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Social Innovation, Conflict, and the Institutionalization of German Energy Co-operatives

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Berlin, July 2017

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BEST PAPER AWARD

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Abstract

Transformation to sustainability requires an understanding of the underlying innovation processes that includes new types of "social contracts" between governments and an activated civil society. Leading think tanks like the Intergovernmental Panel for Climate Change (IPCC 2012, 2014) or the German Advisory Council on Global Change (WBGU 2011) stress the roles of a combination of elements like new technologies, collective action and behavior, as well as policy experimentation.

In our paper we draw lessons from the example of energy system transformation for the theory of innovation. By 2015, roughly a decade after the passage of Germany's *Erneuerbare-Energien-Gesetz* (Renewable Energies Act), electricity consumption from renewables reached 30%. Within a few years, besides changing the sources of energy, Germany had widely decentralized energy production, integrated energy enterprises as well as citizens in new ways into regional economies and developed new policies, types of finance and governance for its renewable energy sector. In the same period of time Germany witnessed the largest increase in cooperative foundation numbers over the last 40 years and the emergence of a new type of cooperative, the renewable energy cooperative.

How can the course of this multidimensional, multilevel transformation best be explained? In our paper we claim that conventional innovation theories need to be complemented in order to explain what's going on in Germany's energy sector. We further claim that the case of the German energy system transformation provides a formidable example for discovering those elements yet missing in the conventional understanding of innovation processes.

In our paper we characterize important stages, drawbacks and achievements of the German energy transformation. We then briefly introduce into 20th-century economic theories of innovation. Concepts like Increasing competition, changing factor prices, entrepreneurship, and knowledge diffusion surely add to an explanation of German energy transformation. However, these concepts cannot sufficiently explain policies, civil society engagement and the speed of organizational innovation.

We argue that the dynamics of the German transformation to renewables cannot be explained without consideration of the "cognitive dissonance" Germans had felt after two nuclear disasters prior to the turn of the century. After that it was rather the increasing role of the public climate change debate that has activated "civil society"- actors lobbying for support of smaller scaled renewable energy production projects.

We find that, triggered by innovative state policies and cognitive dissonance, the German energy transformation was driven by both economic incentive and citizen collective action. As renewable energy projects became widespread phenomena at the German countryside, competition for land and so called "not in my backyard" problems threatened the project.

The participation of citizens in the financial costs, benefits and allocation decisions of energy production is a way to overcome such problems. Because the co-operative is a proven form for collective finance and participatory multi stakeholder organization there was widespread adaptation and rapid diffusion of renewable energy co-operatives in this period.

We claim that the development process of the new renewable-energy sector in Germany illustrates the important role of cognitive aspects and aspects related to social innovation processes – the adoption of new ideas, norms, and values – and their interplay with technology adoption in the context of citizen co-construction and co-production of institutional policy. Further, we claim that the emergence, adaptation, and diffusion of energy co-operatives illustrate significant processes of conflict negotiation and re-negotiation in a dynamic environment. We conclude with observations regarding the future of the sector as well as what its experiences mean for innovation theory.

1. Introduction

1.1. The German energy transformation and energy co-operatives

Germany is the largest industrialized economy in Europe and the fourth largest worldwide. In 2011, the German government decided on a total opt-out from nuclear power production and has set relatively ambitious targets to implement renewable energies, with a 50% share of renewable energy in electricity consumption by 2030 and 80% by 2050. In the year 2015 in Germany 35% of production and 27% of electricity consumption stemmed from renewable energy sources like wind parks, photovoltaic cells and biogas plants (Federal Ministry for Economic Affairs and Energy 2015). This rapid German energy transformation process results from the combination of state policy with innovative citizen action. On the state's part, a law granting generous feed-in tariffs (*Erneuerbare-Energien-Gesetz*: EEG) for renewables speeded the rate of green technology adoption. On the citizen side, consumption and production patterns have changed and fundamentally new types of citizen organizations have emerged in the energy sector. Wider institutional changes were also part of the story. A precondition was the liberalization of the German energy sector in 1998. After liberalization, however, the energy market still maintained its oligopolistic character, with four large companies controlling 90% of the market share (Laird and Stefes 2009). The key change came when the Renewable Energy Act (EEG) was introduced in 2000 as a reform of the previous Feed-in Law (Stromeinspeisegesetz: StrEG). The act markedly increased the incentives and economic stability conditions for the founding of renewable electricity projects. It has been argued that this change of the regulatory framework contributed greatly to the successful development of the renewable energy sector in Germany (Laird and Stefes 2009). Following the enactment of the EEG, wind, photovoltaic, and biomass energy production increased significantly as numerous new enterprises emerged. Meanwhile 10% of the energy consumers buy so called green energy, a more expensive variety of energy generated by renewable energy plants. Though a multitude of organizational types have been involved in the energy transformation process, the renewable energy co-operatives combine societal and policy aspects with direct citizen action, and therefore offer a promising case study of the theory, stages, problems, and outcomes of social innovation.

The relatively brief period from 2005 to 2015 saw the emergence of 900 new renewable-energy co-operatives in Germany. Different from earlier generations of energy co-operatives, these ones focused on photovoltaic and wind farms or on biogas production. As will be described in more detail later in this paper, the actors were new as well: disproportionately young professionals motivated by social and ecological values. Their goal was not only to reduce greenhouse gas emissions, but more distinctively to democratise the energy system. The new co-operatives were highly localised and scattered, deeply embedded in rural regional societies and economies. The co-operatives made their contribution to Germany's energy transformation, which by 2015 saw 30% of electricity consumption coming from renewable sources.

The new co-operatives were unprecedented, but also did not come out of nowhere. Citizen-activists had previously created a social and political movement championing new approaches to energy, and the passage of Germany's *Erneuerbare-Energien-Gesetz* (EEG) in 2000 provided state sanction and subsidies. Politics and legislation did not determine, however, that new efforts would take the form of co-operatives. Communities and widely scattered actors shaped the material outcome.

As we consider this story, two things become evident to us. First, this is a story of innovation; and second, it is a story that is complicated. State policy played a role. Economics played a role. Technology was changed from fossil and nuclear toward solar and wind. Energy governance was reorganized and redistributed in decentralized ways. Groups of actors such as citizen-consumers changed roles to become producers and owners.

How can the course of this multidimensional, multilevel transformation best be explained, including the choice of co-operatives as an organizational form? In our paper we combine different theoretical concepts to explain the life cycle of this phenomenon. While many examples in the history of co-operatives illustrate innovation and social change, the recent, rapid expansion of renewable-energy co-operatives in Germany is a particularly striking illustration that may add to more general theoretical understanding of how innovation happens and what role social process has to play in it.

In the first part of this paper, we will reflect on the current state of the theory of innovation and will conceptualize main elements of that theory as well as linking to emerging concepts such as social innovation. Against the background of this conceptualization of innovation and social innovation, the second part of this paper presents an analytical narrative switching levels and theory elements of the analysis (Bates et al. 1998) of the German Energiewende and the emergence of a citizen-driven energy system. In particular we ask:

- Why is half of the investment done by civil society energy prosumers?
- Why do we see the strongest development of cooperatives since the last 40 years happen in the energy sector?
- What is the role of values and beliefs for the beginning and for different phases in the scenario?
- Why has the build out of reneweable energy per year stabilized though the social cost have risen?
- What was the role of civil society and new social contracts (government) in the process and how does that fit to conventional theory building?

In the conclusion we will reflect on how well existing knowledge of social innovation processes explains the phenomenon of the German *Energiewende*. We will summarize stages in the German *Energiewende* and discuss in how far they conform to theory or suggest alterations to theory, and we will reflect on what these insights suggest about the future of the co-operatives and the challenges ahead.

2. Concepts of innovation

2.1. Established concepts of innovation

There is considerable literature on innovation which we can review here only in a selective way, focusing on influential ideas and ones that promise relevance to our case.

