

LINKING TRANSITIONS TO SUSTAINABILITY

INDIVIDUAL AGENCY, NORMATIVITY AND TRANSDISCIPLINARY COLLABORATIONS IN
TRANSITION MANAGEMENT

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- *J.M. Wittmayer, N. Schöpke, F.v. Steenbergen, I. Omann (2014): Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges. Critical Policy Studies 8 (4): 465-485*
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EXECUTIVE SUMMARY

This summary provides an overview on the overall PhD thesis, its background, aim, methods and core results. As indicated, it therefore strongly draws on the respective sections of the thesis.

Background (based on Chapter 1, modified)

Fundamental societal challenges, such as climate change, biodiversity loss and poverty, persist despite continuous attempts to resolve them, e.g. the SDGs (United Nations General Assembly, 2015). These societal challenges are characterized as being highly complex, subject to numerous uncertainties, and with their impacts unfolding over long time horizons (Grin, Rotmans and Schot, 2010). They continue to persist because they are related to the organization of societal systems (Schuitmaker, 2012). Transition research proposes that ‘wicked’ or ‘persistent’ problems require a fundamental change in the structures, cultures and practices of a societal system, for the system to become (more) sustainable (Frantzeskaki and de Haan, 2009). The non-linear long-term processes of transformative change are referred to as sustainability transitions (Grin, Rotmans and Schot, 2010).

Sustainability transitions combine a process of radical change (the transition) with a normative direction of change (sustainability). They are complex processes marked by uncertainty, emerging from complex feedback loops within societal systems. Besides complexity, the political nature of the transition processes and related power struggles, inevitably impedes the linear planning of transitions (Avelino, 2009). As such, sustainability transition research has incorporated a societal and cultural dimension (Adger et al., 2012), with agency playing a core, yet under-researched role (Olsson et al., 2014). This particularly concerns the role of human actors in enacting transitions (O’Brien, 2012).

The aim of transition research is to develop analytical tools to understand societal systems complexity, as well as processes and mechanisms of innovation. In the research on transitions one can distinguish between descriptive, analytical (Geels & Schot, 2007; Smith, Voß, & Grin, 2010) and prescriptive studies of transitions (Kemp, Schot and Hoogma, 1998; Loorbach, 2007). The former includes the multi-level perspective on historical socio-technical transitions (Geels & Schot, 2007) focus on providing a descriptive-analytical study of transition dynamics. Building on insights from these approaches, the later including transition management (Rotmans, Kemp and Van Asselt, 2001; Loorbach, 2007) focus on the governance of transitions, including agency and how actors can influence transition processes.

Traditionally, science has focused on the analysis and description of phenomena, such as sustainability transitions, providing knowledge for societal decision makers on how to best understand and approach analyzed problems. Yet, there are increasing calls to advance transdisciplinary as well as transformative, action-oriented approaches to science (Fazey et al., 2018). Thus, forms of science are called for that engage more openly in contributing to societal change, prescribing potential solutions, and collaborating more intensely with societal actors and beyond disciplinary boundaries, when addressing real world problems (e.g., transdisciplinarity, Lang et al., 2012; action research, Reason & Bradbury, 2001; transformative research, WBGU, 2011). The latter form of research, which actively en-

gages with transformation, is the subject of intense debates (e.g. Schneidewind, 2015). These revolve around dealing with normativity in doing transformative science, as well as around the roles research(ers) can legitimately and effectively play vis a vis concrete real world challenges, and governing related societal change processes.

In this thesis, I follow the call for more transformative and transdisciplinary forms of research to engage with societal transitions. Thus, I focus my research on the methods and processes of transdisciplinary collaboration which contribute to the facilitation of transformations of societal systems. In so doing, I build on investigations regarding the role of agency (e.g., actions of individuals and groups) in shaping and transforming the systems in question, as well as on the desired, normative goal of the transition, namely sustainability. Thus, transdisciplinary collaboration, agency and sustainability are the main research themes in this thesis.

Identified research gaps, core research question and objectives (based on Chapter 1, modified)

Transition management as a particular form of prescriptive sustainability transitions research is in the focus of the thesis. It is one popular approach of reflexive governance, and provides a recent and salient example of transformative and transdisciplinary research approaches to societal transitions. The approach purports to deploy reflexivity and learning as strategies to constructively deal with the complex, open ended, uncertain, and ambiguous nature of sustainability transitions. It includes a focus on agency and questions of facilitating transitions, and therein links transformation science and transformative science (WBGU, 2011). The core tool in transition management is the transition arena, a protected space for social learning that is created in a transdisciplinary process. In it, participants meet outside of their usual habits and roles and engage in a deliberative process and transformative action regarding a specific persistent societal challenge.

Reflecting the state of the art in transition management and the foundational multi-level perspective made some interrelated research gaps explicit. They revolve around the normative, sustainability dimension of sustainability transitions. The multi-level perspective as a knowledge-first approach (Miller, 2013), is by definition not concerned with addressing normative issues. Its lack of a concrete idea on facilitating science-society collaboration addressing normative issues appears plausible. Nevertheless, the multi-level perspective also lacks conceptual understandings that would allow for analyzing the particular nature of sustainability transitions. This is true, with regard to analyzing which forms of agency contributes to sustainability transformations. As it does not include a more elaborate concept of sustainability, it also prevents discerning a sustainability transition from any other kind of transition.

Transition management as a process-oriented approach, inherits some of the difficulties of the multi-level perspective. Yet, scholarship has added conceptual and empirics-based ideas, which concern the development of agency, related to empowerment and learning, as well as a procedural perspective on sustainability. The understandings of the concrete transdisciplinary collaboration taking place within the transition arena should be enhanced. This could be done by elaborating action research methods that interrelate procedural and substantial sustainability aspects

and that build on insights from transition psychology. Respective roles of the engaged researchers and activities of tackling issues of fascinating transdisciplinary collaborations, require further attention.

Core research question and research objectives (based on Chapter 1, modified)

The focus of this thesis is on research *for* sustainability transitions – taking a transformative or process-oriented stance (Miller, 2013; Wiek and Lang, 2016) – and less on research *on* or *about* transitions. Thus, it aims towards improving sustainability transition research and contributing to its effectiveness. In doing so, it seeks to address the following core research question:

How can we better understand the transdisciplinary collaboration process by which transition management contributes to sustainability transitions, particularly regarding consideration of normative sustainability aspects, individual agency, as well as well creating and maintaining a societal learning space and the roles of researchers therein?

To address this question, I follow **three sub-objectives**, addressing gaps in different **core themes**:

- a. To achieve a psychologically enriched understanding of individual and sustainability related **agency** in conceptual and empirical understandings of transition management, taking social learning and empowerment as agency related core aspects into account
- b. To include normative considerations, namely **sustainability**, into transition management on conceptual and empirical levels with regard to substantive, procedural and intentional aspects
- c. To conceptualize and explore the **transdisciplinary collaboration** in transition management of creating an arena as an interactive learning space, and the roles of the researchers therein

Three interrelated steps, having complementary research focuses, are undertaken. This includes conceptual-theoretic framework development (I), empirical case study analysis of transition management projects (II), and research reflection on conceptual level as well as on applied methods and processes (III). The scale of the case studies is the community level, as an underexplored application area of transition management (cp. Wittmayer 2016).

Methodological reflection (based on Chapter 2, modified)

The results gained are of *scientific relevance* with regard to understanding transition research better (cp. Bergmann et al., 2005), e.g., in better understanding individual agency. In addition, *societal relevance* in terms of improving the actual practice of transition management is aimed for (cp. Bergmann et al., 2005). As I was not in charge of doing transdisciplinary and transformative research myself, my approach was to complement the action research-based perspective of the transition management researchers (e.g., Wittmayer, 2016), with more conceptual-theoretic as well as evaluative perspectives. I aimed to work towards integration on two levels: first, with regard to crossing over theories and concepts. And second, with regard to linking different forms of research (e.g., expert-

driven with participatory research). Furthermore, I wrote all articles together with coauthors from diverse disciplinary backgrounds and three of them in collaborations with researchers responsible for the transition management cases.

In summary, I used the following research forms and methods: For the *overall conceptual frame*, I relied on conceptual argumentation, theoretical cross-overs and expert literature reviews to understand phenomena more generally. For the *empirical transition management case studies*, I relied on participatory knowledge development. First, I built on literature reviews combined with triangulative empirical analysis and case studies. Secondly, I used case study comparison and thick description mostly oriented towards understanding case specifics. For *reflexive work on researchers' roles and the opening and maintenance of interactive space*, I blended expert and participatory knowledge contributions via literature reviews and qualitative data analysis from transdisciplinary pilot projects.

Portraits of the case studies (based on chapter 2, adapted from Schöpke et al. 2017)

Empirical work draws on the application of transition arenas as core instruments of transition management in two case studies at local level (see box 1) realized as part of the EU FP7 (ENV.2010.4.2.3-1 grant agreement number 265191) project InContext: Individuals in Context from 2010-2013.

Box 1. The case study communities (taken from Wittmayer et al. 2013, modified).

Finkenstein is located in Austria. It is one of the largest communities in Carinthia. About 8500 people live in Finkenstein, spread over about 28 villages, and settlements divided into a Slovenian-speaking minority and a German-speaking majority. The main economic sectors are tourism and (small) industry and agriculture. Societal challenges at the local scale include limited political participation, low social cohesion and over-individualization as well as un- or overused natural heritage. The focus of the community arena process was on quality of life. The vision is put into practice through action-oriented projects or deliberative processes in a number of working groups, e.g., on economics, sustainability and social issues, realizing various activities.

Carnisse is an urban neighbourhood in the city of Rotterdam, The Netherlands. Some 10,000 inhabitants live in Carnisse. It is known as a deprived neighbourhood, scoring low on a number of municipal indexes and marked by a high turnaround of inhabitants, who together represent about 170 nationalities. Severe budget cuts in the municipality are threatening the continuation of social work as well as community facilities. Societal challenges at the local scale include economic hardship, over-individualization, poor building stock, and a lack of social cohesion and public spaces. The focus of the community arena process was on the quality of life in the neighbourhood. The vision is put into practice by a group that aims to re-open one of the community facilities, a community centre and a related community garden under self-management.

The transition arena approach got adapted for local communities, thus then called community arena (Wittmayer et al. 2011). The deliberative process of the community arena includes a common problem framing, envisioning a

sustainable future as well as participatory back-casting to define concrete steps for realizing future visions. Setting up experiments so as to carry out these steps is part of the process. Once finished, the transition arena group presents their transition narrative to a broader public and reconnects it with political, social and economic realities (Wittmayer and Schöpke 2014); the group is its ambassador.

Overview on articles included in thesis (chapter 3)

In sum, I co-published five articles that are included in this thesis:

Chapter 4: F. Rauschmayer, T. Bauler, N. Schöpke (2015). *Towards a thick understanding of sustainability transitions—Linking transition management, capabilities and social practices*. In: *Ecological economics* 109, 211-221. This article develops a thick understanding of sustainability transitions as a meta-heuristic contributing systems, target, and transformative knowledge, including normative considerations and connecting individual agency and structural change within the different knowledge types. It therefore suggest complementing transition management approaches with the more descriptive practice theory and the more normative and individualistic capability approach.

Chapter 5: N. Schöpke, F. Rauschmayer (2017). *Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency*, *Sustainability: Science, Practice and Policy*, 10:1, 29-44. This article develops a behavioural model to orient sustainability transitions by enriching the capability approach developed primarily by Amartya Sen (1987a) and Martha Nussbaum (1993, 2000), with approaches from environmental psychology. Capabilities as freedoms to live a valuable life successfully are used to assess quality of life, providing a normative yardstick to measure impacts of sustainability governance. Enriched with psychology, the model allows to understand the motivational side of sustainability oriented agency and may found a new well-being model based on the freedom to behave pro-social/ sustainable.

Chapter 6: J.M. Wittmayer, N. Schöpke, F. van Steenberg, I. Omann (2014). *Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges*, *Critical Policy Studies*, 8:4, 465-485. This article investigates how transition management as action research can support understanding and addressing societal challenges and making sustainability meaningful locally, based on the cases of Finkenstein and Carnisse. Our main finding is that societal challenges, sustainability and sustainability transitions acquire meaning through practice and interactions in the local context. Action research can offer an interactive learning space in which alternative ideas, practices and social relations can emerge to further a sustainability transition.

Chapter 7: N. Schöpke, I. Omann, J.M. Wittmayer, F. van Steenberg, M. Mock (2017). *Linking transitions to sustainability: a study of the societal effects of transition management*. *Sustainability*, 9(5), 737. This article develops a framework to capture the social effects of transition management processes, namely empowerment, social learning and social capital development. Jointly, mentioned effects shall allow for reflexivity and innovation in developing

socially robust and contextualized solutions to sustainability challenges. The framework is used to empirically investigate the effects of the processes in Finkenstein and Carnisse. Results highlight possibilities to facilitate and assess societal effects, addressing sustainability as their inherent quality. A conceptual and empirical understanding of how social learning, empowerment and social capital contribute to a sustainability transition is provided.

Chapter 8: J.M. Wittmayer, N. Schöpke (2014). *Action, research and participation: roles of researchers in sustainability transitions*. Sustainability Science 9 (4):483–496. DOI 10.1007/s11625-014-0258-4. This article establishes an in-depth understanding of the roles of researchers in process oriented sustainability science. Ideal-type roles are specified based on activities of researchers when creating and maintaining space for societal learning. These roles are change agent, knowledge broker, reflective scientist, self-reflexive scientist and process facilitator. This role heuristic is used to explore the Carnisse case. In the analysis, implications for the self-reflexivity of researchers, role conflicts and potentials, and for the changing role of the researcher and of science in general are discussed.

Summary of results (based on chapter 9, modified)

Regarding a psychologically enriched understanding of individual and sustainability related **agency**, the main contribution made is to explicitly add individual agency to the multi-level-perspective. This allows to better understand transition dynamics as well as to increase the effectiveness of facilitations aiming to support sustainability transitions. This agency can be added in the form of a fourth, micro level, contributing to understand niche and regime level dynamics (see figure 2 below). As Geels (2011) rightly claims, the multi-level-perspective is ‘shot through’ with agency. This thesis contributes to making this role explicit by providing an understanding that corresponds to the overall research unit: sustainability oriented transitions. Thus, the thesis goes beyond ideas of rational, self-interested actors that underlie understandings of agency in current multi-level-perspectives.

Therefore, individual agency is conceptualized as the behavioral freedoms of actors. To better understand how these freedoms are used, the thesis draws on the capability approach that highlights self- and other types of motivations of behavior and enrich it with environmental psychology. The reliance on the concept of freedom places emphasis on the idea of conscious behavior and free will. This is complemented by the concept of taking responsibility, which relates to the capacity and motivation of actors to use gained agency not only for themselves, but also for other types of motives such as sustainability. Based on the developed behavioral model (chapter 5) and the concepts of social effects (chapter 7), it becomes clear that various psychological factors, including pro-social and even altruistic motivations, sustainability awareness and the perceived self-efficacy, are important. They allow individual agency to be captured and strengthened, as addressed in transition management, in the context of sustainability transitions.

The understanding of agency as a combination of behavioral freedom and the willingness and capacity to take responsibility also for other motives, enables an understanding of individual actors as initiators of alternative, more sustainable action. It adds a normative orientation when individuals play a role in consciously creating niches,

building on new principles of action (Göpel 2016) and developing radical innovations (Westley *et al.* 2011). It also expands our understanding of transition management as an emancipatory, democratic endeavor of reflexive governance centring the freedom and responsibility of actors for achieving sustainability transitions.

Analysis of the two transition management cases (chapter 7) empirically grounded the conceptualizations of individual agency and related social effects. Both cases represent typical transition management cases (see chapter 2 on methods), though focusing on local applications. A primary result here is the observation that the community arenas in both cases contributed to the development of social learning, empowerment and social capital which in large part related to sustainability awareness, motivations or capacities to act sustainably. Thereby, social learning had a core function to increase sustainability oriented decision-making and action. Overall, effect development proceeded hand in hand with the development of alternative ideas, practices and social relations in both cases studied (chapter 6). Ideas, practices and social relations could be associated with the transdisciplinary community arena process (e.g., open facilitation, experimentation, reflexive questions). This provides additional empirical support for the effectiveness of the approach used to contribute to the development of sustainability related agency and action.

Regarding the normative considerations, namely **sustainability**, core results are the following: The emphasis on procedural sustainability prevalent in transition management can be complemented with intentional and substantial perspectives on sustainability, creating synergies. Questions about the right perspective on sustainability in sustainability transitions research, are then less about an 'either-or', but rather an 'and' approach. This thesis thus proposes an approach to understanding sustainability that is consistent with the dialectical nature of sustainability transitions, combining an open-ended process of fundamental change with an intended normative orientation – and their facilitation. Empirical work shows how to both facilitate the development of sustainability related social effects (social learning and empowerment), and to propose ways to assess the success of such facilitation (chapter 7). That is, key aspects of procedural sustainability are enriched to also capture intentional sustainability. On a conceptual level, they could be used to capture substantial sustainability as well, linking to empowerment and capabilities. Analysis also revealed the effectiveness of contextualizing universal sustainability morality and large scale societal challenges by using reflexive questions and experiments in the community arena process (chapter 6).

Aiming for increased well-being and quality of life provides a broad entry point for normative orientations in transition management processes and allows to implicitly relating the process to sustainability, while starting from pressing societal challenges at the local level. The aim of enhancing quality of life was understood as being sufficiently open, to not predetermine the agenda of the community arena, but to provide space for a learning journey and high ownership of process and content by participants. In both case studies, this approach proved successful in bringing in the fundamentals of universal sustainability into the process: meaning the consideration of the interplay of local well-being with social and ecological aspects, geographically distant places and longer-term developments. Yet, as suitable and broadly fitting as this entry point to addressing sustainability in community arena processes appears, the framings and facilitation of the processes to capitalize on well-being is critical as a possible hinge. That is, to not run the risk of replacing one buzzword (sustainability) with another perhaps even more fuzzy one (well-being),

and thus lose the normative orientation of the overall process. While this thesis provides exemplary evidence on how this can work in transition management practice, further methodological and empirical work is needed to develop a more robust understanding.

Conceptualizing sustainability on the basis of the capability approach does, in principle, allow for understanding the impacts of transition management on the capabilities of current (and future) generations to live a valuable life. Empirically, increases in this capability can be assumed to have happened with participants of community arena processes, as empowerment was strongly reported (chapter 7). Through proposing a capability based behavioral model, this research builds on the idea of a double-dividend, win-win-win effect in facilitating sustainability (cp. Jackson 2005). That is, transition management contributes to increase well-being of community arena participants by increasing their capabilities and, at the same time, makes a use of these capabilities for enhancing sustainability. This potentially benefits further people in other places or later in time. When formulating this idea as the increasing in the freedom to behave pro-socially, this thesis points out the fundamentally emancipatory character of related transition management attempts, working towards social learning instead of restricting or influencing behavior (cp. Barth 2012). Again, respective learning and empowerment effects related to sustainability intents have been traced in the cases studied – pointing towards the effectiveness of the applied community arena process (chapter 7). Limitations exist with regards to assessing the substantial sustainability outcome of the studied cases; that is, their longer term and larger scale impact.

Regarding the **transdisciplinary collaboration** in transition management of creating an arena as an interactive learning space, and the roles of the researchers therein, core results are the following: The core conceptual and empirical contribution is the community arena methodology, which forms part of process oriented sustainability science. The arenas core activity is to establish and maintain an interactive space (an agora) at the intersection of science and society, to allow for societal learning (chapter 6,7,8 and 4). In this space, a threefold action research process is applied in the form of open-process design, future envisioning and practical experimentation – combining a transdisciplinary process and a normative agenda. Through this process directed towards contextualization and systematic exploration of visions and action, sustainability acquires localized meanings. This process creates alternative ideas, practices and social relations in contrast to dominant regime patterns. In creating these alternatives, participants are guided to address societal challenges locally and potentially contribute to sustainability transitions.

The interactive spaces as the core of the community arena were dynamic and temporal, coming into existence through the dialogical encounters between people in facilitated collaborations of science and society. Therein, the community arena method allowed the abstract idea of an interactive space to be embedded in concrete geographical, social and political contexts, by making terms and processes explicit and adapting them to the local context. Experience from the case studies show how contextualizing sustainability takes place as a collective sense making process. This takes form as a transdisciplinary process with a normative agenda, and has the character of an inherently political act, requiring the self-reflexive and critical attitude of researchers when facing tensions and dilemmas related to finding news forms of social relationships and practices.

Transdisciplinary transition management is an ideal type of process oriented sustainability science, that highlights the value and challenges of experiments and action for research aiming to support sustainability transitions. The developed community arena methodology allowed establishing and maintaining a space for interaction and mutual learning between scientific and societal actors. In this, the thesis has identified a number of key issues that differ markedly in comparison to more knowledge first oriented approach in sustainability science (cp. Miller 2013). These issues include power, sustainability, action and ownership. Action as it is for instance part of transition experiments became apparent as a primary source to actually achieve societal change. In addition, it functioned as a key source of learning about effective solutions strategies for societal challenges and contributing to empowering participants (chapters 6 and 7). When relying on the power of experimentation and taking action, transition management sets a particular focus in contrast to other process-oriented approaches of sustainability science rather producing policy recommendations and strategy derivation (Wiek and Lang 2016). This engagement in real-world action did produce value in the cases studies contributing to sustainability transitions locally. But, it as well produced particular challenges as shown by in the need to engage with local political and power structures (for instance local administrations, chapter 6).

To further understand the actual practice of researchers who open and maintain societal learning spaces, this thesis proposes a researchers' role heuristic, including a number of ideal type roles for researchers (*based on Wittmayer and Schöpke 2014, chapter 8*). Roles are conceptualized based on a number of activities researchers perform to address key issues when creating and maintaining learning spaces. Researcher activities to address issues fundamentally differ in process oriented sustainability research in comparison to knowledge first approaches (cp. Miller 2013). Thus, the role heuristic also contributes to further conceptualize process oriented sustainability science. The ideal type roles are the following (taken from *Wittmayer and Schöpke 2014, strongly modified*):

- The researcher as *reflective scientist* (cp. Pohl et al. 2010) performs a number of activities closest to what is conventionally understood as 'research'. These include systematically collecting, analysing, interpreting and reporting data from an observer point of view, producing scientific knowledge.
- The role designation of *process facilitator* (cp. Pohl et al. 2010) refers to the activity of facilitating the learning process. In the context of process-oriented sustainability science, this role includes the initiation of the process, the selection of participants, and the facilitation of concrete short-term actions.
- As a *knowledge broker* (cp. Miller et al. 2013), the researcher mediates between different perspectives. He/she also provides space for critical reflection and engages in making sustainability relevant and tangible in different contexts.
- The role of *change agent* (cp. Miller et al. 2013) is not 'only' initiating and facilitating learning processes or experiments, but this role also includes the explicit participation of the researcher in processes aiming to address real-world problems.
- The last role is the *self-reflexive scientist*, which refers to being reflexive about one's positionality and normativity, and to seeing oneself as part of the dynamic that one seeks to change.

The role heuristic proved useful to explain the performed activities of researchers. It was shown how researchers' activities allowed for the key issue of creating interactive space to be handled. Sustainability, for instance, was addressed in various activities, e.g., by providing sustainability related information and by asking reflexive questions. The heuristic helped to draw out conflicting aims of different researcher roles performed in Carnisse, and highlighted potentials to handle these conflicts, by using different roles as resources and by searching for suitable combinations to perform different roles and respective activities.

Another contribution of the thesis is an empirically tested toolkit for the structured assessment of the social effects of the community arena approach, with a particular focus on the intersection of key mechanisms of change (learning, empowerment and social capital development) and their relation to sustainability (chapter 7). The toolkit consists of an assessment framework depicting societal effects of transition management more broadly, the operationalization of social effects and outputs of transition management for the local level – and a suggested triangulative approach to data generation and interpretation. It contributes to closing the gap of missing assessment frameworks in transdisciplinary transition management, particularly with relation to sustainability.

Synthesis of results: ten principles for sustainability transition management (chapter 9)

A basic insight of this thesis is that the tension between facilitating a transition as an open-ended process and guiding this process towards a desired future, sustainability, cannot be resolved. It is constitutive to sustainability transition management. However, similar to the idea of a koan in buddism, by working with it, insight and development can emerge. Accordingly, and building on integrated results on the themes of agency, sustainability and transdisciplinary collaboration, I do propose ten principles for sustainability transition management. They are supposed to complement tentants formulated for transdisciplinary sustainability research and transition management to guide a successful performance (e.g. Lang et al. 2012, Loorbach 2010). The principles are based on the premise to draw on three different knowledges, systems, target and transformation knowledge, to orient sustainability transition management by providing an understanding of the system in question, the desired future and the feasible ways of moving from the present to the desired future.

- (1) Take into account three perspective on sustainability, the substantial, intentional and procedural, when aiming to facilitate sustainability transitions.
- (2) Add a micro level of individual agency to the multi-level perspective and aim to think big and small, connecting the bigger and the smaller picture. Thus, work across scales, such as by expanding learning and empowerment from individual participants to arena groups and surrounding communities. Aim to address universal sustainability and larger scale societal challenges on local level and relate local approaches back to the larger scale.
- (3) Understand individuals as the subjects of transitions, the origin of potentially radical innovations, of learning and unlearning and deviating from mainstream practices at regime level. Relate to motivations, awareness,

values, emotions and knowledge – thus the full person – when addressing individuals in transition management.

- (4) Search for synergies in combining both the normative orientation and the process of change, for instance by working towards social effects inherently related to sustainability.
- (5) Aim to facilitate a balanced development of both, increased freedom and empowerment of participants and their willingness and capacities to take responsibility for sustainability. This corresponds to the character of a sustainability transition of combining a process of change and a normative orientation based on principles of justice.
- (6) To facilitate both, empowerment and responsibility, use reflection, experimentation and dialogue to establish connections and awareness: amongst participants and beyond, with individual and group values and purposes, with the local geographical, social, political context as well as with places and spaces affected by local action or non-action.
- (7) Draw on the capacity of listening and asking reflexive questions as process facilitator, knowledge broker and self-reflexive scientist to facilitate the learning journey towards rendering sustainability meaningful locally and developing ideas, practices and relations to address societal challenges.
- (8) Embrace action and experimentation as the only means to actually change something – and as a primary source of learn on possibilities of realizing envision futures (cp Wittmayer 2016). Therefore, draw on experiences from action research, proposing action as the only way to change history (Kemmis 2010).
- (9) Consciously apply different and embrace unconventional roles of researchers, using roles as resources and possibilities, and find an appropriate stance towards the change agent role. Think about distributing roles within the research team and beyond, to secure fit and needed expertise and practice self-reflexivity to for instance deal with the (implicit or explicit) normative stance of all researchers' roles and to acknowledge the (limited) roles of researchers to facilitate change.
- (10) Acknowledge and work the political dimension of opening and maintaining a space for societal learning and initiating a collective sense-making process that aims to contribute to societal change.

References

- Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2012). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, 3(2), 112–117. <https://doi.org/10.1038/nclimate1666>
- Avelino, F. (2009). Empowerment and the challenge of applying transition management to ongoing projects. *Policy Sciences*, 42(4), 369–390. <https://doi.org/10.1007/s11077-009-9102-6>
- Barth M. (2012). Social Learning Instead of Education the Other. *GAIA - Ecological Perspectives for Science and Society*, 21(October 2011), 232–235. Retrieved from http://apps.webofknowledge.com.ezp.sub.su.se/full_record.do?product=WOS&search_mode=GeneralSearch&qid=16&SID=T2ZDUghLanDu5FHpOCR&page=1&doc=5
- Bergmann, M., Brohmann, B., Hoffmann, E., Loibl, M. C., Rehaag, R., Schramm, E., & Voss, J.-P. (2005). Quality Criteria of Transdisciplinary Research. A Guide for the Formative Evaluation of Research Projects. Institut Fuer Sozial-Oekologische Forschung (ISOE), 5–75. Retrieved from <http://www.isoe.de>
- Fazey, I., Schöpke, N., Caniglia, G., Patterson, J., Hultman, J., van Mierlo, B., ... Wyborn, C. (2018). Ten essentials for action-oriented and second order energy transitions, transformations and climate change research. *Energy Research and Social Science*, 40. <https://doi.org/10.1016/j.erss.2017.11.026>
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>
- Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399–417. <https://doi.org/10.1016/j.respol.2007.01.003>
- Jackson, T. (2005). Live better by consuming less?: is there a “double dividend” in sustainable consumption?. *Journal of Industrial Ecology*, 9(1-2), 19–36.
- Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management*, 10(2), 175–198. <https://doi.org/10.1080/09537329808524310>
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., ... Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(SUPPL. 1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Loorbach, D. (2007). Transition management. New mode of governance for sustainable development. ERASMUS University Rotterdam. Retrieved from <papers2://publication/uuid/AF318B66-F63F-4953-8EFE-62B65EDC2149>

- Loorbach, D. A. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance, An International Journal of Policy, Administration, and Institutions.*, 23(1), 161–183. <https://doi.org/10.1111/j.1468-0491.2009.01471.x>
- Miller, T. R. (2013). Constructing sustainability science: Emerging perspectives and research trajectories. *Sustainability Science*, 8(2), 279–293. <https://doi.org/10.1007/s11625-012-0180-6>
- O'Brien, K. (2012). Global environmental change II. *Progress in Human Geography*, 36(5), 667–676. <https://doi.org/10.1177/0309132511425767>
- Olsson, P., Galaz, V., & Boonstra, W. J. (2014). Sustainability transformations: a resilience perspective. *Ecology and Society*, 19(4), art1. <https://doi.org/10.5751/ES-06799-190401>
- Pohl, C., Rist, S., Zimmermann, A., Fry, P., Gurung, G. S., Schneider, F., ... Wiesmann, U. (2010). Researchers' roles in knowledge co-production: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Science and Public Policy*, 37(4), 267–281. <https://doi.org/10.3152/030234210X496628>
- Reason, P., & Bradbury, H. (2001). *Handbook of action research Participative Inquiry and Practice*. Peter. Sage. <https://doi.org/0432>
- Rotmans, J., Kemp, R., & Van Asselt, M. (2001). More evolution than revolution: transition management in public policy. *Foresight*, 3(1), 15–31. <https://doi.org/10.1108/14636680110803003>
- Schäpke, N., Omann, I., Wittmayer, J. M., van Steenberg, F., & Mock, M. (2017). Linking transitions to sustainability: A study of the societal effects of transition management. *Sustainability (Switzerland)*, 9(5). <https://doi.org/10.3390/su9050737>
- Schneidewind, U. (2015). A plea for more diversification in science governance. Looking back at research policy in the year 2014 | Für eine erweiterte Governance von Wissenschaft: Ein wissenschaftspolitischer Rückblick auf das Jahr 2014. *GAIA*, 24(1), 59–61. <https://doi.org/10.14512/gaia.24.1.12>
- Smith, A., Voß, J. P., & Grin, J. (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research Policy*, 39(4), 435–448. <https://doi.org/10.1016/j.respol.2010.01.023>
- WBGU, G. A. C. on G. C. (2011). *A Social Contract for Sustainability*. Retrieved from <http://www.wbgu.de/en/flagship-reports/fr-2011-a-social-contract/>
- Wiek, A., & Lang, D. J. (2016). Transformational Sustainability Research Methodology. *Sustainability Science*, (November 2009), 31–41. https://doi.org/10.1007/978-94-017-7242-6_3

Wiek, A., Talwar, S., O'Shea, M., & Robinson, J. (2014). Toward a methodological scheme for capturing societal effects of participatory sustainability research. *Research Evaluation*, 23(2), 117–132. <https://doi.org/10.1093/reseval/rvt031>

Wittmayer, J. M. (2016). *Transition Management , Action Research and Actor Roles : Understanding local sustainability transitions*. ERASMUS University Rotterdam.

Wittmayer, J. M., & Schöpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability Science*, 9(4), 483–496.

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&

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1 INTRODUCTION

1.1 CONTEXT: SOCIETAL CHALLENGES, SUSTAINABILITY TRANSITIONS, GOVERNANCE AND RESEARCH

More than 20 years after the international community agreed upon sustainable development as a major principle to jointly strive for (WCED, 1987; Janerio, 1992), the environmental, social and economic challenges it addresses have not lost their relevance. The impact of human actions on the earth systems has reached a level equivalent to a geological force (Crutzen, 2002), endangering the safe operating space under which humanity has been living during the Holocene (Rockström *et al.*, 2009). Fundamental societal challenges, such as climate change, biodiversity loss and poverty, persist despite continuous attempts to resolve them, e.g. the SDGs (United Nations General Assembly, 2015).

These societal challenges are characterized as being highly complex, deeply interrelated, subject to numerous uncertainties, and with their impacts unfolding over long time horizons. They are ‘wicked’, ‘persistent’ or ‘ill-defined’ problems, which are perceived, defined and valued differently as they persist over time (Rittel and Webber, 1973; Grin, Rotmans and Schot, 2010). They continue to persist because they are related to the organization of societal systems – and thus deeply embedded in the social and material structure of society itself (Schuitmaker, 2012). Long-term societal stability and wellbeing will therefore depend on pro-actively addressing environmental pressures, social equity and ensuring viable economic activity in tandem.

Changes in societal systems, including human-nature interrelations, frequently occur. However, the prevalence of incremental and responsive adjustments to the shifting landscape of human-nature interrelations, are not considered substantial enough by many scholars to cope with today’s sustainability challenges (Markard, Raven and Truffer, 2012). Therefore transitions, representing radical and structural changes in societal (sub)-systems, have attracted large interest in the scientific community and beyond in recent years (Clark, 2000; Berkhout, Smith and Stirling, 2004; Geels and Schot, 2007; Rotmans and Loorbach, 2009; Grin, Rotmans and Schot, 2010; Markard, Raven and Truffer, 2012; United Nations General Assembly, 2015; WBGU, 2016). Transition research emerged from an interdisciplinary field of study combining innovation studies, history and ecology, with sociology, political and governance studies. It proposes that ‘wicked’ or ‘persistent’ problems require a fundamental change in the structures, cultures and practices of a societal system, for the system to become (more) sustainable (Frantzeskaki and de Haan, 2009). The non-linear long-term processes of transformative change are referred to as sustainability transitions (Grin, Rotmans and Schot, 2010; Markard, Raven and Truffer, 2012).

Sustainability transitions combine a process of radical change (the transition) with a normative direction of change (sustainability). These transitions ‘can be described as a set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology, and belief systems’ (Rotmans, Kemp and Van Asselt, 2001, p. 16). Transitions are complex processes marked by uncertainty. Thus, transitions cannot be imposed on the system (Brown *et al.*, 2012), but emerge from complex feedback loops within the system. Besides complexity, the political nature of the transition processes and related power struggles, inevitably impedes the linear planning of transitions (Avelino, 2009; Farla *et al.*, 2012). As such, sustainability transition research has incorporated a societal and cultural dimension (Adger *et al.*, 2012; Hackmann, Moser and

St. Clair, 2014), with agency playing a core, yet under researched role (Olsson *et al.*, 2014). This particularly concerns the role of human actors in enacting transformation (O'Brien, 2012).

Traditionally, science has focused on the analysis and description of phenomena, such as sustainability transitions, providing knowledge for societal decision makers on how to best understand and approach analyzed problems. Yet, there are increasing calls to advance transdisciplinary as well as transformative, action-oriented approaches to science (Fazey *et al.*, 2018). Thus, forms of science are called for that engage more openly in contributing to societal change, prescribing potential solutions, and collaborating more intensely with societal actors and beyond disciplinary boundaries, when addressing real world problems (e.g., transdisciplinarity, Lang *et al.*, 2012; action research, Reason & Bradbury, 2001; transformative research¹, WBGU, 2011; cp. R.W. Scholz, 2017;). This includes calls for researchers to enact their societal responsibilities (Cornell *et al.*, 2013).

The aim of transition research² is to develop analytical tools to understand societal systems complexity, as well as processes and mechanisms of innovation. In the research on transitions one can distinguish between descriptive, analytical (Bergek, Jacobsson, Carlsson, Lindmark, & Rickne, 2008; Geels & Schot, 2007; Smith, Voß, & Grin, 2010) and prescriptive studies of transitions (Kemp, Schot and Hoogma, 1998; Rotmans, Kemp and Van Asselt, 2001; Loorbach, 2007). Therein, at least four core strands³ of transition research can be differentiated (Markard, Raven and Truffer, 2012). Technological innovation systems (Bergek *et al.*, 2008) and the multi-level perspective (MLP) on historical socio-technical transitions (Geels & Schot, 2007) focus on providing a descriptive-analytical study of transition dynamics, as processes of radical and structural change. Strategic niche management (Kemp, Schot and Hoogma, 1998), as well as transition management (Rotmans, Kemp and Van Asselt, 2001; Loorbach, 2007), build upon the respective insights of the former approaches. They focus on the governance of transitions, including agency and how actors can influence transition processes, and are thus of a more prescriptive nature.

The latter form of research which actively engages with transformation, is the subject of intense debates (Strohschneider, 2014; Grunwald, 2015; Schneidewind, 2015). These debates revolve around aspects of dealing with normativity in doing transformative science (e.g., how are values and the normative goals of research and transitions negotiated?), as well as around the roles research(ers) can legitimately and effectively play vis a vis concrete real world challenges, and governing related societal change processes. Additionally, the focus on solutions to societal challenges has been accused of conforming to solutionism, blurring the apparent separation of research and

¹ When using transdisciplinary modes of research and engaging with normative questions, I use a notion of transformative research that differs from understandings focusing on the transformative impact of disciplinary frontiers and foundational science, e.g., as described by the National Science Foundation; https://www.nsf.gov/about/transformative_research/

² Other approaches sharing similar interests are resilience thinking (Folke *et al.*, 2002; Olsson, Galaz and Boonstra, 2014) and transformations thinking (Westley *et al.*, 2011; O'Brien, 2012; Feola, 2015).

³ Other scholars have mapped the field of sustainability transition studies based on underlying narratives of change (e.g. (Luederitz *et al.*, 2017) or with regard to their adherence to larger schools of thought (like idealist, institutionalist and technological innovation focused) (e.g. (Schneidewind and Augenstein, 2016)). Feola performs a very comprehensive mapping of diverse approaches in the field of transformations and transition studies (Feola, 2015).

politics, while depreciating foundational science (Strohschneider, 2014). Thus, while there are increasing calls for prescriptive forms of research engaging with sustainability transitions and their governance, numerous issues deserve further exploration and clarification.

On a foundational level, the governance of sustainability transitions is concerned with the possibilities of actors sparking a transition, and to influence and facilitate it in the direction of sustainability (Grin, Rotmans and Schot, 2010). Research can contribute three types of knowledge considered relevant to guide a governance of sustainability transitions (Hirsch *et al.*, 2006; Jahn, Bergmann and Keil, 2012; Rauschmayer, Bauler and Schöpke, 2015). While systems knowledge represents the current state and functioning of a societal system in question, target knowledge represent the desired (future) state of this system, and transformation knowledge represents knowledge of 'how to' move from the current situation to the desired one. Scholars have argued, that while science has contributed largely to a better understanding of systems, transformative knowledge is strongly lacking (Fazey *et al.*, 2018). In addition, target knowledge as the consideration of normative orientations in prescriptive transition research, requires more scholarly attention (Rauschmayer, Bauler and Schöpke, 2015; Turnheim *et al.*, 2015).

In this thesis, I follow the call for more transformative and transdisciplinary forms of research to engage with societal transitions. Thus, I focus my research on the dimension of 1) transformation knowledge, and the respective role of transdisciplinary and transformative research. That is, methods and processes of **transdisciplinary collaboration** which contribute to the facilitation of transformations of societal systems. In so doing, I build on investigations in the two other knowledge areas with a focus on current debates. These include 2) systems knowledge regarding the role of **agency** (e.g., actions of individuals and groups) in shaping and transforming the systems in question, as well as 3) target knowledge on the desired, normative goal of the transition, namely **sustainability**. Thus, transdisciplinary collaboration, agency and sustainability are the main research themes in this thesis.

My overall aim in this thesis is to contribute to the enhancement of transdisciplinary sustainability transitions research. I aim to do so with particular regard to developing a better understanding of transdisciplinary collaborations as facilitators of sustainability transitions, the role of human actors in transitions, and the explicit consideration of the normative aim of transitions, namely sustainability.

Pursuing this goal, I focus on a particular form of prescriptive sustainability transitions research called transition management. Transition management is one popular approach of reflexive governance⁴, and provides a very recent

⁴ Although transition management and adaptive management focus on different types of systems (socio-technical and socio-ecological), they share a reflexive governance character. Bridges between transition management and resilience based reflexive governance approaches, such as adaptive management (Tompkins and Adger, 2004; Westley *et al.*, 2013), have been built (Westley *et al.*, 2011). This highlights the relevance of the present thesis for adaptive management, but may not come to fruition without a detailed analysis (Smith and Stirling, 2010) – which is beyond the scope of this thesis.

and salient example of transformative and transdisciplinary research approaches to societal transitions. The approach purports to deploy reflexivity and learning as strategies to constructively deal with the complex, open ended, uncertain, and ambiguous nature of sustainability transitions. It includes a focus on agency and questions of facilitating transitions, and therein links transformation science and transformative science (WBGU, 2011). In contrast to strategic niche management, the second approach of prescriptive sustainability transition studies, it has witnessed numerous applications through the implementation of transdisciplinary projects. In the following, I outline the principles of transition management in relation to the underlying multi-level-perspective, to provide the basis for reflecting on the state of the art, as well as existing gaps in consecutive sub-chapters.

This introductory chapter 1 poses the following structure: Section 1.1 provides the wider context of this thesis, elaborating on the relation between sustainability transitions, their governance and related research sections, and highlights current development and provides the motivation underpinning the overall aim of this thesis. Section 1.2 gives a brief introduction to transition management and the multi-level perspective as the overall conceptual background of the research. The following Section 1.3, presents the transition management approach in more detail, with a focus on the three areas of key interest in this thesis: namely agency, normative orientations towards sustainability, and science-society collaborations to facilitate sustainability transitions. Next, the state of the art, as well as existing research demands, are elaborated. Then, building on Section 1.3, the final Section 1.4 presents the key research questions and the overall structure of the thesis.

1.2 CONCEPTUAL BACKGROUND: TRANSITION MANAGEMENT AND MULTI-LEVEL PERSPECTIVE

Transition management builds on a particular understanding of how to analyze and describe transitions – the multi-level perspective (MLP). The core logic of MLP is to differentiate three main levels when analyzing change. These levels are the niche, the regime and the landscape (Geels, 2002; Rip & Kemp, 1998).

The three levels differ in their degree of stability and the possibility of actors influencing them (Rauschmayer, Bauler and Schöpke, 2015). Socio-technical niches are understood to describe the origin of activities which differ to mainstream practices. In niches, small groups of actors experiment with potentially radical innovative activities (Geels & Schot, 2007). Niches are relatively unstable and dynamically changeable. The regime consists of a ‘conglomerate of structure (institutional and physical setting), culture (prevailing perspective), and practices (rules, routines, and habits)’ (Rotmans and Loorbach, 2009). Bluntly put, it represents the mainstream way of doing something. The regime is dynamically stable, and may be influenced by actors to a certain extent. The landscape is highly stable and considered to be out of reach of influence from actors and groups. This includes global trends such as climate change and urbanization, as well as broadly shared norms such as human rights or free trade (Geels, 2002; Rip & Kemp, 1998).

Scholars consider a transition as a profound change of the regime as the mainstream way of doing something, from one configuration of structure, culture and practices ‘that works’, to another one ‘that works’ (Rauschmayer, Bauler

and Schöpke, 2015). 'Works' here refers to configurations of the different elements in such a way, that their interaction and joint functioning as components of a broader system is possible. Transitions 'do not come about easily, because existing regimes are characterized by lock-in and path dependence, and oriented towards incremental innovation along predictable trajectories' (Geels, 2010, p. 495).

Basic dynamics that may cause a transition to happen are firstly landscape developments that put pressure on the regime (top down); secondly, upscaling niches that replicate or translate widely, while related alternative socio-technical arrangements gain influence (bottom up); and thirdly the integration of innovations from niches into the regime (Rotmans & Loorbach, 2010; see F. W. Geels & Schot, 2007 for more details). The MLP does allow for the analysis and description of socio-technical change dynamics and has been widely applied (Rauschmayer, Bauler and Schöpke, 2015). At the same time, critiques have emerged, e.g., addressing the MLPs' ignorance of aspects of agency (Avelino, 2011; Geels, 2011; Smith, Stirling, & Berkhout, 2005).

Besides being used to structure the analysis of transitions, a number of intervention approaches have been built based on MLP insights (Meadowcroft, 2011). This includes approaches to facilitate innovations to support a transition towards sustainability (Grin, Rotmans and Schot, 2010). While transitions may appear frequently, their historical analysis has shown that their contribution to sustainability cannot be taken for granted (Rotmans and Loorbach, 2009). As such, fundamental changes in the structures, cultures, and practices of the present societal and economic system are necessary conditions for change towards sustainability. Yet, by themselves, they are not sufficient conditions for any system to become (more) sustainable (Frantzeskaki & De Haan, 2009).

'Rotmans *et al.* (2001) started to refer to the targeted fostering of sustainability transitions as transition management' (Rauschmayer, Bauler and Schöpke, 2015, p. 213). Transition management research (Loorbach, 2010) is based on action research (Bradbury and Reason, 2003), as well as integrated assessment (Rotmans, 1998), following the logic of post-normal science (Funtowicz and Ravetz, 1993), mode-2 science (Gibbons *et al.*, 1994; Nowotny, Scott and Gibbons, 2001), transdisciplinary research (Hirsch *et al.*, 2006; Lang *et al.*, 2012) and sustainability science (Kates *et al.*, 2001). It is applied in transdisciplinary collaborations between researchers and other societal actors (Scholz, 2017). Rather than assuming that societal change processes can actually be 'managed' as the name implies, transition management holds that sustainability transitions cannot be governed in a regular way. Due to their open-endedness, non-linearity and uncertainty, they require a reflexive and explorative way of governing, aimed at societal learning.

The approach builds on a number of tenets, guiding principles for reflexive governance of complex socio-technical systems and their change. Tenets include, for instance, that process and content cannot be separated in governance, long-term thinking is used to frame short-term policy, objectives should remain flexible and adjustable, timing is crucial, the creation of space for actors to innovate is a core characteristic, as well as a focus on social learning on different perspectives and options, and finally participation (Loorbach, 2010).

These tenets are translated into interrelated activities at strategic, tactical, operational, and reflexive levels (Loorbach, 2010). Strategic activities include envisioning, strategic debate, the formulation of long-term goals, setting of norms, and long-term thinking. Tactical activities concern interest-driven steering activities at the regime level with a mid-term horizon, related to 'rules and regulations, institutions, organizations and networks, infrastructure, and routines' (Loorbach, 2010, p. 169). Operational activities relate to short-term actions and experimentation, operationalising and enacting 'new structures, culture, routines, or actors' (ibid). Reflexive activities concern evaluation, assessment and monitoring of other activities and their effects, e.g., on societal change. Jointly, these activities compose a transition management framework which can be applied at various levels, from the project to the program to the societal systems level. Depending on the demarcation of the system of interest, the activities are further specified.

The above described four-step framework is translated into the so-called transition management cycle, which includes four interrelated phases (Loorbach, Frantzeskaki, & Lijnis Huffenreuter, 2015). In the strategic first phase, the problem in question is structured, a vision for future development is drafted and the core tool of transition management in practice – the transition arena – is organized. In phase two, images of a desired future are developed, as well as a transition agenda and related transition pathways. Phase three includes setting up and carrying out transition experiments and establishing supporting networks. Phase four reflects and evaluates experiments and their results and adjusts problem structuring, vision and pathways, as well as networks.

As a key instrument to facilitate radical change, transition management focuses on the systematic development and empowerment of alternatives in societal niches, and works with so-called frontrunners as engaged and creative individuals (Frantzeskaki, Loorbach and Meadowcroft, 2012). Transition management aims to provide space and resources for experimentation at a sufficient distance from the dominant regime, which can play the role of empowering niches and allowing for the development of alternatives (Avelino, 2011). While transition management may build on existing niches, its specificities are highlighted even more when it is used to create transition arenas as proto-niches and develop them further to influence the regime (Loorbach, 2007, 2010).

Thus, the core instrument in transition management is the opening of a protected space (the transition arena) to develop, experiment with and nurture alternatives. In the concrete transition management process these participating frontrunners come together in a series of meetings, forming a transition arena. As a first step, the arena develops a joint problem description and structuring for the system in question, e.g. a city, a sector or a region (Loorbach & Rotmans, 2010). Based on a shared understanding of the present, a common sustainable future is imagined (step 2). Building on this vision, possible pathways to realize it are explored, and concrete steps for the realization are backcasted. Thereby long-term vision and short-term actions are connected into a transition agenda (step 3). In the next step (step 4), frontrunners initiate short-term actions and experiments to realize the developed vision. Building up a broadening network of diverse actors that engage in thinking and experimenting, creates the conditions that allow for the spreading, up-scaling and possibly even the breakthrough of innovative solutions to tackle problems (Loorbach & Rotmans, 2010). This may contribute to transitions as radical changes in larger societal scales.

An interdisciplinary group of researchers facilitates the whole process, taking the role of reflective scientists, but also non-traditional roles such as process facilitators or activators. Therefore, a transition team as an interdisciplinary group of researchers is formed to prepare and facilitate the actual participatory governance process, and to select its participants. By implementing transition management in a structured action research process, new insights emerge on individual and societal levels and are implemented and reflected upon in a continuing process (Wittmayer *et al.*, 2013). The developed vision and agenda always need to be adapted to new insights and developments during the transition process. Although transition management has concrete impacts, such as the implementation of the agenda agreed, one major aim is the facilitation of a learning processes, which leads to changing discourses and related attitudes in (dominant) actors (Loorbach & Rotmans, 2010).

Transition management aims to link action and reflection. As it brings together researchers and practitioners in joint research undertakings to address societal challenges, it is of a clear transdisciplinary nature (cp. e.g., Lang *et al.*, 2012; Scholz, 2017; Scholz, 2011). The transition arena itself can be understood as a boundary space between science and society, to jointly develop solutions to societal challenges. As Loorbach *et al.* (2015, p. 54) put it, transition management boils down to creating space for so-called frontrunners (niche-players and regime-players) in transition arenas. Engaged individuals, as frontrunners, play an important role in transition management in building up alternatives in niches.

1.3 STATE OF THE ART AND EXISTING GAPS

In the following, I sketch the state of the art of transition management research taking into account the underlying MLP, outline existing critiques and highlight the concrete gaps addressed in this thesis. To do so, I provide a deeper analysis of the three focus areas of this thesis. These are: 1) Systems knowledge on the role of **agency** in shaping and transforming the societal systems in question; 2) Target knowledge on the desired goal of the transition, namely **sustainability**; And 3) transformation knowledge as methods and processes of science-society collaborations contributing to the **facilitation** of transitions towards sustainability. I start with the aspect of agency before addressing sustainability and facilitation. Thus, I move from aspects of understanding the current system to desired states and developments, before linking both via collaborations facilitating transitions. I reflect on each aspect through referring to the current, critical debate, with a focus on aspects relevant to the core aim of this thesis (see Section 1.1).

1.3.1 Agency

This section analyses how sustainability transition studies in general and transition management in particular, conceptualize agency and human behavior as core elements of systems knowledge. I use three interrelated aspects to structure the section: first, I analyze the function of agency and actors in maintaining and changing a relevant system as portrayed in the MLP. Second, I analyze the reasons, conditions and driving factors of agency in more depth, e.g., in the form of an underlying behavioural model. Third, I discuss the understanding of agency included in prescriptive approaches of transition governance (namely transition management). Finally, I draw out detailed entry points for influencing agency in the transition management process, to spark and influence transitions.

Agency as shaping factor of niches and regimes

As a central framework underlying sustainability transitions studies, the multi-level-perspective (Geels, 2002, 2011) provides a structured understanding of the system(s) studied. This comprises the relevant levels of landscape, socio-technical regime and niche. Scholars conceive regime and niche as organizational fields, which are ‘communities of interacting groups’ (Geels & Schot, 2007, p. 402). Scholars characterize both levels with regard to shared rules and collective action. Thus, niches and regimes are of a similar nature. They differ in their size and stability. Regimes are larger and constructed via stable and well-articulated rules. Niches are smaller and constructed via unstable rules ‘in the making’ (ibid). Scholars thereby understand actors as being embedded in rule structures that structure their actions. At the same time, actions also reproduce and stabilize or change existing rules. Thus, actors are not only seen as rule followers but also rule makers.

Rule sets do include cognitive, normative (including values) and regulative rules. Scholars understand the socio-technical landscape as an exogenous environment that is ‘beyond the direct influence of niche and regime actors’ (Geels & Schot, 2007, p. 400). Examples include macro-economic trends, deep cultural patterns and macro-political developments (ibid.). Related changes generally happen at a slow pace and usually unfold over decades, although abrupt changes may occur as well. In this regard, MLP is based on Giddens’ (1984) structuration theory, explaining the interrelation of agency and structure in society. According to Geels and Schot, actors and agency are implicitly included in the different levels of the MLP (Geels & Schot, 2007). They assert that ‘this is also visible in elaborate case studies, where actors try to make sense, change perceptions as they go along, engage in power struggles, lobby for favourable regulations, and compete in markets’ (Geels & Schot, 2007, p. 405).

Fuenfschilling and Truffer (2016) go one step further and explicitly analyze embedded agency, as agency of actors restricted by existing institutions. Relating to the dual structuration cycle of Giddens, they focus on the attempts of actors to influence and change institutions. Their understanding of institutions is similar to Geels and Schots’ concept of rules, relating to regulative, normative and cognitive structures. Thus, a transition as a radical change of regimes comes about as an interplay of technologies, institutions and agency. Different levels are marked by different intensities of structuration: more loose and unstable in the niche, more interconnected and stable in the regime (Fuenfschilling and Truffer, 2014). A niche may become a regime in the moment that the new rules become structuring for everyday behaviours. With this in mind, how can we understand the relation between agency and structural change, e.g., transitions?

The dynamic interplay of agency and (the making of) structures has become a topic of extensive interest in current research (e.g., Avelino & Wittmayer, 2016; Fischer & Newig, 2016; Göpel, 2016; Wittmayer, Avelino, van Steenbergen, & Loorbach, 2017), focusing actors and agency in transitions. Individual and collective actors are seen ‘as participants in purposive actions in an attempt to prevent or generate change’ (Fischer and Newig, 2016, p. 2 referring to Bos et al. 2013). Actor behavior with regard to such change is then called agency (Fischer & Newig, 2016 referring

to Loorbach, 2007). Agency highlights the ‘undetermined nature of human action, as opposed to the alleged determinism of structural theories’ (Fischer & Newig, 2016, p. 2 stating Scott and Marshall, 2009). Genus and Cole (2008) called for the need to conceptualize more the different forms of actors at different levels, to understand variations in agency of different actors; while Farla *et al.* (2014) proposed to investigate ‘how much leeway actors really have’ to change structures, as agency is embedded (*ibid.*).

