness and efficiency of current economic policy and actors’ responses to this policy instrument.

6. References


Business model resilience in the context of corporate sustainability transformation

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Abstract

The transition to sustainability will not work without rebuilding the economy, i.e. changing its concrete production and consumption patterns. These changes are essentially triggered by corporate strategies (Sommer, 2012; Stubbs/Cocklin, 2008; Lüdeke-Freund, 2009). Therefore, a great part of such a transition will be self-directed transformation processes within individual companies to reduce their environmental impact. Considering that such changes may be wide-ranging and substantial, the major challenge for companies is to identify strategies that contribute substantially to societal transformation processes without de-stabilizing the future existence of a company (i.e. a „resilient“ transformation strategy).

In the social-ecological research resilience generally means the capacity of a system to adapt itself to processes of change and to shape these processes at the same time without compromising the structure and identity of the system itself (Holling, 1973; Gunderson, 2000; Walker et al., 2004). For successful companies this conservation of their structure and especially their identity – e.g. as a brand – is particularly important to continue being successful. Therefore, business model resilience can be understood as the ability of companies to adapt their business models in the face of external shocks or pressure, without losing their identity built by its core business model or its brand.

A resilience approach has not been applied with this perspective to the study of companies and their business models, yet. However, applying such an approach could be useful to better understand companies’ scope of action for self-directed transformation processes within established regimes and, more generally, it might provide new insights for strategic management research.

The hypothesis of the paper is, that business models are in most cases more resilient than assumed but not indefinitely flexible. An empirical basis is needed, in order to classify different types of business model transformation and draw conclusions with regard to their resilience. Exemplified by the fast food industry the paper will develop such an analytical framework.
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Introduction

Although the “Limits to Growth” (Meadows et al., 1972) are being discussed since 1972, global environmental pressure is continuously growing. Recent environmental studies confirm that we should stay within the “safe operating space for humanity” (Rockström et al., 2009: 472), in order not to overstep planetary boundaries.

A major challenge is that these boundaries refer to collective or common goods and the sectors where a transition is actually needed are characterized by a high influence of incumbent firms. Therefore, a transformation of corporate strategies by those powerful companies themselves play a crucial role in “managing” the transition. Since the transition to sustainability will not work without rebuilding the economy, i.e. changing its concrete production and consumption patterns, it is also interesting to analyze how this dilemma could be solved. Therefore, it is important to explicitly focus on incumbent companies. Due to their power and the fact that they translate needs into concrete products and services, the rebuilding of the economy will essentially be triggered by corporate strategies or at least will hardly be possible without it (Sommer, 2012; Stubbs/Cocklin, 2008; Lüdeke-Freund, 2009; Reichel/Seeberg, 2011).

However, it is clear that despite improved technology and innovations of many products and services, a change in (almost) all important sectors, like transport, energy or food, is still needed (van den Bergh et al., 2011). This includes not only a change of the technological production patterns (like technology, infrastructure, knowledge), but also a change in norms, cultural values and in consumption patterns (Geels, 2011; Elzen/Wichorek, 2005; Geels/Kemp, 2012; Grin et al., 2010). In order to enable the reduction of environmental pressure in this way – thus enabling a transition – an interplay of strategies of efficiency (“doing things in a better way”), consistency (“doing things differently”) and sufficiency (“doing fewer things”) (Stengel, 2011; Linz et al., 2002) and a substantial shift in the deep and underlying structure of
the socio-technical system is needed (Elzen & Wieczorek, 2005, p. 651; Geels & Kemp, 2012, p. 49; Grin et al., 2010, p. 2 f.; Kemp & Loorbach, 2006; Meadowcroft, 2009; Rotmans & Loorbach, 2010; Shove & Walker, 2007).

Efficiency and consistency are macro- and micro-economic basic principles that can easily be linked with economic theories, at least in principle (in practice there is in fact still a considerable need to realize the full potential of efficiency- and consistency-oriented measures). Sufficiency, which according to Sachs (1993; Sachs et al. i.p.) implies principles of “smaller”, “slower”, “subsisted” and “short-distanced” seems much more difficult to imagine on a macro- economic level (Jackson, 2011; Latouche, 2009; Paech, 2012; Kallis, 2010; van d. Bergh, 2010) and in particular on a firm level – in theory as well as in practice (Reichel 2011; Bakker et al. 2009; Paech, 2005; Schneidewind/Palzkill, 2011).

