



# EU INNOVATE

## Deliverable D 7.1

*Executive report of findings of WP1-6 from a multi-level perspective*

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Name of authors: Geert Verbong, Bram Verhees, Anna Wiczorek (TU/e)

Name of peer-review: Frank-Martin Belz, Reinhard von Wittken



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## 0. Executive summary

The objective of the EU-InnovatE project has been to map and understand sustainable innovation with a focal role for users: users as innovators and entrepreneurs. The question addressed in this report is: what do we learn from the empirical and theoretical results achieved in the work packages of this project and what are the implications for society in our efforts to move towards more sustainable lifestyles? The main theoretical lens has been the multi-level perspective (MLP), developed for the analysis of transitions.

In work package one the MLP framework has been expanded; it has resulted in two typologies: one on collective user roles in transition processes and one more general typology. The typology on collective user roles makes a distinction between the following roles:

- **User-producers** (or users-turned-entrepreneurs) construct niches by inventing and experimenting with new radical technologies, creating new technical and organizational solutions, articulating new user preferences, and enabling new rules and/or routines to emerge.
- **User-legitimizers** construct niches by developing discourses that provide a larger narrative for niche development. This narrative anchors the viability and significance of the niche, and its rule set. User-legitimizers contribute to the stability of the routines and thus will make the rules more broadly acceptable.
- **User-intermediaries** are system builders: they align the various elements of emerging socio-technical systems, such as products, infrastructures and regulatory frameworks. User-intermediaries play an important role in preparing the ground for the wider adoption process of niche technologies.
- **User-citizens** focus on the political lobby for a particular niche and against the dominant regime (or other promising niches). Similar to user-intermediaries, they play an important role in accelerating niche development. Through the strategic deployment of material and communicative movements, inseparably meshed together in events such as protest actions or boycotts, these actors attempt to de-immobilize the existing systems.
- **User-consumers** invent ways of embedding new technologies in their daily practices. This process entails the testing, repair and maintenance of new technologies, which is often necessary to make these technologies work at all. In addition consumption is never simply about rational economic choices.

This typology focuses on the role of collective users in supporting transitions. However, users can play other roles as well, both individually and collectively. Users are not only purchasers and consumers of a technology but they can be involved in various degrees in the production and design process or act as a co-producer. But users, either individually or collective, can also oppose innovations. To get a more symmetric and complete view on the role of users, we propose a typology of roles by juxtaposing them according to three dichotomies. The first dichotomy is that of sustainable innovation as an **individual** or a **collective** activity. The second is that of **passive** versus **active** roles. The third dichotomy is that of **constraining** or barrier-like user roles versus **enabling** or empowering ones: users can also become a barrier to sustainable innovation.

On the basis of a MLP analysis of the results of the other work packages, the following conclusions can be drawn:

- The EU-InnovatE project has shown that there is a lot of activity in the field of sustainable innovation. Users are increasingly involved in the process of sustainable innovation, both by large companies (user-integrated innovation) and in sustainable end-user innovation. In both cases these activities are still marginal in the context of dominant innovation processes and practices. Although promising, they are still niche activities in the energy, mobility, living and food domains.
- The main question is how to upscale these niches in order to replace the dominant regimes that foster and encourage unsustainable lifestyles.
- For this to happen the emerging niches of sustainable innovations (and sustainable lifestyles) need to be supported. On the basis of the research in EU-InnovatE several recommendations have been proposed to increase the role of users in the company driven sustainable innovations and to improve the process in user-led sustainable innovations.
- These recommendations help to improve the niche internal processes by highlighting and communicating sustainable innovations and lifestyles, by broadening and improving the social network supporting these innovations and lifestyles, and by exchanging and accumulating experiences and lessons learned.
- The challenge of up scaling niches has triggered an interest in business models (and industrial ecosystems). In order to enable a growth and diffusion of pilot projects, they have to become also economically feasible. There are useful contributions on sustainable business models, including multiple value creation, and user-centered business models that are relevant for further research and experimentation in sustainable innovations and lifestyles.

- But for sustainability transitions to happen, more is needed than just encouraging and supporting the development of niches. Transitions occur as the result of multi-level interactions: the societal embedding of sustainable innovations and lifestyles and the destabilization of dominant regimes is necessary as well.
- The other user roles, as identified in the typology of Schot et al. and in the comparable typology of secondary stakeholders by Korsunova et al., can help to empower niche actors in their struggle to change or adapt the rules in favor of more sustainable innovations and lifestyles. The barriers existing regulations pose have been identified in EU-InnovatE as an important one.
- One important issue that has not been addressed fully is that of how pathways to more sustainable lifestyles could look like. There are different pathways that can lead to the same result. It remains unclear what the best long term strategy is: to start not differing too much from existing practices and gradually redirect the development in other direction or start with more radical way of doing things. We propose that both strategies are needed: the first one could be more effective on the long term, but the second is needed to provide examples that e.g. more sustainable lifestyles are feasible but not yet attainable or attractive for larger groups of people. Mixed or hybrid strategies also are an option.
- The SPREAD scenarios used to explore future sustainable lifestyles, offer glimpses of sustainable lifestyles but within very different societal settings and with very little clues how to achieve those. One of the main recommendations is that (reflexive) monitoring is needed to ensure that we are still on the 'right' track, but also to prevent unwanted lock-in in suboptimal or unsustainable pathways. A set of social indicators that can help the monitoring process, has been developed.

## 1. Introduction

The aim of this deliverable is to analyse the findings of the various work packages 1-6 of the EU Innovate project through the lens of the multi-level perspective (MLP). The MLP has been developed for understanding and analysing major transitions, that is, structural changes in how we live, feed, move, use energy etc. It has been one of the core theoretical concepts structuring the EU-InnovatE project. The objective of the EU-InnovatE project has been to map and understand sustainable innovation with a focal role for users: users as innovators and entrepreneurs. The question we will address in this report is: what do we learn from the empirical and theoretical results achieved in this project and what are the implications for society in our efforts to more sustainable lifestyles?

Despite the fact that the project has found ample proof of user innovators and entrepreneurs contributing to the development of (more) sustainable lifestyles, it is obvious that these activities are still marginal compared to dominant mainstream and unsustainable practices. In terms of the MLP, these pilots, initiatives and sustainable enterprises in the various societal domains the project has focused upon (energy, food, mobility and living), are still in the niche phase; although there is variety in the number of initiatives and the stage of development of the various niches, from a societal perspective they only reach a small of the population.

Why a focus on the MLP? The EU-InnovatE project aims to address the obstacles and prospects for sustainable lifestyles and green economy in Europe in the light of the EU's strategic priority of effecting a systemic transition to a low-carbon society. The MLP is an appropriate framework because it allows us to contextualize user-driven innovations, and challenges us to think about their relative influence in the light of a much broader set of socio-technical dynamics. Additionally, the MLP's level of analysis of 'societal functions' corresponds with the EU-InnovatE goal to specifically investigate the four 'key domains' of food, living, mobility, and energy.

The outline of this report is as follows

- A brief introduction to the multi-level perspective and a typology of transition pathways
- WP1 Understanding (Un-)Sustainable Lifestyles in Europe: a typology of collective user roles in transitions developed by Schot et al. (2016a and 2016b) and a more general user typology developed by Verhees and Verbong
- A brief summary and selective analysis of the main results of WPs 2-6, using the MLP; not all deliverables have been used for this analysis
- Some concluding remarks and a reflection on the implication of the findings.

