Policy responses by different agents/stakeholders in a transition:

Integrating the Multi-level Perspective and behavioral economics

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Contribution to the Project

This short paper will consider all possible stakeholders in different stages of a sustainability transition and match their behavioral features and diversity to policies. This will lead to an assessment of potential or expected responses of policy to a range of policies and policy instruments. This ultimately provides information about which behavioral elements should be taken into account for sustainability transition policies in order to increase policy effectiveness.

Keywords: Behavioural economics, beyond GDP, ecological innovation, economic strategy, entrepreneurship, European economic policy, European governance, good governance, industrial innovation, industrial policy, innovation, innovation policy, multi-level governance, policy options, political economy of policy reform, social innovation, socio-ecological transition

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Abstract

This short paper considers all possible stakeholders in different stages of a sustainability transition and matches their behavioral features and diversity to policies. This will involve an assessment of potential or expected responses of stakeholders to a range of policy instruments. Following the Multi-Level Perspective framework to conceptualize sustainability transitions, we classify the various transition policies at niche, regime and landscape levels. Next, we offer a complementary classification of policies based on a distinction between social preferences and bounded rationality. The paper identifies many barriers to making a sustainability transition and how to respond to them. In addition, lessons are drawn from the case of Denmark. The detailed framework and associated literature for the analysis was discussed in Milestone 31 of the WWWforEurope project (Gazheli et al., 2012).

1. Introduction

In order to stimulate fundamental changes in the demand and supply structure of our economies with the aim to move towards more sustainable ways of energy use, production, consumption and transport, we need a "sustainability transition policy". Such a policy can be seen as a package or policy mix that combines environmental and innovation or technology policies (Alkemade and Hekkert, 2011). The challenge in policy making is to provide more coherence and where possible integration between historically distinct policies, such as focused on energy use, resource efficiency, waste management, transport systems, technological innovation, social entrepreneurship and environmental regulation. A well-balanced policy package is needed as the policy ambitions are high. This can best be illustrated by considering which target for cutting carbon dioxide (CO_2) emissions is consistent with a 450 ppmv concentration of CO_2 in the atmosphere: 80-90% reduction of CO_2 intensity of income or production (i.e. CO_2 emissions per Dollar or Euro) depending on scenarios of population and income/consumption growth. Achieving such ambitious goals requires radical innovation and transitions in energy, food and transport systems, manufacturing and service industries. Only a sophisticated policy package can realize such goals.

Sustainability transition policy can influence the speed and direction of change in different sectors of the economy and society. It involves incentives to include previously external costs into one's private decision-making (consumers, producers, investors and innovators alike). It further involves the stimulation and management of learning processes, and creating awareness to keep opportunities and options open to increase the flexibility and adaptation capacity of social and technological systems. It requires a multi-actor and multi-domain approach with explicitly formulated long term policy goals (Rotmans et al., 2001).

Since transition policy is complex and involves a multitude of actors, many different types of policy failures are possible. These can be related to the process of policy design, the implementation of policies, or their acceptance. Institutional and behavioral factors and market failures due to externalities are frequently in the background of these failures. In the following we explain these elements and point out the possible policy failures they involve.[1]

Institutional failures derive from institutions being imperfect and difficult to control. Governments, for example, are not the theoretically expected or hoped neutral and perfect agencies that always serve the general interest and well-being of society (Sterner, 2003). Instead, as is well recognized in public choice theory, public agencies at different levels involve many different actors with particular, often inconsistent interests. One problem is the lack of appropriate information on behalf of public officers or organizations about systems to be regulated as well as about how policies function in a complex system and can create indirect, unintended effects (van den Bergh, 2012, 2013).

Behavioral factors matter in numerous ways (Jackson 2005). First, the way regulatory incentives work depends on the interaction of specific policy instruments and behavioral features of regulated agents. In addition, behavior of agents matters for the social and political acceptance of sustainability policies. Behavioral characteristics of all stakeholders have to be considered to understand the potential sources of resistance to major changes as well as to

[1] This policy assessment uses the insights obtained about stakeholders and their behavioral features, as discussed in detail in Milestone 31 (Gazheli et al., 2012) of this project (WWWforEurope).

identify the agents that can play a catalyzing role in transition processes. This includes paying attention to economic agents like consumers, producers, investors, innovators and governments, and to social agents such as citizens, labor unions, NGOs and, again, governments (Geels, 2010). Research in environmental policy usually emphasizes the behavior of consumers and producers while giving considerably less attention to other actors that play potentially important roles in transitions. As these agents have to undergo behavioral changes during a particular stage of a transition, their behavioral responses should not be neglected in the design of transition policies. For this reason, policy makers do well to take seriously into account proven behavioral features of all types of stakeholders when designing transition policies.

At a fundamental level, various factors contribute to policy failures, notably externalities, public good dilemmas and non-competitive markets (monopolies and oligopolies). Whether or not policies can address these problems depends in part on the efficiency and effectiveness with which the behavior of stakeholders can be influenced. Traditional economic theory of public policy has given much attention to this, although it is fair to say that a main shortcoming of it has been a focus on perfect rationality and isolated agents. Recently, the interest in policy theory seems to be shifting, partly in response to an increasing dominance of behavioral approaches in mainstream economics (Gsottbauer and van den Bergh, 2011).

