The Emergence of Niche Protection through Policies:
The Case of Electric Vehicles Field in Finland

Armi Temmes, Rami-Samuli Räsänen, Jenny Rinkinen and Raimo Lovio

The literature of Strategic Niche Management has rarely discussed how the SNM policies come to amend the existing policies. Through an in-depth study on the development of electric vehicles field in Finland, we show, firstly, how niche actors mobilize protection by policies for their technology through systematic expectations work, and, secondly, how the politicians strategically select technologies to be protected. By zooming in on the emergence and impact of two major policy initiatives, we show that systematic expectations work is characterized by the credibility of enactors and expectations, as well as systematic advocacy and publicity work. We contribute to the SNM literature by showing how policy actions develop through systematic expectations work, as well as continued interaction between enactors and selectors within well-functioning public-private arenas.

Keywords: Electric vehicles, strategic niche management, expectations

Introduction

In this article we study the development of electric vehicles field and related policies in Finland through the systematic expectations work carried out by various actors. We define electric vehicles field as consisting of electric vehicles for personal transportation and related infrastructure. It is an interesting context for research, because a sudden burst of both private sector and political activities recently emerged after many years of no activity or very scattered local activities. Electric vehicles face competition from many other potential groups of niches aiming at mitigating the externalities of transport (Banister, 2008; Geels, 2012; Geels et al., 2012), and accordingly the high level of political support can neither be explained by their ability to solve the societal problems of transport nor by the penetration of vehicles in the market.

We build on the literature of Strategic Niche Management (SNM) (Kemp et al., 1998; Schot & Geels, 2008), which offers a good framework for studying socially desirable and path-breaking innovations, which often need protection from the existing selection pressures. SNM discusses the development of novel technologies in

protected spaces through experimentation and learning. The active role of proponents of specific technologies has been discussed in SNM literature (Geels & Raven, 2006; Ulmanen et al., 2009; Smith and Raven, 2012), but with the exception of Smith et al. (2013) it is rarely discussed how the policies offering protection to niches come to amend the existing policies, which are part of the regime.

Studies on sociology of expectations show how widely shared expectations are known to stimulate, steer and coordinate innovation processes (Borup et al., 2006; Bakker et al., 2012), and we use these insights to complement the literature of SNM to deepen the understanding on how the mobilization of protection by policies happens through interaction between enactors and selectors of technology.

In doing this we also rebuild connections between SNM studies and social shaping of technology studies, for example Social Construction of Technology (SCOT) (e.g. Bijker, 1995) and Actor Network Theory (ANT) (e.g. Callon, 1986), which have a long tradition on discussing the role of persuasion and negotiation on the merits of technologies (e.g. Bijker, 1995, Callon, 1986, Law & Callon, 1988, Latour, 1996). SNM has roots in these traditions (see e.g. Geels, 2010), but the empirical studies in SNM have been dominated by explanations on positive feedback cycles based on the successes of niche experiments (e.g. van der Laak et al., 2007, Schot & Geels, 2008).

We build on these discussions in our attempt to understand 1) how the electric transport actors were able to mobilize protection by policies for their niche through continuous feeding of positive expectations, and 2) how the politicians and policy-makers strategically selected electric transport as a target for protection. In particular, we ask what the characteristics of systematic expectation work are, how, when and by whom expectations are created, why do selectors choose to support electric vehicles field and how the enactors and selectors interact.

There are very few other empirical studies on the development of the electric vehicles field in Finland, but in our earlier studies we have found strong political commitment to support the niche through innovation policy measures (Lovio et al., 2011) and that the field has experienced a hype, which started in 2009 (Rinkinen, 2010). Among the green propulsion technologies the competitors of electric vehicles are biofuels and fuel cells (Geels, 2012), and also in Finland the main competitor of electric vehicles is the biofuel niche, which has been successful in commercializing second generation products (Lovio et al., 2011). This study amends our earlier empirical results by the developments in 2011-2012 and broadens the scope of the informants, which allows us to systematically analyze the expectations work.

The article is arranged as follows. In the following section we discuss the theoretical background of strategic niche management (SNM) literature and the mobilization of protection of niches, the emergence of policies in the transitions literature, as well as the literature on expectations, their emergence and impact on the development of niche technologies. In section 3 we describe our research approach and methodologies used. In sections 4-5 we report our empirical findings, first in an overview and then focusing on the essential events of the expectations work leading to the two major political decisions studied. After that follows the discussion on the findings and conclusions.

Mobilization of Protection for Niche Technologies

Sustainability transitions and policy emergence

The literature on sustainability transitions discusses the processes required for solving major environmental challenges. These processes are characterized by the stability of existing systems (regime), which makes it difficult for novel technologies to gain ground. One of the strands is the strategic niche management (SNM) literature in which individual niche innovations like electric vehicles and related technologies are considered to develop through experimentation first locally, then gradually developing into trajectories (Geels & Raven, 2006) and eventually allowing the technology to become competitive either in the existing regime or to change or replace the regime (Geels & Schot, 2007; Smith and Raven, 2012). The origins of SNM are in evolutionary economics, in which the niche innovations represent variety and the landscape and existing regime represent selection (Garud & Gehman, 2012). However, SNM is also linked to the literatures of Cocial Construction of Technology (SCOT) (e.g. Bijker, 1995) and Actor Network Theory (ANT) (e.g. Callon, 1986, Law and Callon, 1988, Latour, 1996), which deny the independence of variation from selection. The ANT-scholars base their work on a relational ontology, in which selection environment is not given and identities and preferences of actors are formed in continuous negotiation in the networks (Geels, 2010; Garud & Gehman, 2012). In relational ontology persuasion and negotiation activities are integral parts of technology development (e.g. Callon, 1986; Bijker, 1995; Latour, 1996). The SNM approach is based on quasi-evolutionary perspective in which variation is, not considered to be blind (Schot et al., 1994). The actors in SNM are assumed to be able to anticipate the future selection environment and even shape the selection process (Schot & Geels, 2008).

The development of niches has been empirically analyzed (e.g. Ieromonachou et al., 2004; Kivisaari et al., 2004; Raven, 2006; Harborne et al., 2007) using three niche-internal processes, namely articulation of expectations, building of networks and learning (Schot & Geels, 2008; Raven et al., 2010). In successful niches the expectations have been found to become increasingly specific and to converge, the networks to be broad, deep and diverse and learning include second-order learning, in which the basic assumptions are questioned (Schot & Geels, 2008; Raven et al., 2010). Generic knowledge and shared rules are actively developed through specific aggregation activities, like "standardization, codification, model building and circulation of knowledge" (Geels & Deuten, 2006: 267). Positive feedback cycle based on the successes of the experiments (e.g. Geels & Raven, 2006), which take place in protected spaces is considered to enhance niche development. Niche development, however, is usually not smooth, but consists of alternating hypes and disappointments, failures and changes of course (Geels & Raven, 2006; Verbong et al., 2008) affecting the expectations. Alongside the feedback mechanisms, the evolution of protection has been suggested to be a result of active mobilization of protection by the niche actors (Geels & Raven, 2006, Ulmanen et al., 2009, Smith and Raven, 2012), but systematic studies on the development of protection during the emergence of technologies are very rare (Smith et al., 2013).

An essential feature of SNM is formation of protected spaces – niches – for the emerging technologies (Kemp et al., 1998; Smith & Raven, 2012). The various dimensions of protection have been conceptualized by

Smith and Raven (2012) as shielding from the selection pressures, nurturing the niche processes and empowerment of the niche either within the existing regime or in a new regime. Policies play a major role in protecting niche innovations. For example, instrumental to the earlier development of electric vehicles were the Californian clean air standards set in 1988 and the related objective to increase the share of zero emission vehicles (ZEV) (Schot et al., 1994; Dijk & Yarime, 2010). Even if the mandate was relaxed, it was successful in enhancing radical innovation (Dijk & Yarime, 2010).