## 2. The Multi-Level Perspective

The multi-level perspective is a theoretical framework that tries to provide an answer to the question “how does systemic change unfold?” Our world is facing a number of persistent problems: the modern way of provisioning our basic needs is not sustainable in the long run, and is already causing climate change on an unprecedented scale. It is clear that we cannot globalize our current ways of providing food, energy, mobility, healthcare, and water. If we do not take action, these problems will worsen as time progresses – risking even more climate change and profound societal turmoil, tensions and war (Schot, 2014). These persistent problems cannot be solved by optimizing systems of production and consumption alone (e.g. burning fossil fuels more efficiently) but need more radical or systemic change.

The main reason why persistent problems like climate change are so difficult to solve is because they are inextricably entwined with the socio-technical features of the systems of production and consumption of energy, food, mobility etc. These socio-technical systems are sets of technological and non-technological elements involved in the production, distribution and use of technologies (see Figure 1).

However, the scale of the persistent problems mentioned above requires socio-technical transitions: new socio-technical systems need to emerge around sustainable innovations and replace incumbent ones (Grin et al., 2010). Yet path-dependency and the highly interconnected nature of these systems make change difficult (Geels, 2004). Indeed, the stability of the ‘current way of doing things’ is so high that one might question whether things can ever change.

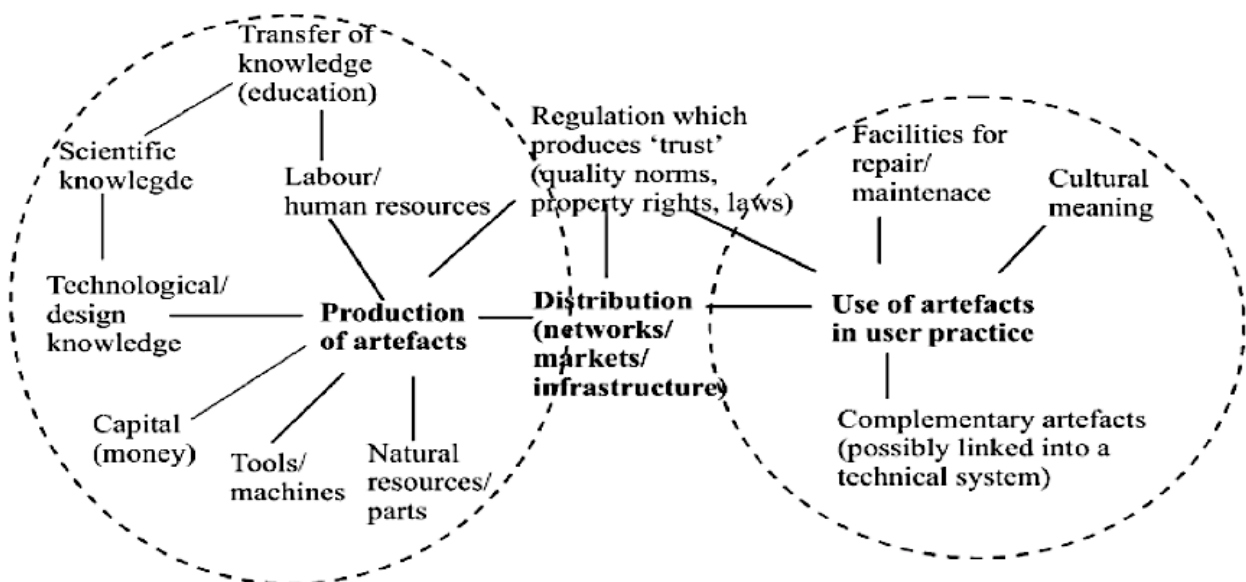


Figure 1. Elements of socio-technical systems. Source: Geels, 2004.

Nevertheless, it's easy to see that socio- technical transitions, whereby entire socio-technical systems were reconfigured into new ones, have happened in the past. The Multi-Level Perspective (MLP) has been developed by analysing historical transitions (Geels, 2004). Combining insights from evolutionary economics, STS, neo-institutional theory and innovation studies, the MLP has become one of the foundational theoretical frameworks in the field of transition studies (see [www.transitionsnetwork.org](http://www.transitionsnetwork.org)).

### 2.1 What is the MLP?

Transition scholars have been able to explain historical transitions by adopting a hierarchical conceptualization of the social world in which innovation processes unfold. Transitions were shown to come about as the result of processes occurring at and between three inter-related levels (the levels of the MLP):

- *Landscape*: (analytically) exogenous long-term trends, such as climate change, economic downturns and demographic changes, punctuated by high-impact events (e.g. disasters, wars).
- *Regimes*: sets of heterogeneous rules (e.g. routines, competences, lifestyles, practices, institutions, regulations) that constitute the stabilized core of the dominant way of realizing a given societal function (regimes entrench socio-technical systems).
- *Niches*: protected spaces for innovations that cannot (yet) compete with mainstream technologies in terms of (price-) performance. If properly nurtured, they can form the 'seeds' of alternative socio-technical systems.

It is important to realize that the field of transition studies does not claim that these levels 'exist in the real world': instead, they are analytical abstracts that researchers superimpose on reality, focusing on relevant aspects of the social world while admittedly leaving others out (e.g. Geels, 2004, 2011).

### 2.2 Transition pathways

Transitions are quite often understood as radical innovations emerging in niches, breaking through and overthrowing the existing regime. A classic example is the introduction of the ICE driven car. However, this is only one way (and not necessarily the most common ones) transitions can occur: the timing and nature of the interactions between the three levels can lead to a variety of transition pathways, based on different kinds and timing of multi-level interactions. The kinds of multi-level interactions refer to the nature of the relation between niche-innovations and landscape pressure with the regime (reinforcing or disruptive). Timing is in particular relevant in the case of landscape pressure on regimes. If this pressure occurs at a time when niche-



innovations are not yet fully developed, the transition path will be different than when they are fully developed.

A set of ideal-typical pathways have been identified by Geels and Schot (2007). A brief summary, taken from Geels and Schot, 2007 and Verbong and Geels, 2010:

- Transformation pathway

This pathway is characterized by external pressure (from the landscape level or outsider social groups) and gradual adjustment and reorientation of existing regimes. Although external pressures create 'windows of opportunity' for wider change, niche innovations are insufficiently developed to take advantage of them. Change is therefore primarily enacted by regime actors, who reorient existing development trajectories. Outside criticism from social movements and public opinion is important, because it creates pressure on regime actors, especially when they spill over towards stricter environmental policies and changes in consumer preferences. Although regime actors respond to these pressures, the changes in their search heuristics, guiding principles and R&D investments are modest. The result is a gradual change of direction in regime trajectories. New regimes thus grow out of old regimes through cumulative adjustments and reorientations. Radical innovations remain restricted to niches.

- Reconfiguration pathway

In this pathway, niche-innovations are more developed when regimes face problems and external landscape pressures. In response, the regime adopts certain niche-innovations into the system as add-ons or component substitutions, leading to a gradual reconfiguration of the basic architecture and changes in some guiding principles, beliefs and practices. In the reconfiguration pathway, the new regime also grows out of the old regime it differs from the transformation pathway in that the cumulative adoption of new components changes the basic architecture of the regime substantially. The main interaction is between regime actors and niche actors, who develop and supply the new components and technologies.