Accordingly, and building on a literature review, Fischer and Newig (2016) proposed different types of actors having different degrees of agency. Types are related to different systems levels (niche, regime, landscape) and governance levels (from local to global). In addition, intermediaries exist linking different levels. The scholars reviewed niche actors as most relevant for sparking alternatives (Fischer and Newig, 2016). These actors at the local, community level have minor agency in terms of influence on the transition, but they do create and manage niches, frame sustainability and facilitate behavioral change. Institutional plurality can provide a positive context for such transformative agency, as it allows for different forms of alternative actions to be possible and legitimate (Fuenfschilling and Truffer, 2014). Nevertheless, to allow for a growing niche, regime actors do desire to acquire influence as well. Niche actors need to connect to regional levels to increase their influence (Fischer and Newig, 2016), and this can be done with the help of intermediaries and networks. Finally, scholars consider national level actors to have the highest agency and to be the most powerful – depending on the situation, they may set positive contexts for alternatives in niches to develop and flourish.

It thus becomes clear that agency is a crucial factor to maintain and change societal systems and to potentially spark a transition – although valid to different degrees for different actors and bounded by given structures. Therefore, what are the factors influencing how actors use their agency, in for instance contributing to a sustainability transition?

Understanding driving factors of agency

When Geels and Schot (2007) outline agency as an essential part of the MLP, they rely on a particular conceptualization of how actors use their agency: acting strategically and in a self-interested way, within a model of bounded rationality. This rule-based understanding of action should allow for the incorporation of various theories on agency into MLP. Smith *et al.* (2005, p. 1492) have critiqued MLP as ‘dominated by rational action’ and ‘too descriptive and structural, leaving room for greater analysis of agency’. And Geels and Schot also acknowledge, that for instance an understanding of specific types of agency in specific transitions have only begun to emerge, and remains an important topic to be researched in more depth (Geels & Schot, 2007, p. 415).

Thus, Farla *et al.* (2012) dedicated a special issue to the exploration of actors and their strategies and related resources in the formation and change of socio-technical systems. They investigate the role of institutional structures and collective expectations. The authors elaborate on the motivations of actors in the form of strategic behavior, e.g., the strategy of social movements to make green values and norms more institutionalized. The special issue

underlines the importance of the strategic interventions of particular actors to enact changes in socio-technical systems.

‘Innovation and transition processes, in other words, do not just emerge from a rather unintentional interplay of actors that pursue their own narrow strategies. Instead, they may be strategically shaped by players with some kind of a ‘larger plan’ or vision — at least to a certain extent. Future research may embark in a more systematic way on how actor strategies and resources impact the outcome of sustainability transitions at the system level.’(Farla *et al.*, 2012, p. 996).

Very recently, Geels began to deepen the underlying concepts of agency in MLP, by elaborating on its’ theoretical micro-foundations in the social construction of technology, evolutionary economics and neo-institutional theory (Geels, 2017). As a result, Geels provides initial ground for a multi-dimensional concept of agency by sketching possibilities to crossover between different theories by linking ideational (idea and value-centered) and actor-focused perspectives, with those that focus on the role of structures and institutions in shaping action. As with MLP that aims to understand organizational fields as actions of related groups, referenced theories underlying MLP embrace an aggregated perspective on agency – backgrounding individual agency. Thus, understanding focuses on strategic and rational action of groups of actors as a potential driver of transitions, while underlying reasons for such action (e.g. motivations, values, interests) remain outside the scope of analysis.

Agency in transition management

Agency and human behavior are not only relevant to a descriptive-analytical perspective on sustainability transitions, but possibly have even higher importance when prescribing transition governance. How do scholars conceptualize agency within transition management? What roles do actors play within transition management? Which models of behavior exist that allow for the explanation (and potentially influence) of action? In the literature on the governance of transitions, agency is referred to rather broadly (Frantzeskaki, Loorbach, *et al.*, 2012; Loorbach, 2010), with a focus on collective decision making, relations of power, governance mechanisms, as well as legitimacy and values underlying agency (e.g., Avelino, 2009; Grin *et al.*, 2010; Smith *et al.*, 2005; Wittmayer *et al.*, 2017). Avelino and colleagues therefore develop a model of multiple actors in transitions, differentiating them by the level of aggregation (individual, niche, regime) and the type of sector (state, market, community, third sector) they act in. Additionally, they develop a comprehensive framework on power in transition, generating a vocabulary to analyze who is exercising what kind of power about what and whom, under which circumstances (Avelino 2017; Avelino & Wittmayer, 2015). This enables us to understand transition dynamics in terms of shifting power relations between actors at different structural levels, and also informing transition governance.

Zooming in on the transition management literature on transition governance, agents and their agency also play a core role. Agency can be understood as the freedom of an actor to choose their behavior and thereby potentially influence the system in which they are part (Fischer and Newig, 2016). It is related to the capacity of actors to act

(Avelino & Wittmayer, 2015, drawing on Grin, 2010) and to trigger transformations, by 'smartly playing into power relations at different levels' (ibid). In this regard, Loorbach calls for transitions to include new 'societal systems that combine freedom of individual development and innovation with (selection) criteria related to collective goods and future developments', including processes of 'changes in perceptions, routines, practices and beliefs at the level of individuals' (Loorbach, 2007, p. 81). Thus, transition management scholars highlight social learning, as well as the empowerment of societal actors, as a primary goal of reflexive governance (Loorbach, 2010). These are processes which can increase agency, allowing for the development and implementation of innovative ideas, practices and structures aimed at tackling societal challenges, as part of complex and ambiguous transition processes.

Thereby so-called frontrunners or change agents play an essential role in developing and spreading alternatives in niches. These are actors with the 'capacity to generate dissipative structures and operate within these deviant structures' (Rotmans and Loorbach, 2010, p. 144). 'Frontrunners' are considered to be individuals with specific competencies and innovative ideas or practices with regard to a societal challenge (Wittmayer *et al.*, 2017). These actors are getting involved into processes of experimentation and learning to (further) develop and apply ideas, practices and structures. Thus, transition management aims to open an interactive space between researchers and societal actors to facilitate learning and the development of innovations, as well as their transfer and spread via networks. Correspondingly, participants are supposed to be empowered, in terms of increasing their capacity to act in general (that is, gaining agency), and in particular to tackle sustainability challenges locally (Loorbach, 2007). Avelino thus focuses empowerment to mean raising the intrinsic motivation of actors to take action (Avelino, 2011; Avelino and Wittmayer, 2016).

Transition management proposes detailed processes and methods to develop alternative ideas, practices and structures (e.g., visioning, backcasting and transition pathway development). In parallel, methods and procedures to facilitate empowerment and learning in transition management have also been developed (Avelino, 2011; Bos, Brown and Farrelly, 2013). However, an underlying theory of behavior to explain the effects of learning and empowerment on the behavior of actors – their agency – has yet to be developed. Comprehensive conceptual understandings of agency and empowerment processes could be better theorised to guide the design and assessment of transition management projects (Avelino and Wittmayer, 2016). This includes critical reflection on normative aspects (ibid).

Critical reflection

The literature reviewed on agency in descriptions of socio-technical systems which builds on MLP, as well as within related prescriptive studies in transition management, exposes two interrelated shortcomings with regards to the provision of systems knowledge on sustainability transitions. These shortcomings are: 1) a superficial understanding of (individual) agency in general; and 2) a lack of consideration of sustainability-related agency and action in particular.

1) An elaborated model of individual behavior and agency which underlies the MLP is lacking. Available studies focus on collective agency and collective, aggregated behavior, in relation to the development and interaction of niches and regime as organizational fields and communities of interacting groups (Fuenfschilling & Truffer, 2016; Geels & Schot, 2007). Agency is understood as the freedom to choose one's behavior, limited by the structuring effects of societal structures (e.g., institutions). This focus is explained by the origin of transition studies in societal level theories (e.g., neo-institutional theory, evolutionary economics) and fits with its core interest of understanding changes of collective behavior and related societal structures.

A psychological perspective on transitions (Loorbach *et al.*, 2015, p. 56) – i.e., allowing for a deeper understanding of motivations, values as well as emotions guiding behavior – is needed. This would enable further understanding of the individual level as starting point for deviation from the rules, motivations and perceptions. Thus, the analysis of transition dynamics and the restructuring role of agency as important parts of MLP, would be enriched. Although Farla *et al.* (2012) rightly caution that individuals never alone enact a transition, a transition can hardly be understood or facilitated without understanding its smallest active element. Thus, Westley *et al.* (2011) reference Christensen *et al.*'s (2006) research, and highlight the microscale of individuals and small groups as the early source of radical innovation. Likewise, Göpel (2016) draws attention to the role of individuals in conscious creation of niches, building on new principles for action. When these new principles influence the paradigms and mindsets at larger systems levels, e.g., the regime, this may provide a deep leverage point for systemic change (Abson *et al.*, 2017).

Transition management acknowledges the critical importance of individual agency to facilitate transitions, in the form of focusing on frontrunners or change agents. Loorbach (2007) suggests drawing on established theories, such as psychology or management science, to better understand frontrunner capacities to engage in change. As mentioned, actor and agency have been researched recently, but not with a focus on the psychology of transitions. Thus, an understanding of the motivations and capacities of frontrunners for taking action, is needed. Scholz (2011, p. 519) asserts that the 'roles and drivers of human actors' remain poorly defined in transition management literature. In close relation, Loorbach recently named social learning, empowerment and more broadly transition psychology as important issues requiring further investigation (Loorbach *et al.*, 2015).

Transition management focuses on the participation of so-called frontrunners, and social learning is one of its major aims. Although, it has no clear concept of why and how individuals engage in these transition experiments, in terms of a psychologically founded behavioural or learning model (Rauschmayer, Bauler and Schöpke, 2015). In addition, a basis for assessing changes occurring within the participating individuals is lacking (Rauschmayer, Bauler and Schöpke, 2015). Since the participating frontrunners are essential to develop niche innovations with regard to strengthening sustainability, a concept of the individual should include questions of values, motivations and reasons for action. This extended focus might help to assess intra-individual changes with regard to sustainability awareness or motivation prompted in the learning processes and facilitated in the TM activities (Rauschmayer, Bauler and Schöpke, 2015).

Beyond the niche level, transition management describes the regime mostly in the tradition of complex systems' theory. When referring to institutional players and factors in politics, business and culture, the individual does not appear in this description of what needs to be changed in the systems. Thus, a conceptualization of agency that relates niche level front-runners and regime level players is also needed. But, that is well beyond the scope of this thesis.

2) The second gap relates to the particular field of analysis, sustainability transitions, and its normative nature. How can we understand the specific type of agency that is needed to contribute to a sustainability transition? As most elaborations on MLP and agency (e.g., Geels & Schot, 2007; Farla *et al.*, 2012) do not include a normative consideration of sustainability in their study of socio-technical transitions, they fail to include an understanding of agency that is particularly suited to understanding sustainability related actions. When relying on models of strategic action and bounded rationality, portraying actors as solely acting out of self-interest, this neglects insights from diverse fields studying human behavior in sustainability contexts. This includes ecological economics (e.g., Costanza *et al.*, 2014; Siebenhüner, 2000), environmental psychology (e.g., Bamberg & Möser, 2007; Shove, 2010; Stern, 2000), ecosystem-service and adaptive management (e.g., Adger *et al.*, 2012; Raymond, Brown, & Robinson, 2011), and others.

Approaches highlight the importance of other motivations of behavior (as opposed to self-interested). They emphasize the inclusion of sustainability related values, worldviews and awareness of sustainable behaviours (as opposed to a neutral stance towards values). And they stress the establishment of institutions oriented towards fostering the common good (as opposed to those fostering self-interested, rational decision making). In sum, the capacity of the MLP to understand sustainability transitions might be enhanced, if amended by models of human behavior that allow an understanding of sustainability related agency.

The same holds true when aiming to facilitate sustainability transitions in the frame of transition management, which is focused on learning and empowerment as generators of the agency of frontrunners within niches. Assessment and facilitation of learning and empowerment can become more effective, if they reflect the nature of sustainability transitions as complex, normative and contested. Behavioral and learning models should allow for the tracking of higher order learning (e.g., Pahl-Wostl *et al.*, 2013; Reed *et al.*, 2010). Thus, they consider changes of assumptions, values, worldviews and paradigms, and increase the capacity of actors to deal with overwhelmingly complex situations in fundamentally new ways. As learning in itself can be considered a neutral process that warrants 'questions of content and intent' (Sterling, 2011, p. 8), changes in values, worldviews and paradigms should relate to the valuation and awareness of sustainability (Rauschmayer and Omann, 2012). Thus, models and approaches are needed, that consider sustainability aspects. This includes the awareness and motivations of actors when they participate in transition management and develop alternative ideas, structures and practices.

This differentiated perspective is not only relevant to niche formation. Potentially it is even more relevant when considering ideas, practices and structures extending beyond the niche and impact upon the regime. Namely, when

they gain a structuring influence on the behavior of larger societal groups – for instance, in forms of rules and norms for action. Scaling and spreading, on one hand, increase the impact of innovations – and thus the potential sustainability impact. On the other hand, growth-processes often challenge the sustainability character of developed alternatives and produce rebound effects (Schäpke & Rauschmayer, 2014). Thus, the positive effects of upcoming transitions towards sustainability are diminished or even reversed. This aspect is discussed in more depth in the following section.

In sum, a detailed understanding of individual behavior and agency in the context of transitions, focused with regard to sustainability transitions in particular, is needed. This would contribute to develop an understanding of the psychology of sustainability transitions.

1.3.2 Sustainability

Target knowledge describes information on the direction of change and the aspired goals. Some scholars distinguish two basic orientations towards sustainability, namely universalist and procedural (e.g., Di Giulio *et al.*, 2014; Miller, 2013), while others add intentional sustainability to their basic distinctions of target knowledge (Hirsch *et al.*, 2006; Jahn, Bergmann and Keil, 2012; Costanza *et al.*, 2014; Rauschmayer, Bauler and Schäpke, 2015). I use this threefold distinction to structure my exploration of perspectives on sustainability in sustainability transitions research, beginning with a deeper elaboration on the three concepts below.

A *substantial* understanding focuses on the actual impacts of actions, policies or the overall transition. This understanding relates to making sustainability transitions a ‘societal goal that can actually be politically monitored, steered toward, and verifiably achieved’ (Di Giulio *et al.*, 2014, p. 55). It requires both a normative framework for defining goals, as well as approaches to evaluate and assess concrete measures and achievements. As such, it often conforms to a ‘Universalist’ understandings of sustainability that builds on normative frames and universal values (Miller, 2013). These are embedded in political agreements on sustainability, like the Brundtland definition referring to human needs and planetary limits, and related values of inter- and intragenerational justice and quality of life (WCED, 1987). Researchers themselves can generally relate their work to these normative frameworks while in detail maintaining a values free stance in their work. Miller regards Universalist morality as thin morality, meaning that it can be ‘everybody’s morality’ – incorporating values that everybody can agree upon (Miller, 2013). To substantialize sustainability then requires moving towards thick morality as a morality that is particular and contextual, and allows qualifying in a particular instance what should be considered as sustainable, and what not. Yet this step of contextualization and particularity may entail conflicts.

Following the *procedural* perspective, sustainability is itself defined as a process (and not an end state). It is a process of ‘identifying important societal values and pathways of a desirable future’ (Miller, 2013, p. 285). Thus, a procedural approach to sustainability is ‘a methodological-oriented approach that focuses on how sustainability comes to be defined and how pathways are developed to pursue it’ (Miller, 2013, p. 284). Therein, ‘sustainability is defined through a participatory or democratic process contingent on place and time’ (*ibid.*). Stakeholders need to

negotiate sustainability values, producing contextualized forms of sustainability goals and measures. Broad definitions of sustainability are less important than the recognition of differences and contextualization. Procedural sustainability also concerns for aspects of sustainability in the process of change, e.g., fairness and inclusivity of decision-making processes. Procedural sustainability and thin sustainability are not in opposition, but a thin definition will need to be developed 'into a contextual understanding of sustainability in a certain place or community' (Miller, 2013, p. 285). As procedural sustainability concerns processes of negotiating and agreeing on sustainability values, it is strongly related to organizing concrete collaborations of science and society to facilitate societal change. The latter is the focus of the following subsection.

The *intentional* dimension concerns the intent of an action, e.g., a policy, research project or consumer action. Under conditions of insecurity, it may empower individuals and groups to act towards sustainability, even if they do 'not know all the possible impacts of their actions' (Di Giulio *et al.*, 2014, p. 54). Intentional sustainability essentially relates to the (sustainability related) norms, values and motivations, the knowledge and awareness which finally make up the intent of actors.

In the following paragraphs, I present and critically discuss the current state of debate in sustainability transitions research on each of the three dimensions of target knowledge.

Substantial sustainability

Leading transition researchers position their collection of landmark publications as 'emerging out of the ambition to develop a new, inspiring perspective on sustainable development' (Grin, Rotmans and Schot, 2010, p. xvii). In the introduction, they focus their contribution on sustainability transition, as 'a radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies' (Grin, Rotmans and Schot, 2010, p. 1). Problems express themselves in the form of crises in multiple domains, such as food, biodiversity or climate change, which are related to societal challenges and therefore considered to be deeply embedded in society (Grin, Rotmans and Schot, 2010, pp. 107–108). Persistent problems are expressions of larger and deeper system crisis, related to the relationship of (1) market, government and society, and (2) values and lifestyles. Thus, a sustainability transition includes 'major changes to existing structures (e.g., institutions and markets), cultures (e.g., the culture of consumerism), and practices (e.g., unsustainable practices such as resource exploitation)' (Frantzeskaki, Loorbach and Meadowcroft, 2012, p. 24).

Interestingly, Grin and colleagues acknowledge that their substantial work does not say much about values and sustainable development (Grin, Rotmans and Schot, 2010, p. 2). Nevertheless, they claim the transition perspective as being ultimately about sustainable development, strived for as a new value system. The authors emphasize that the open-ended nature of their understanding of sustainable development is an asset. It allows for pluralistic appropriations in different contexts. Furthermore, they state that specific understandings of sustainability are suitable to guide discussions on the direction of transitions. These include aspects such as well-being, the needs of the poor

and future generations, respecting planetary limits, and political participation. In consecutive elaborations, the authors focus on aspects of transitions, persistent problems and governance, while making little reference to ethical and normative aspects of sustainability in sustainability transitions.

As such, literature on transition dynamics and core approaches for studying them (such as MLP) consider sustainability only to limited extents when it comes to describing the challenge of a sustainability transition, e.g., as purposeful and contested (Geels, 2011; Geels & Schot, 2007). The core interest then is to describe and analyze processes of change within the multi-level-framework, neglecting the normative aim of these change processes. The same holds true for one approach to govern sustainability transitions, or more precisely, sustainable innovation journeys, which is a form of strategic niche management (Schot and Geels, 2008). Here, sustainability is only loosely included in the analysis as investigation frequently focuses on socio-technological novelties that are somewhat considered to be contributing to sustainable development. This includes, for example, electric vehicles, organic farming or renewable energy. A broadly used assessment framework, particularly one including sustainability aspects, is still lacking.

Transition management scholars often heavily relate their work to the goal of contributing to sustainability (e.g., Rotmans & Loorbach, 2010). Thus, transition management 'is the attempt to influence societal systems into a more sustainable direction, ultimately resolving the persistent problem(s) involved' (Rotmans and Loorbach, 2010, p. 108). In this context, sustainability criteria are understood as 'the conditions under which the same societal function can be provided in the future in a sustainable way, for example, the energy system needs to include clean energy, the health care system needs to be oriented to the individual level and not to systems' (Loorbach *et al.*, 2015, p. 31). Concrete assessment frames to decide on whether the provision of societal functions are sustained, are lacking.

Procedural sustainability

As concrete solutions to persistent problems are uncertain and will only reveal how effective they are over time at a future date, transition management emphasizes the role of experimentation and learning. What can concretely be considered as a solution is often debatable, and must be agreed upon in an ongoing process of negotiation and exploration. To put this approach into practice requires processes and (normativity-based) criteria⁵ to effectively allow for learning and agreement.

A central logic in the recent transition management discourse on addressing sustainability in transition management is that of directed incrementalism (e.g., Frantzeskaki, Loorbach, *et al.*, 2012). Thus, scholars combine an open-

⁵ Normativity based criteria differ from those to objectively track the development of complex (adaptive) systems as included in integrated assessments (e.g. Rotmans and Loorbach 2010).

ended, participative development process with that of 'direction', framed by broad sustainability criteria to guide processes and results (Frantzeskaki, Loorbach and Meadowcroft, 2012). Therein, broadly endorsed definitions of sustainability, e.g., the Brundtland definition, form the point of departure from which dialogue begins. Sustainability and aspects related to it, such as the concept of needs and quality of life, inter- and intragenerational justice (and planetary limits), are considered to be inherently normative and subjective (Frantzeskaki, Loorbach and Meadowcroft, 2012). Governance of sustainability transitions needs to safeguard 'sustainability values such as long-term orientation and intergenerational justice' (Loorbach, Frantzeskaki, & Thissen, 2011, p. 5). Transition management thus builds on thin morality that can be broadly agreed upon (see introduction to chapter). Thin definitions of sustainability then need to be contextualized, negotiated and agreed upon in individual transition management processes.

Thus, transition management proposes a learning journey to render sustainability meaningful at the local level, and to empower societal actors to solve societal challenges. Sustainability itself is considered a collective search process involving the continuous negotiation and balancing of societal values and interests (Loorbach *et al.*, 2011). In this reading, sustainability is not an end state, but a process of iterative steps to discover the meaning of sustainability (*ibid.*). 'Each generation must take up the challenge anew, determining in what directions their development objectives lie, what constitutes the boundaries of the environmentally possible and the environmentally desirable, and what is their understanding of the requirements of social justice' (Frantzeskaki *et al.*, 2012, p. 23; Meadowcroft, 1997). As sustainability is ambiguous, uncertain, inherently normative and contested, and occurs via a process of transition, 'the only way to "enable" sustainable development is through process conditions under which sustainability is discussed, negotiated and explored in light of the major changes that are undoubtedly necessary' (Loorbach *et al.*, 2011, p. 4). Sustainability as an open concept that is a thin moral guideline, provides direction many can agree upon, without defining end-states and 'leaving room for very different operationalisations in the course of time, given specific contingencies in different contexts' (Frantzeskaki *et al.*, 2012, p. 181).

Taking a closer look, this position may be criticized as being overly general and inadequately specified. Frantzeskaki *et al.* (2012: 21) acknowledge 'the often blurred vision of what exactly is sustainable makes the efforts to govern a process towards sustainability both complex and uncertain'. The authors distill five core characteristics of sustainable development from the debate. These include it being a 'complex, long-term, multi-level, integrative, multi-actor process' (Frantzeskaki, 2012, p. 23). In prior writings, authors also included further normative aspects into their description, namely intra- and intergenerational justice (Loorbach *et al.*, 2011). Potential concepts to further specify these values, and thus essential to the discourse on sustainable development, particularly its relation to human well-being and human needs, are not referred to. Authors propose some broad measures to incorporate sustainability values into the transition management process – e.g., concretizing sustainability values within the transition arena, and developing and evaluating transition experiments to better define sustainability values (Loorbach *et al.*, 2015). Avelino and Grin (2017) accordingly propose a phronetic understanding of sustainable development, concretizing the concept based on pragmatic judgements taken within the given situation and context. Concrete descriptions

and empirical analysis of how this is done in practice are generally absent. In addition, frameworks on how to assess the orientation towards sustainability are under development (e.g., Taanman, 2014).

Intentional sustainability

An explicit consideration of the sustainability related aims of the actors engaged in transitions and transition management, is only included to a very limited extent within MLP as well transition management. Within MLP, values, interests and the resulting intentions of actors are considered – e.g., in the form of being strategic or self-interested – but without any particular reference to sustainability. The same holds true for transition management (See prior section on agency and related critical discussion).

Critical reflection

Substantially, sustainability transition scholars frame sustainability in terms of resolving the big challenges and problems societies are currently confronted with. Statements often bring to mind a logic that was termed the naturalistic fallacy (Frankena, 1939) – in German, Naturalistischer Fehlschluss – with sustainable development occurring when all the problems are resolved. This precludes normative considerations, such as allowing the assessment of when a problem can be seen as solved (or mitigated). When sustainability criteria demarcate how societal functions can be sustained over time, this similarly brings up questions on the underlying normative assumptions (besides providing a very high ambition for what can be considered as sustainability): How can we define societal (dys-) functions and decide on which of them to maintain? This then highlights the need for a normatively equipped yardstick and – in relation to procedural sustainability - possibilities to develop it in legitimate ways.

A possible yardstick for ethical considerations to assess say policy options (Schäpke & Rauschmayer, 2014), is their impact on well being and quality of life. Thus, reference can be made to prominent definitions of sustainable development based on ethical concepts of anthropocentric individualism. These include (basic) human needs (World Commission on Environment and Development (WCED), 1987), human well-being, quality of life and capabilities (Anand, Sudhir; Sen, 2000; Alkire, 2002; United Nation Development Programme, 2011). Correspondingly, the impact of sustainability transition governance on human well-being and quality of life, could then be considered. The mere size of the attempted change in the form of societal transitions, broadly and deeply affecting humans and nature, underpins the importance of such considerations. The same holds true for the radical nature of the aspired change, as is for example included in debates on limits to growth, degrowth or ideas around sufficiency (e.g., Schneider, Kallis, & Martinez-Alier, 2010) – as well as the assumed consequences of failing to transition towards sustainability (Rockström *et al.*, 2009; Raworth, 2012). Transition management scholarship does include these links, developing a thin morality, but so far lacks further specification, both substantially (e.g., concrete criteria/assessment frameworks) and procedurally as discussed below.

Procedurally, there are at least two interrelated arguments for equipping transition management with a more nuanced approach on how to address sustainability within the facilitation process.

The first relates to the very nature of transitions as shifts to the radically new. Transition scholars emphasize the importance of considering the counteraction of incumbents, their adoption and cooptation of niche innovation and the overall path dependency of developments (Smink, Hekkert and Negro, 2015). Scholars also frequently highlight issues of agency and power. In this highly politicized environment, a sustainability transition concerns a particular move away from the given system, potentially in counter to the interests of powerful incumbent actors (Smith and Stirling, 2010). Franzskaki, Koopenjan *et al.* (2012) conclude that sustainability values often compete with other values in the transition arena process, and ask for processes to consider different values and develop synergistic visions. They draw attention to normative questions of balancing the aim of (making participants behave) sustainably and democratic values (like transparency, accountability, and self-directedness) in transition governance. This applies as well to the transition arena process as the need to reconcile sustainability and democracy (Meadowcroft, 1997), and calls for scrutiny in observing and facilitating the sustainability character of transitions to prevent cooptation. It also calls for procedures and criteria to allow for a just, inclusive and legitimate process (as highlighted by Loorbach *et al.*, 2015), provided that agreements on future developments impacting multiple actors are made.

The second, related concern considers the importance as well as dual role of innovation for (un) sustainable development. Innovation is not only a promising force to foster transition to sustainability. It is, simultaneously, a major reason for current situations of unsustainability (Westley *et al.*, 2011). Innovations may be used to further deepen the current path of unsustainability by fueling economic growth, or changing society towards becoming more sustainable and resilient (Leach *et al.*, 2012). Politically, halting or slowing down growth is stigmatized as ‘backsliding’ and endangering human well-being, as purportedly ensured by continuous growth (Westley *et al.*, 2011). This requests for procedures to include an assessment of the impact of transition processes on human well-being, as well as to work towards securing the challenging character of the facilitation process in addition to the potentially radical nature of the developed outcome. Thus, there is a need to secure the direction of innovation and transformation towards sustainability (Leach *et al.*, 2012).

Intentionally, and as discussed in Section 1.3.1 on agency above, current understandings of the MLP and transition management only allow for a very limited discernment of the sustainability related intentions of involved actors. As mentioned, a nuanced picture of actors and agency, including sustainability related aspects (such as sustainability values, awareness), appears essential to both understand actors behavior and systems development towards sustainability – as well as to facilitate processes of governance towards sustainability.

In summary, transition management combines thin morality with a procedural approach to sustainability building on directed incrementalism and phronetic sustainability. This approach to sustainability appears to be generally promising (Miller, 2013) and adequate to the nature of the challenge (Frantzeskaki *et al.*, 2012). Two basic questions arise: How to do this in practice? And, how to know if it works? Concrete processes and procedures for developing contextualized understandings and solution options which build on thin sustainability values – e.g., the Brundland definition of sustainability focusing human needs and inter- or intragenerational justice – are critically needed.

Similarly, procedures as well as assessment tools to include and address sustainability values within transition management processes, need to be further developed. This may help build on ethical yardsticks to measure sustainability, such as quality of life or human needs. Finally, a larger gap exists regarding the consideration of the intentional dimension of sustainability (e.g., how to explicitly consider the sustainability intentions of involved actors?).

The section below outlines how sustainability is approached within transition management as a collaborative research approach. This includes an understanding of science and society's role in addressing sustainability transitions, as well as methods used and relevant processes.

1.3.3 Science society collaborations contributing to the facilitation of sustainability transitions

Transformative knowledge in the context of this thesis, relates to the methods and processes of science-society collaboration, which contribute to facilitating sustainability transitions. Knowledge developed in prior sections at the level of systems understanding is taken into account. This relates to agency, and normative targets such as procedural sustainability. Yet, the focus is on the actual collaboration process of scientific and societal actors that allows sustainability to be addressed and agency to be built. This includes methodological and procedural aspects as well as underlying conceptions of the research, and relates to the roles of researchers and societal actors in sustainability transitions (research). I begin by detailing the basic distinctions on research conceptions of sustainability transitions, before addressing roles, methods and procedures.

Process oriented and knowledge first research conceptions

As outlined, in sustainability transitions research there are at least four relevant research approaches to how research engages with transformation, which belong to two broad families. The first broad family consists of descriptive-analytical approaches, focusing on the study, analysis and interpretation of transition dynamics (Markard *et al.*, 2012; Wittmayer, 2016). They include the multi-level-perspective, as well as technological-innovation-systems approach. The second family are prescriptive approaches, that apply action research and transdisciplinary methodologies to support transitions more concretely. This includes transition management (Wittmayer, 2016) and, to some degree, strategic niche management.

The four approaches can be distinguished along a basic differentiation devised by Miller (2013) into knowledge-first and process-oriented (sustainability) research. Following this distinction, approaches conceptualize the interaction of science and society in the production and use of knowledge, in very different ways (Miller, 2013). In knowledge-first approaches, science focuses on the analysis and understanding of (sustainability) problems to generate scientific knowledge, while societal actors contribute values and goals to the negotiation on solving sustainability challenges and transforming society. Scientists try to avoid engaging with questions of values and politics. At the interface of science and society, a boundary zone is created to generate knowledge that is salient, credible and legitimated – and ultimately facilitates (effective) decision-making.

In process-oriented approaches, Scholars place less emphasis on conceptualizing the interface of science and society as a boundary zone with clear-cut borders, but rather as a jointly created and overlapping arena to collectively define sustainability. Both science and societal actors contribute knowledges, values and goals. Here the focus of science is less on creating knowledge by research, but rather on facilitating and contributing to societal intervention and change. While in knowledge-first approaches researchers mainly act as knowledge providers, in process-oriented approaches such as transition management, they also assume additional roles as facilitators and participants in the process (Miller, 2013).

I view research based on the multi-level perspective as generally following the idea of knowledge-first science. This is due to the descriptive-analytical stance researchers take, as well as the orientation towards understanding sustainability transitions without engaging in normative questions about directions of change. As the MLP does not touch upon the concrete facilitation of transitions, I do not elaborate on it in more depth here. The same holds true for the technological innovation systems approach. Strategic niche management appears to be a hybrid: it is prescriptive and process-oriented as it develops options for taking action and facilitating niche development. In addition, it has aspects of knowledge-first approaches, as it does not seek to engage in transdisciplinary research nor in testing sustainability solutions. Lacking these empirical experiences with the facilitation of transitions, I do not elaborate further on strategic niche management here.

Finally, Transition management (Loorbach, 2010; Markard *et al.*, 2012) does explicitly build on normative purposes, as it seeks to address persistent societal problems by stimulating societal processes towards sustainability. The core tool in transition management is the transition arena as a participatory space for selected participants to debate the status quo, develop a future vision, related pathways and transition agenda, and initiate experiments for realizing the envisioned future. Following Miller 'these arenas are sites for boundary management and joint knowledge production by scientists, decision-makers and other stakeholders' (Miller, 2013, p. 287, building on Kemp & Rotmans, 2009). Thus, the arena functions as an agora, a communicative space for scientific and societal actors to speak and interact (Wittmayer 2016, building on Nowotny *et al.* 2003 and Miller 2013).

Thus, transition management aims at empowering actors to address societal challenges and develop radical alternatives, as well as at experimenting with these alternatives and learning about their effectiveness. As previously outlined, sustainability should be considered a process of continuously negotiating and balancing societal values and interests (Loorbach, 2010). While the overall process should be based on (rather general) sustainability values, their concrete meanings in the respective context needs to be discovered and negotiated (Frantzeskaki, Loorbach and Meadowcroft, 2012). As transition management attempts to steer societal change from within the system of interest, problem understanding and solution options are developed in collaborations between various stakeholders (Loorbach, 2010).

Actors' roles in process-oriented transitions research

The role of the scientists is to facilitate a deliberation on what sustainability might look like and how to achieve it (Miller, 2013). As part of the transition team, researchers also initiate and facilitate the overall process, and have to deal with multiple issues that arise from science-society collaboration and real-world engagement in normative topics. Issues include the ethical implications of real-world effects, as well as trade-offs between scientific rigor and societal effectiveness, in addition to process ownership. Furthermore, researchers contribute to this process as one provider of knowledges amongst others. They contribute knowledge at different points in the transition arena process, e.g., initial system and problem analysis based on desk research and interviews. This knowledge is discussed and integrated on an ongoing basis with diverse perspectives, brought by participants involved in negotiating a joint understanding of the problems (Loorbach, 2010).

Together researchers and participants explore possible trajectories for societal development, which includes experimenting with change as well as learning about through critical reflection (learning by doing, combining action and reflection). This in turn opens up the discourse on what should be perceived as sustainable and how to move towards it. Knowledge is produced in a process of learning about the multiple perspectives actors have on the issue at stake, and the variety of options that exist. Thus, the collaboration has a particular real world oriented purpose and a focus on societal effects as levers of transitions to sustainability. As such, contributing to societal change is a more central concern to transition management than the development of new scientific knowledge. Learning about solutions and possible trajectories, and thereby testing existing scientific hypotheses, may effectively be the main aim of the transition management process (Schäpke *et al.*, 2017). Therefore, the approach operates in the mode of transdisciplinarity, as it is oriented towards tackling real-world problems, as well as the development of socially robust knowledge by integrating knowledge from scientific and societal sources (Lang *et al.*, 2012).

Processes and methodologies

The science-society collaboration in transition arenas takes up systems understanding as developed in the section on agency, and proposes processes and methods to develop alternative ideas, practices and structures. These are visioning, backcasting and transition pathway development. Related to these, methods and procedures to allow for empowerment and learning have been developed (Avelino, 2011; Bos, Brown and Farrelly, 2013), allowing for societal effects to be achieved. Procedural advice covers the type of participants to be selected as frontrunners (e.g., holding innovative ideas on the system in question, being influential in their networks) and the overall composition of the arena (e.g., diversity in terms of gender, age, position, etc.). Extending the societal effects beyond the arena, transition management foresees procedures of networking, agenda building and translation to grow beyond the niche and influence further actors. This may increase the agency of arena participants and ultimately affect the regime.

Methodological advice details how to develop a shared problem understanding, vision and transition pathways, as well as coming up with experiments (see Section 1.2). These understandings and visions should be innovative, and

radically different from the mainstream, as well as commonly agreed upon by arena participants. Experiments to test options on realizing the visions are to be ambiguous, with a high possibility of learning as well as of failure, and to influence the system in question (Van den Bosch, 2010). Further advice exists on how to set up transition management processes to facilitate social learning, including focus projects, multi-organizational peer groups, distributed facilitation, adaptability, and flexibility, in addition to time for the development of trust and partnerships with science/research institutions for knowledge exchange (Bos, Brown and Farrelly, 2013). Beneficial starting conditions include a shared and explicit learning agenda (ibid). Very recent studies also outline conditions beneficial for the facilitation of participant empowerment in transition management – e.g., in direction of opening space for (re)negotiation of roles, joint experimentation and reflections (Avelino, 2017; Hölscher *et al.*, 2017).

Critical discussion

Scholars have critiqued the aim of facilitating a transition by way of transition management. Critiques often relate to issues of power, inclusivity (e.g., acknowledging multiple forms of knowledge), as well as the illusion that transitions can be managed at all (Shove & Walker, 2007). Much of this critique focuses on the governance aspect of transition management as a naturally political attempt of multiple actors pooling resources to achieve collective goals, for instance a sustainability transition (Kooiman, 2003). Relatively limited attention has so far been given to the aspect of creating a science-society collaboration that includes research, as well as practical action to contribute to change. That is, the action research or transdisciplinary research character of transition management. Similarly, only some debates focus the research approach of transition management in more general terms, e.g., with regard to the selection of participants, the normative stance of research and the related roles of the researchers (Scholz, 2017, 2011).

At least two areas of questions related to the science-society collaboration within transition management are worth investigating in more depth. Addressing them will contribute to further understanding of how transition management works as a process-oriented approach to (sustainability) science.

Firstly, this includes the concrete transdisciplinary processes of setting up and running a transition arena as a space for learning and knowledge production. Diverse stakeholders participate and multiple knowledges from scientific and societal sources are integrated in this process. Researchers engaged in transition management assume particular roles when setting up the transition arena, running its processes, developing insights, and realizing experiments. These roles differs from those included in traditional views on the way research (should) proceed, that is more oriented towards being a neutral observer and analyst. Thus, researchers assuming these roles cannot rely on a long tradition of research and related experiences and their professional education. In addition, they may operate in contravention to the expectations of societal actors participating in arena processes. Understanding these roles, related activities and challenges, is necessary (Lang *et al.*, 2012), particularly as they (can) contrast to the established roles assumed by researchers. In relation, the process of opening up and maintaining the community

arena as an interactive space, an agora of science-society collaboration, warrants further understanding and empirical exploration. Both aspects are related to understanding transition management as action research, as research actively engaged with societal change. Thus, broader analyses of transition management as action research are relevant to this thesis. This can build on recent work of Wittmayer (2016), who elaborated on transition management as action research at the local level, for instance regarding actor roles in local transitions and local level transition governance.

Secondly, this relates to the expected outcomes of transition management projects as contributions to societal change. Transition management facilitates a learning journey to render sustainability meaningful locally. Thus, further investigations on how sustainability values are negotiated and how universal understandings of sustainability are transferred to contextualized understandings, are of core interest (see previous subsection). What methods and procedures are used in the transition arena to facilitate this process? In relation, it appears essential to better understand the contribution of transition management to facilitate societal transformation to sustainability. How can the core aims of transition management, namely social effects such as social learning and empowerment, be related to sustainability transitions? Conceptual elaboration and empirical analysis of this interrelation has so far been found lacking, particularly with regards to considerations of normative aspects. Methods to assess and evaluate the effects of transition processes, e.g., as part of the overall research process, are unaddressed gaps.

In general, further elaborations on methods and procedures to particularly produce research results in terms of more traditional scientific knowledge advance are another area worthy of investigations. This could include for instance the generation of more generic insights on facilitation of change processes in transition management. Other aspects worth further elaboration are processes and methods of knowledge integration in transition management understood as transdisciplinary research. Due to the focus of this thesis on understanding transdisciplinary collaborations as means to contribute to the facilitation of sustainability transitions, these aspects are not further investigated in this thesis.

1.3.4 Sum up: Essential gaps and their relation

In summary (table 1), the presented literature analysis details how transition research addresses the dimensions of agency and transition psychology, normative sustainability as well as science-society collaborations facilitating sustainability transitions. Results refer to transition management and the underlying multi-level-perspective. The analysis makes existing interrelations and overlaps between mentioned dimensions explicit. This points towards possibilities for developing an integrated picture combining systems, target and transformation knowledge. That is, relating insights on the level of understanding the system, developing a normative target and facilitating a respective transition.

The analysis also made research gaps explicit. In addition, it becomes evident that these gaps are mutually inter-related. They revolve around the normative, sustainability dimension of sustainability transitions in all the three knowledge types. Regarding systems knowledge, this includes a lack of sustainability related awareness, motivation

and attitudes to understand agency as a crucial driver of maintaining and changing systems. Thus, there is a need for elaborating on a psychology of sustainability transitions. At the level of target knowledge, this includes a lack of deep normativity in the form of a substantial understandings of sustainability. This is complemented with a lack of detailed concepts of procedural sustainability and a far-reaching lack in intentional sustainability perspectives. Finally, regarding transformation knowledge, methods and procedures of approaching sustainability in science-society collaborations demand further development, e.g., including developing and assessing societal impacts of research.

When considering MLP and transition management separately, this lack of appropriate consideration of normative dimensions assumes different forms. The MLP as a knowledge-first approach (Miller, 2013), is by definition not concerned with addressing normative issues in sustainability transitions or respective processes. In this regard, its' lack of a procedural understanding of sustainability and a concrete idea on facilitating science-society collaboration addressing normative issues, appears plausible. Nevertheless, as a knowledge-first approach, MLP also lacks conceptual understandings that would allow for analyzing the particular nature of sustainability transitions. This is true, more specifically, with regard to analyzing which forms of agency contribute to sustainability transformations. As it does not include a more elaborate concept of substantial sustainability, it also prevents discerning a sustainability transition from any other kind of transition. MLP would thus need to be combined with: a) a concept of agency that captures sustainability dimensions; and b) an approach to assess the system dynamics at various system levels and related change, with regard to its sustainability character.

Transition management as a process-oriented approach building on MLP, inherits some of the difficulties that MLP faces to address sustainability transitions. This includes lacking an elaborated concept of sustainability transition psychology and a concept of substantial sustainability. Yet, transition management scholarship has added conceptual and empirics-based ideas, which concern the development of agency, related to empowerment and learning, as well as a procedural perspective on sustainability. The understandings of the concrete science-society collaboration contributing to sustainability transitions, namely the transdisciplinary collaboration taking place within the transition arena, should be enhanced. This could be done by elaborating action research methods that interrelate procedural and substantial sustainability aspects and that build on insights from transition psychology in facilitation. In addition, respective roles of the engaged researchers and activities of tackling issues of facilitating science-society collaborations, require further attention.

Table 1: Conceptual overview and existing gaps in sustainability transitions research, embodied in the Multi-level Perspective (MLP) and transition management (tm).

Ind.	Core theme/ knowledge type	Approach in MLP and tm	Identified gap(s)	Interrelations/ overlaps with other areas
a	Agency/ System knowledge	<i>MLP</i> : Embedded agency based on theory of structuralization, focus on organizational fields, rational and self-interested agents. <i>Tm</i> : Diversified perspective on multiple actors and power relations in transitions; aims at empowerment of societal actors to increase agency of acting in ways deviant from the regime; aims at empowerment to solve sustainability challenges locally, and social learning for innovation, problem solving and agency development; empowerment understood as intrinsic task motivation.	<i>MLP</i> : Individual agency/ transition psychology to strengthen analysis of transition dynamics and restructuring role of agency by increased understanding of individual level/ micro-scale as starting point of deviating rules, motivations and perceptions. Understanding specifically sustainability related agency. <i>Tm</i> : transition psychology/ behavioral models, e.g., to understand and address motivations and capacities of frontrunner for taking action; Sustainability related concepts of agency, learning and empowerment; Design and assessment of agency development in transdisciplinary settings, particularly related to sustainability.	To procedural and intentional sustainability (No2); To social impacts of science-society collaboration (No3).
b	Sustainability/ Target Knowledge (intentional, procedural and substantial sustainability)	<i>MLP</i> : Based on thin morality; focus on sustainability transitions as problem solving without normative considerations; no elaborations on intentional or procedural sustainability. <i>Tm</i> : Based on thin morality; focuses procedural sustainability in form of directed incrementalism and phronetic sustainability; understanding of sustainability as learning journey based on sustainability values; mostly lacks ideas on intentional sustainability.	<i>MLP</i> : Substantial sustainability lacks a normative yardstick to assess solution of societal problems and maintenance of societal functions. Intentional sustainability aspects lacking and procedural aspects not applicable. <i>Tm</i> : Substantial sustainability perspectives lack measures to contextualize thin sustainability and ground it in concrete processes; procedural sustainability lacks concrete measures to orient and assess process facilitation towards sustainability transitions; sustainability process criteria (just, legitimate); intentional sustainability underspecified (cp. agency/ area 1).	To sustainability transition psychology (No1); To facilitation of science-society collaboration as process understanding of the transition arena (No3).
c	Facilitation of trans-disciplinary collaboration/ Transformation knowledge (process oriented vs. knowledge first approach)	<i>MLP</i> : N/A, knowledge-first approach focusing the descriptive-analytical understanding of transition dynamics; no conceptualization of processes and facilitation of sustainability transitions. <i>Tm</i> : Process-oriented approach; core tool is the transition arena as interactive space for negotiation of values, worldviews, goals and interests of stakeholders; transdisciplinary research mode; focuses searching, learning and experimentation on solutions for real-world societal challenges and the development of social effects; researchers as one contributor of knowledge(s) amongst others, researcher act as facilitators besides knowledge contribution.	<i>MLP</i> : N/A <i>Tm</i> : Further deepening the transdisciplinary process understanding of establishing and maintaining arena as interactive space; understanding of roles and activities of researchers therein and critical issues to deal with; conceptual and empirical relation of (social) effects aimed for to sustainability; methods and processes to transfer and apply generic sustainability values to local context.	To agency development via empowerment and social learning in general and sustainability transition psychology in particular (No1); to transfer thin sustainability morals to contextualized understanding (No2).

1.4 RESEARCH AIM AND STRUCTURE OF THESIS

The core question I address in this thesis builds on my overall research aim and the gaps outlined above. Recalling Section 1.1, my overall aim is to contribute to the advancement of prescriptive and transdisciplinary sustainability transitions research. I endeavour to do so with particular regard to achieving a better understanding of science-societal collaborations as facilitators of sustainability transitions, the role of individual actors in transitions, and an explicit consideration of the normative aim of transitions, namely sustainability. Thus, I focus on transition management as a recent, popular and salient approach of prescriptive and transdisciplinary sustainability transitions research. In doing so, I seek to address the following core research question:

How can we better understand the transdisciplinary collaboration process by which transition management contributes to sustainability transitions, particularly regarding consideration of normative sustainability aspects, individual agency, as well as well creating and maintaining a societal learning space and the roles of researchers therein?

To address this question, I follow **three sub-objectives**, addressing gaps in the different **core themes**:

- a. To achieve a psychologically enriched understanding of individual and sustainability related **agency** in conceptual and empirical understandings of transition management, taking social learning and empowerment as agency related core aspects into account
- b. To include normative considerations, namely **sustainability**, into transition management on conceptual and empirical levels with regard to substantive, procedural and intentional aspects
- c. To conceptualize and explore the **transdisciplinary collaboration** in transition management of creating an arena as an interactive learning space, and the roles of the researchers therein

These three objectives contribute to outline the types of knowledge related to governing sustainability transitions, namely systems (sub-objective a), target (b) and transformation knowledge (c). Three interrelated steps, having complementary research focuses, are undertaken to achieve these objectives. This includes conceptual-theoretic framework development (I), empirical case study analysis of transition management projects (II), and research reflection on conceptual level as well as on applied methods and processes (III). The scale of the case studies is the community level, as an underexplored application area of transition management (cp. Wittmayer 2016).

Specific tasks in the three steps oriented towards the stated sub-objectives are as follows:

aI: Conceptualization of individual agency and its' development via empowerment and social learning, including sustainability motivations

aII: Empirical analysis of social effects, including empowerment and social learning in relation to normative aims, namely sustainability

aIII: Individual agency related critical reflection, regarding the role of agency for understanding sustainability transition and their facilitation.

bI: Conceptual enrichment of transition management with normative components, particularly regarding sustainability in procedural, substantive and intentional dimensions.

bII: Empirical analysis of processes to contextualize sustainability (procedural sust.) and move from thin to thick morality (substantive sust.), to facilitate sustainability oriented learnings (intentional sust.).

bIII: Critical reflection on possibilities and challenges of addressing sustainability procedurally, substantially and intentionally in transition management.

cI: Conceptualization of transition management as transdisciplinary collaboration in the form of an interactive space and the roles of researchers in opening and maintaining this space

cII: Empirical analysis of process and content of creating and maintaining interactive learning space, and respective roles of researchers

cIII: Critical reflection on possibilities and challenges of opening and maintaining an interactive learning space and respective researchers roles

This thesis consists of five published journal articles, which are reprinted in consecutive chapters (see overview Table 2), as well as a framework embedding the articles. The first two articles (chapters 4&5) are conceptual in nature, contributing mainly to aI and bI as well as aIII and bIII. Articles three and four (chapters 6&7) combine conceptual with mostly empirical investigations and some reflexive work, related to a, b and c. Article five (chapter 8) combines conceptual, empirical and particularly reflexive work, mainly related to c. While the articles do have specific focuses, they generally contribute to more than one aim (table 4).

Table 2: Overview on articles included in thesis

CH	Authors, Title	Publication status and Journal
4	F. Rauschmayer, T. Bauler, N. Schöpke (2015): Towards a thick understanding of sustainability transitions — Linking transition management, capabilities and social practices.	Ecological Economics (109): 211-221
5	N. Schöpke, F. Rauschmayer (2014): Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency.	Sustainability: Science, Practice and Policy. 10(1): 29-44
6	J.M. Wittmayer, N. Schöpke, F.v. Steenbergen, I. Omann (2014): Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges.	Critical Policy Studies 8 (4): 465-485
7	N. Schöpke, I. Omann, J.M. Wittmayer, M. Mock, F.v. Steenbergen (2017): Linking transitions to sustainability: a study into social effects of transition management.	Sustainability 9(737)
8	J.M. Wittmayer, N. Schöpke (2014): Action, Research and Participation. Roles of Researchers in Sustainability Transitions.	Sustainability Science. 9 (4), 483-496

The following figure (1) summarizes the conceptual framework as developed in preceding sections, embedding the overall argument of the thesis. It also includes the aims of the thesis, building on identified research gaps. The primary contribution of this thesis thereby is of an exemplary and explorative nature (cp. chapter 3 on methods).

Introduction

Sustainability transitions require radical change of the regime as the mainstream way of organizing societal systems. This mainstream is composed of an interrelated constellation of prevailing structures (institutions, physical settings), cultures (prevailing perspective) and practices (rules, habits, routines), structuring behavioural options ('embedded agency'). Transition management aims to facilitate niche creation and upscaling for regime influence, with the transition arena as core tool. This interactive space of science and society allows for envisioning, backcasting and experimentation. It builds on a process of directed incrementalism, facilitating social learning and empowerment and thereby generating agency for realizing visions of (sustainability) transitions, providing a thin, broadly agreeable moral orientation. Navigating transitions towards sustainability requires a thorough understanding and practice of creating sustainable alternatives in niches. For creation of alternatives and sustainability orientation, individual actors play a core role. This thesis focuses on sustainability, individual agency, and transdisciplinary collaborations in transition arenas.

Initial framework

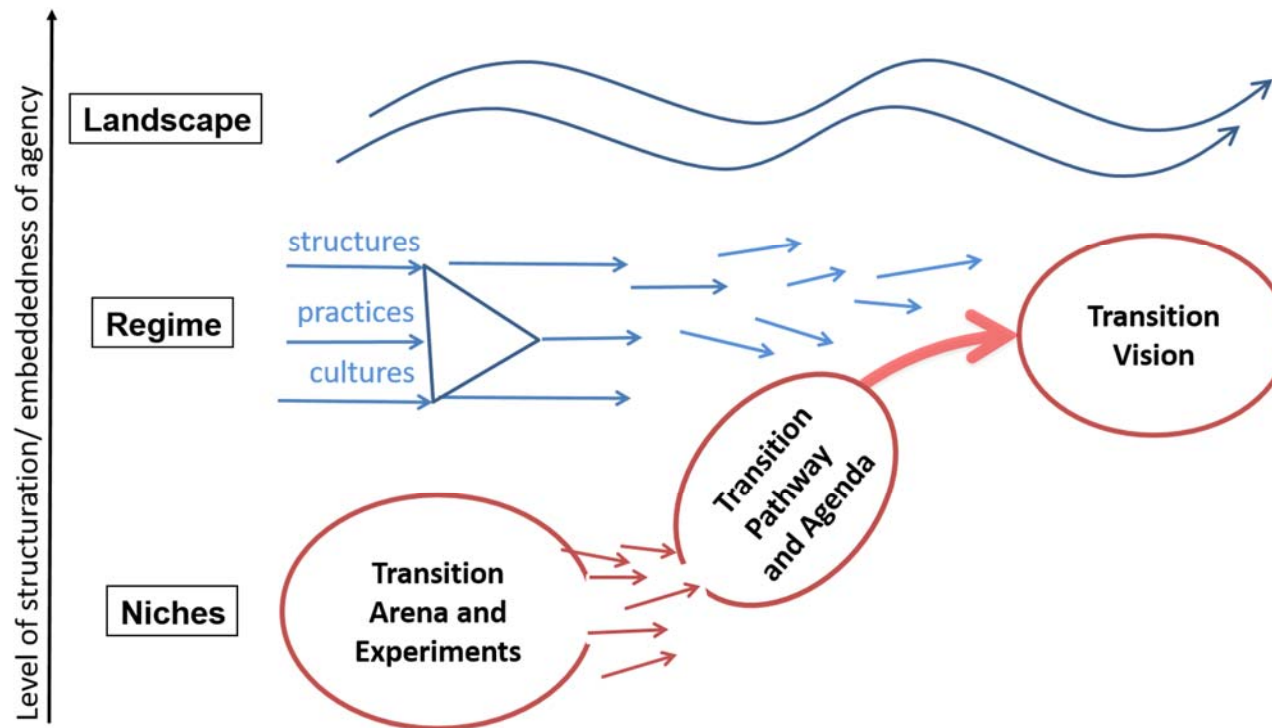


Figure 1: Overview of thesis introduction - state of the art and initial framework of analysis (building on Rauschmayer et al. 2015 strongly modified)

The remaining thesis is structured as follows: Chapter 2 presents and reflects on the methods used to develop the thesis. Chapter 3 includes summaries for the five articles included that form the core of the analysis. Chapter 4-8 provide reprints of the articles. Chapter 9 presents a synthesizing discussion of material from the articles and draws out overall insights with regard to the research question and objectives. Chapter 10 includes a short conclusion and outlook to close the thesis. Chapter 11 includes an annex with supplementary materials to an article.

2 METHODOLOGICAL REFLECTIONS

As outlined in the previous chapter, this thesis combines 1) theoretical-conceptual with 2) empirical case study work, complemented with 3) work reflecting on the research practice. This three-fold character influences the choice of methods used to develop this thesis. The methodological set up emerged and was fine-tuned over the period from 2011-2017. I reflect on it below.

2.1 THE 'RESEARCH JOURNEY' AS REFLEXIVE FRAME

Reflections on methods are guided by the concept of a research journey (McGowan *et al.*, 2014). I use it as a background when describing chronologically how I developed this PhD thesis, weaving in specific information on the methods used. Scholars developed the concept of the research journey to conceptualize how different forms of research can be combined to study complex problems, that require interdisciplinary as well as participatory or trans-disciplinary research approaches. The idea of the research journey revolves around two fundamental tensions that complex problem-related research, such as sustainability transitions research, is confronted with. The first tension concerns

'(1) the search for general trends or broad explanatory studies and (2) academic projects focused on specific problems rooted in specific or grounded observation. The second tension is between (1) knowledge collected through a formalized academic process characterized by falsification, and (2) co-created knowledge between the researcher and subject(s), including traditional knowledge and ways of knowing associated with a long-term relationship with place' (McGowan *et al.*, 2014: 36).

