

# PATHWAYS project

Exploring transition pathways to sustainable, low carbon societies  
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## **Deliverable 3.3: Comprehension of case studies for MLP transition analysis in WP2**

Holger Berg, Laura Echternacht, Johannes Buhl  
Wuppertal Institute for Climate, Environment, Energy GmbH

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## **Preface**

This paper is the deliverable for task 3.3 in work package 3 of the Pathways project. Work package 3 focuses on specific examples of transitions on the ground. I.e. real-life, real world initiatives in sustainability transition processes.

Analysis in work package three is set into five tasks:

1. Task 3.1: Further elaboration of case studies and participative action experiments
2. Task 3.2: Participative action research
3. Task 3.3: Analysis of case studies
4. Task 3.4: Meta-analysis of on-going (and past) projects in identified domains
5. Task 3.5: Collecting the results of the case studies, synthesising the findings of WP3 and preparing for feedback in WP1 and WP2

Associated with these tasks are five deliverables:

- D 3.1: Further elaboration of case studies
- D 3.2: Report on the PAR analysis
- D 3.3: Comprehension of case studies for MLP transition analysis in WP2.
- D 3.4: Operationalization of variables concerning niche-innovations, lifestyles and behaviour for integrated assessment in WP1
- D 3.5: Working paper on transition pathways in the making, its scaling-up and learning potentials

This paper contains deliverable 3.3 due in month 18 of the project. Its aim is to provide insight into the structure, progress and preliminary findings of work package three for work package two and to explore starting points for a dialogue on integration between the work packages based on these insights.

# **1. Introduction: The role of Initiative-based learning for „Transitions in the Making“**

An important goal of the PATHWAYS project is the coupling of three scientific approaches: quantitative systems modelling, socio-technical analysis and initiative-based learning. The associated aim is to arrive at an improved understanding of sustainability transitions. In accordance with this, work package 3 – which represents initiative-based learning – has several duties in informing the other two approaches in order to allow for attempts towards integration (see also the list of tasks and deliverables in the preface). This deliverable is part of these information duties. It is set to initiate and enhance a dialogue for integration with socio-technical analysis in work package 2. In this it also elaborates on preliminary discussions from the Pathways meeting in Leipzig, February 2015. The deliverable is hence to be seen as one starting point for deepening this dialogue, providing sources for interaction and exploring potential common research interests between the two work packages.

To do this, the paper is divided into two main parts: Chapter 2 offers insights into work package 3's present status. It outlines the research approaches taken, delineates new developments with regard to these, and depicts preliminary results and findings. This chapter is hence meant to offer information about work package 3 to researchers in work package 2 from which they may develop further ideas for interaction or pose questions to work package 3. Chapter 3 then explores potential starting points and content for interaction towards integration. It does so on the basis of a concept for integration specifically but not exclusively developed for this project by Turnheim et al. (unpublished manuscript) which is shortly presented in section 3.1. From this vantage point, section 3.2 introduces results and findings of work package 3 to themes of work package 2. This is not to be seen as an integrative attempt in itself but should be perceived as an initial step towards this goal. It highlights existing and potential points of contact, which can be used to intensify the aforementioned dialogue. Chapter 3.3 will then suggest potential next steps and points of interaction subsequent to this deliverable taking the tasks set for each work package as basis.

The paper deliberately takes a modest stance towards integration for several reasons: Firstly, PATHWAYS has just reached its mid-term stage which means that many findings are still preliminary, specifically so in work package 3 which is placed somewhat behind the other two approaches in the project's workflow. Secondly, reflexions on integration in the project so far have shown that there may be different routes towards this aim with differing levels of integrative depth and ambition. It thus has to be found out, what kind of integrative attempts will make sense between the two work packages. This paper has to be seen as a stepping-stone to that aim. Thirdly, integration has to be based on interaction between the work packages and a shared understanding, which is already emerging but still has to be fully created. Again, it is a goal of this deliverable to contribute to this task.

## 2. Comprehension of work package 3: conceptual background, research procedure, and cases of the project

This chapter aims to inform the reader on three distinct issues regarding the research process in work package 3: It will introduce transformative research as a paradigmatic background to the more interventionist investigations conducted, especially but not solely in work package task 3.2. It then provides insight into the research procedures behind the individual sub-tasks. Since this has been done quite extensively in deliverable 3.1<sup>1</sup>, this paper will only shortly touch on general content and will specifically emphasize changes, complements or refinement that have occurred since deliverable 3.1 was handed in. The sections in 2.3 will introduce the case studies under research in this work package. Potential links or relations to work package 2 will then be given in chapter 3.

Initiative-based learning denotes research that focuses on real-life projects driven by a diverse set of actors that – in the case of PATHWAYS – work as catalysts and nuclei for innovation towards transitions (Turnheim et al. unpublished manuscript). Work package 3 conducts three different approaches to research into initiative-based learning:

1. Case study research (Yin 2014, Gerring 2007) which observes and interprets findings from close observation on the ground based on primary and secondary data (work package 3.3),
2. A meta-analysis of existing case studies (e.g. Denyer/Tranfield 2006), and
3. Participatory action research that directly interferes into a transitory setting by supporting specific activities or even instigating them (work package 3.2) (Ozanne/Saatcioglu 2008).

Both the case study-research and the meta-analysis are targeted towards present initiatives that foster transitions towards sustainability. We have labelled these under the heading of “initiative” to acknowledge that while the activities behind each case follow a certain goal, they do not automatically obey a strict logic of planning and execution like projects do. In this we see “initiatives” as wider term: They may constitute a classical project but may also be subject to more fuzzy constructions and processes (see also Berg et al. 2014, deliverable 3.1).

They follow an analytical scheme in which they explore patterns specific to such projects with regard to e.g. agency, network building and resource allocation. The participatory action research follows an interventionist scheme involving direct interaction between researchers and actors of initiatives in transdisciplinary experimental (LivingLab) and real-world laboratory settings. Findings from participatory action research will provide insight into the inner-life of these initiatives, the mechanisms at work, and the role of external influences.

The rationale for research in work package 3 is thus twofold: Understanding of the mechanisms behind “local” projects on the one hand provides an understanding for the less transparent, “messy” and often less rational actions in initiatives (Kirchhoff et al. 2013). Observations in this regard may relate to personal ambition, in-group interaction, barriers in resource acquisition and finance, or interference from local policy or other pressure groups to name just a few. These findings may later enrich or complement assumptions of more abstract models or approaches (Castree et al. 2014). Doing so is a specific goal of cross-work package

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<sup>1</sup> Numerically, deliverable 3.2 stands between 3.1 and 3.3, it is not due before month 34 of the project.

interaction in PATHWAYS. Secondly, this research aims to generate and also apply *actionable knowledge*<sup>2</sup> (Castree et al. 2014, Kirchhoff et al. 2013, Denyer/Tranfield 2006, Argyris 1996) that can be retransferred into practice in order to initiate and support activities towards sustainability transitions, or provide advice e.g. for governmental organizations who aim to promote initiatives for example through funding schemes or the creation of favourable conditions. The specific notion of actionable knowledge has emerged during the research undertaken so far and in interaction within the project thus forming a novel aspect not explicitly addressed in deliverable 3.1.

All approaches to transition research in the Pathways project create actionable knowledge, e.g. in the form implications for policy. The knowledge generated in work package 3, however, has its own specificities in this regard. Derived from analyses of real-life cases and transdisciplinary research, it is set to

- Create practical knowledge in the form of e.g. management implications and instruments for management of initiatives.
- Relate to issues of governance influences of and within such initiatives.
- Refer to learnings that can be derived for specific, e.g. domain related transitions.

Moreover, the observation of work in the field may yield insight into specific barriers or potential future constellations (see chapter 3). The following sections will outline the research approaches conducted here more deeply.

## **2.1. Transformative research as a paradigmatic background**

To understand the approach of initiative-based learning conducted here, it is important to point out the agenda of transformative research as a paradigmatic background to the experimental, more interventionist tasks of this work package. Since the earlier deliverable 3.1 was concentrated on the “practical” fieldwork to be conducted in work package 3 and on the direct research interests behind it, this was somewhat omitted so far. However, as this paper aims to initiate interaction between two distinct work packages, it seems necessary to explain this perspective in work package 3 more deeply.

The German Advisory Council on Global Change (WBGU) uses the expression *transformative research* to describe research that actively advances a transformation. This distinguishes it from forms of transition research<sup>3</sup>, which are aimed at better understanding transformation processes, but do not directly interfere with them. Transformative research is interventionist research that supports transformation processes in practical terms. It strives for technical as well as for social innovations, including their acceleration. It encompasses, for

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<sup>2</sup> Actionable knowledge “informs us how to create or produce what we claim has high external validity. [...] A generalization is actionable if it informs the user how to create it in settings beyond those in which it was first created. Actionability is different from external validity. External validity is about claims of relevance of the findings. It is not about how to create the relevance.” (Argyris 1996, p. 392)

<sup>3</sup> Instead of transition research, the WBGU relates to “transformation research” as investigations that aim to create knowledge on transition/transformation processes. While it can be discussed if transformation and transition research are about the same constructs this is not of direct relevance to this paper and will thus not be elaborated here. We will also refrain from this, since translation issues between a German and an English perspective of this may complicate the problem even further. The main difference to transformative research lies in the proactive stance towards sustainability transitions of the latter, while the former approaches seek to gain “classical” research insights on the phenomenon.

example, consumer research, which is needed for the development of new business models such as the shared use of resource-intensive infrastructures, and also research for technological innovations like efficiency technologies. Due to its interventionist character, transformative research demands a systemic perspective as well as inter- and transdisciplinary methods, including stakeholder participation (WBGU 2011). Transdisciplinarity plays a major role as transformative research includes the involvement of relevant stakeholders into the research process, for different purposes. It seeks to increase the social relevance of research questions through the involvement of stakeholders in setting research goals. Secondly, it also involves stakeholders in the actual research process, and thus aims for the combination of scientific and practical approaches (Talwar 2011, WBGU 2011, p. 22 and 322f).