- Technological substitution pathway

In this pathway, landscape pressures produce problems and tensions in regimes, which create 'windows of opportunity' for niche-innovations. Niche-innovations can use these windows, when they have stabilized and gathered momentum. Diffusion of these new technologies usually takes the form of 'niche-accumulation', with innovations entering increasingly bigger markets, eventually replacing the existing regime. In this pathway newcomers (niche actors) compete with incumbent regime actors.

- De-alignment and re-alignment pathway

Major landscape changes lead to huge problems in the regime. The regime experiences major internal problems, collapses, erodes and de-aligns. Regime actors lose faith in the future of the system. The destabilization of the regime creates uncertainty about dimensions on which to optimize innovation efforts. The sustained period of uncertainty is characterized by the coexistence of multiple niche-innovations and widespread experimentation. Eventually one option becomes dominant, leading to a major restructuring of the system (new actors, guiding principles, beliefs and practices). Figure 2 provides a schematic example of this pathway.

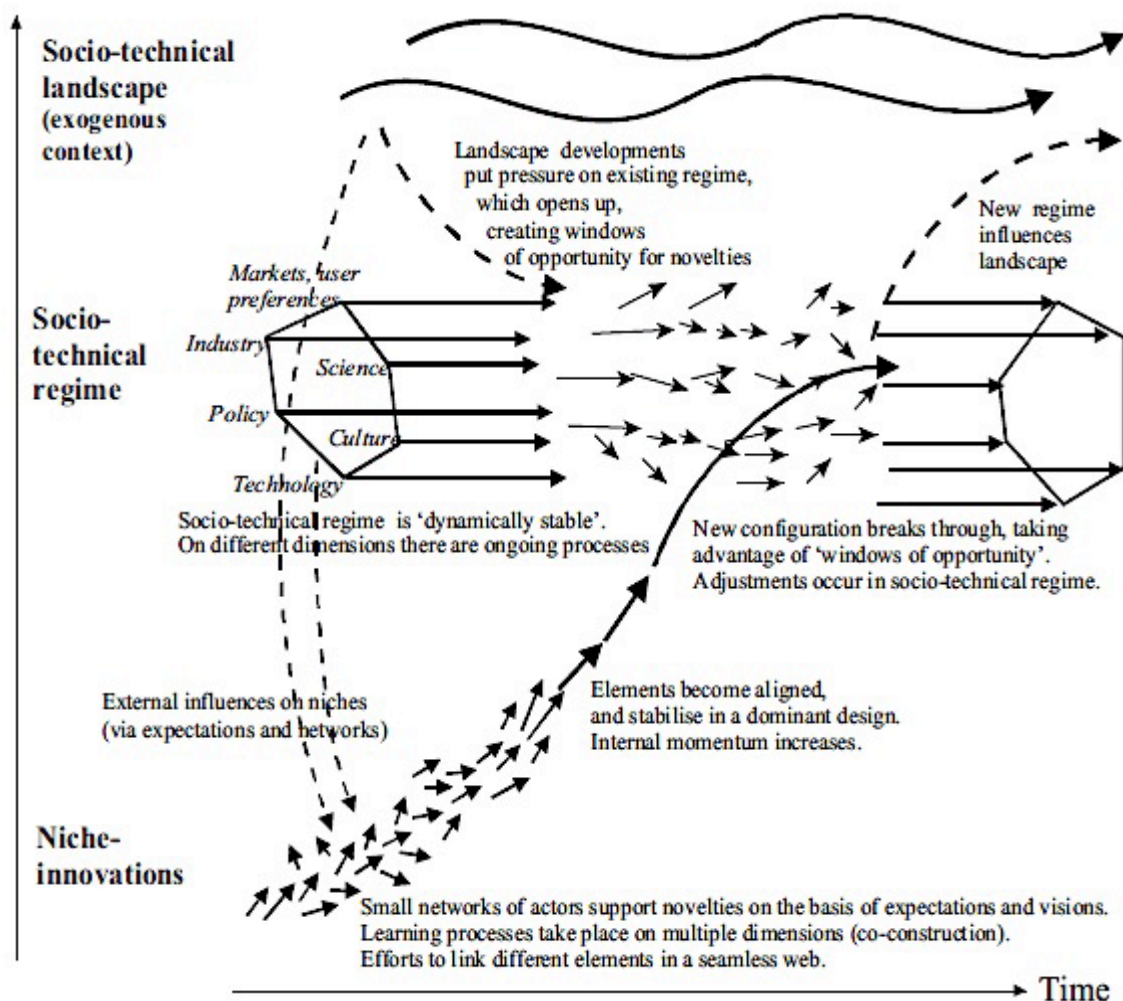


Figure 2. The multi-level perspective and one specific transition pathway (de-alignment/re-alignment)

A few remarks to this typology: Geels and Schot stress that these pathways are non-deterministic ideal types, which are influenced by social processes. Empirical cases may therefore have

elements of more than one pathway. Moreover, over an extended period of time, a sequence of transition pathways can occur. This sequence starts usually with a transformation phase, when regime actors only perceive moderate pressure. Gradually increasing pressure can result in more disruptive changes leading to a phase of reconfiguration and de-alignment/re-alignment.

### *2.3 The role of collective users in transitions*

In the context of WP1, and using historical examples from the energy and mobility domain, Schot, Kanger and Verbong (2016) and Schot and Kanger (2016) have studied the role of collective users in transition processes. According to Schot and Kanger users can play an important role during the entire transition process, but some roles are more salient in particular phases of the transition. They distinguish three phases: a start-up phase, an acceleration phase and finally a stabilization phase.<sup>1</sup>

Typology of collective user roles by Schot et al.:

- **User-producers** (or users-turned-entrepreneurs) construct niches by inventing and experimenting with new radical technologies, creating new technical and organizational solutions, articulating new user preferences, and enabling new rules and/or routines to emerge.
- **User-legitimizers** construct niches by developing discourses that provide a larger narrative for niche development. This narrative anchors the viability and significance of the niche, and its rule set. User-legitimizers contribute to the stability of the routines and thus will make the rules more broadly acceptable. Note, however, that this does not guarantee that stability will emerge or, if it does, that it will become permanent. In the context of heightened uncertainty, various conflicting narratives can re-emerge.
- **User-intermediaries** are system builders: they align the various elements of emerging socio-technical systems, such as products, infrastructures and regulatory frameworks. User-intermediaries play an important role in preparing the ground for the wider adoption process of niche technologies.
- **User-citizens** focus on the political lobby for a particular niche and against the dominant regime (or other promising niches). Similar to user-intermediaries, they play an important role in accelerating niche development. Through the strategic deployment of material and communicative movements, inseparably meshed together in events such as protest actions or boycotts, these actors attempt to de-immobilize the existing systems.
- **User-consumers** invent ways of embedding new technologies in their daily practices. This process entails the testing, repair and maintenance of new technologies, which is often

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<sup>1</sup> Note that in these papers the focus is on the breakthrough of niches, that is one particular transition pathway, the de-alignment/re-alignment pathway of the typology, depicted in figure 2; also, in transition studies usually a pre-development phase is included.

necessary to make these technologies work at all. In addition consumption is never simply about rational economic choices.