Changing behaviours – and in particular motivating more sustainable behaviours – is far from straightforward. Individual behaviours are deeply embedded in social and institutional contexts. We are guided as much by what others around us say and do, and by the 'rules of the game' as we are by personal choice. We often find ourselves 'locked in' to unsustainable behaviours in spite of our own best intentions (Jackson 2005, 2008).

In these circumstances, the rhetoric of 'consumer sovereignty' and 'hands-off' governance is inaccurate and unhelpful. Policy-makers are not innocent bystanders in the negotiation of consumer choice. Policy intervenes continually in consumer behaviour both directly (e.g., through regulation and taxes) and more importantly through its extensive influence over the social context within which people act.

This insight offers a far more creative vista for policy innovation than has hitherto been recognised. In this paper, we intend to provide a list of the most important elements of a sustainability transition policy package. We classify policy measures and instruments in accordance with the Multi-Level Perspective (MLP) (Geels, 2010). Recognizing the importance of behavioral features in policy design, we identify possible behavioral causes of policy failure and distinguish between social or other-regarding aspects and pure bounded rationality.

The paper is organized as follows. Section 2 describes sustainability transition policies and classifies them in line with the MLP into niche, regime and landscape levels. In Section 3 behavioral features and their implications for transition policies are discussed and appropriate policy responses are derived. Section 4 concludes.

2. Sustainability transition policy

In a multi-level transition setting, novelties are likely to occur most frequently in niches, and as associated niches grow, they can trigger a regime shift. For this reason, 'strategic niche management' (Kemp et al., 1998), involves the creation of niches and their support through transition policies to enable a regime shift. Transition management (Rotmans and Loorbach,

2009) broadens the scope of strategic niche management by combining it with a long-term vision and strategic goals for technological improvement. It involves identifying transition pathways consistent with these goals and fostering the development of new niches through specific experiments that may contribute to the envisioned transition. Foxon (2006) goes further by suggesting that supporting policies should not only be designed for niches, but also for the creation of stable intermediate states. These states can take the form of niche networks or connections between niches and emerging new regimes. Supporting niches, niche networks, or relationships between niches and emerging regimes can be necessary to counteract efforts of old regimes to impede a transition. Alkemade et al. (2009) propose an explicitly dynamic optimization approach to planning transitions, focusing on technological dimensions. This involves using the well-known NK fitness landscape algorithm to identify the flexibility of initial transition steps in complex technologies, taking into account modularity and fitness of technologies as well as path-dependence and irreversibility of technological developments. Azar and Sandén (2011) critically discuss the idea that policy should be technologically neutral, that options should be kept open. Instead, they suggest that, depending on relative learning potential to bring unit costs down, picking winners by governments instead of markets is sometimes warranted. Several additional studies in the growing literature on transitions management and policy deal with other aspects of transitions (see section 3.2 in van den Bergh et al., 2011).

Transitions towards sustainability involve technological, psychological and socio-cultural challenges. As a result of interdisciplinary collaboration in sectors such as transport, energy or agriculture, changes in technologies, policies, markets, consumer preferences, infrastructure and scientific knowledge are expected (Geels, 2004). The main actors in these sectors are consumers, firms, innovators, investors, governments, researchers and NGOs. Hence, when designing policies for a transition, policy makers have to take into account the variety of actors these policies are affecting and the interactions of these actors. In Table 1 we present different policy measures affecting transitions, and the impacts these policies may have on stakeholders. Following the MLP framework, the policies considered are classified as being related to niche, regime and landscape levels.

The first set of policies in the table is aimed to support innovative niches. An example is providing grants in the agricultural sector for conversion to organic farming. The second measure considered is those of supporting the creation of niche-networks. These measures try to create a network between producers, innovators, investors and the financial sector in order to help innovators get access to credit, for example. Other policies, which focus on the niche level, are those designed to stimulate local experiments and elevate these to a national level. They influence mostly innovators carrying out local experiments and the financial sector and investors, which may direct the financial flows thereby supporting these experiments. Finally, measures that are on the border between the niche and regime level are policies stimulating escape from existing lock-in of regime-related technologies or practices.

Table 1. Transition policies in a multi-level perspective framework and stakeholders affected

Level	Policy measure	Example	Consumers	Innovators	Producers	Investors	Financial Sector
Niche	Policies supporting niches	Grants for conversion to organic farming		*			
	Support for the creation of niche networks between various stakeholders	Fostering communication between stakeholders, fostering access to credit		*		*	*
	Stimulation of local experiments	Public co-funding of bottom up initiatives		*		*	*
	Policies to escape lock-in	Reforming fossil fuel subsidies, setting strict long term environmental goals, creating infrastructure conditions for new technologies		*	*		
Regime	Support for the expansion of a sector through subsidies or price guarantees	Feed-in tariffs for renewable electricity	*	*	*	*	*
	Policies limiting the power of regimes	Limiting size of firms, no privileges or more frequent contacts with particular firms or representative organizations, transparency of lobbying processes		*	*		
	Promotion of technical or resource diversity	Public R&D investments and subsidizing private R&D in various technologies		*	*		
	Regulating dirty activities	Pollution taxes or tradable permits, command-and-control of pollutive technologies and products	*	*	*	*	*
Landscape	Promotion of civic debate	Public participation in policy development (round tables and meetings).	*		*		
	Information provision	Informative campaigns for consumer behavior	*	*	*		
	Creation of informed debate	Supporting public participation in setting the policy agenda	*		*		
	Developing policy integration (technology, environment, consumers)	Making one ministry responsible for coordinating all initiatives and policies concerning long term sustainability transition	*	*	*		

Note: Stakeholders as defined in Milestone 31 (Gazheli et al., 2012).