According to the prevailing view, companies appear only to be interested in increasing their own production, revenues and profit margins as well as satisfying customer needs. However, severe environmental damage caused by firms is are not reflected in monetary costs and thus, is not considered in their revenues and profit margins. So, many aspects of the exceeded planetary boundaries are outside their consideration. This promotes a systematic and structural overuse, which is due to the externalization of environmental costs and a lack of ‘involving’ firms monetarily.

However, considering the internalization of these external costs, in order to reduce environmental pressure and allowing firms to stay within the safe operating space, causes fear of companies losing their competitiveness, their profit margin, etc. as a direct outcome.

So, for a transition to a sustainable economy, ways have to be found to fit the principles of sustainability (including sufficiency) and profitable business models together and identify the respective scope of action for companies. Even though the constructions of current corporate structures are characterized by trajectories, it can be shown that the development of these structures are to some degree even contingent (Fichter et al., 2010: 72): The emergence of the “new economy” has shown that massive, previously unimaginable, changes in business models are possible and that it is even possible for companies to modify given structures (Zott et al. 2011; Amit/Zott, 2001; Sommer, 2012; Stubbs/Cocklin, 2008; Lüdeke-Freund, 2009; Dunbar/Starbuck, 2006; Timmers (1998); Osterwalder, 2004).

The multi-level perspective as primary analytical framework

In order to understand and manage sustainability transitions, different approaches have been developed (see van den Bergh et al., 2011). One of them is the multi-level perspective (MLP): it describes transitions as an interplay of developments across three analytical levels: the level of landscape, which is the exogenous, given ‘environment’; the level of regime, which reflects the norms and values of the established socio-technical system; and the niche level, where radical innovations are initiated (Geels/Schot 2010; Kemp/Loorbach, 2006; Rotmans/Loorabach, 2010;
Rotmans et al. 2001). Thus, a transition will take place when the current regime gets under pressure and increasing landscape pressure or new powerful niche-innovations create windows of opportunity to change the established regimes.

Following Geels (2011) and Geels and Kemp (2012), the regime basically maps the current “shared beliefs, norms, standardized ways of doing things, heuristics and rules of thumb” (Geels/Kemp, 2012: 56), thus the “deep structures” underlying associated socio-technical systems. While “systems are tangible and measurable (as artefacts, market shares, infrastructure, regulations, consumption patterns, public opinion), regimes are intangible and underlying deep structures (as engineering beliefs, heuristics, rules of thumb, routines, standardized ways of doing things, policy paradigms, visions, promises, social expectations and norms)”(Geels, 2011: 31; Geels/Kemp, 2012: 56 f.; Markard/Truffer, 2008: 605).

Based on Giddens (1984), the three levels of the MLP can be characterized by the “hierarchy of structuring processes” (Smith et al., 2010: 6), i.e. they have “similar kinds of structures, although different in size and stability” (Geels/Schot 2007: 402). While in the regime stable norms and rules apply, stabilizing the established trajectories and influencing regime actors’ scope of action a lot, niche actors have more options, because the rules and norms are “unstable” and “in the making” (Geels/Schot 2007: 402) and not yet established (Smith et al., 2010: 7).

So, for all actors – also for companies – the degree of structuration (Giddens, 1984) has an impact on the possible scope of action. This could help focus the question of how much we could expect from companies to manage a transition to sustainability, or, more accurately, what they are actually able to do – apart from the question of what they want to do. This is important to understand and differentiate, because only when considering firms’ actual scope of action, the development of sustainability management approaches can be more than a desirable dry run (Schneidewind, 1998: 14)).

Therefore, the paper will try complementing the heuristic of the MLP, which aims “to guide the analysts to the relevant questions and problems” (Geels, 2011: 34), with the social-ecological resilience approach and the business model approach, to describe how “resilient” environmental frontrunners can be – and whether they can be at all.

**Business Model Resilience**

**The concept of resilience in social-ecological research**

Due to a high level of uncertainty regarding ecological tipping points, many ecosystems and social-ecological systems are faced with the challenge to survive and maintain their systems not knowing what they have to expect. Considering this uncertainty, future trajectories of social-ecological systems are also determined by the resilience of these systems; resilience being defined as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (Walker et al., 2004: 2). Therefore, resilient systems are able to maintain their essential “system services” and
increase the probability of survival of the social-ecological systems and their services, even under uncertain conditions (Fichter et al., 2010: 24).