Some of the conclusions Schot et al. draw from this typology:

- The systemic character of transitions entails many technological, organizational and institutional changes and has many instances of lock-in creation but as a consequence also more opportunities for path creation and space for agency; this is important for exploring intervention moments for implementing and supporting sustainable innovation
- The transition perspective illustrates that users can be active participants in a process of socio-technical change, shaping the transitions to a sustainable energy system. The salience of these collective user role varies for each phase, see figure 3
- Government policies should go beyond seeing users as consumers whose energy demands can be shaped by raising their awareness about their current energy needs and various prevailing energy options to satisfy them. Instead, policies could also act on the other roles users can play in a specific transition phase (Schot 2016a).

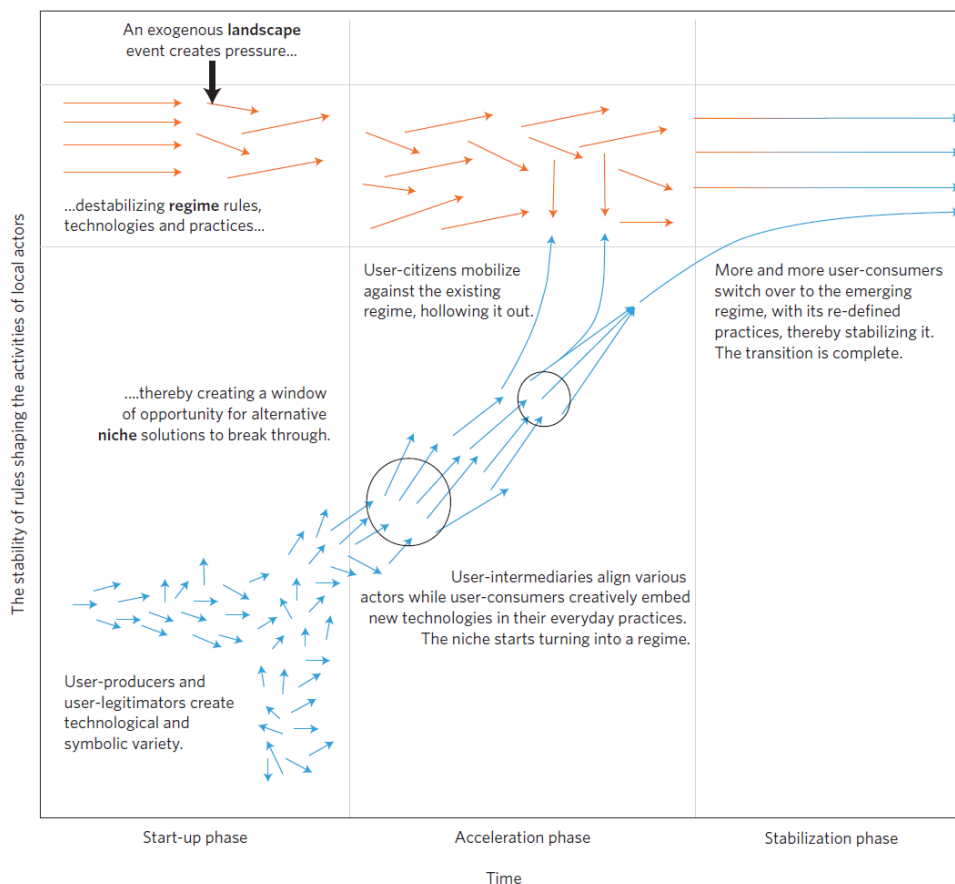


Figure 3. A graphic representation of the roles of collective users in the different transition phases (from Schot, Kanger and Verbong, 2016).

#### *2.4 The users as innovator: a general typology of the role of users in sustainable innovation*

The typology developed by Schot et al, as presented in the previous paragraph, focuses on the role of collective users in supporting transitions. Users can play other roles as well, both individually and collectively. Users are not only purchasers and consumers of a technology but they can be involved in various degrees in the production and design process (e.g. through providing input to designers) or even act as a co-producer and add value themselves (Verhees and Verbong in D2.3). In innovation studies literature, users have traditionally been conceptualized as buyers/consumers, but over the last decades, we observe a shift towards the study of the so-called 'democratization' of innovation (Von Hippel, 2005), meaning that the field acknowledges that (and researches how) users can play roles such as (co-)producers of innovations, as well. This trend is supported by improvements in computer and communications technology that enable users to develop their own new products and services. This enabling role of IT for users to engage in innovative activities obviously extends to the whole field of smart innovation (smart cities, smart mobility, smart energy systems, smart living etc.). Where Schot focuses on roles of collective users that support transitions to more sustainable systems of production and consumption, users also can oppose or reject sustainable innovations, both individually and collectively. The opposition against wind turbine by people living nearby and by national anti-wind turbine organizations is an example. Also non-users, voluntary or intentionally excluded, are an important group category. To get a more symmetric view on the role of users, WP1 also provided a general typology of roles of users in sustainable innovation.

So in what ways can citizens, as users or non-users of an innovation, influence its development? A scan of innovation studies literature reveals many different roles, and although the heterogeneity of frameworks and theories in the field renders it impossible to come to overarching, integrative statements about the precise mechanisms of user involvement, we propose a typology of roles by juxtaposing them according to three dichotomies.

The first dichotomy is that of sustainable innovation as an individual or a collective activity. The second is that of passive versus active roles (i.e. is the positive or negative influence in the innovation process the result of strategic behavior or not?). The third dichotomy is that of constraining or barrier-like user roles versus enabling or empowering ones: users can also become a barrier to sustainable innovation.

In order to make things not too complex, we present two matrices of potential roles: the first one presents individual/collective roles versus active/passive ones (fig 4). The arrows in this figure indicate some of the observations from the innovation literature. Traditionally the focus has been on the adoption of innovations (e.g. by the seminal work of Rogers). However, the last few decades, users have become more involved.<sup>2</sup> The arrow to the quadrant of individual + active is

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<sup>2</sup> Maybe already much earlier as users have been involved in innovation processes in many ways, but this is outside the scope of this research.

representative for the observations by Von Hippel with a focus on democratization and lead actors (Von Hippel, 1986, 2005). The arrow to collective + passive quadrant is illustrative for the emergence of sharing schemes and the use of the collective buying power of consumers. These can be mobilized by sustainable enterprises and NGOs trying to influence companies, e.g. to address negative environmental effects of production but also social abuse like child labor. The arrow to the collective + active quadrant illustrates the emergence of cooperatives, community-based innovation and financial involvement in sustainable innovation by financial schemes like crowd funding (see also below).