While SNM discusses the development of individual niche innovations, transition management approach studies the development of the complex systems as a whole in fulfilling the societal demand. It is based on a predefined vision and subsequent back casting (e.g. Rotmans et al., 2001; Kemp and Loorbach, 2006). Transition management literature describes transition arenas as goal-setting forums (e.g. Rotmans et al., 2001; Kemp & Loorbach, 2006), but Meadowcroft (2009) considers that the actual political process of goal formation is not fully discussed in this literature.

Policies are generally assumed to be based on societal goals (e.g. Voss et al., 2009; Meadowcroft, 2009; Mickwitz et al. 2011) and available policy options, among others novel technologies to be supported (Kivimaa & Mickwitz, 2011). Policy design is increasingly considered an interactive learning and innovation process of policy-makers, politicians and various stakeholders (Voss et al., 2009), also called reflexive governance (Voss & Kemp, 2006) and including contestation and power struggles (Voss et al., 2006). Politics is considered to bring in the democratic legitimacy and preventing excessively technocratic policy-making (Voss et al., 2009). The role of advocacy is broadly acknowledged, but it is often considered to serve the regime and to be a distraction from the societal goals (Voss et al., 2009).

In summary, policies are an essential part of the existing regimes (Kemp et al., 1998; Smith & Raven, 2012), but also important in protecting novel innovations (van der Laak et al., 2007; Smith & Raven, 2012). Yet environmental policy studies and the various strands of transition literature offer little explanation of how the policies for protection of niche innovations come about.

Expectations work

Decisions on protection of a niche technology in its early development are mainly based on the expectations of its future performance, as the performance of the technology is not yet known (Bakker et al., 2012). Indeed, widely shared technological expectations are known to stimulate, steer and coordinate the development (Borup et al., 2006) and to interact with strategies of actors (Budde et al., 2012). Expectations are defined as combinations of "expected progress of the technology at stake, its future markets and its societal context" (Bakker et al., 2011: 153). Expectations deal with the expected success (generalized expectations) and the legitimacy (frames) of the technology in the society (Ruef & Markard, 2010).

Sociology of expectations scholars have recently become interested in the active role of actors in creating widely shared or collective expectations, and the role of decision-makers in assessing the expectations (Bakker et al., 2011; 2012). Two roles for actors have been described: enactors (insiders) and selectors (outsiders) (Garud & Ahlstrom, 1997; Bakker et al., 2011). These roles are not constant, but depend on the situation. Enactors are developers or supporters of the technology; they enact it and have an interest in it. They assess the technology as a scenario and the path towards this vision. Selectors

are sponsors or users of technologies, who choose a suitable technology to solve their problem. They assess the technologies through comparison (Garud & Ahlstrom, 1997; Bakker et al., 2011). These two roles meet and interact in bridging events, which include mutual learning of each other's perspectives (Garud & Ahlstrom, 1997) and arenas of expectations, which in addition to events can be e.g. scientific articles or expert reports (Bakker et al., 2011).

The early phase of an innovation process has been called "expectation phase" (van Lente & Bakker, 2010). During this phase, enactors are suggested to include knowledge producers and their policy supporters, and selectors to be the decision-makers defining the research and policy agendas. However, it seems that the enactor role is not limited to knowledge producers. For example, such role of enactors has been suggested in the electric vehicle development in California for an incumbent company: one of the triggers of the Californian ZEV-mandate seems to have been private action creating positive expectations: an electric concept car presented by General Motors in 1990 (Orsato et al., 2012).

In order to become widely shared (collective) expectations need to be assessed as credible by various selectors. Bakker et al. (2012) suggest that credible expectations build on the existing collective expectations and describe a possible path to a desired target, and are presented by credible actors. Bakker et al. (2012) call this dual credibility and consider it an interesting avenue for further research. In addition politicians need to ensure their legitimacy through combining their political goals endorsed by their constituency and the necessary rational argumentation (Rappert, 1999; Meadowcroft, 2009; Voss et al., 2009). Expert reports, e.g. roadmaps have been found to be powerful tools for the selectors, as they both communicate the facts and the negotiation on the selection arguments (Bakker et al., 2011).

Positive expectations are like promises, which need to be fulfilled through improvement of the performance of the technology within the protected space (van Lente & Bakker, 2010). The probable occurrence of disappointments prompts various strategies among the actors depending on the role of the technology in their strategies. Mostly actors reduce their activities, but some actors have been found to get involved with dedicated efforts to mitigate the disappointment (Konrad et al., 2012). Technologies which have a good legitimacy have been found to be more robust against disappointments concerning the success (Ruef & Markard, 2010).

The recent work on the sociology of expectations uses the term "expectations work" to describe the various activities "by scientists and policy spokespersons to secure a position of their options in the relevant agendas" (van Lente & Bakker, 2010: 707). We contribute to this literature by offering descriptions of the characteristics of systematic expectations work and of the selection process.

Framework for mobilization of protection by systematic expectation work

We build our study on the mobilization of protection within the Finnish electric vehicles field on the following framework, which combines the literatures on sociology of expectations and strategic niche management (Figure 1).

The development starts as scattered local innovation activities (Geels & Raven, 2006; Konrad et al., 2012) by enactors based on local objectives and existing passive protective spaces (Smith and Raven, 2012). The enactors advocate for the technology on various arenas of expectations, like conferences and other events (Garud & Alhstrom, 1997; Garud, 2008), but also in

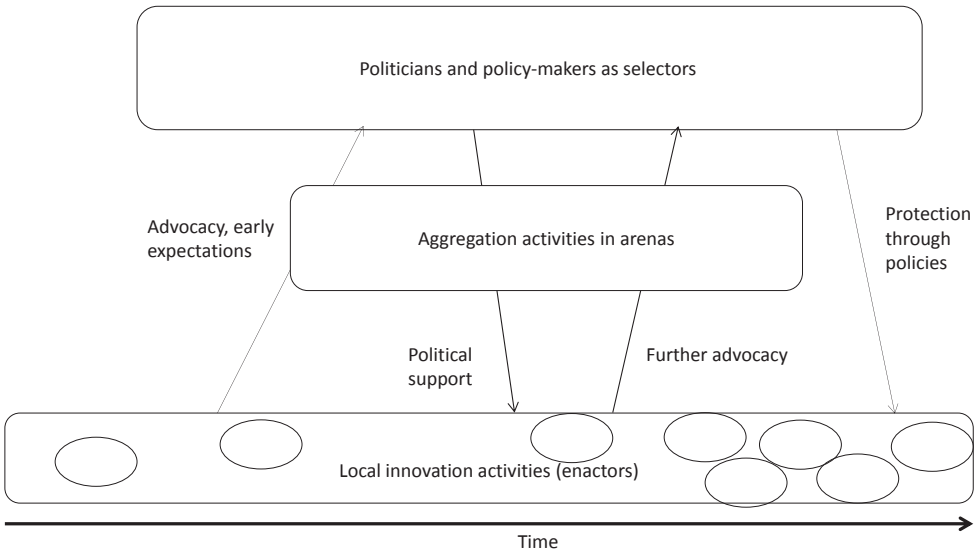

Figure 1. Framework for of the mobilization of protection.

media, research proposals etc. (Bakker et al., 2011).