To specify this vague concept, Walker et al. (2004) suggest four general aspects of resilience and following this, four ways to describe (in a qualitative and a quantitative way) the capability of actors to influence those aspects, namely Latitude, Resistance, Precariousness and Panarchy of a system, and thus, their ability to make it more or less resilient.

According to Walker et al. (2004), Latitude describes the “width of the basin of attraction” (p.2) and the diversity of options for the system. These options characterize the different opportunities for the system to maintain its system services. Resistance characterizes how difficult or easy it is for a system to change and thus the system’s capability to develop and learn. The distance to tipping points and the probability to exceed them – therefore the urgency to change – is described by the Precariousness of a system. Finally, Panarchy describes how dependent the system is to other (threatened) systems and what the “cross-scale interactions” (ibid: 6) look like.

Thus, it is important in how far a system is able to maintain its system service, how dependent it is on other systems (Panarchy), how close to important tipping points it is (Precariousness), how easy the system could be changed (Resistance) and how many opportunities for change a system has at all (Latitude) (ibid: 7). So, the resilience of a system could be increased by addressing these four aspects.

Depending on the concrete design and implementation the resilience approach can be described as a structurally conservative concept (because “every system (service) should be maintained”), but it is always a normative concept (because “these system (services) should be maintained”). It is noteworthy that “resilience is not always a good thing. Sometimes change is desirable, - generally at larger scales, and then effective management requires overcoming the resilience in the system to precipitate change at these scales.” (Walker et al., 2004: 5).

Furthermore, there never an absolute certainty for a system to survive any shocks and changes, even if the resilience of a system is rather high. As a matter of fact, there is no exactly sufficient degree of resilience that guarantees a system’s persistence no matter what (Fichter et al., 2010: 15).

However, what can be said is that resilient systems have a better probability to manage pressure in the face of uncertainty.

**Business model resilience as an analytical framework**

In order to map the degree of structuration and the scope of action of a firm, a framework is needed, which is particularly suitable to describe the relevant system, in which a firm operates, i.e. landscape factors and niche developments as well as the regime or the underlying deep structures. Thus, departing from the MLP, the framework in need should include a more elaborate perspective on firms and markets as the relevant system in which they operate. The concept of business models could be helpful in this aspect. On the one hand, it has the advantage of being able to map the different
components of a firm. On the other hand, it also includes relevant environmental factors directly affecting a firm as well as other factors, which have no direct market impact.

The concept of business model has been discussed extensively in the mid-1990s, due to the rising of the “new economy”, in order to explain the development of – at the time – completely new types of enterprises (for an overview see Zott et al. 2011)).

According to Sommer (2012: 67ff), a business model describes the value proposition of a company with regard to the offered goods and services, the relevant target groups, the key resources and processes to generate the value propositions and the financial logic of the firm. In addition, all of these aspects are perceived as being embedded in the business environment.

So, fulfilling the value proposition for the stakeholders, which could be defined as the respective maintained “system service” of the firm, could be created in different ways (by utilizing current resources and processes and the suitable financial logic). Hence, for a real transition to a sustainable economy it is necessary to obtain certain system services, i.e. the value proposition (like supplying mobility or nutrition) but in a more sustainable and resilient way. Whether and how a company can survive such a reconfiguration of the business model depends on the capability of the firm to manage internal and external change and pressure in a resilient way, i.e. without losing their internal consistency. (Floortje et al., 2011: 9). So for successful companies this conservation of their structure and especially their identity – e.g. as a brand – is particularly important to continue being successful. In the following, it will be argued that resilient sustainable business models could be built in an active and a passive way.

**Passive business model resilience**

Passive business model resilience should recognize the externally given market pressures and the current deep structures of the respective regime, i.e. the basic logic of the way the market functions. Since a transition will take place when regimes get under pressure by increasing landscape pressure or new powerful niche-innovations, passive business model resilience could focus on how resilient an incumbent could react to increasing landscape pressure (like rising oil prices) or competitive threats by the emergence of sustainable niches. Thus, companies with resilient business models would be able to maintain their “system services”, in cases where they are prepared for the worst and most probable landscape pressures and emerging niches at least.