This does not only have consequences for the concept of research but also for the methodology to be chosen. Transformative research not only requires the involvement of actors of transition processes but also the creation of an environment in favour of a coproduction of knowledge between the sciences, politics and stakeholders. Therefore, it has to integrate different forms of knowledge (for example local, traditional or indigenous knowledge), both scientific as well as non-academic of the involved actors. This process is reflexive, i.e. it cannot be implemented linearly, but rather through searching, learning and experimenting in iterative processes. The circular nature of this learning process is a crucial element of this approach.

In this sense, Schneidewind (2013, p. 83) recently called for a transformative literacy that is „the ability to read and utilize information about societal transformation processes, to accordingly interpret and get actively involved in these processes“. He bases this postulation on Scholz (2011) who introduced environmental literacy that is „the ability to read and utilize environmental information appropriately, to anticipate rebound effects, and to adapt to changes in environmental resources and systems, and their dynamics“. In order to do so, research needs to encompass a technological, economic, institutional and cultural dimension in a transformative and transdisciplinary design. The more interventionist approaches in work package 3 of work package task 3.2 are set into this agenda.

Since a transformative approach implies direct and intended intervention by the researchers in order to create knowledge and direct effects it comes with both advantages and disadvantages. As it is developed – and ideally tested – “in situ”, knowledge from transformative research seeks to be of direct relevance to a case through this, it also aims to be more relevant and valid to a specific public beyond the scientific community. Results thus created should hence be more or less directly actionable, i.e. applicable to a given set of circumstances and/or goals. On the backside, the creation of knowledge within a specific background always faces the question as to what degree it is generalizable beyond its particular concern. Even products or services developed and tested in a LivingLab-approach (see below) with a wide range of stakeholders may be limited to a specific geographical, cultural or milieu-specific context. Moreover such research may face distortionary effects like a Hawthorne-effect (Wickström/Bendix 2000) and thus be affected e.g. perception of desirable behaviour on the side of the participants. The interventionist research taken here will have to consider these risks. We will later discuss, in how far a framing of initiatives within the transition research undertaken in work package 2 may help to cope or understand such hazards.

## **2.2. Case study analysis and experimental research in work package 3**

The following sections shortly denote the present methodologies applied in work package 3 for case study analysis and the experimental settings. As outlined above this basically serves to inform the reader about the context and the general approaches taken here and will point

out changes and specificities not given in deliverable 3.1. The overview of the cases and experiments specified in the last sections of this chapter provide new information since these have so far not been completely listed and described before.

### **2.2.1. Case study-based research in initiative-based learning**

This section will provide insights into the concept of case study research in this work package. It will shortly repeat the goals and procedures outlined in deliverable 3.1 and will provide some more insights into the procedure of later analysis.

Work package tasks 3.3 and 3.4 focus on innovations for on-going transitions on the ground, “transitions in the making”. These tasks have been worked out in detail in deliverable 3.1. Their interest lies in learning about the grass-roots processes in initiatives affiliated with sustainable transition pathways: *“In each case study, we will identify factors that effectively enable or disable a transition, focusing on interactive patterns of stakeholders, their social practices, norms, attitudes and corresponding decisions, including straightforward barriers such as lack of finance. In order to offer a feasible and sound collection of case studies, the (meta-) analysis of case studies [task 3.4] gathers primary data from qualitative interviews with experts on the spot and secondary data from desk research that screens information about the cases available (from basic descriptions to project and research reports).”* (DOW of this project, 11). This research hence belongs investigations aiming to acquire knowledge on systems and goals, eventually deriving lessons for transformative knowledge.

Research on initiatives in work package task 3.3 and 3.4 is set within the classic boundaries of case study research (on the methodological aspects behind the following points cf. Yin 2014). Based on the concept of initiatives case study analyses in work package 3 analyses real-world transformative phenomena taking place in the present or very recent past. It is deeply interested in the real-world context, as it seeks to identify the aforementioned real-life effects and also aims to derive a specific form of “actionable knowledge” (see above, also Castree et al. 2014, DeWulf et al. 2005). Since these real-world effects may be still developing and on-going, and new emergent phenomena are always possible, there is no clear distinction to be made between the single case and its boundaries. It is important to note that this necessarily leads to some (intended) degree of openness in the study of each case in order to allow room for new, unexpected findings. The research protocol has hence been designed to allow for this kind of openness, giving room to unexpected findings and the individuality of each case. Also, research in work package 3 clearly is subject to a situation where more variables than stable data points exist. Each of the case studies conducted here has thus been designed to rely on different sources of primary or secondary data for its completion so that evidence should lead to triangulated, and therefore more valid, results (Campbell 1975). The research protocol, which was provided for the investigation into the single cases, also employs prior theoretical propositions in the form of an ideal type case against which the actual cases can be plotted.

The case studies provide in-depth insight into the activities and (social) processes involved in on-the-ground initiatives undertaken to instigate, foster or promote transition pathways. They address the role of agency, interdependencies, as well as resource acquisition and allocation. To be able to account for these different aspects, the cases are being studied and analysed with reference to a framework depicted in the research protocol (Berg et al. 2014). The analyses and the underlying protocol have been subdivided into three periods of action, based on a process logic provided by van de Ven et al. (1999). They are depicted for an ideal type case in Table 1. The cases analysed will be plotted against this ideal type and deviations from it will be analysed, e.g. to improve understanding on messiness, learning or governance. Our interest here concerns learnings from the dynamics within the single case studies (Eisenhardt



1989) and from cross-case comparisons in transition domains (Yin 2014) also allowing unexpected findings and openness to novelty. Consequently, the analytical approach itself has to maintain its own openness and allow taking up new findings or discarding old assumptions in its progress.

Potential interaction between work package 2 and work package 3 may hence profit from the single cases (e.g. per domain) and their combined analysis for more general findings. In this regard, work package 3 will also profit from being elaborated by multiple investigators (Pettigrew 1990, Eisenhardt 1989, see also section 2.3), most of whom are also part of investigation in work package 2. This fact will hopefully enhance the chances for cross-fertilization of the two work packages. However, while the research process and its underlying research questions can be presented here, the exact form of the results can only partially be assumed at this state of work package 3's progress due to the aforementioned condition of openness. Changes of content and conclusions may therefor occur for individual cases and for the analysis alike.

**Table 1: Ideal type phases of an initiative with representative context (Berg et al. 2014, 17)**

<b>Gestation period</b>	<b>Development period</b>	<b>Implementation period (Termination/Diffusion)</b>
<ul style="list-style-type: none"> <li>• Initiation/ formation</li> <li>• First idea + goals</li> <li>• First movers</li> <li>• Formation of action group</li> <li>• First plan of resource allocation</li> <li>• Emergence of action plan</li> </ul>	<ul style="list-style-type: none"> <li>• Agents take preparatory action on the ground; their ideas are opened to a wider public.</li> <li>• Other stakeholders become active               <ul style="list-style-type: none"> <li>- Coalitions form</li> <li>- Opposition emerges</li> </ul> </li> <li>• Reconfiguration of plans and goals while initiative unfolds (according to tested feasibility)</li> <li>• Initiative changes/evolves</li> <li>• Resources are gathered</li> <li>• New alliances may be formed</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation starts</li> <li>• Agents take concrete action on the ground</li> <li>• Resources are allocated</li> <li>• Practical feasibility is tested</li> <li>• Support/ opposition may emerge/ re-emerge/ change</li> <li>• Again measures and plans may have to change</li> <li>• Outcome:               <ul style="list-style-type: none"> <li>- Establishment (local success)</li> <li>- Diffusion (spill over)</li> <li>- Failure</li> </ul> </li> </ul>

### **2.2.2. Experimental methods in work package 3.3: Participatory action research and LivingLabs**

This chapter presents the participatory methodology pursued in work package 3 based on the explications made in chapter 2.1. It will describe the logic behind these settings with some more detail than has been done in deliverable 3.1.

Next to “classic” analysis, efforts in participatory action research should develop, apply and derive lessons for transitions towards sustainability. They hence represent approaches of transformative research as described earlier. The experimental settings of the work package

are designed to lead to more sustainable environments or technologies together with the actors on the ground: locals, companies, activists, etc. The approaches seek to draw advantages from involving different kinds of expertise (Kirchhoff et al. 2013, Ozanne/Saatcioglu 2008) in order to better capture and understand the mechanism and processes on the ground. This is also done to evade unwanted emergent phenomena or contra-productive practices that may lead to e.g. rebound effects which may not become apparent in more artificial laboratory or experimental settings assuming that scientific findings in some social contexts can be better achieved if professional researchers involve ‘laymen’ into their research (Lewin 1997), in order to try and intervene in existing social structures. These non-researchers do however provide their specific knowledge on the background or specificities of a certain problem. Examples for integrated expertise may regard researchers’ knowledge from a different discipline, experience from other cases and methodological abilities; market- and production-related knowledge of companies and their technical skills; awareness of local affairs, circumstances and specific motivation for change from locals and activists. Real world experiments in transformative research do not strive to control the experimental settings in utter strictness, but strive to learn from and foster the experimental setting. Based on Groß und Krohn (2005) real world experiments are hybrid modes of experimentation. They oscillate between modes of knowledge production and knowledge application as well as between controlled and context specific conditions. Current real world experiments in transformative research are for example often set in transitions of cities and city quarters as loci of (social) innovation in an urbanizing world.