Figure 4: A representation of user involvement in sustainable innovation

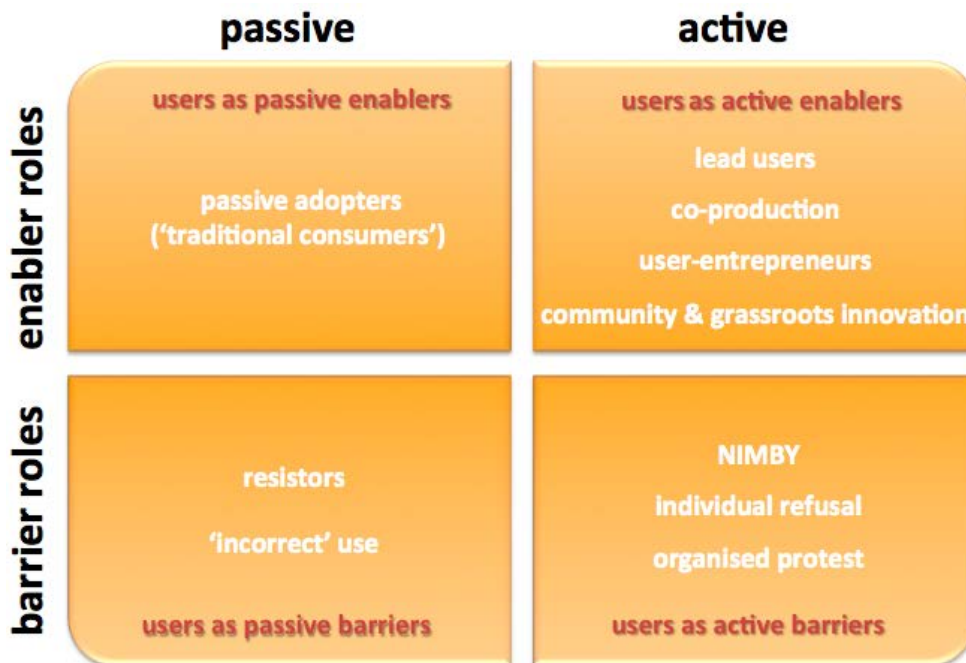


Figure 5: A second representation of user involvement in sustainable innovation

As mentioned before, users can also become a barrier to sustainable innovation. This is illustrated in the second matrix. Within all four quadrants, both individual users' roles are present as well as collective ones. The individual roles are the focus of research on the psychological, cultural, physiological characteristics that render them more or less inclined to opt in or out; the collective roles are highlighted from a more sociological perspective in which various group dynamics play a role. We present here a brief overview of user's role in the different quadrants in figure 5 (from Verbong et al., 2016).

#### *Passive enabler roles*

Here we find the 'traditional consumer': a passive adopter of an innovation, in our case purchasers and users of sustainable innovations.

#### *Passive barrier roles*

In the lower left quadrant, we find various passive barrier roles: e.g. not participating in using the available options of the smart energy system due to individual preferences and/or collective practices, or 'incorrect' use due to lack of knowledge. Individuals are subsumed into adopter categories (early adopters, early majority, late majority and laggards) that aim to explain non-adoption. Often, non-users roles are simply seen as resisters to an innovation: rejecters, excluded and expelled users are largely ignored (Wyatt, 2014). The 'solutions' proposed often take the form of educating users to move them to a more active role.

#### *Active barrier roles*

Importantly more active user-barriers to implementation exist, as well. We find these active barrier-roles in the lower right quadrant: active resistance by individual households to a smart grid innovation (e.g. refusing to install smart meters or to give access to data) and the so-called NIMBY ('Not In My Back Yard')-phenomenon e.g. to the location of wind turbines or large solar plants. But we find here also more collective roles that can range from large-scale social movements actively resisting innovations through organized protests and political pressure (e.g. against nuclear power (Geels and Verhees, 2011) to more local, yet highly organized resistance (Höffken, 2012).

#### *Active enabler roles*

Active enabler roles reside in the upper right quadrant. For example, users can become so-called 'lead users' (Von Hippel, 1976) that act as a key sources of information and ideas that lead to innovations which are then marketed by firms (e.g. households actively engaging in smart grid projects and providing feedback to suppliers, DNOs and utilities). Other active enabling roles are e.g. individual households becoming prosumers or even 'user entrepreneurs' who convert sustainable solutions to a problem they experience into a business.

In addition, collective user roles that actively enable sustainable innovation are captured by concepts such as ‘collaborative consumption’ (e.g. co-housing, car sharing), ‘cloud-based’ and ‘peer-to-peer’ business models in the IT domain, and the ‘collective buying power’-based business model: autonomous associations of users who cooperate for mutual benefit. Other models for collective enabling of sustainable innovation include ‘crowdfunding’ (Vasileiadou et al., 2015)), and ‘cooperatives’ (groups of users that collectively rent plots or roof space and install relatively large capacities of collectively purchased wind turbines or solar panels and in doing so, effectively become small, collective energy producers (Asmus, 2008; Dewald and Truffer, 2011; Huijben and Verbong, 2013)). Finally, ‘community innovation’ is worth mentioning in this respect: groups of users collective users that act as initiators, designers and maintainers of technological projects in their own locality (e.g. street, neighborhood, village), as well as ‘grassroots innovation’ (Seyfang & Smith, 2007), in which social movement organizations (a form of collective users) actively produce sustainable innovations for such niche markets but, in doing so, expand beyond their locality and form the seeds of mainstream solutions. The numerous Local Energy Cooperatives are a prime example of such collective engagement.

This typology offers a more symmetric representation of user roles in sustainable innovations and in transition processes. It is partially complementary to the typology proposed by Schot et al.



### 3. A selective analysis of the results from work packages 2-6

#### 3.1. Reflection on the classification of innovations

In the following we will look at some of the results and a number of issues from the other work packages. In WP 3 the focus has been on mainly large companies trying to integrate users in the process of designing, developing and implementing (more) sustainable products and services. The authors (in line with WP 6.1) use the following classification of sustainable innovations (D3.2, 4):

- Incremental innovations: end-user innovation in the form of improvement of existing products/services
- Novel innovations: end-user integration in the form of a novel products/services, including reorienting an existing product/service in a new direction
- System innovation: end-user integration in the form of a novel new product/service that seeks to alter or change an established socio-technical regime

From the 18 cases studied: 10 are considered as novel, 5 as incremental and only 3 aim at system innovation.

An important issue raised in D6.1 (20) is that there is a clear bias in sustainability oriented research in favour of more radical innovations. Incremental innovations are “less welcome”. In the section on incremental versus system innovations (D6.1, 20) the authors conclude on the basis of the literature studied that incremental Sustainable End-user Innovations (SEI) have been quite successful, while more system oriented innovations encountered large difficulties to break through. The utilisation of wind power in Denmark provides an example: the gradual improvement and up scaling of an existing design (a turbine with three rotor blades) has resulted in a dominant design (and Danish companies) that has conquered the world. From an MLP perspective however, wind turbines have been disruptive, not so much in terms of technological innovation, but more because it enabled distributed generation in a centralized power system. The long term impact has been the start of the destabilization of the current electricity regime.

The classification and discussion raises several interesting points:

- One of the problems with potentially radical or disruptive innovation is that only with hindsight one can decide whether this potential has materialized, that is that the innovation contributed to structural changes in a specific domain (or multiple ones).
- On the other hand seemingly incremental innovations can in the long term become a key element of a transition. Or framing it differently: there are different transition pathways possible and one cannot conclude ex ante which one is the most promising from a sustainability perspective. Incremental innovations can, in the ‘right’ circumstances trigger a transformation pathway, which can set in motion a process of more radical change (reconfiguration or de-alignment and re-alignment). On the other hand, incremental

innovation aim often at optimizing the incumbent system and, as a result, can reinforce lock-in in the current unsustainable system

- From a transition perspective the category of novel innovations could provide an interesting starting point. To understand this, we have to look at a debate that has been introduced in the Strategic Niche Management (SNM) literature. The central idea in SNM, based on the MLP, is that potentially radical innovations need to be protected against regular selection pressures (e.g. from the market), hence the need for the creation of protective spaces or niches. In such a niche deviations from dominant rules are allowed (and sometimes even encouraged). Hoogma et al (2001) in his research on the introduction of Electric Vehicles in Europe in the 1990s, distinguished two dimensions on which innovations could deviate from dominant rules: (1) technology choice and design, and (2) the environment (or context) of use. In either case a new design or use could fit in the normal design or use or stretch these.