At the regime level we classify policies supporting the expansion of a whole sector, such as subsidies in favor of renewable energy options, which have a major effect on all the stakeholders. Consumers, producers and innovators are especially affected because the support reduces the price of energy. Subsidies will also create a market for innovators who can invest in R&D in order to produce more efficient products, such as PV cells. Producers are affected since they may qualify for the grants and thereby sell renewable energy at subsidized prices. Financial companies and investors may take advantage in order to invest in the sector. These policies influence mostly producers and innovators, and their market opportunities. The last types of policies at a regime level treated are those supporting the development of a sector by pricing pollutants, for example CO_2. In this case, producers are affected negatively since the cost of producing dirty goods will increase as a result of taxation or price changes. Consumers are also influenced since they may change their consumption behaviors as a result of a change in prices. Innovators are affected as altered prices will change the profits associated with certain directions of innovation. In turn, investors and financial organizations are affected negatively or positively depending on the sector (dirty or clean) in which their investments are concentrated.

Measures at the landscape level can be the promotion of civic debate, for example, on the use of chemicals. Consumers are affected since they are involved in the civic debate and producers because the measures may affect the way they produce or test their products. Similar measures are those based on information provision. To highlight the potential effectiveness of behaviorally sound environmental policies, Abrahamse et al. (2007) demonstrate how a number of interventions such as customized information, goal setting and tailored feedback can improve energy saving behavior. These measures have to take into account people's ability to imitate and use cheap channels of learning. Here the identification and use of the most influential role models and actors, perhaps by awarding prizes (Nannen and van den Bergh, 2010), may increase policy effectiveness. Another type of measure at a landscape level are policies creating informed debate – such as public participation in policy development – through mechanisms like meetings and round tables. Involving citizens in policy design may positively influence the likelihood of a sustainability transition. Frey and Stutzer (2002) find that the participatory program used by Swiss districts in the form of referendums makes people feel involved and happier. Comparing eligible voters with non-eligible foreigners living in these districts, it becomes clear that two-thirds of the well-being improvement can be attributed to participation itself while only one third is the result of actual policy improvements. Broader citizen participation in political decisions can improve the social-political feasibility of new policies.

Such broader citizen participation is exactly what a transition policy aims to foster. It goes beyond the disciplinary boundaries and affects all realms of life in ubiquitous forms. However, it is still not perfectly clear, even by following Geels (2010), whether the policy maker should focus on the idea of a transition in particular unsustainable socio-technical subsystem like transport, electricity production or agriculture or a transition towards increasing sustainability in general, throughout the economy. Great transformations, as described and explained by Polanyi (2001) [1944], encompass all features of society, culture and economy, and are not fully steerable but demand a high degree of social and environmental embeddedness. Geels (2010: 504-505) argues that 'evolutionary theory' and 'interpretivism' appear as the main

crossover ontologies for the implementation of sustainable transition policies in a multi-level perspective. The reason is given by their modular theoretical power with regards to cognitive as well as behavioral learning, a notion also highlighted by evolutionary economists such as Witt (2001) or more recently Safarzynska (2013). This aspect highlights also the complex interplay of instinct, cognition and learning for the inheritance of different 'consumption technologies' (compare also Veblen, 2000) [1899]. But, in the context of niche-regime-landscape interactions, it is necessary to integrate the broader notion of social learning along a co-evolution of habitus and the field (Bourdieu, 1994) to realize a system transformation. Geels (2010: 507) proposes with regard to the issue of crossovers between ontologies and the notion of long-term learning in the MLP view, in line with Rammert (1997), that integration of Giddens' structuration approach, actor-network theory with constructivism, and evolutionary theory is useful. In this respect we would like to emphasize a stronger social and naturalistic embeddedness of behavioral features highlighting the theory of practice approach in post-structural sociology and in the old institutional economics.

It is clear that the potential responses towards a transition policy will depend on welfare gains and losses for economic agents. While, the issue of welfare is still not very well understood within such a dynamic policy outlook, we recognize that dynamics lie at the heart of sustainable development studies. As Safarzynska (2013) argues it is not easy to find appropriate normative frameworks for evolutionary transition problems. Binder (2010) elaborates on an analytical framework for preference learning and its normative implications to contribute to evolutionary economic problems, such as raised by Bowles (1998) or Witt (2003) for instance. However Safarzynska (2013) discusses the relevance of 'virtue ethics' for evolutionary economic policies by elaborating on 'economic practices' in context of sustainable transitions. We argue that this approach is highly promising, since it follows a theory of practice doctrine but emphasizes a more dynamic vision of Sen's (1999, 2010) capability approach. Sustainability policy demands a multidimensional umbrella of change and needs to activate political knowledge in practices. Evolutionary policy makers have to follow radical empiricism, as articulated in American pragmatism and in post-structural theories of practice for instance – compare Massumi (2011) for a first synthesis of these two important streams of thought. Such a policy perspective emphasizes aspects beyond ethics and systems of moral rules in the first place. It is about activation, practice and the demand for dynamic politicians. In order to remain or to keep active in the political field it is necessary to distinguish between transition and transformation in very broad terms.