The authors propose that researchers consciously and deliberately navigate between the different poles underlying presented tensions. Combining the underlying tensions in a two dimensional matrix (Figure 2) provides researchers with an explicit map – the research landscape. Researchers can use it to reflect on their research and to understand how knowledge is developed by consecutively using different methods and approaches. The research journey thereby builds on the insight that complex problem research should employ an iterative, learning approach to conducting research, rather than following a strictly planned approach.

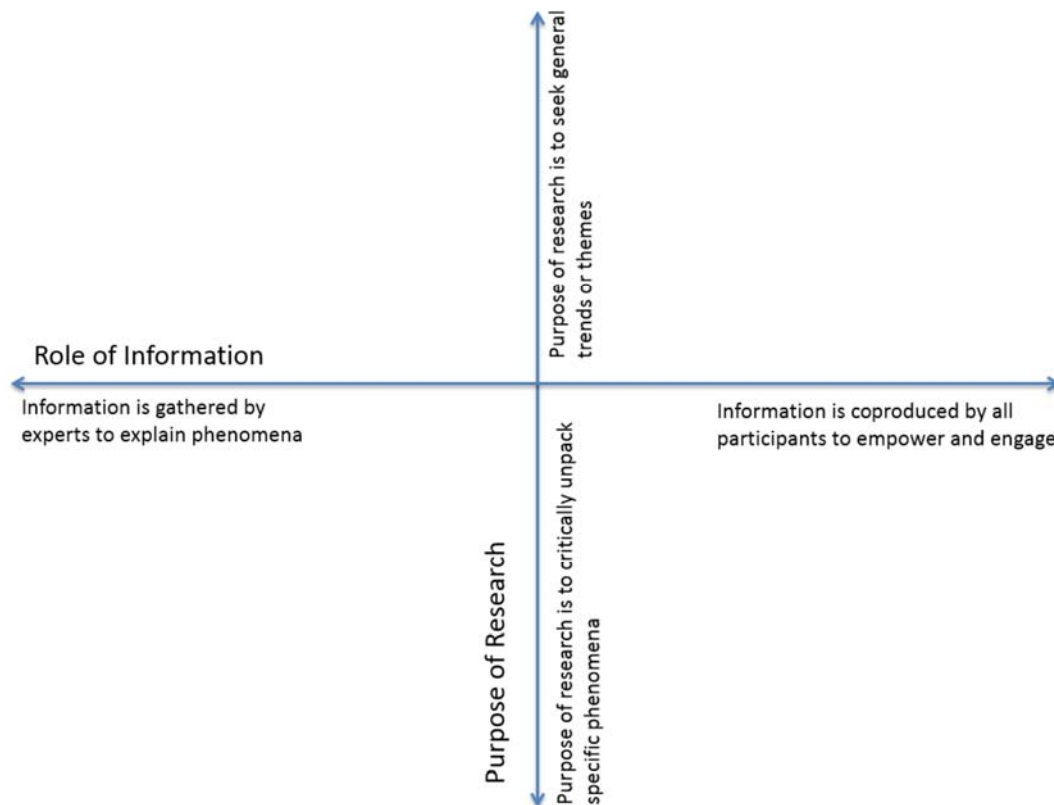


Figure 2: The research landscape. Source: McGowan et al., 2014

2.2 EMBARKING ON DOING A PHD EMBEDDED IN A RESEARCH PROJECT: FIRST AMBITIONS

A number of factors influences the shape of the individual research journey: its particular starting point, the initial aims of the research, the actors involved in the research, as well as the context where the research takes place. I began research related to this thesis as part of working in an EU FP7 project named ‘InContext-Individuals in Context: supportive environments for sustainable living’, running from 2010-2013. The project aimed to understand the transformative potential of communities and the role transition management could play in unleashing this potential. Thus, the project aimed to combine inner (e.g., focusing on emotions, values, and worldviews) and outer (e.g., external structures) perspectives on individual and collective behavior. It combined conceptual-theoretic research (e.g., Schöpke & Rauschmayer, 2012b) and case studies on existing sustainability initiatives (e.g., Bauler, Debourdeau, Baasch, Umpfenbach, & Piotrowski, 2013), with transition management pilot projects at the community level (e.g., Wittmayer et al. 2013). The latter were based on action and transdisciplinary research (Bergmann *et al.*, 2012; Bradbury & Reason, 2003; Lang *et al.*, 2012; Reason & Bradbury, 2001). Thus, all four poles composing the tensions underlying complex-problem related research, represented by the tips of the arrows in figure 2, appear relevant to the aims of InContext.

My initial role in the project was to contribute to the theoretical-conceptual work, although I later also became involved in reflecting on and evaluating empirical work in pilot projects. The aims of and work done in InContext partly overlaps with that of this PhD thesis. Nevertheless, I undertook a major part of the actual analysis and writing after the end of the project. My thesis also differs in its specific interest in what researchers within the frame of the InContext project aimed for and achieved. I will reflect on both – the InContext work and my personal contribution in this thesis – in the following paragraphs. This includes the continuous evolution of the research aims and approaches as the project and thesis progressed.

The initial aim of my PhD research was to develop an encompassing understanding of individuals in the context of transitions. This first phase was radically '*expert/ theory*' oriented. Thus, an early outline of my PhD work was framed as 'Integral sustainable development and inner transition arena', and drew on a generic and widely encompassing theoretical framework (Integral Theory by Ken Wilber (e.g. Wilber, 2001)). I planned to take the InContext pilot projects as case studies. Correspondingly, the first conceptualization of the theoretical cornerstones of the InContext project (Schäpke & Rauschmeyer, 2011) were highly abstract and discussed core concepts of the project in broad theoretical terms. The cornerstones document aimed for comprehensiveness in terms of perspectives covered, and was rather eclectic in terms of literature referenced.

The initial conceptualizations of the InContext project was translated into a more elaborated, yet still rather theoretical and comprehensive 'common approach' towards behavioural change, sustainability and the functioning of transition management (Schäpke & Rauschmeyer, 2012b). The common approach had a complex model of individual sustainability behavior at its core, that InContext internally called the 'Spaghetti-Model' (due to multiple feedback loops). We developed it based on deductive theorizing. As both the first ideas on the thesis and outlines of the theoretical frame of the project were interested in general phenomena, and how they play out in the specific cases, I located the purpose of the research in the middle ground between a more generic and a specific orientation. *Number 1* in figure 3 represents these first two publications and related work.

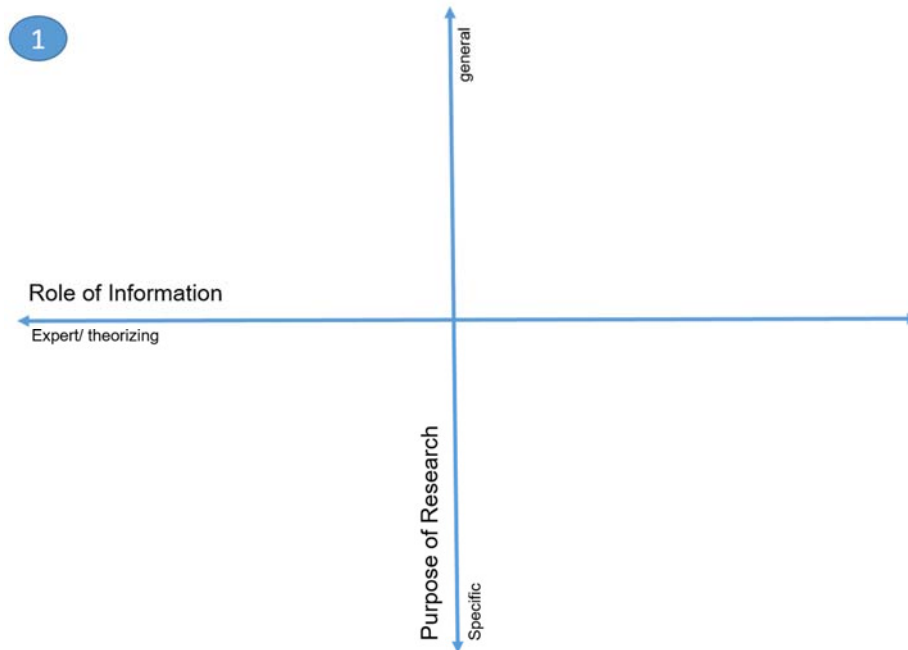


Figure 3: 'Expert-theory' phase of research journey.
(Concept of research journey based on McGowan et al., 2014)

2.3 REORIENTATION OF PHD TOWARDS SYSTEMATIC EXPLORATION AND CONCEPTUAL BOUNDARY WORK

At this stage, my employment with the InContext project ended. It transpired that remaining InContext pilot project researchers considered my initial ideas about the aim and approach of my PhD interesting, but not of practical use to the concrete work in the pilot projects. This was due to their abstract, theoretical and blurred nature. Thus, there was limited possibility for me to further pursue the initial ideas for my thesis with both the funding of my work and necessary collaboration emerging as challenges. Furthermore, I aimed to develop a thesis of practical value and therefore was taken aback by the negative feedback of my colleagues. Thus, after a period of reorientation and crisis, my PhD research took a new route.

My main intuition was that there was a need to establish more elaborated linkages between the change facilitated in transition management, the transition, and the associated normative aim, namely sustainability. Thus, I sought to position the PhD as having an interlinking role in two ways: first, I planned to engage in boundary work to co-develop a theoretical frame to understand local transition management by crossing over diverse approaches and theories. Second, following on from the boundary work, I wanted to engage in both theoretical and conceptual work, as well as with empirical, action research work in particular. Thus, I engaged as an external researcher, which provided me with a high degree of flexibility in terms of having limited obligations, as well as a high capacity for

adaptation to the concrete demands of the respective internal collaborators within the projects. Accordingly, the PhD thesis acquired a more iterative character, linking the different poles of the research journey landscape.

This manifested in two complementary steps, opening the second **'moderate expert/ applied theory'** phase of the research journey: First, I substantiated and differentiated the theoretical-conceptual work, through co-producing two discussion papers (Rauschmayer, Bauler, and Schöpke, 2013; Schöpke & Rauschmayer, 2012a). We based both papers on literature reviews and conceptual argumentations, and were interested in understanding phenomena in general terms. Rauschmayer *et al.* (2013) included an in-depth analysis of the blind spots of transition management with regard to providing systems, target and transformation knowledge for the governance of sustainability transitions (*point 2*, figure 4). It also elaborated on possible crossovers of transition management with the capability approach and social practice theory to remedy these blind spots. As a result, we produced a theory-based heuristic, including conceptual approaches covering target, system and transformation knowledge of sustainability transitions. Schöpke & Rauschmayer (2012a) developed a behavioural model based on a cross-over between the capability approach and environmental psychology, to lay the groundwork for understanding empowerment and sustainability transition psychology (*point 3*, figure 4). Thus, it conceptually deepened the theoretical considerations on sustainability transition psychology and agency developed by Rauschmayer *et al.* (2013).

Both discussion papers built on interdisciplinary work, oriented towards integrating theoretical perspectives on objects of shared interest (individual, normative-oriented behavior in one case, transition governance in the other), similar to boundary objects (Star and Griesemer, 1989). Work on crossing over between capabilities and environmental psychology was later published as the first article contributing to this thesis (*point 3*, (Schöpke & Rauschmayer, 2014)). It proposed a theory-based behavioural model termed 'dynamic-norm-activation-capability-model'.

Second, I drafted specific research questions and evaluation criteria for the pilot projects, in close collaboration with researchers responsible for the transdisciplinary work in the pilot projects. Starting from theoretical concepts, we defined the questions and criteria sufficiently broadly to leave room for qualitative inquiry into the specificities of the different pilot projects (*point 4*, figure 4). We took theoretical concepts – such as empowerment, learning and sustainability as developed earlier (points 2 and 3) - into consideration. We operationalized them in a rather open way, allowing us to capture information on them, while also allowing for a broader understanding of the specific cases to emerge. Thus, my formerly rather deductive approach towards analyzing the pilot projects based on theoretical considerations, switched towards a more open, partly inductive approach towards understanding pilot projects processes and, particularly, their effects. We began to develop single and comparative case studies with exploratory aims, seeking to learn what can be learned from local level transition management projects (Yin, 2014).

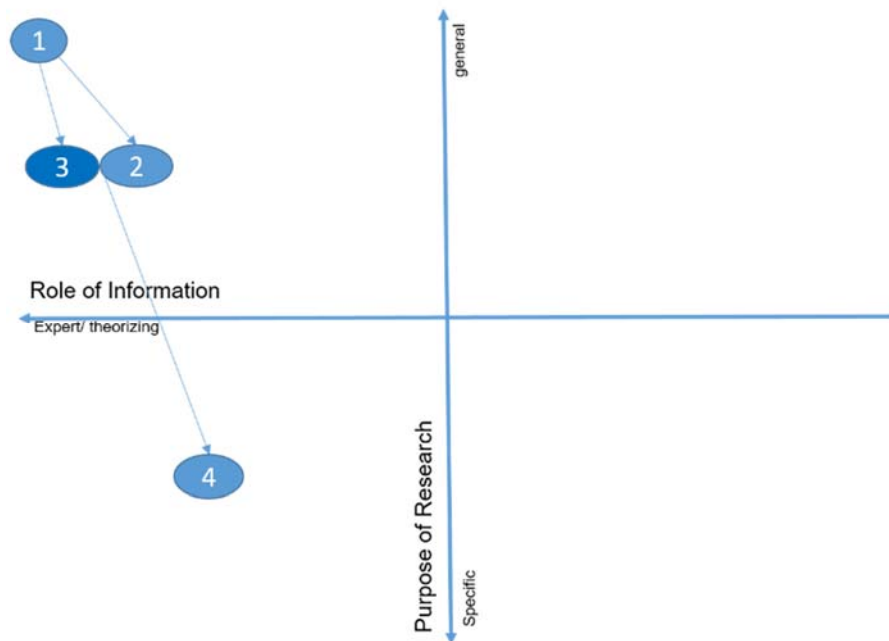


Figure 4: 'Moderate expert/ applied theory' of research journey. Dark blue balls represent articles included in thesis, light blue balls other publications/ research steps, light arrows depict chronological development of the thesis; based on McGowan et al., 2014

2.4 SETTING UP EXPLORATIVE AND PARTICIPATORY CASE STUDIES

Thus far, my primarily conceptual-theoretical work continued to relate more and more to the actual transition management processes and the development of case studies. Work then shifted from the theoretical side to include more participatory elements, according to the underlying distinctions of the 'research journey'. I was participating in the monitoring and reflection of the transdisciplinary, action research-based pilot projects. At this point, I realized that the scope of my thesis would be less oriented towards primarily understanding sustainability transitions and its research; rather my research aims towards improving sustainability transitions research and its effects. Thus, I am interested in research *for* sustainability transitions – taking a more transformative or process-oriented stance (Miller, 2013; Wiek and Lang, 2016) – and less in research solely *on* or *about* transitions.

The actual action research in the transition management projects followed a clear procedural outline (Wittmayer, Van Steenberg, Quist, Loorbach, & Hoogland, 2011). This made the research process transparent (cf., Cash *et al.*, 2003; Schwartz-Shea & Yahow, 2012) and, with regards to the steps taken, reproducible. As the outline was not co-authored by me, it is not included in the thesis overview (cp. figure 4). The procedural outline comprised a participatory systems analysis, a joint development of a vision, the deriving of transition pathways via a backcasting approach, and initiating of transition experiments to move towards the vision. It also comprised participatory monitoring and evaluation.

As such, the procedural outline also included a general outline for the development of data collection measures. Those were further specified as the project was moved along by all the researchers involved in the pilot projects and their analysis (Wittmayer *et al.*, 2013; Wittmayer *et al.*, 2011, 2012), and can be understood as a preparatory step for jointly producing a case study development protocol as recommended by Yin (2014). Thereby, researchers of InContext applied the transition management methodology at the community level in three cities (Carnisse in Rotterdam, Finkenstein in Austria and Wolfhagen in Germany), two of which are used in this thesis. I do not use the Wolfhagen case study, as the data generated from the local research process there did not fit the focus of this thesis, nor did collaboration with the responsible researcher allow for a further, in-depth analysis.

Transition management at the local level, e.g., in cities, provides case studies of particular interest, due to the high relevance of cities for understanding sustainability transitions. Cities are both responsible for a large share of (negative) sustainability impacts, as well as sites and drivers of dynamic developments potentially contributing to a shift towards sustainability (Bulkeley and Castán Broto, 2013; Evans, Karvonen and Raven, 2016). Thus the two cases studied – Finkenstein and Carnisse – have been used as contrasting cases (Flyvbjerg, 2006) to explore the spread of potential applications and the effects of transition management at the local level (Yin, 2014). Although both follow the typical transition arena methodology, they are quite different and contrasting with regard to the specific settings they took place in. Carnisse is an urban, deprived and highly multicultural neighborhood, while Finkenstein is an agglomeration of villages in the countryside, with a thriving economic sector and a very strong Austrian majority. Thus, the dynamics and challenges encountered also differed.

2.5 ADDING A REFLEXIVE PERSPECTIVE TO INTERRELATE CONCEPTUAL AND PARTICIPATORY WORK

In the next step, I added a third perspective to the conceptual-theoretic (e.g., conceptualization of transition governance, *points 3&4*) and phenomenon specific (e.g., social effects of pilot projects, *point 2*) inquiries into sustainability transitions (compare basic dichotomy in figure 2). That is, the reflection of the experiences from the concrete participatory action research practice (*point 5a*, figure 5) (Wittmayer *et al.*, 2013). Thus, the three-fold character of the thesis mentioned earlier, was developed and an **'integrative phase'**, linking 'expert/ participatory' and 'general/ specific', began.

We used a review of literature on action research practice to develop an understanding of key issues that arise in doing action research in sustainability transitions, including sustainability, power, ethics, and ownership. We identified related actions that researchers use to resolve them, and used these to reflect the concrete experience within the InContext project. This step was the first occasion in which an integration of theoretical-conceptual with empirical work had occurred, and has been included in my thesis. We gained empirical data to reflect the action research practice from multiple monitoring interviews accompanying the individual projects, as well as participatory observations of approx. 25 participatory meetings (cp. Schöpke, Omann, Wittmayer, van Steenberg, & Mock, 2017; Wittmayer *et al.*, 2013; Wittmayer *et al.*, 2011, 2012). Data was analysed using an inductive approach to understand key issues of transition management as action research. Insights were then contrasted with issues deduced from the wider action research literature.

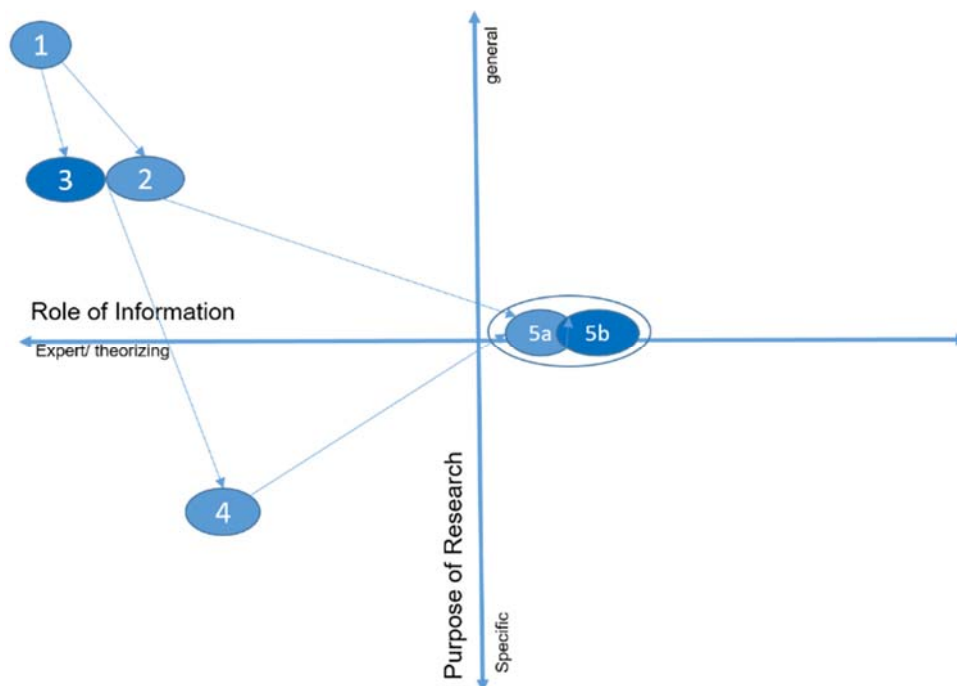


Figure 5: 'Integrative' phase of research journey. Dark blue balls represent articles included in thesis, light blue balls other publications/ research steps, light arrows depict chronological development of the thesis, circles depict close relation of publications, e.g., discussion papers later published as articles in reworked form; based on McGowan *et al.*, 2014

Considering that the practice of action research within transition management has only been shallowly developed, we chose an explorative approach (Wittmayer, 2016). We developed practical recommendations on how to practice action research in the context of sustainability transitions. Beyond the scope of this thesis, scholars later tested and distributed insights gained, via so-called reality check fora with stakeholders from interested communities across

Europe (<http://www.incontext-fp7.eu/events.html>) – as well as via a final project conference engaging a broad audience (<http://www.incontext-fp7.eu/node/53.html>).

To achieve a systematic understanding of researchers' roles and actions in science-society collaborations taking place in transition management, the analysis up to this point lacked both conceptual rigor and a relation to the existing state of the art. Thus, building on the first action research reflection mentioned (*Point 5a*), we moved on to an in-depth analysis of the process of opening and maintaining a transition arena as a communicative space. This included emergent critical issues, and the activities and ideal-type roles of the researchers involved in addressing these issues (*Point 5b*, figure 5, Wittmayer & Schöpke 2014). Our analysis built on a review of action research and transition management literature to develop key issues and ideal-types of roles, and then used this heuristic to reflect the Carnisse pilot project. Therein, we used empirical data gained by the transition management action researchers amongst us. This included 60 participant interviews, informal contacts and participatory observations. Researchers generated and analyzed empirical data, following an interpretative research paradigm oriented towards transparency and reflexivity as quality criteria of research (Schwartz-Shea, 2012; Schwartz-Shea and Yahow, 2012).

There was not only a lack of research on action research in transition management in general, but also of the respective roles of researchers in particular. Thus, we again opted for a crossover of different literature strands to develop the broad frame of analysis and used it to explore Carnisse as an empirical case. Carnisse may be seen to some extent as a critical case in the understanding of Flyberg's (2006) work, or similarly as a representative case in the understanding of Yin (2014). As a critical case, it may enable us to make reasoned suppositions that something that worked in Carnisse, could also work elsewhere. According to Wittmayer this may be true, as 'Carnisse is considered as an exemplary site for the quest of cities and local communities worldwide to address issues they are facing and to explore possible future directions' (Wittmayer, 2016, p. 76). Thus, we presented ideal-type roles of researchers and related activities that are suitable to tackle key issues researchers encounter in process-oriented sustainability science. Ideal-type roles, understood as generic and abstract descriptions of roles, provide a heuristic for the researcher to reflect and consciously design their research practice.

2.6 DEVELOPING AND INTERPRETING EMPIRICAL DATA FROM THE CASES

In close relation, a first assessment of social effects – namely social learning, empowerment, and social capital development – of two transition management cases was undertaken (*point 6*, figure 6, Schöpke *et al.*, 2013). Thus, a '**participatory/ combined general/ specific**' phase began, in which we derived social effects from a literature review and specified them as analytical categories. We then used analytical categories to frame questions and items for semi-structured surveys, interviews and – adding a stronger emphasis on co-production – a participatory evaluation workshop. The latter produced self-evaluations of the process and generated documents by participants, as well as participants' observations. Data sources were combined into a consecutive triangulative analysis. Results included conceptualizations of social effects and empirical analysis of social effects of the two case studies. Additionally, and in a separate step, we briefly explored the orientation of the pilot projects visions and actions towards

sustainability as a normative goal. The analytical focus on social effects, separated from sustainability considerations, strongly limited the overall insights we gained towards the sustainability orientation of the cases studied. It did not allow us to judge the effectiveness of steering towards sustainability via pursuing social effects, nor to answer this thesis’s related research interests.

In parallel, we undertook in-depth investigations of the concrete processes in Finkenstein and Carnisse, to understand how sustainability as a broad and general normative aim acquires meaning in local contexts (*point 7*, figure 6). This analysis builds on similar data sources as the prior step (*point 6*), but adds ‘thick descriptions’ of the cases in question, respective research processes and their evolution as well as the surrounding project contexts (Geertz, 1973; Denzin, 1989). In addition, it applies a more inductive approach to analyze the specific process. Thus, we used broad analytical categories from the literature to frame data interpretation. We interpreted the data in various rounds of joint reflections amongst researchers and iteratively amended interpretations based on critique by article reviewers (cp. Wittmayer, Schöpke, van Steenberg, & Omann, 2014). An increasingly coherent and refined framing of the case analysis and the analysis itself developed. We gained an understanding of the contextuality and situatedness of the case study processes and results lacking in other empirical work, which primarily focused on the evaluation of results (e.g., social effect development) or development of overarching concepts (e.g., ideal-type researchers roles).

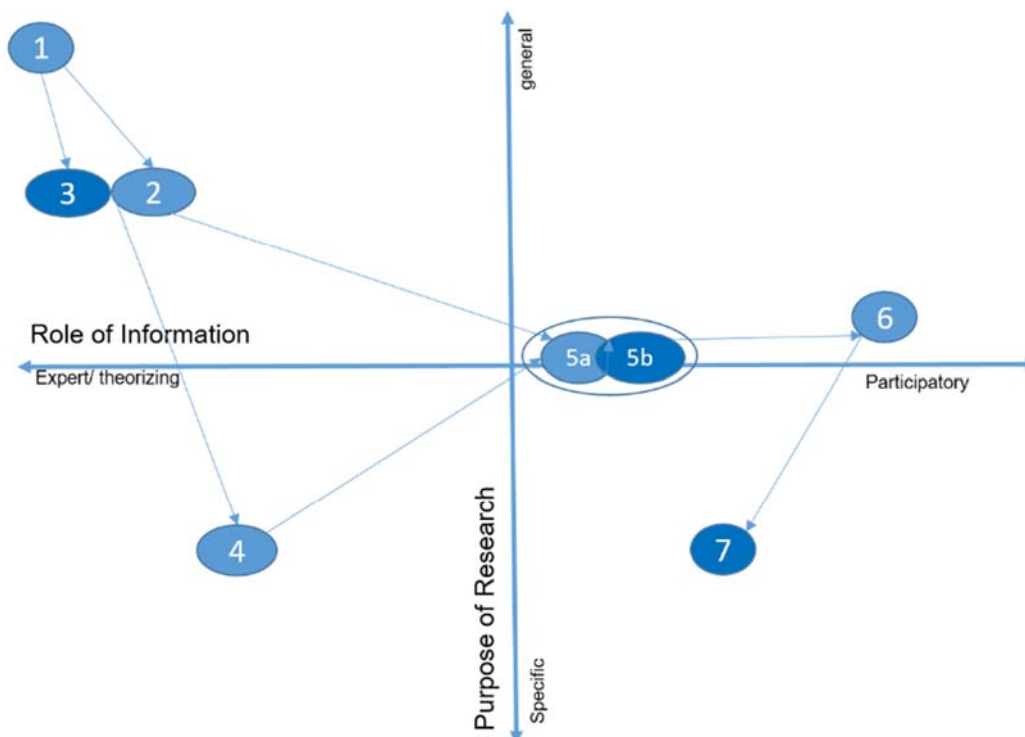


Figure 6: ‘Participatory’ and combined ‘general/ specific’ phase of research journey. Dark blue balls represent articles included in thesis, light blue balls other publications/ research steps, light arrows depict chronological development of the thesis, circles depict close relation of publications, e.g., discussion papers later published as articles in reworked form; concept of research journey based on McGowan et al., 2014

2.7 ANALYSIS AFTER THE END OF THE PROJECT

The final chronologically undertaken steps of the work for this thesis, were done after the end of the InContext project in late 2013. I returned to a **'general' phase**, partly 'expert', partly 'participatory' in character. It comprised the condensation of the overall theoretical framework (*point 8*, figure 7, Rauschmayer *et al.* 2015), thereby building on initial considerations (*point 3a*) and including insights from empirical work. A key result was a conceptual heuristic covering target, system and transformation knowledge to reflect and design sustainability transition governance. The overall, broad framework to interrelate the various analysis of this thesis was developed.

This framework development phase comprised a substantially reworked analysis of the societal effects of the transition management cases (former *point 6*). The latter included a much more elaborated literature review to develop the evaluative framework and respective categories and indicators (*point 9*, figure 7, Schöpke *et al.*, 2017). Therein, the relation between social effects and sustainability was positioned at the centre. It integrated an intensified joint assessment and interpretation of the collected empirical data, contributing to a comparison of both cases studied. For the empirical analysis, we used multiple sources of data, including participatory evaluation workshops, surveys, semi-qualitative interviews, and participant observations. We combined them into a triangulative analysis of the phenomena in question, allowing for a multifaceted understanding and robust insights based on complementary investigations (Yin, 2014). Results included a conceptualization of social effects and their evaluation, taking into account the state of the art, and a comparative evaluation of transition management social effects from the two cases. We gained an understanding of how social effects are interrelated with the normative aims of transition management.

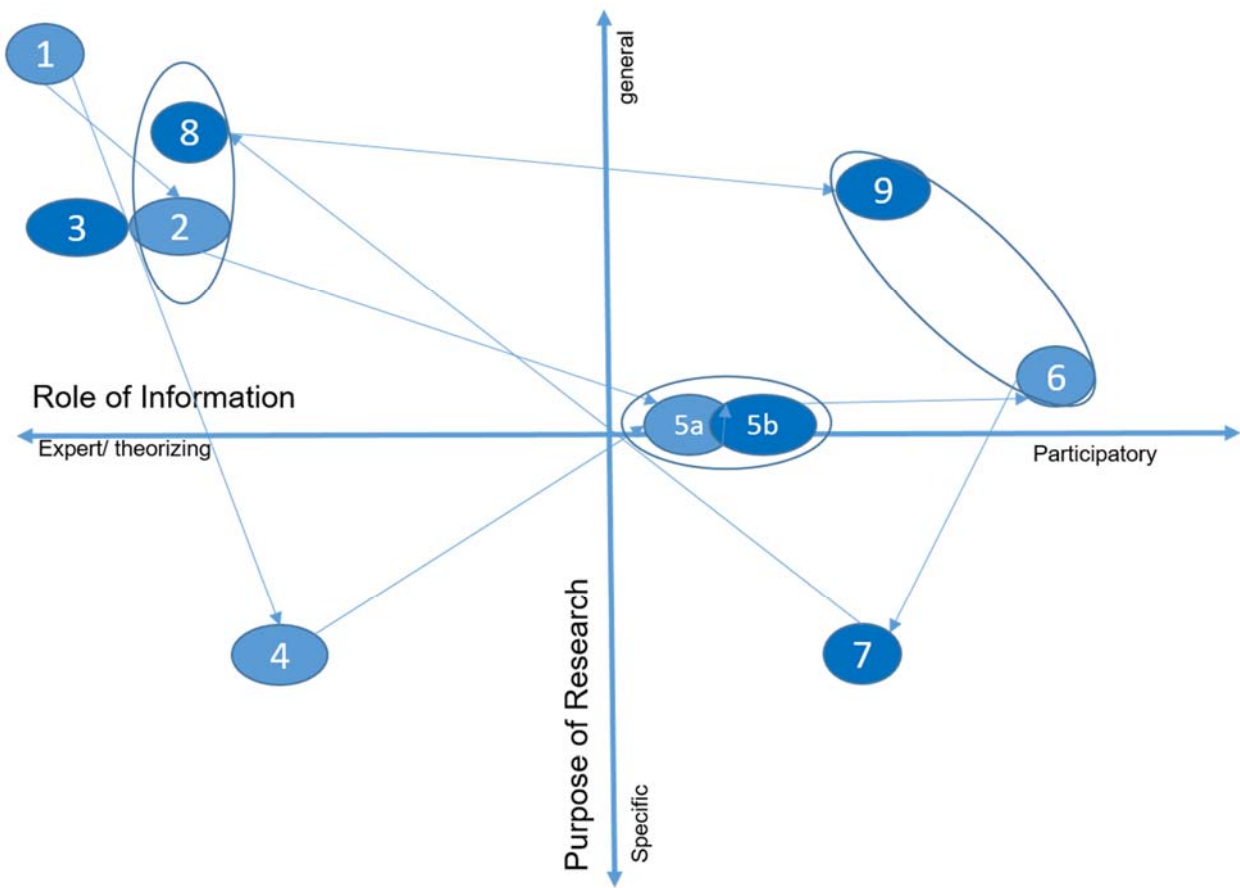


Figure 7: ‘General’ phase and overall picture of research journey of this thesis. Research and respective publications moved across the research landscape. This included zooming in on specific phenomena related to participatory work, and zooming back out to gather more general understandings – both based on participatory and expert based analysis. Dark blue balls represent articles included in thesis, light blue balls other publications/ research steps, light arrows depict chronological development of the thesis, circles depict close relation of publications, e.g., discussion papers later published as articles in reworked form; concept of research journey based on McGowan et al., 2014

2.8 REASSEMBLING THE PICTURE OF THE OVERALL RESEARCH JOURNEY

Summing up, I developed the five articles comprising this thesis in the course of a research journey, including numerous steps and multiple publications (figure 7). This research journey was iterative in two ways. Research steps pursuing different aims (e.g., concept development and empirical analysis) built upon each other. In addition, research steps related to one aim developed bit by bit as well (e.g., from discussion papers to articles), including insights regarding other aims and including feedback from peers. The journey began as a highly abstract, expert based elaboration of very broad conceptual frames, (*point 1*, figure 7), that was considered to have very limited potential usability. Then, it led to conceptual frames more related to the actual empirical material (2,3), as well as

mostly case based monitoring and evaluation attempts (4). We then grounded the research in reflection of the transdisciplinary work, with an interest in how general topics of transdisciplinary research play out in the concrete cases. Thus, we took into account insights from participatory work (5a, 5b). Monitoring and evaluation on social effects of transition management were then further enriched with results from participatory work (6), and the transdisciplinary research practice and related effects in parallel became embedded in a thick description of the cases (7). In the final steps, insights gained from participatory work was re-embedded into a re-drafted conceptual framework (8), and re-evaluated against a more theoretically refined evaluation social effects framework (9). Thus, the character of the research journey involved zooming in on specific phenomena related to participatory work, and zooming back out to gather more general understandings – both based on participatory and expert based analysis.

2.9 RELATING THE RESEARCH JOURNEY, THESIS AIMS AND METHODS USED

As mentioned, I am interested in research *for* sustainability transitions – taking a more transformative or process-oriented stance (Miller, 2013; Wiek and Lang, 2016) – and less in research *on* or *about* transitions. Thus, I was aiming towards improving sustainability transition research and contributing to its effectiveness. As such, the results gained during this thesis are not only of *scientific relevance* with regard to understanding transition research better (cp. Bergmann et al., 2005). In Chapter 1, I outlined diverse contributions with regard to the current debate on transitions research, e.g., in better understanding agency and how to address sustainability as an explicitly normative goal in transition management. In addition, the results of this thesis aimed for *societal relevance* in terms of improving the actual practice of transition management (cp. Bergmann et al., 2005). This, for instance, resonates with the aim of better understanding science-society collaboration to facilitate sustainability transitions. It then could potentially contribute to improving such practice and its real-world outcomes. However, how does this play out in my research, given the fact that I was not in charge of doing transdisciplinary and transformative research myself? How does it take form regarding methods used?

My approach was to complement the interpretative, phronetic and action research-based perspective of the transition management researchers (e.g., Wittmayer, 2016), with more conceptual-theoretic as well as evaluative perspectives. For the latter, I drew on my background as a sustainability scientist, as well as my embedding and collaboration with environmental political and ecological economic researchers at Helmholtz Centre for Environmental Research. Thus, I aimed to work towards integration on two levels: first, with regard to crossing over theories and concepts (e.g., between social effects of transition management and normative sustainability concepts done in article 9). And second, with regard to linking different forms of research (e.g., expert-driven with participatory research) as shown in figure 7 above. Furthermore, and corresponding to my role within the project and the aim of this thesis, I wrote all articles together with coauthors from diverse disciplinary backgrounds. Three articles were written in intense collaborations with researchers responsible for the transition management processes.

In the following, I present a summary of the research forms and methods that I used to pursue the different tasks and aims of this thesis (see section 1.3). This is done in relation to the specific role information played and the

individual purpose of research when pursuing the tasks. Role and purpose were key factors to understand my research journey above.

- I. For the **overall conceptual frame** (publication points 2 and 8), I relied on conceptual argumentation, theoretical cross-overs and expert literature reviews. Thus, I was mostly interested in understanding phenomena that are more general, and drew on expert analysis.
- II. For the **empirical transition management case studies**, I relied on participatory knowledge development in two ways. First, I built on literature reviews with triangulative empirical analysis and case comparisons. Here, I combined an interest in general trends with specific observations in the individual cases (point 6 and 9). Secondly, I used case study comparison and thick description mostly oriented towards understanding case specifics (point 7).
- III. For **reflexive work on researchers' roles and the opening and maintenance of interactive space**, I mainly relied on balanced combinations of investigating general trends and understanding specific phenomena (points 5a and 5b). Therefore, I blended expert and participatory knowledge contributions via literature reviews and qualitative data analysis from transdisciplinary pilot projects. Analysis in I. and II. did contribute some critical reflexive insights as well.

In sum, I co-published five articles that are included in this thesis. These articles cover the threefold approach of conceptual-theoretic, empirical and reflexive work in specific, yet complementary ways. In the following, I provide an overview on the basic aim of research and respective role of information as elaborated with regard to my research journey above. This is complemented with types of arguments and respective methods used in the articles forming this thesis (table 3).

Table 3: Research foci and methods used in thesis articles (light gray areas show primary conceptual work, dark gray areas show combined conceptual, empirical and reflexive work)

Chapter/ short-title	4 Towards a thick understanding of sustainability transitions	5 Behavioral models for sustainability transitions	6 Making sense of sustainability transitions locally: action research	7 Linking transitions to sustainability: societal effects of transition management	8 Roles of researchers in sustainability transitions
Number/ Figure 8	8	3	7	9	5b
Purpose and basic focus of research					
Aim of research and role of information	Understanding general aspects of sustainability transitions based on expert knowledge	Understanding general aspects of sustainability transitions based on expert knowledge	Understanding specific aspects based on participatory processes	(Rather) Understanding general aspects of sustainability transitions based on expert knowledge and participatory processes	Understanding specific aspects based on participatory processes
Type of argument and reasoning/ analysis	Conceptual argument based on the enrichment of existing concepts and the development of new concepts/ models by bridging existing ones	Conceptual argument based on the enrichment of existing concepts and the development of new concepts/ models by bridging existing ones	Argument based on empirical analysis building on conceptual work and enrichment of existing concepts/ models.	Argument based on empirical analysis building on conceptual work based on the enrichment of existing concepts and the development of new concepts by bridging existing ones.	Argument based on empirical analysis building on conceptual work based on the enrichment of existing concepts and the development of new concepts by bridging existing ones.
Synthetic/ boundary work	Yes, regarding concepts	Yes, regarding concepts	Yes, regarding concepts and regarding linking conceptual and participatory work	Yes, regarding concepts and regarding linking conceptual and participatory work	Yes, regarding concepts and regarding linking conceptual and participatory work
Exploratory	Yes	Yes	Yes	Yes	Yes
Development of Hypothesis	Yes	Yes	Yes	Yes	Yes
Empirical work	No	No	Yes	Yes	Yes
Reflexive elements towards research practice	Partly (conceptually reflexive)	Partly (conceptually reflexive)	Yes	Yes	Yes, strongly
Methods used					
Review	Yes, argument based on an expert literature review	No	No	Yes, in form of a keyword based literature search and reasoned selection of texts	Yes, argument based on an expert literature review
Case study	No	No	Yes	Yes	Yes
Case comparison	No	No	Yes	Yes	No
(Semi-) Qualitative data analysis	No	No	Yes, in form of a thick description of cases from multiple data sources and inductive category development	Yes, building on a broad qualitative data analysis and deductive category development	Yes, to some degree, based on a deductive category development
Triangulative data generation/ analysis	N/A	N/A	Yes (documents, interviews, surveys, observations)	Yes (documents, interviews, surveys, observations)	Partly (documents, interviews, observations)
Transdisciplinary/ Action Research based	No	No	Yes (underlying process using participatory envisioning, problems structuring, pathway development, experimentation and evaluation, self-reflexive practice of action researchers)	Yes (underlying process using participatory envisioning, problems structuring, pathway development, experimentation and evaluation, self-reflexive practice of action researchers)	Yes (underlying process using participatory envisioning, problems structuring, pathway development, experimentation and evaluation, self-reflexive)

The basic focuses of research and respective methods employed can be related to the aims of this thesis via core themes and the knowledge types pursued. In an ideal-type combination, research with different focuses are performed in complementary ways: I) develops theoretically sound concepts, while II) allows for empirical exploration, enrichment and testing of concepts and hypothesis, and finally III) includes critical reflection of research practice contributing to results in I) and II). Thus, it deepens understanding of research practice and obtained results. Such combinations of research with different focuses addressing individual key themes, allows for the most robust understanding. A basic overview reveals such complementary perspectives for all three core themes (see Table 4). A detailed discussion on how various chapters, their primary research focuses and themes of interest interrelate can be found at the end of chapter 3.

Table 4: Relation of key themes, research approaches and articles included in thesis

Research focus/ <i>Theme</i> (and knowledge type)	I Conceptual frame	II Case studies	III Reflexivity
a: <i>Agency</i> (systems knowledge)	Yes Chapter 5, complemented by 4&7	Yes Chapter 7	Partly Chapter 8, complemented by 7
b: <i>Sustainability</i> (target knowledge)	Yes Chapters 4,5,6, complemented by 7	Yes Chapters 6,7	Yes Chapters 6,7,8
c: <i>Transdisciplinary collaboration</i> (transformation knowledge)	Partly Chapters 6,8, complemented by 4	Yes Chapters 6,7,8	Yes Chapter 6, 8

2.10 CRITICAL REFLECTION ON RESEARCH PRACTICE AND QUALITY

The potential strength of this thesis lies in its synthesizing character, producing new perspectives on the challenges by linking formerly separate theoretical and empirical approaches to sustainability transitions research. A second strength lies in the exploration of the topic via case study and case comparison work, developing hypothesis based

on empirical insights. The scope of the analysis thus is to explore themes formerly underinvestigated in sustainability transition literature, e.g., transition psychology and sustainability aspects of facilitating science-society collaboration. A third strength can be seen in the iterative combination of three strands of research: the conceptual theoretic, the empirical-analytical, and the (self) reflexive. This dialogue developed in the course of the InContext research project and parallel and consecutive work on this PhD thesis, when my formerly strong orientation towards conceptual work evolved more and more towards an integrative orientation.

As outlined in the research journey, the process of writing this thesis was full of unplanned developments, challenges and the constant need to reconcile research following different logics (e.g., action research, interpretative research in case studies and conceptual-theoretic work in theory work packages). This led to the need for improvisation and for adjustments. It also led to the overall picture having more of the character of a mosaic, rather than a linearly developed chain of questions, analysis and results. Thus, development of insights is based on a mix of deductive and inductive work termed abduction, having the character of skillfull improvisation (Wittmayer, 2016, chapter 2.1.2)

‘In this puzzling-out process, the researcher tacks continually, constantly, back and forth in an iterative-recursive fashion between what is puzzling and possible explanations for it, whether in other field situations [...] or in research-relevant literature. The back and forth takes place less as a series of discrete steps than it does in the same moment: in some sense, the researcher is simultaneously puzzling over empirical materials and theoretical literature’ (Schwartz-Shea and Yahow, 2012, p. 27 as stated in Wittmayer 2016).

In accordance with the exploratory character of this thesis, different chapters produce broadly complementary results, with research questions and concepts used generally corresponding to each other across articles. Variations and even deviations of how we operationalized core themes in detail are part of the broad exploration of themes. The following chapter includes summaries of all articles included in this thesis. It ends with an overview of keywords used in different articles, highlighting coherent usages of concepts in the different articles as well as variations present. Thus, it allows for capturing the complementarity between articles and enhances the robustness of the overall insights. It furthermore allows the determination of whether insights are based on conceptual reasoning, empirical analysis or reflection only or on combinations thereof. I use this differentiation, further developed at the end of chapter 3, to specify claims made in the results synthesis chapter 9.

The cases studied in chapters 6-8, namely Finkenstein and Carnisse, represent typical transition management processes at the local level. This local level has not been in the focus of transition management applications and literature so far (Wittmayer 2016). Given the important role of the local level to play in transitions, this motivates the importance of present cases. As cases show a range of similarities, e.g., the methods applied, the size in terms of inhabitants, western European location, but do strongly differ with regard to type of agglomeration, they can be of use to explore the bandwidth of applying transition management to the local level. Chapter 8 relies on Carnisse as

a case study only, representing a typical case of local transition management application. My colleagues responsible for the action research in the case studies aimed for a transparent research process, process ownership by engaged people and reflexivity of researchers (Wittmayer, 2016). Those factors were applied as quality criteria to the research process (Schwartz-Shea, 2012). As outlined in the research journey above, transparency of the process was increased by drafting and publishing methodological guidelines beforehand, joint discussion of process with participants and documentation of process and methods in publications. Methodological guidelines and documentations also make the process, not necessarily the results, reproducible. Process ownership was strengthened by an open agenda in the facilitation of community arena, activating facilitation techniques and respective attitude of researchers. Ownership was rated positive by participants in both cases studied (Wittmayer & Schöpke, 2014). The reflexivity of researchers was facilitated by working in teams, exchange between the teams responsible for the different case studies, writing reflexive articles (Wittmayer & Schöpke, 2014), as well as critical discussion between action researchers and InContext team members responsible for the conceptual-theoretical framework development (such as myself). Critical discussion then, in turn, contributed to the appropriateness of conceptual work for concrete transition management practice as outlined above.

This abductive, integrative and exploratory research approach, building on skillfull improvisation and iterations between conceptual, empirical and reflexive work, corresponds to the research aims of this thesis and the de-facto research setting my thesis was embedded in (e.g., the InContext project, Helmholtz Centre for Environmental Research, later project-external collaborator). Nevertheless, this results in limitations concerning the possibilities to generalize results. Similarly, validity and reliability of results were not the focus of the action research case studies – and respective publication of results (chapters 6-8).

3 SUMMARY OF ARTICLES

This chapter presents summaries of the published research articles that form the core of this thesis. Each article, included in the published original in later chapters of this thesis, is summarized regarding its main research aim, approach and core results related to the research aims and objectives of this thesis. Following up on the five summaries, an overview table is presented, relating core results and research aims and objectives with core themes and focuses of research (see table 4 above). The final subchapter 3.6 discusses the coherence, complementarity and potential contradictions in terms and concepts used in the different chapters and respective articles. This lays the ground for the synthetic discussion of results across chapters in chapter 9.

3.1 CHAPTER FOUR - TOWARDS A THICK UNDERSTANDING OF SUSTAINABILITY TRANSITIONS: LINKING TRANSITION MANAGEMENT, CAPABILITIES AND SOCIAL PRACTICES

This chapter addresses aspects of individual agency, normativity and facilitation of science-society collaborations, as part of transition governance and respective research gaps (table 1). Together with my co-authors, I developed a thick understanding of sustainability transitions by way of conceptual argumentation, building on a review of key literature. We then presented this thick understanding in the form of a meta-heuristic covering three types of knowledge that research needs to contribute to for the successful facilitation of sustainability transitions. These are target, system and transformation knowledge. To develop the meta-heuristic, we engaged in crossing-over three approaches: transition management focusing transformation knowledge; social practice approaches providing rather descriptive system knowledge; as well as the capability approach, focusing on target knowledge.

We used transition management as a starting point, providing insights on how, where and why to set up niche formation processes and develop alternative solutions to societal challenges. Therefore, transition arenas and transition experiments are proposed as core tools. Transition management builds on a multilevel understanding of societal transitions as the interplay of niches, regimes and the landscape. While providing transformative knowledge, the approach lacks target knowledge on the normative aim of the transition. It leaves it to the participating actors to define substantial and procedural sustainability goals, and does not provide sustainability assessment tools. In addition, it lacks systems knowledge regarding a clear picture of the interplay of individual agency and structure to provide a reading of the societal change aimed for.

Consecutively, we augmented the capability approach to transition management adding a normative perspective and introducing a conceptualization of individual agency. Scholars define capabilities as the real freedoms a person has to live a valuable life. The capability approach differentiates self and others with regards to motivations when actors decide about which behavioral alternatives to perform. As a partial theory of justice, the capability approach provides both an understanding of individual behavior and a normative yardstick to measure societal changes towards a better life. Thus, scholars have linked capabilities as freedoms to live a valuable life, to needs based approaches of understanding sustainable development. This provides a direct relation of capabilities to common definitions of sustainable development as, e.g., included in the Brundtland Report (WCED, 1987). Thus, capability assessments allow measuring the effect of changes on sustainability, in terms of maintaining or increasing capabilities of today's and future generations.

The capability approach, like other individualistic and rationality-based approaches, is limited in terms of understanding individual and collective behavioral changes – as behavior appears to be embedded into complex and shared socie(tal) practices. Thus, to add systems knowledge to the meta-heuristic, this chapter turns towards social practices approaches. These approaches build on a sociological perspective on change. Adding them does provide a rich understanding of the interplay of individual agency and the development of societal structures. Practices are composed of skills, materials and meanings related to shared activities, and particularly routinized behaviors within society. Examples include activities such as cooking&eating or moving&travelling, which are composed of respective sets of skills, materials and meanings. Societal transformations then occur as a co-evolution of material artefacts, socio-economic conditions, organizational and institutional reconfigurations, as well as changes in individual and collective values, interpretations, knowledge and behavior. Social practice approaches do allow conceptualizing innovations at niche level in the form of new practices developed by groups of individuals that poses shared meanings, skills and artefacts.

As a *core result* of the chapter with regard to the overall thesis, we suggest a meta-heuristic to contribute to the prescription of sustainability transitions governance. The thick description includes concepts, methods and procedures of transition management to facilitate transitions. It furthermore includes considerations on individual agency and normative assessments of developments, building on the capability approach. It also includes a perspective on societal change as an interplay of individual agency and structure, building on the social practice approach.

We described the overall process of facilitating sustainability transitions as follows: for a transition to happen, the societal regime needs to change. This regime can be described as prevalent and unsustainable practice that needs to be transformed towards more sustainable ones. Practice approaches can be used to understand the entangled skills, artefacts and meanings composing practices. Transition management facilitates the desired change by opening an interactive space for learning, building on participatory envisioning of and experimentation with new and more sustainable practices. Then a network of supporters is built to spread and upscale alternative practices. This process allows for an empowerment of niche actors, increasing their agency, as well as for social learning on viable alternatives. The joint aim of both processes is to alter the existing regime practice to become more sustainable.

The capability approach can be used to assess the sustainability of practices at niche and regime level. For example, different practices of eating&cooking as developed alternatives should therefore be understood with respect to their impacts on the capabilities of the current poor and future generations. This provides a means to judge their substantial sustainability. At the same time, we elaborated how the capability approach, in particular when it is psychologically enriched, offers grounds to better understand why people engage in alternative, more sustainable practices. For example, empowerment and learning fostered by transition management can get targeted to allow for development of capabilities and an increased agency to engage for sustainability. This understanding allows designing policies that take account of these motivations. Aspects of intentional sustainability can get addressed.

In sum, the developed heuristic could provide a conceptual basis of sustainability transitions and their governance. Therefore, we proposed second order governance as a governance that concentrates on providing space for niche development and support to niche diffusion. By extension, it should reflexively cope with the learning and engaging-dynamics at individual levels on which societal sustainability transitions are necessarily reliant on. While oriented to transition governance more broadly, the idea of second order governance can also be used to frame the facilitation of science-society collaborations aiming at contributing to sustainability transitions. These collaborations, as part of the attempt to govern sustainability transitions, are then understood to allow for providing space for niche development by enabling learning, empowerment and thus generate agency. Psychologically enriched capabilities may provide a yardstick to measure sustainability related developments in these collaborations.

Conceptual reflection: Transition management in niches can function as an interlinking element between individual agency and structuring social practices at regime level. Transition management thus creates possibilities to increase agency of actors by providing space for alternative action contrasting social practices. Vice versa, individual agency needs to be understood as embedded in social practices. Furthermore, transformations are not dependent on niche level only, and sustainability is a global and societal goal, that cannot be effectively dealt with at the individual level only (Rauschmayer, Bauler and Schöpke, 2015, p. 219).

3.2 CHAPTER FIVE - GOING BEYOND EFFICIENCY: INCLUDING ALTRUISTIC MOTIVES IN BEHAVIORAL MODELS FOR SUSTAINABILITY TRANSITIONS TO ADDRESS SUFFICIENCY

This chapter dives deeper into the aspect of transition psychology and individual agency linked to intentional and substantial considerations of sustainability, and addresses the existing individual agency gap (table 1). Together with my co-author, I began with a critical discussion of core sustainability strategies – namely efficiency, consistency and sufficiency – as proposed to facilitate societal change in general, and behavioral change in particular. While we found both efficiency and consistency to be central to allow for sustainability transitions, we also detected severe shortcomings regarding their effectiveness. These include, e.g., rebound effects offsetting efficiency gains and slowly developing technologies limiting consistent achievements. Sufficiency, as for instance the voluntary restriction of consumption, thus necessarily complements sustainability efforts. To mediate its lack of popularity due to feared loss of quality of life (e.g., when associated with limiting growth), we proposed to take intentional aspects of sustainability into account. This allows for a broader understanding of quality of life and its contributing factors.

First, the chapter thoroughly introduces substantial, intentional and procedural understandings of sustainability with regard to human behavior. Substantial sustainability concerns impacts of behavior on sustainability aspects, such as the quality of life of future generations. Intentional sustainability concerns the motivation underlying behavior. Procedural sustainability relates to how far the behavior itself is carried out according to sustainability principles. Consecutively, the chapter develops a model of human behavior that links intentional and substantial understandings of sustainability and thus may guide comprehensive sustainability strategies. This provides a model to conceptualize individual behavior and underlying psychological dimensions in sustainability transitions.

To build the model, this chapter combines the capability approach with environmental psychology and particularly the norm activation theory. Thus, it deepens the capability-based understanding of the normative and individual agency dimension of sustainability transitions built in the former chapter. We called the resulting model the dynamic-norm-activation-capability-model. This behavioural model allows designing policies and governance strategies to foster sustainability transitions. It may also inform respective transdisciplinary, action research based transition management attempts. The model is richer than typical models of economic research (building on assumptions of self-interest, rational individuals) like those primarily referenced in writings on the Multi-Level-Perspective (see section 1.3.1). In addition, it is more oriented towards public policy as compared to most psychological research. Therefore, the model does not only take into account different motivations for behavior, including sustainability-oriented motivations. It also allows an assessment of the quality of life impact of policies and strategies, as it builds on capabilities as real freedoms to live a valuable life.

Capabilities have a long tradition of measuring societal progress, as for instance in the Human Development Reports (United Nation Development Programme, 2011). They can be used to design policies, taking into account the effect on the perceived freedoms of people, and therefore their quality of life. Perceived freedoms, determine the capability set of a person as the existing behavioral opportunities contributing to a valuable life. Opportunities thus depend on available resources and conversion factors such as tools and skills. Respective capability assessment can indicate substantial sustainability impacts of policies, as impacts on the quality of life of present and future generations.