On the level of households and individuals, more controllable real world experiments offer a lower degree of freedom without following a pure observe and monitor rationale (see Schneidewind and Scheck 2012, Talwar et al. 2011). In this line, so called LivingLab approaches for sustainable development are an embedded research process to enable innovation processes; users and other actors relevant to the context, actively participate in the development, testing and diffusion of products, services and system solutions, respectively. Sustainability LivingLabs are considered as a reflexive user-integrating research infrastructure that seeks to respond to issues of eco-innovation such as imperfect utilization, unintended side effects or lack of diffusion. We introduce the Sustainable LivingLab approach as a methodology to a user- and stakeholder-integrated action research strategy (Liedtke et al. 2013). LivingLabs can be adapted flexibly according to a defined research question, but follow a certain process logic: defining a problem, designing the research strategy, creating solutions and (iteratively) testing and applying the results.<sup>4</sup> Dependent on the individual goals and circumstances, users and stakeholders can be involved in all or in specific stages of research (Talwar et al. 2011). Given the emphasis on pluralism in participatory action research, quantitative and qualitative methods are often integrated in a mixed methods research design (see Liedtke et al. 2013).

The Wuppertal Institute has advanced this research methodology in several related projects, focusing on sustainability innovations and integrating users and stakeholders. In principle, a LivingLab experimental setting follows three phases (ibid.).

In the first phase, *Insight Research*, the status quo in the field of interest is explored and the required/potential level of change in social practices of households is analysed.

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<sup>4</sup> This process logic is independent from the ideal-type in work packages 3.3. and 3.4. However, as both focus on some sort of innovation, overlaps are possible.

A second phase prepares the user- and stakeholder-integrated development of a transformational design. Stakeholders along the value chain from designers, suppliers to end-users participate in the development phase. They often do so in efforts of *Co-Creation* where the insights of the different groups shall lead to enhanced designs in terms of applicability, acceptance and efficiency.

The third phase *Field Testing* encompasses the implementation of the transformational design in a quasi-experimental setting that allows observing its effect by intervening with social practices of households.

The Living Lab approach offers two central benefits. First, the Living Lab approach helps to improve understanding on the behaviour and needs of users, their habits and practices in terms of resource and energy consumption. Second, and even more important the Living Lab approach comes with transdisciplinary research that can fruitfully develop possibilities to intervene on consumer practices and therewith change social practices effectively.

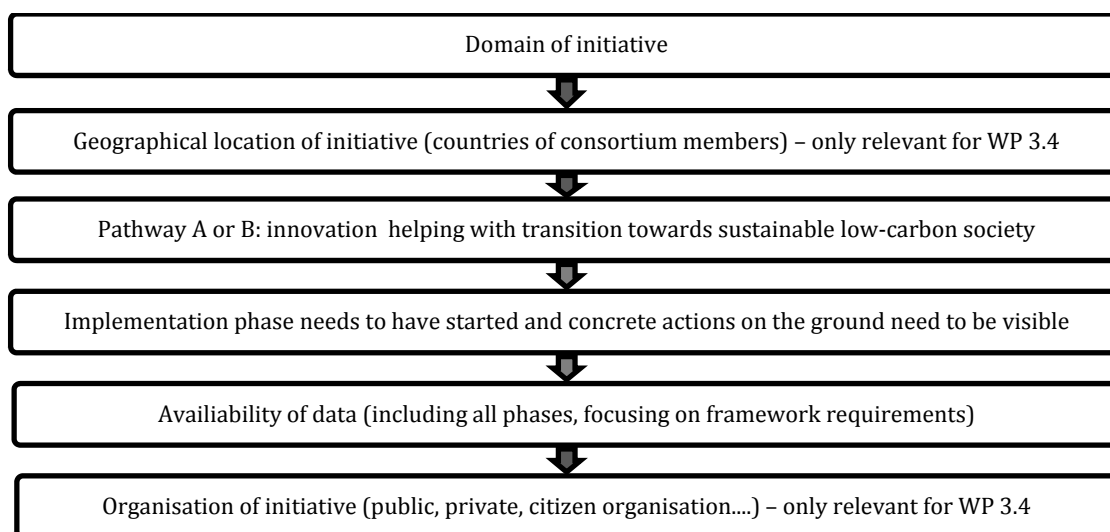
As mentioned above, the elaborations made here mostly concern work package task 3.2. They are necessary to understand the two approaches explained in section 2.3.2.

## **2.3. Overview of case studies and experiments in work package 3**

After introducing some conceptual and methodological specificities in the foregoing sections, the following sections will introduce the reader into the actual case studies and experiments currently conducted in this work package. Both have not been presented so far, so that these parts provide genuinely new content for the information of work package 2. This will later serve to suggest starting points for interaction between the two work packages.

### **2.3.1. Case Studies**

This section informs about the case studies under analysis and provides insights into the first, preliminary findings. Case studies are being conducted in all domains analysed in the Pathways project. As noted above this is being undertaken in the sub-tasks 3.3 and 3.4. The initiatives examined within the case studies and the meta-analysis in work package 3 were selected according to criteria laid out in deliverable 3.1 (to be found under [http://pathways-project.eu/sites/default/files/D3\\_1\\_Criteria%20Analysis%20Case%20Studies\\_28July\\_FinalVersion.pdf](http://pathways-project.eu/sites/default/files/D3_1_Criteria%20Analysis%20Case%20Studies_28July_FinalVersion.pdf)) and are presented in Figure 1 (Berg et al. 2014). The cases need to be relevant for one of the five research domains defined in the DOW of the project: electricity, heat/building, mobility, agri-food system, and multifunctional land use and biodiversity. The focus needs to be on an initiative set in one of the countries of origin of the consortium members. Since the cases will in a later stage of work package 3 be analysed in comparison to the ideal type Pathway concept (A or B) the innovativeness of the cases should be in conformity with either Pathway A or B (overlaps are possible). This means that they work on or with a socio-technological innovation aiming for a transformation towards a sustainable, resource efficient, low-carbon, climate-resilient, and biodiversity rich society (cf. DOW of the project). The major character of the innovation therefore does not need be technological, but can also be social or both. Further criteria set up for selection are that the case should have reached its implementation phase with visible action on the ground, as well as sufficient access to data and primary sources e.g. actors to be interviewed (work package 3.3. only). Cases in the meta-analysis have been chosen so far to complement the cases studied in work package 3.3.



**Figure 1: Procedure for case study selection in work package tasks 3.3 and 3.4 (Berg et al. 2014, 23)**

Table 2 informs about the cases that have been chosen and are being investigated into. For all cases drafts have been received. These are in different states due to the progress of the individual researchers. The table below denotes the cases, it is sorted by domains (first column), then the type of case is provided in the second column – either as an original case study or as part of the meta-analysis – and provides the institution that is currently analysing it. Column 3 gives a short summary of the individual cases’ content. In chapter three these cases will be tentatively related to the findings and goals of work package 2 to discuss potential points for interaction.

**Table 2: overview of cases studies in WP 3, descriptions taken from individual case studies**

Domain	Type and Affiliation	Case study
MFL	Case study FFUL	<b>Peneda-Gerês National Park:</b> This case study illustrates the ways in which innovative forms of land management were developed and implemented in Castro Laboreiro Parish. The innovation addressed throughout this case study relates to the ways in which local communities in coordination with regional institutions (e.g. Peneda Geres National Park) organized themselves in order to use public funds (national and European) for reconciling biodiversity and rural livelihoods. This case study therefore reports a social innovation.
	Case study PBL	<b>Low Holland:</b> Development of Green-Blue services in a National Landscape in a metropolitan region in the Northwestern part of the Netherlands. WLD is a collective that has started as an agricultural nature conservation organisation. Because the organisation was able to get funding for projects, they gain knowledge and could discuss with the national government on the new Common Agricultural Policy. Together with 3 other regions they performed a pilot with money from the government.

		In this pilot they practiced with being an ‘implementation organisation’ and developed different new services based on farming and nature conservation.
	Meta analysis	<b>Food from the sky:</b> Operation of Rooftop farms in London (UK). It is an initiative pursuing a special form of urban gardening called zero-acreage farming (Zfarming). This innovative form of farming is located in and on buildings in urban areas such as rooftop gardens, rooftop greenhouses or indoor farms. “Food from the sky” is a rooftop farm operating on the rooftop of a London supermarket, selling its products downstairs in the shop. This way, unproductive space is purposefully used; vegetation and thus a habitat for e.g. insects is brought into the inner city and emissions from transportation are reduced. Due to community involvement and an educational mission of the farm the local social spirit is also improved.
	Meta analysis	<b>Kristianstads Vattenrike Biosphere Reserve:</b> Is an innovative approach for biosphere management (Sweden). This initiative is an example for how the effort and advocacy of a single person at the right time and place can lead to the transformation of governance structures and therewith to new approaches of nature preservation. By establishing a network of important stakeholders from different institutions on different scales (national, regional, local) and with different aims the general perception of society and all stakeholders on the importance for landscape preservation and protection increased and biodiversity was promoted.
<b>Agri-food</b>	Case study Wuppertal Institute	<b>Biond:</b> Presents the development of an initiative for organic farming that eventually develops into a business case for organic catering in schools. The business undergoes several phases of development through growth and investment with a period discovering its market niche. The case particularly highlights the messiness of business development with a new niche and the importance of agency and governance therein.
	Case study KCL	<b>Capital Growth:</b> Capital Growth, an urban farming network initiative spearheaded by Sustain (the alliance for better food and farming) is an initiative that seeks to develop urban farming in the Greater London area. Capital Growth is a partnership initiative between London Food Link (within Sustain), the Mayor of London, and the Big Lottery’s Local Food Programme. The initiative provides a generic structure for the development of highly localised farming projects, which are mainly based on reclaiming urban spaces and developing them into food-growing spaces but also on raising awareness about food and its provenance, education and training, etc. The initiative has a strong local and community component, generating substantial local enthusiasm. The initiative has been highly successful, with around 3,000 urban food-growing spaces developed since 2008. These spaces are all unique. After a period aimed at multiplication and awareness, it seems that the new strategy