Scholars use these terms interchangably which leads to a variety of combinations such as, socio-technical transition, socio-ecological transition, socio-economic transformation or socio-ecological transformation. This terminological variation is not helping a serious debate on policy conceptualizations and potential implications for behavioral features and needs more attention conclusively. Recently, Brand (2012) suggested that these terms are not only confused in academia but even more in international institutions, which should play the safeguards for sustainable transition policies by their political role. According to Brand (2012: 118) "In political science research, transition generally refers to a change of political regimes, such as the shift away from authoritarian regimes and military dictatorships to more or less liberal-democratic political systems […] Transformation is often used to refer to the transition from the Eastern European socialist planned economy to a capitalist market economy." The

interpretation of transiton is crucial for the design of transition policy, since it defines the central issues of time horizon and acceptance, reception and diffusion among stakeholders.

Many of the behavioral features discussed in the next section go beyond the mere transition aspect of sustainable development and are part of a greater sustainable transformation process. These behavioral features and the diversity of behaviors of specific stakeholders complicate governance in comparison with an (assumed) situation of rational and uniform (representative) agents.

3. Behavioral foundations and barriers to implementation of transition policy

Given the variety of actors and the nature of fundamental change of sustainability transitions, in this section we identify relevant insights of behavioral economics, notably the different behavioral biases and social preferences that may have an influence on policy impacts and acceptance by the different actors. Table 2 introduces the main behavioral factors classifying them into two main categories, other regarding preferences and bounded rationality. In addition, we connect these behavioral features to the stakeholders they impact mostly. Finally, we derive preliminary policy implications.

A first set of behavioral features important for policy design are reputational concerns and altruism. These may stem from intrinsic motivations that can be discouraged by extrinsic motivations like rewards and punishments. Shimshack and Ward (2005), investigating the case of conventional water pollutants in the US, find that concerns about reputation have very strong effects. If certain plants in a regulatory area are fined, their neighbors carefully observe their case and learn from this experience: they respond nearly as strongly to a sanction as the fined firm itself. According to Caplan (2003), repeated interaction between a firm and its consumers can lead to self-regulation. As a result, when an environmentally damaging firm is continuously interacting with consumers, the firm will tend to improve its image and become "cleaner" so as to improve its reputation. Of course, this will be limited to environmental performance improvements that do not go along with too sharp cost rises, which means that such a process will be of little importance for many important environmental issues, notably climate change.

Another barrier to the conversion of altruistic consumer traits to the purchase of environmentally benign products involves the issue of trust. Firms have resorted to "greenwashing" when information is provided to conceal abuse of the environment to create a positive public image (Kaufman, in press). While eco-labelling is in theory meant to overcome this issue, in North America TerraChoice Environmental Marketing (2009) found over 90% of green products engaged in some form of greenwashing. While green credentials vary from product to product, the loss of a person's trust in a particular green product may have ramifications for the "green product sector" as a whole.

Public perception of environmental policies depends on behavioral features of stakeholders. One example is inequity aversion, which suggests that fairness is crucial for gaining public support for policy. This has been shown to be relevant in the case of road pricing (Jakobsson et al. 2000, Fujii et al., 2004), travel demand management measures (Eriksson et al., 2006), and a CO_2 emission tax in the transport sector (Hammar and Jagers, 2007). To

increase the social-political acceptability of Pigouvian taxes and reduce tax evasion, the fairness of revenue recycling from such taxes is essential (Kallbekken et al., 2011).

However, it is also important for investments to be made in public transport infrastructure *prior* to the implementation of Pigouvian taxes. For instance, surveys of the public conducted by Stø et al. (2012?) suggest improving services and infrastructure is crucial to the increased use of public transport and that insufficient quality of such services makes regulatory measures on private cars politically unviable. This barrier to the greening of household transport may be overcome by governments taking a short term hit on their finances by making investments in public transport in advance of Pigovian taxes levied on private transport. Other barriers which may prove more difficult to overcome include the greater travelling times and the changes in lifestyle (more pre-planning and less flexibility) associated with public transport (Stø et al., 2012?).

The behavioral features of stakeholders in a transition can be used in different ways in transition policy design in order to facilitate behavioral change and overcome inertia. If, for example, self-image and status considerations stimulate environmentally damaging consumption, then one may try to re-direct these aspirations towards more sustainable alternatives through the use of 'green' role models (Martikainen, 2009). For this purpose, green status goods are needed. In addition, the transmission of unsustainable norms can be discouraged by paying more attention to the environmental behavior of influential people and organizations. Furthermore, community values can be strengthened to reduce the emphasis on status and image in society. This seems very difficult today in our "anonymous society without borders", but a number of small-scale community-based movements illustrate the increasing dissatisfaction with dominant consumer behaviors (Jackson, 2008; O'Riordan, 2013). The message for policy makers is that greening consumption is not enough; changing behavioral characteristics has to be taken more seriously to encourage broader transitions.