When deciding on which freedoms to realize (that is, which behavioral opportunities to manifest), the capability approach does take multiple motivations for granted. This includes self-centered and pro-social or altruistic motivations. To understand sustainability behavior both types of motivations are relevant. For a more differentiated understanding, we further enriched the capability approach with environmental psychology, differentiating personal characteristics underlying behavior. These are sustainability awareness and perceived self-efficacy, as well as behavior related attitudes, norms and non-moral aspects (e.g., costs of behavior). Together these characteristics influence which behavioral opportunities are considered and which tools are applied to realize behaviors.

The *core result* of this chapter is the developed behavioral model, linking intentional and substantial understandings of sustainability with ideas on empowerment and agency. This allows for a reading of individual agency in accordance with sustainability transitions as normative endeavor. Building on this model is the idea of strengthening freedoms of individuals to behave pro-socially, e.g., sustainably. In other words, empowerment of actors to live a life that is meaningful for them, should go hand in hand with an increased motivation to use acquired agency for sustainability. This depends on attention and motivation to do so. Psychological driving factors of this, such as awareness, self-efficacy (that is the feeling to be capable of a behavior) and norms, are considered in the model. Mentioned freedoms can be strengthened in reflexive, second order governance settings such as in transdisciplinary transition management, aiming for societal learning and empowerment (see section 3.1). The respective behavioral model may inform the design and facilitation of these settings towards sustainability oriented agency increases.

The combination of sustainability motivations with gains in behavioral freedom and quality of life, can thereby form the basis of a new well-being model, suitable to guide sufficiency in combination with efficiency and consistency oriented sustainability strategies.

Conceptual reflexion: the chapter highlights both the limits of sustainability strategies that do not take account of motivations of actors, for instance increasing the risk of rebound effects, as well as the difficulties and short termed successes of external empowerment of actors. It highlights approaches building on social learning as preferable to political restrictions or nudging attempts for increasing freedom, quality of life and sustainability behaviour at the same time.

3.3 CHAPTER SIX - MAKING SENSE OF SUSTAINABILITY TRANSITIONS LOCALLY: HOW ACTION RESEARCH CONTRIBUTES TO ADDRESSING SOCIETAL CHALLENGES

This chapter explores the facilitation of science-society collaboration to serve sustainability transitions, as they take place in transition management. Normative considerations on procedural and substantial sustainability are part of this exploration. It contributes to closing the existing research gap regarding the contextualization of sustainability within transition management.

Initially and on a conceptual level, this chapter presents transitions as a process of solving societal challenges, with sustainability being the respective aim of the change process. It furthermore explores how action research allows large-scale societal challenges and related universal understandings of sustainability (thin morality according to chapter 1.2), to acquire meaning in the local context. Therefore, transition management addressed procedural and substantial / universal understandings of sustainability, jointly in an action research process. That is, a transdisciplinary research process combined with a normative agenda. To do so, transition management opens an interactive space to create alternative ideas (knowledge, future visions), practices (practical experiments, transformative action) and social relations (e.g., new actors).

Thus, this chapter conceptualized the community arena methodology – that is a transition arena adapted to the local context – which then was applied to two transition management case studies. In a series of participatory meetings, local participants in collaboration with researchers realized a five-step process. First, researchers prepared the arena and explored, together with the participants, the local context and challenges. Second, participants and researchers co-developed a structured understanding of local problems and a vision. Third, they jointly performed a participatory backcasting exercise and developed a transition agenda. Fourth, participants led the setting up of experiments. Fifth, the process was monitored and co-evaluated. Researchers prepared, facilitated and documented meetings, as well as collected data mostly via document analysis, interviews and participatory observations.

In both cases, the threefold action research process of an open process design, future envisioning and practical experimentation, did create new ideas, practices and social relations to address societal challenges. The case of

Carnisse, a neighborhood of Rotterdam (Netherlands), addressed challenges related to: the daily struggle of inhabitants for survival, increasing individualization and a lack of social cohesion; a high diversity of inhabitants and migration tendencies combined with a lacking sense of ownership of the place and exchange between inhabitants; and finally a lack of public space and a desolate housing-stock. A new actor was created, the activating researcher, which symbolizes a changed relationship between local participants and outsiders, and created collaborative relations between researchers and participants. New ideas were generated as part of the envisioning process – in itself forming a new practice, helping participants to defy the image of stigmatization and positively relate to their neighborhood. Participants realized a major experiment: they re-opened a community center under citizen self-maintenance. This represented a new idea, practice and social relation/ new actor all in one.

In the case of *Finkenstein*, an Austrian village, challenges related to a lack of political participation and polarization of the political spectrum; geographical and ethical/social fragmentation of inhabitants and low social cohesion; as well as unused or overused natural and cultural heritage. The process established new actors in the local political landscape in the form of the arena group, diverse working groups, a supporting group of local politicians, and the follow up steering group composed of former participants. This community arena process itself constituted a new practice of more inclusive, participatory local governance, with a particularly open and activating facilitation technique. Finally, a diverse set of new ideas was created and put into practice as part of envisioning experimentation.

As *core result* in the context of this thesis, we provided an approach to contextualize sustainability, linking universal and procedural understandings. This is done with both a conceptual and empirical focus. The respective action research process combines a transdisciplinary research process with a normative agenda. In the cases, sustainability was addressed in a semi-open, reflexive way: there was no fixed sustainability aim imposed on participants and processes, nor was the term sustainability frequently used. Rather the process focused on quality of life now and in the future. The idea of sustainability was introduced via reflexive question on the long-term, social and ecological issues, as well as different scale levels – when developing vision, agenda and concrete experiments. In so doing, researchers understood the arena as a process of rendering sustainability meaningful locally. Sustainability was introduced as a dual concept: being dynamic, plural and contested on the one hand, but based on and guided by broad universal definitions on the other. ‘Throughout this open process directed towards contextualization, systematic exploration and the development of alternative (more) sustainable visions and actions, sustainability gained localized meanings in both cases’ (Wittmayer, Schöpke, van Steenbergen, & Omann, 2014b, p. 14). Local manifestations of global challenges and universal sustainability understandings were manifold. The four dimensions of the facilitation can be traced back in the developed visions and actions. Thus, empirical results supported the effectiveness of the conceptual approach. By relating to societal challenges present in broader political and societal debates, the arena developed localized solutions that in turn may be translated to other scales.

As a *second core result*, we described an interactive space that is central to facilitate collaborations of science and society in transition management. The nature of these spaces is dynamic and temporal, coming into existence by the dialogical encounters of people. Presented community arena methods allow the abstract idea of an interactive

space to be embedded in concrete geographical, social and political contexts, by making terms and processes explicit and adapting them to the local context.

As a *third result*, the conceptualized and empirically tested community arena approach provided for new practices, social relations and actors in both cases – and led to a feeling of empowerment amongst participants. Thus, it contributed to an increased agency (see next section 3.4). The threefolded action research process (an open process design, future envisioning and practical experimentation) proved effective in this regard.

Reflexively, the effective creation of such interactive spaces also depends on ‘contextual arrangements with and the possible involvement of incumbent representatives’ (Wittmayer, Schöpke, van Steenbergen, & Omann, 2014b, p. 15). Societal challenges relate and interact with developments on multiple levels, and broader political and societal developments need to be taken into account in the local action research process. Delineating the limits of the community addressed, should allow challenges to be tackled locally and correspond to local identities. Local manifestations of societal challenges in turn can only be fully understood when put in relation with developments at other, larger scales. Creating these understandings is a collective sense making and a political process. The same holds true for sustainability, as universal understandings only become meaningful via interaction and relation to a specific locality. This action research process is required to face the tensions and dilemmas arising, when ‘searching for new ways of relating to and interacting with one another in a changing world’ (Wittmayer, Schöpke, van Steenbergen, & Omann, 2014b, p. 17). In the empirical example, this was done by using four dimensions to support the learning process via reflexive questions (e.g., on the long term or far away places).

Putting transition management into practice in an action research approach, thus emerged as an inherently political endeavor. While interactive spaces have to be created, and researchers take a core role in doing so particularly in the beginning, they soon take on a life of their own and include more people, such as policy officers. Interactions with local political dynamics put researchers *in de facto* political roles when engaging with society and its problems in this immediate form. This brings up questions of definitional power and legitimacy. Engaging in local dynamics asks for an ‘active practice of self reflection and a critical attitude’ (Wittmayer, Schöpke, van Steenbergen, & Omann, 2014b, p. 18). How researchers understand and assume their role, interrelates strongly with how the action research processes take shape (see section 3.5).

3.4 CHAPTER SEVEN - LINKING TRANSITIONS TO SUSTAINABILITY: A STUDY INTO SOCIETAL EFFECTS OF TRANSITION MANAGEMENT

The chapter provides an assessment framework with regard to transition management social effects in relation to sustainability, conceptualized based on a literature review. It also provides extensive empirical materials on two case studies applying the framework. Thus, it contributes to close the gap of missing assessment frameworks for transition management, particularly in relation to the normative orientation of transitions, namely sustainability (table 1). It complements the preceding chapter seven – which concentrated on the action research process – by focusing on analysis of social effects created by this research.

Corresponding to the previous chapter, we conceptualize sustainability transitions as open ended, non-linear and uncertain process of change, and as potential solutions to persistent societal challenges. Transition management implementing a transition arena is understood as social experimentation aiming to create societal effects. To understand the contribution of transition management projects to sustainability transitions, three types of societal effects are differentiated based on established assessment schemes from transdisciplinary sustainability research. Effects are 1) immediate outputs of the projects in terms of products and experiences, 2) more long-term outcomes as changes in collective decision-making and action, as well as 3) impacts mediating between the outputs and outcomes. Impacts include social learning, empowerment and social capital development. These are core aims of transition management, as they have a process character corresponding to the open-ended nature of sustainability transitions.

This chapter identifies impacts as qualitative indicators for the orientation of transition trajectories towards sustainability. Each impact is conceptualized more in depth with a focus on its relation to sustainability. *Social learning* is understood as a 'change in the interpretative frames guiding the actions of a person' (Grin & Loeber 2006). Learning is considered social if learning results are transferred beyond the individual learner to other people and groups. It contributes to sustainability by raising awareness, feelings of responsibility and capacity to react on sustainability related problems and if respective learnings transfers to wider groups. *Empowerment* includes, for instance, increases in intrinsic motivations, gains in decision-making capacities or control over new resources. It contributes to sustainability if intrinsic empowerment is linked to more sustainability awareness, sustainability interests gain more decision-making power or if structural changes (like niche upscaling or empowered new actors) involve sustainability. Aspects of awareness, feeling of responsibility and capacity to act also play a core role in sustainability related capability increases in chapter 6. *Social capital* refers to relationships between individuals, groups and networks and may increase in quantity and quality (trust, common rules, reciprocity). Social capital contributes to sustainability by, for instance, supporting a strong local community, increasing its capacity for sustainability innovations and collective action.

This chapter further provides empirical case study work, assessing the impacts of two local transition management cases. These are identical to the ones outlined in the previous chapter. We operationalized the impacts for local assessments, and differentiated each impact into a number of sub-aspects, covering both the impact per se and the relationship of the impact to the goal of sustainability. Various data sources, such as from interviews, surveys and participatory evaluation meetings, were analysed. Results show the development of social learning, empowerment and social capital per se, with slight differences between the cases. Positive changes of subaspects of the impacts with particular relation to sustainability could also be observed, although to a lesser degree. Thus, the chapter contributes three *main results* regarding our understanding of sustainability, individual agency and transition psychology, as well as facilitation of sustainability transition oriented science-society collaborations:

First, the developed framework allows to both, on a general-conceptual and a concrete-operational level, discern, describe and systematically address the impacts of transition management in relation to sustainability. Social effects are conceptualized as qualitative and tangible indicators for the orientation of transition trajectories towards sustainability. Empirics developed on this basis first of all show that the applied community arena methodology did facilitate the development of social learning, empowerment and social capital development, and increased the capacity of participants to take action. In addition, empirics show, that social effects are interrelated and complementarily contribute to sustainability transitions enhancing our understanding agency in relation to sustainability in its intentional and substantial dimensions:

‘Boldly speaking, social learning raises the orientation of the process towards sustainability and increases the capacity to successfully deal with sustainability challenges. Empowerment makes the sustainability oriented actors and initiatives more powerful. Social capital, finally, may support sustainability attempts to be more resilient and innovative. Nevertheless, these sustainability contributions are dependent on the character of the social learning, on who is being empowered to do what and on whose social capital is increased’ (Schäpke et al., 2017, p. 26).

Second, the chapter empirically shows how the three impacts link different scale levels, from the individual to the group, the community and beyond. This revealed a stepwise development of the impacts, beginning with lower scale levels and later expanding to higher levels. The multi-scalar nature of the effects relates to the overall societal impact of transition management, e.g., the transfer and upscaling of sustainability solutions developed, for instance, by spreading visions or narratives via networks. This contributes to understand individual agency in relation to larger developments in the community and beyond.

Third, the chapter proposes a conceptual as well as empirically tested approach that allowed capturing the semi-open yet reflexive approach of facilitating sustainability transitions. In this approach, a normative orientation is added to facilitation processes as an attempt for resolving the tension underlying sustainability transitions. That is, the necessity of taking an open-ended approach to facilitation respecting complexity, non-linearity and ambiguity of transitions on the one hand, and the attempt to govern them in a specific direction of sustainability.

Reflexive results highlight, that the facilitation approach should get further developed to combine open-endedness and normative orientations fruitfully in pluralistic settings:

‘Importantly, it became clear that there is no inherent relationship between the societal effects and sustainability. They remain two different things, which may be related (conceptually, empirically and process-wise). As such, processes can be oriented toward bringing about societal effects and sustainability together. However, this draws attention to the character of the learning that is facilitated, to the selection of the participants and the overall framing of the process goals, visions, and experiments. How sustainability was approached differed in the empirical cases and showed the context dependency and pluralistic nature of how sustainability takes form locally’ (Schäpke et al., 2017, p. 27).

Positive feedbackloops between the different social effects were traced empirically, and can be used to increase impacts of the overall process when harnessed systematically. But, as interplays are complex, they require more analysis: for instance, to differentiate between synergies and conceptual overlap. Upscaling may lead to adverse influences on sustainability transitions: for instance, via losses in ownership, the disempowerment of participants or losses of the original sustainability character of developed solutions. These can be monitored with the developed framework, but strategies need to be developed to remedy negative effects of upscaling. In a similar fashion, down-sides of social effect developments on the participants need to be monitored, such as the empowerment paradox, creation of outsiders, or an overtendency towards consensus building hampering radical innovations.

3.5 CHAPTER EIGHT - ACTION, RESEARCH AND PARTICIPATION: ROLES OF RESEARCHERS IN SUSTAINABILITY TRANSITIONS

This chapter reflexively deals with the activities and corresponding roles of researchers when shaping transition management processes. Opening and maintaining a space for societal learning is presented as a core aspect, for putting transition management into practice as a transdisciplinary or action research approach. This space for societal learning corresponds to the interactive space developed in chapter six. It is characteristic of a process-oriented understanding of sustainability science, as opposed to a more descriptive analytical, so-called knowledge first approach. The latter imagines a boundary zone between science and society, where science contributes scientific knowledge and societal actors values and goals. The former views science and society as overlapping, with researchers and societal actors collaborating in joint knowledge production and negotiations about values and goals of research. In this space, societal and scientific actors 'address realworld problems, generate knowledge, formulate solutions and pilot actions for a more sustainable future' (Wittmayer & Schöpke, 2014, p. 485).

Four key issues to deal with when opening and maintaining this space for societal learning are outlined in this chapter, based on a review of transition management and action research literature. Issues are related to ownership, sustainability, power, and action. How they emerge and which stance researcher take towards them, differs between process oriented and descriptive analytical approaches. Thus, issues are suitable to characterize process oriented researcher roles in contrast to knowledge first ones. *Ownership* regards ownership of the problem dealt with, the research process, its outcomes and continuation. It arises from an understanding of science and society as overlapping in research practice. Ownership can arise from an open facilitation of the process by the researcher, making participants co-owners and empowering them. Different actors need to negotiate meaning and value of *sustainability* within the created societal learning space, with researchers initiating a learning journey to make it meaningful. *Power* is an important dimension for determining the contours of the learning space and sets its direction. It is relevant both for space-internal dynamics, e.g., regarding the participation of stakeholders with varying power, and external relations, e.g., regarding interacting appropriately with powerful system actors. *Action* relates to the aim of the research process to foster action or real world change. This is particularly relevant with regard to transition experiments set up to learn about the realization of long-term visions and related challenges. Besides real world change, action and related reflection are ways to generate knowledge.

Researchers tackle the core issues via particular activities that we clustered into ideal type researcher roles, either adopted from sustainability science literature or newly suggested by us. Roles include the *reflexive scientist*, aiming to gain scientific knowledge via analysis, observation and reflection, according to the standards of their discipline. This is done from an observer point of view and generally not engaging with normative questions. A second role is the *process facilitator*, actively initiating and facilitating the learning process in the community arena and experiments. This can be done from a normative point of view, 'namely through designing a "sustainable" process (e.g., just, inclusive, future oriented)' (Wittmayer & Schöpke, 2014, p. 488). A further role is the *knowledge broker*, mediating between different perspectives and providing space for critical reflection including making sustainability relevant in different contexts. This should result in generating sustainability knowledge, including normativity, systems complexity and multiple perspectives. The role of the *change agent* involves activities of the researcher when participating in processes that explicitly aim for real world change towards normative goals. Activities include empowering participants to take action, networking or policy formulation. Taking the role of *self-reflexive scientists*, researchers reflect on their positionality and normativity in the process and critically consider themselves as part of the system under investigation.

We then applied the ideal type roles to analyse and reflect on a case study of local transition management in Carnisse. Conceptual insights and experiences from the case provide a number of *core results* mostly oriented towards understanding sustainability transitions oriented science-society collaborations.

First, the chapter conceptualizes a researchers' role heuristic. This provides a vocabulary to reflect on what researchers do in process orientated sustainability research, as shown empirically in the Carnisse case. Using the roles as abstractions for reflexion, this for instance allows us to understand conflicts occurring in research practice and potentials for their resolution. A critical example is how to deal with the issue of sustainability in Carnisse, where participants had rather critical attitudes towards the term of sustainability and the process thus focused on 'quality of life'. As reflexive scientist researchers were aware of the evidential need for change towards sustainability and prepared to spark action as change agents. These aims conflicted with the one of the process facilitator to empower participants to develop their own understanding of sustainability and the self-reflexive awareness on the researchers' limits knowledge. Adapting a 'third role', the knowledge broker, and thereby using the different roles as resources, provided a solution to the described role conflict. Researchers refrained from defining sustainability, but opened a discussion on different dimensions of sustainability (e.g., long-term, environmental). This allowed them to capture the essence of the term. The role heuristic allows for the explicit decision to be made on which roles (not) to take, and thus how to navigate dilemmas, challenges and potentials in everyday research design. Thereby, roles should less be seen as contradictory and exclusive, but rather as complementary resources – combinable depending on contexts, aims of research and abilities and preferences of researchers.

The *second core result* empirically and reflexively highlights the importance of roles unconventional to traditional science. This includes the importance of self-reflexivity when dealing with all key issues (power, sustainability, ownership and action). Self-reflexivity allows to re-adjust principles, goals and processes of research by inviting

multiple interpretations. Furthermore, it allows to constructively deal with the multitude of activities, roles and respective expectations occurring in the research process. The role of the change agent proved most difficult to integrate, as being the furthest away from traditional role understandings of researchers as neutral, reflective scientists. But, it proved essential for empowering participants in Carnisse. Taking this role puts researchers in potentially strenuous positions, e.g., in the form of confrontation with local political actors. It also made group dynamics and power imbalances very explicit. Thus, getting immersed in the field allows us to ‘understand challenges and opportunities from within and from different perspectives’ (Wittmayer/ Schöpke 2014). Unconventional roles do demand particular institutional settings, for instance with regard to trainings of researchers or reward systems as well as suitable quality criteria of research.

Below the contributions of the different chapters on the research aims are presented in an overview.

Table 5: Overview on individual core results from different chapters in relation to research question, themes and objectives. This table provides an overview of the core contributions of the five articles from the main body of this thesis, in line with article summaries as presented above. According to the research focuses of the different chapters (cp. table 4), chapters 4 and 5 do not contribute to case study insights, while all other chapters contribute to all research focuses. Section 3.6 draws out the possibility of combining insights from different chapters on different key terms and concepts. A synthesis of results is discussed in chapter 9.

Core research question: <i>How can we better understand the transdisciplinary collaboration process by which transition management contributes to sustainability transitions, particularly regarding consideration of normative sustainability aspects, individual agency, as well as creating and maintaining a societal learning space and the roles of researchers therein?</i>				
Focus		I: Conceptual frame	II Case studies/ Empirics	III Reflexivity
Theme	Theme related aim/ objective	Focus and theme related subobjective Individual core contributions of chapters		
a: Agency	<i>To achieve a psychologically enriched understanding of individual and sustainability related agency in conceptual and empirical understandings of transition management, taking social learning and empowerment as agency related core aspects into account</i>	<p>a1: Conceptualization of individual agency and its' development via empowerment and social learning, including sustainability motivations.</p> <p>4: Conceptual meta-heuristic to read sustainability transitions, embedding individual agency: Individual action based on realizing capabilities, the freedoms to live a valuable life. Individual Agency embedded in social practices. Transition arenas interrelating individual agency and social practices.</p> <p>5: Dynamic-norm-activation-capability model of individual behavior: Behavioural alternatives defined as capability set. Empowerment increases capabilities. Increased freedom to behave sustainably, if empowerment is accompanied with norm activation. Model to orient sustainability oriented agency increases, via transition management, addressing norms and motivations.</p> <p>6: Transition management as action research facilitates new ideas, practices and actors contributing to transformative action.</p> <p>7: Impacts of transition management, social learning and empowerment, are prerequisites for increased agency and can include sustainability qualities. Impacts are synergistic.</p> <p>8: Key issues of creating interactive space, ownership, power and action, are impacting upon agency development.</p>	<p>all: Empirical analysis of social effects, including empowerment and social learning in relation to normative aims, namely sustainability.</p> <p>4: -</p> <p>5: -</p> <p>6: Cases empirically support the hypothesis, that action research contributes to agency and transformative action.</p> <p>7: Development of impacts (social learning, empowerment, social capital) observed in both cases, partly related to sustainability. Increased capacity to take decisions and actions therefore likely. Impacts observed as being synergistic, reinforcing one another and showing a multi-scalar character. Facilitated impacts expanded from the individual to the niche and potentially beyond.</p> <p>8: Role of change agent proved essential for empowerment</p>	<p>all: Individual agency related critical reflections, regarding the role of agency for understanding sustainability transition and their facilitation.</p> <p>4: Agency as embedded in and deliberate influence on social practices remains underexplored.</p> <p>5: Intrinsic empowerment is more durable and broadly effective than extrinsic empowerment and can better be related to sustainability motivations. Social learning provides promising entry point. Underpins transition management approach.</p> <p>6: Empowerment of participants depending on collaboration of and with powerful actors ('empowerment paradox').</p> <p>7: Social learnings' core function for increased sustainability orientation in decisions and action should be taken into account in facilitation. Interdependency between different social effects can be used for win-win oriented, synergistic facilitation, but requires further investigation. Potential downsides of social effects need monitoring and remedy strategies.</p> <p>8: Change agent role difficult to perform but essential to empower participants.</p>

<p>b: Sustainability</p>	<p><i>To include normative considerations, namely sustainability, into transition management on conceptual and empirical levels</i></p>	<p><i>bl: Conceptual enrichment of transition management with normative components, particularly regarding sustainability in procedural, substantive and intentional dimensions.</i></p> <p>4: Sustainability transitions as societal phenomena that enhance inter- and intragenerational justice through radical transformation, solving persistent societal problems</p> <p>4&5: Capabilities conceptualized as real freedoms of a person to live a valuable life. Capabilities as normative yardstick for developments related to sustainability. New well-being model based on increased freedoms to live a valuable life and behave pro-social/ sustainable.</p> <p>5: Substantial, intentional, and procedural sustainable behavior. Definition of efficiency, consistency and sufficiency sustainability strategies. Dynamic-norm-activation-capability model.</p> <p>6: Transition management as action research proceeding from universal/ thin to contextualized/ thick morality. Sustainability transitions combining process of change process and normative aim of change, sustainability, jointly solving societal challenges.</p> <p>7: Assessment frame of impacts / social effects of transition management in relation to sustainability, generically and operationalized for the local level. Therein, sustainability is related as inherent quality to the impacts of transition management, combining intentional and substantial aspects.</p> <p>8: Sustainability is a key issue in process-oriented sustainability science. Researchers initiating a learning journey to make it meaningful.</p>	<p><i>blI: Empirical analysis of processes to contextualize sustainability (procedural s.) and move from thin to thick morality (substantive s.), to facilitate sustainability oriented learnings (intentional s.).</i></p> <p>4: -</p> <p>5: -</p> <p>6: Transition management as action research created new ideas, practices and social relations tackling challenges locally. Included reflexive questions on four sustainability related dimensions, traceable in the developed visions and actions. Thus, empirics supported the effectiveness of the conceptual approach. Sustainability took different forms locally.</p> <p>7: Analysis showed, that the applied community arena methodology (open yet reflexive facilitation, adding a normative orientation to the process) facilitated the development of social effects and increased the capacity of participants to take action. Effects are interrelated and complementarily contribute to sustainability. Analysis showed upscaling process of sustainability related results.</p> <p>8: Process was oriented towards quality of life and implicitly related to sustainability via reflexive questions of researchers acting as knowledge brokers.</p>	<p><i>blII: Critical reflection on possibilities and challenges of addressing sustainability procedurally, substantially and intentionally in transition management.</i></p> <p>4/5: Social learning as preferable possibility to increase sustainability oriented agency and capabilities.</p> <p>5: Need to consider intentional aspects of sustainability behavior, to avoid flaws of strategies that merely build on self-interested behaviors. Need to combine sufficiency strategies with efficiency and consistency strategies as well as to consider substantial dimensions of sustainability to assure effectiveness.</p> <p>6: Societal challenges and sustainability acquire meaning through practice and interaction, and are inherently context dependent. Their local understandings can only be understood in relation to other scales, based on a collective sense making process. The right scale of the process is important.</p> <p>7: Social effects and sustainability have no inherent relation but are two different things that can be related, requiring respective facilitation and monitoring. Upscaling of sustainability impact requires monitoring and strategies.</p> <p>8: All researchers' roles engage with normativity although differently, creating tensions between approaches and aims as well as potentials for complementarities.</p>
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<p><i>c: Transdisciplinary collaboration</i></p>	<p><i>To conceptualize and explore the transdisciplinary research process in transition management of creating an interactive learning space, and the roles of the researchers therein</i></p>	<p><i>cl: Conceptualization of transition management as transdisciplinary collaboration in form of an interactive space and roles of researchers in opening and maintaining this space.</i></p> <p>4: Conceptual proposition of three knowledge types relevant for transitions governance, namely systems, target and transformation knowledge. Addressing all knowledge types in a conceptual meta-heuristic to read sustainability transitions, providing a bigger picture relating individuals, niches and the regime. Second order governance focusing niche creation, learning, and engagement dynamics.</p> <p>6&8: Community arena as part of process oriented sustainability science, establishing a space for interaction of science and society and of societal learning. A threefold action research process is applied in form of open-process design, future envisioning and practical experimentation – combining a transdisciplinary process and a normative agenda. Through this process directed towards contextualization and systematic exploration of sustainability visions and action, sustainability gains localized meanings. This process creates new ideas, practices and social relations.</p> <p>7: Understanding of transition arena process as social experiment aiming at societal effects. Conceptual and empirically tested framework to capture societal effects of transdisciplinary transition management contributing to sustainability transitions, operationalized for local level.</p> <p>8: Key issues of creating interactive space as core of process oriented sustainability science: ownership, power, action and sustainability. Researchers' role heuristic with ideal type roles of researchers and related activities to work with key issues.</p>	<p><i>cII: Empirical analysis of process and content of creating and maintaining interactive learning space, and respective roles of researchers.</i></p> <p>6: Community arena method allow to embed the abstract idea of an interactive space in concrete geographical, social and political context</p> <p>7: see section bIII above. Tested approach to assess the impacts and their relation to sustainability via a comprehensive, triangulative approach.</p> <p>8: Researchers activities allowed to handle key issues of creating interactive space, thus enable empirical exploration of researchers roles.</p>	<p><i>cIII: Critical reflection on possibilities and challenges of opening and maintaining an interactive learning space and respective researchers roles.</i></p> <p>4: To understand transition, besides individual agency and niche development, larger scale developments need to be taken into account.</p> <p>6: Contextualizing sustainability takes place as a collective sense making process, itself an inherently political act, asking for self-reflexive and critical attitude of researchers facing tensions and dilemmas.</p> <p>7: see section aIII and bIII above. Interdependency between different social effects can be used for win-win oriented facilitation, but requires further investigations. Downsides of social effects need monitoring and remedy strategies. Social effects and sustainability have no inherent relation but are two different things that can be related, requiring respective facilitation and monitoring. Upscaling of sustainability impact requires monitoring and strategies.</p> <p>8: Role heuristic allows for reflexive decision on which roles (not) to take. Roles can be used complementary. Unconventional roles are important for process oriented sustainability research, yet challenging to perform.</p>
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3.6 KEY TERMS USED IN DIFFERENT CHAPTERS AND DISCUSSION ON THEIR COHERENCE, COMPLEMENTARITIES AND TENSIONS

The preceding section included summaries of all articles in this thesis, ending with a summarized overview of key results for each research theme and focus (table 5). Thereby, a number of concepts and terms re-appear across various chapters, jointly producing results for research themes and focuses. Some variation exists in how we understood and used terms and concepts including some conceptual overlaps. Below we first provide an overview on the coherence, similarities and variations of how terms and concepts are used in different articles (table 6), before discussing pairs and groups of related terms and concepts in detail. This allows us to capture the complementarity of insight from different chapters, on different themes and focuses, and thus reinforce the robustness of the overall insights. It furthermore allows us to be precise in articulating when insights are based on conceptual reasoning, empirical analysis or reflection only or on combinations thereof. This differentiation is used to specify claims made in the results synthesis in chapter 9.

Table 6: Prevalence and coherence of key terms and concepts in thesis articles, sorted by themes and chapters. Regular arrows highlight the usage of terms in identical or very similar ways, dotted arrows closely related terms, dashed arrows indicate generally complementary terms, double-dashed arrows indicate potential tensions/ contradicting terms.

Chapter/ Theme	4	5	6	7	8
a: <i>Agency</i> (systems knowledge)	<ul style="list-style-type: none"> (Ind.& collective) agency Capabilities (capability approach) Empowerment (more capa.) Societal Learning Social practices Capabilities to engage for sustainability 	<ul style="list-style-type: none"> Agency Capabilities (capability approach) Empowerment (more capa.) Social learning Dynamic norm activation capability model 	<ul style="list-style-type: none"> Practices (action, experiments) Ideas (visions, discourses) Social relations (new actors) 	<ul style="list-style-type: none"> Social effects/ Impacts including: <ul style="list-style-type: none"> Empowerment Social learning Social capital development Sustainability enriched impacts (e.g. empowerment) 	<ul style="list-style-type: none"> Key issues in societal learning spaces: <ul style="list-style-type: none"> Power Ownership Action
b: <i>Sustainability</i> (target knowledge)	<ul style="list-style-type: none"> Sustainability transitions as societal phenomena that enhance inter- and intragenerational justice through radical transformation, solving persistent societal problems Capability-based assessments of well-being Capabilities as normative yardstick for sustainability Sustainable practices 	<ul style="list-style-type: none"> Sustainability transitions mentioned but not specified Substantial, procedural and intentional sustainable behavior Capability based well-being model Dynamic-norm activation capability model of sustainable behavior, building on environmental psychology and capabilities (Norm-activation, pro-social behavior) 	<ul style="list-style-type: none"> Sustainability transitions as fundamental long term changes combining a direction (Sust.) and a process of change (trans.) to address societal challenges Sustainability and societal challenges as ambiguous, contested and political Universally understood and contextualized sustainability Learning journey to make sustainability meaningful Local/ contextualized understandings of sustainability and sust. challenges, addressed via reflexive questions and related to quality of life 	<ul style="list-style-type: none"> Sustainability transitions as non-linear, uncertain and open-ended change of societal systems. Societal effects, include immediate outputs, long term outcomes and intermediate impacts. Jointly, they contribute to susta. transition Learning journey to make sustainability meaningful Sustainability addressed via reflexive questions and related to quality of life Social effects/ impacts including sustainability aspects form qualitative sustainability indicators 	<ul style="list-style-type: none"> Sustainability transitions mentioned but not specified Sustainability as negotiated and defined through the interaction of different parties in spaces for societal learning, e.g. created by transition management. Sustainability addressed via reflexive questions and related to quality of life
c: <i>Transdisciplinary collaboration</i> (transformation knowledge)	<ul style="list-style-type: none"> Governance combining target, systems and transformation knowledge (Reflexive, second order) Governance of sustainability transitions Transition management as transdisciplinary, action Interactive space Transition arena 	<ul style="list-style-type: none"> Efficiency, consistency and sufficiency sustainability strategies social learning approaches that are part of the governance strategy of transition management 	<ul style="list-style-type: none"> Transition governance Transition management as action research (approach) using transdisciplinary process and having a normative agenda Community arena as space for interaction Role of (action) researcher 	<ul style="list-style-type: none"> Reflexive Transition governance Transdisciplinary sustainability research Transition management put into practice as transdisciplinary research Transition arena/ Community arena as protected space for societal learning 	<ul style="list-style-type: none"> Transition management as process oriented sustainability science using action research approach Community arena as space for societal learning Researchers roles and activities

Mainly concerning theme a - agency

Social learning and societal learning: Within this thesis, both expressions are used in rather interchangeable ways. Conceptually, differentiation can be made. For instance, social learning is a broadly used concept in sustainability science. It concerns learning of individuals that transfers beyond the individuals to wider groups. Societal learning is a term often used in transition management, and relates to learning at higher levels of aggregation in society. A very widely transferred social learning may be considered societal. With regard to the observed transition management practice, the space for societal learning corresponds to the process of social learning of participants in the first place. Although the term 'societal' does show that social learning may go beyond the participants – an understanding that is taken up in the writing on social learning in the thesis, too.

Empowerment, capabilities and agency: The concept of empowerment is used in all chapters of this thesis. In chapters 4 and 5, it is used in relation to the concept of capabilities, where empowerment means an increased capability set and agency. Chapters 6 and 8 use the concept more broadly as gaining capacity to take action. This corresponds to the concept of agency. Chapter 7 includes an in-depth elaboration of the concept of empowerment, building on the idea of increased capacity to take action. Empowerment as included in chapter 7 ('linking sustainability') combines a growing intrinsic task motivation, gains of control on resources, development of new resources, more decision-making power and establishment of new actors. This is similar to an understanding of empowerment as an increase of capabilities (described in chapter 4 and primarily 5), where empowerment is given by changed access to resources, changed psychological factors, individual skills and other conversion factors allowing us to use gained behavioural opportunities. Empowerment according to chapter 7 thus includes both extrinsic (due to factors external to persons) and intrinsic (due to factors internal to a person) empowerment. Empowerment in chapter 7, however, lacks the explicitly normative dimension regarding possibilities to live a valuable life, included in capability increases. In both understandings, empowerment is increasing the capacity of actors to take action and in both a relation of empowerment to sustainability is developed. Thus, in either case sustainability related psychological factors (e.g., awareness, motivation) are combined with the concept of empowerment. In addition, in either case social learning is discussed as an important source of (sustainability related) empowerment. Thus, the use of the term and concept of empowerment in different chapters of the thesis is highly complementary and generally allows for synergic lessons drawing on different chapters.

Societal effects and social effects of transition management: Societal effects include various effects transition management has on society, including more immediate outputs of projects, longer term outcomes (e.g., changes in actions, structures and decision making) and impacts (e.g., learning, social capital development and empowerment) mediating between outputs and outcomes. Social effects only relate to impacts, and are thus a subgroup of the overall effects on society. Use of both terms is specific in the chapters (e.g. chapter 7). Societal effects together with scientific effects compose the overall effects caused by transdisciplinary transition management.

Power, action, ownership and empowerment: Power, action, as well as ownership, are discussed as key issues for opening and maintaining a space for societal learning (chapter 8). They are related to the concept of empowerment as used in chapters 4, 5, 6 and 7. Ownership refers to who owns the problem, the process, its outcomes, and its possible continuation. It is related to the intensity of stakeholder involvement, reaching from information giving to empowerment. Development of a strong ownership of participants likely increases their empowerment. The aspect of power regarding the community arena process, in part concerns who determines the contours of the arena and sets its direction. Actors within the arena differ in their capacity to and to be influenced, and the researchers (should) aim to allow everybody to be heard. Appropriate interaction with power holders outside the arena group is important when reconnecting the arena results to regular societal and policy debates. In both, internal and external arena processes, working with power aspects can contribute to empowerment of participants. Action within the community arena process is oriented towards transferring vision and transition pathways into real world change by making use of transition experiments. This contributes to learning through action and may be associated with an increased capacity to act. Power, action and ownership as key issues that research in community arenas work with, are related to the empowerment of participants and shed light on complementary aspects. As this relation is not investigated in more depth, I refrain from summarizing conclusions across this aspect.

Practices and social practices: Practices (chapter six) are understood according to transition management literature in a rather colloquial way as ‘doing something’, e.g., practical experiments, transformative action. Social practices in turn (chapter four) refer to a concrete concept and unit of analysis, for instance used in studies on sustainable consumption. In the definition of Shove (2003), which we applied in chapter 4, social practices are composed of skills, materials and meanings relating to shared and routinized activities within society. As the terms of practices and social practices differ quite significantly, they are not treated as synonyms and results are not integrated amongst both terms.

Mainly concerning theme b – sustainability

Procedural, substantial and intentional sustainability are terms referred to in many articles of the thesis and this is done in generally coherent ways, thus no further elaboration is needed.

Sustainability, sustainable development, societal challenges and sustainability transitions: All four terms are used in most of the different chapters. Societal challenges are complex, persistent problems that arise from the current organization of society. Transitions are fundamental change processes in the way society is organized, its structure, cultures, and practices. Sustainability describes the normative orientation of this change, towards the resolution of societal challenges and the enhancement of (intra- and intergenerational) justice. Sustainability and sustainable development are used broadly synonymously in this thesis. Sustainability is conceptually related to well-being and justice via the capability approach (chapters 4 and 5), for instance inter- and intragenerational justice in distribution of capabilities. Enrichment of capabilities with environmental psychology contributes to a behavioural model to facilitate sustainable behavior and simultaneous well-being increases, that may provide the basis for a

sustainability oriented well-being model. Empirical work focused on well-being related envisioning, empowerment of participants and reflexive, sustainability related facilitation questions to include sustainability into the community arena process. Thus, approaches vary, but are generally complementary in understanding sustainability transitions (see discussion below).

Mainly concerning theme c – transdisciplinary collaboration

Governance of sustainability transitions and transdisciplinary, process-oriented sustainability research: Combinations of these terms are used in all article chapters of the thesis. The governance of sustainability transitions in this thesis broadly relates to a collaborative effort of diverse societal actors (including government, business, academia, NGOs and others) to influence a societal development in the direction of sustainability. If governance activities focus on niche creation and facilitation of societal learning, they are termed second order governance. Transdisciplinary and process-oriented sustainability research can form part of larger governance activities, as it deliberately aims to contribute to societal change towards sustainability. Transition management in this thesis is part of both, transition governance more broadly and transdisciplinary, process-oriented sustainability research more in particular. It is stated which specific relation is meant in the different instances. Generally, the used of the terms governance of sustainability transitions as well as transdisciplinary transition management is consistent across chapter and allows for synergic lessons respectively. Chapter 4 adds further details on governance (e.g. three knowledge types), providing a broader frame to the overall thesis. Chapter 5 adds different sustainability strategies that are only loosely connected to the rest of the thesis. Chapter 6 and 8 finally elaborate on researchers roles regarding transition governance and particularly spaces for societal learning, deepening the understanding thereof.

Action research and transdisciplinary research, in relation to sustainability: Action research and transdisciplinary research represent two different research fields and traditions, both stressing the collaboration of research and societal actors in relation to normative goals. While action research relates generally more to empowerment, social and democratic aims (for instance, democratizing research or enhancing local capacities to solve community problems), transdisciplinary research has often been applied to sustainability problems. Although learning across both fields has only recently started (e.g., Wittmayer 2016), and this thesis is part of such an attempt, both research traditions have many aspects in common. Transition management when being referred to as a process oriented research approach, builds on both traditions of action and transdisciplinary research. Both terms have slightly different perspectives, but add highly complementary insights regarding transition management practice due to their historic focuses. Transdisciplinarity contributes rather to relating transition management to sustainability, while action research rather contributes to understanding the action oriented and transformation character of transition management.

Transition arena and community arena. A transition arena is part of the transition management approach and includes a participatory problem analysis, envisioning, transition agenda development, back-casting, experimentation, and evaluation process. A community arena is a transition arena adapted specially for the local, communal

level. In the context of this thesis, both terms are used. As the local, community level is the focus of this research, insights mostly apply to the community arena. On a broader, more conceptual level, insights can also apply to the transition arena approach more generally.

Space for societal learning and interactive space: Both terms are used to describe the community arena process in a mostly synonymous way. Both, chapter 6 and 8, describe the process of opening and maintaining interactive/ societal learning spaces. Depending on the respective core interest of the individual chapter, aspects discussed regarding interactive/ societal learning spaces can differ. But, elaborations are highly complementary. The space for societal learning is described as the space ‘where science and society address realworld problems, generate knowledge, formulate solutions and pilot actions for a more sustainable future’ (Wittmayer & Schöpke 2014: 485). We call them spaces for societal learning, as they ‘aim to contribute to learning on a societal level’ (ibid). To do so, spaces ‘allow for reflexivity and the questioning (and possible integration) of assumptions, knowledge, goals and values’ (ibid). The community arena is similarly described as space for interaction or interactive space in chapter 6, jointly created by researchers and practitioners to develop and nurture alternative ideas (e.g., visions), practices (e.g., experiments) and social relations (e.g., actors) that further sustainability transitions. In a corresponding way, chapter 4 relates to ‘interactive space’ that allows for participatory envisioning of and experimentation with new and more sustainable practices.

Overall insights on consistency, complementarity and tensions across chapters and themes:

a: Regarding agency the terms and concepts used in the most consistent and connected ways are social learning and empowerment, which are also key terms used in transition management literature. They are complemented with additional perspectives, e.g., on capabilities, practices and power, ownership and action. There is no real contradiction or tension here – some perspectives can be summarized only to limited extents, e.g. capabilities and different understandings of empowerment.

b: Concerning sustainability, only some concepts are broadly shared across chapters. Rather chapter 4 and 5 tend to share concepts, while 6-8 do as well. The former share an approach to sustainability that includes substantial understandings of sustainability related to the capability approach (e.g. using capabilities as normative yardsticks for sustainability transitions). This is complemented with an intentional perspective on pro-social behavior and norm activation. The latter highlight the character of sustainability transitions as contested, uncertain and political and stress the process dimension of contextualizing universal sustainability understandings locally. Thus, they emphasize the role of a learning journey to make sustainability meaningful locally, and of a semi-open, reflexive facilitations to do so. Related measurements do include social effects/ impacts, inherently being related to sustainability. These sustainability enriched social effects/ impacts are used to assess and design the learning journey (chapter 6-8). Contentwise, they strongly correspond to the sustainability related behavioral model built on the capability approach (the dynamic norm activation capability model) developed in chapter 5. Thus, while the different emphasis

on intentional and substantial as well as procedural sustainability does pose some tensions for combining insights, the two approaches can be seen as complementary.

c: Transdisciplinary collaboration exposes many similar usages of terms and concepts, such as transition governance, transdisciplinary transition management and community arena. A few outliers in chapter 4 and 5 exist. For instance, the terms of efficiency, consistency and sufficiency sustainability strategies, as well as target, transformation and systems knowledge led governance are added. Particularly the second one helps to frame the overall approach and to sort the other contributions into it: for instance as visible by using target, transformation and systems knowledge as categories in the overall thesis. Similarly, the term of researchers' roles is mentioned only in chapter 6 and 8. As it details the concept of the community arena as a learning space, it complements other chapters.

Overall, the chapters of this thesis include an often coherent use of key terms and concepts. A limited number of additional terms are prevalent only in a few chapters and some overall variations of terms used do exist. Generally, variations and added terms are complementing the overall understandings of agency, sustainability and transdisciplinary collaborations. No real contradictions in terms used have been found. Thus, developing arguments across chapters and drawing broader conclusions appears generally possible.

3.7 FURTHER PUBLICATIONS IN THE CONTEXT OF THE THESIS

A number of further publications have provided inputs into the results generated in this thesis. This includes mostly reports and pre-publications that were developed in the course of the InContext project (see chapter 2 on methods). I list them in chronological order below, including short explanations on how they relate to the overall thesis.

1. Schöpke, Niko; Rauschmayer, Felix (2011): The Cornerstones of InContext – Individuals in Context: Supportive Environments for Sustainable Living. Discussion Paper (unpublished)

InContext project deliverable, outlining some key concepts and areas of future research with regard to project goals, systems knowledge and transformation knowledge, as well as proposals for distribution of respective responsibilities within the project consortium.

2. Schöpke, Niko; Rauschmayer, Felix (2011): InContext: Foundations of a common approach. Project report — Systematic Reflection and Theory Building — Protocol/ Handbook on Common Approach. Online unter: http://incontext-fp7.eu/sites/default/files/D2.1_Common%20Approach_0.pdf.

InContext project report and deliverable for the EU, developing a first conceptual overview of the project, including individual and sustainable behavior and how to support it using the community arena methodology.

3. Schöpke, Niko; Rauschmayer, Felix (2012): Addressing Sufficiency — Including altruistic motives in behavioural models for sustainability transitions. UFZ Discussion Paper 2012-17. Online unter: <https://www.econstor.eu/bitstream/10419/67956/1/733700535.pdf>

UFZ-Discussion paper and Pre-Publication developing a first, rather complex model, of individual and normative behavior by linking the capability approach to environmental psychology.

4. Wittmayer, Julia; Baasch, Stefanie; Mock, Mirijam; van Steenbergen, Frank; Omann, Ines; Schöpke, Niko (2013): Taking stock – Three years of addressing societal challenges on community level through action research. Pilot specific synthesis report. Online unter: http://www.incontext-fp7.eu/sites/default/files/D4.5%20-%20Taking%20Stock-final_0.pdf

InContext project report and deliverable to the EU. The report provides conceptual and mostly empirical results gained in the third year of the project and towards the end of the actual transition management process in the cases studied.

5. Wittmayer, Julia; Schöpke, Niko; Feiner, Georg; Piotrowski, Ralph; van Steenbergen, Frank; Baasch, Stefanie (2013): Action Research for Sustainability: Reflections on transition management in practice – Research brief. Online unter: http://www.incontext-fp7.eu/sites/default/files/InContext-ResearchBrief-Action_research_for_sustainability.pdf.

Transfer publication reporting on the action research approach of the InContext project in the cases of Rotterdam, Wolfhagen and Finkenstein, including an outline of key issues to be addressed and a reflection on the action research practice performed, including the role of researchers. Recommendations for doing action research for sustainability transitions are developed.

6. Wesely, Julia; Feiner, Georg; Omann, Ines; Schöpke, Niko (2013): Transition management as an approach to deal with climate change. In: Proceedings of Transformation in a Changing Climate, 19-21 June 2013, Oslo, Norway. University of Oslo. Interactive. S. 43-52.

Article presented at the Transformation in a Changing Climate Conference exploring possibilities and limitations of transition theory, transition governance and particularly transition management to understand climate change challenges and prescribe respective solutions.

7. Schöpke, Niko; Omann, Ines; Mock, Miriam; Wittmayer, Julia; von Raggamby, Anneke (2013): Supporting sustainability transitions by enhancing the human dimension via empowerment, social learning and social capital. In: SCORAI Europe Workshop Proceedings: Pathways, Scenarios and Backcasting for Low Carbon and Sustainable Lifestyles. S. 277-293.

Discussion paper presented at SCORAI Europe workshop, developing a first conceptual understanding of empowerment, social learning and social capital and their contribution to sustainability transitions and applying the concepts to analyse three transition management case studies (Rotterdam, Wolfhagen and Finkenstein).

8. Rauschmayer, Felix; Bauler, Tom; Schöpke, Niko (2013): Towards a governance of sustainability transitions: Giving place to individuals. In: SCORAI Europe Workshop Proceedings: Pathways, Scenarios and Backcasting for Low Carbon and Sustainable Lifestyles. S. 97-121 (Ebenfalls erschienen als UFZ Discussion Papers 17/2013 – GeNECA 10).

Discussion paper presented at SCORAI Europe workshop, developing a first cross-over between transition management, the capability approach and the social practice approach. The paper engages in an extensive discussion of the potential uses of this cross-over in the areas of sustainability assessments, social learning for sustainability empowerment and the upscaling of niches.

3.8 REFERENCES OF CHAPTERS 1-3

- Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., ... Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio*, 46(1), 30–39. <https://doi.org/10.1007/s13280-016-0800-y>
- Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2012). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, 3(2), 112–117. <https://doi.org/10.1038/nclimate1666>
- Alkire, S. (2002). Dimensions of human development. *World Development*, 30(2), 181–205. [https://doi.org/10.1016/S0305-750X\(01\)00109-7](https://doi.org/10.1016/S0305-750X(01)00109-7)
- Anand, S., & Sen, A. (2000). Human Development and Economic Sustainability. *World Development*, 28(12), 2029–2049.
- Avelino, F. (2009). Empowerment and the challenge of applying transition management to ongoing projects. *Policy Sciences*, 42(4), 369–390. <https://doi.org/10.1007/s11077-009-9102-6>
- Avelino, F. (2011). Power in transition: Empowering Discourses on Sustainability Transitions, 405.
- Avelino, F. (2017). Power in Sustainability Transitions: Analysing power and (dis)empowerment in transformative change towards sustainability. *Environmental Policy and Governance*, (August). <https://doi.org/10.1002/eet.1777>
- Avelino, F., & Grin, J. (2017). Beyond deconstruction. a reconstructive perspective on sustainability transition governance. *Environmental Innovation and Societal Transitions*, 22(March), 15–25. <https://doi.org/10.1016/j.eist.2016.07.003>
- Avelino, F., & Wittmayer, J. M. (2016). Shifting Power Relations in Sustainability Transitions: A Multi-actor Perspective. *Journal of Environmental Policy & Planning*, 18(5), 628–649. <https://doi.org/10.1080/1523908X.2015.1112259>
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psychosocial determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14–25. <https://doi.org/10.1016/j.jenvp.2006.12.002>
- Bauler, T., Debourdeau, A., Baasch, S., Umpfenbach, K., & Piotrowski, R. (2013). Alternative Collective Consumption and Production Niches - Lessons from their emergence development and governance. Deliverable 3.3. InContext: EU ENV.2010.4.2.3-1 grant agreement n° 265191. Berlin. Retrieved from [http://www.incontext-fp7.eu/sites/default/files/D3.3-Case studies Synthesis Report-final.pdf](http://www.incontext-fp7.eu/sites/default/files/D3.3-Case%20studies%20Synthesis%20Report-final.pdf)

- Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems : A scheme of analysis Analyzing the Functional Dynamics of Technological Innovation Systems : A Scheme of Analysis. *Research Policy*, 37(37), 407–429. <https://doi.org/10.1016/j.res-pol.2007.12.003>
- Bergmann, M., Jahn, T., Knobloch, T., Krohn, W., Pohl, C., Schramm, E., & Klein, J. T. (2012). *Methods for transdisciplinary research: a primer for practice*. Campus Verlag.
- Bergmann, M., Brohmann, B., Hoffmann, E., Loibl, M. C., Rehaag, R., Schramm, E., & Voss, J.-P. (2005). *Quality Criteria of Transdisciplinary Research. A Guide for the Formative Evaluation of Research Projects*. Institut Fuer Sozial-Oekologische Forschung (ISOE), 5–75. Retrieved from <http://www.isoe.de>
- Berkhout, F., Smith, A., & Stirling, A. (2004). Socio-technological Regimes and Transition Contexts. In *System Innovation and the Transition to Sustainability* (Vol. 44, pp. 48–75). Edward Elgar Publishing. <https://doi.org/10.4337/9781845423421.00013>
- Bos, J. J., Brown, R. R., & Farrelly, M. A. (2013). A design framework for creating social learning situations. *Global Environmental Change*, 23(2), 398–412. <https://doi.org/10.1016/j.gloenvcha.2012.12.003>
- Bradbury, H., & Reason, P. (2003). Action Research: An Opportunity for Revitalizing Research Purpose and Practices. *Qualitative Social Work*, 2(2), 155–175. <https://doi.org/10.1177/1473325003002002003>
- Brown, K., Furneaux, C., & Gudmundsson, A. (2012). Infrastructure transitions towards sustainability: a complex adaptive systems perspective. *International Journal of Sustainable Development*, 15(1-2), 54–71.
- Bulkeley, H., & Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, 38(3), 361–375. <https://doi.org/10.1111/j.1475-5661.2012.00535.x>
- Cash, D., Clark, W. C., Alcock, F., Dickson, N., Eckley, N., & Jäger, J. (2003). Saliency, Credibility, Legitimacy and Boundaries: Linking Research, Assessment and Decision Making. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.372280>
- Christensen, C. M., Baumann, H., Ruggles, R., & Sadtler, T. M. (2006). *Disruptive Innovation for Social Change Key ideas from the Harvard Business Review article By Clayton M . The Idea in Practice Identifying Catalytic Innovations*. *Harvard Business Review*, 2–4.
- Clark, W. (2000). Transition toward Sustainability, A. *Ecology Law Quarterly*, 1(4), 1021–1073. <https://doi.org/10.15779/Z38884G>

- Cornell, S., Berkhout, F., Tuinstra, W., Tàbara, J. D., Jäger, J., Chabay, I., ... van Kerkhoff, L. (2013). Opening up knowledge systems for better responses to global environmental change. *Environmental Science and Policy*, 28, 60–70. <https://doi.org/10.1016/j.envsci.2012.11.008>
- Costanza, R., Cumberland, J. H., Daly, H., Goodland, R., Norgaard, R. B., Kubiszewski, I., & Franco, C. (2014). *An introduction to ecological economics*. Boca Raton: CRC Press.
- Crutzen, P. J. (2002). Geology of mankind. *Nature*, 415(January), 23. <https://doi.org/10.1038/415023a>
- Denzin, N. K. (1989). *Interpretive interactionism*. Newbury Park: Sage.
- Evans, J., Karvonen, A., & Raven, R. (2016). *The experimental city*. Milton Park: Routledge.
- Farla, J., Markard, J., Raven, R., & Coenen, L. (2012). Sustainability transitions in the making: A closer look at actors, strategies and resources. *Technological Forecasting and Social Change*, 79(6), 991–998. <https://doi.org/10.1016/j.techfore.2012.02.001>
- Fazey, I., Schöpke, N., Caniglia, G., Patterson, J., Hultman, J., van Mierlo, B., ... Wyborn, C. (2018). Ten essentials for action-oriented and second order energy transitions, transformations and climate change research. *Energy Research & Social Science*, 40(April 2017), 54–70. <https://doi.org/10.1016/j.erss.2017.11.026>
- Feola, G. (2015). Societal transformation in response to global environmental change: A review of emerging concepts. *Ambio*, 44(5), 376–390. <https://doi.org/10.1007/s13280-014-0582-z>
- Fischer, L. B., & Newig, J. (2016). Importance of actors and agency in sustainability transitions: A systematic exploration of the literature. *Sustainability (Switzerland)*, 8(5). <https://doi.org/10.3390/su8050476>
- Flyvbjerg, B. (2006). Five Misunderstandings About Case-Study Research. *Qualitative Inquiry*, 12(2), 219–245. <https://doi.org/10.1177/1077800405284363>
- Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations. *AMBIO: A Journal of the Human Environment*, 31(5), 437–440. <https://doi.org/10.1579/0044-7447-31.5.437>
- Frankena, W. K. (1939). The Naturalistic Fallacy. *Mind*, 48(192), 464–477.
- Frantzeskaki, N., & de Haan, H. (2009). Transitions: Two steps from theory to policy. *Futures*, 41(9), 593–606. <https://doi.org/10.1016/j.futures.2009.04.009>

- Frantzeskaki, N., Koppenjan, J., Loorbach, D., & Ryan, N. (2012). Concluding editorial: Sustainability transitions and their governance: lessons and next-step challenges. *International Journal of Sustainable Development*, 15(1/2), 173. <https://doi.org/10.1504/IJSD.2012.044040>
- Frantzeskaki, N., Loorbach, D., & Meadowcroft, J. (2012). Governing societal transitions to sustainability. *International Journal of Sustainable Development*, 15(1/2), 19. <https://doi.org/10.1504/IJSD.2012.044032>
- Fuenfschilling, L., & Truffer, B. (2014). The structuration of socio-technical regimes—Conceptual foundations from institutional theory. *Research Policy*, 43(4), 772–791. <https://doi.org/10.1016/j.respol.2013.10.010>
- Fuenfschilling, L., & Truffer, B. (2016). The interplay of institutions, actors and technologies in socio-technical systems — An analysis of transformations in the Australian urban water sector. *Technological Forecasting and Social Change*, 103, 298–312. <https://doi.org/10.1016/j.techfore.2015.11.023>
- Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age. *Futures*, 25(7), 739–755. [https://doi.org/10.1016/0016-3287\(93\)90022-L](https://doi.org/10.1016/0016-3287(93)90022-L)
- Geels, F. (2017). Agency in sustainability transitions and the Multi-Level Perspective: Theoretical micro-foundations and crossovers between social constructivism, evolutionary economics and neo-institutional theory. In Paper presented at the International Sustainability Transitions Conference 2017. Gothenburg.
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, 31, 1257–1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8)
- Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, 39(4), 495–510. <https://doi.org/10.1016/j.respol.2010.01.022>
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>
- Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399–417. <https://doi.org/10.1016/j.respol.2007.01.003>
- Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York: Basic Books.
- Genus, A., & Coles, A. M. (2008). Rethinking the multi-level perspective of technological transitions. *Research Policy*, 37(9), 1436–1445. <https://doi.org/10.1016/j.respol.2008.05.006>
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzmann, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies*. Los Angeles: Sage.