Innovation is commonly thought to start with a moment or process of invention – either the entirely new creation of something that never before existed, or the introduction of an idea that is new to its context. In economic theory, the word innovation is normally reserved for new ways of doing things that are more effective or more efficient than preceding methods and that spread once introduced. In other words, innovation may proceed from an invention, but it is not an innovation unless it has spread, become institutionalised, and provided benefits. Literature on innovation indicates most writers assume that innovations are economically driven and technological in character (Frankelius 2009).

Given this widespread perspective, we can conceptualise an innovation process in a simple and general way as illustrated in Figure 1. An agent or actor (inventor, entrepreneur) – possibly responding to some environmental impulse – identifies an invention that is new to the current context. Refining, validating, prototyping, or scaling up this invention entail some costs that must be surmounted; if they are, a process of diffusion can occur that would result in innovation. We will use this simple model to map various ideas about elements in the innovation process.

Figure 1: Generalized stages in an innovation process (conceptual)
Source: Own illustration

Entrepreneurs as disruptors

Josef Schumpeter (1942) drew attention to the role of the entrepreneur in the innovation process. The entrepreneur who invests in a technology lowers production costs, enabling firms who adopt the technology to outcompete firms who are slower or less able to do so. The result is a disruption, or "creative destruction."

Evolutionary economics and institutional explanations of innovation

Schumpeter's idea of creative destruction is related to evolutionary economics, a term coined by Thorstein Veblen (1898). Evolutionary economics carries further the idea that innovations interact with an institutional environment to produce an outcome, stressing

the role of competition among ideas in which the winners are those that create the greatest value for the cost.

Subsequent, classic work by Richard Nelson and Sidney Winter (1977, 1982) focused on changes in technologies and in routines, considering mechanisms that cause variation, selection, and self-replication. They saw big organizations and universities as agents of innovation, producing new ideas and ways of doing things. An environment characterised by uncertainty and institutional diversity then determines which potential innovations succeed. As a result innovation can be seen as "the conditional probabilistic outcome of various R&D strategies [and] the workings of a selection environment" (1977, p. 71).

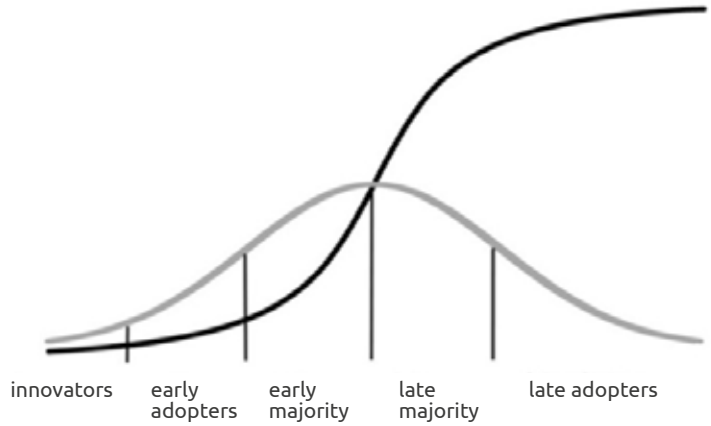
Conditions that induce innovation

While many writers have been concerned with what happens downstream of the entrepreneur or the innovative idea, others have considered what induces actors to produce and deploy inventions. Looking at innovation as an engine of development, Yujiro Hayami and Vernon Ruttan considered how innovation is induced by economic constraints. Comparing different development paths in different countries, they concluded that development resulted from a sequence of innovations that addressed the scarcity in each case of the most restricted factors of production and their price relations (Hayami and Ruttan 1984). Thus constraints such as the scarcity of particular factors of production can be seen as inducing innovation.

Diffusion of innovation

At the other end of the process, some writers have considered diffusion as a prerequisite of innovation. Attention to the processes by which an innovation diffuses will be particularly important to any detailed analysis of its interplay with its environment. Nineteenth-century French sociologist Gabriel Tarde (1903) was among the first to formulate the concept of diffusion and to identify the logistic or S-shaped growth curve associated with diffusion of innovations. The classic work on diffusion of innovations, Rogers (1995, 2003), outlines how a population may be seen as subdivided into multiple categories of agents ranging from innovators to laggards. As new groups "buy into" an innovation, the population of individuals who have adopted it grows, displaying a characteristic logistic growth curve (Figure 2:5, black line).

Figure 2. Logistic innovation curve
Source: Own illustration (adapted from Rogers 1995, 2003)



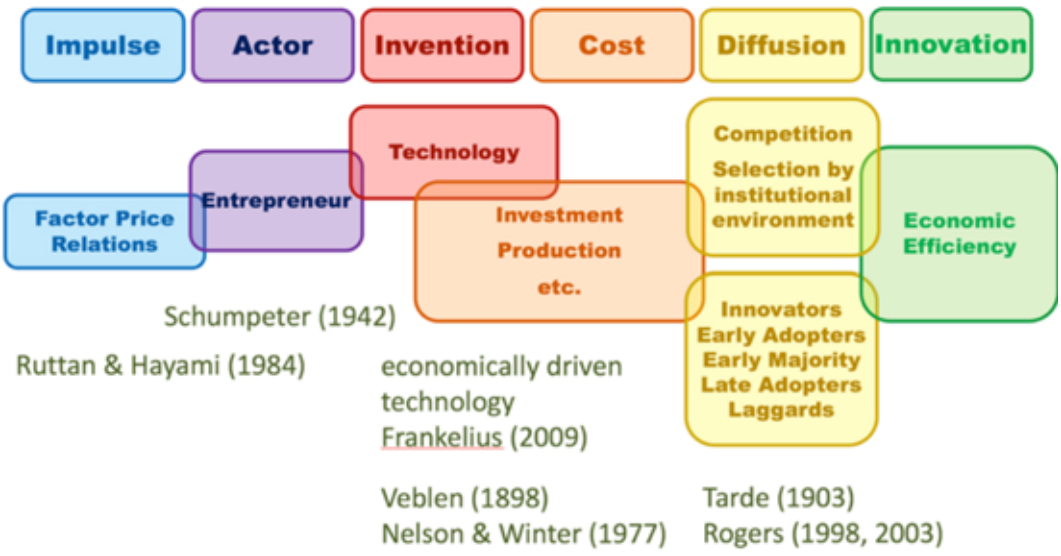
In a typical case growth in numbers is slow at first (as only early adopters are getting on board), then mounts rapidly in a take-off phase during which most of those who are going to adopt the given innovation under the given circumstances do so. A plateau follows as the innovation gradually reaches the least willing adopters.

Missing elements?

Summing up the concepts surveyed so far, all are useful for understanding a complex phenomenon such as that represented by German energy transformation. However, it remains a puzzle why German citizens have chosen a particular type of governance, the co-operatives. There is entrepreneurship and disruption in our story, technology and cost calculations, and competition of ideas with selection against an institutional field. Something induced this wave of innovation, and possibly one could regard a new appreciation of environmental and social costs as a constraint that spurred innovation. As we will show in the final section, diffusion of innovation did occur on the familiar pattern. There are actors, inventions, drivers, and a pattern of adoption similar to other examples of innovation. We sum up the extended concept so far in Figure 3.

But as a whole all this is so far neither convincing nor complete. In our case the actors were not classic entrepreneurs or R&D programs, but collective or civil-society agents; their efforts were motivated prominently by values (not efficiency), which simultaneously shaped the institutional selection field they encountered. The innovations involved technology but perhaps the most interesting aspects (such as decentralisation and novel organisational forms) were driven also by other factors. The innovations were not preconceived by the inventor and passively accepted by adopters; rather, the invention or innovation changed during the process of diffusion, for example, to focus on co-operatives.

Figure 3: Annotated innovation process (various writers)
Source: Own illustration



Given the incompleteness of the field of innovation theory, is not surprising that mainstream concepts of innovation, established up to the late 20th century, do not cover our case. As Nelson and Winter observed, the then-existing frameworks were "at best a rudimentary characterization of process and relevant institutional structure [;] a considerably more fine grained theoretical structure is needed" (1977).