However, the large scale adoption of less environmentally damaging behavior will be more difficult to obtain in practice. The main barrier to changing behaviors is that material artifacts constitute a powerful 'language of goods' that we use to communicate with each other about status, identity and social affiliation (Jackson, 2009). Material consumption is also boosted from a desire to keep up with the Joneses, which is also known as 'competitive consumption'. Another barrier to the adoption of less environmentally damaging behavior arises from the heating of homes. Herein surveys conducted by Stø et al. (2012) find that comfort and warmth as higher priorities over financial and environmental considerations. This particular barrier may be overcome through more efficient heating systems or better home insulation, which would allow comfort to be maintained for a lower carbon footprint.

Environmental and social behavior is strongly affected by moral and normative concerns too. Sterner (2003) documents that taking into account the probability of being caught in evading taxes, people should evade more. However, it is the motivation of doing the right thing that increases people's willingness to pay. For example, if a particular behavior is normally considered shameful, the introduction of fines might lead to counter-productive results. Similarly, if a particular behavior is considered as the right thing to do, financial rewards can erode this feeling (crowding out).

Table 2. Policy instruments classified along behavioral features

Behavioral feature		Consumers	Innovators	Producers	Investors	Financial sector	Policy implications and instruments
Other regarding preferences	Altruism/Reputation	*					The supply of public goods strongly depends on the level of altruism. Repeated interaction between a firm and its consumers can lead to self-regulation. By reinforcing the interactions between firms and consumers or obliging firms to periodically report their environmental performance, this can improve as a result of concerns about reputation.
	Fairness	*					Different examples such as road pricing, travel demand management measures, and a CO_2 emission tax in the transport sector show that fairness is crucial for policy acceptance. To increase the social-political acceptability of Pigouvian taxes and reduce tax evasion, the fairness of revenue recycling from such taxes needs to be well explained to citizens.
	Moral and normative concerns	*					The literature shows that taking into account the probability of being caught in evading taxes, people should evade more. The motivation of doing the right thing increases people's willingness to pay. For example, if a particular behavior is normally considered shameful, the introduction of fines might lead to counter-productive results. Similarly, if a particular behavior is considered as the right thing to do, financial rewards can erode this feeling (crowding out).
	Status	*					In order to re-direct aspirations that stimulate environmentally damaging consumption towards more sustainable options, green status goods may be useful. Community values can be strengthened to reduce the emphasis on status and image in society.
	Reciprocity	*					Different experimental studies show that people act favoring members of the same group compared to out-group members. Creating niche networks will improve collaboration between niches and thereby increase the power the overcome or resist regime backlashes.
	Imitation/Critical masses	*		*			Imitation can both hinder and foster a transition. Imitation of environmentally damaging habits can act as a barrier to transitions. On the other hand, imitation of environmentally beneficial habits can contribute to the likelihood of sustainability transitions. When a critical mass of people imitating and diffusing the same innovation is reached, imitation becomes a force that helps the transition instead of hindering it. The use of influential role models is important for achieving critical masses.
	Lobbying			*		*	Structural reasons of bounded rationality at the collective level include political myopia (election cycles, party interests and personal interests of politicians and public officers), stakeholder involvement in power games (e.g., lobbying), the lack of direct accountability to voters, and regulatory capture. These biases are important for transition policies which have to balance long-term societal goals with short-term concerns.

	Habits, routines/satisfying	*		*			Policy should reckon with additional reasons for inertia, notably firm routines and consumer habits. Managers and consumers often stick to their traditional ways of doing things. These routines can be changed by building awareness. Awareness training of appropriate experts can stimulate the incorporation of environmental standards in the design and management of the production system in the case of industrial routines. A combination of incentives, regulatory tools, and norms can be effective to change consumer habits. Insights from social psychology facilitate changes in habits.
	Affect	*		*			Understand the reasons for reluctance to change unsustainable consumption behavior. Insight into consumers' psychological valuation of consumer goods is important. Crucial aspects are to understand how positive emotions relate to environmentally harmful consumption and how to build affective connections with the natural environment.
	Framing	*		*			Information provision by the government can affect perceptions of climate change and associated decisions by stakeholders. Focusing on the benefits of mitigation instead of the negative consequences of inaction can increase positive attitudes towards mitigation. If too complex messages about environmental behavior are provided, people can use psychological defense mechanisms that hinder behavior change.
Bounded rationality	Discounting	*	*	*	*	*	People have been found to discount more strongly in contexts of environmental impacts, like investing in renewable energy or energy conservation equipment, than in a purely financial context.
	Over-confidence			*			Investors overestimate the probabilities of certain outcomes (and their own ability to predict these outcomes). Understanding the basis of investor behavior can help to devise appropriate incentive schemes, information strategies and regulations. Overconfidence can make regulatory intervention necessary to reduce cyclicality in the economy.
	Over-optimism			*			Organizational pressure and two cognitive biases known as anchoring and competitor neglect make firms overly optimistic. In the case of environmental problem solving this can have detrimental effects that need to be addressed.
	Disposition effect				*	*	Investors sell winning shares quickly and hold loosing shares for longer periods. The perception of potential losses and gains determine people's choices in risky situations, not the expected utility that can be calculated from a concave utility-of-wealth function. Understanding such behavioral biases is crucial in dealing with transitions of complex systems where uncertainties abound.
	Equity premium puzzle				*	*	Investors buy bonds even if stocks in the long run perform consistently better. This behavior can be caused by loss aversion combined with frequent evaluation of portfolios by agents relying on "mental accounting". Here, more frequent access to information about stock/bond returns can be disadvantageous, because it shifts investments to the least risky assets offering the lowest returns in the long run. This may be bad news for investments in risky sustainability projects.