- Giddens, A. (1984). *The Constitution of Society - Outline of a Theory of Structuration*. Berkeley: University of California Press.
- Giulio, A. Di, Fischer, D., Schäfer, M., & Blättel-mink, B. (2014). Conceptualizing sustainable consumption: toward an integrative framework. In *Sustainability: Science, Practice & Policy* (Vol. 10, pp. 45–61).
- Göpel, M. (2016). *The Great Mindshift* (Vol. 2). Cham: Springer International Publishing. <https://doi.org/10.1007/978-3-319-43766-8>
- Grin, J., Loeber, A. (2006). Theories of learning. Agency, structure and change. In *Handbook of Public Policy Analysis: Theory, Politics, and Methods*; Fischer, F., Miller, G., Sidney, M., Eds.; CRC Press: Boca Raton, USA, 201–222.
- Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to sustainable development: new directions in the study of long-term transformative change*. New York: Routledge.
- Grunwald, A. (2015). Transformative Wissenschaft - Eine neue Ordnung im Wissenschaftsbetrieb? *Gaia*, 24(1), 17–20. <https://doi.org/10.14512/gaia.24.1.5>
- Hackmann, H., Moser, S. C., & St. Clair, A. L. (2014). The social heart of global environmental change. *Nature Climate Change*, 4(8), 653–655. <https://doi.org/10.1038/nclimate2320>
- Hirsch, G., Bradley, D., Pohl, C., Rist, S., & Wiesmann, U. (2006). Implications of transdisciplinarity for sustainable research. *Ecological Economics*, 60, 119–128. <https://doi.org/10.1016/j.ecolecon.2005.12.002>
- Hölscher, K., Wittmayer, J. M., Avelino, F., & Giezen, M. (2017). Opening up the transition arena: An analysis of (dis)empowerment of civil society actors in transition management in cities. *Technological Forecasting and Social Change*. <https://doi.org/10.1016/j.techfore.2017.05.004>
- Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics*, 79, 1–10. <https://doi.org/10.1016/j.ecolecon.2012.04.017>
- Janerio, R. De. (1992). United Nations Conference on Environment & Development Rio de Janeiro , Brazil , 3 to 14 June 1992. *Reproduction*, (June), 351. <https://doi.org/10.1007/s11671-008-9208-3>
- Kates, R. W., Clark, W. C., Corell, R., Hall, J. M., Jaeger, C. C., Lowe, I., ... Svedin, U. (2001). *Sustainability Science*. *Science*, 292, 641–643.
- Kemp, R., & Rotmans, J. (2009). Transitioning policy: co-production of a new strategic framework for energy innovation policy in the Netherlands. *Policy Sciences*, 42(4), 303–322. <https://doi.org/10.1007/s11077-009-9105-3>

- Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management. *Technology Analysis & Strategic Management*, 10(2), 175–198. <https://doi.org/10.1080/09537329808524310>
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., ... Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(SUPPL. 1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>
- Leach, M., Rockström, J., Raskin, P., Scoones, I., Stirling, A. C., Smith, A., & Thompson, J. (2012). Transforming Innovation for Sustainability, 17(2). <https://doi.org/http://dx.doi.org/10.5751/ES-04933-170211>
- Loorbach, D. (2007). Transition management. New mode of governance for sustainable development. ERASMUS University Rotterdam. Retrieved from <papers2://publication/uuid/AF318B66-F63F-4953-8EFE-62B65EDC2149>
- Loorbach, D. A. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance, An International Journal of Policy, Administration, and Institutions*, 23(1), 161–183. <https://doi.org/10.1111/j.1468-0491.2009.01471.x>
- Loorbach, D., Frantzeskaki, N., & Lijnis Huffenreuter, R. (2015). Transition Management: Taking Stock from Governance Experimentation. *Journal of Corporate Citizenship*, 2015(58), 48–66. <https://doi.org/10.9774/GLEAF.4700.2015.ju.00008>
- Loorbach, D., Frantzeskaki, N., & Thissen, W. (2011). A Transition Research Perspective on Governance for Sustainability. In C. C. Jaeger, J. D. Tabara, & J. Jaeger (Eds.), *European Research on Sustainable Development* (pp. 73–89). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-19202-9_7
- Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, 42(3), 237–246. <https://doi.org/10.1016/j.futures.2009.11.009>
- Luederitz, C., Abson, D. J., Audet, R., & Lang, D. J. (2017). Many pathways toward sustainability: not conflict but co-learning between transition narratives. *Sustainability Science*, 12(3), 393–407. <https://doi.org/10.1007/s11625-016-0414-0>
- Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, 41(6), 955–967. <https://doi.org/10.1016/j.respol.2012.02.013>
- Meadowcroft, J. (1997). Planning for sustainable development: Insights from the literatures of political science. *European Journal of Political Research*, 31(4), 427–454. <https://doi.org/10.1111/1475-6765.00324>

- Meadowcroft, J. (2011). Engaging with the politics of sustainability transitions. *Environmental Innovation and Societal Transitions*, 1(1), 70–75. <https://doi.org/10.1016/j.eist.2011.02.003>
- Miller, T. R. (2013). Constructing sustainability science: Emerging perspectives and research trajectories. *Sustainability Science*, 8(2), 279–293. <https://doi.org/10.1007/s11625-012-0180-6>
- Nowotny, H., Scott, P., & Gibbons, M. (2001). *Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty*. Cambridge: Polity Press.
- O'Brien, K. (2012). Global environmental change II. *Progress in Human Geography*, 36(5), 667–676. <https://doi.org/10.1177/0309132511425767>
- Olsson, P., Galaz, V., & Boonstra, W. J. (2014). Sustainability transformations: a resilience perspective. *Ecology and Society*, 19(4), art1. <https://doi.org/10.5751/ES-06799-190401>
- Pahl-Wostl, Claudia, Becker, G., Knieper C., Sendzimir, J. (2013). How Multilevel Societal Learning Processes Facilitate Transformative Change. Pdf, 18(4), 58.
- Rauschmayer, F., Bauler, T., & Schöpke, N. (2013). Towards a governance of sustainability transitions: Giving place to individuals (UFZ Discussion Papers No. 17/2013).
- Rauschmayer, F., Bauler, T., & Schöpke, N. (2015). Towards a thick understanding of sustainability transitions - Linking transition management, capabilities and social practices. *Ecological Economics*, 109, 211–221.
- Rauschmayer, F., & Omann, I. (2012). Transition to sustainability: Not only big, but deep. *Gaia*, 21(4), 266–268.
- Raworth, K. (2012). *A Safe and Just Space for Humanity: Can we live within the doughnut?* Oxfam Discussion Papers, 26 pp.
- Raymond, C. M., Brown, G., & Robinson, G. M. (2011). The influence of place attachment, and moral and normative concerns on the conservation of native vegetation: A test of two behavioural models. *Journal of Environmental Psychology*, 31(4), 323–335. <https://doi.org/10.1016/j.jenvp.2011.08.006>
- Reason, P., & Bradbury, H. (2001). *Handbook of action research Participative Inquiry and Practice* Peter. Sage. <https://doi.org/0432>
- Reed, M., Evely, A. C., Cundill, G., Fazey, I. R. A., Glass, J., & Laing, A. (2010). What is social learning? *Ecology and Society*. Retrieved from <https://researchrepository.st-andrews.ac.uk/handle/10023/1624>

- Rip, A., & Kemp, R. (1998). Technological Change. In S. Rayner & E. L. Malone (Eds.), *Human choice and climate change*. Vol. II, *Resources and Technology* (pp. 327–399). Columbus, Ohio: Battelle Press.
- Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155–169. <https://doi.org/10.1007/BF01405730>
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., ... Foley, J. A. (2009). A safe operating space for humanity. *Nature*, 461(7263), 472–475. <https://doi.org/10.1038/461472a>
- Rotmans, J. (1998). Methods for IA: The challenges and opportunities ahead. *Environmental Modeling and Assessment*, 3(3), 155–179. <https://doi.org/10.1023/A:1019019024003>
- Rotmans, J., Kemp, R., & Van Asselt, M. (2001). More evolution than revolution: transition management in public policy. *Foresight*, 3(1), 15–31. <https://doi.org/10.1108/14636680110803003>
- Rotmans, J., & Loorbach, D. (2009). Complexity and transition management. *Journal of Industrial Ecology*, 13(2), 184–196. <https://doi.org/10.1111/j.1530-9290.2009.00116.x>
- Rotmans, J., & Loorbach, D. A. (2010). Conceptual framework for analyzing transitions. In J. Schot, J. Grin, & J. Rotmans (Eds.), *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change* (pp. 126–139). Routledge. <https://doi.org/10.4324/9780203856598>
- Schäpke, N., Omann, I., Wittmayer, J. M., van Steenberg, F., & Mock, M. (2017). Linking transitions to sustainability: A study of the societal effects of transition management. *Sustainability (Switzerland)*, 9(5). <https://doi.org/10.3390/su9050737>
- Schäpke, N., & Rauschmayer, F. (2012a). Addressing sufficiency: Including altruistic motives in behavioural models for sustainability transitions. *UFZ Discussion Papers*.
- Schäpke, N., & Rauschmayer, F. (2012b). *InContext: Foundations of a common approach*. Project report — Systematic Reflection and Theory Building — Protocol/ Handbook on Common Approach. Berlin. Retrieved from http://incontext-fp7.eu/sites/default/files/D2.1_Common Approach_0.pdf
- Schäpke, N., & Rauschmayer, F. (2014). Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency. *Sustainability: Science, Practice, & Policy*, 10(1), 29–44.
- Schäpke, N., & Rauschmayer, F. (2011). *The Cornerstones of InContext – Individuals in Context*. Supportive Environments for Sustainable Living.

- Schneider, F., Kallis, G., & Martinez-Alier, J. (2010). Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue. *Journal of Cleaner Production*, 18(6), 511–518. <https://doi.org/10.1016/j.jclepro.2010.01.014>
- Schneidewind, U. (2015). Transformative Wissenschaft – Motor für gute Wissenschaft und lebendige Demokratie. *Gaia*, 24(2), 88–91. <https://doi.org/10.14512/gaia.24.2.5>
- Schneidewind, U., & Augenstein, K. (2016). Three Schools of Transformation Thinking: The Impact of Ideas, Institutions, and Technological Innovation on Transformation Processes. *GAIA - Ecological Perspectives for Science and Society*, 25(2), 88–93. <https://doi.org/10.14512/gaia.25.2.7>
- Scholz, R. (2017). The Normative Dimension in Transdisciplinarity, Transition Management, and Transformation Sciences: New Roles of Science and Universities in Sustainable Transitioning. *Sustainability*, 9(6), 991. <https://doi.org/10.3390/su9060991>
- Scholz, R. W. (2011). *Environmental Literacy in Science and Society. Environmental Literacy in Science and Society: From Knowledge to Decisions*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CB09780511921520>
- Schot, J., & Geels, F. W. (2008). Technology Analysis & Strategic Strategic niche management and sustainable innovation journeys : theory , findings , research agenda , and policy Strategic niche management and sustainable research agenda , and policy, 20(December 2014), 37–41. <https://doi.org/10.1080/09537320802292651>
- Schuitmaker, T. J. (2012). Identifying and unravelling persistent problems. *Technological Forecasting and Social Change*, 79(6), 1021–1031. <https://doi.org/10.1016/j.techfore.2011.11.008>
- Schwartz-Shea, P. (2012). Judging Quality: Evaluative Criteria and Epistemic Communities. In *Interpretation and Method. Empirical Research Methods and the Interpretive Turn* (pp. 89–114). Armonk/ London: M.E. Sharpe.
- Schwartz-Shea, P., & Yahow, D. (2012). *Interpretive Research Design. Concepts and Processes*. New York and London: Routledge.
- Shove, E., 2003. *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Berg.
- Shove, E. (2010). Beyond the ABC: Climate change policy and theories of social change. *Environment and Planning A*, 42(6), 1273–1285. <https://doi.org/10.1068/a42282>
- Shove, E., & Walker, G. (2007). CAUTION! Transitions ahead: Politics, practice, and sustainable transition management. *Environment and Planning A*, 39(4), 763–770. <https://doi.org/10.1068/a39310>

- Siebenhüner, B. (2000). Homo sustinens—towards a new conception of humans for the science of sustainability. *Ecological Economics*, 32(1), 15–25. [https://doi.org/10.1016/S0921-8009\(99\)00111-1](https://doi.org/10.1016/S0921-8009(99)00111-1)
- Smink, M. M., Hekkert, M. P., & Negro, S. O. (2015). Keeping sustainable innovation on a leash? Exploring incumbents' institutional strategies. *Business Strategy and the Environment*, 24(2), 86–101. <https://doi.org/10.1002/bse.1808>
- Smith, A., & Stirling, A. (2010). The politics of socio-ecological resilience and socio-technical transitions. *Ecology & Society*, 15(1), 1–13. <https://doi.org/11>
- Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, 34(10), 1491–1510. <https://doi.org/10.1016/j.respol.2005.07.005>
- Smith, A., Voß, J. P., & Grin, J. (2010). Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research Policy*, 39(4), 435–448. <https://doi.org/10.1016/j.respol.2010.01.023>
- Star, S. L., & Griesemer, J. R. (1989). Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39. *Social Studies of Science*, 19(3), 387–420. <https://doi.org/10.1177/030631289019003001>
- Sterling, S. (2011). Transformative Learning and Sustainability: sketching the conceptual ground. *Learning and Teaching in Higher Education*, (5), 17–33. Retrieved from <http://doi.wiley.com/10.1002/sd.1556>
- Stern, P. C. (2000). New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, 56(3), 407–424. <https://doi.org/10.1111/0022-4537.00175>
- Strohschneider, P. (2014). Zur Politik der Transformativen Wissenschaft. In *Die Verfassung des Politischen* (pp. 175–192). Wiesbaden: Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-04784-9_10
- Taanman, M. (2014). Looking for Transitions: Monitoring approach for sustainable transition programmes (Doctoral dissertation, Erasmus School of Social and Behavioural Sciences).
- Tompkins, E. L., & Adger, W. N. (2004). Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change? *Ecology and Society*, 9(2), 10.
- Turnheim, B., Berkhout, F., Geels, F., Hof, A., McMeekin, A., Nykvist, B., & van Vuuren, D. (2015). Evaluating sustainability transitions pathways: Bridging analytical approaches to address governance challenges. *Global Environmental Change*, 35(October), 239–253. <https://doi.org/10.1016/j.gloenvcha.2015.08.010>

United Nation Development Programme. (2011). *Sustainability and Equity: A better future for all*. Human Development Report. New York: Palgrave.

United Nations General Assembly. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. New York. Retrieved from <https://sustainabledevelopment.un.org/post2015/transformingourworld>

Van den Bosch, S. (2010). *Transition Experiments. Drift* (Vol. PhD Thesis).

van Mierlo, B., Regeer, B., van Amstel, M. (2010). *Reflexive monitoring in action. A Guide for Monitoring ...*, (November 2015), 3–104. Retrieved from [http://www.falw.vu.nl/en/Images/Reflexive monitoring in Action B van Mierlo and B Regeer 2010_tcm24-399363.pdf](http://www.falw.vu.nl/en/Images/Reflexive_monitoring_in_Action_B_van_Mierlo_and_B_Regeer_2010_tcm24-399363.pdf)

WBGU. (2011). *A Social Contract for Sustainability*. Retrieved from <http://www.wbgu.de/en/flagship-reports/fr-2011-a-social-contract/>

WBGU. (2016). *Humanity on the move: Unlocking the transformative power of cities. Summary*. Berlin. Retrieved from <http://www.wbgu.de/en/fr2016/>

WCED. (1987). *Our common future: Report of the 1987 World Commission on Environment and Development*. Retrieved from <http://www.un-documents.net/wced-ocf.htm>

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., ... Van Der Leeuw, S. (2011). *Tipping toward sustainability: Emerging pathways of transformation*. *Ambio*, 40(7), 762–780. <https://doi.org/10.1007/s13280-011-0186-9>

Westley, F. R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., & Bodin, Ö. (2013). *A theory of transformative agency in linked social-ecological systems*. *Ecology and Society*, 18(3). <https://doi.org/10.5751/ES-05072-180327>

Wiek, A., & Lang, D. J. (2016). *Transformational Sustainability Research Methodology*. *Sustainability Science*, 31–41. https://doi.org/10.1007/978-94-017-7242-6_3

Wilber, K. (2001). *A theory of everything: An integral vision for business, politics, science and spirituality*. Boulder: Shambhala publications.

Wittmayer, J.; Van Steenberg, F.; Quist, J.; Loorbach, D.; Hoogland, C. (2011). *The community arena: a co-creation tool for sustainable behaviour by local communities methodological guidelines*. Deliverable 4.1.

Wittmayer, Julia; Mock, Mirijam; van Steenberg, Frank; Baasch, Stefanie; Omann, I., & Schöpke, N. (2013). *Taking stock – Three years of addressing societal challenges on community level through action research. Pilot specific synthesis report*. Berlin.

- Wittmayer, J. M. (2016). *Transition Management , Action Research and Actor Roles : Understanding local sustainability transitions*. ERASMUS University Rotterdam.
- Wittmayer, J. M., Avelino, F., van Steenbergen, F., & Loorbach, D. (2017). Actor roles in transition: Insights from sociological perspectives. *Environmental Innovation and Societal Transitions*, 24(October), 45–56. <https://doi.org/10.1016/j.eist.2016.10.003>
- Wittmayer, J. M., & Schöpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability Science*, 9(4), 483–496.
- Wittmayer, J. M., Schöpke, N., van Steenbergen, F., & Omann, I. (2014). Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges. *Critical Policy Studies*, 8(4), 465–485. <https://doi.org/10.1080/19460171.2014.957336>
- Wittmayer, J., Schöpke, N., Feiner, G., Piotrowski, R., Steenbergen, F. Van, & Baasch, S. (2013). Action Research for Sustainability Reflections on transition management in practice Authors :, (June), 1–24.
- Wittmayer, J., Steenbergen, F. van, Bohunovsky, L., Baasch, S., Quist, J., Loorbach, D., & Hoogland, C. (2011). Pilot projects getting started Year 1 Status Report. Berlin.
- Wittmayer, J., Steenbergen, F. van, Bohunovsky, L., Baasch, S., Quist, J., Loorbach, D., & Hoogland, C. (2012). Pilot projects on a roll - Year 2 pilot specific reports. Berlin.
- World Commission on Environment and Development (WCED). (1987). *Our Common Future*. New York: Oxford University Press.
- Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Los Angeles: Sage publications.

4 TOWARDS A THICK UNDERSTANDING OF SUSTAINABILITY TRANSITIONS — LINKING TRANSITION MANAGEMENT, CAPABILITIES AND SOCIAL PRACTICES

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Abstract

Scientific activities which are targeted to engage and enact on societal problems – and governance of sustainability transition itself is one such activity – are necessarily prescriptive endeavours, have to recognize the fundamental normativity of sustainable development, need to be based on a thick description of the issues to change, and should embrace the multi-dimensional importance that individuals take in societal change. Societally relevant research on and for sustainability transitions therefore has to produce systems, target, as well as transformative knowledge. The challenges of sustainability transitions require furthermore that the individual and the societal levels have to be linked as to relate individual agency and structural change within the different knowledge types.

Taking transition management as a rather obvious starting point to enrich the concept of sustainability transitions, the paper elaborates that its conceptual basis is too thin to address the first two types of knowledge. In its current elaborations, transition management does furthermore not cover individual agency as potential driver of transitions. We therefore suggest complementing transition management approaches with the more descriptive practice theory and the more normative and individualistic capability approach. We suggest a heuristic combination that places individuals back into the study of sustainability transitions.

Keywords

Transition management, Capability approach, Practice theory, Transdisciplinarity, Sustainability transitions

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4.1 INTRODUCTION

There are multiple on-going attempts to develop scientific knowledge to enhance sustainability transitions. Part of such knowledge is meant to percolate institutions sufficiently in order to support the development of policies that could further the fundamental changes needed in our societies for a shift to sustainable development (e.g. WBGU, 2011). Considering however these scientific attempts' relatively weak performances in effectively supporting change on larger scales, it might well be assumed that the current knowledge leaves out essential elements. The present paper attempts to identify what elements are missing in transition management (TM) as one of the most prevalent approaches that is currently used in parts of Europe to scientifically ground the governance of sustainability transitions (Grin et al., 2010; Loorbach, 2007). Additionally we propose how at heuristic level to enrich TM's conceptualisation of sustainability transitions. As a frame of reference, we use the differentiation of knowledge in systems, target, and transformative knowledge as elaborated by transdisciplinarity scholars (Costanza et al., 1997; Hirsch Hadorn et al., 2006; Pohl and Hirsch Hadorn, 2007; Jahn et al., 2012). By systems knowledge, we understand the knowledge necessary to understand an issue, i.e. in our case a transition, its dynamics and reasons; target knowledge is about the future state of the system aimed for, and why it is aimed for; and transformative knowledge is about the ways and means of practically realizing the desired state of the system in question.

We purport that the resolutely transdisciplinary – indeed often action research based – approach and conceptualisation of TM provides a worthy entry point for the development of the necessary transformative knowledge. TM allows contextualizing the lessons from facilitating experimentation and learning processes with practitioners developing innovative solutions to societal challenges. TM furthermore generates knowledge on broadening networks of supporters to scale up innovations, and thereby to infuse transformations into society (Loorbach and Rotmans, 2010). However, such knowledge does not suffice when the objective is to contribute to large-scale societal problem-solving. Transformative knowledge has also to take account of the political structure in which it takes place as well as of the agents which are to pursue the transition to sustainability. Additionally, and this is the main point of our argument, target knowledge as well as systems knowledge need to be generated as well. This double agenda of enriching TM with accurate target- and systems-knowledge is what we pursue hereafter.

First, research for sustainability transitions as policy-oriented transdisciplinary research calls for a well-grounded comprehension of what the societal problem is about (i.e. for systems knowledge). Sustainability transitions are defined by Grin et al. (2010: 1) as “a radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies”. This raises the question whether to look at the issue from an individual or a societal perspective, or to find an adequate way to combine micro and macro perspectives into a coherent systems-wide knowledge. Fundamental society-wide modifications will necessarily target to change every day behaviour of citizens/consumers. However behavioural approaches, especially in economics grounding on individualistic and rationality-based perspectives, can only to a very small part explain behavioural dynamics and change (Røpke, 2009; Shove, 2010). Behavioural change appears to be rather enshrined in complex

soci(et)al practices than to be the result of relatively one-dimensional shifts in individual choices triggered by particular exogenous signals: in clear, it is not the (change of the) price tag on a commodity that helps us understand behaviour. Developing a more adequate dialectic between the individual and the social/collective appears thus to be a prerequisite to enhance our systems knowledge of change and of sustainability transitions.

Second, knowledge is needed at the level of the teleology of the analysed sustainability transition (i.e. target knowledge). Non- governed – historical – transitions are only indirectly normative, since they do not follow pre-defined normative goals, but still can be assessed against them *ex post*. Surprisingly, advocated transition processes such as sustainability transitions as well often do not seem to have clear-cut objectives or normatively defined principles to steer the process of particular transition dynamics towards a more sustainable world. Typically, the substantial and procedural objectives of specific transition initiatives are actually left for definition by involved actors. However, it seems unsatisfying that a governance approach of sustainability transitions avoids explicitly addressing the normativity of sustainability, i.e. intra- and intergenerational justice. Sustainability is based on ethical individualism. This is true since the Brundtland Commission (WCED, 1987) spelled the objective out as the improvement of individuals' conditions (i.e. respecting needs) while preserving environmental conditions (i.e. respecting natural capacities). By extension, sustainability transitions are thus societal phenomena targeting to improve (inter- and intra-generational) justice, the result and consequences of which should be measured at an individual's level. The imperative to generate a layer of target knowledge, quite the same as it is argued above with respect to systems knowledge, is inherently asking to relink the societal and the individual. Additionally, it asks to introduce explicit elements of normativity and to confront transition initiatives with an assessment of their environmental impacts.

In the following, we hypothesize that any informational, scientific basis for transition governance should comprise all three layers of knowledge, i.e. target, system and transformative knowledge, and that these are to be grounded both at the societal and at the individual levels. It is indeed the conceptualisation of this bridge between individual and societal levels which we want to explore in the following paper. In extension, our proposal is to combine TM with practice approaches (PA) and the capability approach (CA). This combination provides indeed for a transdisciplinary approach by enriching the transformative knowledge of TM in two directions: First, it adds the possibility to better apprehend the teleology of TM by using CA as the basis for assessing transition initiatives and societal changes (i.e. adding target knowledge). Second, it provides for a more multi-dimensional and robust comprehension of the social systems at play by adding a PA perspective (i.e. adding systems knowledge). We suggest that these three approaches actually are a combinable – and even a stackable – set of approaches, providing for a bundle of heuristics able to ground a more effective and large- scale governance of sustainability transitions.

In the following Section 4.2, we present TM as our foundational heuristic. In particular, we introduce the multi-level perspective (MLP) and related transition management approaches and stress their limitations in generating target and systems knowledge. The multi-level perspective as adopted in TM allows developing a focus on how to enhance societal transitions via the building-up and main-streaming of niches.

In Section 4.3, we start to envisage complementing TM with approaches that improve the provision of target and systems knowledge. First (Section 4.3.1), we delineate how the capability approach (CA) can be mobilized to assess the enhancement of social justice based on human well-being, and how CA allows accounting for the interaction of societal and personal factors. As a partial theory of justice (Sen, 2009), CA clearly is able to generate target knowledge. However, CA has a series of limitations themselves which render the approach relatively un-operational when it comes to deliver transformative and systems knowledge. In a second instance (Section 4.3.2), we stack practice approaches (PA) on top of the capability-enriched TM heuristic. By adding PA, we are able to better disentangle human action as resulting from the interaction between meaning, material, and skills. PA provides us with the analytical capacity to develop a reading at meso-level of how change occurs and evolves, and as such can provide for an account of the systems at the intersection of individuals and society.

Section 4.4 will allow us to discuss the heuristic assemblage of a “CA-and PA-enriched TM”, i.e. to envisage the consequences of our attempt to ground the prescriptive governance of normatively defined transitions on a rich description of change(s). We implicitly argue that the strengths and weaknesses of these three heuristics – TM, CA, and PA – can be fruitfully combined into a meta-heuristic. This heuristic will allow re-situating an individual into the conceptualisation of societal transitions and will help to address the normativity-illusion of current TM-approaches. Because none of the three approaches is considered as being fully elaborated theory, we refrain from a discussion of these three approaches in their full theoretical depth. We rather use them as a three-folded heuristic basis that allows developing an enriched (meta) heuristic of transition governance.

4.2 TRANSITION MANAGEMENT AS A FOUNDATIONAL HEURISTIC

4.2.1 Transition Research and the Multi-Level Perspective

Rotmans and Loorbach (2009: 185) define transitions as radical, structural changes of societal (sub)systems. Following Rotmans et al. (2001: 16), transitions “can be described as a set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems”. Transition research aims at developing analytical tools that take into account the complexity of societal systems and their mechanisms of innovation. In more detail, Markard et al. (2012: 955) distinguish four different theory strands within transition research: exploring technological innovation systems (e.g. Bergek et al., 2008), applying the multi-level perspective (MLP) to the analysis of historical socio-technical transitions (e.g. Geels and Schot, 2007), elaborating on the operationalization of strategic niche management (Kemp et al., 1998), and experimenting with processes to manage transitions (e.g. Loorbach, 2007; Rotmans et al., 2001). The first two research avenues primarily aim at analysing and describing transitions as processes of radical and structural change focussing on transition dynamics. The latter two are rather more prescriptive in their nature and focus on issues of agency and how transitions are influenced by deliberate actor- based processes.

Transition research in general has been largely rallying behind a particular perspective on how to analyse dynamics of change: the multi- level perspective (MLP). While the MLP has been considerably complexified over the years, as a shared analytical concept it differentiates three basic levels to analyse change: the niche, the regime, and the

landscape (Rip and Kemp, 1998). A socio-technical niche is typically built up by a small group of actors pursuing at least partly differing activities from the regime and is a space particularly prone for more radical innovations to occur at least at experimental level (Geels and Schot, 2007). The regime can be understood as “a conglomerate of structure (institutional and physical setting), culture (prevailing perspective), and practices (rules, routines, and habits)” (Rotmans and Loorbach, 2009: 185); it represents the way things are done in the ‘normal’. The landscape in turn is thought of as the mostly exogenous context, by definition out of the influence sphere of individual actors, like e.g. global trends (climate change, urbanisation) or globally shared norms (human rights) (Geels, 2002; Rip and Kemp, 1998). An example may illustrate the levels: German community energy initiatives (niches) multiplied and expanded drastically after the Fukushima nuclear melt-down (landscape level), mostly due to an institutional change initiated by the governmental decision to enter a phase of large-scale energy transition (regime level).

Such transitions, though, “do not come about easily, because existing regimes are characterized by lock-in and path dependence, and oriented towards incremental innovation along predictable trajectories. Radical innovations emerge in niches, where dedicated actors nurture alignment and development on multiple dimensions to create ‘configurations that work’” (Geels, 2010: 495). A transition becomes hence effective when it leads to shifting a regime from one particular socio- technical configuration that works towards another, and such shifts might happen via three, often interlinked basic dynamics: a) top down, when landscape developments put pressure on the regime; b) bottom up, when niches scale up and replicate or translate more widely their novel socio-technical arrangement and gain influence; and, c) when processes at the regime level lead to an integration of innovations from the niche level into the regime (Rotmans and Loorbach, 2010).

Through the lens of the MLP, dynamics of change can thus be analysed, described, hypothesized about. While being a very effective ordering heuristic itself, the MLP – and in particular the quasi- unavoidable focus of analysts to privileging the observation of niche dynamics and socio-technical innovations – has been lately assessed in more critical terms. Critique has notably been raised with respect to MLPs' ignorance of aspects of agency/structure (Avelino, 2011; Smith et al., 2005; but Geels, 2011).

However structuring the MLP heuristic is to ground the analysis of transitions; it also supported the configuration of a toolbox of intervention techniques (Meadowcroft, 2011). Techniques can be deployed to foster particular socio-technical innovations in order to facilitate the emergence of sustainability transitions, i.e. radical transformations towards a sustainable society (Grin et al., 2010). Indeed, historical studies of transitions have shown that these often have not led to a more sustainable society (Rotmans and Loorbach, 2009). While a fundamental change in the structures, cultures, and practices of the present societal and economic system seems necessary to embrace sustainability fully, change and transitions themselves are not a sufficient condition for any system to become (more) sustainable (Frantzeskaki and De Haan, 2009). Rotmans et al. (2001) started to refer to the targeted fostering of sustainability transitions as transition management.

4.2.2 Managing Transition Dynamics Towards Sustainability

In essence, transition management (TM) is an explorative and participatory process addressing 'persistent' or 'wicked problems' and searching for long-term sustainable solutions (Rotmans et al., 2001; Loorbach, 2010). 'Persistent problems' are based on failures of societal systems, which can only be overcome by a restructuring of these systems, i.e. by a transition (Rotmans and Loorbach, 2009). The TM framework has been advocated to provide the basis to manage transitions in an operational sense: it is "flexible enough for adaptation but prescriptive enough to be functional in practice" (Loorbach, 2010: 172). TM is based on action research (Loorbach et al., 2011), as well as on research approaches closely linked to (Socio-)Ecological Economics such as Integrated Assessment (Rotmans, 1999), Post-Normal Science (Ravetz, 1999) and Sustainability Science (Kates et al., 2001). It puts forth a number of prescriptive tenets to manage complex systems (Rotmans and Loorbach, 2009). Its focus, thus, is on systems, not on individuals or practices.

From this systems perspective, governing open-ended, non-linear, and uncertain sustainability transitions requires iterative, reflective and explorative ways based on societal learning (Frantzeskaki et al., 2012; Loorbach, 2010). TM is such a reflexive governance approach. It can be understood as "a multilevel model of governance which shapes processes of co-evolution using visions, transition experiments and cycles of learning and adaptation." (Kemp et al., 2007: 78). Within TM-processes, sustainability is never an a priori explicit objective, but rather the possible outcome of negotiation, debate, competition and experiment (Loorbach, 2007). Hence, quality criteria regarding the process are considered more important for sustainable development than pre-defined understandings or end-states. In a similar fashion, process and content of TM are inseparable, meaning "the complexity analysis of a societal system [...] determines the opportunities of managing such a system" (Loorbach, 2007: 86).

As (radical innovations in) niches are potential sources of radical system changes (e.g. establishment of a new regime), TM aims to provide niche actors with the space and resources for experimentation. The creation of transition arenas shall create sufficient distance and protection from the incumbent regime and empower niche actors to develop capacities to generate viable alternatives to or comprehensive alterations of the targeted regime (Avelino, 2011; Loorbach, 2010). "The ultimate goal of transition management should be to influence and empower civil society in such a way that people themselves shape sustainability in their own environments, and in doing so contribute to the desired transitions to sustainability" (Loorbach, 2007: 284). By implementing TM in a structured action research process, the promise is that new insights emerge on individual and societal levels which could be implemented and reflected upon in a continuing process (Wittmayer et al., 2013, 2014). The objectives of the transition process "should be flexible and adjustable at the system level. The complexity of the system is at odds with the formulation of specific objectives and blueprint plans" (Loorbach, 2010: 167). Therefore TM avoids a too early selection of innovations and keeps options open to learn about alternatives before selecting (Rotmans and Loorbach, 2009). This allows for an adaptive, open and participatory process of vision development. In essence, TM uses first- and second-order learning, empowerment, joint visioning, and networking as stepping stones for sustainability transitions.

TM targets the emergence of structural, societal transitions and has been practiced in a variety of policy fields (Avelino et al., 2012; Verbong and Loorbach, 2012), on regional and urban scales (Roorda et al., 2012; Wittmayer et al., 2011) in the Netherlands and beyond. It focuses at enabling radical changes of societal systems, building on an understanding of the interplay between different levels of societal structures. TM provides an interventionist approach building on empowering collectives as it translates descriptive knowledge of complex systems' development into tenets and instruments of transition governance. In linking theoretical knowledge and practical engagement when enabling transitions (Rotmans and Loorbach, 2010), it goes beyond traditional positivistic understanding of sciences. As one of its major contributions, the TM framework provides the basis for managing transitions in an operational sense.

TM thus incorporates a certain level of system knowledge by denominating several components of societal (sub)systems as well as their interrelations. The clear strength of the approach nevertheless is to provide a comprehensive level of transformative knowledge; while being highly adaptable to context and terrain, TM has a precise idea on how to build up actor-based processes to trigger and sustain change. And more importantly, TM relates to a very clear conceptualization of the nature of the lever to activate change and reflexive governance.

4.2.3 Transition Management as Transdisciplinary Endeavour: Current Critiques and Ways To Go Forward

As introduced above, we hypothesize that any scientific basis for transition governance should comprise three layers of knowledge, i.e. target, system and transformative knowledge, and that these are to be grounded both at the societal and at the individual levels. In the following we first critically discuss the contribution of transition management to the three knowledge types before pointing towards possible avenues to overcome identified shortcomings. As pointed out, TM contributes substantial transformative knowledge. The approach nevertheless has received due criticism as well, particularly with regard to the role of (1) power and (2) individual agency in transformative processes. TM also faces criticism with regard to (3) systems and (4) target knowledge.

(1) TM is critiqued for its naivety to issues of power, politics and democratic legitimacy (Shove and Walker, 2007, 2008; Duineveld et al., 2007; Smith and Kern, 2009; Smith and Stirling, 2008; Hendriks, 2007; Meadowcroft, 2007). In the same line, Shove and Walker (2007: 764ff) argue that too little attention is paid to the processes of negotiation of the goals with- in TM experiments. Duineveld et al. (2007) are concerned by TM-researchers having a 'double

role⁶ which can be prone to obscuring the analysis: possessing definitional power on how issues are framed in the participatory process (Avelino, 2011) and on how the selection of the participants is framed. Although an empowerment of niche actors is a core aim of TM, it remains unclear what exactly is meant by this empowerment and what it can be built upon (Avelino, 2011). It also remains opaque how the interaction between (niche) experimentations and incumbent (regime) system could be prescribed in practice (see the critique on power, politics and legitimacy above). Those and further criticisms led to a productive scientific dialogue and an emerging stream of critical transition researchers (Jhagroe, 2012; Avelino, 2011; Eshuis et al., 2012; Van Steenberghe and Wittmayer, 2012; Jhagroe and Frantzeskaki, 2012).⁷

(2) With all its strengths and precision on the level of transformative knowledge, our foundational heuristic lacks a deeper consideration of individuals and their agency. At the level of specific TM-interventions, TM neither has a clarifying conceptualisation of the individuals engaging in transition experiments, nor a basis for monitoring or assessing changes occurring at the level of the participating individuals. Scholz (2011: 519) criticises that the “roles and drivers of human actors” remain undefined. TM operationally focuses on organising participation and developing societal learning. The approach nevertheless has no clear concept of why and how individuals engage in transition experiments in terms of a psychologically founded behavioural or learning model. Participants are essential ingredients to see niche experiments evolve (towards more sustainability). Therefore, TM should embrace a more encompassing conceptualisation of the individual. This extended comprehension should include peoples' values, motivations and reasons for action both for themselves and within a collective. This might help to correctly assess intra-individual changes with regard to sustainability awareness or motivation prompted in the learning processes facilitated in a typical TM process.⁸

(3) TM describes the regime mostly in the tradition of complex systems' theory (e.g. Rotmans and Loorbach, 2009). Although TM aims at radical changes the definition of this change is (in line with the systems' perspective) very encompassing, including structure, culture and practices. In this complex picture it somewhat remains opaque what exactly should change: e.g. is it the level of emissions, the emitting practices or determinants of these practices that are to be changed? In addition, the role of individual agency (besides the role of frontrunners) is without clear conceptualization within the systems perspective. Here, this systems perspective should be combined with a thicker description of the object of change, taking account of both, agency and structure.

⁶ For a comprehensive analysis of researchers' roles in process oriented sustainability science such as TM see Wittmayer and Schöpke (2014).

⁷ Interestingly enough, a number of these critical thought exercises are located within the main advocating hub of TM (i.e. the Dutch Research Institute for Transitions, DRIFT).

⁸ This would also contribute an answer to Loorbach's call that transitions need to include new “societal systems that combine freedom of individual development and innovation with (selection) criteria related to collective goods and future developments” including processes of “changes in perceptions, routines, practices and beliefs at the level of individuals” (Loorbach, 2007: 81).

(4) TM falls short of distinguishing the normative orientation of change. TM is claimed to be “explicitly a normative model by taking sustainable development as long-term goal” (Loorbach, 2010: 163). Despite of focussing explicitly on addressing sustainability issues, the TM concept has witnessed critique of its understanding of sustainable development as being rather blurred (e.g. Smith and Stirling, 2008; Smith and Kern, 2009). As the transition management methodology puts the concrete definition, interpretation and valuation of sustainability in the hands of the process, i.e. the participating individuals, a substantive definition of sustainability cannot be found in TM literature. At operational level, in many TM-processes, animators are even urged not to use supposedly overloaded terms such as sustainability (e.g. Wittmayer et al., 2013, 2014). As a consequence, the approach proposes open-ended and implicit ways to confront participants with the normative concept of sustainability. The approach falls short to propose methods to assess the procedural achievements (e.g. future visions or pathways) developed by participants against scientifically grounded understandings of sustainability. For Ecological Economics, it is utterly post-modern that major TM-thinkers refrain from properly addressing the imperative of – for instance – explicitly positioning TM within the nexus strong/weak sustainability, and hence provide at least a series of principles for assessment. This may in the end lead to sustainability becoming completely negotiable, and therewith random, at niche, but also at regime levels.

The ambition of the present paper is to provide for initial thoughts that may help to overcome both these under-conceptualisation and (at least potential) blind spots. In the following section, we develop on the capability approach (CA) as a possible add-on heuristic to TM. CA is a frontally normative and individualistic approach and therewith may provide in particular a way to address missing target knowledge (point 4, above) and to deal with the issue of agency (2). In a subsequent section, we will operate an identical manoeuvre with respect to practice theory approaches (PA) that can provide a thicker description of the things to be changed, mainly addressing (3), but also, differently from CA, (2). It is only after having developed on both potential add-ons that we come back to discuss what the stacking of add-on heuristics onto TM entails methodologically, and whether the potential meta- heuristic is correctly combining forces to leverage out the above- developed weaknesses of TM.

4.3 COMPLEMENTING TRANSITION MANAGEMENT WITH TARGET AND SYSTEMS KNOWLEDGE: HEURISTIC BUILDING BLOCKS

4.3.1 The Capability Approach: Normative and Individualistic

CA is predominantly an individualistic approach (cp. Robeyns, 2005) and as such in line with economics, its originating discipline. However, CA dresses a conceptualisation of humans that is much more open and complexity-friendly than the strictly mono-dimensional homo oeconomicus which is underlying many social sciences (cp. Ingebrigtsen and Jakobsen, 2009). CA attaches preponderant value to the substantive freedom, defined as capabilities, of each individual to pursue a life s/he values or has reason to value. Capabilities depend on the availability of resources, e.g., disposable revenue, as well as other market or non- market goods and services, but also on the personal ability to use those, as well as the social and environmental factors (i.e. conversion factors) enabling such. Understanding the individual freedom and agency to live a valuable life as the basics of quality of life, CA offers a

framework to evaluate whether policy measures or societal developments contribute to enhancing a just distribution of the capabilities intra- and intergenerationally (target knowledge). In this sense, CA appears right from start as a promising candidate to frame the assessment of sustainability transitions. Furthermore, when enriched through concepts from environmental psychology, it offers a rich description of why humans engage in sustainable behaviour (Schäpke and Rauschmayer, 2014).

First, CA can be differentiated from resource- and capital-centred approaches as it considers that resources, although important, do not determine what constitutes human development or flourishing: people differ in their willingness, abilities and possibilities to transform a given amount of resources into wellbeing. Secondly, CA differs from basic- needs approaches that heavily influenced the Brundtland report: although fulfilment of some socially determined basic needs is important, those needs differ from person to person and the freedom to decide which needs to meet how is an important wellbeing factor for each of us. Thirdly, CA is not merely subjectivist and self-centred. Even though subjective wellbeing is important, people's adjustments of their subjective expectations to lower levels of objective standards of living should not inflict assessments of justice. Furthermore, it is part of human agency to also want to do something that does not only contribute to one's own, but also to others' wellbeing. CA does take it for granted that individuals are not only motivated by enhancing their own well-being through improving their standard of living or that of their family and friends, but that people also commit themselves to enhance the well-being of others (Sen, 1987). Independently of motivations, it is important for individuals which of their goals they can realize (or, in the language of the CA: which functionings they can achieve) and whether they have the real freedom to choose amongst different goals (or: whether they have a large capability set). Sen and Nussbaum, the two central CA-scholars, have developed distinct versions of CA (cp. Sen, 1985; Nussbaum, 2011). But both agree that the evaluative space of what is valuable for human life, which at the same time is the goal of public policy, is multidimensional. While Sen does not define these dimensions (he argues that this should only be done in context-specific democratic deliberations), Nussbaum has – in a preliminary consensual process – defined a list of fundamental capabilities. She considers those essential for any good human life and to be guaranteed by governments for their citizens.⁹

For sustainability transitions, these points are important, as they assume that there is more than resource consumption that counts, that transitions should not be defined top-down, and that altruistic pro-social motivation (and behaviour) can be counted on. This last point offers a way to consider intra- and intergenerational justice as the essential elements of sustainable development beyond the need to build on egoistic motivations alone (Lessmann and Rauschmayer, 2013).

An example of food consumption could illustrate the basic process of explaining a sustainable behaviour in terms of CA: Eating vegetarian as an achieved functioning could be a realization of a goal regarding own health, but could

⁹ According to Nussbaum (2000, 2011), the ten central capabilities refer to: life, bodily health, bodily integrity, senses, imagination and thought, emotions, practical reason, affiliation, other species, play and control over one's environment.

also meet other-regarding aims taking into account the CO₂-output related to meat production, use of rare farmable land, etc. Eating vegetarian requires certain resources (first of all: comestible plant products). Vegetarianism is enhanced by the conversion factors such as gender norms (e.g. allowing men to refuse meat), food culture (e.g. in Argentina or Kirgizstan), and by an appropriate climate and land profile. Political measures aiming at promoting vegetarian food consumption herewith can increase individual freedoms to meet goals of personal and others' well-being in different ways than just by focusing on resources (e.g. taxing meat). At the same time, forcing everybody to eat vegetarian would restrict the capability set and herewith lower personal freedom.

This implies that real freedom includes the availability of resources, including environmental assets (Polishchuk and Rauschmayer, 2012), but also social institutions, individual skills, etc. to convert these resources into capabilities. Herewith the capability approach is a means to structurally define the idea of a good life in a culturally and historically independent way (cp. Di Giulio et al., 2012). This structure can be used to non-paternalistically specify a good life in concrete situations as shown by the example of vegetarianism above. But it can also be mobilized for conceptions of justice and can herewith be useful for conceptualising sustainable development (Ballet et al., 2011, 2013; Sen, 2013; Rauschmayer and Lessmann, 2013). Conceptually, it has been purported that intra- and intergenerational justice can be measured by assessing capability sets, instead of using subjective metrics, such as pleasure or preference, or objective metrics, such as income or access to other resources¹⁰ (Gutwald et al., 2014). Practically, though, this encounters a problem of operationalization: what exactly are the valuable dimensions of human well-being? Are there thresholds? Are the dimensions (partially) commensurable?

Above, we have identified weaknesses of TM to provide for the necessary target knowledge, i.e. its low capacity to address the normativity of sustainable development, as well as its lacking ability to conceptually integrate individuals into the societal levels. In this regard, CA's main attractiveness might result from its clear stance on normativity: the objective of CA is to foster individual human flourishing, conceived of as an enhancement of individual capabilities. In this sense, capability-based assessments have been widely used to monitor societal achievements as aggregations of individual changes in capabilities. The most prominent example for its evaluative use is the Human Development Index, but CA has also been used to measure inequalities due to gender, age, or education (Leßmann, 2012). CA is also used prospectively, i.e. to predict effects of specific measures on human development (Alkire, 2008). It provides a quite straightforward analytical avenue to sustainable development, i.e. development aimed at human flourishing of all current and future people (e.g. Sen, 2013). When measuring sustainability achievements at two points in time, the capability-based assessment approach is, in principle, able to discriminate between sustainable and unsustainable developments.¹¹

¹⁰ Within the current sustainability indicators, nearly only environmental indicators deal with intergenerational aspects. They are motivated by resource-views (ecosystem goods), but also concern environmental conversion factors (Polishchuk and Rauschmayer, 2012). Social and individual conversion factors are rarely represented as sustainability indicators.

¹¹ This, however, is not without problems when analysed more sharply (Lessmann and Rauschmayer, 2013).

On the other hand, the use of the capability approach for generating knowledge on sustainability transitions encounters several drawbacks, particularly in the area of systems (1 and 3) and transformation knowledge (2 and 3):

(1) The CA is based on the assumption that individuals decide consciously and individually on their behaviour, even more so that the highest “good” to strive for is more decisional space and decisional capacity. With regard to systems knowledge, CA hence neglects more structural approaches that see individual behaviour much more as a result of structural forces than of conscious individual decisions (Shove, 2010 on her critique to individualist behavioural models — see also next section). The conception of what is valuable freedom inevitably depends on the CO₂-output related to meat production, use of rare farmable land, cultural contingencies, technical availabilities, and other factors that remain outside the scope of the CA.

(2) As an evaluative concept, the capability approach is limited to comparative statics and herewith shows an important transformation knowledge gap. Herewith, it cannot capture the highly important dynamic and reflexive processes happening during sustainability transitions. Feedback loops between realized functionings and resources as well as personal, social, and environmental conversion factors are usually not considered (Lessmann and Rauschmayer, 2013, but Pick and Sirkin, 2010 for personal conversion factors), even though this would be necessary for understanding dynamics on an individual level (such as rebound effects) as well as on a societal level. This leads to the third point:

(3) The CA has no theory on societies, governance, collectives, group deliberations: in classical terminology, CA has a problem of aggregation which translates in our conceptualisation into a systems- and transformation knowledge gap. The importance of public discourse (Alkire, 2006) as well as the interdependencies of individual capabilities (Drèze and Sen, 2002) has been acknowledged in principle, but the capability approach – normatively, methodologically, and ontologically – remains an individualistic approach. Consequentially, CA only has a very rough (and controversial) understanding of collective capabilities (e.g. Ibrahim, 2006; Pelenc et al., 2013; Volkert, 2013). It lacks an understanding how the interaction of individuals in groups, such as sustainability niches, creates capabilities that can enhance the flourishing of each member in a way that could not have been achieved without this interaction. Volkert (2013) has very briefly discussed the concept of indirect agency that could be used to explain why individuals engage in niches in order to change the regime level.

In sum, CA has some predictive force when it comes to assessing effects of policies or of societal developments on capabilities. CA furthermore offers an acclaimed approach to justice and normativity that is conceptually richer than most other approaches used in social and economic sciences, while being closer to operationalization than most other philosophical approaches to justice (Sen, 2009). However favourable CA thus appears to meet the target knowledge and normativity requirements of sustainability transitions missing in TM, the above developed limitations make CA unsuitable to deal with aspects of societal transitions to sustainability “on its own”. In particular, the three flaws point to the evidence that a CA-enriched TM might have some inherent difficulties to deduce pre-

scriptions for societal, interpersonal processes. As a consequence to our endeavour of enriching the conceptualisation of TM, we are in need for an additional layer to our heuristic assemblage that could cover up for the identified limitations.

4.3.2 Practice Approaches: Weaving Individuals into Context

When calling for change and transitions in contemporary societies, a rather straightforward question is: change of what exactly? While it is the outcomes of our human activities – be it in terms of pollutions, emissions, inequalities or health hazards – that would be targeted in a strictly result-based approach, it is more difficult to find an answer when we look at the generators of these outcomes. Is it individuals, societies, or some other conceptualisation of the collective that should be our focus of analysis? Classic socio-economic approaches invoke basic aggregational principles to conclude that if the necessary change is recognized to be societal, then the analytical foci are those individuals that compose a society. We have seen above that this aggregational principle – especially at the level of CA – is not operationalizable without difficulties. As a consequence, the more progressive approaches have since long critiqued the analytical focus in economics onto the (semi-rational) individual, and the development of a conceptualisation of a collective is recognized to be a necessity.

Practice theory has been developed to bridge individualistic (*homo oeconomicus*) and structural (*homo sociologicus*) approaches (Reckwitz, 2002); it sees human behaviour as being embedded in a conjunction of individual, structural, cultural, and technical elements. This modification of the analytical focus onto the level of integrative (Schatzki, 1996) practices allows accounting for the change in configurations of material, cultural and socio-economic items that define daily life (Southerton, 2009) as well as routinized doings. Besides of this theory-based argument, individuals tend to see their life as being composed of a series of interrelated practices such as cooking&eating or moving&travelling, instead of a set of unrelated, individual behaviours as consumers or as choice agents; a fact which Røpke (2009) sees as a major argument to employ a PA-filter for analytical work.

Applying a practice focus on societal transitions allows de facto describing the occurring change (and herewith generating systems knowledge) as a co-evolution of innovations in material artefacts, socio-economic conditions, organisational and institutional re-configurations, while simultaneously accounting for evolutions in collective and individual values, moral interpretations, lifestyles, social capital, body activities, emotions, or knowledge (Shove et al., 2012; Reckwitz, 2002). In this sense, practice theorists and scholars might be particularly well equipped to investigate transitions that go beyond the introduction of mere technological innovations, as it provides for a profoundly socio-technical reading of contemporary societies.

At least since Warde (2005), practice approaches (PA) have become the reference in consumption studies, notably because they can be very explicative of what consumers do, say, think they do, say they do, mean to do. Shove (2003) has equally brought PA to some prominence with extensive case-study work in the area of consumption studies. Coming back to the example of vegetarianism, the perpetuation of occasional vegetarianism such as it is targeted

by initiatives such as 'Veggie Thursdays' can be described with quite some profoundness and richness with frameworks derived from PA. Such rich descriptions can be constructed from observing and translating such everyday practices over time and space, and by accounting properly for the interplay of meanings, skills and artefacts that ground practices. Reducing the practice of eating vegetarian once a week to an individual's decision over his diet (e.g. to a rational account over the healthiness of carnivore/vegetarian diets) would leave out to properly account of a number of factors, such as:

- (1) The cultural factors of eating (e.g. many Veggie Thursday initiatives are articulated at the collective level, i.e. make it a weekly collective experience to discard meat).
- (2) The habitual modes of behaviour that structure our lives (e.g. Veggie Thursday initiatives are meant to enhance the sense of experimentation and accumulation of skills of individuals).
- (3) Or for the impact of the design and material availability of vegetarian meals (e.g. Veggie Thursdays are incentivising canteens to offer only or mainly vegetarian meals on a particular day of the week).