As writers on the subject of energy co-operatives have noted, what is needed to understand them is an amalgam or "a synthesis of technological and social change" (Yildiz *et al.* 2015). For the story we want to explain, what is missing are the prominent roles played by values, collective change agents, and civil-society actors. In other words, a more convincing and complete explanation needs centrally to build in psychological, social, and political factors. Other, generally more recent concepts of innovation can prove helpful in these regards.

2.2. Emerging concepts of innovation: Adding social, cognitive, and participatory dimensions

What we have characterised, above, as mainstream concepts of innovation have been supplemented in recent times by a variety of emerging approaches that appear particularly relevant to our case. We identified three promising bodies of thinking: social innovation, cognitive models, and user innovation. As we did in the previous section, we will survey each of these briefly in turn for the contributions it can make to an enlarged model of innovation.

Social innovation

Though theorising social innovation is new, social innovations are not. In fact they surround us. Their importance is increasingly recognized by researchers and policy-makers, but as will be described below the theory of what they are, how they emerge, and how they develop is still in comparatively early stages.

Peter Drucker was an early user of the term social innovation when he asked, "Are we overemphasizing science and technology as this century's change agents? Social innovations … may have had even profounder impacts on society and economy" (Drucker 1987, p. 29). Since then, the term has become so widely used that some have bemoaned that it may simply be a buzzword (Pol and Ville 2009, Borzaga and Bodini 2014, p. 412); that it lacks sufficient definition to be useful (Cnaan and Vinokur-Kaplan eds. 2015, p. 2); and that it is undertheorised: "Research about social innovation is still largely based on anecdotal evidence and case studies lacking unifying paradigms" (Caijaba-Santana 2013, p. 43). Some care is called for to define carefully what we mean by social innovation.

We draw attention to the following points of attachment in the literature on social innovation as promising insights to bring more rigour to the theorising of social innovation:

- According to an influential definition, social innovation describes "a novel solution to a social problem that is more effective, efficient, sustainable, or just than present solutions and for which the value created accrues primarily to society as a whole rather than private individuals" (Stanford Graduate School of Business 2015).
- The concept highlights "a process of collective creation in which the members of a certain collective unit learn, invent and lay out new rules for the social game of collaboration and of conflict or, in a word, a new social practice, and in this process they acquire the necessary cognitive, rational and organizational skills" (Howaldt and Schwarz 2010, p. 26).
- The concept highlights innovations that are social in both their ends and their means, that are both good for society and enhance society's capacity to act (Murray et al. 2010, p. 3; European Union, BEPA 2011 and 2014).
- In the minds of many researchers, including ourselves, the concept particularly applies to broad, transformative and systemic solutions to systemic social and ecological issues (Haxeltine et al. 2013).

While such insights are useful beginning points, they are not specific enough for our purposes. We need a framework, similar to what we have outlined above for earlier concepts of innovation, that helps direct attention to impulses, actors, and so on in the social-innovation process.

A fine-grained theory of innovation requires considerable attention to social actors, and in this regard there are a variety of approaches in the existing theoretical literature. Generally, those approaches that emphasize the problem-solving aspect of social innovation – the novel idea, product, or service – also tend to emphasize the role of the individual social entrepreneur and the specific act of invention. Those approaches that

emphasize the systemic nature of social innovation draw attention to different processes. Thus a number of writers distinguish between approaches that stress individual social entrepreneurship and philanthropy on one hand, and ones that focus on the collective character of social-innovation processes on the other hand (Bouchard 2013, p. 17).

For phenomena such as we are analysing in this paper, we have found that a useful approach is one developed at the Université du Québec à Montréal, Centre de Recherche sur les Innovation Sociales et l'Économie Solidaire (CRISES). Building on institutional and organizational theory, CRISES researchers articulate an innovation process whereby actors, seeking to change social relations, exploit cracks in society, conflicts and gaps among existing societal institutions, in order to create new organizational forms. The diffusion of these organizational forms and the related innovations change societal institutions (Klein and Harrisson eds., 2007, esp. introduction). Harrisson and Klein theorize the underlying process as follows: "Social institutions are born and tested initially in organizations. At first they constitute actions limited to a particular problem, deviant actions that bypass institutionalized rules. From there, when they respond to widespread social needs, they diffuse to other organizations and from there to the general public" (Harrisson and Klein 2007, p. 6; Lévesque et al. 2014). The prototyping of innovations within specific, favourable organizational forms is a solution to "the problem of embedded agency" (Battilana and D'Aunno 2009) that faces social actors. In putting together new organizational forms for their innovations, such actors will adapt and use what exists in a process of social bricolage (Di Domenico et al. 2010). In another publication, one of us has elaborated on this institutional-organizational model of social innovation and how it can be applied to explaining co-operatives (Fairbairn forthcoming 2017).

Knowledge brokerage

In perfect markets, the price mechanism will lead demand and supply of innovations to a clearing level. But in reality, markets are characterized by imperfect information. This causes 'structural holes' in the network, creating a need for brokerage (Mazzarol, Reboud, Clark, Simmons and Mamouni-Mimnios, 2013). Cooperatives are supposed to bridge this gap for farmers, by providing them access to information, knowledge and markets, which would otherwise be difficult or impossible to access individually. To reduce the constraints to innovation that farmers face, the activities of innovation intermediaries range from creating awareness, to search for new innovations, information brokerage, finding and matching partners, contracting, and supporting in marketing the outcomes (Howells, 2006; Smedlund, 2006).

Cognitive perspective

The idea that actors in social-innovation processes aim to prompt social change begs the question, what is the internal experience or thought process that leads them to do so? Many of the definitions of social innovation refer to a "problem" or a "need," but how are problems or needs constructed or identified in the first place in a way that entails collective action on them? With social innovation defined as intentional and goal-oriented, it is likely that cognitive and social-cultural mechanisms are at work.

Conventional theories of innovation underestimate the importance of cognitive elements in the innovation process. For example, Festinger's theory of cognitive dissonance has proved to be one of the most powerful theories in modern psychology. Festinger argued that conflicting feelings create psychological discomfort in people, who will then act to reduce their discomfort by reducing the dissonance or avoiding the sources of it. They will change either their cognition or their behaviour to achieve a greater consonance (Festinger 1957).

Our hypothesis is that that kind of felt discomfort and the decision to confront it, rooted in cognitive dissonance, is the key moment for social innovation.

Participatory perspective

In addition to considering the cognitive processes of individual actors, a theory of social innovation also needs to consider the collaborative, collective, and participatory nature of many or perhaps all social innovations. Even where a social innovation is conceived by a single individual – and in the case of German energy co-operatives this does not appear to be the case – the diffusion of the innovation depends on wide circles of other actors who often do not simply replicate the innovation, but also act as innovators themselves in changing it. Eric von Hippel's concept of "user innovation" or democratization of innovation is particularly relevant here (2005). The population of adopters are not only passive choosers, but reshape the innovation as it is occurring. Such a perspective moves us from linear models of innovation to ones that involve cycles and feedback loops among multiple, interacting innovators. These processes highlight the importance of information and interaction channels through which actors including user-innovators engage and inspire each other. In fact von Hippel argues there is a "a general trend toward a[n] open and distributed innovation process driven by steadily better and cheaper computing and communications" (Von Hippel 2005, p. 193).