However, as companies are faced with great uncertainty, it is not always easy for them to identify the worst and most likely risks affecting them. This can result in spending time and money on unnecessary risks, which are not occurring in the end, or the firms are faced with unexpected risks, which they are not prepared for.

So, passive business model resilience is a reactive approach. In order for a firm to include more sustainable or sufficiency strategies in its business model, there has to be external pressure, like increasing oil prices or emerging organic food trends, which has severe and direct impact on the company, because it does not react to perceived risks alone.
Unfortunately, the reality shows that in current regimes other kind of pressure on companies are much more relevant (e.g. because they can externalize environmental costs). Thus, there is the possibility that non-sustainable strategies of companies are quite resilient because external incentives for sustainability simply do not exist from the point of view of the firm.

**Active business model resilience**

The second way to achieve sustainable resilient business models is not a reactive, but an active strategy. It is recognized that there are given market pressures and deep structures, but it is also recognized that firms have a certain scope of action; thus, they are not only structure-reproducing agents, but there is also a structure-building role of firms (Schneidewind, 1998; Schneidewind/Petersen 1998). So, active business model resilience focuses on the deep structure of a regime and the question on what are resilient ways for firms to include sustainable (including sufficiency) strategies in their business models against marked pressures – even in situations where no substantial landscape pressure or emerging sustainable niches exist.

The basic requirement for companies is being able to remain in the markets – and therefore in current regimes – to offer and generate their value proposition. For this reason incumbents are often shying away from change and have an interest in preventing new sustainable trends and innovations, in order to solidify their status and position and reproduce the regime. Otherwise, they are quite capable of adapting or initiating change, even under short-term destabilization of their own market power (Floortje et al., 2011: 7; Hill/Rothaermel, 2003; Arend, 1999).

With regard to transitions this implies that there are two options for firms; either to keep away from or constantly react to niche innovations and landscape pressure (passive business model resilience) or to be pioneers and initiate change by themselves and fully utilize their available scope of action (active business model resilience).

An active resilience approach increases not only the resilience of the business model, but also the resilience of the entire human-environment system (by including sustainable and sufficiency strategies in the business model proactively and before there are strong external incentives) and therefore should be identified and promoted.

According to the four criteria of a resilient system identified in social-ecological resilience research, a firm could develop an active resilience business model guided by the following heuristic:

1. Define the respective system service (or value proposition)
   
   In order to increase the resilience of the business model, the first step is to determine the relevant maintained “system service” of the firm – consequently including the question of what the specific contribution to the prosperity of society is. Even if the following steps will not be performed, defining the own value proposition could be very instructive to the companies and could already have effects on corporate strategies. At best the definition
of the value propositions is developed in cooperation with all stakeholders by determining which system service is important and indispensable for whom (Fichter et al., 2010: 26).

2. Identify the diversity of the options to create the value in a different, sustainable and – if necessary – in a sufficient way (Latitude)

If the system service has been defined, the firm has to figure out, if there are different ways of satisfying the respective needs. Depending on the system service, the company has to find new innovative – and sustainable – ways to fulfil their value proposition. Due to its unique effects, strategies of smaller, slower, subsisted or short-distanced should be focused on.

3. Identify how near or far away the economic tipping points are (Precariousness)

Of course, fulfilling the value proposition in a more sustainable way will not change the importance of essential economic indicators – like revenues or profit margins – but could provide a more open perspective on corporate aims. A company will not reconfigure its business model to an extent where it will not be competitive anymore. So, a risk assessment of the worst and most probable pressures and deep structures, which impede the new strategies and could attack the new business model – therefore the economic tipping points – has to be carried out.

4. Identify how fast or slow the new strategies could be developed (Resistance)

If and how fast a company can reconfigure the way it creates value (and maybe the whole value proposition) is already related to the desired level of change (e.g. are the necessary changes related to the production or product level or of the level of consumer needs (for the different levels see Schneidewind, 1995) and the firms ability to learn. It should carefully be assessed how much structural change a company and its stakeholders could absorb effectively, how fast this could be done, and whether radical or more incremental changes are needed (Fichter et al., 2010: 22).

5. Identify the dependence and the interaction with other systems (Panarchy)

At least the dependence and interaction of the company with other (sub-) systems of the regime is important. So for some companies a weakened or strong finance sector, for example, is particularly relevant for the success of reconfiguring the business model in a resilient way.