		(Grow to Sell) seeks greater emphasis on productivity and developing achievable targets in terms of harvest/yield/impact for each growing space.
	Meta analysis	<b>Buschberghof:</b> Set in Germany the initiative operates organic farming, establishing a local food system and organising a farm following the concept of “community-supported agriculture”. The initiative promotes biodiversity not only through cultivating without artificial fertilizers and pesticides but as well through the cultivation of ancient types of vegetable. Furthermore, the reconsideration of value of food, seasonal and regional vegetables minimises food waste and reduces CO <sub>2</sub> emissions from storage and transportation.
	Meta analysis	<b>Original Unverpackt:</b> Establishing a shop for unpackaged bulk shopping (Germany) This initiative illustrates a shop selling unpackaged groceries and detergents. On the one side it therewith promotes the reduction of food packaging. In 2010, 2.7 Mio tonnes of plastic packaging have been used in Germany alone. Reducing this amount to a minimum at the point of sale can save a lot of CO <sub>2</sub> taking production chains into account (reduced plastic production, reduced need for crude oil extraction, etc.). Besides, the ecosystem will profit from fewer plastics spreads into the environment (e.g. fewer animals die because of plastic in their digestion). On the other hand, Original Unverpackt sells organic and locally produced products.
<b>Mobility</b>	Case study KCL	<b>Amsterdam Metropolitan Area Electric (MRA-E):</b> Amsterdam Metropolitan Area Electric (MetropoolregioAmsterdam (MRA) Elektrisch) is a project set up by MRA in 2011 to stimulate the development of electric mobility in the region. The main focus is the collaboration across communes for the rollout of a charging network to further the attractiveness and acceptability of electric mobility. MRA-E also provides centralised support to regions and municipalities (e.g. tendering, advice, etc.). The main interest of the case study concerns the cooperation between local and regional actors towards long-term objectives and commitments to overcome typical infrastructure barriers in socio-technical transitions.
	Case study Manchester University	<b>Transport projects and transport governance</b> arrangements in greater Manchester (UK). This case study addresses two interrelated issues:  (1) the building of a suite of Greater Manchester transport projects funded by the national Local Sustainable Transport Fund and other forms of funding.  (2) The background to these projects, the way they have been framed and efforts to implement them cannot be understood without appreciating their interrelationships with the construction of transport governance arrangements in Greater Manchester. Transport governance – and indeed the wider governance of low

		carbon – in Greater Manchester is a messy and historically rooted story. This can be understood as a forty-year process of governing experimentation which has intensified and become more formalised in recent years. It is key to understanding the transport projects set out above to also understand these governance arrangements, the key actors in this process, how this has changed over time and what agendas this has resulted in. The important aspect of this case are not only are the projects in the making but also the governance context.
	Meta analysis	<b>Cargo Hopper:</b> This initiative aims to introduce an environmentally friendly cargo delivery system for cities based on special electric vehicles (Netherlands). This innovation seeks to achieve the goal of an environmental friendly cargo delivery in inner cities through electric cargo vehicles and the reorganisation of delivery schemes. The electric vehicles, powered with regenerative energy, reduce the use of fossil fuels, therewith reduce emissions and counteract air pollution problems due to high traffic volume and the resulting street congestion.
<b>Electricity</b>	Case study KCL	<b>Brixton Energy:</b> This case looks at local community renewable energy projects. It focuses specifically on Brixton Energy, a not-for-profit cooperative, which creates “cooperatively owned renewable energy projects”. It has completed its 3 <sup>rd</sup> solar community rooftop installation (BES3) by September 2013. BS4 is currently in planning. The funding is innovative, it relies on: <ul style="list-style-type: none"> <li>- Community investors for initial investments (a form of crowd funding)</li> <li>- Feed-in tariffs and local electricity supply contracts as a revenue stream</li> <li>- Re-invest revenues to shareholders and in community</li> </ul> It is strongly normatively driven, the main motor being local community actors (residents). It is inscribed within a parent initiative: Repowering London. This could be described as a community-driven movement, with links with activists, local authorities, celebrity support, etc.
	Case Study FCUL	<b>Coopérnico:</b> Coopérnico is a Portuguese cooperative of renewable energy with the mission to involve citizens and companies in creation of the new energy paradigm (renewable and decentralized) for the benefit of society and the environment. The Coopérnico was founded by a group of 16 citizens from different professional areas and with different backgrounds, but who share a common concern: sustainable development. It defends a renewable energy and responsibility model contributing to social, environmental and sustainable energy future.

	Meta analysis	<b>EWS Schönau:</b> Energy cooperative working towards decentralization of energy generation and supply (Germany). This initiative addresses several issues immanent in the current national regime. EWS Schönau is an energy supplier that evolved out of a citizens' movement against nuclear power and offers advice on reducing energy consumption, advocates the decentralization of energy generation and supply and offers electricity from renewable sources. Since the liberalization of the energy market, it supplies to customers all over Germany.
<b>Heat</b>	Meta analysis	<b>SolabCool:</b> Development of an air-conditioning technology using sorption cooling technology (Netherlands) It addresses the heat generation as well as heat consumption side: through the technology "SolabCool" offers a possibility to transform unused heating energy from the district heating system or industrial production sites into cold for air conditioning. Thus, significant amounts of energy are saved when cooling residential and commercial buildings.
	Case study SEI	<b>Sustainable community Hökarängen:</b> initiative aiming to create inspiring and repeatable examples for how resource efficiency can be achieved within a neighbourhood by involving and activating the people who live and/or work there (Sweden). The project aims, through interdisciplinary action research <sup>5</sup> , to develop, test and demonstrate ways in which various forms of cooperation between property owners, residents and others can work together to reduce energy and other resource use in a residential area.
	Meta analysis	<b>BedZed ("Beddington Zero Energy Development"):</b> Is a housing initiative concerned with reducing the environmental footprint of its residents that combines innovative solutions for energy savings, on-site energy production, waste management, water management, etc. (UK) BedZed is a housing initiative which is related to more sustainably lifestyles in general, but focuses on heat energy in specific. BedZed is UK's first large scale mixed use sustainable community, which was designed and build to minimise emissions. It shows how diverse living arrangements can be made sustainable on a larger scale.

In the course of working on work package 3 some preliminary findings have been made which will be elaborated further on as the project continues. These findings relate to the role of governance, social and institutional learning effects in an initiative's evolution, and the role of interaction and network building for up-scaling or replication, and/or initiative success.

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<sup>5</sup> This case hence relates to research undertaken in work package task 3.2. At present, however, investigations related to this case within the PATHWAYS project, will not conduct interventionist actions, but analyse them "from the outside".



Governance is an issue at the heart of many cases. All cases relate to some form of initiative building, i.e. internal governance at one point becomes necessary and inevitable. The forms of governance that were taken up or emerged in the course of the cases and the lessons learned therefrom will thus be one of the central items of interest here. Moreover, many cases show some form of intervention either from governmental sources or by other external actors, e.g. through investors that had more or less intensive effects on the initiative's further development. For example, in the MFL domain new (land)management approaches which relate to new forms of governing land use are (part of) the innovation in the centre of the initiative, in other cases, governance can be analysed as barrier or driver to success, e.g. through support or funding measures or through legal intervention. The interaction between different actors and interest groups affecting initiative development and the effects initiative might have on policy (see e.g. Hall 1993) will hence be examined. Analytical findings on governance have been studied within the PATHWAYS project tasks associated with deliverable 4.3 "Report reviewing the literature on policy and governance of sustainability transitions, leading to recommendations for transitions analysis" (Nykqvist and Turnheim 2015). The results of this report will be taken into account for further analysis of governance issues. It is assumed that it will help to shed further light potential interaction between the work packages in this regard.

Learning is addressed through empirical findings and implications on networking and knowledge sharing that can be compared to the three-phase model presented in 3.1. Learning here concerns learning effects such as knowledge creation that were achieved in the course of the initiatives but also refers to what has been learned from each case in theory and practice (DeWulf et al. 2005, Eisenhardt 1989), e.g. in the form of actionable knowledge. Many cases show adaptation processes that occurred within their evolution, e.g. adapting to unintended emergent phenomena, aligning towards stakeholder demands or to new opportunities.

A successful transition can only be achieved with social acceptance of innovation. This observation has already been discussed with regard to transitions towards sustainability e.g. for renewable energies (Wüstenhagen et al. 2007) and CCS (Huijts et al. 2007). Stakeholders of social as well as technical innovations are thus critical in this perspective, since their reactions on the innovation heavily affects the success and potential of an initiative. This is for example evident in the case of BIOND where acceptance (and non-acceptance) led to distinct adaptations of the business model and in the case of transport in Greater Manchester where the non-involvement of certain actor groups led to the installation of infrastructure for cyclists that is affected by the non-acceptance of the cyclists themselves which eventually caused severe underutilization. Due to its granularity, work package 3 can offer a close-up on e.g. user perception and therewith contribute to work package 2. Aspects of potential interaction with regard to the findings illustrated above will be discussed in chapter 3.

### **2.3.2. Experiments**

The experimental settings in this work package and their underlying procedures have been described with lesser intensity so far. They will be portrayed on the next pages. As laid out above, work package 3 will conduct participatory action research in two different settings: Smart home systems and food consumption as was described in the project's DOW. Smart home system research will be conducted within a LivingLab setting. The food consumption experiment is set within an initiative concerned with transforming a city quarter (the so called „Arrenberg“ in Wuppertal, Germany) into a more sustainable district in the area of climate friendliness and sustainable nutrition. Both analyses are based on transformative and transdisciplinary research designs. As experiments they aim to find out how transitions can be introduced or fostered through participatory sustainability research (Wiek et al. 2014). The

aim will be to develop further knowledge on the processes themselves, to create actionable knowledge for further experiments and to derive insights for the present transitions as was the goal for the initiatives in case study analysis. Further details will be specified for the experiments individually below.

### **LivingLab Smart Home-Systems**

The analysis to be conducted here will follow two schemes: Direct results for a user-integrated design process towards more sustainable heating, and findings on the research process and participatory action research itself. The latter analysis shall yield insight into the actual processes and occurrences taking place in participatory action research.