2.3. An Expanded model of innovation

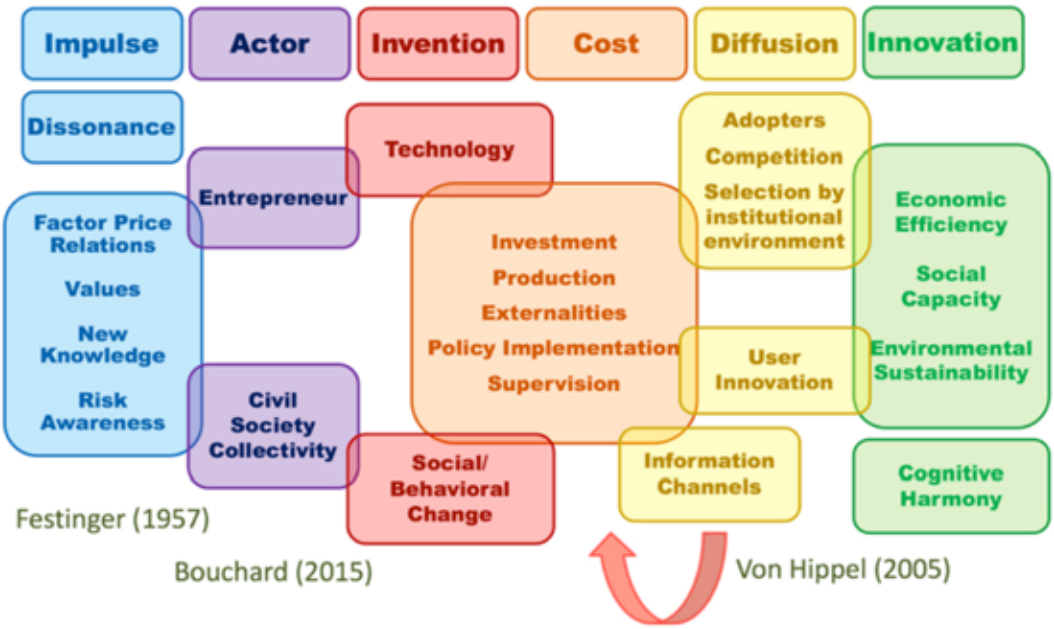
We believe social innovation, supplemented by concepts of cognitive dissonance/ harmony and user innovation such as we have described above, promises a more complete theory of innovation – one that will help us explain the development of German energy co-operatives, and likely also explain many other examples better than established theory does (Figure 1).

Ideas of social innovation have not systematically been connected to pre-existing theories of economic and technical innovation. Our argument is that important phenomena of contemporary social change processes are of a "social ecological technical systems" variety (Smith and Stirling 2010). Consequently, our definition of what is to be called an innovation borrows from these multiple conceptualizations: social and other innovations as we see them are the result of social, technological and economic factors. New ideas that meet social needs, create social relationships, and form new collaborations we call social innovations. They may comprise elements of competitive as well as collective governance, and include intentional and goal-oriented actions aimed at prompting social change. In the same vein, we think that findings of diffusion theory may apply to the spread of social innovations. In the narrative we present we will add nuance to these

views by considering dynamics and technological aspects in social innovation and social ones in technological innovation.

Like other inventions, social inventions may come in waves, triggered by windows of opportunities in a time of change or crisis, by the breakdowns of some institutions, or by conflicts of some institutions with others. Technical and technological inventions may be part of this story, in two senses: first as sources of disruption that create the need or preconditions for social innovations; second, potentially, as results of social innovations or as part of the intentional processes of finding harmony in the pursuit of such innovations. Social actors act – innovate, adopt, adapt – within a complex environment where multiple types of economic, technological or ecological innovations are likely to be interrelated with each other.

Figure 4: Combined technological, social, and cognitive innovation process
Source: Own illustration



Like other forms of innovation, social innovations may encounter resistance or constraints from existing institutions and from groups that have power. Economic and technological innovations may in some cases encounter extreme resistance, and it seems at least as likely that social innovations will do so because their intended purpose is to change social relationships. Many social innovations will likely bear on power structures in society and so almost by definition lend themselves to creating a backlash from those who are better off under the current structure. Property rights conflicts and differences in the resources actors can put into play may determine outcomes of innovation processes (Knight 1992).

Like other forms of innovation, social innovations undergo a process of diffusion and stages. As described above Rogers's model postulates that populations consist of innovators, early adopters, early majority, late majority, and laggards, differentiated by their propensity to adopt an innovation. In the case of social innovations, these groups

will be differentiated by their orientations towards the social institutions that are the object of change, by differing time horizons, and by their reactions to the ideas or social movements that are proposing change.

In the remainder of this paper, we will discuss the elements of this framework in the context of the German *Energiewende*. Our claim is that hundreds of newly created citizen energy organizations have increased society´s capacity to respond to the challenge of climate change and non sustainable energy production. Likewise they have created harmony in an area that was characterized by cognitive dissonance Our example is the rapid emergence and spread of a completely new type of energy organization run and funded by citizens: the German renewable energy co-operative. Our aim is to classify this case within the proposed framework of social innovation theory.

3. Applying the model: Invention and diffusion of German renewable-energy co-operatives

3.1. Changing risk perceptions and innovative state policy

Germany is the largest industrialized economy in Europe and the fourth largest worldwide. Against the background of the Fukushima (2011) and Chernobyl (1986) disasters and coupled with the need to respond to the threat of climate change, the German government decided on a total opt-out from nuclear power production and has set relatively ambitious targets to implement renewable energies, with a 50% share of renewable energy in electricity consumption by 2030 and 80% by 2050. In the year 2015 in Germany 35% of production and 27% of electricity consumption stemmed from renewable energy sources like wind parks, photovoltaic cells and biogas plants (Federal Ministry for Economic Affairs and Energy 2015).

This rapid German energy transformation process results from the combination of state policy with innovative citizen action. On the state's part, a law granting generous feed-in tariffs (*Erneuerbare-Energien-Gesetz*: EEG) for renewables speeded the rate of green technology adoption. On the citizen side, consumption and production patterns have changed and fundamentally new types of citizen organizations have emerged in the energy sector. Wider institutional changes were also part of the story. A precondition was the liberalization of the German energy sector in 1998. After liberalization, however, the energy market still maintained its oligopolistic character, with four large companies controlling 90% of the market share (Laird and Stefes 2009). The key change came when the Renewable Energy Act (EEG) was introduced in 2000 as a reform of the previous Feed-in Law (*Stromeinspeisegesetz*: StrEG). The act markedly increased the incentives and economic stability conditions for the founding of renewable electricity projects. It has been argued that this change of the regulatory framework contributed greatly to the successful development of the renewable energy sector in Germany (Laird and Stefes 2009). Following the enactment of the EEG, wind, photovoltaic, and biomass energy production increased significantly as numerous new enterprises emerged. Meanwhile 10% of the energy consumers buy so called green energy, a more expensive variety of energy generated by renewable energy plants. Though a multitude of organizational

types have been involved in the energy transformation process, the renewable energy co-operatives combine societal and policy aspects with direct citizen action, and therefore offer a promising case study of the theory, stages, problems, and outcomes of social innovation.

3.2. The role of collective cognitive dissonance

At a superficial level, the German *Energiewende* appears to be a story about government policy driving new technology, yet such a superficial view completely misses the nature and dynamics of the innovation process. A recent book documents how citizen action, grassroots initiatives, and experimentation since the 1970s laid the basis for what happened after 2000 (Morris and Jungjohann 2016). The EEG itself was an unconventional piece of legislation – "a bit of a rogue law" – drafted by parliamentarians themselves rather than by officials, and steeped in bipartisan thinking (Green and Social Democrat) shaped by social movements (*ibid.*, p. 212). In short, the law was not the origin but a key product of an innovation process.

German citizens, be it as consumers or producers, have played an active role in implementing the country's energy transformation. In German society there is a felt need to change the energy system, which in the late 20th century relied heavily on coal and nuclear generation. Anti-nuclear concern together with the climate change discourse gave rise to respective social movements and finally led new energy legislation followed by a complete nuclear opt-out. One could interpret The Renewable Energy Act of 2000 and the adoption of the incentives it has created as a response to increasing discomfort of the German society with its system of energy production and consumption. Similar cognitive discomfort drove specific citizens to act. Importantly, their goals were not simply to phase out nuclear power or to reduce greenhouse gas emissions. Rather, and in addition, they sought to democratize the energy system – to change societal institutions, power distribution, and social relationships.

