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Business Models for Sustainability.
Innovative Regional Business Models as a Means of a Sustainable Change in the Energy Industry

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Abstract

Are 'conventional' business models systematically linked to problems like the overload of human and natural systems and the excessive exploitation of resources? And, to ask for the opposite, are 'alternative' business models better able to promote positive effects—positive in terms of an ecologically and socially sustainable corporate behaviour? If the current conventional structures tend to harm man and the environment, what is the role of the underlying business models, i.e. the business logic of earning money related to possibilities of promoting corporate sustainability? The approach at issue seeks to find out how innovative enterprises and their business logics may contribute to mitigate central sustainability problems. This research—in a first step focusing on local or regional energy systems—shall help answering the superior question of how essential sustainability problems could be addressed by new and uncommon business logics of earning money.

The pillars of this research are: (i) sustainable entrepreneurship, including sustainability innovations; (ii) the business case for sustainable energy, including its realisation as viable business; and (iii) a focus on local or regional production systems. The research interest is to open the 'black boxes' in which sustainable entrepreneurs discover and capitalise on business cases for sustainable energy and the theoretical and empirical ways these business cases can be realised. While the concept of distributed economies helps to identify quality driven development strategies of local or regional production systems, sustainable entrepreneurship and the business model perspective allow for focussing on the business management aspects. Therefore it is suggested to apply the distributed economies approach as a conceptual perspective and as a merging frame for issues concerning regional sustainability and local or regional

production systems. This perspective has to be refined with theories of sustainable entrepreneurship and business models.

1 Introduction

Are the characteristics of 'conventional' business models in the energy industry linked to sustainability problems which occur when energy is produced and used? And to ask for the opposite correlation, are 'alternative' business models able to promote positive effects— positive in terms of an ecologically and socially sustainable energy production and consumption? If the current socio-technical system tends to harm man and the environment (WGBU 2003), what could be the role of the business logic of earning money (Osterwalder 2004) represented by specific business models? When asked for a possible shift towards a more sustainable energy industry, do 'business models for sustainability' exist (Wüstenhagen & Boehnke 2007) and do such business models play a role in supporting a sustainable transformation of the energy industry, at least partly?

In the following referring to 'the energy industry' includes the socio-technical system related to grid- or network-based primary and secondary energies like gas, electricity or heat. Fuels are only included where explicitly stated. Geels describes a socio-technical system as consisting of "a cluster of elements, including technology, regulation, user practices and markets, cultural meaning, infrastructure, maintenance networks [and] supply networks" (Geels 2004, 19). A socio-technical system may be stable for several reasons (Geels et al. 2004, 6 et seqq.), but there are also considerations on the possibilities of system innovations and transitions to sustainability (ibid.). This chapter provides a brief description of the addressed energy industry, problems of its transformation and the specific role business models could play in theory and in practice.

1.1 Background: a 'locked-in' socio-technical system

Focussing on Germany, actual statistic data show that the dominating oligopoly of a few multinational energy companies is based on and highly addicted to fossil fuels and nuclear power (BMWi 2007a, 2008; VDEW 2007). Often, energy production and consumption are declared to be key topics of sustainable development (Pfriem 1995, 30; Spangenberg et al. 1999, 34; Bohnenschäfer et al. 2003, 2; WBGU 2003, 1; Johansson 2005, 972; Wüstenhagen & Boehnke 2007, 253). The negative impacts of the given energy system are thoroughly analysed and publicly discussed (WBGU 2003; Hennicke et al. 2006; Reiche & Bechberger 2006; Campbell et al. 2007; Wagner 2007; IPCC 2008): Natural resources are depleted whilst the dependency on foreign resources grows, the global environment's ability of absorbing emissions and overexploitation is overstrained, energy prices are mounting and leading to social problems, even in developed and industrialised countries like Germany. According to the Federal Ministry of Economics and Technology (BMWi) the number of companies being active in the German energy markets is rising to date. This development is related to the complex process of liberalisation which started in 1998 (BMWi 2007b) and which is still an important and widely discussed topic on the agendas of economic and energy policy. Despite this process, focussing on electricity, only four companies out of approximately 1.000 (VDEW 2006b) delivered nearly 50% of the electricity consumed by end customers in 2005 (VDEW 2006a). These companies also control about 80% of the energy production units and operate 100% of the high-voltage transmission network (VDN 2007). Additionally, a few hundred subordinate network operators distribute electricity to end users (ibid.).

As can be seen from this very rough and simplified description, the German energy industry has historically and politically grown to a very complex production system that is aligned to a large-scale production strategy. Despite numerous political efforts to change essential aspects of that system (market liberalisation, network regulation, promotion of renewable energies and measures of energy efficiency etc.), still, from a macro-perspective, change happens incrementally and to some extend backwards as the current discussions on nuclear

power show. In other words the energy system's constitution as sketched above is an example of a 'locked-in' and 'path-dependent' socio-technical system (David 1985; Arthur 1989; North 1994) characterized by a centralized large-scale production strategy. The large-scale production units herein can amongst others be explained with neoclassical economic drivers (economies of scale) (Frank 2006; Johansson et al. 2005). Concerning the transmission network, theories of so called natural monopolies may help to understand the given structure and its resilience (Fritsch et al. 2003, 223). To sum up, it is a path-dependent system that could only be changed by a multidimensional transformation process based on system innovations shifting from the current socio-technical system to a more sustainable one (Berkhout et al. 2004, 49-51; Geels et al. 2004, 1). Reiche and Bechberger point out the different factors of success that have to be considered when a sustainable transformation of the energy system is discussed (Reiche & Bechberger 2006, 20): the general economic conditions, strategies of assertion, the complex multi-level political system, the integration of very different actors and at least the technological determination. Simplified, this is coherent with the multidimensional understanding of a socio-technical system (see above).