This results in two main strategies: a fit and conform strategy, aimed at replacing the current system, and a stretch and transform strategy, aimed at introducing a new regime.<sup>3</sup> In a more recent article '*What is protective space? Reconsidering niches in transitions to sustainability*', Smith and Raven (2012) elaborated on the different ways niches and regime can interact. They distinguish six dimensions for regime-niche interaction (based on the six regime dimensions in the MLP, introduced by Geels, see fig.2). For each of these dimensions the authors provide a specific form of protection, or framed differently the set of rules against which a sustainable innovation has to be protected (or which deviation is allowed). After phases of shielding and nurturing of promising innovations, in order to achieve breakthrough empowerment is crucial. Smith and Raven make a distinction between empowering to fit and conform and empowering to stretch and transform breakthrough. They write about the first strategy: "An innovation that is originally perceived as potentially path-breaking becomes incremental in terms of its broader socio-technical implications. This is not a problem on narrow socio-economic terms, because the cumulative economic impact of incremental innovations is considered large, if not larger than more disrupting forms of innovation" (p.1030). On the second strategy: "The process and content of stretching and transforming will not be entirely internal to the niche, but will rely upon other processes of change within the regime and in the broader society and economy. Important considerations here are the general influence that sustainability advocates have in the institutionalization of environmental values and social justice in society and in their influence (same page)."

- Conclusion: we agree that the focus in this research (and in the large majority of research on sustainable innovation is on innovation that deviates substantially from regular

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<sup>3</sup> This is a rather brief summary of the discussion, for a more specific description of these strategies, see e.g. Smith and Raven, 2012.

practices. However, it remains unclear what the best long term strategy is: to start not deviating too much from existing practices and gradually redirect the development in other direction or start with more radical way of doing things. The outcome is not decided only by the success of the sustainable innovation, but according to Smith and Raven, also by development in the broader institutional setting. We propose that both strategies are needed: the first one could be more effective on the long term, but the second is needed to provide examples that e.g. more sustainable lifestyles are feasible but not yet attainable or attractive for larger groups of people.

### *3.2 Role of secondary stakeholders*

The analysis of the cases in WP3 shows a diversity of user integration methods. According to the authors this “means that also different kinds of users have been involved depending on the final target segment: lead users or laymen, technically-oriented users, internet savvy youngsters and bloggers, sustainable lifestyle experts or regular supermarket consumers, detached home owners or lower income segments” (D3.2, 7). Apart from the nature of the product or the service, D3.2 points at the key role of organizational involvement. The extent of organizational enablers seems to be highly relevant, in particular for more radical innovations (p. 7-8).

An important result of the analysis of the research on user-integration is the vital role played by ‘secondary’ stakeholders (apart from companies and users) in open sustainable innovation. This was found in all cases (p.11).

In D3.4 a typology of secondary stakeholders is presented:

- The innovation initiator role: stakeholders have been involved in the ideation of new products or services
- The legitimator role: partnering with stakeholders can provide legitimacy to the development of new products and service, using end user inputs
- The Educator role: stakeholders can be involved in communication and education on products and services in a more mature stage of development, adding more legitimacy.
- The Broker or Mediator role, mediating the relationship between the innovating companies and other stakeholders involved
- The Product (service) Concept Refiner role: end user providing feedback on the product or service and this way contributing to the wider diffusion of the product or service
- The Impact Extender role: by offering additional advantages the impact of a sustainable innovation is increased.

Some conclusions and remarks by the authors:

- “Stakeholders may have a multitude of roles (functions) within the same innovation process. Although some roles easily fit with certain stages of new product/service development process, they may also be pertinent to several stages at the same time” and “The groups of secondary or fringe stakeholders may actually be more relevant for sustainability-oriented innovations than their primary counterparts.” (D3.2, 16).
- Secondary stakeholders are typically represented by the scientific community (universities, research institutes), local communities (i.e. different types of potential end users), NGOs (driven by social, safety and/or environmental issues).
- Government and regulators (including municipalities) are typically on the border between being a primary and a secondary stakeholder: their primary role is to set the rules of the game and regulate, but on the other hand they often do have potential for secondary roles as well.
- “The complexity and ambiguity of secondary stakeholders is higher than that of primary ones that have their roles defined rather clearly (e.g. customer, supplier), but it is that ambiguity of the secondary stakeholder roles that can lead to greater potential for innovations “(D3.2, 17).

Although the focus of research is different, the typology proposed by Korsunova, Halme and Goodman, displays a striking similarity to the typology proposed by Schot et al. In particular the roles that focus on the larger diffusion and embedding of sustainable innovation are (active consumers - concept refiners, legitimators, intermediary - brokers, citizen - impact extenders). This implies that both at the level of sustainable product (service) development and on the level of changes in societal systems<sup>4</sup>, a multitude of stakeholder (or user) roles can be distinguished, that are all relevant in making the product (service) a success, but also contribute larger, in this case to a transition to a more sustainable society. This is also in line with the previous conclusion on the need of a broader embedding of sustainable innovations. The focus on technological innovation (and the belief in a technological fix) often obscures this. Both the typology of Schot et al. and that of Korsunova et al. point at the need to pay more attention to the other, more indirect (in relation to the innovation) roles actors can and have to play, whether they are called collective user roles or secondary stakeholder roles (see also e.g. Klerkx and Leeuwis, 2009; Kivimaa, 2014). This could well be one of the main insights the EU-InnovatE project has produced. It also has implication for the policy recommendations.<sup>5</sup>

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<sup>4</sup> Please note, that these levels (as e.g. in multi- level governance) are different from the analytical levels introduced by the MLP.

<sup>5</sup> Prof. F. Belz presented at the final EU-InnovatE conference in Brussels, November 22 2016, a first idea how specific policy instruments can be assigned to user roles in different phases in the transition process.

Another issue is the emphasis on the importance of open innovation for sustainable innovation. (D3.2, 11-12). The authors find that other stakeholders play a vital role in open sustainability innovations. Indeed, open innovation seems to be in particular relevant for sustainable innovation. However, although it is a very popular topic in innovation management studies, open innovation initiatives still are rather rare (with the exception of the ICT industry). In practice, many intended open innovation projects run into legal problems in particular in relation to IPR. The authors therefore argue for the need of more flexible legislation to enable experimentation involving user integration. This should include more access to data, as privacy laws now often impede learning between experiments.

This also is an issue that has been addressed in the transition literature. A key assumption in transition studies (Transition Management and SNM) is, in line with the conclusion of Korsunova et al., that a single company or innovator never will succeed in implementing a potentially disruptive innovation. For this a social network of is needed, including a variety of different actors (or stakeholders). According to the transition literature this network should also include relative outsiders who can provide alternative perspectives on the development of sustainable innovations (one interesting conclusion on the integration of users is that companies have difficulties accepting ideas from outside the company (D 3.2, 10); this is exactly one of the recommendations to involve outsiders in the process).