The next chapter will use the analytical framework developed here as a heuristic to conceptualize a potential increase in active business model resilience in the fast food sector.
Business model resilience in the fast food sector

Nutrition has become a considerable driver of increasingly exceeding some planetary boundaries (e.g. climate change, nitrogen and phosphorus cycle, change in land use). For example, about 20 percent of the total material flows of Germany are caused by the food sector (Mathews et al. 2000) and the agriculture in Germany accounts for more than 13 percent of the German total greenhouse gas emissions (Hirschfeld et al., 2008).

Considering that there is continued population growth, change in world-wide eating habits (with increasing consumption of meat and dairy products) and the development of a western lifestyle-oriented global middle class (Foresight, 2011; Koerber, 2008), the use of resources in food production and the resulting environmental pollution and emissions will continue to rise.

Broad societal trends, such as the rise of single households, due to urbanization and individualization, flexibility of labor and time constraints, also contribute to an increasing consumption of convenience products and fast food (Koerber et al. 2008; KPMG, 2012).

Especially in the classic fast food sector – often characterized by products with high meat and fat components – promotes thereby environmental but also health problems.

For this reason, the heuristic for increasing active business model resilience will be tested in the case of the very sensitive fast food sector.

1. Define the respective value proposition (or system service)
   First of all, the fast food company has to define its system service, which should be maintained. How important this definition is from a sustainability point of view is shown by the different possibilities and wide range of potential definitions: Whether the system service is seen as providing (healthy) nutrition in a “fast way” or as selling meaty burgers has a decisive impact on social prosperity as well as environmental pressure.

2. Identify the diversity of the options to create the value in a different, sustainable and – if necessary – in a sufficient way (Latitude)
   If the system service is defined as providing “good food fast” (McDonald's Deutschland, 2012), the company has to control, if it meets this value proposition based on the current business model and product ranges. However, it is not enough to introduce efficient processes or shift the production processes to renewable energies. Providing good (thus healthy and sustainable) food for companies in the classic fast food sector means that they have to consider sufficiency strategies. Particularly from an environmental point of view (e.g., high energy and land use, high emission of greenhouse gases), but also from a health point of view (high caloric value with low nutrients), it is necessary to reduce meat consumption, e.g. by a
limited meat product range and increased vegetarian offer. An interesting example in this respect is that even Mc. Donald’s experimented with the introduction of Veggi-Burgers (Stumböck, 2012) or with completely vegetarian restaurants (Simons, 2011).

3. Identify how near or far away economic tipping points are (Pecariousness)

How near or far the economic tipping points are, depends on different conditions, e.g. the type of enterprise, in which market it is acting, how powerful the firm is and how competitive it is. Focusing on incumbent firms, the worst case could be losing market leadership. However, the large companies have enough monetary resources to experiment with different strategies and to test a number of innovations without fear of disappearing from the market immediately.

Of course even a change of the product range is a risk – like any other innovation – and so there is the possibility of (temporarily) lower revenues and profit margin. How well and long a company can handle this, has to be estimated empirically in individual cases.

4. Identify how fast or slow the new strategies could be used (Resistance)

For large firms a large resistance and low internal capability of change may often be a greater problem than economic tipping points - especially if the change means not only a transformation at the product and process levels. For fast food enterprises, which have focused on selling burgers or other very unsustainable products so far, it is very difficult to change because they have to change not only the whole product range, but also the current internal consistency and self-defined system service (to deliver “good food fast” for example). Since large firms are often characterized by structural inertia and also have to consider various stakeholders with different grades of power, it is difficult to internalize changed strategies.

What happens when there are substantial conflicts regarding the ‘right’ strategy among important stakeholders can be shown by the example of Pepsi: The CEO Indra Nooyi has tried to change not only the product range, but also to reconfigure the whole business model by restricting the commercials of thickeners (including Pepsi-Cola), investing in new social internet networks and offering whole grain snacks, yogurt and fruit juice. In the end, the business model transformation from a soft drink manufacturer to a provider of healthy nutrition has failed, which was mostly due to internal reasons of different opinions about the transformation and infightings (Hage, 2012).

5. Identify the dependence and the interaction with other systems (Panarchy)

Some food crises (like BSE or swine fever) have shown how strong the (fast) food industry is depending on upstream value chain levels. Such crises could promote a resilient transformation of a business model. The specific
dependence and interaction with other systems of a fast food company have to be analyzed empirically in the individual cases.