In the last decade several alternative approaches emerged trying to establish decentralised and independent energy systems based on renewable resources. The spectrum of these alternatives includes single unit solutions like micro-turbines to citizens' initiatives for solar-energy to the restructuring of utility companies like Elektrizitätswerke Schönau (utility company Schönau, Germany). A possible co-existence of centralised large-scale systems and decentralised small-scale concepts like wind-farms or bioenergy-plants is often discussed like a clash of opposed philosophies (Wagner 2007, 279). According to Johansson et al. (2005, 974, 977) and Wagner (2007, 281), aside lobbying and politics, this situation should rather be seen as a convergence and symbiosis bearing chances for future system's architectures and not as conflictive and incompatible approaches.

Even if there where outsized technological barriers hindering the 'third way' of overcoming the extremes of centralised vs. decentralised and large-scale vs. small-scale production systems and even if economic and management research will never be able to catch the technological problems fully, anyhow, thinking about the outlined situation is important: "Merely technical innovations, although certainly important, will not be sufficient to resolve the present contradiction. Innovative ways of organising production-consumption systems supported by an alternative set of value determinants are pressing necessities." (Johansson et al. 2005, 372) That's why the notion 'socio-technical system' was used above to label the energy industry. Production activities and their socio-ecological implications are not solely determined by the technologies applied. Economic behaviour based on certain values also plays a crucial role. Even if there were technological barriers which cannot be overridden, the possibility to change the economic behaviour—here: the business logic—which determines the use of technologies is at hand.

Despite questions of technological convergence or opposition it is obvious that in general different production systems require different business logics leading to different business models (Tapscott et al. 2000; Osterwalder 2004; Stähler 2002a, 2002b). This is the simple consideration on which the outlined research is based: Currently, different alternative small-scale production systems are being developed. For some reasons there is a scope for development which allows for different alternatives to be "tested". Focusing on the German energy industry again: Let aside the 'big four' and the macro-structure that grew over decades, there are nearly 1.000 regional utility companies that could change to some extend, theoretically. Additionally, regions, towns, villages, citizen's initiatives etc. independent from existing companies are an appropriate starting point. For sure, many of the regional utility companies belong to the described oligopoly. And the remaining surely won't form a coordinated movement under the flag of a greening energy industry. But the important implication is that potentially hundreds *or thousands of niches do exist—protected by political instruments like feed-in tariffs. The niches could transform a significant stake. But more important than simply believing in the effect of adding small*

steps is to actively identify, explain and create seminal business approaches that may carry niche solutions to a further diffusion.

1.2 A flexible approach: sustainable entrepreneurship & distributed economies

The picture drafted above focussed on the socio-technical energy system with its large-scale production strategy and its resilient macro-structure. But this picture is incomplete for the case of Germany. The number of decentralised small-scale systems based on renewable energies increased significantly since the 1990s and, generally, the renewable energy industry creates augmenting social benefits e.g. in terms of new employment and reduced environmental externalities (BMU 2006). In 2005 a share of 4.6% of the primary energy consumed in Germany was provided by renewable energies—in 2000 this share was 2.6% (BMU 2006, 37). Examples of decentralised systems are wind turbines and biogas plants. In 2005 more than 17,500 operating wind turbines were counted (ibid., 61), the first ones were set up in the mid 1980s. Those installations provided 4.3% (2005) of the electricity generated in Germany. As another example, energy from biomass is a promising but still underdeveloped alternative. Millions of small biomass boilers produced 4.8% of the consumed heat and nearly 3,000 biogas plants provided 2.2% of the electricity consumption (ibid., 96). The Federal Ministry for the Environment (BMU) estimates that 200,000 biogas plants could be installed—based on agricultural waste. In this case, for example, one of the most pressing tasks is the use of heat as a joint product (Lube 2007). Solving such problems often requires more than technological progress alone. Beyond technologically innovative production units that simply feed-in their energy to a public or private grid, system innovations require multidimensional changes: technological substitution, coevolution and new functionalities (Geels 2004, 19 et seq.).

A discussion of theories of system innovations has to be rescheduled. At this stage the important point is that the concept of coevolution focuses on social aspects explicitly. “System innovations not only involve technological substitutions, but also changes elements such as user practices, regulation, industrial networks, infrastructure, and cultural meaning.” (ibid., 20) It is assumed that aspects like actor setting and cooperation, the creation of new production and consumption contexts and new business approaches are prerequisites for the dissemination of sustainable energy. Local or regional energy systems that match numerous supplies and needs may be an adequate strategy to overcome lacks of efficiency and efficacy (Johansson et al. 2005; Mirata et al. 2005; Ristola & Mirata 2007). But when and how do such strategies emerge? According to Schaltegger and Wagner (2008) the so called ‘business case for sustainability innovation’ may help to explain when and how (business) opportunities for sustainable energy can emerge.

Sustainable production systems can be interpreted as special cases of system innovation. Hence, this type of innovation may be labelled ‘sustainability innovation’ (Fichter 2005). Following Schaltegger and Wagner (2008) a “sustainability innovation can be defined as the implementation of those technical, organizational, use system-related, institutional or social improvements that contribute to the conservation of critical natural goods or to globally and long-term sustainable levels and forms of consumption and production” (ibid., 38). Moreover, “[s]ustainability innovation is by definition characterized by high social benefits” (ibid., 39), i.e. increased positive externalities or reduced negative externalities (Fritsch et al. 2003). “If no social benefits (beyond those commonly known for innovations, such as positive spillovers) exist, then an innovation is not a sustainability innovation.” (Schaltegger & Wagner 2008) To explain when this type of innovation will be carried out, the authors refer to their concepts of ‘sustainable entrepreneurship’ and the ‘business case for sustainability’ (Schaltegger & Wagner 2006a, 2008). “A key requirement for spontaneous emergence seems to be the existence of a business case or the potential to create a business case …, that is, a demand-side potential or demand-side development that enables a profitable sustainability innovation.” (Schaltegger & Wagner 2008, 39) The business