Note: Behavioral features and stakeholder classifications derived from Milestone 31 (Gazheli et al., 2012).

The provision of specific information pertaining to environmentally beneficial behavior and green products is crucial for promoting less environmentally damaging lifestyles. Within this area there are currently two types of barriers preventing the widespread adoption of such lifestyle. The first barrier involves a lack of publically available information as to how one practices green behavior and purchases green products. Some examples are given by Stø et al. (2012):

- Household heating systems – focus group discussions revealed a lack of confidence by households in their ability to operate their heating systems such that they were put off from adjusting settings and timers to suit their personal heating needs.
- Household appliances – there was a lack of awareness by consumers as to the energy consumption of various household appliances.
- Energy efficient housing refurbishment – stakeholder interviews and focus group discussions revealed consumers were often unaware of the potential to make existing houses more energy efficient. This included a lack of knowledge regarding refurbishment benefits and costs and difficulty in locating competent artisans.
- Green motoring fuels – consumers lacked awareness of the environmental benefits of green fuels and the technical knowledge behind such fuels.

The second barrier preventing the adoption of environmentally beneficial lifestyles lies in the way information pertaining to green lifestyles and products is presented. In this context framing of information is important (Gifford and Comeau, 2011). It has been shown that focusing on the benefits of mitigation instead of the negative consequences of inaction can increase positive attitudes towards mitigation (Spence and Pidgeon, 2010). The complexity of communication is a further important aspect of framing. Too complex messages about environmental behavior can provide opportunities for people to use psychological defense mechanisms that hinder behavior change (Antal and Hukkinen, 2010). Another example is the energy efficiency market which appears to suffer from a bias that involves undervaluing the future energy savings from an energy efficient product relative to the initial purchase price of the product i.e. overvaluing the life-cycle cost of the product. Often consumers fail to calculate the life-cycle costs of various appliances either because it is not worth their time or they have insufficient information (Di Maria et al., 2010). This uncertainty-loss aversion bias against investments in energy efficiency is, however, quantifiable and can potentially be corrected by policy measures, such as information provision and education. A concrete policy-relevant insight based on behavioral research in this field is that fees or rebates affecting prices (for instance, of cars) or greenhouse gas emission standards can be more effective in this context than an externality tax on carbon (Greene, 2011).

The increase in social mobility within and between countries of recent decades, while aiding labor market flexibility, has acted as a barrier on the ability of households to implement energy efficient refurbishments (Stø et al., 2012). This situation arises as it makes little economic sense for people to refurbish their houses if they will be somewhere else when the benefits of lower energy bills materialize. An increase in the proportion of people renting as opposed to owning their own homes will entail similar negative impacts on the number of people deciding to conduct such refurbishments as landlords face the burden of investing capital while not capturing reduced energy costs (Stø et al., 2012). One potential mechanism

to overcome these barriers would be to make it easier for energy efficient refurbishments to be reflected in the price of houses and rent.

Overall the issue of capital is a barrier to overcome for the majority of energy efficient and clean energy investments ranging from efficient household appliances, energy efficient housing refurbishments, the purchase of fuel efficient (including hybrid) vehicles and solar panels. The upfront capital costs may deter some people from making these types of investments as they are typically of greater clarity compared to the future energy savings. In addition, not every household may be in a strong enough financial position to meet these upfront capital costs. One potential solution to this dilemma would be to create a so called 'green bank' with the ability to make loans to households to cover these upfront costs. The creation of such a bank would also enable all sectors of society to take part in reducing their environmental impacts and to enjoy reductions in energy bills regardless of income or wealth.

Policy needs to understand the reasons for the reluctance to change unsustainable consumption behaviors. Looking through the lens of consumer behaviour reveals a complex and outwardly intractable policy terrain. People are attached to material consumption in a wide variety of ways, some of them functional, some symbolic (Jackson 2005, 2008). They are often locked in to unsustainable patterns through a complex mixture of factors some of them institutional, some of them social or psychological.

The rhetoric of 'consumer sovereignty' and does not help much here because it regards choice as individualistic and fails to unravel the social, psychological and institutional influences on private behaviours. Some behaviours are motivated by rational, self-interested, and individualistic concerns. But conventional responses neither do justice to the complexity of consumer behaviour nor exhaust the possibilities for policy intervention in pursuit of behavioural change. The apparent intractability of consumer behaviour is in part a function of the policy model which has dominated conventional thinking on pro-environmental and pro-social change. But the evidence suggests that this model is inaccurate. Despite the rhetoric of modern 'hands-off' governance, policy intervenes continually in the behaviour of individuals both directly (through taxes, regulations and incentives) and (more importantly) through its extensive influence over the social and institutional context.