A policy advice of transition researchers in the Netherlands has been quite successful. The advice was to enable experiments, that is, to create protective spaces where alternative instruments can be tested and nurtured. A prime example has been the IPIN program in the Netherlands (Innovation Program on Smart Grids, 2011-2015). In this program it was for example possible to introduce in a limited project flexible electricity tariffs, which is at the moment legally not allowed? This program (and similar pilots) has led to a legal proposal to institutionalize the option of the experimental spaces. However, the law that includes regulations to make experiments legally possible has not yet been passed by the Dutch Parliament (but for reasons not connected to this issue).<sup>6</sup>

However, one very important lesson has been, that creating a space for nurturing sustainable innovations maybe quite difficult, the main challenge however, is to break out of these protected spaces, that is, to upscale those innovations with a potential to make our lifestyles more sustainable. In line with what we have previously argued the empowerment of the actors supporting these innovations is crucial, as this is about changing dominant rules in society (both formal and informal). Framed differently: the main challenge is to upscale promising sustainable innovations. There are two main strategies: to improve the viability of sustainable innovations by developing (sustainable and user centered) business models (Huijben and Verbong, 2013) and to change the rules, which can be interpreted as institutional entrepreneurship (Jolly, 2016). In

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<sup>6</sup> This the so-called STROOM law; the minister of Economic Affairs also included regulations on unbundling of commercial and distribution activities, a reason for a majority of the senators to reject the whole proposal.

particular for institutional entrepreneurship, the roles of collective users (Schot), or secondary stakeholders (Korsunova) offer a promising new perspective.

### *3.3 Spillover effects*

Another conclusion both from D3.3 and D 4.3 is the occurrence of positive spillover effects. In the case of Company driven Open Sustainability Innovation (COSI), customer participation not only induces behavioral changes in the targeted domain (e.g. energy or food) but also in other domains. The same result is found in the research on Sustainable innovation and entrepreneurship: members or customers of local sustainable initiatives such as energy cooperatives also change their behavior in other domains (to a certain degree). The fact that both in company driven and in user driven innovation the same positive spillovers have been found is striking and encouraging.<sup>7</sup> Two comments: the participants in both studies belong to groups with at least an interest in sustainability issues; the question is in how far this applies to other groups in society. Also, the question is whether these behavioral changes will last over an extended period of time.

From an MLP perspective this is about multiple niche interaction. Although there has been some research on this aspect (Verbong et al) and it also can be incorporated theoretically in the MLP<sup>8</sup>, other approaches potentially are more apt to address the interaction between different domains. In particular a social practice approach can shed light on the interaction between different practices in daily life (Schatzki, 2002; Shove, 2003, 2014). From a business perspective, the literature on shared value (Porter & Kramer, 2006) or multiple value creation (Jonker et O’Riordan, 2016) could offer a starting point for further research in this area.

### *3.4 Niche development*

Belz and Binder (2015, and D4.4) have developed a process model of sustainable entrepreneurship. The model has six stages. The main conclusions from our perspective are that “the development of a triple bottom line solution takes place successively, not simultaneously, to reduce the complexity of the challenging task” (proposition 4). They either start with tackling a social problem or an ecological problem or gradually develop a triple bottom line solution. This is an important recommendation for future sustainable entrepreneurs. Belz and Binder also

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<sup>7</sup> In an assessment of the SPREAD scenario’s this issue of interaction between different domains has been mentioned (D2.1); the assumption was that sustainability gains in one domain could be offset by losses in another. “Our second conclusion is that examining the scenarios in terms of societal domains is that it allows us to acknowledge the possibility that people (choose to) ‘live sustainably’ in one domain while not in another: a possibility which is not explicitly dealt with in the scenarios, but whose value has been corroborated by sustainable consumption research in the field of economic psychology (e.g. Thøgersen and Ölander, 2002).” The findings here seem to suggest that this is not the case.

<sup>8</sup> Interaction between niches is included in MLP studies, e.g. in the work by Geels and Schot or Verbong et al., but this often remains at a rather abstract level and does not focus on changes in daily life.

conclude that the two strategies are different pathways to create triple P solutions. However, these are a different type of pathways than the pathways described in 2.2, in particular because they address completely different scales. While the transition pathways are the result of the interaction between the different levels, the sustainable entrepreneurship pathways are essentially strategies to build or reinforce successful niches. In fact, the final proposition is addresses this issue: “sustainable enterprises create new sustainable niches or enter established sustainable niches and segments in the higher end of the market”. From an innovation studies perspective this is hardly a surprising conclusion, as most new products or services are being sold first to more affluent consumers, but it stresses point that apart from a sustainable business also a niche needs to be created or expanded.

Other work packages have built on this. The conclusion in D6.1 is that users have become important drivers for sustainable innovation. However the potential is not used fully as “end-users (are) currently under-appreciated and (are a) largely untapped resource for driving the transition towards a greener and fairer European economy.”(D6.1, 3). Nielsen, Reisch and Thøgersen make a distinction between independent sustainable end-user innovation (SEI) and facilitated SEI, each needing specific forms of support. For the last category for example the lead user method and crowd funding are useful to support these activities.

From a transition studies perspective, both forms of support of SEI aim at creating and developing niches for sustainable innovation. In the SNM literature key processes (or internal niche-processes) are articulation of expectations, creation of social networks and the need for learning processes (Schot and Geels, 2008). However, there is a distinction between managing a specific sustainable innovation work and making a niche successful. Raven et al (2011) show “those interactions between local experiments and global niches are not self-evident and do not take place in a linear way. Instead, they take much effort, happen continuously and suffer from regular relapses.”(p. 1077). The work at niche level also requires different qualities and competences than operational management of a specific project or of a sustainable enterprise. For example, lobbying for regulatory changes is quite different from activities in a local practice.<sup>9</sup> (This does not mean that some entrepreneurs are active on both levels. From a transition perspective the need to create a favorable institutional setting for SEI to blossom can be interpreted as a need for niche-level activities (see previous paragraph).

### *3.5 Future sustainable lifestyles*

The main part of the research in EUINNOVATE has been on on-going activities in the field of sustainable innovation and lifestyles. In WP2 and WP5 the focus has been on how sustainable lifestyles could look like in the future. The main objective of WP2 and WP5 has been to assess the short- and long-term obstacles and opportunities associated with the transition to European

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<sup>9</sup> The Raven et al explores the relation between local practices (projects) and the MLP; see fig. 2, p. 1066.

sustainable lifestyles and green economy through user sustainability innovation. For this purpose an existing set of scenarios produced by the EU-funded 'SPREAD Sustainable Lifestyles 2050' project (SPREAD, 2012) has been taken as a starting point.<sup>10</sup> A first assessment of the SPREAD scenarios using the MLP questioned the plausibility of the interaction between technological innovations and social changes along the scenarios' pathways to create a society in 2050 that can operate within environmental limits and simultaneously will fulfil the social conditions for a sustainable society (from D2.1).

Because of this, the SPREAD scenarios have been augmented by Forum for the Future to obtain more insight in the dynamics of the different transition pathways. In particular attention has been given to the role of users to influence the transition to sustainable lifestyles. Using the MLP-analysis the axes of the scenarios have been rephrased in globally versus locally oriented and top down governance versus bottom-up governance. Furthermore the MLP has been used to explore the developments on the landscape, regime and niche levels and the dynamic interactions between the levels. The three levels have been used to explore the developments in the four domains (energy, mobility, food and living), again with a focus on the role of user-innovators (D5.3, 14). Using the user typology, developed in WP2 and presented in paragraph 2.4, the role of users has been expanded to include active, passive or resisting roles, either individually or collectively (D5.3,4). As a result, the scenarios have become more realistic, including also 'shadow sides'.