By definition, practices are neither homogeneously distributed over a society, nor identical from one individual to another, nor consensually perceived as such. Problematic for case study work, e.g. when defining the niche or regime practice, then is the definition and delimitation of what a practice actually is. Reckwitz's (2002) heuristic approach that "practices exist as provisional but recognizable entities composed of recognizable conventions, images and meanings, materials and forms of competence" does not necessarily provide an operational blueprint to proceed to classification and identification work. Indeed, some authors (Spaargaren, 2003; Southerton et al., 2004) apply a very broad categorisation of (social) practices (e.g. eating, sleeping, moving) which does not allow lining practices to MLP and TM. Others use practices as a heuristic while working on relatively confidential alternative phenomena (e.g. vegetarianism, collaborative sharing). Additionally, on a theoretical level, Schatzki (1996) introduced dispersed practices to account for generic (horizontal) behaviour in societies such as for instance consuming, contemplating or explaining. Shove introduces bundles and complexes of practices to account for either loose "co-location and co-existence" (2012: 17) or the more integrated and "co-dependent" (2012: 17) aggregation of practices into peoples' lifestyles. This aggregational conceptualisation can be of particular interest if – as in our present case – the interactions between the regime (of social practices) and whole bundles (or complexes) of alternative niche practices are to be explored.

The challenge when thinking PA in the light of transitions is to understand to which degree the strength of PA in interlinking societal and individual levels (which is the main blind spot of our CA-enriched TM conceptualisation) can offset the relative weaknesses with regard to target knowledge generation of PA raised by the context of the governance of sustainability transitions: (1) PA are relatively unsuitable for prescription and notably with regard to dynamic societal processes; (2) PA are relatively non-functional to meet the normativity stance of sustainable development assessments.

(1) Inserted in their particular web of meanings, skills and artefacts (Shove, 2003), practices change over time and are diffusing over space. PA reveal complex pictures of the entanglement of everyday life; hence, they account for dynamics and appear particularly suited to meet the requirement for systems knowledge. Paradoxically, PA have difficulties (Warde, 2005) to accurately account for change; more precisely, to identify the sequence of what change in meanings (or skills or artefacts) preceded or even caused what evolution in skills (or meanings or artefacts). Causalities or consequential delimitations are rather impossible to be recognized from practice-based analyses, except for the individual empirical case study. Most operationalizations, including work by primary scholars in PA (e.g. Shove and Walker, 2008), mirror this very difficulty by the fact that their descriptive work is only shallowly usable to deduce any form of interventionism or governance approach or prescription. To give an example: while it is rather easy to observe the changes induced by occasional vegetarianism in the practices of buying foodstuffs, consulting cookbooks or discarding of left-overs (here referring to the main artefacts connected to operationalizing Veggie Thursdays in one's home), PA do not allow 'predicting' which policy intervention on which aspect of the entangled elements of the practice might be successful to lower the CO₂-emissions due to those practices. This does not mean that the question of the steering or governance of practices is not seen as being a critical one; quite the contrary, as many of the current practice scholars are very actively trying to investigate this space (see Shove et al., 2012). With respect to our investigation into transitions and their governance, this fundamental difficulty at the level of PA provides actually for an effective entry point to link practices with transition management approaches, which are per definition oriented towards interventionism.

(2) Practice approaches bear inherent difficulties when used to conceive assessments of the sustainability of practices. While it is rather straightforward to assess and rank the practices of occasional vegetarianism as in Veggie Thursdays according to the CO₂-emissions related to the plates' contents the other 6 days of a week, this may already be different in terms of their complexities when referring to these practices' embeddedness in other practices (e.g. urban living and urban gardening) or when attempting to assess climate-impacts of the wider practice (e.g. of shopping for foodstuff). The fundamentally important assessment question with respect to the adequate setting of the perimeter – including the definition of where one practice ends and another starts – is trivial for PA, and very much a matter of the analyst's personal case study reading. A wider difficulty lies in the fact that PA could, e.g., observe and describe the societal shift to less carnivore diets in Europe along the different skills, artefacts, and meanings related to this change in practice. However, PA will neither be able to assess the effects of these multi-dimensional changes on the well-being of the people effectuating this shift in their practice, nor on the well-being of the world's poor or future generations or more generally on the quality of ecosystems. Under no circumstances could it be said that participating to 'more' practices would be better than being involved in less, nor whether more conscious participation to practices would be better than a passive induction of practices. With other words, it will be impossible to judge the impact of measures targeting a shift in practices against criteria stemming from intra- and intergenerational justice precepts such as those provided by sustainable development.

In the end, PA can contribute to improve our understanding of sustainability transitions by providing a framework which can be used to produce a more complex picture of everyday changes. Those changes are lived by individuals

but develop into some form of coherence (and hence, their *raison d'être*) only at the societal level. When using PA in a multi-level perspective, PA allow us to conceptualise the particular form of the collective – the niche – that rides the transition. A practice could be the unit of analysis for the group of individuals because they share meaning, skills and artefacts at socio-technical innovation level. This combination will be explored to some more depth in the next section.

4.4 HEURISTIC ASSEMBLAGE FOR THE GOVERNANCE OF SUSTAINABILITY TRANSITIONS — CONFIGURING A CA- AND PA-ENRICHED CONCEPTUALISATION OF TRANSITION MANAGEMENT

We started our paper with the need to develop scientific knowledge to enhance sustainability transitions. Along a differentiation used by transdisciplinary scholars, we distinguished systems, target, and transformative knowledge. Starting with transitions management (with its multi-level perspective), we have argued that TM is strong in generating transformative knowledge – a knowledge form that had been disregarded by more traditional scientific approaches. At the same time, TM does not provide for sufficient target and systems knowledge and neglects the role of the individual as a driver for change and as the source of normativity. Due to their respective strengths, we therefore suggested to stack CA and PA on TM. The combination of the three approaches might seem to be a heroic undertaking. The objective of our effort needs thus to be clarified. We do not intend to develop the ground for a theoretically sound overarching approach to sustainability transitions. What we rather have in mind is to present an eclectic assemblage of heuristics, the combination of which can be used to guide prescriptions for governing sustainability transitions which are both normatively assessable and enable to link the individual to the societal dynamics she is embedded in.

Above, we developed the specific strengths of the three approaches: Within TM, concepts, methods and procedures have been developed that aim at facilitating sustainability transitions. Building on systems and evolutionary thinking, TM has taken up the challenge to generate transformative knowledge that was missing to induce societal change to sustainability. A rich body of experiences has emerged. These experiences are building on thick descriptions of case studies on the configuration of what is addressed in TM as being niches, e.g. how collaboration and learning happen, how niches impact on the mainstream. The CA, in quite a complementary fashion to TM and PA, offers a very clear conceptualisation of the individual; CA allows fostering our understanding why individuals engage in these activities, and how participation to such collectives can impact on individual wellbeing. By extension, CA can be mobilized to comprehend how such engagement could be strengthened or even made more effective in terms of its impact on individuals' capabilities. Capabilities of current and future generations can be used as targets for sustainability transitions and CA-based evaluations allow judgments on inter- and intragenerational effects of policy measures — it herewith offers a normative framework for sustainability-related assessments (target knowledge). PA are well performing at rendering the bigger picture (systems knowledge) by highlighting the complexities and entanglements of human activities. The interrelations between skills, material artefacts, and meaning can be used to observe macro-societal change (e.g. analysing meta-practices such as food provisioning) as well as on the level of collectives or groups which practice non-mainstreamed activities (e.g. analysing the introduction of

“Veggie Thursdays”). These meso-level activities, i.e. meso-level practices which involve collective agency, might be those that transition management approaches are focussing on.

Fig. 8 illustrates our heuristic assemblage by borrowing and adapting the iconic MLP-visualisation from Geels (Geels, 2002; Geels and Schot, 2007) and the icon of Shove's practices (Shove et al., 2012). Starting from the top, the societal urge for transitions appears because obvious ‘unsustainable’ practices (in blue) prevail and should somehow transform into ‘sustainable’ ones (in green). PA can be mobilized to analyse the entanglements between skill, material and meaning of both kinds of practices. But PA do not help us to distinguish between sustainable and unsustainable practices, nor do they really allow us to prescriptively devise – i.e. to steer and govern – a world of blue practices into a world of green ones.

It is here that TM comes into play as the body of experiences and experiments with empowering, managing and mainstreaming of transition arenas (i.e. niches). In iterative, reflective and explorative ways of societal learning involving vision development and networking, TM avoids a too early selection of innovations and keeps options open to learn about alternatives before selecting promising niches. Still TM cannot be used to determine the sustainability of niches; it merely purports a promise to enact change.

The sustainability assessment of practices on the levels of niches and regimes can be undertaken through CA-based assessments. The latter CA-based level of evaluation also renders a picture of the motivations behind such niche-level engagements, and – by extension – how transition governance could facilitate such engagement and make it more effective.

We exemplify our assemblage by looking at food as one of the big consumption challenges (UNEP, 2010): Current sustainability analyses of food consumption often refer to ecological footprints highlighting e.g. that the consumption of meat involves a high CO₂-emission, a high use of energy and an inefficient use of arable land (e.g. Gerber et al., 2013). These analyses lack, though, in clearly relating to the normative source of sustainability, i.e. the possibility of each human to live a dignified life. We propose that CA offers a backdrop for relating the footprints to individual motivations and capabilities of those involved in practices with high and those involved in practices with low footprints.

At the same time, food consumption is one of the factors involved in the societal practices of cooking&eating (amongst others — practices of shopping might also be relevant). Understanding food consumption in such bigger picture might help understand why certain information campaigns or incentive-based policies might not be effective. While PA can analyse cooking&eating practices to great depth (e.g. Warde, 2013), they cannot tell us why, for example, the current extent of meat consumption in industrialized countries is more or less sustainable than vegetarian practices. Neither can PA indicate how a change from meat-eating&cooking to vegetarianism could be supported at individual or policy levels.

In order to facilitate such change, TM can be used to identify different niches of practices of eating&cooking that are different from the regime practice. Those niches of practices could be veganism, vegetarianism, voluntary simplicity in eating&cooking, community-supported agriculture, organic food cooperatives. Acknowledging that societal processes are complex and not to be governed in a straightforward way, TM refrains from selecting one most promising niche for upscaling. TM rather opens an interactive space for participatory envisioning of and experimentation with new and more sustainable practices, followed by a process of building a network of supporters to spread and upscale the alternative (Loorbach, 2007; Wittmayer et al., 2014). This process allows for an empowerment of niche actors as well as for societal learning on viable alternatives, with the joint aim of altering the regime practice to a more sustainable one. By and through itself, though, TM does not have the ability to differentiate the sustainability differences of one or the other eating&cooking niche — a capability-based analysis can do so. It is not straightforward to indicate which practices of eating&cooking are more or less sustainable. Resource footprints may be an indicator for their sustainability — the reasoning behind why it is fair or unfair to use a certain amount of hectare equivalents for one's food relates, though, to concepts of fairness between humans.¹² The idea that every human should have the freedom to lead a dignified life can be and has been translated to capabilities and the elements of CA. Different practices of eating&cooking should therefore be understood with respect to their impacts on the capabilities of the current poor and future generations as a means to judge their sustainability. At the same time, the CA, in particular when it is psychologically enriched, offers grounds to better understand why people engage in alternative food practices. This understanding allows designing policies that take account of these motivations.

Governance for sustainability transitions requires transformative knowledge that mostly applies to the niche level, but has to link it to system knowledge at the regime level so as to better understand how alternative niches might impact societal practices. The target knowledge, i.e. the contribution of this intended practice change, refers to the individual level. We acknowledge that the distinction between systems knowledge at the regime, transformative knowledge at the niche, and target knowledge at the individual level is too simplistic. Individuals might well have to live intra-personal transformation (O'Brien et al., 2013) which requires transformative knowledge at the level of their individual systems and their individual targets. Additionally, sustainability is a societal and global goal that cannot be dealt with properly at an individual, or micro-collective, level. Sustainability targets are deduced on all collective levels, and transformations do not only happen through the impact of niches.

¹² We abstain from discussing fairness between humans and non-humans in order not to complicate the discussion even more. The same applies to the discussion on the appropriateness of ecological footprint indicators for measuring sustainability.

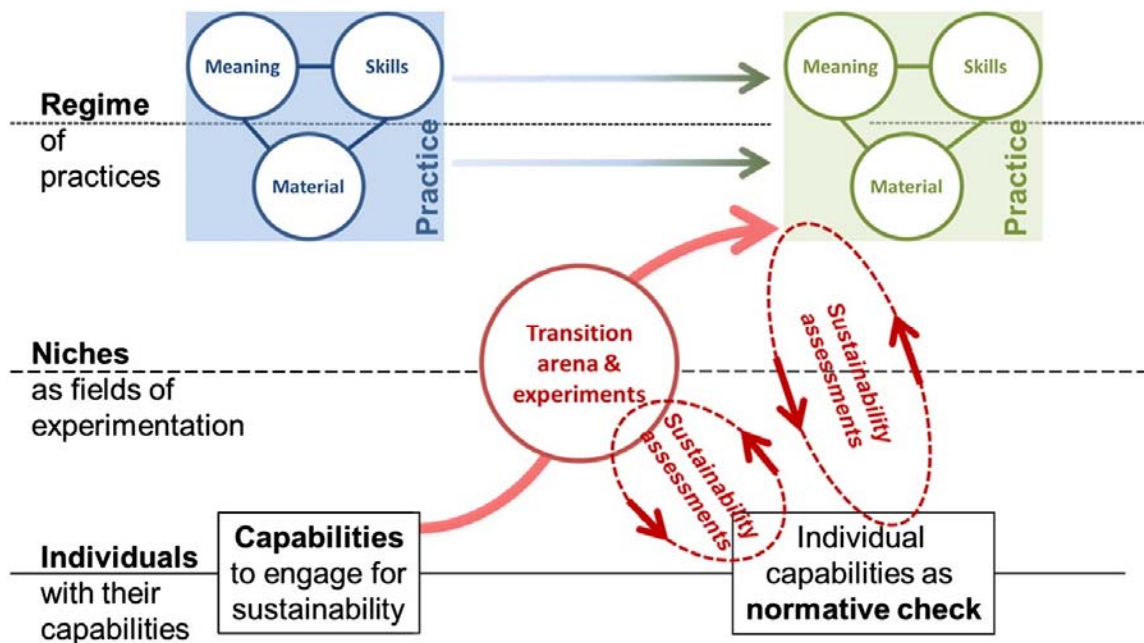


Figure 8: Assembling practice theory, transition management and capability approach for governing sustainability transitions. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

4.5 CONCLUSION

We headed to address one of the most pressing policy challenges with respect to sustainability transitions. Scientific activities which are targeted to engage and enact on societal problems – and transition governance itself is one such activity – are necessarily prescriptive endeavours, have to recognize the fundamental normativity of sustainable development, need to be based on a thick description of the issues to change, and should embrace the multi-dimensional importance that individuals take in societal change. Hence, transition governance requires a combination of systems, target, and transformative knowledge referring to individual, group, and societal levels. We explored in which way a combination of three heuristics, with their respective strengths and weaknesses, might overcome the impossibility of an overarching theory which would allow providing the background for understanding sustainability transitions.

First, transition management has been developed to infer societal transitions, but TM lacks target knowledge as it cannot differentiate between sustainability-related outcomes and other outcomes of transitions. It is even one of the fundamental in-builds – and arguably strengths – of TM to leave the definitional space of objectives open for negotiation and agreement to participants. Furthermore, beyond issues related to individual innovators, TM does not have a sufficiently clarified understanding of those individuals who are participating in the transition experiments; what makes a collective attractive? TM additionally lacks systems knowledge as it concentrates on the transformation within the niches and not those that should be induced at the societal or individual levels.

Second, the capability approach covers part of these normative and individual shortcomings. CA has been developed to provide for normative assessments based on a conceptualisation of individual human development. CA can – with obvious difficulties – be adapted to be usable for sustainability assessments: CA is able to differentiate between self- and other-regarding motivations, the latter being of particular importance in any move towards more inter- and intra-generational justice. But, CA-based models are static and contain no theory of societal phenomena. Therefore, lacking transformative knowledge, they cannot explain societal, dynamic processes such as sustainability transitions. Lacking a proper conceptualisation of societies, CA cannot identify causal relations between individual and societal changes.

Practice approaches, finally, can be mobilized to describe changes at the societal level, indicating how social practices come about and change. At the same time, PA have no normative foundations, i.e. lack target knowledge, and have difficulties in translating the observation of change into causal relationships, i.e. PA lacks transformative knowledge. Both aspects make it rather challenging to deduce prescriptive policy advice on the basis of PA.

We tried to show how a combination of these three heuristics, where transition management is seen as foundational for thinking the governance of sustainability transitions, could generate a heuristic assemblage which could be of use to describe, explain, assess and interrelate changes at the individual, the niche, and the regime levels. From the scope of this paper it remains obvious that next steps include detailing the prospects of this combination notably with respect to the design of formal governance policies. Testing empirically the linkages between a CA- and PA-enriched TM in particular with respect to the design of policy instruments is one of the avenues that we would hope to inspire. Developing such an empirical exploration will certainly confront the heuristic assemblage with a final layer: the question of integrating power. It is not yet clear how using the assemblage as a conceptual basis of sustainability transitions could change its governance. One upshot might be that such governance rather has to focus on second- order governance, i.e. a governance that does not only concentrate on providing space for niche development and support to niche diffusion, but a governance scheme that can reflexively cope with the learning- and engaging-dynamics at individual levels on which societal sustainability transitions are necessarily relying on.

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4.6 REFERENCES

Alkire, S., 2006. Public debate and value construction in Sen's approach. In: Kaufman, A. (Ed.), *Capabilities Equality. Basic Issues and Problems*. Routledge, New York, pp. 133–154.

Alkire, S., 2008. Using the capability approach: prospective and evaluative analyses. In: Comim, F., Qizilbash, M., Alkire, S. (Eds.), *The Capability Approach: Concepts, Measures, and Applications*. Cambridge University Press, Cambridge, pp. 26–50.

Avelino, F., 2011. *Power in Transition. Empowering Discourses on Sustainability Transitions*. Erasmus Universiteit Rotterdam.

Avelino, F., Bressers, N.E.W., Kemp, R., 2012. Transition management and sustainable mobility policy: the case of the Netherlands. In: Geerlings, H., Shiftan, Y., Stead, D. (Eds.), *Transition Towards Sustainable Mobility: The Role of Instruments, Individuals and Institutions*. Ashgate, Hampshire, pp. 33–52.

Ballet, J., Bazin, D., Dubois, J.-L., Mahieu, F.-R., 2011. A note on sustainability economics and the capability approach. *Ecol. Econ.* 70, 1831–1834. <http://dx.doi.org/10.1016/j.ecolecon.2011.05.009>.

Ballet, J., Koffi, J.-M., Pelenc, J., 2013. Environment, justice and the capability approach. *Ecol. Econ.* 85, 28–34. <http://dx.doi.org/10.1016/j.ecolecon.2012.10.010>.

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., Rickne, A., 2008. Analyzing the functional dynamics of technological innovation systems: a scheme of analysis. *Res. Policy* 37, 407–429.

Costanza, R., Cumberland, J., Daly, H., Goodland, R., Norgaard, R., 1997. *An Introduction to Ecological Economics*. St. Lucie Press, Boca Raton

Di Giulio, A., Brohmann, B., Clausen, J., Defila, R., Fuchs, D., Kaufmann-Hayoz, R., Koch, A., 2012. Needs and consumption — a conceptual system and its meaning in the context of sustainability. In: Defila, R., Di Giulio, A., Kaufmann-Hayoz, R. (Eds.), *The Nature of Sustainable Consumption and How to Achieve It*. Oekom, München, pp. 45–66.

Drèze, J., Sen, A., 2002. *India: Development and Participation*. Oxford University Press, Oxford.

Duineveld, M., Beunen, R., Ark, R., Assche, K., During, R., 2007. *The difference between knowing and walking the path: een essay over het terugkerend maakbaarheidsdenken in beleidsonderzoek*. Wageningen University and Research Centre, Wageningen.

Eshuis, J., Spekking, W., Loorbach, D., Roorda, C., Stuiver, M., Van Steenberghe, F., 2012. Challenges and tensions in area based transitions. Paper presented at the 7th International Conference in Interpretive Policy Analysis, Tilburg, the Netherlands, 5–7 July.

Frantzeskaki, N., De Haan, H., 2009. Transitions: two steps from theory to policy. *Futures* 41, 593–606.

Frantzeskaki, N., Loorbach, D., Meadowcroft, J., 2012. Governing societal transitions to sustainability. *Int. J. Sustain. Dev.* 15 (1–2), 19–36.

Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Res. Policy* 31, 1257–1274.

Geels, F.W., 2010. Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Res. Policy* 39, 495–510.

Geels, F.W., 2011. The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environ. Innov. Societal Transit.* 1, 24–40.

Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. *Res. Policy* 36, 399–417.

Gerber, P.J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Faluccci, A., Tempio, G., 2013. Tackling Climate Change Through Livestock — A Global Assessment of Emissions and Mitigation Opportunities. Food and Agriculture Organization of the United Nations, Rome.

Grin, J., Rotmans, J., Schot, J., 2010. *Transitions to Sustainable Development*. Routledge, London.

Gutwald, R., Leßmann, O., Masson, T., Rauschmayer, F., 2014. A capability approach to intergenerational justice? Examining the potential of Amartya Sen's ethics with regard to intergenerational issues. *J. Hum. Dev. Capabilities* 1–14 <http://dx.doi.org/10.1080/19452829.2014.899563>.

Hendriks, C., 2007. Making democratic sense of socio-technical transitions for sustainability. Paper presented at the Politics and Governance in Sustainable Socio-Technical Transitions, Blankensee, Germany.

Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., Wiesmann, U., 2006. Implications of transdisciplinarity for sustainability research. *Ecol. Econ.* 60, 119–128. <http://dx.doi.org/10.1016/j.ecolecon.2005.12.002>.

Ibrahim, S.S., 2006. From individual to collective capabilities: the capability approach as a conceptual framework for self-help. *J. Hum. Dev.* 7, 397–416. <http://dx.doi.org/10.1080/14649880600815982>.

Ingebrigtsen, S., Jakobsen, O., 2009. Moral development of the economic actor. *Ecol. Econ.* 68, 2777–2784. <http://dx.doi.org/10.1016/j.ecolecon.2009.04.002>.

Jahn, T., Bergmann, M., Keil, F., 2012. Transdisciplinarity: between mainstreaming and marginalization. *Ecol. Econ.* 79, 1–10. <http://dx.doi.org/10.1016/j.ecolecon.2012.04.017>.

Jhagroe, S., 2012. Tussen transitie management en ideologie. Een aanzet tot transitiepolitiek 2.0. 26 maart 2012. DRIFT. Downloadable via. <http://www.drift.eur.nl/?p=262>.

Jhagroe, S., Frantzeskaki, N., 2012. A state of exceptional democracy: unravelling the politics of crisis in Dutch infrastructure governance. Paper presented at the 7th International Conference on Interpretive Policy Analysis Understanding the Drama of Democracy: Policy Work, Power and Transformation, July 5–7, 2012, Tilburg, The Netherlands.

Kates, R.W., Clark, W.C., Corell, R., Hall, J.M., Jaeger, C.C., Lowe, I., McCarthy, J.J., Schellnhuber, H.J., Bolin, B., Dickson, N.M., Faucheux, S., Gallopin, G.C., Grübler, A., Huntley, B., Jäger, J., Jodha, N.S., Kaspersen, R.E., Mabogunje, A., Matson, P., Mooney, H., Moore, B., O'Riordan, T., Svedin, U., 2001. Sustainability science. *Science* 292, 641–642. <http://dx.doi.org/10.1126/science.1059386>.

Kemp, R., Schot, J., Hoogma, R., 1998. Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. *Tech. Anal. Strat. Manag.* 10 (2), 175–196.

Kemp, R., Loorbach, D., Rotmans, J., 2007. Transition management as a model for managing processes of co-evolution towards sustainable development. *Int. J. Sustain. Dev. World Ecol.* 14, 78–91. <http://dx.doi.org/10.1080/13504500709469709>.

Leßmann, O., 2012. Applying the capability approach empirically: an overview with special attention to labor. *Manage. Rev* 23, 98–118. http://dx.doi.org/10.1688/1861-9908_mrev_2012_02_Lessmann.

Lessmann, O., Rauschmayer, F., 2013. Re-conceptualising sustainable development on the basis of the capability approach: a model and its difficulties. *J. Hum. Dev. Capabilities* 14, 95–114. <http://dx.doi.org/10.1080/19452829.2012.747487>.

Loorbach, D., 2007. Transition Management. New Mode of Governance for Sustainable Development. International Books, Utrecht.

Loorbach, D., 2010. Transition management for sustainable development: a perspective, complexity based governance network. *Governance* 23 (1), 161–183.

Loorbach, D., Rotmans, J., 2010. The practice of transition management: examples and lessons from four distinct cases. *Futures* 42 (3), 237–246. <http://dx.doi.org/10.1016/j.futures.2009.11.009>.

Loorbach, D., Frantzeskaki, N., Thissen, W., 2011. A transition research perspective on governance for sustainability. In: Jaeger, C., Tàbara, J., Jaeger, J. (Eds.), *European Research on Sustainable Development. Transformative Science Approaches for Sustainability* vol. 1, pp. 73–89.

Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. *Res. Policy* 41 (6), 955–967.

Meadowcroft, J., 2007. Environmental political economy, technological transitions and the state. Paper presented at the Politics and Governance in Socio-technical Transitions, Blankensee, Germany.

Meadowcroft, J., 2011. Engaging with the politics of sustainability transitions. *Environ. Innov. Societal Transit.* 1 (1), 70–75.

Nussbaum, M.C., 2000. *Women and Human Development: The Capabilities Approach*. Cambridge University Press, Cambridge.

Nussbaum, M.C., 2011. *Creating Capabilities: The Human Development Approach*. Belknap Press.

O'Brien, K., Reams, J., Caspari, A., Dugmore, A., Faghihimani, M., Fazey, I., Hackmann, H., Manuel-Navarrete, D., Marks, J., Miller, R., Raivio, K., Romero-Lankao, P., Virji, H., Vogel, C., Winiwarter, V., 2013. You say you want a revolution? Transforming education and capacity building in response to global change. *Environ. Sci. Pol.* 28, 48–59. <http://dx.doi.org/10.1016/j.envsci.2012.11.011>.

Pelenc, J., Lompo, M.K., Ballet, J., Dubois, J.-L., 2013. Sustainable human development and the capability approach: integrating environment, responsibility and collective agency. *J. Hum. Dev. Capabilities* 14, 77–94.

Pick, S., Sirkin, J., 2010. *Breaking the Poverty Cycle: The Human Basis for Sustainable Development*. Oxford University Press, Oxford.

Pohl, C., Hirsch Hadorn, G., 2007. *Principles for Designing Transdisciplinary Research*. Oekom, München.

Polishchuk, Y., Rauschmayer, F., 2012. Beyond “benefits”? Looking at ecosystem services through the capability approach. *Ecol. Econ.* 81, 103–111. <http://dx.doi.org/10.1016/j.ecolecon.2012.06.010>.

Rauschmayer, F., Lessmann, O., 2013. Editorial: the capability approach and sustainability. *J. Hum. Dev. Capabilities* 14, 1–5. <http://dx.doi.org/10.1080/19452829.2012.751744>.

Rauschmayer, F., Bauler, T., Schöpke, N., 2013. Towards a governance of sustainability transitions: giving place to individuals. SCORAI Europe Workshop Proceedings: Pathways, Scenarios and Backcasting for Low Carbon and Sustainable Lifestyles, pp. 97–121.

Ravetz, J., 1999. What is post-normal science. *Futures* 31 (7), 647–653.

Reckwitz, A., 2002. Toward a theory of social practices. A development in culturalist theorizing. *Eur. J. Soc. Theory* 5, 243–263. <http://dx.doi.org/10.1177/13684310222225432>.

Rip, A., Kemp, R., 1998. Technological change. In: Rayner, S., Malone, E.L. (Eds.), *Human Choice and Climate Change* vol. 2. Battelle Press, Columbus, OH, pp. 327–399.

Robeyns, I., 2005. The capability approach: a theoretical survey. *J. Hum. Dev.* 6, 93–117. <http://dx.doi.org/10.1080/146498805200034266>.

Roorda, C., Frantzeskaki, N., Loorbach, D., Steenbergen, F.V., Wittmayer, J., 2012. *Transition Management in Urban Context — Guidance Manual, Collaborative Evaluation Version*. Drift, Erasmus University Rotterdam, Rotterdam.

Røpke, I., 2009. Theories of practice — new inspiration for ecological economic studies on consumption. *Ecol. Econ.* 68, 2490–2497. <http://dx.doi.org/10.1016/j.ecolecon.2009.05.015>.

Rotmans, J., 1999. *Integrated Assessment. A Bird's-Eye View*. ICIS, Maastricht.

Rotmans, J., Loorbach, D., 2009. Complexity and transition management. *J. Ind. Ecol.* 13 (2), 184–196.

Rotmans, J., Loorbach, D., 2010. Towards a better understanding of transitions and their governance. A systemic and reflexive approach. In: Grin, J., Rotmans, J., Schot, J. (Eds.), *Transitions to Sustainable Development — New Directions in the Study of Long Term Transformation Change*. Routledge, New York, pp. 105–220.

Rotmans, J., Kemp, R., Asselt, M.V., 2001. More evolution than revolution: transition management in public policy. *Foresight* 3 (1), 15–31.

Schöpke, N., Rauschmayer, F., 2014. Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency. *Sustain. Sci. Pract. Policy* 10 (1), 29–44.

Schatzki, T.R., 1996. *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge University Press, Cambridge.

Scholz, R.W., 2011. *Environmental Literacy in Science and Society: From Knowledge to Decisions*. Cambridge University Press, Cambridge, UK.

Sen, A.K., 1985. *Commodities and Capabilities*. Elsevier, Amsterdam. Sen, A.K., 1987. *On Ethics and Economics*. Blackwell, Oxford.

Sen, A.K., 2009. *The Idea of Justice*. Penguin, New York.

Sen, A.K., 2013. The ends and means of sustainability. *J. Hum. Dev. Capabilities* 14, 6–20. Shove, E., 2003. *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Berg.

Shove, E., 2010. Beyond the ABC. *Climate change policy and theories of social change. Environ. Plan. A* 42, 1273–1285. <http://dx.doi.org/10.1068/a42282>.

Shove, E., Walker, G., 2007. CAUTION! Transitions ahead: politics, practice, and sustainable transition management. *Environ. Plan. A* 39, 763–770. <http://dx.doi.org/10.1068/a39310>.

Shove, E., Walker, G., 2008. Transition management and the politics of shape shifting. *Environ. Plan. A* 40, 1012–1014.

Shove, E., Pantzar, M., Watson, M., 2012. *The dynamics of Social Practice. Everyday Life and How It Changes*. Sage Publications.

Smith, A., Kern, F., 2009. The transitions storyline in Dutch environmental policy. *Environ. Polit.* 18 (1), 78–99.

Smith, A., Stirling, A., 2008. *Social-ecological resilience and socio-technical transitions: critical issues for sustainability governance. STEPS Working Paper 8. STEPS Centre, Brighton*.

Smith, A., Stirling, A., Berkhout, F., 2005. The governance of sustainable socio-technical transitions. *Res. Policy* 34, 1491–1510.

Southerton, D., 2009. Re-ordering temporal rhythms: coordinating daily practices in the UK in 1937 and 2000. In: Shove, E., Trentmann, F., Wilk, R. (Eds.), *Time, Consumption and Everyday Life: Practice, Materiality and Culture*. Berg, Oxford & New York, pp. 49–63.

Southerton, D., Chappels, H., van Vliet, B., 2004. *Sustainable Consumption: The Implications of Changing Infrastructures of Provision*. Edward Elgar, Cheltenham

Spaargaren, G., 2003. Sustainable consumption: a theoretical environmental policy perspective. *Soc. Nat. Resour.* 16 (8), 687–701.

UNEP, 2010. *Assessing the environmental impacts of consumption and production: priority products and materials. A Report of the Working Group on the Environmental Impacts of Products and Materials to the International Panel*

for Sustainable Resource Management (Hertwich, E., van der Voet, E., Suh, S., Tukker, A., Huijbregts M., Kazmierczyk, P., Lenzen, M., McNeely, J., Moriguchi, Y.).

Van Steenbergen, F., Wittmayer, J., 2012. Carnisse in transitie? Een verkenning van het verleden, het heden en de toekomst van een Rotterdamse wijk. 30 oktober 2012. DRIFT-uitgave. Downloadable via. <http://www.drift.eur.nl/?p=262>.

Verbong, G., Loorbach, D., 2012. *Governing the Energy Transition; Reality, Illusion or Necessity?* Routledge, New York.

Volkert, J., 2013. Concepts of Agency, Sustainable Human Development (SHD) and collective abilities. *Maitreyee - E-Bull. Hum. Dev. Capability Assoc.* 22, 9–12.

Warde, A., 2005. Consumption and theories of practice. *J. Consum. Cult.* 5, 131–153. <http://dx.doi.org/10.1177/1469540505053090>.

Warde, A., 2013. What sort of a practice is eating? In: Shove, E., Spurling, N. (Eds.), *Sustainable Practices: Social Theory and Climate Change*. Routledge, New York, pp. 17–30.

WBGU — German Advisory Council on Global Change, 2011. *World in Transition — A Social Contract for Sustainability*. WBGU, Berlin.

WCED, 1987. *Our Common Future*, report by the United Nations World Commission on Environment and Development. <http://www.un-documents.net/wced-ocf.htm> (03. 04.2010).

Wittmayer, J., Schöpke, N., 2014. Action, research and participation: roles of researchers in sustainability transitions. *Sustain. Sci.* 9, 483–496. <http://dx.doi.org/10.1007/s11625-014-0258-4>.

Wittmayer, J., Steenbergen, F.V., Quist, J., Loorbach, D., Hoogland, C., 2011. *The community arena: a co-creation tool for sustainable behaviour by local communities*. Berlin. http://incontext-fp7.eu/sites/default/files/Methodological%20guidelines_final.pdf (accessed 15.05.2013).

Wittmayer, J., Schöpke, N., Feiner, G., Piotrowski, R., Steenbergen, F.V., Baasch, S., 2013. *Action research for sustainability reflections on transition management in practice*. Berlin. http://www.incontext-fp7.eu/sites/default/files/InContext-ResearchBrief-Action_research_for_sustainability.pdf (accessed 21.09.2013).

Wittmayer, J.M., Schöpke, N., van Steenbergen, F., Omann, I., 2014. Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges. *Crit. Policy Stud.* 1–21 <http://dx.doi.org/10.1080/19460171.2014.957336>.

5 GOING BEYOND EFFICIENCY: INCLUDING ALTRUISTIC MOTIVES IN BEHAVIORAL MODELS FOR SUSTAINABILITY TRANSITIONS TO ADDRESS SUFFICIENCY

Authors

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Abstract

Sustainability transitions require altered individual behaviors. Policies aimed at changing people's consumption behavior are designed according to efficiency, consistency, and sufficiency principles. Taking into account shortcomings of the first two principles, this paper specifically addresses the sufficiency principle. Sufficiency policies are not very popular due to the fear that they may impede quality of life. This fear might be eased when highlighting the motivational side of sustainable behavior, such as the wish to care for future generations and the world's poor. This article uses the capability approach (CA), developed primarily by Nobel-laureate economist Amartya Sen (1987a) and philosopher Martha Nussbaum (1993, 2000), to a) include the differentiation between self- and other-oriented goals and behavior, b) build on its demonstrated success in assessing quality of life, and c) assess the sustainability of behavior and policies. These three facets make CA suitable to analyze the effectiveness of sufficiency policies on sustainability and quality of life. To better understand the motivational side of sustainable behavior, CA is here for the first time enriched through approaches from environmental psychology. This enables us to highlight the idea of intrinsic empowerment as a building block for sufficiency policies. We close the article by highlighting further avenues for research.

Keywords

quality of life, sustainable development, social behavior, public policy

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5.1 INTRODUCTION

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of “needs,” in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs (WCED, 1987).

The most common definition of sustainable development (SD) is the one from the Brundtland Commission reproduced above, where the central terms are “needs” and “limitations” (WCED, 1987). Reinterpreting the fulfillment of needs, a decent quality of life is considered a central goal of SD (Rauschmayer et al. 2011; Di Giulio et al. 2012). To reach this goal, SD policies, addressed to governments, businesses, and individuals alike¹³ aim at improving quality of life by solving (global) environmental problems and social inequalities/inequities. Many contemporary scholars postulate a claim for intra- and intergenerational justice as the main motive behind the Brundtland conception of SD (Anand & Sen, 2000; Ott & Döhring, 2008; Christen & Schmitt, 2011; Schöpke, 2011).

Core sustainability strategies follow the principles of efficiency, consistency, and sufficiency (Grunwald & Kopfmüller, 2006). Traditional economic models emphasize increasing one’s own well-being as the main motivation for action and mainly focus on efficiency improvements. These improvements would, for the individual consumer, ideally allow an increase in individual well-being through, for example, more consumption, while at the same time creating less environmental impact. Sustainability scientists have largely shown such approaches to be ineffective, due to rebound effects that offset or even overcompensate for efficiency gains (e.g. Jackson, 2009; Crompton, 2010; Santarius, 2012; Enquete-Commission, 2013; Schneidewind, 2013).

Consistency improvements aim at qualitative changes in production and consumption patterns by resource substitution and adaption to natural resource flows. Consistency aims to contribute to safeguarding spaces for growth of material flows, consumption, and the economy at large (Grunwald & Kopfmüller, 2006). Increasing one’s own well-being would then harmonize with consuming different, innovative, and more environmentally friendly products. Nevertheless, innovations increasing consistency are still missing in a large number of fields, while other innovations, such as the sustainable harvesting of fish or wood, cannot be addressed by consistency attempts at all (Jackson, 2009; Stengel, 2011).

We assume that the effectiveness of efficiency or consistency improvements can be strengthened when accompanied by a more fundamental value shift. This includes strengthening altruistic motivations for changing behavior and, as a consequence, adopting sufficiency strategies as a focus on what is “really” relevant and needed for a good life

¹³ In this article, we focus on individuals, whose overall consumption has substantial social and ecological impacts (Reisch & Røpke, 2004; Jackson, 2005).

such as limiting consumption by way of voluntary simplicity. Behavioral models that take account only of self-centered motivations cannot account for such change.

It is unclear, though, whether a sustainability ethos calls upon individuals to check their own everyday (consumption) behavior to be in line with the values of SD or whether it is in their role as citizens to push policy toward SD (Grunwald, 2010; 2011). In both roles, individual behavior can be termed sustainable when it contributes to SD and individuals may be motivated to act on either basis by their own interest or by altruistic considerations (Stern et al. 1999). To further understand how individual behavior can contribute to SD, it is helpful to differentiate among three different views on sustainable behavior:

- Substantially, one could consider behavior sustainable that in effect allows the world's poor and future generations to meet their needs by being able to realize a decent quality of life, no matter what motivates the respective behavior.
- Intentionally, one could consider only such behavior sustainable that is motivated by the wish to allow the world's poor and future generations to meet their needs and to realize a decent quality of life—rather independently of the behavioral effects.

- Procedurally, one could consider a behavior, or a set of connected behaviors, sustainable if the behavior itself is carried out in line with principles of sustainability, for example by establishing voting procedures on decisions concerning environmentally relevant infrastructure that are consistent with principles of inter- and intragenerational justice.¹⁴

We argue that it is useful to link the first and the second views to analyze different SD strategies. While efficiency strategies take the substantial view, sufficiency arguments, such as those prominent in contemporary degrowth debates, draw on both substantial and intentional definitions (Kallis, 2011). Efficiency strategies try to motivate substantial sustainable behavior only by interest in personal well-being, not necessarily questioning current and consumption-oriented definitions of well-being (Schneidewind, 2013). This omission of the intentional dimension of SD might be one possible reason for rebound effects occurring in the implementation of efficiency strategies (cf. Peters et al. 2012).

At the same time, many members of western societies do not adopt sufficiency-oriented consumption patterns easily. Various barriers related to quality of life impede this adoption including conventions, feared loss of convenience, or conflicts with common consumerist lifestyles (Stengel, 2011; cf. Fuhrer & Wölfling, 1997). An increased willingness to take responsibility and to bear the costs associated with sufficiency lifestyles seems to require a fundamental

¹⁴ For reasons of simplicity, we do not follow the strand of procedural SD here (cf., Leach et al. 2010 for an in-depth discussion).

value shift toward an intentional view on SD. Individuals express this value shift by behaving pro-socially and in accordance to altruistic values (Jackson, 2009; Stengel, 2011; cf. Boulanger 2010).¹⁵

There is ample evidence that nonconsumptive behavior and the well-being of others are important for one's own quality of life (e.g., Diener & Diener, 1995; Ura et al. 2012; Helliwell et al. 2013). Assuming that sufficiency strategies were selected merely for reasons of one's own well-being makes it difficult to explain why routines predicated on sufficiency practices have not yet been widely adopted (Alcott, 2008). Along these lines, we assume that people have the goal to care for others: policies designed with underlying models that do not account for those motivations, or assume only self-interested motivations, strengthen the importance of bandwagon or free-rider effects that—in turn—decrease the likelihood of pro-social behavior (Molinsky et al. 2012). Models of individual (citizen or consumer) behavior that are meant to help assess all three—efficiency, consistency, and sufficiency strategies for SD—should therefore also account for altruistic sustainability motivations (Ingebrigtsen & Jacobsen, 2009). Policies based on models predicated on other-regarding goals may enhance people's freedom to behave sustainably, both intentionally and substantially.

It is unclear, though, which models can be used as a basis for integrating sufficiency strategies coherently into policy design and assessment. As a first shortcoming, while mainstream behavioral models, assuming a self-oriented motivation and based on well-being or utility maximization, can analyze efficiency or consistency strategies, the lack of models that include altruistic motivations hampers design and analysis of sufficiency strategies.¹⁶

Furthermore, sufficiency strategies need to be assessed and evaluated to show their effectiveness. This assessment needs to include both substantial sustainability impact as well as impact to quality of life, herewith addressing the main reason for nonadopting sufficiency strategies—the fear that sufficiency strategies might impede quality of life. In this context, psychological considerations of individual motivations to behave sustainably, such as self-centered or other-regarding motivations, once more become crucial (Kaufmann-Hayoz et al. 2010). Most current psychological models, though, do not fulfill the assessment requirement with regard to quality of life, which they do not link to behavioral analysis at a societal level (cf., for environmental psychology, Osbaldistan & Schott, 2012).

We suggest that to be able to analyze substantial and intentional views on SD with respect to personal behavior, a more explicit behavioral model is needed, a model that includes self-centered and altruistic motives as well as an

¹⁵ The orientation to act in coherence with the common good, even if it conflicts with individual interests, can be called altruism or pro-social behavior (Fuhrer & Wölfling, 1997). The terms “pro-social behavior”, “pro-social values,” and “altruism” have various definitions, which overlap to a large extent. Twenge et al. (2007) define pro-social behavior as “actions that benefit other people or society as a whole,” while Lishner & Stocks (2008) define altruism as “a motivational state with the goal of increasing another's welfare.” Scholars debate whether pro-social behavior and altruism lead to future benefits for the helper (e.g., Knickerbocker, 2003; Twenge et al. 2007). In this article, we look at altruistic motivations as sources for pro-social behavior, no matter whether there are future benefits to the actor or not.

¹⁶ Peters et al. (2012) state “Most studies analyzing the rebound effect are based on neo-classical economic models and therefore ignore sociological and psychological aspects.” They further develop a psychological approach to study rebounds, showing that enriched models can be functional for the evaluation of efficiency strategies as well.

ability to assess different impacts of changed behavior at a societal level, on the one hand with regard to quality of life, and, on the other hand, with respect to substantial sustainability. In this way, the model can be a basis for more holistic policy design and assessment.

The main aim of this article is to develop and discuss such a model that combines societal and psychological elements to facilitate discussions on sustainability transitions. In an effort to identify new models of sustainable behavior that are appropriate for policy analysis, we link psychological models with the capability approach (CA). CA has been primarily developed by Nobel-laureate economist Amartya Sen (1987a) and philosopher Martha Nussbaum (1993; 2000) as an alternative to understandings of human flourishing based on resource availability and well-being (Rauschmayer et al. 2011).

Capability, understood as the freedom to live a life one values or has reason to value, has become prominent in the discussion on human development. CA has been widely used to monitor societal achievements, and is particularly present in discussions pertaining to global intragenerational justice (e.g., UNDP, 2011). Understanding such freedom as the basic quality of life, CA offers a structure to better appreciate what individuals require to have this freedom.

In the following treatment we focus on the particularity that the standard assumptions of CA can account for the difference between self-interested and pro-social behavior.¹⁷ At the same time, these assumptions can be extended by standard models from environmental psychology to explain differences in behavior when shifting to sufficiency policies for SD. On this basis, we can formulate recommendations for sustainability policies that are based on a model of individual behavior that is richer than typical models used for economic research and that is more oriented to public policy than most psychological research.

In this article, we develop and discuss such a model, so that SD policies can be designed and assessed in a more encompassing way. The journey that we pursue links several different issues. First, we elaborate the differences among efficiency, consistency, and sufficiency strategies for SD. We then introduce the concept of capabilities in the context of SD. Third, we enrich the capability concept by drawing on standard concepts from environmental psychology. Fourth, we sketch a model based on these links and then discuss the perspectives and limitations of combining these different concepts in one model. The aim here is to evaluate the degree to which it offers a promising approach for assessing and designing more encompassing SD strategies. The article closes with a summary and outlook.

¹⁷ Egoistic and altruistic/pro-social aspects are also reflected in most basic reasons for action (Grisez et al. 1987), fundamental human needs (Max-Neef, 1991), or other such lists of what constitutes human flourishing or quality of life (see Alkire, 2002 for a comparison).

5.2 SUSTAINABLE DEVELOPMENT: EFFICIENCY, CONSISTENCY, AND SUFFICIENCY STRATEGIES

We understand the main implications of SD, as defined by the Brundtland Commission, as the need for intra- and intergenerational justice on a global scale (WCED, 1987). To achieve these goals, production and consumption patterns have to change dramatically. Mainstream economic models of consumer and producer behavior are based on revealed preferences and focus on realizing efficiency principles. In light of this approach, sustainability strategies based on efficiency gains appear promising, insofar as they encourage the allocation of resources into production that enhances well-being. The aim behind propagating efficiency strategies (e.g., Lovins et al. 1998) is to create win-win situations, realizing growing personal well-being and a shift to SD at the same time. According to this approach, individual interests, values, and preferences do not have to change if the incentives are correctly determined. Such an efficiency-based approach either does not account for motivations or assumes that all actions can be explained by the motivation to maximize one's own well-being (for a discussion, see Kals & Russel, 2000). On the basis of an efficiency strategy, SD would come about without the individual actors having to develop empathy for other humans as a main motivation. With the distinction introduced above, substantially sustainable behavior would not require intentionally sustainable behavior.

Nevertheless, efficiency improvements (for example, in energy or material use) have to date been strongly challenged in their effectiveness due to rebound effects (e.g., Kleinhückelkotten, 2005; Hinterberger et al. 2009; Jackson, 2009; Crompton, 2010). The overall rebound can be defined as the amount of the efficiency improvement offset by the raise in demand caused by the very efficiency improvement (Mandeler & Alcott, 2011). Rebound effects occur at a personal or a systemic level and are analyzed focusing at psychological, financial, or material aspects of producer or consumer actions (see Sorell & Dimitropoulos, 2008; Mandeler & Alcott, 2011; Santarius 2012 for an in-depth discussion).¹⁸

In the field of consumer behavior, which is in the focus of this article, rebound effects occur when consumers reallocate the financial savings generated by efficiency improvements to more consumption (financial rebound effect; Santarius, 2012). An example is the reinvestment of money saved by using more efficient technology into new energy- or resource- consuming products or product characteristics, such as buying cars with more efficient but also larger engines. Under such circumstances, the aggregate resource consumption remains the same or even grows (de Haan et al. 2007). Similar to the effect of lower financial costs, decreasing socio-psychological costs of consumption can be regarded as further possible reasons for rebound effects (psychological rebound effect; Santarius, 2012). If for example neighborhood pressure or the norms of a peer group prevent consumers from buying sport-utility vehicles, "this could change as soon as SUVs with hybrid powertrain[s] enter the market" (de Haan et al. 2007). Similar to a focus on efficiency, sustainability strategies in line with the principle of consistency appear attractive, as they

¹⁸ Scientific assessment of overall rebound effects is a highly contested field. Estimations of rebounds (also called "backfire" or the Jevons paradox) vary largely due to industry sectors and countries assessed as well as methods used. On average, rebound effects are considered substantial: Santarius (2012) supposes 50% and this figure is similar to the calculations of the German Advisory Council for the Environment (SRU 2011), which additionally estimates rebounds of more than 100% in particular sectors.

promise altered production and consumption patterns through fundamental innovations in technology oriented toward a basic consistency with natural capital protection (Kleinhüchelkotten, 2005).

Consistency improvements aim at qualitative changes in production and consumption patterns by resource substitution and adaption to natural resource flows and therewith at safeguarding spaces for growth of material flows, consumption, and the economy at large (Grunwald & Kopfmüller, 2006). Increasing personal well-being would harmonize with consuming different, innovative, and more environmentally friendly products. Besides technical and institutional interventions, and in contrast to mere efficiency strategies, the promotion of consistency attempts would benefit from deeper consideration of psychological aspects such as values, knowledge, or social groups (Kaufmann- Hayoz et al. 2010). Nevertheless, innovations increasing consistency are still missing in numerous fields of production and are unlikely to emerge at scale in the foreseeable future, while other challenges, such as the sustainable harvesting of fish or wood, cannot be addressed by consistency attempts at all (Kleinhüchelkotten, 2005; Jackson, 2009; Stengel, 2011).

Sufficiency strategies for SD—such as voluntary simplicity—are based on individual willingness to restrict the consumption of natural resources (Schneider et al. 2010).¹⁹ Such approaches lead to lower volumes of consumption and appear desirable from an ecological point of view, but would also further intra- and intergenerational justice (Kleinhüchelkotten, 2005). Reducing pressure on the environment and decreasing the massive inequalities in consumption levels between affluent and absolutely or relatively poor communities implies that new (role) models of

¹⁹ We are not talking here of forced sufficiency due to poverty or of customary and unconscious sufficiency, but of the conscious choice (implying freedom) of a sufficiency oriented lifestyle

sustainable consumption must be developed (Sorrell, 2010; Siebenhüner, 2011). These interventions must combine sustainability and a good life and are at least in part based on an idea of a low-consumption lifestyle predicated on richness in time and social interaction as sources for well-being and happiness (Hinterberger et al. 2009). In consequence, sufficiency in a broad sense is an integral part of such new prosperity models integrating cultural changes (Kleinhüchelkotten, 2005). However, although sufficiency as a lifestyle is argued to increase personal well-being (e.g., Linz et al. 2002), self-interest alone apparently is not enough motivation to reduce “overconsumption” (Alcott, 2008). Substantially sustainable behavior along the lines of sufficiency principles requires intentionally sustainable behavior.

We argue that efficiency improvements and consistency attempts need at least to be accompanied by changes in behavior in line with the principle of sufficiency, even though the systemic effects of sufficiency strategies or their combination with efficiency and consistency need further analysis regarding resource consumption and environmental impact (Alcott, 2008).²⁰ Furthermore, we assume that orienting efficiency only around self-regarding motives suggests an overly restrictive model of human behavioral motivations (Ingebrigtsen & Jacobsen, 2009). Effective SD strategies have to deal with individuals who aim to increase personal well-being through consumption as well as through the articulation of pro-social values, such as social equality, political participation, and the common good (Heidbrink & Reidel, 2011). Strategies need also to consider individuals who integrate substantial and intentional sustainable behavior into their roles as consumers and as citizens. Effective SD strategies therefore have to address self- and other-regarding motives relevant for consumers and citizens alike.

5.3 THE CAPABILITY APPROACH USED TO UNDERSTAND AND ADDRESS MOTIVATIONS FOR BEHAVIOR

One of the factors prompting Amartya Sen to develop the capability approach (CA) was his critique of how mainstream neoliberal economics fails to adequately consider motivation for action. By interpreting any action as monodimensional utility maximization, standard economics loses sight of other reasons for actions such as those expressed in deontological ethics (Sen, 1977). Reinterpreting altruistic behavior as behavior oriented towards one’s own well-being is a categorical mistake.

Sen (1987b) proceeds then to differentiate between two main motivations for human agency—own well-being and commitments to others’ well-being. In each category, he takes multidimensionality of human goals and realizations for granted. In both motivational categories, it is relevant to individuals how well they fare. This depends on the realization of goals and on the individual freedom to really choose among different goals. In the language of CA, the realization of goals is called “achieved functioning” and the freedom to choose among different goals is termed

²⁰ Similar to efficiency rebounds, sufficiency rebounds can occur at a macroeconomic level, since products and services not used by one consumer simply may get consumed by another (Alcott, 2008; Boulanger, 2010; Mandlener & Alcott, 2011). In contrast to efficiency rebounds, the overcompensation of sufficiency savings by sufficiency rebounds is not typically possible (Mandlener & Alcott, 2011). Scholars argue for a policy mix based on efficiency, sufficiency, and consistency or de commodification strategies alike (Alcott, 2008; Boulanger, 2010; Mandlener & Alcott, 2011).

“capability set” (see Figure 9). Resources are a basis for this freedom, but CA also examines the personal, cultural, and environmental conversion factors that humans require to convert resources into freedoms.

An example of personal mobility illustrates this concept. Cycling to work (the achieved functioning) could be a realization of a goal of own well-being, but could also meet other-regarding aims concerning the bicycle’s carbon-dioxide (CO₂) neutrality, silence, and so forth. Cycling to work requires certain resources (a bicycle and a usable surface) and is enhanced by various conversion factors such as traffic culture (say Copenhagen vs. Los Angeles), protective regulations, climate, and land profile. Political measures to promote cycling herewith can be understood as an increase in individual freedom to meet self- and other-regarding goals. Those policies could focus on resources and on the conversion factors. At the same time, policies forcing everybody to travel by bicycle would restrict the capability set and herewith lower personal freedom.

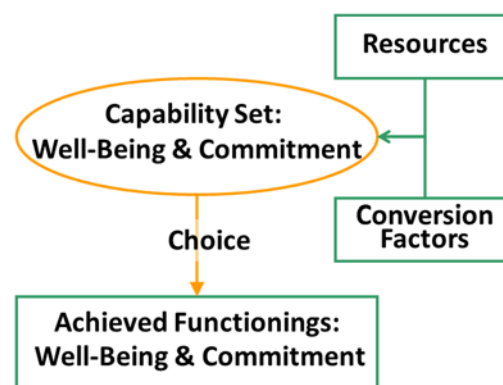


Figure 9: The capability approach

In conclusion, real freedom includes the availability of resources (in the form, for example, of environmental assets), but also social institutions and individual skills to convert these resources into capabilities. Thus, the capability approach is a means to structurally define the idea of a good life in a culturally and historically independent way (Di Giulio et al. 2012). This structure can be used to nonpaternalistically specify a good life in concrete situations, as shown by the example of personal mobility above.²¹ Sen (1985) and Nussbaum (2000) have developed different versions of CA, but both agree that the evaluative space of what is valuable for human life is multidimensional. While Sen (1985) does not define these dimensions (he argues that this should only be done in context-specific democratic deliberations), Nussbaum (2000) has—in a preliminary consensual process—defined a list of fundamental capabilities that she considers essential for any good human life and which should be guaranteed by governments.²²

²¹ Additionally, justice can then be measured by capabilities instead of using subjective metrics such as pleasure or preference or objective metrics such as income or access to other resources (Gutwald et al. 2014).