case for sustainability innovation can, simplified, be described as a win-win situation. Social benefits from an innovation (e.g. positive effects like reduced environmental impacts) can be transformed into private benefits. An example of appropriating social benefits is the willingness to pay for an innovation. If customers are willing to pay e.g. for positive ecological attributes of a product or service, the social benefits turn into private benefits for the customers. Simultaneously, suppliers can benefit privately as they can capitalize on the social benefits. In general terms, this problem is about the internalisation of externalities, that is, to overcome the discrepancy between public and private benefits (Fritsch et al. 2003; Wüstenhagen & Boehnke 2007; Schaltegger & Wagner 2008). Wüstenhagen and Boehnke (2007) discuss this discrepancy as a central barrier to the decision for sustainable energy (see below). In this regard a 'business case for sustainable energy' (ibid.) emerges when entrepreneurs discover profitable business opportunities that overcome or at least reduce this discrepancy. *At this stage, the business case for sustainable energy shall be understood as a specification of the business case for sustainability innovation.*

1.2.1 Sustainable entrepreneurship

"The entrepreneurial challenge thus is to be economically successful with the supply of products and services which change—on a purely voluntary basis—consumption patterns and market structures leading to an absolute reduction of environmental impacts and negative social effects." (Schaltegger & Wagner 2008, 35) What kind of entrepreneurship is needed to discover and capitalise on such business opportunities and to influence consumption patterns and production structures (in the field of energy)? The above mentioned authors propose to label them 'sustainable entrepreneurs'.

The conceptual thinking about ecologically and socially sound economic behaviour emerged in the 1990s for a first time, with an emphasis on environmental protection (Schönwandt 2004, 56; Schaltegger & Wagner 2008, 28 et seq.). "This body of work focuses on environmentally friendly innovations in processes, products or services and has also stressed the for-profit nature of environmental entrepreneurship." (ibid.) Entrepreneurship concepts like 'bioneer' and 'ecopreneurship' evolved in this first wave (Schaltegger & Petersen 2000; Petersen 2003; Schaltegger 2005; Schaper 2005). Concepts that account for distinct social aspects emerged in parallel in the past years. "This literature focuses on how social entrepreneurship can create sustainable economic value, such as providing club goods to members or by providing access to specific market segments and on bottom-of-the-pyramid innovation in emerging markets and developing economies." (Schaltegger & Wagner 2008, 29) These authors try to synthesise both streams of primarily environmental and social objectives under an umbrella concept of sustainable entrepreneurship and sustainability innovations.

Schaltegger et al. apply two dimensions for the definition of different environment and society related entrepreneurship concepts: the scope of the priority of environmental and societal goals and the scope of market effects (Schaltegger & Petersen 2000; Petersen 2003; Schaltegger 2005; Schaltegger & Wagner 2008). For now, only a hint can be given to what extend these concepts are related to the focused real-life problem. "Unlike bioneers, sustainable entrepreneurs are mostly not inventors. Instead of spending time in laboratories, sustainable entrepreneurs search for inventions which they can shape and place on markets to create turnover and influence market structures. Only in exceptional cases are successful inventors sustainable entrepreneurs at the same time." (Schaltegger & Wagner 2008, 35) As bioneers are strongly related to R&D activities to create inventions in and for niches (Schaltegger & Petersen 2000, 11), the sustainable entrepreneur's core business is to "search for business ideas triggered by environmental and societal problems and solutions, to identify the market potential of inventions and to realize market success with them" (Schaltegger & Wagner 2008, 35). Both types strive for business success but the lev-

els of realisation differ (niche vs. mass market). Thus, concepts of entrepreneurship related to environmental and societal problems and solutions may help to identify and explain possible business cases for sustainable energy. Entrepreneurs combine forward-looking technological inventions and business opportunities in order to create striking sustainability innovations. In addition, the process of 'sustainability entrepreneurship'—as Hockerts calls the different business phases from opportunity identification to the mass market—can serve as a theoretical perspective that identifies possible steps on the way to a sustainable transformation (Hockerts 2003, 152 et seqq.). This process could start with bioneers on a local or regional level that further try to unfold a strong market influence and a strong social or political influence; both, as sustainable entrepreneurs themselves or in cooperation with such.

The further question is, "what are the underlying factors which determine when sustainable entrepreneurs emerge spontaneously in a market and carry out sustainability innovations?" (Schaltegger & Wagner 2008, 39) Schaltegger and Wagner (2008) outline three preconditions: the existence of a business case per se and two forms of regulatory change. Political instruments like feed-in tariffs or incentive programs (BMU 2008a, 2008b) can serve as examples of the latter. Furthermore, it is argued that those "regulatory boundaries can be influenced or developed by business companies … [or] politicians can be motivated by non-business considerations to regulate market failure and to change market conditions" (Schaltegger & Wagner 2008, 39). In such an environment sustainable entrepreneurs discover business opportunities and create win-win situations.

Specific relations of the different entrepreneurship concepts, the outlined real-life problem and the research aims cannot be discussed in depth in this overview. It is assumed that considerable relations do exist. Intuitively, processes of discovering and capitalising on business opportunities in the field of sustainable energy may be explained with the rationale e.g. of bioneers and sustainable entrepreneurship. Regarding possible structural effects that may support a sustainable transformation of the socio-economic energy system, it has to be discussed if and how the different entrepreneurship concepts can contribute to the identification and explanation of adequate business approaches. Generally, the analysis of these approaches has to include specific entrepreneurship concepts and their contributions to sustainability innovations, their ability to capitalise on the business case for sustainable energy and the way this capitalisation can be realised. It is suggested that the latter task necessitates the analysis of the specific business logics and the corresponding business models. This research is inspired by innovative 'start-ups' and changes of consumption patterns and production structures on the local or regional level. It is also suggested that these changes are consequences of the businesses sustainable entrepreneurs create. Good examples are, amongst others, the bioenergy villages Jühnde in Germany (Ruppert et al. 2008), Mureck in Austria (Tomescu 2005) and Enköping in Sweden (McCormick & Kaberger 2005b). *The research interest is to open the 'black boxes' in which sustainable entrepreneurs discover and capitalise on the business cases for sustainable energy and the theoretical and empirical ways these business cases can be realised.*

1.2.2 Distributed economies

As outlined so far, the three main pillars of this research are:

i. sustainable entrepreneurship, including sustainability innovations,
ii. the business case for sustainable energy, including its realisation as viable business, and
iii. focus on local or regional production systems.