Governments are not just innocent bystanders in the negotiation of consumer choice. They influence and co-create the culture of consumption in a variety of ways. In some cases, this influence proceeds through specific interventions – such as the imposition of regulatory and fiscal structures. In other cases it proceeds through the *absence* of regulations and incentives. Most often it proceeds through a combination of the ways in which Government intervenes and the ways in which it chooses not to (Jackson 2005).

The endowment effect and the affect attributed to things we own (Thaler, 1980; Steg, 2005) are important here. For example, the modal shift from car use to public transport is often perceived as a loss of individual freedom. This calls for policy efforts to more carefully explain the various benefits that citizens may derive from an envisioned policy change. For example, proposals for car free pedestrian areas in downtown districts often meet with strong resistance from shop owners, local residents and visitors coming by car. However, once implemented many of these people turn out to highly value such pedestrian areas, which suggests that communication with citizens about policy consequences can and should be improved. At the same time, insight into changes in consumers' psychological valuation of consumer goods is important. Such changes have been observed for car use in China (Zhu et

al., 2012). Understanding of how positive emotions relate to environmentally harmful consumption is crucial because giving up behaviors associated with these emotions is very difficult due to the endowment effect. Another strategy is to build affective connections with the natural environment to sort of foster an endowment effect with the environment. This may then contribute to creating strong motivations for environmental conservation (Hinds and Sparks, 2008).

Policy should reckon with additional reasons for inertia, notably firm routines and consumer habits. Without awareness and self-reflection, managers and consumers often stick to their traditional ways of doing things (Carrus et al., 2008). The first step to change these routines and habits is building awareness. In the case of industrial routines, for example, awareness training of appropriate experts can stimulate the incorporation of environmental standards in the design and management of the production system (UNIDO, 2008). In the case of consumers, a combination of incentives, regulatory tools, and norms can be effective to change habits. In practice, this means that besides traditional policies like pollution pricing or regulation, insights from social psychology can be implemented in the form of particular instruments to change habits. Examples are providing information about environmentally relevant, comparative behaviors (e.g., regarding energy or water use) of neighbors, households with similar socio-economic features, or other users such as in the context of tourism or transport (Schultz et al. 2007; 2008).

Lessons from the case of Denmark

While much of the last section identified barriers to less environmentally damaging behavior and proposed policy solutions accordingly, there is one country where significant success has been achieved in the greening of its energy sector. Since 1980 to 2010 Denmark has increased the renewables share of domestic electricity supply from 0% to 33.1%, and the renewable energy share of gross energy consumption from 2.9% to 20.2% (Sovacool, 2013). The catalyst for such a remarkable change was the OPEC oil price rise of the 1973 which impacted Denmark particularly hard. At the time 85% of Denmark's electricity came from oil while the transport sector was almost entirely dependent on imported oil (Lund, 2010). The policy making emphasis therefore shifted towards modifying the energy sector to enable Denmark to be in a better position to cope with future oil price spikes. This was accomplished through three policy pillars.

The first policy pillar involved a cooperative approach to the construction of wind turbines in Denmark. This involved according to Sovacool (2013):

- all farmers and rural households having the chance to install turbines on their own land,
- local residents could become local cooperative members in their municipalities or neighboring municipalities while exclusive local ownership was a condition for operating permits,
- electric utilities could only build large wind farms if the wishes of farmers and local residents were not violated.

Even though other countries have improved in recent years considerably their investment in wind power capacity, electricity from wind power in Denmark still makes up the highest proportion of domestic electricity demand across all countries.

The second policy pillar initially focused on converting oil boilers for heating to use of natural gas and coal to break dependence on imported oil (Mortensen and Overgaard, 1992). In addition, combined heat and power (CHP) units were encouraged for the same purpose. In the 1990s cogeneration units were required to replace district heating units and their previous use of oil, diesel and coal was prohibited and replaced by natural gas (Hendriks and Blok, 1996). If the local market was too small to support cogeneration, the district heating plants were required to use biomass. In 2011 renewable sources and natural gas made up 50% and 25% of all CHP fuels respectively (Sovacool, 2013).

The final policy pillar focused on making energy efficiency improvements. Denmark first introduced an energy tax for all households in 1977 and a carbon tax across all sectors in 1996 (Sovacool, 2013). In many ways Denmark was ahead of its time in the implementation of these policies such that even now there are some countries without a carbon tax, and even in those countries with such a tax it is applied only to specific sectors. Importantly, Denmark kept these taxes high even as fossil fuel prices fell in the 1980s and 1990s so that the renewable energy industry could depend on stable fuel and electricity prices (Sovacool, 2013). Other developments under this policy pillar included the setting of energy efficiency goals for electricity, natural gas and district heating providers in 2006, and the early adoption of energy labeling for appliances and buildings in 1979.