3.3. Civil society as change agent

Next to conventional entrepreneurs taking up economic incentives, citizens singly or in small groups played a decisive role as new actors in the change process. Around 30% of investments in the renewable energy sector, for example, were made by private people or community enterprises (Holstenkamp and Müller 2013). Therefore, what has been taking place is not just a change in the production technology triggered by changing factor price relations – from fossil to renewable energy sources – but a more complex and interrelated set of changes in the energy system driven by actors who are new to energy production (Holstenkamp and Müller 2013). The current 145,000 members of renewable-energy co-operatives in Germany (DGRV 2014) include the innovators and early adopters of a new model. A recent survey profiling co-operative members indicates that the majority of energy co-operative members are men who are above 35 years old, are highly educated and belong to higher income groups. Members exhibit a strong interest in actively participating in and influencing local energy policy while also generally supporting renewable energy and decentralization policies (Yildiz et al. 2015). Other studies clearly show that the innovators and adopters exhibit a strong value orientation.

They are characterized by a vision of change in society (sustainable energy production) and a change in social relations (democratization and local citizen control) rather than a primary motivation of economic gain (Sagebiel et al. 2014).

In deciding how to act, citizen activists had to work within, choose among, and adapt existing organizational forms. As it happened, the legal form of the co-operative was available and reasonably suited to direct local energy enterprises. Co-operative principles such as self-help, self-administration, and self-responsibility – embodying values of equality, equity, and independence – were a conceptual fit with the goal of democratizing energy and distributing power (the political-economic kind) more widely.

However, the existing German legal form of co-operative was based on the idea of direct economic service to members, known as the promotion principle or *Förderprinzip*. The idea of a co-operative whose purpose is to change society, while selling electricity into the grid rather than supplying directly to members, is a substantial adaptation of German co-operative ideas. Members are not necessarily those who use the specific energy services but rather those who wish to invest in societal change and participate in renewable energy in a collective sense. And while 90% of German energy co-operative members are private persons, other members include farmers, financial co-operatives (*Volksbanken*), and enterprises as well as public entities or churches (DGRV, 2014). Community supporters and institutional members give the energy co-operatives a multistakeholder aspect that has been uncommon in Germany.

In short, the existing legal form of the co-operative was useful to citizen-activists, but in employing it they also changed it and created not only new co-operatives but a new kind of co-operative.

3.4. Interconnections of social, organizational, and technological innovations

The German energy transformation was integrally tied, in the minds of actors, to decentralization and democratization of energy production. There is ample scope for citizen participation at the production level, such as by participating in or establishing local energy co-operatives and citizen-owned wind parks (Yildiz et al. 2015). Between 2006 and the beginning of 2014, about 900 such energy co-operatives were newly established, with co-operative members investing EUR 1.5 billion (DGRV 2014). On the consumer side, households as well as industry can now buy different energy mixes from a variety of energy traders, including co-operative, municipal and private traders and renewable and non-renewable electricity varieties. From the technology side and depending on the source of energy, the cost of energy production from renewables has dropped up to 35%. From a development perspective, this energy transformation has often been perceived as an opportunity for job creation and regional development, especially in remote and sometimes indebted rural communities. However, as will be discussed further below, the planning and installation of renewable production plants has also prompted conflicts at the local level regarding land use as well as about the choice of specific technological and organizational forms (Becker et al. 2014). In other words, changes have proceeded hand in hand in production technology (from coal and nuclear to wind, solar, and biomass), in roles of citizens (from consumers to consumer-

producers), in governance and control (concentrated to distributed and diverse), and in organizational form (large corporates to citizen co-operatives, and co-operatives of new multistakeholder form previously uncommon in Germany). Technological, organizational, and social innovations have been intertwined. Not surprisingly, given the nature and complexity of the changes, there have also been conflicts and constraints.

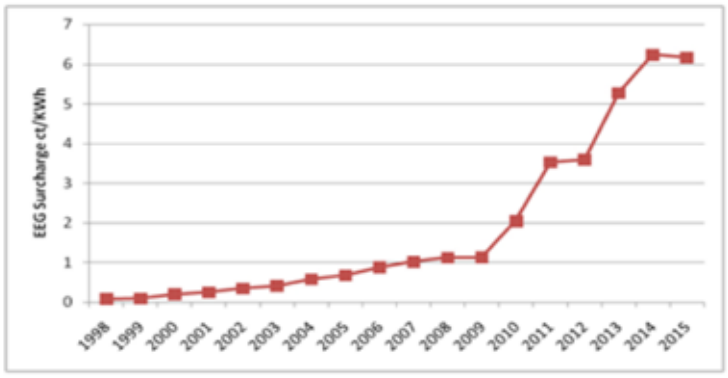
3.5. The social conflicts of innovation

While the Renewable Energy Law was a key to unlocking institutional barriers to innovation, other kinds of constraints have also shaped the development of the sector including politics, interests, markets, and public perceptions. The core idea of the EEG is to share the cost of implementing new environmentally friendly technologies among all energy consumers, according to their energy usage. In order to lower market-entry barriers, especially for small and medium-size producers, the larger grid operators are obliged to preferentially feed-in electricity from renewable sources. From the perspective of electricity producers and investors, the EEG guarantees above-market-price feed-in tariffs for renewable electricity through 2020, differentiating between technologies and regions. The EEG has been subject to a range of reforms and adjustments depending on the political parties in power, the current economic situation, technological progress and new experience gained from implementing the law. Significant reforms in 2012 and 2014 have changed the landscape, and another reform of the law is expected in 2016, underscoring how the institutional environment is changeable and conflict-ridden.

Regarding electricity consumers, the cost of the program has been incorporated into the electricity bill through a surcharge per unit of use, which was 6.24 cents/kWh in 2014, accounting for more than 20% of the total electricity bills paid by private households (Figure 3). Consequently, private households bear 35% of the costs for the EEG, tallying up to EUR 8.3 billion out of EUR 23.6 billion in 2014 (Bantle 2014).

Figure 5: EEG surcharge in cents/kWh

Source: federal Ministry for Economic Affairs and Energy 2012 and Netz-Transparenz 2015



Source: Federal Ministry for Economic Affairs and Energy 2012 and Netz-Transparenz 2015

The EEG has been critically discussed by both politicians and the public. According to recent studies, 90% of Germans consider the energy transformation to be important or very important, but around 50% feel that their share in the overall costs is too high (Bantle 2014). The experience of renewable energy bears out the idea that the spread of innovations particularly depends on how the social conflicts resulting from the innovations are managed. In Germany as elsewhere, conflicts at the local level have arisen regarding the implementation of energy projects. This is true not only for fossil but also for renewable energy projects, even though a majority of the population seems to agree with the ongoing energy transformation and its objectives. The use of any kind of energy source can adversely affect nearby residents by spoiling the landscape (including by requiring extension of grid lines), causing unpleasant smells, noise pollution or the depreciation of the value of real estate. (Becker et al. 2014). In Germany, this issue has become a typical example of the Not In My Back Yard problem, where a population in principle agrees to the necessity of implementing a certain measure but not in their immediate proximity. Becker *et al.* (2014) develop a typology of local conflicts around energy policies, distinguishing among conflicts over distribution of benefits, procedures for planning and decision-making, land use, regional identity, and technology acceptance.