From (i) mainly seminal theoretical and conceptual questions concerning entrepreneurship and innovations arise; point (ii) refers to connecting the real-life problem to (i) and an analysis of entrepreneurs and businesses based on the business case for sustainable energy; point (iii) necessitates a specific theoretical and empirical perspective.

The following paragraphs introduce a perspective that can serve as a general frame for the theoretical and empirical work. To explore when and how business cases for sustainable energy evolve and when and how they are being realised by sustainable entrepreneurs, it is suggested that a merging frame which is appropriate for addressing the local or regional level has to be applied. It is suggested that the idea of 'distributed economies', introduced by Johansson et al. (2005), can serve as a conceptual perspective to enclose the theoretical interests and the real-life phenomena. The concept of distributed economies provides criteria and guidelines that can help to assess strategies of local or regional production systems. As it is an approach of industrial design, it has to be extended with a more business management related perspective. *While the concept of distributed economies helps to identify quality driven development strategies of local or regional production systems, sustainable entrepreneurship (see above) and the business model perspective (see below) allow for focussing on the business management aspects.*

"Distributed economies (DE) is currently best described as a vision by which different innovative development strategies can be pursued in different regions." (Johansson et al. 2005, 974) The authors highlight advantages of small-scale, locally or regionally based production systems. The rationale is, that "[l]arge units are efficient in many ways, but they are not flexible. Once they have been established they can only defend themselves by force, through growth" (ibid., 973). Furthermore, Johansson et al. argue that "a natural consequence of the optimisation of the production function is that the production units tend to increase in size" (ibid.). Even if production processes are enhanced by means of pollution-prevention, "an ever-increasing consumption and the associated re-bound effects" (ibid., 972) can annihilate any positive effects. With regard to regional development, they identify several negative effects of the traditional production economy: "increased vulnerability and inflexibility … mounting environmental problems … consumers becoming increasingly disconnected and estranged from producers … continuous and painful restructuring of industries … quality assuming a subordinate role [and] value creation becoming centralised and being moved out of regions" (ibid., 974). These statements only highlight arguments concerning the pros and cons of large- and small-scale production economies. Despite the fragmentary impression that Johansson et al. deny any advantages of large-scale production systems, their intention is to clearly point out that new strategies and economic approaches have to be found in order to create more sustainable production structures.

As the classical economic paradigms tend to see the key to progress in efficiency and growth strategies, the authors state that the "structure and sometimes even the purpose of our production systems need to be questioned and ultimately transformed" (ibid., 972). Remarkably, large-scale approaches can be part of such transformation: "The distributed economies concept does not advocate abandoning large-scale production systems once and for all. On the contrary, there will certainly be a need for efficient ways of producing commodities and bulk goods … However, it seems likely that a renewed balance of small and large and in particular new forms of symbiosis and coexistence can bring about benefits for both systems." (ibid., 977; emphasis added) The concept of DE is a primarily quality driven approach. Opposing purely efficiency and growth driven economic strategies, this approach is thought to "function as a 'search engine' for identifying and testing new innovative business concepts on regional levels and introducing innovations, at all levels of the system of production and consumption" (ibid., 975; emphasis added).

The following box 1, based on Mirata et al. (2005, 982) and Ristola and Mirata (2007, 188), overviews a suggested, yet not finally defined set of basic elements that can allow for a more sustainable design of local or regional production systems. These aspects are re-

garded to be assisting principles for the development of regional sustainability. As Johansson et al. deliver 'fundamental areas of concern' that are broad and close to general principles of sustainable regional development (2005, 975), Mirata et al. (2005) provide a slightly modified version of these principles. In this early stage the 'search engine method' of Johansson et al. is based on case studies. Mirata et al. carried out case study analyses that, amongst others, dealt with cases of bioenergy and biomass products (2005, 983 et seqq.). It is suggested that the provided guiding criteria for the 'fundamental areas of concern' can serve as a basis for the assessment of the local and regional cases that will be analysed in the following research on business cases for sustainable energy and business models for sustainability.

- Increasing the diversity and flexibility of economic activities
- Securing local parties' power to influence relevant decisions
- Increasing wealth creation for a larger number of people
- Increasing the sustainable use of local and preferably renewable resources
- Increasing the share of renewable resources in economic activities
- Decreasing pollutant emissions and waste generation
- Increasing the share of value added retained in the regions
- Increasing the value addition to local resources and improving the quality of products
- Increasing the share of non-material (e.g. information, know-how) and higher value added material resources in the cross-boundary resource flows
- Increasing the diversity and intensity of communication and collaboration among regional activities

***Box 1** Guiding principles for sustainable regional production systems, compiled from Mirata et al. 2005, 982 and Mirata & Ristola 2007, 188*

Regarding the third pillar of this research—(iii) focus on local or regional production systems—the concept of distributed economies can serve as an orientation for the identification and the assessment of local or regional production systems. The aim is to identify, explain and create seminal business approaches according to the business case for sustainable energy and furthermore to learn about business models for sustainability. The idea of distributed economies research is to identify and test new and innovative business concepts (Johansson et al. 2005, 975). To date, this approach lacks concise perspectives on business management related activities. The industrial design perspective is predominant, as can be seen in Johansson et al. (2005), Mirata et al. (2005) and Ristola & Mirata (2007). *Therefore it is suggested to apply the distributed economies approach as a conceptual perspective and as a merging frame for issues concerning regional sustainability and local or regional production systems. This frame has to be refined with theories of sustainable entrepreneurship and business models.* The first in order to analyse the emergence of entrepreneurship and sustainability innovations on that level, the latter in order to learn about business cases for sustainable energy and their realisation.