The politicians and policy-makers as selectors assess the credibility of the expectations when making decisions for support, like political goals, funding or mandates. Initially the expectations mainly develop through discursive activities. Therefore, the credibility of the actors voicing expectations matters for the selectors (Bakker et al., 2012).

The credibility of expectations is further increased through continued innovation activities, i.e. improvement of the performance of the technology (Konrad et al., 2012). The performance and learning are supported by aggregation activities (Geels & Deuten, 2006) in arenas like working groups and research programs, where actors exchange experiences, visions and expectations.

High expectations, which may develop into hype and improved knowledge attract new actors to the field, affect the policy goals and increase the political support (Voss & Kemp, 2006; Konrad et al., 2012). Disappointment following hype may disrupt the networks and stop the development (Geels & Raven, 2006; Ruef & Markard, 2010). Enactors may also mitigate the disappointment through further expectations work (Konrad et al., 2012). Gradually expectations become widely shared, i.e. collective expectations (Konrad et al., 2012) and thus influence collective decisions like policies (Konrad, 2006; Borup et al., 2006; Bakker et al., 2012; Konrad et al., 2012).

Research Approach and Methodology

To learn more about the emergence of niche protection through policies, we study the electric vehicles field in Finland during a period when first major policy instruments supporting electric vehicles were launched (years 2008–2012). These five years are very interesting as very much activity emerged very quickly. The short time allows us to study the expectations even if we do

not know the outcome yet. The data was collected during the years 2009–2013, which allows us to observe most of the development in real-time.

We define electric vehicles field as covering electric vehicles, their users, necessary infrastructure, stakeholders and governance. The field is still in the making, and the development has seen various visions, hypes and disappointments (Callon, 1986; Schot et al., 1994; Hoogma et al., 2002; Geels, 2012). The main actors include car makers, both new entrants and incumbents with somewhat different strategies (e.g. Oltra & Saint Jean, 2009; Dijk and Yarime, 2010; Sierzchula et al., 2012), battery producers (Orsato et al., 2012), utilities and other infrastructure providers (Callon, 1986; Orsato et al, 2012; van der Vooren et al., 2012) and various emerging service providers (Orsato et al., 2012; Loock & Müller, 2012).

The Finnish industry became interested in electric vehicles for the first time after the oil crises in the 1970's. Some incumbent companies in automotive, oil and electricity fields were involved in small-scale experiments in the area in the 1980s. In the 1990s, some 200 electric vans called Elcat were manufactured within a project by a major utility company, but the project was discontinued in 2001. The field restarted to develop very rapidly in 2008 by both private and public action. The lack of big automotive manufacturers makes the industry structure flexible for system changes, but the competing niche of biofuels is strong. These characteristics make the Finnish electric vehicles field an interesting case for the study of the interaction of private action and policies.

We focus our study on the emergence of two major policy measures aiming at enhancing the Finnish business on electric traffic. These were Working Group of the Ministry of Employment and the Economy on electric vehicles (MEE working group) (TEM, 2009) and Electric Vehicle Systems Programme (EVE) (Tekes – the Finnish Funding Agency for Technology and Innovation, 2011–2015).

Data

We use data from various sources, written public records, interviews and conference observations in order to obtain the views of many different actors, both enactors and selectors. The written material represents expectations at the time they were made, thus minimizing retrospective bias. Interviews enrich the data with personal views of the process from different angles and are a source for expectations of the time of the interview.

Sixteen semi-structured interviews were carried out. Approximately half of them were recorded and transcribed, half were filed as interview notes of two interviewers (Table 1). The interviews of 2010 have also been discussed in an earlier report (Lovio et al., 2011).

Four expert reports on the prospects of the Finnish electric vehicles field were studied: Background report of the Working group of the Ministry of Employment and Economy (Biomeri, 2009), Report commissioned by Tekes from SWOT-consulting (SWOT, 2010), Report of Finpro (Finpro, 2010) and report commissioned by the Ministry of Transport and communications in 2010 (Nylund, 2011).

In addition we observed five conferences (Garud, 2008) related to the niche: TransEco annual conferences 2010 and 2011, TransEco e-bus-seminar 2012, EVE-platform (ElectricTraffic) seminar on future electric city transport 2012 and EVE Program Annual Seminar, 2012.

Moreover, we made two sets of media collection, in fall 2009 and in winter 2012. The media data of October–December 2009 cover energy use of personal mobility by

Table 1. Summary of interviewed informants.

eCars – Now!	Electric vehicle activist	9/2010
Ensto	Director, new technologies	9/2010
Fortum	Research Director, new technologies Director, Public Affairs	9/2010 12/2012
GreenNet Finland	Development manager, early EV activist	9/2010
Ministry of Transport and Communications	Senior officer, environmental issues	11/2011
Technology Industries	Coordinator of Electro Mobility group	3/2012
Tekes	Program manager of EVE	9/2010, 2/2012
VTT research centre	Program manager of TransEco research program	2/2012
HSL (Helsinki Metropolitan Public Transport Services)	Director, transport services	11/2011
Aalto University, eSINi project	Project manager	3/2012, 8/2012
Eera Consulting	Coordinator of ElectricTraffic	3/2012
Helsingin Energia	Head of R&D	6/2012
Confederation of Finnish Industries	Director General, former Minister of Economic Affairs	3/2013

five Finnish newspapers on 282 articles. Out of these articles 95 dealt with electric or hybrid vehicles. The papers include a leading daily published newspaper Helsingin Sanomat, two leading business newspapers (weekly magazine Talouselämä and Kauppalehti published on weekdays), a weekly newspaper Tekniikka & Talous which combines business and technological perspectives and weekly Vihreä Lanka, which is a politically oriented paper of the Finnish green party. Helsingin Sanomat can be regarded as a central arena for reproducing and circulation cultural meanings in the Finnish context.

Another set of media data was collected between January and March 2012. The newspapers Helsingin Sanomat, Tekniikka & Talous, Kauppalehti and Talouselämä studied for the earlier media data were amended by technology and automotive magazines Auto Bild Suomi, Tuulilasi and Tekniikan Maailma offering views from the automotive market. All articles, which explicitly referred to EVs were included in the data set. The collection included, for instance, benchmark studies of the automotive magazines comparing the performance of vehicles with different engines and articles on technology development of electric vehicles. In addition, press releases of a set of selected enterprises were collected covering the years 2008–2012. Altogether 90 press releases and 141 media articles were collected in the winter 2012.

Analysis

This study is a synthesis of four separate, but complementing qualitative analyses. First, the architecture of the field was researched by identifying actors and networks and their evolution. Second, the development of the niche was studied with event structure analysis. Third the articulated expectations were analyzed and fourth the development of expectations through discursive activities

in the early stages was analyzed with discourse analysis.

We identified the organizations relevant for the field from earlier research (Lovio et al., 2011), media, R&D programs, expert reports and from interviews. The result of this mapping was a list of organizational actors which were enterprises, governmental and non-governmental organizations. We made illustrations of the actors and their connections at different times. Several versions of the narratives were written and used for identification and selection of main players, types of cooperation and resource flows in different periods.

Event structure analysis (ESA) is an inductive methodology developed by Heise (1989) for mapping cause and effect relationships in processes. The method has been used by for instance, Valorinta et al. (2011) for analyzing dynamics of competition in a period of over 40 years in the Finnish retail market. In the context of administrative decision-making, the method was used by Stevenson et al. (2008) to analyze connections of events in a planned social change, while Griffin (1993) utilized the event structure analysis on the analysis of a racial conflict, which happened in Mississippi in 1930. Although the method is general regarding the scope of applicability, the use of the event structure analysis demands in-depth understanding of the local physical and social contexts in order to understand the rationales of actors' decision-making and thus the connectedness of unfolding actions (Griffin, 1993).