²² According to Nussbaum (2000; 2011), the ten central capabilities refer to: life, bodily health, bodily integrity, senses, imagination and thought, emotions, practical reason, affiliation, other species, play, and control over one’s environment.

Even though the link between CA and SD is far from evident (cf. Anand & Sen, 1996; 2000; Leßmann, 2011; Leßmann & Rauschmayer, 2013; Rauschmayer & Leßmann, 2013), we suggest that exploring this connection offers several advantages that we investigate in the following (see also Di Giulio et al. 2012).

5.4 UNDERSTANDING SUSTAINABLE DEVELOPMENT: NEEDS, CAPABILITIES, AND THE GOOD LIFE

Two facets of CA are important in the context of SD. First, CA explicitly includes goals for actions that aim not only at one's own but that also include others' well-being; it therefore has a wide concept of human agency. Second, CA links needs, resources, and well-being. The importance of both facets is elaborated in more detail below.

In the first instance, substantial sustainable behavior can be motivated by a wish to increase one's own well-being. This is especially the case when the behavioral context has been carefully arranged (an example of an increase of one's own well-being in relative terms would be good cycle lanes or high taxes on fossil fuels where the funds are used for subsidizing public transportation). Through the use of external incentives or regulation, it is possible to make people behave substantially sustainably in their own interest for their own well-being. Such an arrangement is workable in some cases, but, due to uncertainties, impossible in others. The case of the European Union (EU)-wide obligatory inclusion of bioenergy in petrol for individual mobility, and the partial withdrawal of the obligation, shows that the authorities were not able to foresee the effects of this measure on biodiversity and food issues arising from land-use change. Even when such political arrangements to set incentives for sustainable behavior are possible, they are often not realized for immediately practical or political reasons. Furthermore, studies from social psychology, anthropology, and behavioral economics have questioned the efficacy of arrangements that only rely on incentives to increase one's own well-being (Cleaver, 2000; Fehr & Falk, 2002; Vatn, 2009). Kerr et al. (2011) show in detail how the introduction of payments for ecosystem services in communities can lower the effectiveness of protection efforts that formerly relied on pro-social norms. As stated above, financial and psychological rebound effects contribute to rendering efficiency improvements ineffective—improvements that in principle could link substantial sustainable behavior and increased personal well-being.

In line with the Brundtland Commission that focused on the needs of the unborn and the world's poor as those individuals the furthest away from a current European perspective, sustainable behavior can also be motivated at times by a wish to care for even very distant people. One major expression of this intentionally sustainable behavior is the commitment to principles of intra- and inter-generational justice as translated into practical behavior by, for example, purchasing fair-trade products or engaging in pro-environmental behavior. CA's distinction between self-oriented and other-oriented goals (see preceding section) acknowledges that people are inherently motivated for SD, meaning people "care" for the well-being of currently poor and of future generations. Thereby, CA can differentiate between intentionally and substantially sustainable behavior.

In the second instance, needs, if understood in an abstract and categorical way can—in a methodological sense—be understood as the fundamental structure of any multidimensional set of capabilities.²³ All functionings can be understood in their capacity to realize different needs—cycling to work, for example, contributes to realizing the needs for subsistence, participation, idleness, identity, and freedom (cf. Max-Neef, 1991). This constitutes a direct terminological link to the Brundtland definition of SD.²⁴ To achieve functionings, one requires personal abilities, such as skills, knowledge, and motivations; if successful, this realization meets needs, is gratifying, induces well-being, and increases quality of life (Rauschmayer et al. 2011). At the same time, CA directly considers goods and resources as well as social, institutional, and environmental structures (elements of the behavioral context individuals are facing) that are relevant for meeting needs. Meeting needs today and in the future to realize a decent quality of life, and therewith realizing well-being and commitment goals alike, requires a material and social basis. If people today want to behave intentionally and substantially sustainable, if they want to include the needs of future or distant people in their decision-making considerations, then they will have to devote attention to the impacts of their behavior on the material and social basis of other people's lives (Leßmann & Rauschmayer, 2013). By considering this material and social basis, CA not only offers the mentioned terminological link to meeting needs, but a direct substantial link to the goal of SD as well.

The capabilities approach has been used mostly to analyze where governments can redistribute resources or alter relevant conversion factors to enhance the capability set of underprivileged people. Put differently, the aim of policy measures motivated by CA analyses has often been on extrinsic empowerment that builds on resources and conversion factors external to people. Susan Pick & Jenna Sirkin's (2010) applied research on poverty demonstrates that, by including intrinsic empowerment by way of enhancing capability-sets through changing psychological factors, CA can still increase its potential. Realizing this potential is crucial as motivational factors are essential for sufficiency strategies.

5.5 CONTRIBUTIONS AND FLAWS: THE EXAMPLE OF “BREAKING THE POVERTY CIRCLE” /PARTICIPATORY DEVELOPMENT WORK

This section introduces an experience-based model that explains the success of intrinsic empowerment in poverty-reduction campaigns (Pick & Sirkin, 2010). It is a first step to building a CA-based model that accounts for normative sustainable behavior (which we develop in the final section, “An Integrative Model”). The original Pick-Sirkin model combines the CA with the theory of planned behavior, assuming that people consciously choose behavior out of a set of perceived real opportunities, while personal abilities and self-perception are essential variables in perceiving opportunities and in choosing options (Figure 10).

²³ Max-Neef (1991) uses ten abstract and categorical needs shared among humans: subsistence, protection, affection, understanding, participation, idleness, creation, identity, freedom, and transcendence.

²⁴ In contrast to the abstract needs understanding of Max-Neef and other scholars of humanistic psychology (Maslow, 1987, Vlek, 2000), the Brundtland Commission's conception of needs also included strategies to meet those needs, such as jobs, sanitation, or water supply.
 Doctoral thesis of Niko Schöpke

Pick & Sirkin (2010) show how CA has been used to understand the driving factors behind successful community development in Mexico, particularly with women and poor groups. Already 25 years ago, Susan Pick had identified psychological barriers as the main reason for the nonimplementation of family-planning measures in Mexico. When subsequently addressing these barriers through educational work by nongovernmental organizations (NGOs), she noticed that women participating in such groups start to behave differently, not only in family planning, but also with respect to the educational system and their own economic activity. Intrinsic empowerment through education not only increased their capabilities in one area, but also enhanced their opportunities elsewhere—new skills induced changed behavior, which led to a different perception of self and self-efficacy. This, in turn, is the basis for recognizing new opportunities in other areas of life.

Figure 10 redrafts this feedback loop. Women recognized specific opportunities, such as visiting doctors who taught family-planning methods, but tended not to see these physicians because of high socio-psychological barriers. Training allowed them to overcome these obstacles. This (and further changed behavior) also gave the women another image of themselves—different personal norms, higher self-efficacy, and altered attitudes toward family or sexuality. This new image intrinsically empowered them to create new opportunities in previously unexplored areas, such as child education or business, which in turn led to changed behavior and improved well-being. These intrinsic empowerment programs enabled participants to develop novel perceptions, to exploit available resources, and to facilitate the self-enhancement of their capability set.

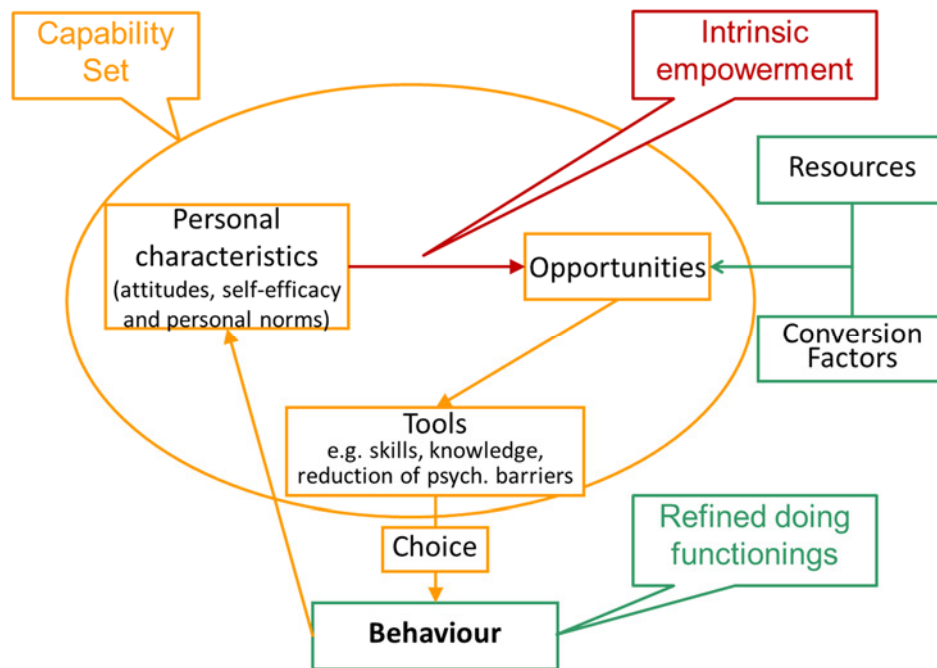


Figure 10: Intrinsic empowerment out of poverty (altered from Pick & Sirkin, 2010). Tools and personal characteristics in CA models are usually among the conversion factors (e.g., Robeyns, 2005). Here, external and internal conversion factors have been separated to highlight the internal dynamics.

The feedback loop described above might contribute to making these kinds of changes more durable, where the motivation for changed behavior is self- (or family-) regarding. Pick & Sirkin's (2010) intrinsic empowerment model helps to demonstrate how long-lasting, widespread changes toward individual well-being can be achieved, which is especially important in countries with widespread poverty. Such interventions do not, however, say very much about sustainability in the sense of the Brundtland definition of SD, where the motivation clearly lies in other-regarding interests predicated on caring for the world's poor and future generations. However, the Pick-Sirkin model does provide help in accounting for altruistic motivational factors for intentional sustainable behavior. Therefore, translating this model to include sufficiency-oriented motives in industrialized countries requires some modifications. In the following section, we draw on studies from environmental psychology to gain insight into strengthening the impetus for other-regarding behavior independently of well-being motivations.

5.6 STEPS TO EXTEND THE SCOPE OF THE CAPABILITY APPROACH BY LINKING IT TO PSYCHOLOGY

5.6.1 Variables Influencing Behavior Shared by Different Psychological Approaches

Behavior that can be considered substantially sustainable often contradicts individual self-oriented interests, particularly in the short and middle term (Fuhrer & Wölfling, 1997). To take responsibility for, to bear the related individual costs of, and to act in coherence with the common good can be called pro-social behavior, motivated by

altruism (Hopper & Nielsen, 1991; Fuhrer & Wölfling, 1997; Stengel, 2011).²⁵ Following Frey and colleagues (1996), we can assume that people convinced that sustainable behavior is worthwhile (who are intrinsically motivated) are likely to have more stable substantial sustainable behavior than those not similarly convinced (see as well de Groot & Steg, 2009). Therefore we consider them to be less likely to “rebound” in their sustainability behavior due to financial or psychological effects outlined above (cf. Peters et al. 2012). Persuading people, though, does not make them behave sustainably, as (altruistic) motives do not automatically become relevant for (pro-social) behavior.²⁶ What are the psychological reasons behind behavior in general and pro-social, sustainable behavior in particular? A number of concepts from psychology have been applied to questions of pro-environmental and sustainable behavior (Matthies & Homburg, 2001; Steg & Vlek, 2009; Osbaldiston & Schott, 2012). These approaches include the theory of planned behavior (Fishbein & Ajzen, 1975; Ajzen, 1991) and the norm-activation model (Schwartz, 1977; Schwartz & Howard, 1981), but also models on the influence of habits by Triandis (1977) and the ipsative theory of action (Foppa, 1989). Matthies et al. (2004) screen the different theories for the factors considered most important for environmentally friendly behavior and discuss numerous studies (see as well Kaufmann-Hayoz et al. 2012). Named variables include:

²⁵ De Groot & Steg, (2007; 2008; 2010) and Garcia-Mira et al. (2013) differentiate altruistic and biospheric values as variables influencing the motivation for environmentally friendly behavior and find empirical proof for their influence on pro-environmental behavior. For reasons of simplicity we consider both of them under the term of altruistic values.

²⁶ A core characteristic of altruistic motivations is that most people would approve of altruistic norms to govern a particular behavior, but not everybody behaves according to this norm (Hopper & Nielsen, 1991).

1. The personal environmental norm (feeling of obligation for environmentally friendly behavior)
2. Social norms (perceived behavioral expectations of others)
3. Awareness of problem, awareness of consequences
4. Cost/benefit expectations
5. Awareness of consequences of behavior/ascription of responsibility
6. Perceived personal agency/behavioral control
7. Habits

In the context of analyzing and strengthening sustainable behavior based on altruistic motives, the theory of planned behavior and Schwartz's norm-activation model appear promising as they consider norms and values as important variables influencing behavioral choice (cf. Matthies et al. 2004). The Schwartz model in particular has been successfully applied to case studies on altruistic behavior. Within both models, individual behavior is thought to depend

on the intention to behave in a certain way (e.g., Schwartz, 1977; Ajzen, 1991). This implies that we focus our analysis on behavior that is chosen consciously. Behavioral habits are not the primary focus of this model.²⁷

5.7 TOWARDS ALTRUISTIC MOTIVATIONS FOR BEHAVIOR

5.7.1 Core Variables: Personal and Social Norms

The theory of planned behavior proposes behavioral intentions as crucial variables on deciding actual behavior. Three aspects are supposed to determine intentions: 1) the attitude toward the behavior, 2) the subjective norm (as the perceived expectations of relevant others), and 3) the perceived behavioral control (Matthies et al. 2004). The individual attitude toward a behavioral alternative is influenced by its anticipated consequences. In this understanding, altruistic behavior is performed if there is a strong subjective norm expecting altruism and if the persons holding this norm are of great importance to the actor. A precondition for this outcome is the perception that a person is able to carry out the considered behavioral alternative.

The norm-activation model of Schwartz & Howard (1981) offers additional explanatory power, as it looks more deeply into the different norms individuals hold. The model explains how norms are activated in certain situations and how they are translated into personal responsibility that finally leads to pro-social behavior (Fuhrer & Wölfling, 1997).²⁸ Schwartz & Howard (1981) understand behavior as motivated by the wish to act in a norm-concordant way, differentiating between general ethical norms and personal and social norms. General ethical norms are translated into personal norms during socialization. Various personal norms together form cognitive structures at a high level of abstraction. To direct concrete decisions about how to behave, these abstract personal norms have to be activated and evaluated with regard to the specific situation (Fuhrer & Wölfling, 1997). They result in feelings of individual moral obligation to act in a certain way.

Social norms, in turn, are based on expectations of other persons of how the individual should act in a given situation and also influence the decision of which behavior to carry out. Pro-social behavior can be motivated by personal or by social norms (Stern et al. 1999). To better understand pro-social behavior via the norm-activation model, we take a closer look at the behavioral choice process assumed in the model.

²⁷ Habits are, of course, very important elements of behavior. But behavioral change and motivation can hardly be explained through habits due to the unconscious selection of such behavior. One might, of course, assume that in the beginning unconscious behavior was consciously intended before turning into habits (Aarts, 1996; Schäpke & Rauschmayer, 2011). Consumer-awareness programs will address the challenge of bringing unconscious behavior back to consciousness and create new behavioral alternatives (Kaufmann-Hayoz et al. 2010).

²⁸ For empirical testing of the norm-activation model see Hopper & Nielsen, 1991; Hunecke et al. 2001; Joireman et al. 2001; for a comparative discussion see Stern et al. 1999.

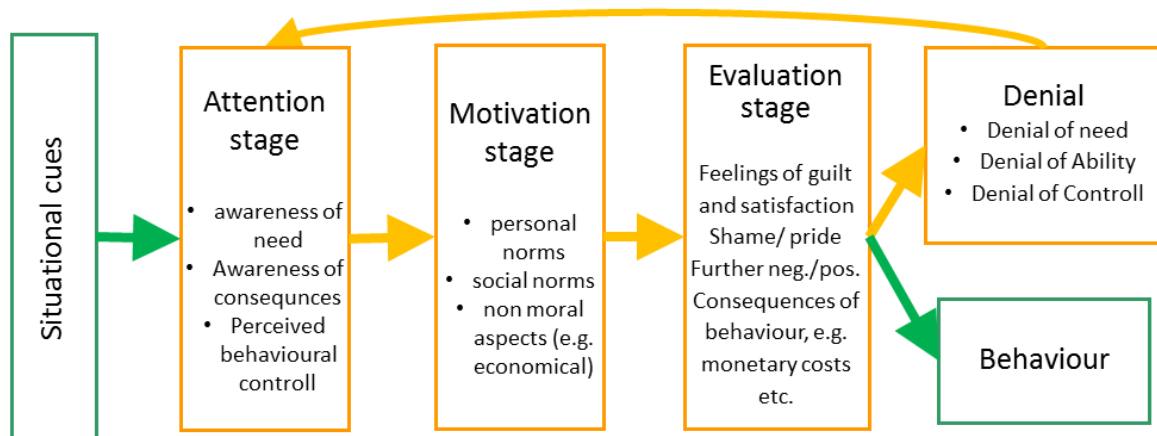


Figure 11: Graphical representation of the norm-activation model (Klöckner & Matthies, 2004, strongly modified).

5.7.2 Process of Norm-Activation for Pro-Social Behavior

Schwartz & Howard (1981) conceive a four- stage process for reaching normative decisions (Figure 11):

1. Attention stage: Specific problem-relevant feelings and cognitions are activated by situational cues. This process of activation occurs in three steps. First, individuals check whether they have to act at all. With regard to sustainability problems, they evaluate whether the situation is dangerous or challenging to humans or the environment (Fuhrer & Wölfing, 1997). Second, they identify existing behaviors able to cope with the problem. Finally, they evaluate their individual ability to carry out relevant behavior (perceived behavioral control).
2. Motivation stage: If an individual possesses the ability to carry out such problem-relevant behavior, different implications of the behavior are considered—physical and material including monetary implications, on the one hand, and ethical and social consequences on the other hand. Ethical consequences refer to internalized personal norms, while social consequences relate to other people’s social norms and expectations with respect to the considered behavior. Both norms create individual and case-specific moral obligations.
3. Evaluation stage: The individual evaluates the consequences of behavior, considering case- specific aspects such as time and money as well as person-specific aspects such as the importance of the personal norms involved for self-concept (Fuhrer & Wölfing, 1997). A violation of a personal norm results in shame, while upholding a personal norm results in pride (Hopper & Nielsen, 1991). Violating social norms can cause guilt, anger, or fear with regard to the anticipated reaction of others (Hopper & Nielsen, 1991).

4. Manifestation stage:

- a. Denial: A conflict arises when various positive and negative consequences of the considered behavior are evaluated as more or less equivalent. The individual then starts redefining the problem and moral obligation. Here, a re-evaluation of any of the three first stages can lead to denying the importance of the decision to act (Fuhrer & Wölfling, 1997).
- b. Behavior: In the case of no-denial, a (pro-social) behavior becomes manifest (Fuhrer & Wölfling, 1997). A self-interested behavior is expressed if no altruistic personal or social norms are activated (e.g., due to missing awareness of consequences or missing altruistic norms) or if the individual does not feel responsible for the consequences and/or if the related personal costs are evaluated to be higher than the moral obligation of a pro-social behavior.

5.7.3 Preconditions of Pro-social Behavior

As stated above, a core characteristic of altruistic behavior is that most people would approve a norm governing a particular behavior, but not everybody behaves according to it (Hopper & Nielsen, 1991). In accordance with this observation, subsequent studies (e.g., Kals & Russell, 2000) show that the majority of European citizens have a strong altruistic motivation for global environmental protection. Empirically, this motivation significantly influences concrete willingness to conduct environmentally friendly behavior (Matthies et al. 2004). Nevertheless, and following norm-activation theory, empirical research shows that transmission of personal norms into pro-social behavior has certain preconditions. Stronger awareness of (future) consequences and individual attribution of responsibility increasingly lead to personal norms that promote pro-social behavior (Fuhrer & Wölfling, 1997; cf. Schwartz & Howard, 1981; Bierhoff & Montada, 1988; Joireman et al. 2001; Bamberg & Schmidt, 2003; De Groot & Steg, 2009).

Additionally, scholars of environmental psychology highlight the influence of the perceived ability to select behavioral alternatives (i.e., size of the capability set) on the perception of individual responsibility. If people feel strongly predetermined in behavioral possibilities, they feel less responsible for the consequences of their actions (Heberlein, 1972). Accordingly, perceived behavioral control is a crucial variable in various social psychological models of behavior (Bandura, 1977). A lack of belief in the individual ability to carry out a behavioral alternative significantly reduces the motivation and feeling of moral responsibility to behave in a certain way. Studies show a strong tendency to recalibrate personal norms in cases of high anticipated personal cost of environmentally friendly behavior. In this way, the willingness to engage in environmentally friendly behavior is reduced (Tyler et al. 1982; De Groot & Steg, 2009b).

In the next section, we include the knowledge gained from environmental psychology in an integrated model to understand motivations for behavior. This model links CA and the norm-activation model and puts an emphasis on the freedom to choose behavioral alternatives as well as on the awareness of behavioral consequences as key factors influencing pro-social behavior.

5.8 AN INTEGRATIVE MODEL: LINKING CA AND CENTRAL VARIABLES OF PSYCHOLOGY

This section combines the interpretation of CA as developed by Pick & Sirkin (2010) with the norm activation model of Schwartz & Howard (1981). We begin by reviewing Figure 9, which highlights a person's capability set, defined as the valuable behavioral alternatives from which a person is free to choose. This set consists of the opportunities the person has to act, plus her skills and personal characteristics. A person's opportunities depend on the use of external resources and conversion factors. We now extend the bicycle example mentioned above by noting that the capability to ride a bicycle depends on resources (e.g., possessing a bicycle) and external conversion factors (e.g., a reasonably smooth pathway). Recognizing the opportunity to ride a bike depends on the person's attitudes, their perceived self-efficacy, and their norms. Making use of the opportunity asks for certain skills and knowledge (e.g., the skill to ride a bike). A person decides to carry out a certain behavioral alternative to realize her well-being or agency goals. Two feedback loops arise from a successfully achieved behavior. The internal loop enhances the person's perceived self-efficacy, their awareness of the problem, and their attitudes toward a specific behavior, whereas the external loop influences the resources and conversion factors and, in turn, the opportunities a person has.

In addition to Pick & Sirkin's version of CA, the new model presented in Figure 12 further differentiates the steps involved with regard to the activation of norms particularly relevant for choosing pro-social/altruistic behavior. The choice to behave in a certain way (e.g., to ride a bicycle) or not depends, on one hand, on the behavioral alternatives that consist of the person's opportunities (resources and conversion factors), and the skills they can apply to make use of them. In the case of the current example—does she have a car or is a public transportation system available? On the other hand, the behavior's likely consequences are evaluated against moral and non-moral criteria, such as time, money, and the importance of the personal norms involved for the person's self-concept (is cycling good/bad, expensive/cheap? Does it correspond to her self-image as, for example, an athletic or independent person?).

But the consideration of pro-social behavioral alternatives (she wants to cycle due to care for others and not for her own interest) has attention and motivation as conditions. In the attention stage, specific and problem-relevant feelings and cognitions have to be activated (mobility-induced CO₂ emissions need to be regarded as a problem) and the person has to be aware of her own ability and responsibility to behave in a pro-social way (she can go by bicycle to work). In the motivation phase, as the second condition to perceive a specific behavior as an opportunity to behave pro-socially, a specific moral obligation is created as a function of the economic, moral, and social costs of behavior (she should care for the environment, her image, and her expenses when going to work).

Then the consequences of behavior are evaluated against the developed moral obligation to behave pro-socially. This evaluation either leads to pride and gratitude for behavioral alternatives in line with personal and social norms or to shame, fear, and guilt for behavior opposing these norms. If this calculation leads to an ambivalent result, a redefinition of the problem and the moral obligation is possible via denial and/or justification (in fact, it does not matter that she takes the car, as all others travel by car as well). Finally, the behavior—pro-social or not—becomes manifest (Fuhrer & Wölfing, 1997).

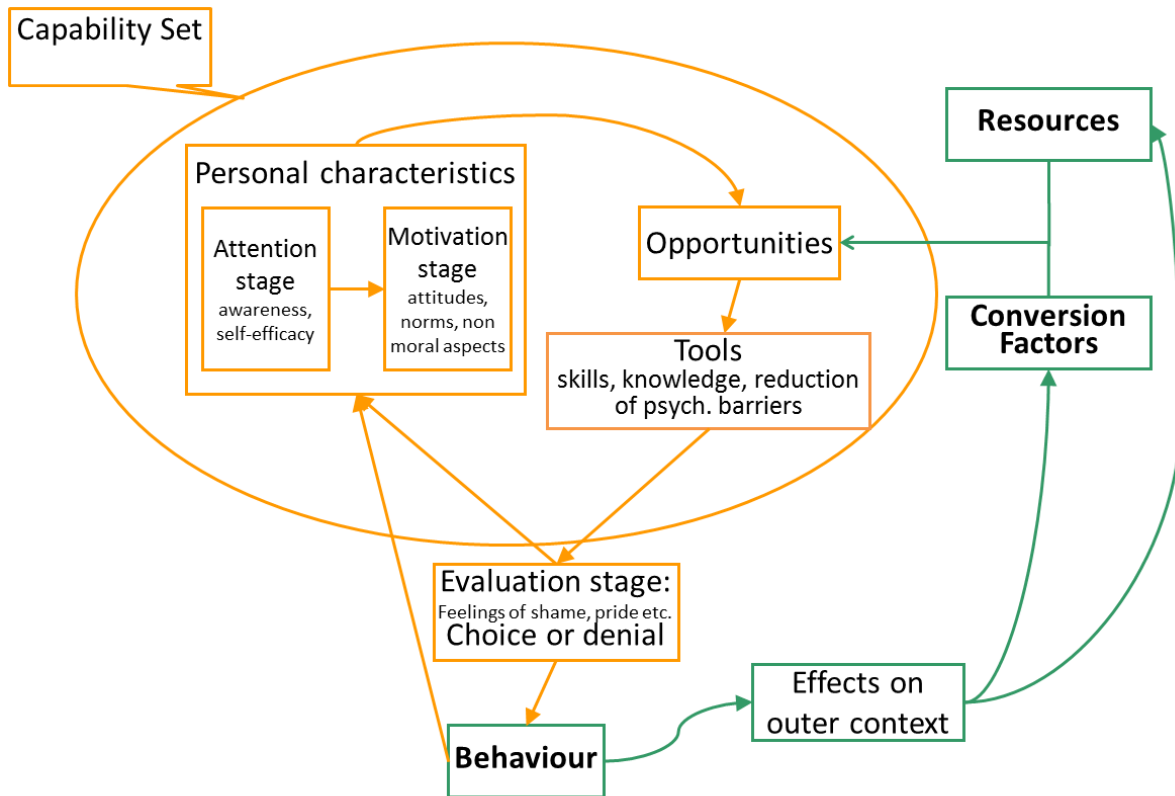


Figure 12: Dynamic norm-activation-capability model

Pro-social behavior therefore depends on the relevant personal and social norms, along with the opportunities and skills, responsibility, self-efficacy, and awareness of the necessity to comply with these norms. The capability set, as the freedoms of a person to act, depends on the characteristics of this person as well as her opportunities and tools. Carrying out a chosen behavior, or denying the need to carry it out, impacts the personal characteristics. Executing it also feeds back to the behavioral context and may change the behavioral opportunities. For example, increased cycling leads to higher traffic security for cyclists.

5.9 CONCLUSION AND OUTLOOK: THE FREEDOM TO BEHAVE PRO-SOCIALLY

Recalling the introduction and the section on SD, strategies that address both altruistic and self-interested motivations for behavior appear particularly promising for strengthening sustainable behavior. Whereas current psychological models have studied this combination (Steg & Vlek, 2009), those approaches cannot be used to assess strategies on societal target variables such as quality of life. Models currently used for such assessments, though, are mostly based on self-interested motivations or do not take into account differences in motivations at all (e.g., Schleich & Mills, 2012). Within CA, which has been used for societal assessments of different kinds of policies, behavior is understood as directed to meet self-interested and other-interested goals. It therefore offers two entrance

points for empowering people to “live a life one has reason to value” including altruistic reasons for behaving sustainably. As CA provides little information on the importance of altruistic reasons or of pro-social behavior within this “life one has reason to value,” intrinsic concepts can enrich CA.

The dynamic norm-activation capability model developed in the preceding section allows designing and assessing efficiency, consistency, and sufficiency SD policies and instruments, as they include psychological considerations with behavioral impacts on the societal target of quality of life via the CA. The following explanations are a starting point for discussions on how to further develop and use the model.

5.9.1 Including the Strengthening of Pro-social, Sustainable Behavior

The model allows for assessing the extent to which a sustainability policy addresses the psychological driving factors of pro-social behavior (such as awareness building or strengthening feelings of self-efficacy and responsibility). It focuses on the psychological empowerment of citizens and consumers, as it enables analysis of whether a policy measure increases the capability set to behave sustainably with regard to the use of resources and conversion factors. The model can be used to derive interventions that strengthen these effects and are intentionally and substantially sustainable.

Matthies et al. (2004) distinguish between intervention approaches that focus on external and internal variables. External variables include technical modifications as well as incentives and punishments that change a given situation; they are the external conditions of behavior. Internal variables are differentiated into norm- and knowledge-centered approaches. The latter strengthen problem- or action- oriented knowledge while the former focus on the activation/strengthening of norms through campaigns or role-models. This differentiation of internal variables may guide the design of effective policies, including sufficiency principles that specify when citizens require more knowledge and when an activation of norms might be more effective. This differentiation might even build a basis for modeling interventions that allow the further development of personal norms to include more consideration of others (cf. Wilber, 2000).

5.9.2 SD Policies Shifting the Focus of Quality of Life

The dynamic norm-activation capability model suggests understanding sufficiency-oriented SD policies not only as restrictions in resource use but as shifts of the capability set toward goals motivated by the well-being of others. Individuals subject to such policies, such as converting car lanes to cycle or public-transport lanes, might lose the self-interested capability to go to work comfortably while gaining the freedom to more easily achieve the other-interested goal to reduce CO₂ emissions. Whether individuals appreciate this new freedom depends on their altruistic motivations and on the individual recognition that the new freedom can meet other-regarding goals. Converting car lanes to cycle lanes may therefore be combined with information and norm-activation campaigns such as those mentioned above. We assume (with no empirical validation so far) that similar feedback effects occur for sustainability issues as for poverty eradication, as described in the section on Pick & Sirkin (2010). This implies that shifting

the capability sets to include intentionally sustainable goals and achievements will have a self-reinforcing aspect. Again, policy effects should reinforce intentional and substantial sustainability.

Our model not only allows psychological analysis, but includes—with the concept of capabilities—a variable that has been used for decades to describe societal progress.²⁹ It therefore allows scholars or politicians to indicate the potential impact of a policy on capabilities and functionings of a person or group. Including psychological and external variables, its application furthermore allows identification of internal and external sources for shifts in capability enhancements or detractions. This might be carried out by analyzing whether the policy is likely to foster a process of intrinsic empowerment that increases the capabilities and functionings available to a person and thereby the advancement of well-being (and agency) goals. Through time-series analysis, one might even get answers as to how durable (intrinsic) empowerment for increasing capabilities and functionings could be achieved.

Nevertheless, the model has limitations for strengthening sufficiency strategies that propagate norms such as voluntary simplicity. Freedom to choose a behavioral alternative is an important factor influencing the probability that a pro-social behavior is chosen. To understand empowerment as increasing the capability to behave only in a pro-social way appears like a contradiction to the original idea of the capability approach itself. Propagating altruistic motives for pro-social behavior may stimulate reactions that lead to opposite effects. It is not evident, though, how to design SD strategies that foster capabilities and increase the likelihood of pro-social behavior without substantially interfering with people's freedom.

Three possible entry points, ranging from more directed to open approaches, are capability ceilings, nudging, and, finally, social learning. First, introducing capability ceilings (Holland, 2008) or bounded capabilities (Jackson, 2009) might be alternatives for political actors to steer capability developments. Holland and Jackson plead for introducing sustainability-motivated limitations to individual capability enhancement on a political level. These limitations might create resistance, but they could also be understood as an enhancement of social norms. Empirical research could clarify this question.

Second, the concept of nudging, making the sustainable behavior alternative the most convenient and easy to recognize, might form an alternative to steer capability developments while not directly limiting individual freedom (Thaler & Sunstein, 2008).³⁰

A third entry point for strengthening both empowerment and pro-social motivations, while not interfering with individual freedom, are social learning approaches that are part of the governance strategy of transition management

²⁹ The most important applications are the UNDP reports on human development, most notably in our context the UNDP (2011) report on sustainability and equity.

³⁰ However, as an anonymous referee pointed out that the idea of nudging itself is contrary to the concept of conscious decision-making prominent in CA and in the psychological models discussed here.

(Grin et al. 2010; cf., Barth 2012). The approach aims to empower people to give a contextualized form to sustainability corresponding to their own demands and environments (Loorbach, 2007), building on a participatory envisioning and experimentation process (for an in-depth discussion, see Schöpke et al. 2013). Processes of joint deliberation and reflection are supposed to allow going beyond individual interests “and create opportunities for a shared understanding and joint action” (Garmendia & Stagl, 2010).

5.9.3 New Well-Being Model

The dynamic norm-activation capability model encompasses variables relevant to the well-being of actors. On the one hand, these variables include normative goals of guaranteeing freedom to live a life one has reason to value. On the other hand, it addresses variables that foster the willingness of actors to behave pro-socially and adopt a sufficiency-oriented lifestyle. It therefore may form the basis for a new well-being model. The newly developed model does not consider behavior intended to realize self- or other-regarding goals as opposites, but offers ways to strengthen individual capabilities that link self- and other-regarding goals and thereby increase overall well-being.

This article has developed a model that explicitly includes the intentions behind sustainable behavior and that can therefore assess efficiency, consistency, and sufficiency strategies for SD, resulting in changes in politically relevant variables such as quality of life. This model delivers a foundation to assess the behavioral impacts of a wider variety of public policies than has been previously possible.

As far as we have been able to discern, combining concepts from environmental psychology and CA in one model is new and much still must be done to specify and improve this approach. We can identify three conceptual questions that require further attention. First, is norm activation, even though widely used in environmental psychology, really the appropriate model to analyze intentionally sustainable behavior? Second, is the link between the norm-activation model and CA via the theory of planned behavior conceptually solid and can it be used empirically? Finally, how should capability sets be measured in the domain of sustainable behavior? Despite the openness of these questions, we have shown that a norm activation–CA link is conceptually feasible and has promise for including sufficiency strategies for SD into analyses and designs of sustainability policies. How this could be done in practice, though, remains to be shown.

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5.10 REFERENCES

- Aarts, H. 1996. Habit and Decision Making: The Case of Travel Mode Choice. Unpublished Doctoral Dissertation. Katholieke Universiteit Nijmegen, The Netherlands.
- Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2):179–211.
- Alcott, B. 2008. The sufficiency strategy: would rich-world frugality lower environmental impact? *Ecological Economics* 64(4):770–786.
- Alkire, S. 2002. Dimensions of human development. *World Development* 30(2):181–205.
- Anand, S. & Sen, A. 1996. *Sustainable Human Development: Concepts and Priorities*. New York: United Nations Development Program.
- Anand, S. & Sen, A. 2000. Human development and economic sustainability. *World Development* 28(12):2029–2049.
- Bamberg, S. & Schmidt, P. 2003. Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz, and Triandis. *Environment and Behavior* 35(2):264–285.
- Bandura, A. 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review* 84(2):191–215.
- Barth, M. 2012. Social learning instead of educating the other. *GAIA* 21(2):91–94.
- Bierhoff, H. & L. Montada. (Eds.). 1988. *Altruismus: Bedingungen der Hilfsbereitschaft*. [Altruism: Conditions of the Willingness to Help]. Göttingen: Hogrefe (in German).
- Christen, M. & Schmidt, S. 2011. A formal framework for conceptions of sustainability: a theoretical contribution to the discourse in sustainable development. *Sustainable Development* 20(6):400–410.
- Cleaver, F. 2000. Moral ecological rationality, institutions and the management of common property resources. *Development and Change* 31(1):361–383.
- Crompton, T. 2010. *Common Cause: The Case for Working with Our Cultural Values*. Surrey: WWF-UK.
- De Groot, J. & Steg, L. 2009. Morality and prosocial behavior: the role of awareness, responsibility, and norms in the norm activation model. *The Journal of Social Psychology* 149(4):425–449.

De Groot, J. & Steg, L. 2009b. Mean or green: which values can promote stable pro-environmental behavior? *Conservation Letters* 2(2):61–66.

De Groot, J. & Steg, L. 2008. Value orientations to explain beliefs related to environmentally significant behavior: how to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior* 40(3):330–354.

De Groot, J. & Steg, L. 2007. Value orientations and environmental beliefs in five countries: validity of an instrument to measure egoistic, altruistic and biospheric value orientations. *Journal of Cross-Cultural Psychology* 38(3):318–332.

De Haan, P., Peters, A., & Scholz, R. 2007. Reducing energy consumption in road transport through hybrid vehicles: investigation of rebound effects, and possible effects of tax rebates. *Journal of Cleaner Production* 15(11):1076–1084.

Di Giulio, A., Brohmann, B., Clausen, J., Defila, R., Fuchs, D., Kaufmann-Hayoz, R., & Koch, A. 2012. Needs and consumption: a conceptual system and its meaning in the context of sustainability. In R. Defila, A. Di Giulio & R. Kaufmann-Hayoz (Eds.), *The Nature of Sustainable Consumption and How to Achieve It*. pp. 45–66. Munich: Oekom Verlag.

Diener, E. & Diener, C. 1995. The wealth of nations revisited: income and quality of life. *Social Indicators Research* 36(3):275–286.

Dolan, P. & White, M. 2007. How can measures of subjective well-being be used to inform public policy? *Perspectives on Psychological Science* 2(1):71–85.

European Environment Agency (EEA). 2013. *Towards a Green Economy in Europe*. Copenhagen: EEA.

Enquete-Kommission. 2013. *Schlussbericht der Enquete-Kommission Wachstum, Wohlstand, Lebensqualität-Wege zu nachhaltigem Wirtschaften und gesellschaftlichem Fortschritt in der Sozialen Marktwirtschaft [Final Report of the Commission of Inquiry on Growth, Prosperity, Quality of Life: Towards a Sustainable Economy and Social Progress in the Social Market Economy]*. Bonn: Deutscher Bundestag (in German).

Fehr, E. & Falk, A. 2002. Psychological foundations of incentives. *European Economic Review* 46(4–5):687–724.

Fishbein, M. & Ajzen, I. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.

Foppa, K. 1989. *Grundlagen einer ipsativen Theorie des Handelns [Foundations of an Ipsative Theory of Action]*. Bern: Institute of Psychology, Bern University (in German).

Frey, B., Oberholzer-Gee, F., & Eichenberger, R. 1996. The old lady visits your backyard: a tale of moral and markets. *Journal of Political Economy* 104(6):1297–1313.

Fuhrer, U. & Wölfling, S. 1997. Von den sozialen Grundlagen des Umweltbewusstseins zum verantwortlichen Umwelthandeln: die sozialpsychologische Dimension globaler Umweltproblematik [From Social Foundations of Environmental Awareness to Responsible Environment-related Behavior: The Social Psychological Dimension of Global Environmental Problems]. Bern: Hans Huber (in German).

Garmendia, E. & Stagl, S. 2010. Public participation for sustainability and social learning: concepts and lessons from three case studies in Europe. *Ecological Economics* 69(8):1712– 1222.

Grin, J., Rotmans, J., & Schot, J. 2010. *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change*. New York: Routledge.

Grisez, G., Boyle, J., & Finnis, J. 1987. Practical principles, moral truth and ultimate ends. *American Journal of Jurisprudence* 32(1):99–151.

Grunwald, A. & Kopfmüller, J. 2006. *Nachhaltigkeit [Sustainability]*. Frankfurt: Campus Verlag (in German).

Grunwald, A. 2010. Wider die Privatisierung der Nachhaltigkeit [Against privatization of sustainability]. *GAIA* 19(3):178–182 (in German).

Grunwald, A. 2011. Statt Privatisierung: Politisierung der Nachhaltigkeit [Instead of privatization: politization of sustainability]. *GAIA* 20:17–19 (in German).

Gutwald, R., Leßmann, O., Masson, T., & Rauschmayer, F. 2014. A capability approach to intergenerational justice? examining the potential of Amartya Sen's ethics with regard to intergenerational issues. *Journal of Human Development and Capabilities* 1–14.

Heidbrink, L. & Reidel, J. 2011. Nachhaltiger Konsum durch politische Selbstbindung: Warum Verbraucher stärker an der Gestaltung von Entscheidungsumwelten mitwirken sollten [Sustainable consumption by way of political self-regulation: why consumers should get increasingly involved in the formation of environments for decision-making]. *GAIA* 20 (3):152–156 (in German).

Heberlein, T. 1972. The land ethic realized: some social psychological explanations for changing environmental attitudes. *Journal of Social Issues* 28(4):241–270.

Helliwell, J., R. Layard, & J. Sachs. (Eds.). 2013. *World Happiness Report 2013*. New York: United Nations Sustainable Network Development Solutions Network.

Hinterberger, F., Hutterer, H., Omann, I., Pirgmaier, E., Giljum, S., Stocker, A., & Teufel, A. 2009. Welches Wachstum ist nachhaltig? Ein Argumentarium. [What kind of growth is sustainable? An argumentation]. In F. Hinterberger, H. Hutterer, I. Omann, & E. Freytag (Eds.), *Welches Wachstum ist nachhaltig? Ein Argumentarium [What Kind of Growth is Sustainable? A Set of Arguments]*. pp. 29–125. Vienna: Mandelbaum Verlag (in German).

Holland, B. 2008. Ecology and the limits of justice: establishing capability ceilings in Nussbaum's capabilities approach. *Journal of Human Development* 9(3):401–425.

Hopper, J. & Nielsen, J. 1991. Recycling as altruistic behavior: normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior* 23(2):195–220.

Hunecke, M., Blöbaum, A., Matthies, E., & Höger, R. 2001. Responsibility and environment: ecological norm orientation and external factors in the domain of travel mode choice behavior. *Environment and Behavior* 33(6):830–852.

Ingebrigtsen, S. & Jakobsen, O. 2009. Moral development of the economic actor. *Ecological Economics* 68(11):2777–2784.

Jackson, T. 2005. Live better by consuming less? Is there a “double dividend” in sustainable consumption? *Journal of Industrial Ecology* 9(1):19–36.

Jackson, T. 2009. *Prosperity Without Growth: Economics for a Finite Planet*. London: Earthscan.

Joireman, J., Lasane, T., Bennett, J., Richards, D., & Solaimani, S. 2001. Integrating social value orientation and the consideration of future consequences within the extended norm activation model of proenvironmental behavior. *British Journal of Social Psychology* 40(1):133–155.

Kahneman, D. & Sugden, R. 2005. Experienced utility as a standard of policy evaluation. *Environmental and Resource Economics* 32(1):161–181.

Kallis, G. 2011. In defence of degrowth. *Ecological Economics* 70(5):873–880.

Kals, E. & Russel, Y. 2000. Umweltschützendes Handeln: eine rationale Entscheidung für den Gesundheitsschutz? [Pro-environmental behavior: a rational choice for health-protection?]. *Umweltpsychologie* 4(2):44–59 (in German).

Kaufmann-Hayoz, R., Bruppacher, S., Harms, S., & Thiemann, K. 2010. Einfluss und Beeinflussung externer Bedingungen umweltschützenden Handelns [Influence and interaction of external conditions of pro-environmental behavior]. In E. Lantermann & V. Linneweber (Eds.), *Enzyklopädie der Umweltpsychologie: Grundlagen, Paradigmen und Methoden der Umweltpsychologie [Encyclopedia of Environmental Psychology: Principles, Paradigms and Methods of Environmental Psychology]*. pp. 721–757. Göttingen: Hogrefe-Verlag (in German).

- Kaufmann-Hayoz, R., Bamberg, S., Defila, R., Dehmel, C., Di Giulio, A., Jaeger-Erben, M., Matthies, E., Sunderer, G., & Zundel, S. 2012. Theoretical perspectives on consumer behavior: attempt at establishing an order to the theories. In R. Defila, A. Di Giulio, & R. Kaufmann-Hayoz. (Eds.), *The Nature of Sustainable Consumption and How to Achieve It*. pp. 81–112. Munich: Oekom Verlag.
- Kerr, J., Vardhan, M., & Jindal, R. 2011. Prosocial behavior and incentives: evidence from field experiments in rural Mexico and Tanzania. *Ecological Economics* 73:220–227.
- Kleinhüchelkotten, S. 2005. *Suffizienz und Lebensstile: Ansätze für eine milieuorientierte Nachhaltigkeitskommunikation [Sufficiency and Life-Styles: Approaches for Milieu-oriented Sustainability Communication]*. Berlin: BWV (in German).
- Klöckner, C. & Matthies, E. 2004. How habits interfere with norm-directed behavior: a normative decision-making model for travel mode choice. *Journal of Environmental Psychology* 24(3):319–327.
- Knickerbocker, R. 2003. Prosocial Behavior. <http://learningtogive.org/papers/paper52.html>. January 22, 2014.
- Kopfmüller, J., Brandl, V., Jörissen, J., Paetau, M., Banse, G., Coenen, R., & Grunwald, A. 2001. *Nachhaltige Entwicklung integrativ betrachtet: konstitutive Elemente, Regeln, Indikatoren [An Integrative Approach to Sustainable Development: Building Blocks, Rules, Indicators]*. Berlin: Sigma (in German).
- Leach, M., Scoones, I., & Stirling, A. 2010. *Dynamic Sustainabilities: Technology, Environment, Social Justice*. London: Earthscan.
- Leßmann, O. 2011. Sustainability as a challenge to sustainable development. In F. Rauschmayer, I. Omann, & J. Fröhmann. (Eds.), *Sustainable Development: Capabilities, Needs, and Well-Being*. pp. 43–61. London: Routledge.
- Leßmann, O. & Rauschmayer, F. 2013. Re-conceptualising sustainable development on the basis of the capability approach: a model and its difficulties. *Journal of Human Development and Capabilities* 14(1):95–114.
- Linz, M., Bartelmus, P., Hennicke, P., Jungkeit, R., Sachs, W., Scherhorn, G., Wilke, G., & von Winterfeld, U. 2002. *Von nichts zu viel: Suffizienz gehört zur Zukunftsfähigkeit [The Right Amount of Everything: Sufficiency is Part of Sustainability]*. Wuppertal: Wuppertal Institute (in German).
- Lishner, D. & Stocks, E. 2008. Altruism. In W. Darity (Ed.), *International Encyclopedia of the Social Sciences*. pp. 87–88. Detroit: Macmillan.
- Loorbach, D. 2007. *Transition Management: New Mode of Governance for Sustainable Development*. Chicago: IPG Books.

- Lovins, A., Lovins, L., & Weizsäcker, E. 1998. *Factor Four: Doubling Wealth, Halving Resource Use*. London: Earthscan.
- Madlener, R. & Alcott, B. 2011. Herausforderungen für eine technisch-ökonomische Entkoppelung von Naturverbrauch und Wirtschaftswachstum unter besonderer Berücksichtigung der Systematisierung von Rebound-Effekten und Problemverschiebungen [Challenges of a Technical-Economic Decoupling of Natural Resource Consumption and Economic Growth with a Particular Focus on Systematizing Rebound Effects and Problem-Shifts]. Aachen: Rheinisch-Westfälische Technische Hochschule (in German).
- Maslow, A. 1987. *Motivation and Personality*, 3rd ed. New York: Pearson Longman.
- Max-Neef, M. 1991. *Human Scale Development: Conception, Application and Further Reflections*. London: Apex Press.
- Matthies, E. & Homburg, A. 2001. Umweltpsychologie [Environmental psychology]. In F. Müller-Rommel (Ed.), *Studium der Umweltwissenschaften. Bd. 2: Sozial- und Erziehungswissenschaften* [Study of Environmental Science. Vol 2: Social Sciences and Education]. pp. 95–124 Berlin: Springer (in German).
- Matthies, E. Homberger, I. Matthäus, S. Engelke, P., & Moczek, N. 2004. *Lokale Agenda Prozesse psychologisch steuern*. [Local Agenda: Guiding Processes Psychologically] Lengerich: Pabst Science (in German).
- Molinsky, A., Grant, A., & Margolis, J. 2012. The bedside manner of homo economicus: how and why priming an economic schema reduces compassion. *Organizational Behavior and Human Decision Processes* 119(1):27–37.
- Neumayer, E. 2010. *Weak Versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*. Northampton, MA: Edward Elgar.
- Nussbaum, M. 1993. Human behavior and social justice: on defense of Aristotelian essentialism. In M. Brumlik & H. Brunkhorst (Eds.), *Gemeinschaft und Gerechtigkeit* [Community and Justice]. pp. 323–361. Frankfurt: Fischer
- Nussbaum, M. 2000. *Women and Human Development: The Capabilities Approach*. New York: Cambridge University Press. Nussbaum, M. 2011. *Creating Capabilities: The Human Development Approach*. Cambridge, MA: Belknap Press.
- Osaldiston, R. & Schott, J. 2012. Environmental sustainability and behavioral science: meta-analysis of proenvironmental behavior experiments. *Environment and Behavior* 44(2):257– 299.
- Ott, K. & Döhring, R. 2008. *Theorie und Praxis starker Nachhaltigkeit* [Theory and Praxis of Strong Sustainability]. Marburg: Metropolis (in German).

- Peters, A., Sonnberger, M., Dütschke, E., & Deuschle, J. 2012. Theoretical Perspective on Rebound Effects from a Social Science Point of View: Working Paper to Prepare Empirical Psychological and Sociological Studies in the REBOUND Project. Working Paper Sustainability and Innovation, No. S2/2012. Karlsruhe: Fraunhofer ISI.
- Pick, S. & Sirkin, J. 2010. *Breaking the Poverty Cycle: The Human Basis for Sustainable Development*. New York: Oxford University Press.
- Rauschmayer, F., Omann, I., & Frühmann, J. 2011. Needs, capabilities, and quality of life: reconceptualizing sustainable development. In F. Rauschmayer, I. Omann, & J. Frühmann, J. (Eds.), *Sustainable Development: Capabilities, Needs, and Well-Being*. pp. 1–24. New York: Routledge.
- Rauschmayer, F. & Leßmann, O. 2013. Editorial: The capability approach and sustainability. *Journal of Human Development and Capabilities* 14(1):1–5.
- Reisch, L. & I. Røpke (Eds.). 2004. *The Ecological Economics of Consumption: Perspectives from Ecological Economics*. Northampton, MA: Edward Elgar.
- Robeyns, I., 2005. The capability approach: a theoretical survey. *Journal of Human Development* 6(1):93–117.
- Sachverständigenrat für Umweltfragen (SRU). 2011. *Wege zur 100% erneuerbaren Stromversorgung [Ways to 100% Renewable Electricity Supply]*. Berlin: Erich Schmidt Verlag.
- Santarius, T. 2012. *Green Growth Unravelling: How Rebound Effects Baffle Sustainability Targets When the Economy Keeps Growing*. Berlin: Heinrich Böll Foundation.
- Schäpke, N. 2011. *Integrale Nachhaltige Entwicklung: der Beitrag der Integralen Theorie Ken Wilbers zu einer ganzheitlichen Sichtweise Nachhaltiger Entwicklung [Integral Sustainable Development: The Contribution of Ken Wilbers' Integral Theory to a Holistic Understanding of Sustainable Development]*. Saarbrücken: VDM Verlag (in German).
- Schäpke, N. & Rauschmayer, F. 2011. *Foundations for a Common Approach: Systematic Reflection and Theory Building*. Berlin: InContext.
- Schäpke, N., Omann, I., Mock, M., Wittmayer, J., & von Raggamby, A. 2013. *Supporting Sustainability Transitions by Enhancing the Human Dimension via Empowerment, Social Learning and Social Capital*. SCORAI Europe Workshop. October 7–8, Rotterdam, The Netherlands.
- Schleich, J. & Mills, B. 2012. Determinants and distributional implications in the purchase of energy-efficient household appliances. In R. Defila, A. Di Giulio, & R. Kaufmann-Hayoz. (Eds.), *The Nature of Sustainable Consumption and How to Achieve it*. pp. 181–192. Munich: Oekom.

- Schneider, F., Kallis, G., & Martinez-Alier, J. 2010. Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. *Journal of Cleaner Production* 18(6):511–518.
- Schneidewind, U. 2013. Wandel verstehen: auf dem Weg zu einer “Transformative Literacy” [Understanding change: towards a Transformative Literacy]. In H. Welzer & K. Wiegandt (Eds.), *Wege aus der Wachstumsgesellschaft* [Ways out of the Growth Society]. pp. 115–140. Frankfurt: Fischer (in German).
- Schwartz, S. 1977. Normative influences on altruism. In L. Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology*. pp. 221–279. New York: Academic Press.
- Schwartz, S. & Howard, J. 1981. A normative decision-making model of altruism. In J. Rushton & R. Sorrentino (Eds.), *Altruism and Helping Behavior*. pp. 189–211. Hillsdale, NY: Erlbaum.
- Sen, A. 1977. Rational fools: a critique of the behavioral foundations of economic theory. *Philosophy and Public Affairs* 6(4): 317–344.
- Sen, A. 1985. Well-being, agency, and freedom: the Dewey Lectures 1984. *Journal of Philosophy* 82(4):169–221.
- Sen, A. 1987a. *Commodities and Capabilities*. Amsterdam: North Holland.
- Sen, A. 1987b. *On Ethics and Economics*. Malden, MA: Blackwell.
- Siebenhüner, B. 2011. Kann die Politik es richten? Konsument(inn)en als politische Akteure [Can policy do it right? consumers as political actors]. *GAIA* 20(1):14–16 (in German).
- Sorell, S. & Dimitropoulos, J. 2008. The rebound effect: micro-economic definitions, limitations and extensions. *Ecological Economics* 65(3):636–649.
- Sorrell, S. 2010. Energy, economic growth and environmental sustainability: five propositions. *Sustainability* 2(6):1784–1809
- Steg, L. & Vlek, C. 2009. Encouraging pro-environmental behavior: an integrative review and research agenda. *Journal of Environmental Psychology* 29(3):309–317.
- Stengel, O. 2011. Weniger ist schwer: Barrieren in der Umsetzung suffizienter Lebensstile; und wie wir sie überwinden können [Less is more difficult: barriers to the realization of sufficiency oriented lifestyles; and how they can be overcome]. *GAIA* 20(1):26–30 (in German).
- Stern, P., Dietz, T., Gregory, T., Guagnano, A., & Kalof, L. 1999. A value-belief-norm theory of support for social movements: the case of environmentalism. *Human Ecology Review* 6(2):81–98.

Triandis, H. 1977. *Interpersonal Behavior*. Monterey, CA: Brooks/Cole.