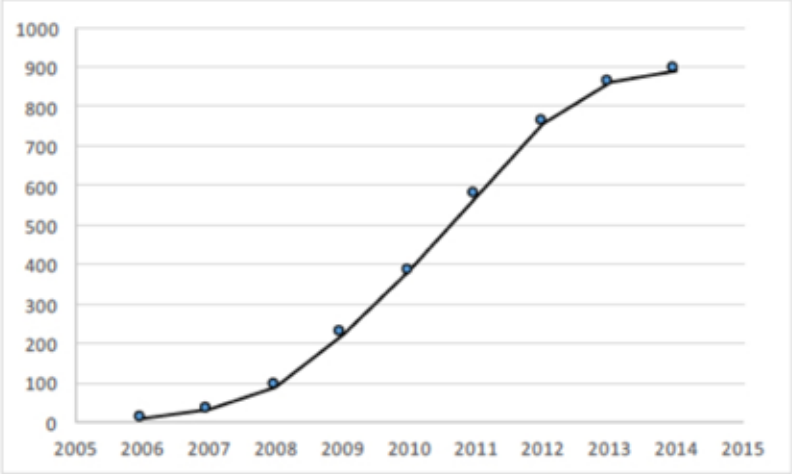
Biogas presents a particular case of conflicting interests over renewable energy production. Biogas is produced from liquid manure, crop residuals as well as from maize, cereals or sugar beets. Fixed feed-in tariffs have made biogas production profitable for farmers, leading to significant increase in maize production. It is estimated that 1,157,000 ha arable land were used for the cultivation of plants, mainly maize, for biogas production in 2013. Intensive maize cultivation can cause environmental problems such as high nitrate concentrations and loss of pastures (Scholwin *et al.* 2014). Moreover, new problems of cognitive dissonance have arisen regarding the moral implications of using potential food crops for the production of energy, especially with increasing world-market prices for staple foods and conflicts over land resources (Bayerischer Rundfunk 2015; Süddeutsche 2014). Particularly in Eastern Germany, land prices have increased over the last 15 years, one factor being the subsidized returns to biogas production that have attracted investment in agricultural land. Not only biogas plants but also large solar parks can directly lead to land conflicts between investors and farmers or residents over land use (Süddeutsche 2012).

It is precisely the background of such conflicts over land use and distribution of income that in our view explains the emergence and adoption of citizen energy organizations like cooperatives. Energy co-operatives are organizational forms for citizen-driven conflict resolution, increasing citizen participation in the planning, management and organization of renewable energy projects. Local knowledge and participatory planning and investment help to avoid the costs of conflict settlement and reduce potential resistance against projects of energy transformation at the local level. Through co-operative organization, local populations become the owners, managers and beneficiaries of their own energy plants (Becker et al. 2014). At the same time, the co-operatives, despite their comparative advantages in certain respects, may also provoke conflicts that ultimately hinder further expansion. In the next section, we examine the patterns and outcomes (so far) of the spread of this new co-operative organizational form in Germany.

3.6. Diffusion curves of organizational innovation

German renewable-energy co-operatives almost exhibit a textbook pattern of diffusion of innovation, with an initial phase of early adoption, a critical mass period in which know-how and price relations became publicly known and initiated a boom period, a phase in which policy makers reduced economic incentives to avoid social cost and overheating of decentralized investment followed by a phase of stagnation by the end of 2014 (Figure 6).

Figure 6: Number of energy co-operatives created in Germany 2006-2014
Source: Müller and Holstenkamp 2015



By the end of 2014, there were 973 registered energy co-operatives in Germany and of these, 892 had registered after 2006. Energy co-operatives are the strongest growing co-operative sector in Germany, constituting 11% of all registered co-operatives in the country. Among all newly founded co-operatives, the share of energy co-operatives reached 64% in 2012. However, the number of newly registered co-operatives decreased after 2011.

The outcome of citizen action has been the dispersed creation of energy co-operatives as small organizations, with 43 members on average when founded. But the total number of members per co-operative has been increasing rapidly: by 2014 most energy co-operatives had between 50 and 200 members. In nearly 75% of current co-operatives the minimum investment requirement per individual member is less than EUR 500. The average investment per individual member is EUR 738 (DGRV, 2014). These numbers indicate that a large number of people participate in and contribute to the ongoing energy transformation with relatively small profit interest and amounts of capital. According to calculations by the German co-operative association DGRV in 2013, the 145,000 members of energy co-operatives hold altogether €470 million equity capital and have invested around €1.67 billion in renewable energies. On average, German energy co-operatives had an annual turnover of €337,000 and paid a dividend of 4.26% in 2013. While substantial compared to a starting point of zero a decade ago, the sector of renewable energy co-operatives remains small and fragmented compared to other actors in the energy system. With changes in the institutional environment, reflecting political

dynamics, it is not clear what the prospects may be for the same kind of social innovation in future. The next section discusses the question as to how future possibilities for energy co-operatives can be considered from a theoretical perspective

3.7. Outcome: A new energy system and saturation phase

As reflected in Figure 6 above, the spread of energy co-operatives levelled off with an increase of 104 registered in 2013 and an increase of only 29 in 2014. Is this the end of the founding boom in the energy co-operative sector? And what are the reasons of this adverse trend? The answers to these questions will determine whether the co-operatives have reached their logistic plateau, or whether their first spurt of growth will be followed by a renewal of innovation. Two institutional factors for the current reluctance to register new energy co-operatives can be identified: the amendment of the Renewable Energy Act in 2014 and a new financial regulation mechanism, known as KAGB, implemented in 2013. The fixed feed-in tariffs together with a rapid expansion of renewable energy production have led to an increase of electricity prices for end consumers. Therefore, politicians have decided to limit energy costs for citizens by reducing feed-in tariffs and limiting newly installed capacity for renewable energies. High energy prices are also seen as a threat to Germany's competitiveness in international markets. Following this line of argument, the EEG reforms in 2012 and 2014 gradually transform its measures from fixed feed-in tariffs to a market-based price premium. This has weakened the credibility of the new social contract between government and society and reduced planning security for new renewable energy plants.

The other institutional factor at play here has been the introduction of compulsory direct marketing of energy oriented towards prices realized at the stock exchange. This is a potential disadvantage for small energy producers with less professional management and lower risk-taking ability. Moreover, starting in 2015 a public tendering procedure has become compulsory for new larger photovoltaic plants competing for land. In the future, feed-in tariffs will not be fixed by the government but will be determined by this tendering procedure (Federal Ministry for Economic Affairs and Energy 2015). This will pose a significant market-entry barrier for larger co-operatives mainly investing in photovoltaic plants. The tendering procedure carries a high administrative burden for local initiatives, because large energy producers will find it easier to come up with cost of application writing, mitigate the risks of application rejection and diversify their production portfolios. At present, initial experience with tendering in this context is being gathered, and it is expected that law makers will have to deal with a number of protests and critical evaluation studies on the subject. Meanwhile, the first signs of a restructuring process among energy co-operatives have also been observed. Experts expect that mergers and acquisitions as well as strategic networks will be formed among co-operative initiatives. Technological progress, framed through paradigms such as "Industry 4.0" and "smart grids technology", and the need to better position local energy providers in more and more internationalizing markets, appear to be the current drivers of these processes. In the future, the products of energy co-operatives will have to diversify towards a product mix between photovoltaic energy, wind, biomass and the use of excess heat. Where this cannot be achieved through the growth of a single co-operative, co-operatives are likely to do what they always have done: join forces at

the regional and federal-state levels (as has been the case with Thuringia and Bavaria) or group together in innovative ways (virtual power plants) with the aim of making energy co-operatives sustainable and competitive. The forms of this possible new set of innovations are, therefore, not yet determined. Nevertheless, in terms of the characteristics envisaged in our model, we can identify at least the potential to achieve the outcomes anticipated from a large-scale social innovation.

One of the defining features of social and other kinds of innovation is the increase in capacity for future innovative action. Energy co-operatives both benefited from and likely contribute to an increase in capacity for citizen economic action. Energy co-operatives emerge in complex and dynamic settings of legal regulations, economic prospects, political targets and social expectations. Müller and Rommel (2010) identify a set of political, economic, social and technological factors that have favored the founding of energy co-operatives in Germany, claiming that they may ease local participation in follow up energy projects and associated planning decisions. Such co-operatives may also enable further collective decision making and help to economize on energy producers' agency and risk costs. In addition, co-operatives may have an advantage in solving some current transparency problems in the German energy market. Compared to other organizational forms, co-operatives may benefit from increasing public awareness about the importance of citizen participation in energy transformation, provide a counterweight to traditionally monopolistic energy market structures, and realize competitive advantages for offering local green energy, as the market for renewables often lacks transparency (Sagebiel *et al.* 2014).