2 The role of business models

The second pillar—(ii) the business case for sustainable energy, including its realisation as viable business—encloses research related to the identification of opportunities that enable sustainable entrepreneurs to discover and capitalise on the business case for sustain-

able energy. That is, to identify, explain and create windows of opportunity e.g. for the distribution of sustainability innovations such as micropower technology (Wüstenhagen & Boehnke 2007) or the reorganisation of consumption patterns and production structures of whole communities (McCormick & Kaberger 2005b; Tomescu 2005; Ruppert et al. 2008). The preconditions for the business case were outlined according to Schaltegger and Wagner (2006, 2008) (see above). The problem of transforming social into private benefits was discussed as one possible barrier to its realisation. Following Wüstenhagen and Boehnke (2007) three main barriers have to be considered (see below). The approach of the latter authors is to search for business model configurations that may overcome these barriers. They conclude: "Appropriately designed business models are an important opportunity to overcome some of the key barriers to market diffusion of sustainable energy technologies." (Wüstenhagen and Boehnke 2007, 257)

To sum up so far, sustainable entrepreneurship was considered to be an entrepreneurial precondition and a concept to explain when and how possible business cases for sustainable energy may be discovered and capitalised on. The emergence of sustainability innovations depends on forms of entrepreneurship and the accessibility of a business case (Schaltegger & Wagner 2008). In this research, the process of sustainability entrepreneurship (Hockerts 2003) shall be analysed on the local or regional level in order to learn about sustainable production systems (Johansson et al. 2005). Such systems are considered to be part of a sustainable transformation of the socio-technical energy system (Geels 2004). As a last step, the central aspect of this research on business models for sustainability has to be added. Following Wüstenhagen and Boehnke (2007) and Schaltegger and Wagner (2008) appropriate business models are the key to successfully capitalising on business cases for sustainability innovation: "Hence the question arises, what business models exist and can be developed with social benefits which can be partly appropriated? Only with business models, should a business case for sustainability innovation exist and (if the sustainability innovation is suitable for the mass market) sustainable entrepreneurs emerge spontaneously." (Schaltegger & Wagner 2008, 39)

2.1 Business model perspective

A business model, from a theoretical point of view, can be described as "an abstract conceptual model that represents the business and money earning logic of a company" and that serves "as a business layer (acting as a sort of glue) between business strategy and processes" (Osterwalder 2004, 15). Moreover, "the business model is not a guarantee for success as it has to be implemented and managed. [It] is something else than the company's business process model" (ibid.). It is important to avoid two main misconceptions: Firstly, the business model perspective, from a business management point of view, does not refer to the so called 'business modelling'. According to Osterwalder, business modelling is process related, that is, the development of business processes for example based on tools and methods like UML activity diagrams or Petri nets (ibid., 14), "while business models essentially focus on value creation and customers" (Osterwalder et al. 2005, 15). Therefore, it will be avoided to use the idiom business modelling as it is confusing and does not refer to the entrepreneurial tasks that are addressed. Secondly, applying a business model perspective is not the same like having or developing a business strategy (Stähler 2002a, 2002b; Osterwalder 2004; Seddon et al. 2004; Krstov & Sinkovec 2007). Stähler (2002b) discusses the relations between the concepts of business strategy and business models. "A business model itself is not a strategy. Simply having a business model is not a strategy." (ibid., 48; emphasis added, translated by the author) He distinguishes two relations between business models and business strategy: In the first case the business model is subject to the business strategy, that is, the realised business model depends on the strategy—it is an expression of the applied strategy. In the second case the business model is a result of (un-)intended decisions and activities and is not explicitly managed. If

in this case the business strategy is analysed the underlying business model appears. In the first case the business model is an output of an applied strategy, in the second case the strategy is a description of the business model.

Two reasons can be given for the application of a business model perspective: Practically, "[b]usiness model analysis can help to understand and communicate the key success factors of value creation. Furthermore, it can be used to measure, compare or even change the business logic" (Wüstenhagen & Boehnke 2007, 255) of operating companies. And theoretically, "[r]esearchers seem to agree that a business model describes how a business creates value and that it is an important unit of analysis, highly relevant to both management theory and practice" (ibid.). From this theoretical point of view the business model perspective will be applied to focus on a suitable unit of analysis, which allows considering on how sustainable entrepreneurship realises the business case for sustainable energy. It is assumed that on the business model level organisational and managerial aspects, their expression via business performance and the connectedness to general and individual environments could be sufficiently analysed. This means, issues of performing business and its effects (e.g. changing consumption patterns and production structures) will be examined crossing companies' borders following defined aspects like infrastructure management, product innovation, customer relations and financial aspects (Osterwalder 2004). In other words: the resource-based and the market-based view of the firm will be combined for an integrated point of view (Wüstenhagen & Boehnke 2007). If the applied business model concepts make it necessary to look at the whole supply chain—maybe from resource extraction to the customer's energy use—the analysis has to take care in order to understand the special characteristics of the business models and their factors of success (or failure). For a proper decision of which elements have to be integrated it is important to develop a concise definition of the term business model and its functions and elements.

For now, it is suggested to start with Osterwalder's conceptual business model definition: "A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money. It is a description of the value a company offers to one or several segments of customers and the architecture of the firm and its network partners for creating, marketing and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams." (Osterwalder 2004, 15) It is obvious that this general definition has to be connected to the specific characteristics of sustainability related businesses.