We used event structure analysis to analyze the developments of the Finnish electric vehicle field. We defined events as actual historical happenings, which were observable primarily from public sources or which were described in the interviews. Second, we built a chronological event list (2008–2012) by utilizing all the data collected for the study (Räsänen et al., 2013). This long list was found to overemphasize public action at the cost of private activities. We analyzed this long list to create a shorter aggregated version of the process, which describes the main steps and activities of key players with approximately similar weights. As there are no general rules for choosing the relevant elements (Heise, 1989), one of the authors did the aggregation in an iterative way for each event, using the assessment of actors' motives and relatedness of the events as basis. We conducted the actual event structure analysis with the aid of online process analysis software Ethno. The result was tested with Ethno's test procedures and the program suggested few changes. However, the result of the event structure analysis was maintained, because it had a better fit with the observed process than the rational action based test-result (Griffin, 1993).

The result of the analysis is a simplification of a complex process of the development of the field. In Figure 2 aggregated events are numbered in a chronological order and the implicational relationships of events are presented with arrows. As most of the events are pooled from several incidents the aggregation has affected timing of events. However, the chronological order of events was not found to affect the assessed implicational relationships. In addition, in the analysis we chose to focus on key actors. We filed 110 statements on expectations from the media data, reports and interviews of 2011–2012 and coded them in terms of time, source, specificity, quality and subject matter. We asked questions like: are they shared by actors, do they converge, how specific are they, are they substantiated by ongoing projects, i.e. what is the quality (Raven et al., 2010). We listed statements uttered by specific individuals (interviewee, specific informant of media or journalist having written the article) and stating

something of the future development of any part of the electric vehicles field.

Discourse analysis of the electric vehicle field was based on the articles collected in 2009. The articles were stored and coded in NVivo software in order to identify discourses. This included multiple phases. First, broader thematical perspectives were identified, after which these perspectives were further coded to identify discourses. Systematic method of collection and avoidance of search words enabled the identification of new phrases, non-conventional actors and weak signals, in other words, it enabled a variety of examination, which is desirable for qualitative inquiries (see e.g. Alasuutari, 1999).

Although multiple discourses were present in individual media articles, we did not attempt to identify all of them. Rather, we used deductive-natured identification to discover the main discourses on the electric vehicle field and related expectations of the personal transport system. The data contains multiple meaning potential and this analysis discusses a part of it. The interpretation of the reader is an evident part of this analysis.

In the following chapters we first give an overview of the development of the electric vehicles field in Finland based on the event structure analysis (Chapter 4). In Chapter 5 we take a closer look on selected events, which were essential for the expectations work and for the development of protection by policies.

Overview of the Co-evolution of Emerging Electric Traffic Field and Related Policies

The events during the years 2008–2012 (Figure 2) can be divided into three phases. The first phase consists of private actions characterized as local experiments and emergence of extensive advocacy, which led to the first policy action. The second phase includes further local actions and media hype encouraged by the first policy action. During the third phase the actors attempt to mitigate the disappointment and ensure the second major policy action for the protection of the electric vehicles field. These phases are described below.

In 2008 many private activities emerged starting the *first phase*. Metropolia University of Applied Sciences started a project to build an electric racecar (ERA, see zoom 1). A group of investors founded European Batteries to start production of electric vehicle batteries based on lithium technology. The utility company Fortum re-established its EV business seven years after closing the Elcat-project. eCars – Now! user community received funding from Fortum for converting a Toyota Corolla into an electric vehicle. Valmet Automotive signed contracts on manufacturing American Fisker Karma luxury cars, Garia golf cars and Norwegian Think City -cars in Finland. Technical Research Centre of Finland (VTT) initiated an R&D program (TransEco) for the development of energy efficiency and emission reduction technologies for transport. TransEco initially emphasized biofuels, but later the program evolved to one of the arenas of the electric vehicles field as well. Approximately 40 Finnish companies were estimated to be active in the electric vehicles field in the beginning of 2009, and their net sales totaled 200 million Euros (Biomeri, 2009).

All this led to the first policy action in February 2009, when Ministry of Employment and the Economy appointed Electric Vehicles in Finland Working Group to examine the prospects of electric vehicles in Finland and elsewhere (MEE working group) (see zoom 1).

The *second phase* (2009–2010) was based on the ambitious recommendations of the

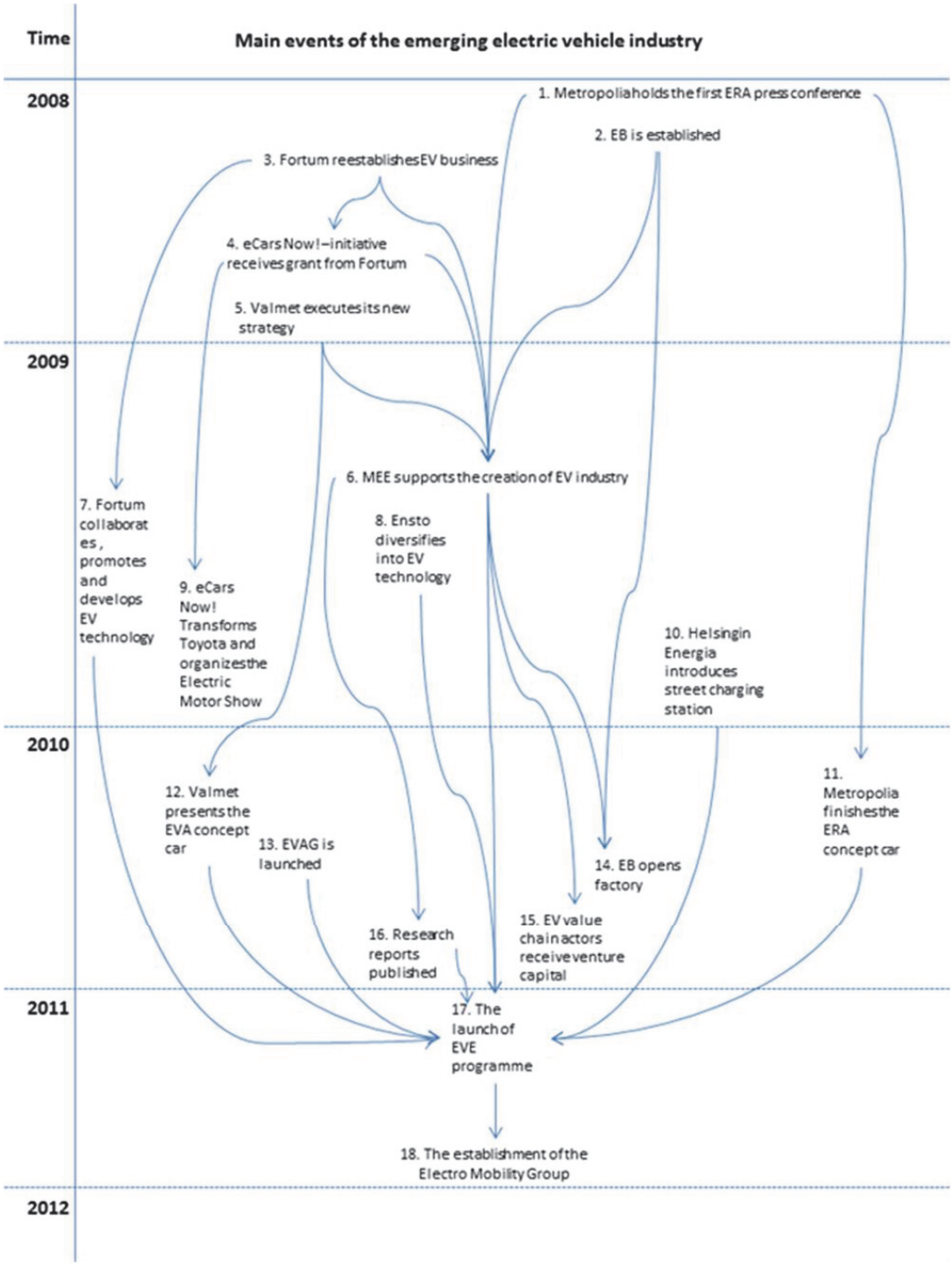

Figure 2. Main events of the emerging electric vehicles field in Finland based on the event structure analysis.