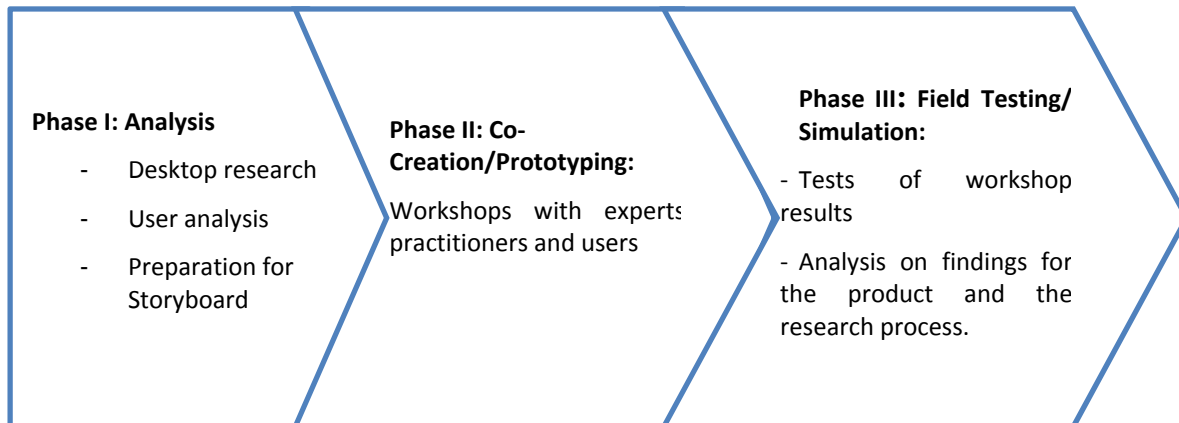
In recent research smart home systems were identified to have significant potential in contributing to energy saving in heat and energy consumption (Ernst&Young 2013). This separates them from other efforts regarding smart metering which so far have shown to be of lesser effect. However, smart home systems, too, can only have positive outcomes when they are tuned to the customers' needs and understanding. In other words, such a system has to be both user-friendly and understandable when being introduced, and throughout its utilization phase. Otherwise, users or installers are prone to cause inefficiency through either false installation or application schemes, or in the form of rebound effects (Chitnis et al. 2014). An expert discussion round with a producer of smart home systems as well as other heating appliances has led to the following, non-exhaustive list of potential sources for inefficient use:

- Adequacy of the systems to users and target group
- Usability, comprehensibility
- Actual savings: actual duration of use, regularity of use, activeness of the user
- Adaptability and adjustability of the system
- Potential Rebound and Prebound effects
- Feedback provided by the system (quality of, design and content of reports)
- Disturbing attributes in the utilization phase (e.g. noise)
- Error proneness
- Usability in maintenance

The LivingLab to be performed in this work package will address this problem and concentrate on the design of the human-machine interface as one of the major sources for false applications and thus inefficiency. It will bring together designers, user, installers, researchers and a smart home producer to work on the subject. The LivingLab will follow the typical three-step structure (Figure 1): The first phase consists of introductory research that investigates into the present situation of heating in households, the technological promise of smart home systems and potential user needs. A second phase will take the form of co-creation activities. The groups mentioned above will work together in workshops to delineate the requirements for an effective smart home system user interface from different angles. They then will eventually co-design this interface from the findings made. The third phase will simulate or field-test the design to arrive at insights on its suitability and potential needs for further development.

Insight gained here will concern technological and behavioural aspects of smart home systems. It will hence create knowledge on how user-integration may lead to different design and utilization concepts when compared to company only-based product development. This in turn may yield insights into governance on product development, and on effects regarding the acceptance of a newly designed technology and its utilization.

**Figure 1: Phases of LivingLab research**



### **Real-world experiment in Agro-food sustainability: The „Essbarer Arrenberg“**

This experiment is set into activities for sustainability in a central city quarter of Wuppertal called the “Arrenberg”. As in the LivingLab Setting above, research will address the experiment itself and also strive to take a “meta-perspective” and reflect upon the role and chances for research in such a setting. About 5,550 inhabitants live in the Arrenberg, which occupies an area of about 0.86 km<sup>2</sup> resulting in an over-proportional population density in comparison to other districts of Wuppertal. As housing rents are comparatively low, many students and recipients of social welfare live there. About 1.700 inhabitants are non-German. Being located in the western part of central Wuppertal the quarter is well accessible through public transport. It is the location of about 400 companies ranging from services, handicraft enterprises, shops over gastronomy to health-oriented businesses. The quarter was firstly build during the Industrial Revolution in the 18<sup>th</sup> and 19<sup>th</sup> century, housing factories, the (former) manufacturer’s mansions, and housing for workers. At present, it undergoes a considerable transition towards a modern district with more sophisticated housing opportunities. However, most of the housing infrastructure is still old-fashioned and demands modernization.<sup>6</sup>

Due to the structure of inhabitants with many young persons and entrepreneurs, a rather innovative and sustainability oriented culture has emerged that seeks to develop the quarter into a place for sustainability transitions. Originating from activities to promote social life, climate friendliness and renewable energies, numerous activities have been started under the label “Aufbruch am Arrenberg” (meaning “Take-off of the Arrenberg”). The latest of these activities concerns aspects of sustainable nutrition in the quarter labelled “Essbarer Arrenberg” (“Edible Arrenberg”). It comprises urban gardening projects, a plan to set up urban farming (aquaponic), a “restaurant day” and a food sharing initiative. While participative action research undertaken here will survey the whole activity “essbarer Arrenberg”, its focus will be set on food sharing. This experiment hence deviates from the LivingLab in that it is not arranged or instigated by the researchers but inserts participatory action research into an on-going process.

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<sup>6</sup> There are clear signs for gentrification in parts of the „Arrenberg“. However, a complete transition to that direction is not likely in the foreseeable future.

As a real-world experiment participatory action research is conducted as a “joint set-up of the research between researchers and practitioners, involving the practitioners in all crucial moments and decisions of the research” (DeWulf et al. 2005, 179). Deliberations on the concrete content of the experiment started in late 2014 and early 2015 in conversations between one of the leading actors in the Arrenberg and the leader of this work package. Since early 2015 researchers of the Institute take part in activities and workshops regarding the “Essbarer Arrenberg” and develop a program together with the local activists in a “democratic” process where researchers and “activists” commonly decide on the scheme to follow (Talwar et al. 2011). First food sharing activities have commenced at April 16<sup>th</sup> and are monitored by WI researchers. At present the evolution of the activity is observed and further measures for improvement or development of the initiative will be discussed together with the activists in June to uphold the democratic nature postulated for such a participatory action research process (Ozanne/Saatcioglu 2008). At present it is planned to continue the experiment until early 2016 and test several measures regarding improvement towards sustainability until then. Due to the democratic nature of participatory action research the measures will be devised, discussed and decided upon between the researchers and the activists on an equal footing (Talwar et al. 2011). From this workshop on further steps will hence be decided.

This experiment clearly relates to new modes of governance for a sustainability transition. The local transition itself is rooted in the personal and collective motives of the population. Researchers will add to this governance by partly moderating the development of this process, so that they may invoke a new mode of governance into the process. Here too, learning effects and through participation and interaction as well as the question of social acceptance of the initiative can be covered. With regard to points for potential interaction these experiments will be discussed specifically with regard to “pre-configurations” (see below).

This description ends chapter 2, which was designed to provide information on background processes, as well as current results and findings in work package 3. The next chapter will explore potential starting point for integration between work packages 2 and 3.

### **3. Comprehension of Case Studies for “Dynamics of Transition Pathways”: Initial findings and potential for future interaction from a work package 3 perspective**

In this chapter we aim to identify starting points and offer first insights to initiate a dialogue on integration between the work packages. Section 3.1. provides a framework for this drawing on a concept devised in a paper by Turnheim et al. (unpublished manuscript) for integration between the research approaches in PATHWAYS<sup>7</sup>. It will inform on attempts toward integration mainly based on two concepts – “aligning” and “bridging”. In section 3.2 a tentative attempt is made to relate present findings of work package 3 as outlined in the previous chapter to the interest of work package 2. Potential next steps of a dialogue between the work packages are then delineated in section 3.3.

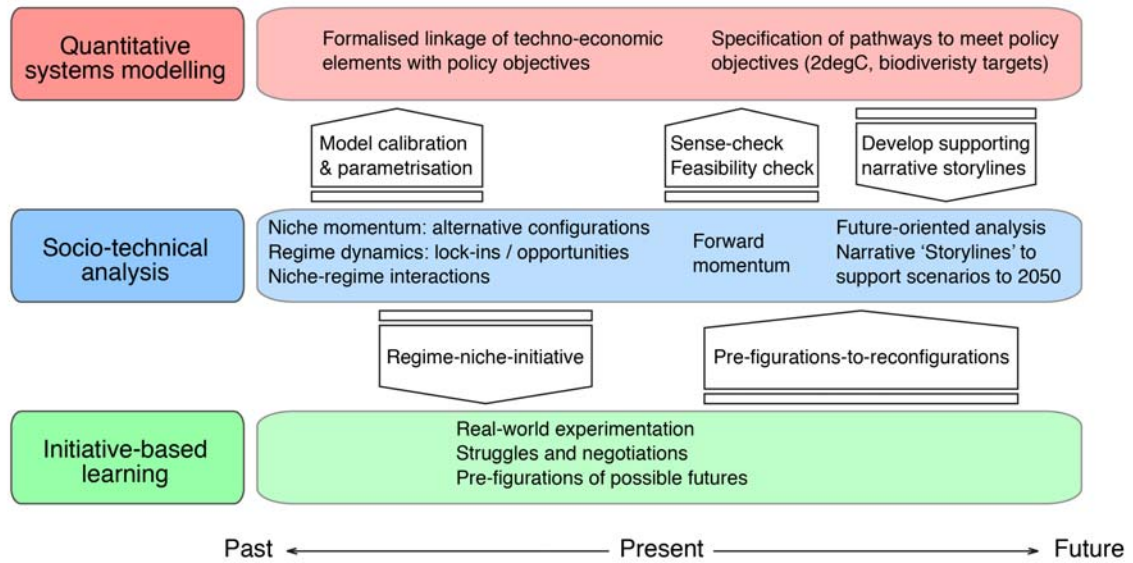
#### **3.1.Integration through bridging and aligning in the PATHWAYS project**

This section takes up ideas that were developed in work package 4 of the PATHWAYS project. Work package 4 directly addresses issues of integration between the approaches used in the project – quantitative systems modelling, socio-technical analysis and initiative-based learning. The considerations made therein may hence provide a step stone towards a dialogue between work packages 2 and 3. They are summarized here and will be applied in the following sections.