2.1.1 Essential business model framework

The business model concept ('business model ontology') introduced by Osterwalder (2004, 42 et seqq.) consists of defined elements, their relations and functions. As this outline has to provide a short overview of the research project at hand, only the main clusters will be introduced.

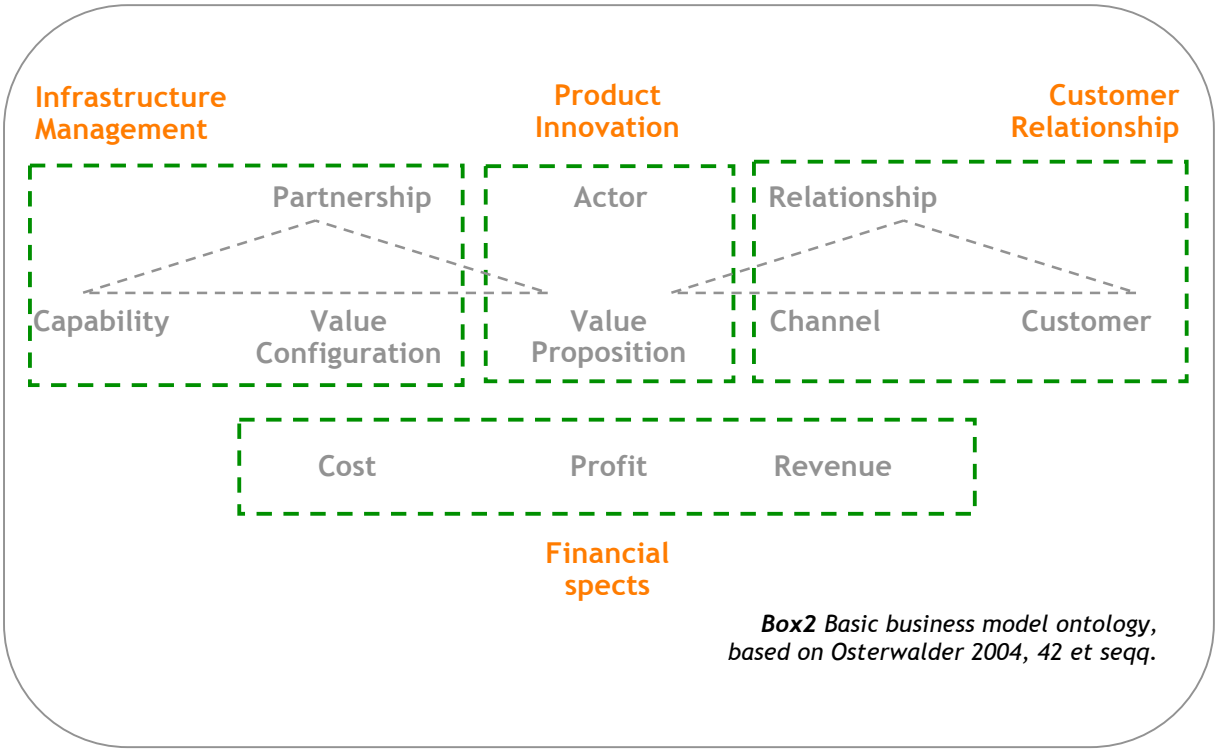
Infrastructure Management: The infrastructure management perspective describes how the value configuration and the necessary resources and activities are arranged. Capabilities include basic abilities to create value for the customer; this value creation can be supported by companies' partnerships.

Product (Innovation): "A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer." (Osterwalder 2004, 43)

Customer Relationship: This perspective defines the target customers, the specific customer oriented relationships and the channels used to offer value propositions.

Financial aspects: The financial perspective represents e.g. the cost structure and revenue flows, i.e. the way money is employed in the business model and the way money is earned on a variety of revenue flows.

As solid theoretical linkages of the business model perspective and topics of sustainable entrepreneurship are rare, Wüstenhagen and Boehnke (2007) deliver a seminal application of this concept. They discuss three basic barriers to the diffusion of sustainable energy technologies: environmental externalities, capital intensity and long lead times and the power of incumbents (ibid., 253 et seq.). They argue: „Appropriatley designed business models are an important opportunity to overcome some of the key barriers to market diffusion of sustainable energy technologies." (Wüstenhagen & Boehnke 2007, 257) The introduced problem of internalising externalities could, according to the authors, be solved with an appropriate value configuration. "Consequently focusing the value proposition on the aspects that create the highest (private) customer value, rather than primarily highlighting the public benefits of sustainable energy, is a means to address the challenges posed by environmental externalities." (Ibid., 257) The considerations of Wüstenhagen & Boehnke are chosen as a starting point for the further development of a theory on business models for sustainability. Here, in the real-life context of sustainable energy on a local or regional level.