MEE working group on the prospects of the electric vehicles and related industries in Finland. The events received much public attention resulting in remarkable media hype (Rinkinen, 2010, see zoom 2).

Two new actors entered the scene. Electric device manufacturer Ensto won the charging station contract to the city of Oslo. Ensto was already part of the ERA-racecar network and one of the investors in European Batteries, but since autumn 2009 Ensto has been a visible part of the Finnish electric vehicles field. The utility company Helsingin Energia built the first street charging station in central Helsinki in 2009, which was inaugurated by the Mayor of Helsinki. The head of R&D in Helsingin Energia became one of the champions of the Finnish electric vehicles field promoting especially the infrastructure and service businesses.

Several concept cars were launched during 2009–2010. The eCorolla of eCars – Now!, was launched in connection to the first Electric Motor Show in Helsinki. AMC Motors, University of Oulu and Chinese companies launched their concept car Sanifer. The ERA race car of Metropolia and Valmet Automotive's EVA were launched in early 2010. The inauguration of the factory of European Batteries in Varkaus attracted both public and political interest because of the involvement of the Minister of Economic Affairs. The prospects of mining lithium in Finland were also studied during the process.

However, the business of European Batteries remained poor. Also Valmet Automotive suffered from problems with its contracts. At Valmet Automotive the production of Think City reduced and was stopped altogether in 2011. Production of the American sports car Fisker Karma was delayed several times from the original plan of the end of 2009 due to quality problems.

The *third phase* (2010) represents the actions for reviving the ambitions of the report of the MEE working group and to start a major R&D program based on those ambitions. It required further expert reports and founding of a network for advocacy (see zoom 2). In an attempt to support suffering businesses the Finnish Industry Investment (FII) invested venture capital to European Batteries, Valmet Automotive and lithium mining in 2010–2011. In 2013 neither of these businesses were active in the electric vehicles field.

The Electric Vehicle Action Group published a letter of intent in early 2011 to advocate for a demonstration platform-based approach in the EVE R&D program, and in December 2011 the program, which was the second major innovation policy measure, was publicly launched (see 5.2.). Soon thereafter the actors in the field founded the Electro Mobility Industry Group.

A Closer Look at the Emergence of the Two Major Policy Measures

In this section we take a closer look at some of the essential mobilization activities leading to the two major policy measures within the electric vehicles field in Finland during 2008–2012. The first zoom shows how local innovation activities, development of networks and systematic advocacy work towards politicians as selectors led to the first action of political support to the field, i.e. founding a working group to define political goals for the field. The second zoom shows how the development was first supported by hype created by the first policy measures, then slowed down by disappointment, which was mitigated by further systematic advocacy and expectations work. This resulted in major innovation policy measures including R&D funding and investment support for electric vehicle demonstrations.

Private action and advocacy as triggers of the first political goals

Among the many private activities the Metropolia race car project (ERA) was a bold move by an active individual, a teacher of automotive electronics, Sami Ruotsalainen. He had a very good reputation in the field, which gave him credibility (Smith, 2007; Bakker et al., 2012) and Metropolia had experience of organizing demanding car design projects for its students, which offered a pre-existing niche (Smith and Raven, 2012) for actors to operate.

The objectives of the project were local, but also created expectations of electric vehicles as a technology interesting to the students and legitimate in the society, as stated by Ruotsalainen: *"Our aim is to raise the profile of our school through these car projects. Our target is also to get new good students." "We intend to demonstrate with this project, how car traffic, which is problematic for the environment, can work in the future."* ERA car was able to fulfill the initial promises (van Lente & Bakker, 2010) as soon after the launch it achieved second prize in an international competition for innovative sports cars, which gave the project broad publicity and the positive feedback required for further action (Geels & Raven, 2006).

Metropolia was also successful in creating broad networks of private actors, both incumbents and new entrants, which further improved the credibility of actors and formed a basis for the later advocacy work and resource creation: *"The cooperation with Metropolia in the ERA project is important for Fortum [a major utility company]"* (research director, Fortum). The project was very successful in feeding positive expectations about electric vehicles, but also contributing to innovation activities which are necessary to give credibility to the discursive activities (Konrad et al., 2012), which is confirmed by several interviewees, e.g. the project manager at Aalto University: *"The ERA car project of Metropolia changed the attitudes [towards electric vehicles]"*.

The growing interest among private actors in the Metropolia network was successfully turned into systematic advocacy work towards political decision-makers. The enactors included among others public affairs departments of large incumbent companies. Based on a general statement in the political program of the Finnish government the advocates started their work: *"We started knocking on the doors and gradually things started to happen. This is how the things happen: you start wondering why nothing happens [which has been planned on a strategic level] and somebody starts to act."* (coordinator, Eera Consulting). As electric vehicles hardly existed in practice, the tool of the lobbyists was expectations work: *"You sell a thought, a vision on what the future could bring, simultaneously with the planning of the project, before it has any concrete form"* (coordinator, Eera Consulting).

The advocates were successful in enhancing political activity. Appointment of the MEE working group was an exceptionally strong commitment to a single technology by the Ministry, which usually defines policy only on a general level. The active players were the politicians rather than the civil cervants. Therefore the motivations of politicians as selectors are of interest for this zoom. The beginning was difficult, because there was no interest in electric vehicles in Finland and electric vehicles technology was not considered to support the Finnish industry: *"The word electric vehicle did not exist in the transport strategy of 2008"*. *"The original political understanding was that all governmental support to electric vehicles would leak to foreign car manufacturers"* (director, public affairs, Fortum).

At the time the Government was struggling with the consequences of the financial crisis, decline of key industries and the

shortage of manufacturing contracts for Valmet Automotive. Therefore suggestions for a potential new industrial cluster in the making became interesting to the politicians. The commitment of large incumbent companies like Fortum and Valmet Automotive contributed to the credibility of the expectations. Prime Minister Vanhanen was personally taken to the initiative. The newspaper Helsingin Sanomat reported: *"Prime Minister Matti Vanhanen has often spoken for electric vehicles. Vanhanen forecasts that in 2040 the majority of traffic would be based on electric vehicles."*

However, the initiative was strongly contested. The Government coalition was led by the Centre party, whose constituency is mainly rural. For them the competing biofuel niche was more attractive, because forest-based raw materials offer income in rural areas. Minister of Economic Affairs, Mr. Mauri Pekkarinen was less than enthusiastic about electric vehicles than the prime minister from the same party. *"When the MEE working group delivered its report, Minister Pekkarinen said that this proves that in electric vehicles have no impact between 2020-2030… and then talked 20 minutes about biofuels"* (director, public affairs, Fortum).