Hinging on the key differences between the approaches, Turnheim et al. (ibid.) suggest a framework for integrating them through a strategy based on the procedures of “aligning” and “bridging”. The *alignment* procedure refers to an identification of “*the joint elements around which an integrated ‘meta-perspective’ on sustainability transitions pathways can be articulated in terms of applied concepts, problem-frames and empirical domains.*“ (ibid., pp. 12-13.) Deliberating further on the integration process the authors introduce *bridging* as „[the] *integration of differentiated perspectives [...] fruitfully oriented towards improving the nature and quality of information for decision-making (for different actors) – that is, towards specific governance problems, explicitly mobilising the different kinds of information on offer to elicit the criteria around which situated transition strategies can be evaluated.*” (ibid., p. 13). The authors suggest that these steps have to be repeated iteratively for successful attempts to integration and that concepts, information and targets have to be shared between the respective approaches to make these attempts successful.

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<sup>7</sup>The notion of „integration“ is taken on as a broad concept in the PATHWAYS project. I.e. it is not about merging the different approaches, but to identify where they may complement each other, learn from each other, etc. The paper by Turnheim et al. (unpublished manuscript) gives further details on this. These ideas are delineated to some extent in section 3.1 below, based on the postulations of the aforementioned paper.



**Figure 2: Schematic representation of steps in an interlinked chain of analysis of future oriented transition pathways (Turnheim et al. unpublished manuscript, p. 17)**

The paper devises two forms of interaction between work packages 2 and 3 (figure 2). The initiatives studied in the initiative-based learning approach can profit from contextualisation and analysis within the broader framework of the Multi-level Perspective. Through this, they can be understood with regard to their position and role in the process-logic model behind socio-technical analysis (see next chapter) and their contribution towards instigating, supporting or decelerating a sustainability transition. Findings made in initiative-based learning on the other hand may provide socio-technical analysis with a perspective on (potential) future transitions or regime constellations. These “pre-figurations” can contribute insights into configurations, conflicts, efforts, etc. which may be expected for future regimes and can hence offer conclusions to the feasibility of future oriented scenarios and narratives. They may provide instances of self-similarity when the initiatives are especially suited for replication or up-scaling. The figure also addresses the idea of “reconfiguration” which was framed by Geels and Schot (2007). Reconfiguration occurs when innovations used to solve a local problem diffuse into the regime and in this course trigger adaptations and knock-on effects in the regime’s basic architecture. In this case an initiative would not be seen as the precursor to a completely new regime but as a factor that changes the incumbent regime from within. In this case the initiatives would not inform about a future regime but rather about change of the present one.

The following sections and the discussion will use this concept and the suggestions made therein to identify points for potential interaction between work packages 2 and 3 of the PATHWAYS project. Section 3.2 will start a contextualisation of work package 3 cases in terms of work package 2 and hence provide first ideas for the actual pursuit of the work laid out in the downward arrow of Figure 2 in a future dialogue. It thereby also fulfils a part of the task set for this deliverable as relates the two work packages for comprehension. Section 3.2 will then identify starting points for the aforementioned dialogue based on the future deliverables of the work packages and reason on the upward arrow of pre-figurations and re-configurations for future-oriented analysis. From this a possible „dialogue“ between the work packages may then be started.

### 3.2. Comprehension of cases for socio-technical analysis

While conceptual and methodological onsets behind work package 3 have been delineated in the foregoing chapter as ground-laying information to work package 2, we want to use the idea of framing set out by Turnheim et al. (unpublished manuscript) to relate our research to socio-technical analysis. Specifically we address the idea of shared concepts, information and targets as well as the suggestions regarding potential interaction set out in the position paper. This section will hence take up the idea specified in the downward arrow for interaction between work package 2 and 3 and provide a framing of work package 3 case studies in terms of MLP analysis. For this we will sort our cases and experiments into the concept laid out above and also reason on potential contact points of the analytical foci (governance, learning, acceptance) to work package 2, e.g. based on the notion of pre-figuration and reconfiguration depicted in Figure 2. The suggestions made here are not to be seen as a finalized analysis, but as a starting point to begin related discussions.

To make the following discussion relevant to non-informed readers it might be useful to shortly delineate the process logic by which the idea of regime transitions is described in socio-technical analysis in a multi-level perspective (MLP) and relate it to the ideas of initiative-based learning. This can already be seen as a first step in sharing information for a shared concept either towards alignment or bridging. The process logic can be summarized as follows: The first phase is constituted by a “local phase”, in which innovations „emerge in one or more local practices that are relatively independent“ (Schot and Geels 2008, p. 268) and are bound to local demand and context. The rising awareness of the existence of further actors working towards similar goals or with similar technologies, may lead to a second, inter-local phase: Small networks are established in the form of e.g. supplier-producer relations. The notion of inter-local shows, that knowledge is proprietarily kept within networks. A focus of this phase is on raising reputation and legitimacy. In the following trans-local phase, knowledge infrastructure is created leading to a broad diffusion of knowledge, and intermediary actors (e.g. industry associations) form that act on a broader level. The final, global phase is reached and a global status established, when “institutionalisation and standardisation result in the establishment of dominant cognitive rules” (ibid p.286). The concept is depicted in Figure 3.

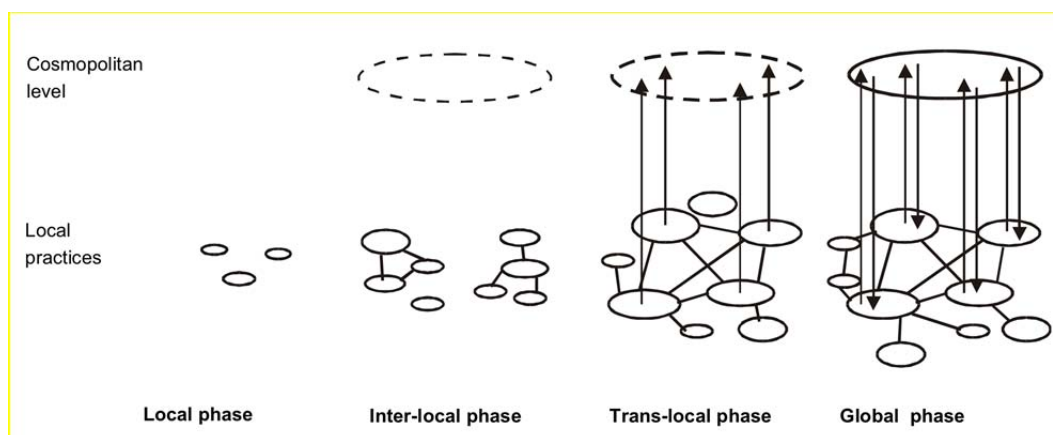


Figure 3: Four phases of development of shared technological knowledge Geels and Deuten 2006, p. 269.

We see the initiatives analysed in work package 3 as directly touching on the idea of “*local projects*” in socio-technical analysis and the related Strategic Niche Management (see Geels/Raven 2006, Smith 2006, Geels, F. & Deuten 2006). The role of local projects has been laid out for innovative niches by Schot and Geels (2008), it is strikingly similar to the description of initiatives: “*Developments may start with one or a few projects [initiatives], carried by local networks of actors, who are interested in innovations for idiosyncratic or local reasons. The cognitive rules (such as expectations) that guide these projects are initially diffuse, broad and unstable. Local projects form test beds for these diffuse ideas and spaces for the elaboration of new ideas.*” (Schot/Geels 2008, p. 543). The initiatives investigated here may therefore be perceived as such local projects as they adhere to the broader framework set out, concerning e.g. locality and messiness. However, research undertaken in work package 3, especially with regard to the experimental cases, should only cautiously be equated with the concept of local projects, as that could confine them to specific interests and research questions that could omit some ideas of initiative-based learning, specifically in terms of interventionist approaches. We nevertheless do see the initiatives’ role as “test-beds” in a similar way and hence support the idea of seeing them as pre-figurations and reconfigurations. The concept of local projects therefore provides an excellent connection between the work packages. An already further step for integration that can be suggested from this observation would hence be to align the framework and findings for initiatives with the typology of transition pathways suggested by Geels and Schot (2007, see section 3.1). The aim would be to not only discuss contributions from insights on initiatives to the reconfiguration-type transition but also to discuss potential insights from initiatives for the other types described.

Based on this short summary, we now hint to relations of the case studies in work package 3 to the analyses of work package 2. Specifically, the cases will be sorted to the domain-specific niche analyses of deliverable 2.1. This is intended as an informational step prior to bridging and aligning, that highlights potential touching points. To allow for discussion subsequent to this paper, we then provide hints towards the cases’ individual orientation within the taxonomy of socio-technical analysis. I.e. we refer them as either belonging to an existing niche, as being linked to an incumbent regime, or by classifying them as potential pre-figurations of novel niches (Table 4).