The combination of these policy pillars has enabled CO_2 emissions (adjusted for climate variations and net electricity exports) from the electricity and district heating production sectors to fall by 32% in absolute terms during 1980-2011 (Danish Energy Agency, 2013). In addition to these policies, it is important to remember that Danish energy policy was remarkably consistent between 1973 and 1998, which saw its markets for wind energy, CHP and energy efficiency expand rapidly (Sovacool, 2013). Stability in energy policy is crucial, as households, firms and investors will be less likely to make the energy efficient investments if uncertainty exists over the future returns to such investments. While Denmark admittedly benefits from the flexibility to sell excess wind power and buy hydro power from Norway, which alleviates variability in the supply of wind power, the environmental performance of Denmark's energy sector is still worth holding up as a shining example to other countries with aspirations to reduce the environmental impact of their domestic energy sectors.

4. Conclusions

In this paper we introduced the various stakeholders involved in sustainability transitions and investigated their behavioral biases which may have an influence on the process of policy design, implementation and acceptance. This will lead to an assessment of potential or expected responses to a range of policies and policy instruments.

We described different sustainability transition policies and classified them into the niche, regime and landscape level, following the MLP framework. In addition, we described the impact that such policy measures may have on the different actors involved in sustainability transitions. We introduced the concepts of 'strategic niche management', transition management and niche networks. These concepts consider the different actors involved in transitions and their interaction but do not shed enough light on the behavioral features of various stakeholders in the design of transition policies.

A first stakeholder whose decisions have important consequences for the environment is the consumer. A number of consumer behaviors that involve bounded rationality or other-regarding preferences may be considered in transition policy design. Important biases such as habits, status quo bias, affect and imitation contribute to inertia. Transition strategies need to either reduce or take well into account the effects of these biases. Important cases are altruism, fairness and effects of framing influence levels of cooperation, acceptance of policies and risk perceptions. Norms and rules evolving in groups have important consequences too. Understanding group behavior and the role of leaders in organizations, role models, and potential change agents can inform about the effectiveness of sustainability transition policy.

A second group of stakeholders consists of producers and investors. Producers are often over-optimistic and their decisions are affected by anchoring. Instead of perfect profit-maximization firms usually stick to satisfactory strategies, convert these into routines, and change only when profits drop below the market average (or profits of competitors). Similarly, investors – who allocate capital and thereby have a very large influence on the speed of transitions – show different behavioral anomalies. Overconfidence in financial markets, for example, may increase risky investments beyond what is rational. This may contribute to the cyclic behavior of the economy, while it can also help to counterbalance loss aversion in the case of risky sustainability projects, (such as on renewable energy).

A third group of stakeholders includes institutions like governments. In the context of sustainability transitions, it is important to keep in mind that governments are made up by groups and individuals that have their own self-interests and behavioral characteristics. They usually operate out of the market, so they do not have the same market incentives as consumers and especially producers to behave rationally to some degree. Furthermore, the policies made by governments have to consider the behavioral features of economic actors. Issues that matter for policy effectiveness are framing that changes risk perceptions, fairness that influences policy acceptance, and status, affect and habits that create inertia.

We identified many barriers to change associated with particular behavioral features of various stakeholders in this paper. The list is too long to summarize unfortunately. In addition we analyzed briefly the illustrative case of Denmark, which has performed considerably better in making a transition to renewable, notably wind, energy as well as economy-wide energy efficiency than other EU countries. One important lesson is that Danish energy policy was very consistent between 1973 and 1998, which allowed its markets for wind energy, combined heat and power (CHP) and energy efficiency expand successfully. For long term investments in renewable energy and energy conservation policy conditions have to be clear well in advance, and as much as possible consistent between countries. The latter is needed to avoid carbon leakage due to relocation of energy-intensive industries and shifts in trade patterns because of policy differences among countries. Such international consistency and long term clarity of policy requires an international climate agreement that provides the necessary climate regulatory setting for the coming decades.

Implications of behavioral features of stakeholders for policies and instruments as mentioned here provide a rough direction, which in some cases has been confirmed theoretically and empirically, while in other cases more research is need for such confirmation (or refutation). This paper suggested that insights from behavioral economics often have a critical role in such analyses. A number of behavioral features were identified for the most important stakeholder groups. This is one step towards a better understanding and

management of sustainability transitions and design of an effective and efficient transition policy package.

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Project Information

Welfare, Wealth and Work for Europe

A European research consortium is working on the analytical foundations for a socio-ecological transition

Abstract

Europe needs change. The financial crisis has exposed long-neglected deficiencies in the present growth path, most visibly in the areas of unemployment and public debt. At the same time, Europe has to cope with new challenges, ranging from globalisation and demographic shifts to new technologies and ecological challenges. Under the title of Welfare, Wealth and Work for Europe – WWWforEurope – a European research consortium is laying the analytical foundation for a new development strategy that will enable a socio-ecological transition to higher levels of employment, social inclusion, gender equity and environmental sustainability. The four-year research project within the 7th Framework Programme funded by the European Commission was launched in April 2012. The consortium brings together researchers from 33 scientific institutions in 12 European countries and is coordinated by the Austrian Institute of Economic Research (WIFO). The project coordinator is Karl Aiginger, director of WIFO.

For details on WWWforEurope see: www.foreurope.eu

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