The arguments of new business and attractive technology did, however, prevail. A visible political supporter of electric vehicles Mr. Jyri Häkämies, former Minister of Economic Affairs in the next Government coalition, reflects the motivations of the selectors: *"it is a sign of a forerunner society that we have been leaders in the penetration of cell phones, therefore we cannot lag behind in this kind of solutions."*

Our first zoom confirms the understanding of extant research on the role of credible individuals in the early stages of expectations work (Smith, 2007, Bakker et al., 2012), but also shows the importance of building a network sufficiently strong to have an impact on selectors as stated by director, public affairs of Fortum: *"I think that there started to be a lot of pressure. There were companies: European Batteries and Ensto started to make electric-vehicle-related things. Valmet Automotive was active."* This was achieved through presenting a goal which was sufficiently bold to be interesting but also credible.

Electric vehicles are also politically attractive means of supporting the greening of traffic, as it offers a possibility to combine the environmental and economic objectives with good visibility in the media. This supports the findings of Rappert (1999), Meadowcroft (2009) and Voss et al. (2009) that the buy-in of politicians in policy development requires combining the political interests and the rational argumentation of policy goals. Our zoom also confirms the assumption that propulsion improvements of private cars have a better public acceptance and therefore political acceptance than policies restricting car use, even if the latter are more effective in solving the policy goals (Nyqvist & Whitmarsh, 2008; Geels, 2012). The role of systematic advocacy and politicians as selectors of technology is stronger than has been empirically shown before.

Hype and disappointment mitigation lead to innovation policy action

In its report the MEE working group set ambitious targets for the growth of the electric vehicles cluster in Finland. "*The share of electric vehicles of all new cars sold in 2020 is 25 %* " (TEM, 2009: 7). The report created a political goal, which still is referred to verbatim. It created a strong signal for private actors, and many private actions arose. These together with political visibility increased the media attention on the electric vehicles field (Figure 3).

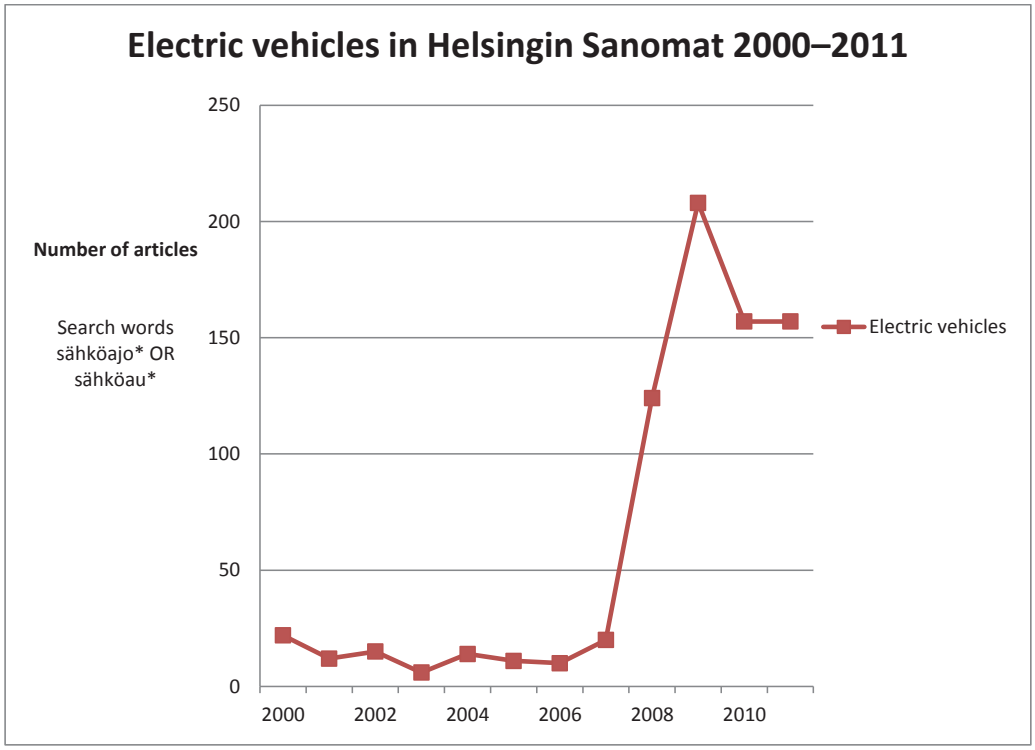

Figure 3. Number of articles on electric vehicles in Helsingin Sanomat.

In addition to the MEE working group report, the government foresight report on climate and energy policy (Finnish Government, 2009) increased the legitimacy of electric vehicle development. Bold policy targets for decreasing CO_2 emissions were translated as a broader promise and mandate to protect the specific niche of electric vehicles (cf. van Lente, 2000). This mandate played an important role in speeding up discussions from various viewpoints.

As the concept cars had been noticed publicly, they possessed a material substance, resulting in a wider set of actors seeking to 'join' the innovation discursively by bringing their own references to the debate. A variety of electric car test drives, charging demonstrations and consumer queries were put in and discussed during the hype phase. These kinds of technological and social explorations can be seen as part of the learning process for niche accumulation (Schot & Geels, 2007), and they resulted in including a heterogeneous set of actors, also apart from industry and political parties, to participate in the hype, whilst not necessarily sharing an interest in contributing to these expectations (cf. Konrad, 2006).

Much of this increased media discussion was characterized as expectations-laden and positive future imaginaries with specific emphasis on the market potential of the cluster. Using metaphors such as 'stimulating drug', electric cars were expected to boost up the Finnish economy.

> As a medicine lithium stimulates mood, but soon it might stimulate the Finnish economy. European Batteries is building a factory that uses lithium for electric car batteries in Varkaus. (Talouselämä 11.12.2009)

> Waiting for Christmas and electric cars have much the same. You can see the signs of both. Helsingin Energia announced this week Finland's first street charging point in Kamppi. (Helsingin Sanomat 19.12.2009)

The dominating economic discourse celebrated the market promises raising from the charging, manufacturing and battery industries, in particular emphasis on growth and employment effects. The new private actors in the electric vehicle cluster were represented as examples of the promising clean tech cluster. The discourse attached electric cars deeply in the dynamics of economic systems: Rather than rethinking the social embedding of new technology, economic discourse constructed electric vehicles as 'business-as-usual' or from the perspective of rational consumer.

However, also more critical voices were heard, implying shortcomings in the automotive and battery business and public support mechanisms. The technology was questioned in terms of high costs and performance, and the prospects for public support was seen as prerequisite for success.

> The electric car comes and rescues, is a mantra on many lips. In reality it takes more time what has been thought to have a substantial amount of electric cars, and the electricity they use must be produced in one way or another. A coal plant as a power source for electric cars does not sound an environment-friendly solution. (Tekniikka & Talous 23.10.2009)

> Old dominance slows down the electric cars. The traditional car industry tries to prevent agile electric car manufacturer from too strong market penetration. (Talouselämä 13.11.2009)

Accordingly, this 'hype phase' was indeed a combination of high media attention and high rising expectations (Ruef & Markard, 2010), but it also entailed critical voices especially on the technological premises and promises of electric vehicles. The increased media attention, was not only made up of shared expectations prompted by 'enactors', but media also played a role of informing 'selectors' with such expectations and provided selectors an arena to assess and reflect on the technologies. The media does not only simplify the emergence of the new innovation, but rather *adds* it into a complex mesh of meanings.

The phase was also characterized by competing expectations across technological communities (van Lente & Bakker, 2010; Bakker et al., 2011). As Geels (2010) points out, regime actors develop discourses that maintain legitimacy when they are faced with problems or criticisms and, on the other hand, social movements and niche actors try to de-legitimate the regime by framing industry practices or responses to problems as insufficient, outdated or unacceptable. Our zoom confirms this point: regime actors, car manufactures in this case, seek to maintain the legitimacy of the dominant path by introducing 'green technology' cars, whereas social movements try to de-legitimate the path as unsustainable by questioning the need for mobility (Rinkinen, 2010).