In work package 2, the **multifunctional land use (MFL) and biodiversity domains**<sup>8</sup> are combined in the analysis of PATHWAYS, as biodiversity is often one goal of sustainable MFL initiatives and the preservation of nature often conflicts with other land uses. As stated in the deliverable 2.1 report (Zwartkruis et al. 2015, p.6) “*land use is the outcome of many societal functions and activities, e.g. energy production, food production, but also for example recreation, housing, protecting people against water (floods, heavy rainfall etc.) and protecting species and habitat conservation.*” In work package 2, niches analysed in these domains include for example urban farming, innovative socio-ecological system management approaches and renewable energy production in agricultural systems. Urban farming is included in this domain, as it relates to more land use functions than just agriculture but combines it with functions of the urban area regime and nature management. Accordingly, the initiatives examined in work packages 3 deal with innovative approaches to manage national parks or biosphere reserves (Low Holland, Netherlands, Peneda-Gerês, Portugal, and Kristianstads Vattenrike, Sweden) and a new agricultural concept of zero-acreage farming

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<sup>8</sup> Reports on respective analyses for the domains in work package 2 are accessible on <http://www.pathways-project.eu/output>.



(Zfarming) allowing the use of built land for farming. In the respective example of Zfarming, “Food from the sky”, an artist and activist operated the farm together with volunteers on the rooftop a supermarket in London, selling the products directly on the market. New management models for land use e.g. combine several stakeholders leading to integrated solutions that are suitable for all actors, may lead to new services and, in any case, added value for the environment.

For the **agri-food domain**, several trajectories can foster the transition to a low-carbon society and an environment rich in biodiversity. The report on the agri-food domain of work package 2 already indicated several movements and niches working towards this goal. Niches such as precision farming using GPS, innovative fodder for cows lowering GHG emission in the dairy chain, organic farming, changing consumption habits towards vegetarian or vegan nutrition and reducing food mileage through the introduction of local food systems are described therein. Besides the negative impact of the food production chain itself (especially of dairy and meat products), there are as well problems which are induced indirectly and which are not yet addressed in the niche analysis, such as waste production through packaging or energy consumption for food preparation. Two of the initiatives analysed in work package 3 focus on those latter two aspects. With the initiative “original unverpackt” we analyse the business model of a packaging free supermarket: On the one hand it promotes the reduction of food packaging and on the other hand it sells organic and locally produced products. Biond, the second initiative examined here, is an innovative school catering company that as well promotes organic and local products. In this case, a temporary insolvency of the business provides a special opportunity to analyse financial and organisational (governance-related) barriers. The other two cases offer insights into alternative, sustainable forms of food production: The Buschberghof in Germany is one of the first farms in Europe operated according to the concept of Community supported agriculture, promoting biodiversity by cultivating without artificial fertilizers and pesticides and growing ancient types of vegetable. Further contributions to a transition are the reconsideration of the value of food, seasonal and regional vegetables, minimization of food waste and reduced CO<sub>2</sub>-emissions from storage and transportation. The case study of „Capital Growth“ describes and analyses the growth and development of an urban farming network. Through its network character, the involvement of the lord mayor of London, Boris Johnson, and a high marketing character the case offers special insights into governance structures and also on replication. The experiment on the “Essbarer Arrenberg” is also set in this frame. It delineates a pre-figuration for potential future nutrition schemes which are locally organized and urban, it also includes several aspects of governance such as local self-organization processes.

In the **mobility domain** PATHWAYS mainly focuses on road transportation. Niche developments analysed in this respect are electrification of transportation through plug-in hybrid, hybrid or battery electric vehicles, bio fuels, hydrogen fuel cell vehicles, car sharing and cycling schemes, Inter-modal Ticketing (Smart Cards) as well as compact city plans. Two of the initiatives presented in work package 3 refer to electrification of transport. One refers to electric cargo vehicles especially developed for inner-city transport: The “Cargo Hopper”, developed by a Dutch company, is an environmentally friendly (green energy powered) and quiet option for delivering cargo, aiming at reduced mileage (through route optimization and a cooperation with waste). The delivery routes are optimised to reduce mileage in the first place, but also – due to cooperation with a disposal company – the cargo hopper seldom drives without load, enhancing resource efficiency. The second case study, set in the area of Amsterdam (MRA-E), mainly focuses on collaboration across communes for the rollout of a charging network to further the attractiveness and acceptability of electric mobility. This case, as well as the third initiative that investigates into the development of a sustainable

transportation scheme for Greater Manchester, (e.g. promotion of bicycles), offers special insights into governance on different levels (e.g. local, regional actors, federal government).

In the **electricity domain** both the consumption and the production side play key roles for greenhouse gas emissions. Several niche technologies such as onshore and offshore wind plants, bioenergy plants and high efficient light-systems such as CFL and LED lighting try to diminish this problem. To shed light on initiatives in this domain, work package 3 analysis two community energy projects in the UK, Germany and Portugal. Brixton Energy is a community energy initiative, involving the community into financing, installing and operating solar power stations. The German community energy project EWS Schönau started as a citizens organisation fighting against nuclear power in 1986 and evolved to an actor on the national energy market, selling green energy to 140.000 customers and investing into the development of green energy sources. Coopérnico, a Portuguese cooperative aiming at the involvement of citizens and companies in the establishment of a more sustainable energy system based on renewable and decentralized energy production, is the third initiative in this regard. The last initiative in this domain is an initiative successfully applying a technology for air-conditioning depending on excess heat, offering its technology and service to business and consumers (SolabCool). In this, it differs from the other initiatives as it deals with a technological rather than social innovation.

The fifth domain examined is the **heat domain**. It also comprises two levers for transition: heat generation and heat consumption. To reduce heat consumption, heat energy saving passive houses as well as smart metering were analysed in the niche analysis of work package 2. On the generation side, niches such as small-scale residential biomass heating systems, district heating or solar thermal heating systems were investigated. In the analyses of specific initiatives in work package task 3.4, an initiative was chosen that combines both parts: BedZED is a housing initiative in the UK that aims at reducing the environmental footprint of its residents and combines innovative solutions for energy savings, on-site energy production, waste management, water management, etc. The initiative presented in the case study on Hökarängen (Sweden) started with a focus on citizen engagement to reduce energy (heat) and resource consumption but meanwhile broadened its focus due to the experiences made in the initiative's process. The project aims to develop, test and demonstrate ways in which various forms of cooperation between property owners, residents and others can work together to reduce the consumption of energy and other resources in a residential area. It therefore tries to create inspiring and repeatable examples for activities involving and activating the people who live and/or work in the respective area. The LivingLab experiment is also set in this domain. It will shed light on the interaction of different actor groups in a common effort for a socio-technical innovation in the smart-metering niche.

The cases examined in work package 3 may provide interesting insights that offer points for integration in work package 2. As pointed out above, these are especially related to agency and governance and the relation and interaction between initiative-level with the regime- and niche-levels. For this, we classify the cases according to the following groups in terms of the socio-technical approach as outlined above:

- Pre-figuration stage (pre-fig.): Cases of this category represent innovative initiatives working that are not yet visible at niche or regime level. They allow an analysis of structures not detectable through the lenses of MLP in work package 2 and might lead to findings contributing to e.g. future-oriented research on the configuration of niches (see section 3.3).
- Niche stage: The initiatives can be related to an already established niche. This category might lead to findings on interaction between initiatives as granular parts of niches. Work package 3 may thus give insights into dynamics that the MLP (in PATHWAYS) cannot account for due to its focus on the niche from a more abstract perspective.

- Regime stage: Characteristic for initiatives classified as related to a regime is that their activities cope with existing regime challenges, aiming at improving the regime performance which might lead to a transition from within (reconfiguration).

A suggested qualification of the initiatives in terms of the project is presented in Table 4. Here, we also summarize which pathway (A or B) the initiatives mainly promote and give a first indication on analytical aspects the assessment might contribute to. Again it needs to be pointed out, that this is a first attempt to start information sharing, so that the classifications here can very well be discussed and altered or refined. The information used for this qualification is based on the present findings in the individual cases.

**Table 4: Summary of comprehensions from cases in work package 3.**

Domain	Case study	Tendency towards Pathway A	Tendency towards Pathway B	Governance	Learning, Role of users, Diffusion	Relation to socio-technical analysis
<b>MFL</b>	Peneda-Gerês National Park	X		X	X	Regime
	Low Holland		X	X	X	Niche
	Food from the sky		X		X	Niche
	Kristianstads Vattenrike		X	X		Regime, but aiming at change in behaviour
<b>Agri-food</b>	Biond		X	X	X	Pre-fig
	Capital Growth		X	X	X	Niche
	Buschberghof		X		X	Pre-fig
	Original Unverpackt		X		X	Pre-fig
	Essbarer Arrenberg		X	X	X	Pre-fig
<b>Mobility</b>	Amsterdam Metropolitan Area Electric		X	X	X	Niche
	Transport in Greater Manchester		X	X		Regime
	Cargo Hopper	X			X	Pre-fig
<b>Electricity</b>	Brixton Energy		X	X	X	Niche, with pre-fig governance
	Coopérnico		X		X	Niche, with pre-fig governance
	EWS Schönau		X	X	X	Pre-fig
	SolabCool	X				Pre-fig
<b>Heat</b>	Sustainable community Hökarängen		X	X	X	Pre-fig
	BedZed		X	X		Pre-fig
	LivingLab		X		X	Pre-fig

The bottom-up and society-driven initiatives analysed in work package 3 mainly relate to Pathway B. New actors in the cases analysed here often originate from civil society or social movements, and the momentum that is created is more related to social structures, interactions, and patterns of behaviour. Technological innovations, explicitly developed by the initiatives analysed, play a prominent role in the cases of “cargo hopper”, “SolabCool” and the LivingLab. These cases were the only ones in which the first movers are deeply

involved in production oriented companies. Supporting the theory of ideal type pathways, these companies are incumbent firms already established in the business of the related domains and existing regimes. Thus we see these initiatives as oriented towards a pathway A. As shown in Table 4 multiple cases address scalability and diffusion and might eventually lead to further empirical evidences for the initiative-niche relation.