***Box2** Basic business model ontology, based on Osterwalder 2004, 42 et seqq.*

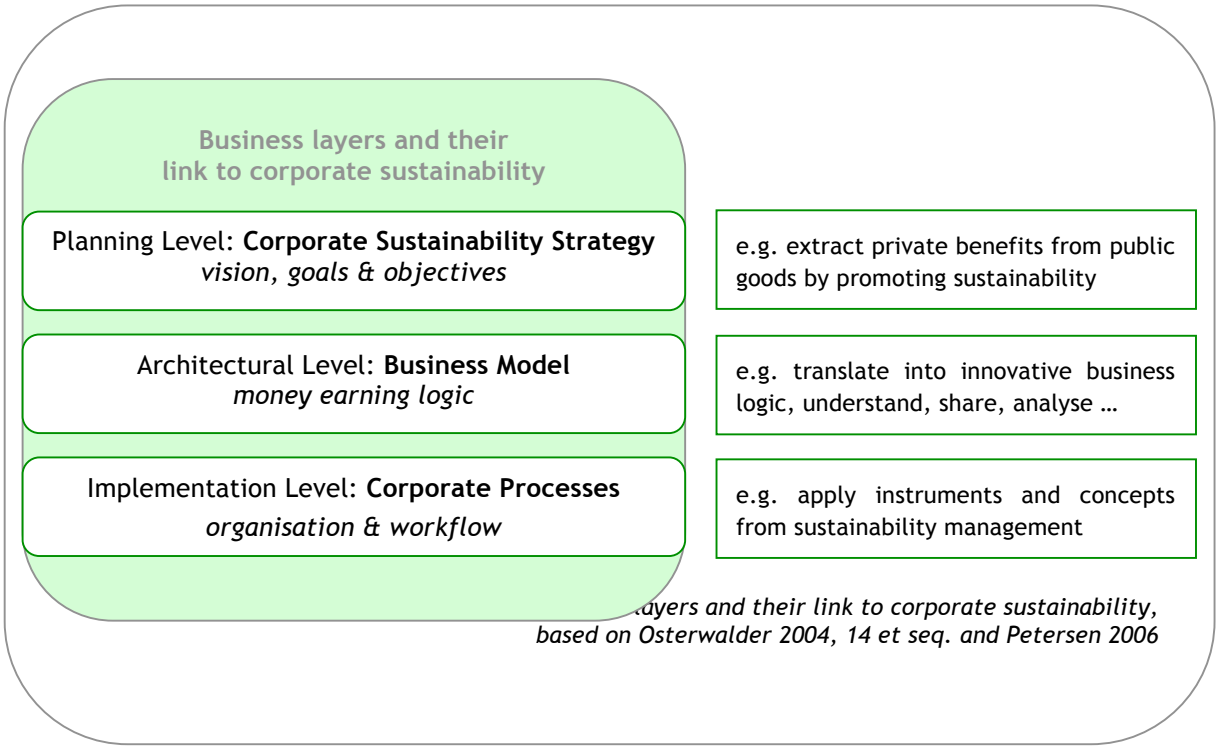
2.1.2 Functions of the business model perspective

"Because business model research is a rather young research domain it must still prove its relevance. Its main area of contribution could be the creation of concepts and tools that help managers to capture, understand, communicate, design, analyze, and change the business logic of their firm." (Osterwalder et al. 2005, 19) The main functions, practically, are:

- "understanding and sharing,
- analyzing,
- managing,

- prospects and
- patenting of business models." (ibid.)

To overcome the complexity of real-life business models it is important to be able to capture and visualize it on an abstract level. Based on an adequate visualisation the business logic can be better understood and shared, that is, the business logic becomes subject to management processes (Osterwalder et al. 2005). In this way the business model concept contributes to the analysis of a company. The way a company does business, with emphasis on value creation, can better be measured, tracked an observed and compared. The business model becomes a new unit of analysis leaving classical perspectives like the business unit, corporation or industry (Stähler 2002a). It is obvious that management tasks become supported. The management can analyse the business models adequacy to environmental pressures and then plan, change and implement a modified or new business model. Better design, reaction and alignment improve the quality of decision making (Osterwalder 2004). From a likewise strategic point of view "the business model concept can help foster innovation and increase readiness for the future through business model portfolios and simulation" (Osterwalder et al. 2005, 24). The last aspect, patenting, points to the origin and the primal main field of application: The area of information and communication technologies. "In the 1990s with the advent of IT-centered businesses the term Business Model rose to prominence. The rise of the term is closely related to the emergence and diffusion of commercial activities on the internet." (Stähler 2002a, 1)



…ayers and their link to corporate sustainability, based on Osterwalder 2004, 14 et seq. and Petersen 2006

It is obvious that the business model concept can serve for several purposes but therefore has to be carefully defined to be applicable. In the context of sustainability management its adaptability has to be discussed—this will be a central topic for the following research. Business strategy (strategic sustainability management; Schaltegger & Wagner 2006b) and business processes (concepts and instruments of sustainability management; Schaltegger et

al. 2007) address business purposes on different 'layers'. According to Osterwalder (2004), these layers are different points of view that differ widely. Business models can be seen "as the translation of a company's strategy into a blueprint of the company's logic of earning money. Putting strategy, business models and process models together one can say that they address similar problems (e.g. the one of earning money in a sustainable way) on different business layers" (ibid., 14). The illustration (box 3) of the conceptual place of the business model layer and its approach to corporate sustainability is a first and hence very abstract and simplified idea of how to possibly associate sustainable entrepreneurship and corporate sustainability management with the business model concept. For now, it is obvious that an in depth discussion of the theoretical implications has to follow.

The related theoretical research question is about how this conceptualisation may serve to explore the emergence of sustainable entrepreneurship, sustainability innovations and the possibilities to discover and capitalise on the business case for sustainable energy. With regard to the definition of sustainability related business fields, Petersen (2006, 401) askes: "What does all this mean for an ecopreneur's way of business and how does it differ from conventional companies?" This question shall be addressed for the very special field outlined above. It is very close to the questions posed in the introduction and thus will guide the theoretical and empirical work on business models for sustainability.

2.2 Why a business model perspective?

The idea is to interpret business models as (un-)intended results of alternative approaches and as 'business blueprints' that can stimulate further dissemination of alternative business logics. Sustainable entrepreneurs may herein capitalise on their regionally, technologically and financially limited scopes for development to support a bottom-up transformation process. This process may then rely on bringing forward innovative business models and the corresponding sustainable entrepreneurship. But how could alternative business models and sustainable entrepreneurship become established in a resilient socio-technical system? Theories on corporate strategy for market development may later help to analyze mechanisms of assertion (corporate structural policy) (Pfriem 1995; Dyllick et al. 1997; Schneidewind 1998; Petersen 2003). It does not matter if global strategies for a breakthrough will result or not. Firstly, "big technological breakthroughs are not always needed for important changes in society, a slow improvement of technological skills may, when they pass a certain threshold, provide the means for dramatic changes" (Spangenberg et al. 1999; recited from Johansson 2005, 973) and "a common misconception seems to be the assumption that […] changes must be associated or brought about by fundamental scientific and technical breakthroughs. In fact, important changes in society can have happened in the past without dramatic changes in basic technology" (Johansson 2005, 973). Secondly, "[a] shift in economic thinking is necessary, together with a larger vision for production chains" (Johansson 2005, 973). This mindset-shift can also happen without simultaneously visible radical changes. "A socio-technical system may be changing on political, institutional and market dimensions *before* the emergence of a new radical technology." (Geels 2004, 28) Here, changes on the market dimension concerning actors and their businesses are focussed.