There is a potential for citizen energy production to appeal to larger audiences based on values. Recent representative studies among consumers based on choice experiments show that German consumers are willing to pay a significant price premium of up to 16% for renewable energy (Kaenzig et al. 2013). At the same time, it has been shown that consumers are willing to pay a higher price for electricity produced locally by municipal energy providers like co-operatives. In the end, consumer willingness to pay for electricity seems to increase with greater amounts of renewable energy available and with shorter distances between households and energy providers (Sagebiel et al. 2014). At present, at least 10% of all households in Germany already choose costlier electricity tariffs that are entirely based on renewable energies. It follows that energy co-operatives can be seen as offering a way for citizens to express their preferences and actively promote the energy transformation from the bottom up. Because of the sometimes nontransparent ways in which renewables are offered in the energy mix of large scale providers, local energy production is preferred because consumers feel that they have better control over the process and outcome of green energy production. In this situation, co-operatives can enhance trust, increase transparency and reduce the information and enforcement costs of the energy transformation (Sagebiel et al. 2014). For these reasons, we can tentatively identify the achievement of real societal gains of the kind envisaged by theories of social innovation, as well as the possibility of renewed innovation and/or additional gains to come. As always, the outcome will depend on the choices of actors, the interplay of their strategies with societal institutions, and the forms of collaboration and alliances that emerge.

4. Conclusion

4.1. Understanding German renewable-energy co-ops as complex innovation

Germany´s *Energiewende* has increased the country's capacity to deal with risks of nuclear power and climate change. Even though it had been argued that the energy transformation and the nuclear opt-out of the year 2011 could have led to a serious supply gap, today Germany has become a net exporter of energy. Renewable energy co-operatives represent a social innovation one could call "citizen energy," a new idea to meet a social need: the need for sustainable energy production. At the same time, they are about more than production; their purpose is to create new social relationships: to democratize and decentralize economic power in the energy sector, and to constitute citizens as active producer-consumers rather than passive consumers. The initial spread of this new model depended critically on new collaborations and alliances, including a new role for the federal state in creating an enabling framework, and regional partnerships with local communities and local economic actors for regional economic development. These changes were not the product only of individual inventors acting in isolation. This was, rather, a collective effort, and one directed towards the intentional goal of grand social change. In short, German renewable-energy co-operatives seem to satisfy all elements of the definition we have advanced for social innovation.

At the same time, they are about more than only social innovation: this is social innovation bound up with technological, economic, and technical or process innovations. Energy is being produced by different mechanical means, in a different geographic configuration of physical locations, and organized legally, financially, and administratively in different forms, than if citizen action had not occurred in this way and on this scale. The different kinds of innovation in this case are inseparable. While aspects of this case could be understood by conventional theories of economic innovation, or by various models of social innovation, we believe the meaningful and important particulars of this innovation process can best be illuminated using a unified paradigm following elements and a basic logic we have elaborated in this paper.

The impulse to form the co-operatives came from changing perceptions of risk and cost related to nuclear energy and greenhouse gases in relation to renewable technologies. Environmental concerns and democratic values created cognitive dissonance – discomfort with the existing energy ownership and supply system.

Actors who took up this cause were disproportionately educated professionals – people with social and economic resources – motivated by values.

Their invention was the decentralised renewable-energy co-operative, focusing on photovoltaic, wind, or bio-energy production in ways generally closely interlinked with rural regional economies. Social entrepreneurship?This amounted to a new kind of co-operative as well as a new social-economic partnership involving multiple kinds of stakeholders.

The costs of creating and replicating the co-operatives, and their diffusion, were shaped by interactions with an institutional field of laws, subsidies, latent local conflicts, and resistance. This institutional field was itself changing as a result of the innovation process and reactions to it. Direct economic costs were only part of the story. Co-operatives helped resolve local issues of power, control, and identity in some cases, but conflicts engendered by the wider change process and the EEG also ultimately limited their spread. They illustrated a classic diffusion pattern, with a levelling-off determined at least as much by political and institutional factors as by economic ones, competition, or lack of willing adopters. Like all successful social innovations, their dynamic growth culminated in their institutionalization.

The case of co-operatives in the German *Energiewende* illustrates a combined social-institutional-technological innovation process, one that changed economic processes and outcomes, redistributed social power, created new roles and relationships among actors, and contributed to environmental sustainability. No one thread of this process is understandable without seeing the whole tapestry.

4.2. Generalising the Model

In synthesis, we characterize social innovation for our purposes as a multi-facetted hybrid between more conventional economic and technological concepts and concepts that stress cognitive and social-change aspects of innovation. At the beginning stands actors´ discomfort with a given situation. Cognitive dissonance may characterize important triggers for social change. The next stage in the social innovation process is to be characterized by its actors. “Social Entrepreneurs” or an activated “civil society,” respectively, may best describe actor categories in the social change process and types of interactions between inventions, technological or institutional ones, must be distinguished. These inventions create cracks, conflicts and costs for society and produce adopter types as well as diffusion curves which may ultimately lead to changing capacities of society as a whole. Knowledge? Remote areas Evaluation of these capacities remains a social process which may create harmony or discomfort, the latter of which may trigger a new round of change.

4.3. Further Research

We believe that many theoretical concepts combined – notably including conventional concepts of innovation along with social innovation and other new ideas – best explain the story of how and why German renewable-energy co-operatives developed as they did. Our model represents a way of combining these elements, a framework and research heuristic that may also be useful to other researchers. Given the wide nature of the field of innovation studies, our insights are necessarily partial and would benefit from both additional theoretical insights and additional case studies.

Sources

Bantle, C. (2014), Erneuerbare Energien und das EEG: Zahlen, Fakten, Grafiken (2014): Anlagen, installierte Leistung, Stromerzeugung, EEG-Auszahlungen, Marktintegration der erneuerbaren Energien und regionale Verteilung der EEG-induzierten Zahlungsströme.

Bates, Robert H., Avner Greif, Margaret Levi, Jean-Laurent Rosenthal, and Barry R. Weingast (1998), Analytic Narratives, eds. Princeton, NJ: Princeton University Press.

Battilana, J., and D'Aunno, T. (2009), Institutional Work and the Paradox of Embedded Agency. In *Institutional Work: Actors and Agency in Institutional Study of Organizations*, ed. Lawrence, T. B.; Suddaby, R., and Leca, B. Cambridge: Cambridge University Press.

Bayerischer Rundfunk (2015), Biogas: Nachhaltigkeit mit Nebenwirkung. www.br.de/themen/wissen/dossier-energiealternativen-biogas100.html, as accessed on March 2, 2015.

Becker, S.; Bues, A.; Naumann, M. (2014), 'Die Analyse lokaler energiepolitischer Konflikte und das Entstehen neuer Organisationsformen. Theoretische Zugänge und aktuelle Herausforderungen'. EnerLOG Working Paper, No. 1.

Borzaga, C., and Bodini, R. (2014), What to Make of Social Innovation? Towards a Framework for Policy Development. *Social Policy & Society*, 13(3), 411–421.

Bouchard, M., ed., (2013), *Innovation and the Social Economy: The Québec Experience*. Toronto: University of Toronto Press.

Bühler, H. (2015). Beurteilung der Geschäftsmodelle unter Berücksichtigung des KAGB. Presentation held at the conference "Bundeskongress genossenschaftliche Energiewende" on February3, 2015, Berlin, Germany. *Bundesverband Erneuerbare Energien 2015*.

Cajaiba-Santana, G. (2013), Social Innovation: Moving the Field Forward. A Conceptual Framework. *Technological Forecasting and Social Change*, 82, 42-51.

Centre de recherche sur les innovations sociales (CRISES). www.crises.uqam.ca, as accessed on July 15, 2015.

Cnaan, R. A., and Vonokur-Kaplan, D. (2015), Social Innovation: Definitions, Clarifications, and a New Model. In: Cnaan, R. A., and Vinokur-Kaplan, D. (eds.), *Innovative Nonprofits: Organizations that Make a Difference*. Los Angeles: Sage.