In chapter 2 we have also alluded to three points of interest as potential analytical foci that emerged from the case study findings so far. These are governance, learning and acceptance. We suggest that all three may be of interest for interaction. *Governance* clearly plays a role in both work packages. Turnheim et al. (unpublished manuscript) have also utilized this issue as a focal point in the paper. It is hence a natural theme for further common investigation. *Learning* in our case refers to individual as well as social learning effects within concrete groups, networks etc. Here, work package 3 again is more fine grained and concrete than work package two, but the frequent notion of adaptation, adoption, novelty and innovation in socio-technical analysis clearly also refers to learning processes, albeit of a different but related kind. *Acceptance* then means the consent of actors, users, consumers etc. to the initiatives' goals. It is relevant for the interest on items such as diffusion and adoption in socio-technical analysis and also part of the intangible aspects examined in regime analysis. We suggest that these observations may hence pose a starting point for *bridging* attempts in order to arrive at an improved understanding through shared discussions or analyses on the topics, potentially leading to an iterative integration effort as cited above. Insights into how such innovation and diffusion processes are pursued could also provide hints for pre-configuration and reconfiguration processes in regime- and future-oriented analyses. For example, some innovation processes show more democratic and integrative character than is traditionally assumed for logic models of innovation processes. The activities, decision-making procedures and outcomes of such initiatives could therefore be different from what would be expected from more classical types. This is certainly one aspect where initiatives may be perceived as test beds. The following chapter will now outline possible starting points for further attempts towards interaction and dialogue between the two work packages in the PATHWAYS project.

### **3.3. Developing suggestions for interaction between work packages 2 and 3**

This section seeks to identify and suggest more concrete points of interaction between the work packages. It will do so based on the tasks set in the project. It follows the hypothesis that substantial interaction between the two work packages has to take place in the form of a dialogue where concepts and findings from each work package are used to inform each other on issues of interest. This can be based on the concepts of bridging and aligning as pointed out above. The paper by Turnheim et al. (unpublished manuscript) suggests specific steps towards this process.

As a first step they suggest *aligning* so that a shared perception and a common understanding on items of interest emerges between the approaches that may enable and improve the targeted dialogue. We suggest that the framing of work package 3 cases in terms of work package 2 as done in the previous section might be a starting point to this procedure. From here, niche and/or regime context can be provided for the initiatives and the initiatives' relation to this context (conflicting, supporting, etc.) can be analysed. As suggested earlier, that would enable exploration on potential (future) effects of an initiative, point towards opportunities or barriers for up-scaling and replication, and more distinctly inform on system effects exerted on an initiative to name some possible implications. Moreover, concepts like actionable knowledge and acceptance could find more depth and an improved foundation by

seeing them within a larger frame. The inclusion of information on broader development, on arising opportunities from regime instabilities, or negative feedback through counter-action activities, etc., comes to mind here. The exact form of these attempts needs have to be discussed between the work packages.

Bridging then forms the second step in the framework. Here, the analysis of the different approaches is focused on specific analytical problems as research questions (e.g. transition governance) to profit from the different types of knowledge and insight created by the respective approaches. While the paper by Turnheim et al. (ibid.) specifically addresses governance as an exemplifying and pivotal point for integration, this is clearly not the only area of interest for integrative attempts. Based on the arguments developed in the prior section we suggest that e.g. learning and learning effects in sustainability transitions could constitute another area of common endeavours. The suggested task of providing hints for pre-figuration from work package 3 to work package 2 implies that such efforts between the work packages could for example regard forward-looking analysis. We will return to this idea further below. To deepen and validate the findings from these two steps Turnheim et al. then postulate the necessity of iterating them. This would be the task of a continued dialogue between the work packages.

For the identification of concrete common steps in the project, a pragmatic approach is to think along the tasks of each work package to look for points of interaction directly within the project. We have elaborated on the tasks and procedures in work package 3 in the previous chapters. To propose further onsets we now shortly summarize the task in work package 2:

In work package 2 socio-technical analysis is being applied in a MLP to the transition pathways of five empirical domains in specific countries (see 3.2). The objective is to study the current technological state, drivers and barriers for changes and governance structures in a way that findings are comparable across domains and countries. In a first step (deliverable 2.1), green niche-innovations were analysed by first describing the particular technological or social innovation(s) in the respective domain and then examine the influence of related actors, social network, strategies and institutions involved in the domain's transition towards a more sustainable Pathway. The analytical objective was to identify the pathway that an individual niche innovation relates to (Pathway A, B or 0) and to assess the momentum of each niche in order to evaluate its potential to overthrow the prevailing regime(s). In a second step (deliverable 2.2), the focus is laid on the socio-technical regimes and sub-regimes in each domain. To assess their stability and identify possible cracks and tensions, the tangible and intangible elements characterizing the regime are described with regard to the respective industries, consumers and policy makers. While tangible elements comprise e.g. investments into machinery, (measurable) consumption patterns and the existence of structuring institutions (e.g. governmental departments), intangible elements relate to e.g. routines, standards, beliefs and policy. Furthermore, the landscape as a source of potential cracks and tensions is also included into the analysis. Task 2.1 and the associate deliverable have been fulfilled at the end of 2014 and deliverable 2.2 ends with month 18 (May 2015). The framework of 2.1 has already been used in section 3.2 to frame the initiatives analysed here into work package 2 interests. To analyse the feasibility of different transition pathways, three further steps will be taken within the work package: a) an integrated assessment of deliverable 2.1 and deliverable 2.2 in deliverable 2.3, b) comparing transition pathways in different countries within a domain (deliverable 2.4) and c) assessing the process of future transition pathways in a forward-looking analysis in deliverable 2.5. We suggest that major points of bridging and aligning between work package 2 and work package 3 can be rested on the desiderata behind these deliverables.

Processes that align the results of work package 3 with the already existing analyses (deliverables 2.1 and 2.2) represent a starting point that was initiated in section 3.2. Findings from the initiatives could for example inform about the perspective of actors in these niches towards the on-going transitions and may therefore lead to deeper insights on e.g. less tangible matters. Work package task 2.1, the analysis of niche innovations within the domains, made use of the concept of “momentum”, i.e. the force and speed associated with the diffusion (or non-diffusion) of a specific innovation. Main drivers (or barriers) for this were identified from the techno-economic, the socio-cognitive, and the policy/governance dimensions. With regard to this concept, findings from the initiatives may elucidate specificities of these dimensions (e.g. socio-cognitive peculiarities of specific domains, or governance modes) or take different functions as either exemplary/ideal cases, contrasting cases or as explanatory cases (Yin 2014) for specific aspects within the MLP. Also some cases may work as extreme cases (Gerring 2007) when compared to a niche or regime showing e.g. particularly deviating behaviour to the status quo. Which of these points will be of interest and pursued within PATHWAYS will be subject to further analyses and dialogue.

The deliverables 2.3 and 2.4 are mainly internal to analysis in work package 2, findings in work package 3 could however lead to amended insights into the processes behind transitions for specific countries in a following step where possible. The forward-looking analysis of task 2.5 might provide the most distinct starting point for bridging between the approaches. Dependent on the focal points that will be chosen for the analysis, a dialogue could be started on pre-figurations found in the initiatives. From this, conceptualisations of potential niche and regime developments could be informed and enriched through bridging attempts. Some examples can be named: E.g. the initiatives analysed in work package 3 hint towards cooperatives as important forms of governance for present innovations towards sustainability. The cases of Brixton Energy, EWS Schönau, Low Holland and Peneda-Geres contain examples for this. Similarly, the Swedish case of Hökarängen and the experimental setting in the “Essbarer Arrenberg” point towards the orchestration of transitions in city-quarter contexts by private citizen initiatives, while Capital Growth is set in the full London area. These cases can offer insight into transitions in urban contexts, which may be of importance in the light of a worldwide megatrend towards urbanization. Likewise the participatory cases and experiments (e.g. Hökarängen, Essbarer Arrenberg and the LivingLab) may shed light on new governance forms for integrated innovation processes.

Based on the processes for interaction devised by the integration strategy for the PATHWAYS project and from perspectives of the tasks of both work packages, potential points and steps for further interaction were proposed in this section. To actually make bridging or aligning procedures happen, it is up to the researchers in the project to discuss the actual chances in a dialogue as described above. Further attempts to integrate research but also the identification of additional research questions may result from this.

## 4. Conclusion

This paper represents deliverable 3.3 of work package 3 in the PATHWAYS project. Its aim was twofold: To inform researchers of work package 2 on the content, purpose and preliminary findings of the work package and to explore potential for integrative attempts between the work packages. In order to do so, its present status, content and preliminary findings were presented in chapter 2. The general methodological approaches of the work package were described which include analytical (work package tasks 3.3 and 3.5) and more interventionist schemes (task 3.2). Specifically addressing the interventionist methods, the idea of transformative research as a background was delineated (section 2.1). After that section 2.2 presented the methodologies behind case study analysis and participatory action research and pointed to changes or novelties added after the provision of the dedicated research protocols in deliverable 3.1. Section 2.3 then introduced the reader to present content and preliminary findings of the case study analysis and the two experiments in participatory action research. More concretely, the content of the case studies and experiments was described and three analytical foci – governance, learning and acceptance – were explained. An exploration of further points and steps towards integration was conducted in Chapter 3. Firstly, a concept for integrating between the approaches in PATHWAYS (quantitative systems modelling, socio-technical analysis and initiative-based learning) developed by Turnheim et al. (unpublished manuscript) was summarized for this purpose in section 3.1. This concept was then used as a vantage point for the following sections. 3.2 related the cases and findings in work package 3 to findings and desiderata of work package 2. Through this, potential contact points between e.g. case studies and niches could be identified and some suggestions for subsequent integration were made. For example the foci of governance and learning were used to point towards common interests of the work packages that may serve as leverage points in a future dialogue. Chapter 3.3 then used the strategy for integration delineated by Turnheim et al. and the tasks of both work packages as starting points for deliberating on further issues and steps that may be taken up in subsequent efforts towards integration. Examples for such suggestions are the proposal of a bridging effort in forward-looking analyses of regime transitions. At this point it bears repeating that this deliverable has to be seen as a starting point for the discussion between the work packages and not as an integrative attempt in itself. It is rather a contribution to a dialogue supporting and instigating such an integration which then has to be based on shared concepts, mutual information and an iterated dialogue.



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