The aim of this research is not to develop promising global strategies for the sustainable transformation of specific socio-technical systems—that would correspond to strategies of transition management (Teisman & Edelenbos 2004). Moreover, the aim is to learn about alternative business logics in order to guide the development of new businesses that could support a sustainable transformation from the bottom. It is suggested that suitable subject-matters of research are business models related to alternative production systems. It will be explained that the empirical phenomena of niche energy systems possess specific characteristics that make it necessary to refer to business models as a special unit of analysis. For example, so called bioenergy villages and regions try to meet their energy needs

with resources like biomass, wind and solar energy (Graß & Scheffer 2000; Tischer et al. 2006; Ruppert et al. 2008). According to Johansson et al. (2005) decentralised systems following a small-scale production strategy may be called 'distributed economies'. Special cases of distributed economies are the objects of investigation: Regional bioenergy systems based on renewable resources. From a management research perspective business models related to these alternative approaches are focused. According to the above discussed socio-technical system and its resilience on the macro-level it is reasonable to focus on changes on the micro-level following a market model paradigm (Geels et al. 2004).

The approach at issue seeks to find out how innovative enterprises and their business logics may contribute to solve central sustainability problems of socio-technical systems. This research shall help answering the general question of how essential sustainability problems could be addressed by new and uncommon ways of production. The objects of investigation are already operating but also hypothetical business models. General business model frameworks are applied (Stähler 2002a, 2002b; Loos et al. 2003; Osterwalder 2004; Osterwalder et al. 2002, 2004, 2005). So far, existing business model research related to sustainability issues often deals with a more service oriented perspective aiming at the transformation of benefits from physical materials to benefits from service, e.g. car-sharing (Hockerts 2003, 2007). Currently, research on a possible business model / corporate sustainability correlation is performed without clearly depicting the applied understanding of the term business model (e.g. see the case studies conducted in Hamschmidt 2007). Case studies on different industries and diverse types of ventures deliver very important conclusions about companies' businesses and sustainability problems. But a clearly defined perspective to analyse business logics and business models in the context of corporate sustainability is still missing.

3 Objectives and research questions

Taking care of the described real-life problem, the aim can be described as follows: "Our overriding goal is to contribute to the transition towards more sustainable economic activities by extracting lessons from cases that can guide the evolution and spread of alternative production systems." (Mirata et al. 2005) This general purpose serves as a background for the specific research dedicated to regional bioenergy business models. Therefore the aim is to discover innovative solutions emerging from regional business opportunities and to analyse aspects describing contexts and phases of their development, actor configurations, socio-economic and socio-ecological performance, factors of success etc. With the help of defined criteria a typology of business models may result. These will be assessed stressing their ability to change the embedding socio-technical system.

3.1 Research questions

The epistemological interest of this research is guided by changes in the energy industry that already take place: the share of renewable energies increases since the 1990s (BMWi 2008), approaches of decentralisation in science and practice, diversification of actors and a slight reallocation of possible revenues (Bechberger & Reiche 2006). Do these signals indicate a sustainable transformation? What is the role of new and innovative small-scale businesses and forms of sustainable entrepreneurship; do they support those subtle tendencies? The first and most general question arising is:

- *Do regional bioenergy businesses contribute to a sustainable transformation of the socio-technical energy system?*

Documented examples of further developed bioenergy systems are, amongst others, the bioenergy villages Jühnde in Germany (Ruppert et al. 2008), Mureck in Austria (Tomescu

2005) and Enköping in Sweden (McCormick & Kaberger 2005b). In these cases more or less independent circle flow economies were developed, producing and distributing bioenergy. The leitmotif of these cases was to realise sustainable energy systems based on eco-friendly regional resources and the entrepreneurial spirit of the locals. Significant stakes of the monetary flows associated with energy now belong to these regions. The corresponding business tasks were realised on very different ways, by very different actors.

- *Are there ideal types of bioenergy business models to be identified? Do specific drivers and barriers of their realisation exist?*

Mechanisms of dissemination have to be identified. The diffusion of business models for sustainability may trigger a transformation of the concerned industry. How can alternative business logics develop in a niche, form socio-technical regimes and at least create a new and sustainable landscape (Geels 2004, 32 et seqq.) How can bioenergy business logics disseminate and stimulate further sustainable entrepreneurship and further sustainability innovations? The last set of questions deals with the possibility of business model 'blueprints' leaving the niche and creating a mass market.

- *How can 'blueprints' of bioenergy business models disseminate? Do specific drivers and barriers of their diffusion exist?*

To sum up, this set of questions aims at identifying and describing a window of opportunity allowing for a sustainable transformation of the socio-technical energy system. The technological limits to a possible transformation as outlined above are being fully accepted. As pointed out, this research wants to shed light primarily on possible changes of business logics and their contribution to transformation processes.

3.2 Hypothesis

The considerations on the socio-technical energy system, its sustainable transformation and the role business models could play lead to the following hypothesis: *Regional bioenergy systems can contribute significantly to the development of a sustainable energy industry, (i) if processes of sustainable entrepreneurship allow for the emergence of alternative business logics and (ii) if the emerging business models are stable, transferable and assertive*.

To revise this assumption knowledge on different bioenergy systems and the related business models has to be gathered. The aim is to identify and analyse regional bioenergy business models and assess their contribution to a sustainable transformation of the socio-technical energy system.

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