Discussion: the potential of the analytical framework of business model resilience

The proposed framework for analyzing the scope of action of business in current regimes may be a fruitful heuristic for identifying and promoting ways of increasing the resilience of companies as well as human-environment systems.

Since the transition to a sustainable society, which is required in order to stay within planetary boundaries, will not work without incumbents firms, it is important to involve them in the transition and find ways that avoid threatening their resilience.

However, currently successful companies will only take responsibility for the necessary transition, if their success is not endangered by the transition and if they can avoid losing their core structure and identity – allowing them to continue to fulfil their system service. On the one hand, it therefore is necessary for a company to keep in mind landscape pressure and niche innovations (passive business model resilience). On the other hand, it has been shown that companies are not only structure-reproducing, but also structure-building actors (Giddens, 1984). So, there are also possibilities to improve business model resilience in an active way – at least in theory.

On an analytical level it seems that – even in very unsustainable sectors, such as the fast food sector – there is scope to increase the latidude, the resistance, the panarchy and the precariousness in an active – and sustainable – way.

However, here are some critical aspects that need to be considered:

- In determining the companies’ system service or the value proposition it is very important that in this process all stakeholders are included. Without the involvement of all relevant actors, a mismatch between the stakeholders is possible and likely and the company’s success is endangered by a lack of support for the (new) identity of the company shared by all stakeholders.

- To be truly sustainable and stay within planetary boundaries, it is often not sufficient to consider only efficient technologies and processes for identifying a different and sustainable way to fulfill the value propositions. Greater emphasis should be put on sufficiency innovations and strategies – e.g. smaller, lower, subsisted or short-distanced – even if they are difficult to integrate with the current logic and strategies of the companies.

- The speed of the transformation of business models has to be adjusted to the respective companies and the business situations of the companies. Too rapid transformations may endanger the companies’ resilience, because it is not possible to evaluate the individual experimental developments and to internalize learning processes.
• The dependencies and interactions with other systems – maybe even resulting from the transformation of the business model itself – must always be kept in view, in order to enable a flexible and resilient reaction at all times.

However, in order to evaluate the active business model resilience of companies, of course more than a theoretical analysis is needed. It requires future empirical tests, which are still pending.

Conclusion

It was the aim of this paper to develop an analytical framework for studying the scope of action of incumbent firms in the regime. For that purpose, several theoretical approaches – the multi-level perspective on sustainability transitions and Giddens’ theory of structuration, the social-ecological resilience approach and the concept of business models – have been introduced and discussed. Comparing these approaches has resulted in an integrated framework for describing the scope of action of business and how resilient an environmental frontrunner can be.

This framework focuses on two different ways in which a more resilient business model can be generated. Passive business model resilience is a reactive way to increase the resilience of a firm. Transformations towards more sustainable business models depend on external pressure on landscape or niche level, e.g. increasing oil prices or emerging organic food trends, which has severe and direct impact on the company, because it does not react to perceived risks alone.

The second way is to increase a firm’s active business model resilience, so that the firm is not only structure-reproducing, but also a structure-forming actor. According to the four criteria of a resilient system identified in social-ecological resilience research, a firm could develop an active resilience business model guided by defining its respective system service (or value proposition), its latitude, precariousness, resistance and panarchy.

The short example of the fast food sector has shown how this framework can help to identify sufficiency-oriented innovations and strategies for a company in a resilient way. This is not to say that there will in fact be a transition towards a more sustainable fast food industry – but a potential and possibilities could be demonstrated.
References


Elzen, B.; Wieczorek, A. „Transitions towards sustainability through system innovation“. *Technological Forecasting and Social Change* 72, Nr. 6 (Juli 2005): 651–661.


Hage, S. „Indras letzte Runde“. manager magazin 5, Nr. 12, 2012


Hirschfeld, J.; Weiß, J.; Preidl, M.; Korbun, T. „The Impact of German Agriculture on the Climate – Main Results and Conclusions“ Discussion Paper 189/08, IÖW, 2008


KPMG „Expect the unexpected: Building business value in a changing world.“ KPMG International. 2012


Meadowcroft, J. “What about the politics? Sustainable development, transition management,


Sachs, W.; Schneidewind, U.; Palzkill, A. „From Sustainability to Sufficiency – the „four S“-concept to frame sufficiency strategies“. Working Paper Wuppertal Institute (in Progress)