According to Forum for the Future, the MLP has been used as framework, that guided the underpinning of the dynamics along the transition pathways and that supported the creation of plausible storylines.<sup>11</sup> However, it is difficult to relate the scenario and the pathways leading to each of the scenarios directly to the typology as proposed by Schot and Geels (2007); but these pathways, as has been mentioned, ideal types. Each of the augmented scenarios starts more or less with a transformation phase, and continues either in the direction of reconfiguration or de-alignment/re-alignment. A technological substitution pathway is less likely, given the structural changes (on multiple dimensions) on the long-term.<sup>12</sup> However, the pathway typology is rather abstract; the augmented scenarios are much richer in detail and their multi-level dynamics is more complex than in the ideal types of the Schot/Geels typology. These more systemic and situated forms of illustration are required to understand key variables for a sustainable society and to take into account non-linear and complex change over time. The conclusion here is that the MLP has provided clues for adding societal dynamics to the scenarios. In this way, it has been a valuable framework, but the use of the MLP for prospective purposes needs further elaboration.

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<sup>10</sup> In the reports published on the SPREAD scenarios, the MLP has been mentioned as a concept used in the construction of the scenarios but remains unclear in which way this has been the case. See [http://www.demoshelsinki.fi/wp-content/uploads/2013/02/D4.1\\_FourFutureScenarios.pdf](http://www.demoshelsinki.fi/wp-content/uploads/2013/02/D4.1_FourFutureScenarios.pdf), p.3 on which the MLP is presented.

<sup>11</sup> There have only been a few examples of using the MLP for prospective purposes, in particular the socio-technical scenario method (Hofman & Elzen, 2010).

<sup>12</sup> Substitution seems to play a larger role in the original SPREAD scenarios



A final comment is the need to map and monitor transition dynamics. A conclusion from WP5 is that the prospective use of indicators and values that are loaded with today's assumptions could counteract rather than promote the systemic changes necessary for realizing sustainable lifestyles. The data that are currently available to quantify social and economic indicators do not represent the shifts that need to occur in the future to 2025 and 2050, on its own. Describing patterns of 'social conditions' using existing quantitative data sets shows their relative growth and significance along each scenario pathway, but does not prospectively indicate the direction or nature of change that will take place 2015 – 2050, nor enable judgements about what is important to manage and who is involved – or who needs support (from D2.2 and D5.1).

## 4. Conclusions and discussion

The question we have addressed in this report was: what, using the multi-level perspective, can we learn from the empirical and theoretical results achieved in this project and what are the implications for society in our efforts to more sustainable lifestyles?

Several conclusions can be drawn

- The EU-InnovatE project has shown that there is a lot of activity in the field of sustainable innovation. Also, increasingly users are getting involved in the process of sustainable innovation, by large companies (user-integrated innovation) and in Sustainable End-user Innovation. However, in both cases these activities are still marginal in the context of dominant innovation processes and practices. In terms of the MLP, they are, although promising, still niche activities in the field of energy, mobility, living and food. Some niches are larger (e.g. organic food) and there are differences between EU member states (e.g. renewable energy in Germany).
- The main question is how these niches can develop further and how they on the long term can replace the dominant regimes that foster and encourage unsustainable lifestyles. In the transition literature this has been framed as the challenge of up scaling of promising sustainable innovations.
- For this to happen the emerging niches of sustainable innovations (and sustainable lifestyles) need to be supported. Several things can be done. The analysis of the process of sustainable innovation in the context of the EU-InnovatE project has substantially increased our insight in the process of sustainable innovation. The large number of cases in different EU member states investigated in the EU-InnovatE project has shown that sustainable innovations are a burgeoning field: there are a large number of projects, experiments, businesses in all four domains, covered by EU-InnovatE. On the basis of these analyses several recommendations have been proposed to increase the role of users in the company driven sustainable innovations and to improve the process in user-led sustainable innovations.
- These recommendations help to improve the niche internal processes by highlighting and communicating sustainable innovations and lifestyles, by broadening and improving the social network supporting these innovations and lifestyles, and by exchanging and accumulating experiences and lessons learned.
- In transition studies the challenge of up scaling niches has triggered an interest in the field of business models (and industrial ecosystems). In order to enable a growth and diffusion of pilot projects, they have to become also economically feasible. Hence the increasing interest in field of strategic management and business models. There are interesting contributions on sustainable business models, including multiple value creation, and user-

centered business models that are relevant for further research and experimentation in sustainable innovations and lifestyles.

- But one of the central points of the MLP is that for sustainability transitions to happen, more is needed than just encouraging and supporting the development of niches. Transitions occur as the result of multi-level interactions. Translated to the topic of this program: the societal embedding of sustainable innovations and lifestyles and the destabilization of dominant regimes is necessary as well. Both the typology of Schot et al. and that of Korsunova et al. address this issue. They point to the need to pay more attention to the other, more indirect roles actors can and have to play to help sustainable innovations to become mainstream. They can play a pivotal role in overcoming the resistance of incumbent actors (and more general the barriers dominant regimes offer) by a variety of activities (exemplified in the different roles). The exact framing of those roles - whether they are called collective user roles or secondary stakeholder – is less relevant. This probably is one of the main insights of the EU-InnovatE project.<sup>13</sup>
- These other user roles or secondary stakeholders can help to empower niche actors in their struggle to change or adapt the rules in favor of more sustainable innovations and lifestyles. The barriers existing regulations pose have been identified in EU-InnovatE as an important one. From an MLP perspective, they require institutional entrepreneurship. This is an important field for further research.
- One important issue that we feel has not been addressed fully, is that of how pathways to more sustainable lifestyles could look like. Also, as we have discussed, there are different pathways that can lead to the same result; these can even differ for the domains studied in the EU-InnovatE project (energy, mobility, food, and living). As we have concluded, it remains unclear what the best long term strategy is: to start not differing too much from existing practices and gradually redirect the development in other direction or start with more radical way of doing things. We propose that both strategies are needed: the first one could be more effective on the long term, but the second is needed to provide examples that e.g. more sustainable lifestyles are feasible but not yet attainable or attractive for larger groups of people. Mixed or hybrid strategies also are an option.
- The SPREAD scenarios offer glimpses of sustainable lifestyles but within very different societal settings and with very little clues how to achieve those. One of the main recommendations from the transition literature is that (reflexive) monitoring is needed to ensure that we are still on the 'right' track, but also to prevent unwanted lock-in in suboptimal or unsustainable pathways. The EU-InnovatE project has developed a set of social indicators that can help the monitoring process.

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<sup>13</sup> The use of the concept of user by Schot encompasses some of the roles that Korsunova et al. describe as secondary stakeholders, whereas in the EU-InnovatE project the users are referred to as end-users.

Finally, a few other points:

- The notion of the end-users maybe needs to be reflected upon. As the EU-InnovatE project convincingly has demonstrated, users have become involved or are even leading in all kind of activities related to sustainable innovation. The notion of end-user is more of a legacy of an earlier era, in which users mainly were passive consumers at the end of production-consumption chains.
- The fact that both in company driven and in user driven innovation the same positive spillovers have been found is striking and encouraging. As we concluded, this is an issue that has been not extensively addressed by the transition studies literature.
- More attention is needed to the study of failed innovations (or to second order learning). Although a few failed innovations have been included in the research, the focus on successful sustainable innovations and lifestyles can deliver biased results. A more symmetrical approach in research to success and failure can remediate this.

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