Disappointments and critical voices in the media turned selectors cautious about further protection: *"decision-makers were not convinced that [electric vehicles field] was worth a technology program of its own. They doubt that cars will be manufactured*

here anyway" (program manager, Tekes, 2010). However, it did not disrupt the networks, but further expectations work was launched to advocate for a demonstrations program, which was considered crucial by the enactors: *"We need purchasing support for 1000 [electric] cars, a semi-massive field experiment, which would be a start for the increase of electric vehicles in Finland"* (director, new technologies, Ensto).

The private sector collected forces to mitigate the disappointment. Eera Consulting, which is an active enactor in the electric vehicles field, established Electric Vehicle Action Group (EVAG), whose target was *"to implement the MEE vision of electric vehicle numbers in Helsinki region".* The visible result of EVAG was a letter of intent by 43 actors in January 2011 to start a demonstration platform even if the final decision of the program funding was still pending. The actors were companies, cities, research organizations and non-governmental organizations: *"Our members were active… I brought the paper to [our CEO] and he signed it to show that we support this project. It was one project to advocate for these demonstrations."* (coordinator, Technology Industries). Pollock and Williams (2010) showed that consultants often have an analyst role in innovation, i.e. role supporting the selectors. We show here an active enactor role of consultants.

Both existing and new actors produced expert reports in order to revive the expectations of the electric vehicle field (Pollock & Williams, 2010, Bakker et al., 2011). Tekes (SWOT, 2010) and the Ministry of Transport and Communications (Nylund, 2011) directly advocated for demonstrations (even if the latter voiced cautious expectations of electric vehicles), and Finpro (business-owned organization for the enhancement of internationalization of Finnish companies) advocated for services (Finpro, 2010).

One of the supportive arguments was a reframing of the field from vehicles and their components to emphasizing the infrastructure, which had more potential for offering new business opportunities for Finnish companies: *"The Finnish electric vehicle cluster is like a guerrilla group. Valmet [Automotive] is too small to develop a strong cluster around it. The effort should be concentrated on the development of infrastructure, which would be more natural for Finland."* (director, new technologies, Ensto). *"We tried to communicate that this needs to be seen as broader than manufacturing cars. Then it will be interesting for Finland."* (director, public affairs, Fortum). The Ministry of Transport and Communications broadened the discussion from technology policy towards transport policy (Nylund, 2011).

The work of the advocates was successful as the expectations started to become more positive again in late 2010, even if *"no leap in e.g. battery technology can explain the present hype"* (program manager, Tekes, 2010). The good legitimacy and political suitability outweighed the credibility problems of the expectations on the success of the technology: *"I believe the biggest drawback is the lack of credibility. Cold climate, charging infrastructure, the risk of the car leaving you on the road to your summer cottage"* (former Minister of Economic affairs).

EVE-technology program and a major investment support program by MEE for electric vehicles and charging infrastructure were launched in December 2011 in the presence of high-level politicians. EVAG-consortium developed into a demonstration platform of the EVE-program (ElectricTraffic). EVE program is a major innovation policy effort in the area of electric vehicles and related technologies including governmental R&D funding, demonstration platforms and company

projects. *"Tekes program is one that gathers [actors]. It is probably the most important [initiative]. Such companies as Siemens joined. Other big [companies] than us. Others than small companies. Valmet is actively along. It has caused that this is taken more seriously"* (director, public affairs, Fortum).

The Electro Mobility Industry Group was founded in 2011 to enhance the cooperation and to improve the business possibilities of companies and organizations within electric vehicles field. By the end of 2012 the members include 57 organizations representing vehicle manufacturing, charging equipment and systems, software, intelligent traffic, smart grids, research and education, legislation and standardization. The group invests in networking within the industry and with the authorities, builds a common vision of the branch and informs the decision-makers. The group forms a permanent arena for aggregation activities i.e. enhancing knowledge flows and development of generic knowledge (Geels & Deuten, 2006).

In addition to EVE-program, the Finnish emission-based vehicle taxation first time in 2012 explicitly acknowledged electric vehicles as zero-emission vehicles, which have the lowest vehicle tax. This is the first piece of vehicle legislation specifically referring to electric vehicles. Even if the number of electric vehicles is low, the sales are increasing and the availability of cars is improving. The business model of charging infrastructure and related services is developing. A new field has been established.

Discussion

The enactors of the electric traffic niche in Finland have carried out carefully planned and highly visible expectations work (Bakker et al., 2011) through events, R&D programs, expert studies, demonstrations and political connections. The role of politicians as selectors of technology was crucial. The development of the field is summarized in Figure 4. In the following we summarize our findings on systematic expectations work

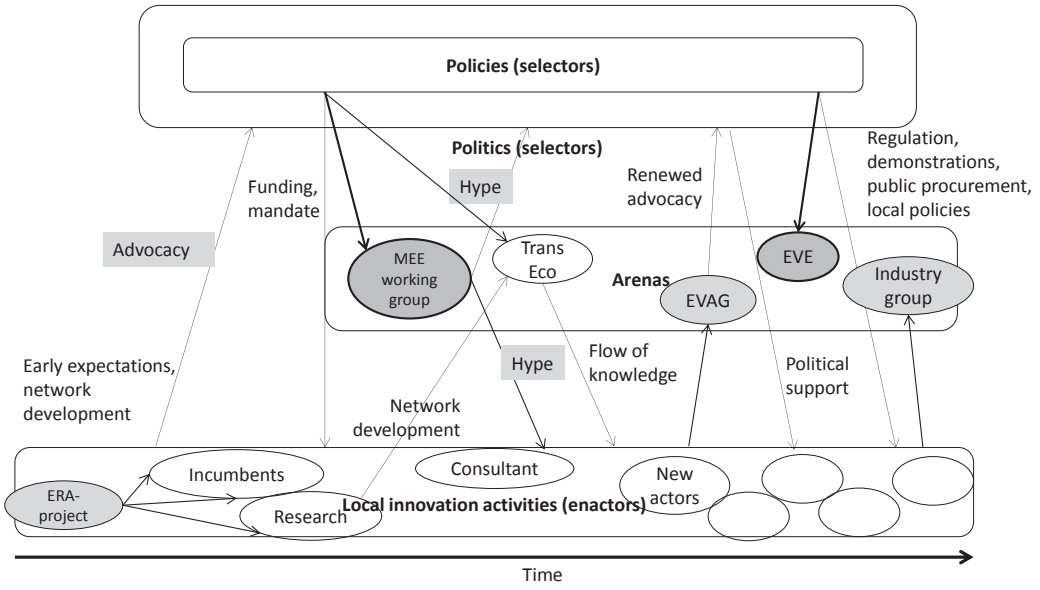

Figure 4. Expectations work in the Finnish electric vehicles field.

and the role of arenas in the development of electric vehicles field.

Characteristics of Systematic Expectations Work

The characteristics of *credible expectations* in expectations work has been discussed by Bakker et al. (2012) and our work confirms their conclusions on the need to build on the existing collective expectations and to draw a path forward. We also follow Ruef and Markard (2010) in showing that the legitimacy of the technology is crucial for mitigation of disappointments of the success of the technology. In addition we found that an important part of mitigation of disappointment is an adjustment of the framing of the field to concentrate on the successful parts of the technology and to avoid focus on the disappointments.