DGRV (2014), Energiegenossenschaften. Ergebnisse der Umfrage des DGRV und seiner Mitgliedsverbände. www.genossenschaften.de/sites/default/files/Auswertung%20Studie%20Brosch%C3%BCre%202014.pdf, as accessed on April, 15 2016.

Di Domenico, M., Haugh, H., and Tracey, P. (2010), Social bricolage: Theorizing social value creation in social enterprises. *Entrepreneurship Theory and Practice*, 34(4), 681-703.

Drucker, P. F. (1987), Social Innovation – Management's New Dimension. *Long Range Planning*, 20(6), 29-34.

European Union, European Commission, Bureau of European Policy Advisers (BEPA) (2011). *Empowering people, driving change, social innovation in the European Union*. Luxembourg: EUR-OP.

European Union, European Commission, Bureau of European Policy Advisers (BEPA) (2014), *Social Innovation: A Decade of Changes*. Luxembourg: European Commission.

Fairbairn, Brett (forthcoming 2017), "Raiffeisen as Social Innovator." *Annals of Public and Cooperative Economics* 88,3 (August).

Federal Ministry for Economic Affairs and Energy (2015), Gabriel: Erste Ausschreibungsrunde Photovoltaik-Freiflächenanlagen kann im Februar 2015 starten. www.bmwi.de/DE/Presse/pressemitteilungen,did=687578.html, as accessed on March 5, 2015.

Festinger, L. (1957), *A Theory of Cognitive Dissonance*. Stanford, CA: Stanford University Press.

Frankelius, P. (2009), Questioning two myths in innovation literature. *Journal of High Technology Management Research*, 20(1), 40–51.

Harrisson, D., and Klein, J.-L. (2007), Introduction. In Klein, J.-L., and Harrisson, D. (eds.) *L'Innovation sociale. Émergence et effets sur la transformation des sociétés*. Québec: Presses de l'Université du Québec.

Hayami, Y., and Ruttan, V. W. (1984), Toward a Theory of Induced Institutional Innovation. *Journal of Development Studies*, 20, 203-223.

Haxeltine, A., Avelino, F., Wittmayer, J., et al. (2013), Transformative Social Innovation: A Sustainability Transitions Perspective on Social Innovation. www.transitsocialinnovation.eu/ content/original/Book%20covers/Local%20PDFs/01%20paper%20Haxeltine%20Wittmayer%20and%20Avelino%202013%20Transformative%20SIs%20.pdf, as accessed on July 15, 2015.

Holstenkamp, L., and Müller, J. R. (2013), Zum Stand von Energiegenossenschaften in Deutschland Überblick. Ein statistischer Überblick zum 31.12.2012. *Working Paper Series in Business and Law*, 14.

Howaldt, J., and Schwarz, M. (2010), Social Innovation: Concepts, Research Fields and International Trends. Dortmund: Sozialforschungsstelle Dortmund.

IPCC (2012), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. Special Report of the Intergovernmental Panel on Climate Change. New York: Cambridge University Press.

IPCC (2014), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva, Switzerland: IPCC.

Kaenzig, J.; Heinzle, S. L.; Wüstenhagen, R. (2013), Whatever the customer wants, the customer gets? Exploring the gap between consumer preferences and default electricity products in Germany. *Energy Policy*, 53, 311–322.

Klein, J.-L., and Harrisson, D. (eds.) (2007), *L'Innovation sociale. Émergence et effets sur la transformation des sociétés*. Québec: Presses de l'Université du Québec.

Knight, J. (1992), *Institutions and Social Conflict*. Cambridge: Cambridge University Press.

Laird, F. N., and Stefes, C. (2009). The diverging paths of German and United States policies for renewable energy: Sources of difference. *Energy Policy*, 37(7), 2619–2629.

Lévesque, B., Fontan, J.-M., and Klein, J.-L. (eds.) (2014), *L'innovation sociale: Les marches d'une construction théorique et pratique*. Québec: Presses de L'Université du Québec.

Morris, Craig, and Jungjohann, Arne (2016), *Energy Democracy: Germany's ENERGIEWENDE to Renewables*. n.p.: Palgrave Macmillan.

Mazzarol, T., Reboud, S., Clark, D., Simmons, R., & Mamouni-Limnios, E. (2013), Co-operatives in a system context. *Cehiers du CERN* (44). Available online at http://documents.escdijon.eu/pdf/ceren/cahiers_44/CR44_4.pdf, accessed on May 31, 2016.

Müller, J. R., and Rommel, J. (2010, Is there a future role for urban electricity cooperatives? The case of Greenpeace Energy. *Proceedings of the 7th Biennial International Workshop Advances in Energy Studies Barcelona. Spain, 2010*, 185–195.

Müller, J. R., and Holstenkamp, Lars (2015), Zum Stand von Energiegenossenschaften in Deutschland - Aktualisierter Überblick über Zahlen und Entwicklungen zum 31.12.2014. Leuphana Universität, Lüneburg.

Murray, R., Caulier-Grice, J., and Mulgan, G. (2010), *The Open Book of Social Innovation*. The Young Foundation. http://youngfoundation.org/wp-content/uploads/2012/10/The-Open-Book-of-Social-Innovationg.pdf, as accessed on April, 15 2016.

Nelson, R. R., and Winter, S. G. (1982), *An Evolutionary Theory of Economic Change*. Harvard University Press.

Pol, E., and Ville, S. (2009), Social Innovation: Buzzword or Enduring Term? *The Journal of Socio-Economics*, 38, 878-885.

Rogers, E. M. (1995), *Diffusion of Innovations*. New York: Free Press.

Sagebiel, J., Müller, J. R., and Rommel, J. (2014), Are consumers willing to pay more for electricity from cooperatives? Results from an online Choice Experiment in Germany. *Energy Research & Social Science*, 2, 90–101.

Scholwin, F., Grope, J., Schüch, A. et al. (2014), *Dossier: Biogas aus Energiepflanzen Potenziale und Flächen, Anbauprioritäten und Kosten, Natur und Landschaft*. www.izes.de/cms/upload/pdf/Meilensteine_2030_oekologische_Bewertung_Biogas.pdf, as accessed on March, 2 2015.

Schumpeter, Joseph A. (2013) [1942], *Capitalism, Socialism and Democracy*. London and New York: Routledge.

Smith, A., and A. Stirling. 2010, The politics of social-ecological resilience and sustainable socio-technical transitions. Ecology and Society15(1): 11.

Stanford Graduate School of Business, Center for Social Innovation (2015), http://csi.gsb.stanford.edu, as accessed on July, 15 2015.

Süddeutsche (2012), *Kottgeisering und die Solaranlage—Dorffrieden statt Energiewende*. www.sueddeutsche.de/muenchen/fuerstenfeldbruck/kottgeisering-und-die-solaranlage-dorffrieden-statt-energiewende-1.1320052, as accessed on March 2, 2015.

Süddeutsche (2014), *Lebensmittel in Biogasanlagen—Strom aus dem Supermarkt*. www.sueddeutsche.de/wissen/lebensmittel-in-biogasanlagen-strom-aus-dem-supermarkt-1.2167766, as accessed on March, 2 2015.

Tarde, G. (1903), The laws of imitation (E. Clews Parsons, Trans.). New York: H. Holt & Co.

Veblen, T. B. (1898, Why Is Economics Not an Evolutionary Science? *Quarterly Journal of Economics*, 12(3), 373–97.

Von Hippel, Eric (2005), *Democratizing Innovation*. Cambridge, Mass.: The MIT Press.

Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU (2011), *Hauptgutachten – Welt im Wandel – Gesellschaftsvertrag für eine Große Transformation*. Berlin. http://www.wbgu.de/fileadmin/user_upload/wbgu.de/templates/dateien/veroeffentlichungen/hauptgutachten/jg2011/wbgu_jg2011.pdf, as accessed on April 15, 2016.

Yildiz, Ö., Rommel, J., Debor, S. et al. (2015), Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda. *Energy Research & Social Science*, 6, 59-73.

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