One of the main findings of our study is the crucial role of *systematic advocacy and publicity work* in expectations work. The role of professional lobbyists is to combine the message systematically with the current political agenda to ensure the democratic legitimacy of the expectations (Konrad et al., 2012, Voss et al., 2009). We also show the major role of media visibility, which is strongly influenced by the systematic publicity work by the professional lobbyists. They understand that high-level political support attracts media attention, but public hype is also an important motivation for politicians to continue their engagement in the electric vehicles field.

Expectations work requires *credible individuals*. Credibility is based on different characteristics at different stages of the niche development. Our study confirms the well-known role of idealistic enthusiasts (Smith, 2007) in the early stages of the development of the electric vehicles field in Finland. Following the argument of Bakker et al. (2012) we show that in addition to being able to depict a radical but plausible alternative to existing practices a niche champion benefits from personal credibility towards various players within the regime and outside it in order to create the necessary networks for the creation of lobbying capacity towards selectors. In the process of the field development the credibility of the individuals is defined by additional characteristics. The role of professional lobbyists with necessary political contacts and ability to combine the niche objectives with the political goals has rarely been discussed in the SNM literature before. We recognized a special type of "pragmatic system builders" (Smith, 2007), who gained credibility among regime players by being cautious and even contesting the arguments of the "niche idealists".

The credibility of the expectations work among policy-makers is greatly enhanced by the participation of *large incumbent organizations*. Noteworthy in our case is the active role of utilities, which shows that the electric vehicles niche develops both in connection to the auto-mobility regime and the electricity regime. This shows that expectations work is required towards several interacting regimes (e.g. Markard & Truffer, 2008).

Expectations work is carried out in various *arenas*, which contribute to vision-setting, development and flow of knowledge, testing of expectations, contestation between the competing technologies etc. In the following section we discuss in more detail our findings on the arenas.

Arenas in the development of an industrial field

Extant research has described various forms of arenas from the highly formal vision-setting transition arenas (e.g. Rotmans et al., 2001) to occasional bridging events (Garud & Ahlstrom, 1997), aggregation activities (Geels & Deuten, 2006) and fluid arenas of expectations (Bakker et al., 2011). We

suggest an important role for temporary but organized arenas like the MEE working group, R&D program groups and industry networks in successful expectations work. They offer in addition to expectations work important opportunities for learning and gradual definition of a common vision between enactors and selectors including technology developers, users, and policy-makers.

In our case, the five main networks have different members and objectives. They consist of actors representing governmental offices, companies, research institutions and non-governmental organizations. The companies are both incumbents and new entrants. In addition to the official members of e.g. steering groups of the networks, influential actors operate in lobbying and network building. The expectations work includes both innovation activities and discursive activities (Konrad et al., 2012; see Table 2).

MEE working group was both a result and an actor in expectations work. It set out to define goals for innovation policy on electric vehicles. The enactors advocated for a broad definition of the field, because cars were not sufficiently interesting for Finnish industry: *"we attempted to draw a cluster, or at least a broader frame of reference, which would make it feasible for Finland to be active in it"* (member of the group, director, public affairs, Fortum). In addition to being a vision-defining group (like a short-term transition arena) it was an arena for reflecting on the expectations, defining the field and development and for mutual learning, even if very different from aggregation activities described by Geels and Deuten (2006).

Especially the three later networks consciously enhance knowledge flows and development of generic knowledge, i.e. serving as aggregation activities (Geels & Deuten, 2006; see Table 3). TransEco program puts much effort on networking. ElectricTraffic consortium is one of the platforms of EVE-program, which developed from efforts to mitigate the disappointment. The Electro Mobility Industry Group forms a permanent arena for advocacy and development of generic knowledge (Geels & Deuten, 2006).

Table 2. Innovation and discursive activities (Konrad et al., 2012) within the main arenas of the Finnish electric traffic field.

	ERA race car network 2008 -	**MEE working group 2009**	**TransEco program 2009 -**	**ElectricTraffic consortium of EVE program (former EVAG) 2010 -**	**ElectroMobility Industry group 2011 -**
Innovation activities	Building of an electric race car		R&D in alternative fuels and energy efficiency of vehicles.	EV demonstrations and infrastructure development, R&D	
Discursive activities	Seminars, competition, interviews	Ambitious targets for business opportunities	Advocacy to politicians (transport policy)	Advocacy to politicians (innovation policy), Publicity work	Advocacy, standardization

Table 3. Aggregation activities of the electric traffic arenas in Finland.

Geels and Deuten, 2006	**TransEco 2009 -**	**ElectricTraffic consortium of EVE program (former EVAG) 2010 -**	**Electro Mobility Industry group 2011 -**
Standardization, model building, writing of handbooks, formulation of best practices	Popularization of results	Gathering of user experience, Writing guidelines Enhancing charging infrastructure, Initiative in establishing electro-mobility operator	Participation in standardization and advocacy on legislation development are core activities
Developing of knowledge for the use of others	Project results open for all participants	Project results open for all participants	
Organized e.g. by industry associations, where "actors perceive themselves as part of an emerging community with collective interests".	Initiated and coordinated by a State Research Institute	Coordinated by a powerful consulting company	Part of Federation of Technology Industries, membership based
Forums that enable and induce the gathering and interaction of actors	Broad consortium, steering group discussions, seminars	Broad consortium, various gatherings	Regular meetings, seminars

Conclusions and Limitations

We contribute to the SNM literature by showing how the policy actions developed through systematic expectations work initiated by private innovation activities followed by advocacy, strategic selection of the technology for support by the politicians, and continued work within well-functioning public-private arenas. In doing so we bring the SNM literature closer to the constructivist part of its origins from the emphasis on evolutionary approach and positive feedback cycles. To this aim we concentrated on a short time frame, real-time data collection and several complementary data sets.

We empirically confirm the extant knowledge of how the early actions were initiated by the enactors of the technology (Bakker et al., 2011) based on local expectations (Geels & Raven, 2006) and occupying a pre-existing niche (Smith & Raven, 2012). In addition we show how initial network building and a continuous interaction between actors, politicians and policy-makers within various arenas has maintained the niche, even if the real development of electric vehicles field has hardly started yet (Figure 4). Following Bakker et al. (2012) we call this process systematic expectation work and describe its characteristics. We conclude that systematic expectations work is an essential feature of the development of technological niches.

This study represents a short hype of one niche in one country. We do not know whether the electric traffic niche will

succeed in the end. There are numerous details, which still hold the existing regime together. The demonstrations develop much slower than expected. A possibility of a major disappointment remains. Moreover, the electric traffic niche in Finland is dependent on many external factors, which were not fully taken into account. The penetration of the vehicles is dependent on the international developments in the automotive industry, and the business of the infrastructure manufacturers is dependent of the demand in other countries. In spite of these limitations we believe that the domestic dynamics over this short period explain the mechanisms of mobilization of protection by policies.

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Armi Temmes
Department of Management and International Business
Aalto University School of Business
P.O. Box 21230, 00076 AALTO
Helsinki, Finland
armi.temmes@aalto.fi

Rami-Samuli Räsänen
Center for Knowledge and Innovation Research (CKIR)
Aalto University School of Business
P.O. Box 21230, 00076 AALTO
Helsinki, Finland
rami-samuli.rasanen@aalto.fi

Jenny Rinkinen
Department of Management and International Business
Aalto University School of Business
P.O. Box 21230, 00076 AALTO
Helsinki, Finland
jenny.rinkinen@aalto.fi

Raimo Lovio
Department of Management and International Business
Aalto University School of Business
P.O. Box 21230, 00076 AALTO
Helsinki, Finland
raimo.lovio@aalto.fi