Twenge, J., Baumeister, R., DeWall, N., Ciarocco, N., & Bartels, M. 2007. Social exclusion decreases prosocial behavior. *Journal of Personality and Social Psychology* 92(1):56–66.

Thaler, R. & Sunstein, C. 2008. *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New York: Penguin.

Tyler, T., Orwin, R., & Schurer, L. 1982. Defensive denial and high cost prosocial behavior. *Basic and Applied Social Psychology* 3(4):267–281.

United Nations Development Program (UNDP). 2011. *Human Development Report 2011: Sustainability and Equity: A Better Future For All*. New York: Palgrave.

Ura, K., Alkire, S., & Zangmo, T. 2012. *GNH and GNH Index*. Bhutan: Centre for Bhutan Studies.

Vatn, A. 2009. Cooperative behavior and institutions. *The Journal of Socio-Economics* 38(1):188–196.

Vlek, C. 2000. Essential psychology for environmental policy making. *International Journal of Psychology* 35(2):153–167.

Welsch, H. 2009. Implications of happiness research for environmental economics. *Ecological Economics* 68(11):2735–2742.

Wilber, K. 2000. *Integral Psychology: Consciousness, Spirit, Psychology, Therapy*. Boston, MA: Shambhala.

World Commission on Environment and Development (WCED). 1987. *Our Common Future*. New York: Oxford University Press.

6 MAKING SENSE OF SUSTAINABILITY TRANSITIONS LOCALLY: HOW ACTION RESEARCH CONTRIBUTES TO ADDRESSING SOCIETAL CHALLENGES

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Abstract

Today's society is facing a broad array of societal challenges, such as an unstable economic system, climate change and lasting poverty. There are no straightforward solutions, rather these challenges ask for fundamental societal changes, that is, sustainability transitions. Faced with the question of how these challenges can be understood and dealt with, we argue for action research as a promising approach. Focusing on their localized manifestations, we ask whether and how action research can support understanding and addressing societal challenges and making sustainability meaningful locally. We tackle this question on the basis of two case studies in local communities based on principles of transition management. Our main finding is that societal challenges, sustainability and sustainability transitions acquire meaning through practice and interactions in the local context. Action research can offer a space in which alternative ideas (e.g., knowledge, future visions), practices (e.g., practical experiments, transformative action) and social relations (e.g., new actors) can emerge to further a sustainability transition.

KEYWORDS

action research; sustainability transition; societal challenges; sustainability; transition management

Status

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6.1 INTRODUCTION

Today's society must face numerous challenges, including climate change, the public debt crisis, an unstable financial and economic system, an ageing population, poverty and work migration flows. No straightforward solutions exist, as these challenges are disputed, normative, context-dependent and long-term, and involve multiple actors (Rittel and Webber 1973, Hisschemöller 1993). Following Grin et al. (2010), these challenges are symptomatic of or represent more fundamental persistent problems, which can only be resolved by a systemic shift, a transition.

Although of a global nature, it is at the local scale – in urban neighborhoods, communities, towns, cities and regions – that we most noticeably interact with these challenges. Here, they are contested, deconstructed and reconstructed, thereby becoming 'indigenized' (Appadurai 1990). How then, given their intrinsic diversity, can these challenges be understood and dealt with?

To answer this question, we propose a twofold approach: on the one hand, we relate societal challenges to debates about a desired future, that is, sustainability. On the other hand, we relate them to a process of change, that is, a transition. Combining these two concepts, Grin et al. (2010, p. 1) propose an understanding of sustainability transitions as 'a radical transformation towards a sustainable society as a response to a number of persistent problems confronting contemporary modern societies'. There is a growing body of research analyzing these transitions as long-term radical changes of societal systems (Van den Bergh et al. 2011, Markard et al. 2012). While many transition scholars focus on the global scale, we aim to explore local manifestations. In doing so, we propose to use an action research approach, which seeks to put 'social research to use for democratic social change' (Greenwood and Levin 2007, p. 5).

The main aim of this article is to explore whether and how action research can support communities in understanding and addressing societal challenges and making sustainability meaningful locally. In addressing this question, we discuss the benefits and dilemmas of an action research approach. We draw upon our experiences as action researchers in two European communities, Rotterdam–Carnisse (the Netherlands) and Finkenstein (Austria). The former is a neighborhood often portrayed as impoverished and is inhabited by residents who feel stigmatized and powerless in improving their living environment. The latter is a rural community of high potential, due to its geographical, natural and cultural setting, and heritage. This has, however, been hampered by low participation, lacking social cohesion and conflicting interests between geographically dispersed community members. Action research helped us to create and maintain a space for interaction between all involved. Both societal challenges and sustainability acquire meaning in such an interactive space and become grounded in a specific location and context. We suggest that alternative ideas, practices and social relations can emerge from these spaces to address societal challenges.

In Section 6.2, we begin by introducing the core concepts: sustainability linked to societal challenges, sustainability transitions as a change process to address these challenges and action research as a practice to combine understanding and addressing societal challenges. In Section 6.3, we introduce the specific action research approach we

used, the community arena, before analyzing its practice in Finkenstein and Rotterdam–Carnisse in Section 6.4. We then discuss contextualized meanings of sustainability, the importance of interactive and geographical space in sustainability transitions and the role of the action researcher.

6.2 SUSTAINABILITY, SOCIETAL CHALLENGES, TRANSITIONS AND ACTION RESEARCH

To understand and address societal challenges, we turn to two bodies of scholarship: on the one hand, sustainability research, which looks at desired futures for addressing societal challenges; on the other hand, (sustainability) transitions research, which focuses on understanding and governing transformational change processes. We introduce action research as a third notion, as it engages with these kinds of questions and seeks to make them intelligible. In this section, we establish an understanding of these three core notions and set the scene for our cases studies.

6.2.1 Societal challenges and sustainability

Sustainable development and sustainability³¹ have become important concepts and normative guiding principles for international policymaking since the late 1980s. The Brundtland report established an understanding of sustainable development as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED 1987). Many understand this principle as a claim for inter- and intra-generational justice and for balancing economic development, social justice and environmental protection (see discussion in Hopwood et al. 2005). Five years later, numerous governments ranked sustainable development as a top priority at the United Nations Conference on Environment and Development in Rio de Janeiro. Linking the environment and development discourses, sustainable development became defined as the ‘integration of environment and development concerns’ focusing on ‘the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future’ (UNCED 1992, Ch. 1).

Though it is beyond the scope of our article to give a complete overview of the competing political trends and policy frameworks (see Dryzek 1997, Hopwood et al. 2005, Connelly 2007), we would like to highlight three points: first, sustainable development, while strongly influenced by its environmentalist roots, is increasingly broadened to include other aspects, such as social justice and poverty reduction (O’Riordan 2009). Second, societal challenges and sustainability are inherently ambiguous, contested and normative (Connelly 2007). These concepts are therefore of a political nature; their use and definition require societal deliberation. This implies that striving for sustainability means taking dynamics into account and recognizing the plural and political nature of the meaningmaking process (Leach et al. 2010). Third, we point to the inherent tension between a universal understanding of sustainability and the apparent need for a continuous meaningmaking process. Miller (2013) draws a helpful distinction between universal and procedural understandings of sustainability, with the former embodied through, for example, the

³¹ We use the concepts of sustainability and sustainable development as synonyms in this article since this is common practice in related scientific discourses. For an in-depth analysis of commonalities and differences between both concepts and terms see, for example, Lélé (1991).

Brundtland definition and the latter in what he calls ‘a process for identifying important societal values and pathways for a desirable future’ (Miller 2013, p. 285).

6.2.2 Societal challenges, sustainability transitions and (their) governance

Societal challenges can best be regarded as ‘persistent problems’ (Grin et al. 2010, pp. 107–108): problems deeply embedded in society. They involve a multitude of interrelated actors, domains and scale-levels, and have no obvious points of leverage. To address them, scholars suggest that fundamental long-term changes are needed – sustainability transitions (O’Riordan and Voisey 1997, Grin et al. 2010). The notion of a sustainability transition is helpful in analyzing current societal dynamics (e.g., as expressed through societal challenges) by combining the direction of change (i.e., sustainable development rather than, for example, mere economic growth) with a specific process (i.e., transition rather than, for example, optimization). Fundamental change, however, is far from straightforward: ‘it will require major changes to existing structures (e.g., institutions and markets), cultures (e.g., the culture of consumerism), and practices (e.g., unsustainable practices such as resource exploitation)’ (Frantzeskaki et al. 2012, p. 24). In addition, though transitions may not necessarily lead to more sustainable system configurations, governance, research and facilitation may work in favor of it (Rotmans and Loorbach 2009).

Part of sustainability transitions research focuses on governance – how actors (can) influence the movement toward sustainability (Grin et al. 2010). Transition management is one of the main approaches (Loorbach 2010, Markard et al. 2012) in this regard and explicitly seeks to address persistent societal problems. It is described as an iterative, reflexive and complexity-based governance approach that postulates that there is neither a clear-cut meaning for the goal of sustainable development, nor an explicit process to lead our societies in that direction. In Miller’s terms (Miller 2013), transition management combines the universal (e.g., Brundtland definition) and procedural definitions of sustainability (i.e., the need for contextualization and deliberation) (see also Frantzeskaki et al. 2012). While sustainability is seen as ‘the baseline from which dialogue begins’ (van Buuren and Loorbach 2009, p. 387), transition management advocates a collective meaning-making process.

Belying its name, transition management is not about management, but about organizing process and content through ‘an interactive and selective participatory stakeholder searching process aimed at learning and experimenting’ (Grin et al. 2010, p. 140). By developing and nurturing alternatives – referred to as niches or micro developments – the incumbent regime (i.e., the dominant structure, culture and practices of a societal system) can be superseded and society transformed (Grin et al. 2010). Part of influencing transitions is thus the creation of space for ideas, activities and actors to innovate and search for alternatives (Loorbach 2007, 2010).

The body of literature on transition management also debates issues of politics, power and agency (Shove and Walker 2007, Hendriks 2009, Meadowcroft 2009, Voß and Bornemann 2011), as its practice gives rise to questions such as: who is (not) organizing the process, who defines what is (not) sustainable, who is (not) invited to the process, which challenges are (not) addressed, and which solutions are (not) explored, and why? Action research offers a way to address these questions.

6.2.3 Action research

Action research aims to address and possibly solve real-life problems. It is mostly about normative notions comparable to sustainability, namely the enhancement of human flourishing, emancipation, democracy and the empowerment of those involved (Greenwood and Levin 2007, Reason and Bradbury 2008).

Action research has a long history reaching back to the work of John Dewey and Kurt Lewin in the early twentieth century. It spans approaches to collaborative research from different traditions, which share three elements: action (i.e., real-world change), research (i.e., the generation of new scientific knowledge) and participation (i.e., the collaboration of scientists with practitioners) (Greenwood and Levin 2007). In general, action research can be understood as the collaborative production of scientifically and socially relevant knowledge, transformative action and new social relations, through a participatory process addressing a particular question formed in the interaction between researchers and other actors (Dick 2004, Greenwood and Levin 2007, Reason and Bradbury 2008, Kemmis 2010). These characteristics make it an interesting approach for interpretive and critical policy analysis and closely related to dialogical approaches therein (Wagenaar 2011, Bartels and Wittmayer 2014 (this issue)).

Kemmis (2010, p. 425 emphasis in original) establishes an explicit relation between the process dimension of action research and the broad normative aim of sustainability: 'Action research aims to explore new ways of doing things, new ways of thinking, and new ways of relating to one another and to the world in the interest of finding those new ways that are more likely to be for the good of each person and for the good of humankind, and more likely to help us live sustainably'. As such, we see this approach as suitable for understanding and addressing broader societal challenges and their local manifestations. We share this aspect with researchers who focus on the governance of sustainability transitions (e.g., transition management) and either advocate or use action-research-based approaches (Schot and Geels 2008, Avelino 2011, Loorbach et al. 2011, Audet and Guyonnaud 2013, Audet 2014).

In this section, we introduced a basic understanding of our main concepts. Sustainability is taken as both a normative notion about a desired future in which societal challenges have been addressed and a continuous meaning-making process. Sustainability requires fundamental change processes in our society's fabric, understood as sustainability transitions. To facilitate sustainability transitions, rather than other kind of transitions, scholars postulate a reflexive governance approach referred to as transition management. Transition management can be practiced through an action research approach, which combines a normative agenda and a transdisciplinary research process. In this way, an interactive space is created between researchers and practitioners, where alternative ideas (e.g., knowledge, discourses, visions), practices (e.g., transformative action, experimentation, learning) and social relations (e.g., actors) that further sustainability transitions are developed and nurtured. By opening this interactive space for alternatives, transition management as action research has the potential to render societal challenges and their possible answers meaningful in a specific locality

6.3 THE COMMUNITY ARENA: SPACE FOR SUSTAINABILITY TRANSITIONS

As part of an EU FP7 research project, InContext, a consortium of researchers explored the context for sustainable behavior and the transformative potential of communities in addressing societal challenges. The project did so through theory development, case study work and action research. In this section, we outline the action research methodology that was developed: its basis, aims and the process it foresees.

The community arena methodology is largely based on the governance framework of transition management. Building on complex systems, governance and social theories, Loorbach (2010) proposes a number of tenets for transition management. Among others, these tenets suggest that: (1) process and content are inseparable (i.e., a system cannot be influenced without knowledge of it); (2) the participation of a variety of stakeholders is necessary for social learning, for a diversity of solutions and for supported outcomes; (3) a system cannot be effectively influenced from the outside; one becomes part of the system one aims to change; and (4) the creation of space is necessary for alternatives to emerge. These principles have been translated into a governance framework with activities at different levels – strategic (e.g., problem structuring, visioning), tactical (e.g., agenda setting, coalition forming), operational (e.g., experimenting) and reflexive (e.g., monitoring, learning) (Loorbach 2010).

The main aim of the community arena methodology was to empower communities to live more sustainably. There is an interactive space at the heart of the community arena, where researchers and stakeholders come together to reflect and act upon their individual and collective needs, values and beliefs, as well as the current situation of the community and desired future developments. Based on the action research (Greenwood and Levin 2007, Kemmis 2010) and transition management literature (Loorbach 2007, 2010, Grin et al. 2010), this is the locus for developing and nurturing alternative ideas, practices and social relations, all of which further sustainability transitions. While this interactive space is of an abstract nature, it is situated within specific social, geographical, economic, ecological and political contexts.

The community arena methodology includes a process design spanning five phases (Wittmayer et al. 2011a).

- In the *Preparation and Exploration phase* (phase 1), a team of researchers and at times locally relevant persons prepares a first (actor and system) analysis based on interviews, participant observation and document analysis. The team not only prepares, documents, analyses, monitors, co-ordinates, manages and facilitates the whole process, but also selects its participants.
- In phase 2, the *Problem Structuring and Visioning phase*, the team invites some 10–15 engaged individuals with divergent or alternative worldviews from the local community – referred to as change agents or front-runners. During several meetings, they discuss the status quo (what is the problem and what are the current societal challenges?) and envision a sustainable future for their community in 2030.
- In the third phase, *Backcasting, Pathways & Agenda*, the group formulates pathways and milestones for realizing this future by reasoning back from the future to the present. The process results in a change narrative, as well as immediate action points – the transition agenda.

- As part of the fourth phase, *Experimenting and Implementing*, the agenda is presented to the wider community and put into practice through a number of experiments or projects.

In the final phase, Monitoring & Evaluation (ideally taking place in parallel to the others), the goal is to make learning from process and experimentation about the current situation, the (desired) future and corresponding pathways explicit.

To put this framework into practice, various terms and processes need to be made explicit and adapted to a specific context. Answers have to be found to questions such as: what are 'alternative' worldviews? Who are front-runners or change agents? How to address sustainability in the community arena? We outline our choices in the case descriptions and discuss them in Section 6.5.

6.4 CASE STUDIES

In the following, we analyze the implementation of the community arena in Rotterdam–Carnisse and Finkenstein. For each case, we first introduce the local context, before describing how societal challenges were understood. We then analyze how the societal challenges in each community were addressed. Rather than looking at each challenge separately, we continue to focus on process and content. Thus, we examine how (1) the community arena process, (2) the resulting vision and transition agenda and (3) the resulting experimental activities led to the production of alternative ideas, practices and social relations to address the challenges faced by these communities.

Taken together, the answers to these questions lead to a contextualized understanding of societal challenges and sustainability, which we further discuss in Section 6.5. Our analysis includes a reflection on the intricacies of using action research as an approach to understand and address societal challenges in the two cases. We base our descriptions on project documentation³² and methods that are outlined in the text.

6.4.1 Rotterdam–Carnisse

Context

Carnisse is a neighborhood in the city of Rotterdam, the Netherlands, with some 11,000 (out of Rotterdam's 600,000) inhabitants. As part of Rotterdam South, Carnisse is currently labelled as 'neighborhood of extra interest' by the national government and scores low on a number of municipal indexes (e.g., social and security index). The first and third authors were involved as action researchers in the period from September 2010 to March 2013. We conducted some 60 interviews, did participant observation and document research, had informal contacts on numerous occasions, as well as organized and facilitated 13 participatory meetings. For an overview of the process, see Figure 13.

³² The process and outcomes of our action research in both Carnisse and Finkenstein are documented in a number of deliverables of the InContext project (see Wittmayer et al. 2011a, 2011b, 2012, 2013a, 2013b, 2013c).

Based on the system and actor analysis (via interviews, participant observation and document analysis) and a pre-meeting with key interviewees, we adapted the initial process design. The deliberative process was started in parallel (rather than consecutive) to practical experimentation in February 2012. The deliberative process gathered about 15 local change agents to frame the present situation in Carnisse, envision their neighbourhood in 2030 and draw pathways toward this future in five meetings. The resulting future narrative, entitled ‘Blossoming Carnisse’, was shared with the neighborhood during a public meeting in November 2012. The practical experimentation focused on the reopening of a local community center, which was taken as a symbol of the current and possible future state of Carnisse, thereby acting as a link between the two processes. The community arena was rounded off with an evaluation meeting in spring 2013.

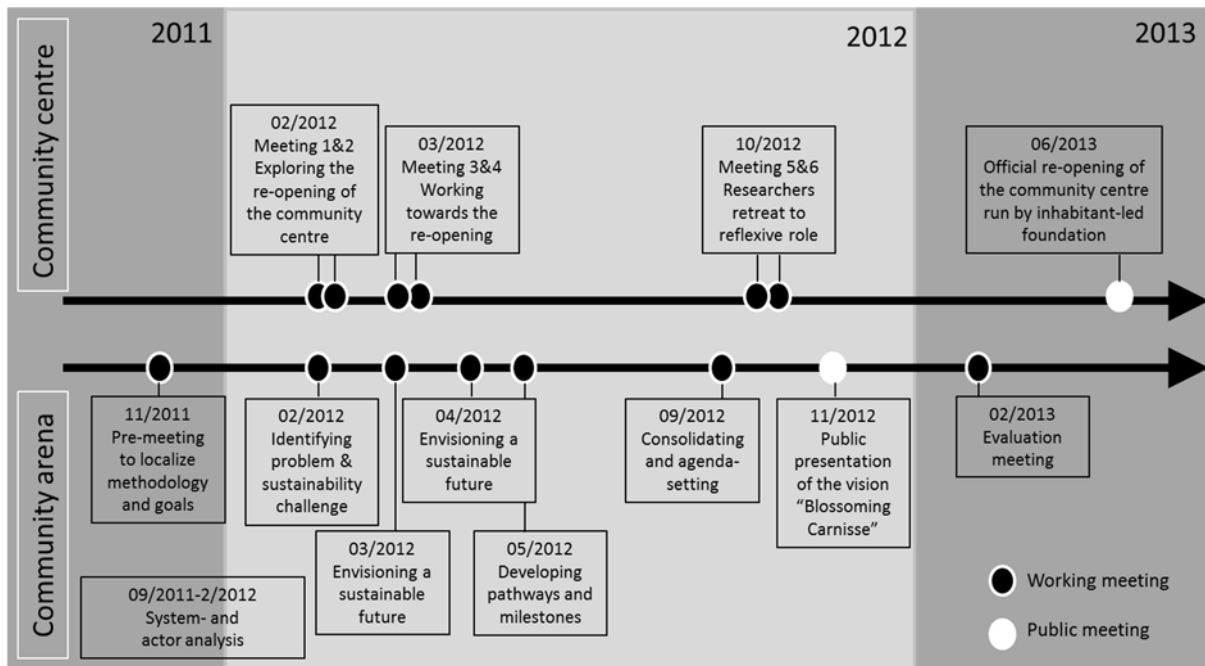


Figure 13: Timeline of the community arena process in Carnisse (slightly modified from Wittmayer and Schöpke 2014).

UNDERSTANDING SOCIETAL CHALLENGES IN CARNISSE

In the pre-meeting, the overall aim of the action research process was defined as supporting and stimulating inhabitants to shape and take ownership of the future of their neighbourhood and formulate desired (government) activities. The researchers decided not to invite local policy officers, as they seemed trapped in the dominant policy discourse (i.e., ‘deprived neighborhood’) and, above all, expressed disinterest in envisioning a future Carnisse through an open and participatory process. Building on the researchers’ system analysis, participants extensively discussed the state and challenges of Carnisse during the first meetings. These challenges were embedded in a historical framing of the neighbourhood and its ‘rich and turbulent history’. The researchers summarized it as follows:

- (1) **Struggle for survival:** Carnisse is known as a working-class neighborhood, with poverty, low incomes and a small array of shops. The economic crisis and the accompanying government budget cuts left deep marks, and old welfare structures were being dismantled, such as public facilities, the local inhabitant organization, the welfare organization and the district municipality.
- (2) **The individual and the collective:** Increasing individualization in Carnisse allows for personal freedom, but also means that greeting each other has become an exception rather than the norm. While everybody seems to 'be busy with their own lives' (Interviewee A, 2011), there is a common longing for more cohesion and a 'shared neighborhood feeling' (Interviewee B, 2011). This goes beyond individuals and includes a longing for more synergy and cross-pollination between institutional actors.
- (3) **Diversity:** While the neighborhood is diverse in some regards – hosting about 170 nationalities, many different official churches and a variety of worldviews – , it is less so in terms of housing stock, street scenes, public space and shops. Many inhabitants expressed their frustration with the negative image of a 'deprived neighborhood' and were eager to relativize it by pointing to the many initiatives that were arising from within the community.
- (4) **Connectedness:** Carnisse shows relatively high degrees of migration. The young, poorly educated and newly arrived immigrants move in, and the relatively better-off move out (usually starting families). This constant flow of people hinders bonding between people and the laying down of roots; Carnisse is seen as a transit station toward a better living environment. There is, however, a stable core of people with a nostalgic sense of the past, and places such as schools, churches and community centers that support the establishment of bonds.
- (5) **Public space:** The quality of the housing stock in Carnisse is poor, which is related to the high degree of private ownership by large investors. The uncared-for exteriors give the neighborhood a desolate look, and the old interiors exacerbate social and economic problems. The public space is neglected and unappealing (e.g., there are few parks or green spaces), and many complain about it.

As researchers, we formulated the overall challenge as an orientation toward future thinking (rather than short-termism), with resilient and innovative practices (rather than cramped and nostalgic ones) based on an attitude of learning from alternatives (rather than controlling risks) (Van Steenbergen and Wittmayer 2012).

Addressing societal challenges in Carnisse

First, we put the process design and overall agenda up for discussion – most prominently during the pre-meeting, but also throughout the deliberative meetings. In doing so, we hoped to build a sense of shared ownership of process and outcome and thereby create a new practice: a group of inhabitants discussing and filling an open agenda according to their insights and concerns. This attitude and novel practice proved hard to maintain. The participants, while being attracted by the open agenda of the process, were used to outsiders giving clear directions and also expected this from us as researchers. In the feedback, it was mentioned that we 'should have been more decisive' (Interviewee C, 2013). Ultimately, it proved hard to strike a balance between fulfilling the need and wish for a

process/content leader and offering an encouraging space for initiative, learning and interaction. By acting as we did, we prompted the definition of a new actor: ‘activating researchers’ (Participant A, 2011), and an alternative interpretation of what an outsider – a researcher – does: ‘... that you come along on the path of change and all that is part of it’ (Participant B, 2011). This led to changing relations between residents and researchers.

Second, the participants developed a future vision for and of Carnisse, ‘Blossoming Carnisse’. It was generally perceived as a guideline for future developments and focused on future images related to topics such as living together, public spaces, housing, economy and cooperation. By including new ideas, the vision addressed and countered the image of a desolate and impoverished neighborhood, and the related nostalgia relating to an individualizing society, poor housing quality or low economic activity. Each future image was connected with the present through a list of existing initiatives, such as Radio Carnisse or Neighbourhood Mediation. It was important for the participants to see that the neighborhood already engaged in activities addressing the five challenges and contributing to a blossoming future. This therefore functioned as a new practice, helping participants to defy the stigmatization of their neighborhood, while rethinking their relation to the district municipality.

Third, in the parallel experimentation trajectory that we were running, we picked up on a number of interview statements concerning the closure of a local community center. We invited residents for an orientation meeting, which led to the establishment of, first, an action group and, later, a foundation as a new local actor. With our support, they aimed at reopening the community center under citizen self-maintenance. The group faced a number of institutional, financial, emotional and legal challenges, but officially reopened the building almost one and a half years after the initial meeting. The process created space for new ideas to emerge, such as a self-managed community center, and helped to overcome feelings of powerlessness. Simultaneously, space was given to (formerly less active) residents and actors who had the drive, time and ideas to become engaged in the action group and in the different activities connected to the running of a community center – in itself a new practice for most of those involved. This space further allowed all actors to search for new roles and relations: for inhabitants to care for their surroundings, for policy actors to search for what it means to support citizens through means other than money, and for us, the researchers, to deal with emotions, high expectations and issues of trust.

Based on this description, it turned out that the three-folded action research process (an open process design, future envisioning and practical experimentation) indeed created new and alternative ideas, practices and social relations. Participants (including the researchers) were able to translate abstract notions into tangible challenges and an innovative action-oriented perspective addressing these challenges in a number of ways.

6.4.2 Finkenstein

CONTEXT

Finkenstein am Faaker See is located in Austria, on the border to Slovenia and Italy, and is one of the largest communities in Carinthia (one of the nine Austrian Länder). About 8500 people live in Finkenstein – distributed over about 28 villages and settlements and divided into a Slovenian-speaking minority and a German-speaking majority. Since the 1980s, the population has been growing due to increasing birth rates and an incoming flow of people who work in cities nearby but favor the ‘nice, beautiful’ village for living. Most of the working population commutes, mainly to Villach, a nearby city.

The action research project in Finkenstein was led by a research institute from Vienna and a consultancy specialized in regional sustainable development, which together formed the implementing team. When the community council decided to officially support and cofinance the InContext project, locally referred to as the ‘Lebensklima- Projekt’ [Climate for life-project], a consultative body was created consisting of political representatives and other officials – the supporting group. The project started in late 2011 and included a participatory envisioning and agenda-setting process in the community arena, as well as the creation of up to nine working groups seeking to realize the vision through actions and experiments. In spring 2013, the official project ended, a local coordination team was elected, and some of the working groups continued to exist (see Figure 14 for an overview). This team was to build a bridge between local politicians and the administrative body on the one hand and the working groups, including citizens, on the other.

The second author was part of the larger InContext team and became engaged in Finkenstein during the final evaluation workshop. The fourth author initially supervised the action research process, but became more and more involved as the project progressed. The analysis of Finkenstein draws on personal experiences, evaluation results, some 70 interviews, 16 participatory meetings and project deliverables. In addition, there was intensive contact with other Finkenstein action researchers to complement our insights.

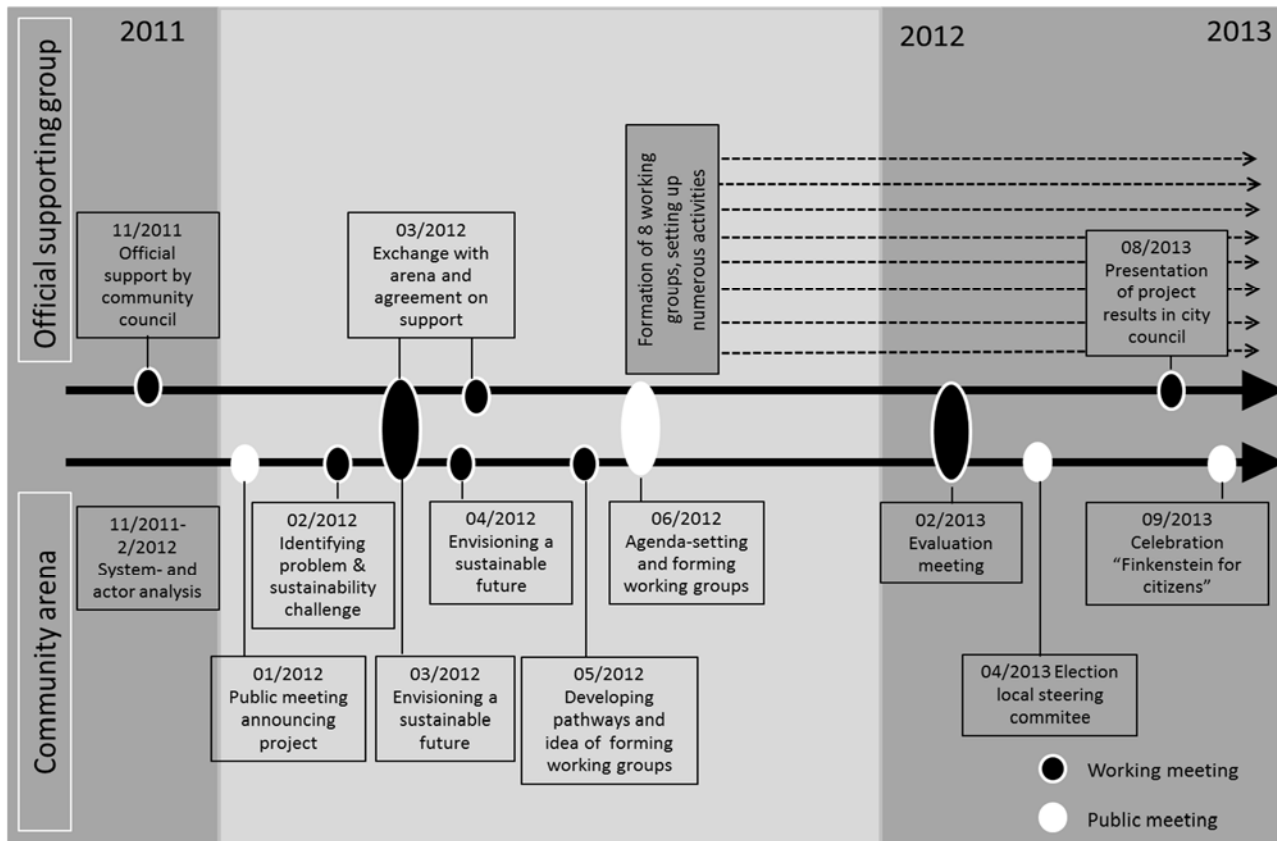


Figure 14: Timeline of the community arena process in Finkenstein

Understanding societal challenges in Finkenstein

We performed a system analysis based on desk research, document analysis and interviews. It was then discussed with the community arena members at the beginning of the arena process. The analysis disclosed the following dominating challenges (cf. Mock and Feiner 2012):

- (1) **Limited political participation:** Many interviewees voiced concerns over the lack of participatory culture in community politics and pointed to a low level of citizen engagement and trust in local politicians. As in other parts of Carinthia, the political landscape is highly polarized – there are strong right-wing parties, and the established political system is perceived as rather narrow and, at times, ‘feudalistic’.
- (2) **Fragmentation and low social cohesion:** In general, social cohesion is characterized as low and individualization tendencies are pointed out. The long-established Slovenian minority remains partly marginalized, though the majority of conflicts have been settled. Newcomers from other Carinthian communities are seen as being less integrated in community life than families already living in Finkenstein for generations. In addition, the community is geographically dispersed over 28 villages and settlements, spread across a

large area and each with its own problems and issues. While parts of the community are dominated by (small- and medium-sized) industry, others rely primarily on tourism or (smallscale) agriculture.

- (3) **Endangered or unused rich heritage:** Many interviewees expressed appreciation for the area's pristine natural environment, as well as for its location at the border to Italy and Slovenia. As such, they highlighted the potential for tourism and a high quality of life. There have also been conflicts of interest, particularly concerning large infrastructure and industry development. These having already led to environmental problems, citizen initiatives have sought to prevent further developments.

All in all, this analysis showed a perceived gap between the high potential of the community, with regard to its setting and heritage, and the lack of concrete positive results from these advantages. Interviewees also frequently reported related feelings of powerlessness and a sense that citizens were unable to change the local situation.

ADDRESSING SOCIETAL CHALLENGES IN FINKENSTEIN

First, and with regard to the arena process, we focused on opening up a broad space for actors and ideas. There was a strong interest in the 'Lebensklima' project from the beginning, as in the initial well-attended public meeting. Interviewees expressed their respective hopes: 'Something like your project has not been done here before!' (Interviewee D, 2012).

In selecting the community arena group, we aimed for diversity in terms of age, gender, profession, culture and length of residence in Finkenstein. We only selected individuals without formal political mandates, as they could contribute a certain degree of independence from established political interests to the arena process. There was one exception, where a person became member of a political party during the process and tried to use the community arena to recruit new members. Participants were also selected for their openness to critical and open debate on the future of the community, as well as for personal engagement within it. Although we proactively addressed the issue of legitimate participation, there was strong public criticism from certain political party representatives, which we addressed and clarified through personal conversations.

Alongside the community arena, a supporting group of local officials was established. The group aimed to institutionalize communication between the arena and officials and to secure official recognition of the arena results. As such, (new) actors were given space next to the established political institutions and administrative bodies. This led, simultaneously, to new relations through a working link to community politics via the supporting group. Generally, the community arena was part of establishing a new practice – more inclusive, participatory governance – and applying a form of direct democracy. Both new practice and social relations complement the existing political structures by involving citizens more actively and empowering them to be active.

Second, the vision and transition agenda directly and broadly address the societal challenges identified through new ideas and practices. During the meetings, as researchers, we stimulated the emergence of alternatives by using

a range of techniques, such as open moderation technique, or visioning through theater play. The open and activating facilitation was positively evaluated by participants (Omann et al. n.d.) and constituted a new practice in local participatory governance.

With the vision, new ideas on the future of Finkenstein were developed. The visioning led to a set of core principles and the symbol of a star, the 'Finkenstein'. The group declared its aim: to 'jointly shape Finkenstein for the benefit of all, nature and humans, and leading to freedom and joy of life' (Lebensklima 2012). Additionally, a good living climate in Finkenstein should be established that ensures 'that our lifestyles do not curb the possibilities of other people living on earth or of the generations to come' (Lebensklima 2012). The vision was further concretized into principles to guide upcoming activities in diverse areas, such as the economy (local economy, cooperation), environment (careful usage), social (living together, mutual support) and participation (active citizenship).

Third, societal challenges were addressed by setting up experiments, which led to alternative ideas, practices and social relations. In Finkenstein, about nine working groups were established on a diversity of topics, representing a new practice of collaboration. Participants developed numerous activities in them, all of which tackled the societal challenges identified. By way of example, a workshop series on local sustainability and a guided tour for bicycle tourism were initiated to take advantage of the local natural heritage in a sustainable way. Other activities included a workshops series on public participation and a welcome brochure for new residents. Both addressed the low participatory culture and connected to feelings of powerlessness, as well as the tendencies toward social fragmentation. For the working groups, we drafted communication guidelines to secure an open, respectful and productive dialogue within the groups, thereby consolidating the new practice of participatory governance.

A last major experiment related to the challenge of limited political participation was started just before the researchers exited the process. When ending our formal involvement in the process, we proposed the election of a temporary coordination team that would prepare the self-organized election of a permanent local coordination team. Two months later, a team of eight persons was elected through sociocratic³³ elections (as an alternative practice to democratic elections), establishing a new actor in the community. This was done to form a link between local politics and the public and thus improve communication and reduce feelings of powerlessness.

It turned out that the threefolded action research process (an open process design, future envisioning and practical experimentation) indeed created numerous new and alternative ideas, practices and social relations. Overall, the community arena process and outcomes formed a field of experimentation with a new and more participatory form of local governance – one relying on the establishment of new social relations, ideas and practices. As such, it directly addressed all three challenges outlined above.

³³ A sociocratic election is an intermediate form between consensus and majority vote, allowing all voters to temporarily block decisions in case of strong concerns.

6.5 POTENTIALS AND CHALLENGES OF MAKING SUSTAINABILITY MEANINGFUL LOCALLY

We return to our initial question and main argument to discuss the insights from the two case studies and point to the benefits and dilemmas from conducting action research. The discussion is divided into four parts, namely (1) locating societal challenges, (2) contextualizing sustainability, (3) creating interactive space and (4) practicing action research.

6.5.1 Locating societal challenges and sustainability transitions

Societal challenges acquire different meanings in different localities – as we see from our two cases. The notion of geographical context and its importance for sustainability transitions has, however, only lately become more prominent (Coenen et al. 2012, Raven et al. 2012, Truffer and Coenen 2012). Building on this work, we point out two key elements for the study of local communities.

We first turn to what is understood as ‘community’. In InContext, we used administrative-geographical boundaries to delineate them, which made sense in terms of putting a research methodology into practice. While rather unproblematic for Finkenstein, the focus on the neighborhood scale in Carnisse had both positive and problematic aspects. We found that people could easily identify with it and had a sense of ownership with regard to local developments or the community center. Nevertheless, with Carnisse being only one seventh of one of the 14 districts of Rotterdam, the scale could be too small to tackle persistent problems. This sensitizes us for the dangers of a falsely understood localism, which prioritizes the ‘local’ as most suitable level for transformative change (Marvin and Guy 1997). Additionally, the boundaries of these administrative spaces proved to be rather fluid for residents; Carnisse is perceived as much larger and more inclusive geographically.

Second, the community arena is one of the first attempts to contextualize transition management for the local scale. This raises new questions about the interrelation of developments on different scales, for example, the linking of small, local changes to broader systemic change. In both communities, the action research processes and outcomes interacted with broader policy and societal discourses. In defining the challenges (and possibly their origins) locally, participants engaged in the political process of collective problem framing – a profoundly political act (cf. Bacchi 2009). For example, Finkenstein was seen as mirroring the broader Carinthian political culture with low participation and high polarization. In Carnisse, the closures of public spaces were related to the global economic downturn and associated budget cuts. In fact, community centers are being closed across Rotterdam and the Netherlands, and diverse actors struggle with the question of how to sustain these necessary meeting places. The developments in Carnisse are illustrative for these developments and provide inspirations to others. Hence, understandings of societal challenges are related to and interact with discourses and developments on multiple levels – for example, regional or urban, national and European – and across several areas – for example, citizenship, climate, sustainability and participation.

6.5.2 Contextualizing sustainability

Generally speaking, transition management combines universal and procedural definitions of sustainability (see Section 6.2). This approach has not been without its critics. Some scholars questioned how sustainability acquires meaning within the process, and how the results of the action research process can be assessed with regard to sustainability outcomes (Shove and Walker 2007, Rauschmayer et al. 2013). We will attempt to address these criticisms on the basis of the case studies.

In our research practice³⁴, we agreed to refrain as much as possible from using the term sustainability. In Carnisse, the term was seen as worn-out, vague and abstract, whereas in Finkenstein it was only used when talking about the project as such (e.g., to secure cofunding from the municipality) and, later in the process, when citizens created a working group on sustainability. Instead of constraining the participants by imposing a specific definition of sustainability, this approach allowed a plurality of values and meanings to surface. This conception fitted the dialogical nature of the space for interaction that we hoped to create, while fostering creativity and a sense of process and outcome ownership, as well as space for alternative ideas, practices and social relations. Notwithstanding this intention, our values and understanding of sustainability inevitably entered the process. Part of our definitional power was the initiation of the process, including the invitation of specific actors and the presentation of our analysis. Starting from the latter, we opened the floor to others to contest, deconstruct and systematically explore and develop a shared understanding of societal challenges, sustainability visions and the process as such. We also operationalized the concept of sustainability into four dimensions, which we used in our facilitation to motivate people thinking into these directions. These are (1) environmental thinking (awareness of nature and natural resources), (2) social thinking (consideration and acknowledgement of self and others), (3) time horizon (short- and long-term) and (4) inter-regional thinking (connection with other parts in the world, near and far).

Through an open process directed toward contextualization, systematic exploration and the development of alternative (more) sustainable visions and actions, sustainability gained a localized meaning in both cases. In Finkenstein, sustainability came to mean active political participation addressing the gap between the community's high potential and its geographical and social fragmentation. In Carnisse, addressing the challenges meant taking collective ownership of the neighborhood's future.

These four dimensions can be traced back in the outcomes of the community arena (e.g., the visions and projects). By focusing on quality of life in Finkenstein, both environmental and social issues were raised from the outset. In Carnisse, the social dimension became the entry point of the process and led to environmental concerns being raised at a later stage. Generally speaking, the Finkenstein arena developed a vision and agenda that includes several

³⁴ For earlier discussions on addressing sustainability in this research practice, see Wittmayer et al. (2013a, 2013c), Schöpke et al. (2013), and Wittmayer and Schöpke (2014).

elements of universal sustainability, such as the claim that leading a good life today should not interfere with the ability of future generations or of others living in different places to do so.

6.5.3 Creating interactive space

At the heart of the community arena methodology lies an interactive space for researchers and change agents to foster alternatives to the mainstream. Such spaces allow ‘for reflexivity and the questioning (and possible integration) of assumptions, knowledge, goals and values’ (Wittmayer and Schöpke 2014). This is where societal challenges and sustainability come to be understood, the mainstream questioned, and alternative ideas, practices and social relations developed and nurtured. Taken together, these further sustainability transitions.

This interactive space is not something out there waiting to be discovered; it comes about through dialogical encounters between people. Greenwood and Levin (2007, p. 135) refer to it as an ‘arena for dialogue’, as through dialogue do we question our current understanding of the world and formulate alternatives (cf. Wagenaar 2011). As such, these spaces are temporal, dynamic and dependent on actors and context. In Carnisse and Finkenstein, the community arena as well as the experiments and working groups became interactive spaces. Our engagement as action researchers opened them, but it was the engagement and collaboration of local actors and the access to (external) funding that made it possible.

Such spaces are surely not exclusive to research processes where researchers have a decisive, but also changing and multifaceted role. The influence of the research teams was more significant at the beginning of the process by, for example, setting up the arena groups and inviting or excluding actors. Whenever practical and local knowledge was more important, such as in the working groups in Finkenstein or the community center in Carnisse, the role of the researchers became more modest – we were just one of many actors.

Opening and maintaining an interactive space is also hard work for a number of reasons. It means dealing with existing power holders as the Finkenstein case showed in relation to rival party politics. It also includes dealing with diverse worldviews, ensuring everybody has their say and questioning own and others engrained patterns of behavior, values and beliefs. In the deliberative visioning process in Carnisse, participants had strong expectations toward us to take the lead in setting the agenda and deciding on next steps or follow-ups. These stemmed from a long series of experiences with earlier participatory processes. In order to attain the collectively agreed-upon aim of the action research (i.e., to support and stimulate inhabitants to shape the future of their neighborhood), we deemed it necessary to question this behavior and to follow neither their invitation nor our personal impulses to take the lead. Our stance was not welcomed by all, as was expressed in the evaluation meeting.

The space created by bringing a group together to have a dialogue on the future of their community or to address a community challenge through experimentation cannot be reduced to an action research process – while being opened by it, it soon takes on a life of its own. In Carnisse, the action group and later the foundation explored new ideas and practices to reopen the community center. In practice, it turned out that the interactive space was not

restricted to them, but also included others, such as the district municipality that was searching for new ways to relate to citizen initiatives. In Finkenstein, citizens and (political) officials engaged in a new 'culture of cooperation and dialogue'. Both communities saw change agents and municipalities exploring alternative ideas, practices and forms of interaction for sharing societal responsibility (e.g., through the coordination committee in Finkenstein or the foundation in Carnisse). Thus, these interactive spaces were expanded to include policy officers in the dialogical process of making sense together (cf. Hoppe 1999). This proved difficult at times and not all encounters were positive. In Carnisse, for example, we experienced conflicts with policy officers who interpreted our activities for the reopening of the community center as directed against the district municipality. In more general terms, the effective creation of a space for alternative ideas, practices and social relations also depends on contextual arrangements with and the possible involvement of incumbent representatives.

6.5.4 Practicing action research: local political dynamics and the role of the action researcher

In implementing the community arena methodology, we were building a complementary 'shadow process' to current policymaking processes (cf. Loorbach 2010). It required us to make sense of the rather abstract transition management framework, translating it into concrete practice and (collectively) giving meaning to its concepts in Carnisse and Finkenstein. Taking decisions is another challenge faced by action researcher in the creation of interactive spaces: whom to (not) invite or select for participation, which official bodies to (not) relate to, which analysis to (not) make and what to (not) view as societal challenges.

All of these questions and corresponding decisions become sensitive and political once embedded in an actual context. Engaging with society and its problems puts the researcher in a de facto political role, prompting questions of definitional power (e.g., who defines the agenda and selects participants) and legitimacy (e.g., what are the relations of new actors with the existing political system) (cf. Shove and Walker 2007, Avelino 2011). While conventional scholarship downplays this aspect of the researcher's role, it is inescapable in action research. Taking one's 'social responsibility' as a researcher (Cornell et al. 2013) places high demands on one's personality and integrity.

The nature of the action research process is strongly connected to how the role of the researcher is understood (cf. Wittmayer and Schöpke 2014). In Finkenstein, the research team was seen as a role model or leader. For the practical process focusing on the community center in Carnisse, this understanding was more fluid and changed over time: the research team initiated the process of reopening the community center, became a regular participant and later an external advisor. Role understandings are subject to an ongoing negotiation process that peaks at specific moments (e.g., the pre-meeting in Carnisse where we were framed as 'activating researchers') (cf. Greenwood and Levin 2007). This can also make the researcher something of a pawn and places high demands on one's personality and integrity (e.g., when being personally approached to discuss problems) (cf. Coghlan and Shani 2005, Westling et al. 2014 (this issue)). These demands are intensified through the fact that action research involves taking difficult decisions – not after a long reflection, but in the midst of a high-paced process (Greenwood and Levin 2007). In this respect, working and reflecting as a team turned out to be crucial in making sense of developments.

As outlined above, the community arena is relatively open and flexible in terms of its concrete focus and implementation. It is therefore prone to instrumentalization by a number of actors, a tendency that the arena shares with other reflexive governance approaches (Voß and Bornemann 2011) or forms of action research (Boezeman et al. 2014 (this issue), Bonetti and Villa 2014 (this issue)). In an ideal world, this means that actors identify with and take ownership of the process and its outcomes, as was the case for parts of our work: the community center in Carnisse or the Finkenstein vision. However, this mechanism can also work negatively as we have seen in Finkenstein, where we had to deal with party politics.

6.6 CONCLUSIONS

In this article, we introduced sustainability as a dual concept: dynamic, plural and contested, but based on broad universal definitions, which can act as guiding stars. It is also an inherently political concept, which demands explicit public negotiation to become meaningful in a specific time and place. Sustainability is a prominent answer to address societal challenges, requiring fundamentally new and alternative structures, cultures and practices – a sustainability transition. We argued that action research can do just this by understanding and addressing societal challenges and making sustainability meaningful through the generation of new ideas, practices and social relations in an interactive space. The question we explored in this article is whether and how action research can support communities, like Rotterdam–Carnisse and Finkenstein, in understanding and addressing societal challenges and making sustainability meaningful locally. Concluding this article, we draw attention to its three main contributions.

The first is evidence that societal challenges are inherently context dependent and become meaningful only through practice and interaction. These concepts would have remained empty and abstract without the action research practice and its creation of interactive spaces. Our research shows that generic and global societal challenges become translated into a variety of manifestations at the local level; this happens through their interaction with a specific locality. At the same time, they can only be fully understood in relation to other scales (e.g., regional, national, global scale). The act of defining societal challenges and local manifestations is both a collective sense-making process and a political process. Interactive spaces, such as the community arena, are meant to address these aspects and assist in better understanding and dealing with societal challenges. This, in turn, has its own pitfalls and requires more thorough research into power dynamics and the politics of action research (cf. Shove and Walker 2007, Gaventa and Cornwall 2008, Kemmis 2008).

The second is that collective sense-making also takes place in relation to a desired future direction, for example, sustainability and sustainability transitions. While sustainable development includes broad universal notions, the community arena advocates combining these with a deliberative process. In our processes, universal notions of sustainability were translated into four dimensions supporting the searching and learning process and allowing for the emergence of alternative ideas, practices and social relations. This has proved a fruitful combination and warrants further research, which could focus on the relation between sustainability and action research, and be compared to the community arena.

The third is that, at the local level, action research based on transition management principles is about finding ways to work together on the sustainable future of a community by creating and maintaining spaces for interaction. These are spaces for nurturing and empowering alternatives (whether ideas, practices or social relations) that have the potential to contribute to fundamental and sustainable change in the long term. They also enable incumbents and powerful actors to position themselves with regard to new developments and coevolve through dialogical encounters – being outside but not detached. As such, action research is also about facing the dilemmas and tensions that arise from searching for new ways of relating to and interacting with one another in a changing world. By looking at specific interactions, practices, social relations and ideas through the magnifying glass of action research, these are made explicit and can thereby become objects and mechanisms of change.

By not assuming the usual role of a distant observer, researchers experiment with action research for sustainability as a form of research that is process- and future-oriented and engages the researcher as part of the problem and the solution. By taking ‘dialogue as the road to understanding’ (Wagenaar 2011, p. 228), action research for sustainability overcomes the distinction between knowledge and action. Paraphrasing Kurt Lewin, it is by trying to change the local situation that we gain a deeper understanding thereof – that learning and knowledge production can take place. One becomes part of the high-paced local dynamics through engagement; we argue this should be accompanied with an active practice of self-reflection and a critical attitude. This is also important in light of the explicitly normative context of sustainability.

Action research can create spaces for interaction in which knowledge is coproduced, action is generated, and social relations are potentially redefined. Rooted in specific localities, these activities can address the local manifestations of societal challenges. These small steps create and foster alternatives in terms of ideas, practices and social relations that eventually add up to more fundamental system change toward sustainability. Although we cannot be certain that a sustainable future will emerge in Carnisse and Finkenstein, we think that action research projects like ours are arguably a very promising way for addressing the challenges involved with sustainability transitions.

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6.7 REFERENCES

- Appadurai, A., 1990. Disjuncture and difference in the global cultural economy. *Theory, culture and society*, 7, 295–310. doi:10.1177/026327690007002017
- Audet, R., 2014. The double hermeneutic of sustainability transitions. *Environmental innovation societal transitions*, 11, 46–49. doi:10.1016/j.eist.2014.02.001
- Audet, R. and Guyonnaud, M.-F., 2013. Transition in practice and action in research. A French case study in piloting eco-innovations. *Innovation: the European journal of social science research*, 26 (4), 398–415.
- Avelino, F., 2011. Power in transition. Empowering discourses on sustainability transitions. Thesis (PhD). Erasmus University Rotterdam.
- Bacchi, C., 2009. *Analysing policy: what's the problem represented to be?* Frenchs Forest: Pearson Education.
- Bartels, K.P.R. and Wittmayer, J.M., 2014. Symposium introduction: usable knowledge in practice. What action research has to offer to critical policy studies. *Critical policy studies*, 8 (4). doi: 10.1080/19460171.2014.957335
- Boezeman, D., et al., 2014. Participation under a spell of instrumentalization? Reflections on action research in an entrenched climate adaptation policy process. *Critical policy studies*, 8 (4). doi: 10.1080/19460171.2014.950304
- Bonetti, M. and Villa, M., 2014. In the shadow of legalism: understanding community participation in an overly bureaucratic context. *Critical policy studies*, 8 (4). doi:10.1080/ 19460171.2014.950305
- Coenen, L., Benneworth, P., and Truffer, B., 2012. Toward a spatial perspective on sustainability transitions. *Research policy*, 41, 968–979. doi:10.1016/j.respol.2012.02.014
- Coghlan, D. and Shani, A.B., 2005. Roles, politics, and ethics in action research design. *Systemic practice and action research*, 18 (6), 533–546. doi:10.1007/s11213-005-9465-3
- Connelly, S., 2007. Mapping sustainable development as a contested concept. *Local environment: the international journal of justice and sustainability*, 12 (3), 259–278. doi:10.1080/13549830601183289
- Cornell, S., et al., 2013. Opening up knowledge systems for better responses to global environmental change. *Environmental science and policy*, 28, 60–70. doi:10.1016/j.envsci.2012.11.008
- Dick, B., 2004. Action research literature: themes and trends. *Action research*, 2 (4), 425–444. doi:10.1177/1476750304047985

- Dryzek, J., 1997. *The politics of the earth: environmental discourses*. Oxford: Oxford University Press.
- Frantzeskaki, N., Loorbach, D., and Meadowcroft, J., 2012. Governing societal transitions to sustainability. *International journal of sustainable development*, 15 (1/2), 19–36. doi:10.1504/IJSD.2012.044032
- Gaventa, J. and Cornwall, A., 2008. Power and knowledge. In: P. Reason and H. Bradbury, eds. *The sage handbook of action research. Participative inquiry and practice*. 2nd ed. London: SAGE, 695–707.
- Greenwood, D.J. and Levin, M., 2007. *Action research. Social research for social change*. 2nd ed. Thousand Oaks, CA: Sage.
- Grin, J., Rotmans, J., Schot, J., in collaboration with Loorbach, D. and Geels, F.W., 2010. *Transitions to sustainable development: new directions in the study of long term transformative change*. New York, NY: Routledge.
- Hendriks, C., 2009. Policy design without democracy? Making democratic sense of transition management. *Policy sciences*, 42 (4), 341–368. doi:10.1007/s11077-009-9095-1
- Hisschemöller, M., 1993. *De democratie van problemen*. Thesis (PhD). Vrije Universiteit, Amsterdam.
- Hoppe, R., 1999. Policy analysis, science and politics: from ‘speaking truth to power’ to ‘making sense together’. *Science and public policy*, 26 (3), 201–210. doi:10.3152/147154399781782482
- Hopwood, B., Mellor, M., and O’Brien, G., 2005. Sustainable development: mapping different approaches. *Sustainable development*, 13, 38–52. doi:10.1002/sd.244
- Kemmis, S., 2008. Critical theory and participatory action research. In: P. Reason and H. Bradbury, eds. *The Sage handbook of action research. Participative inquiry and practice*. 2nd ed. London: SAGE, 695–707.
- Kemmis, S., 2010. What is to be done? The place of action research. *Educational action research*, 18 (4), 417–427. doi:10.1080/09650792.2010.524745
- Leach, M., Scoones, I., and Stirling, A., 2010. *Dynamic sustainabilities: technology, environment, social justice*. Oxon: Earthscan.
- Lebensklima, 2012. *Vision für Finkenstein*. Entwickelt vom BürgerInnenforum des SERI-Projekts LebensKlima in Finkenstein. Unpublished report.
- Lélé, S., 1991. Sustainable development: a critical review. *World development*, 19 (6), 607–621. doi:10.1016/0305-750X(91)90197-P

- Loorbach, D., 2007. Transition management. New mode of governance for sustainable development. Thesis (PhD). Erasmus University Rotterdam.
- Loorbach, D., 2010. Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance*, 23 (1), 161–183. doi:10.1111/j.1468-0491.2009.01471.x
- Loorbach, D., Frantzeskaki, N., and Thissen, W., 2011. A transition perspective on governance for sustainability. In: C.C. Jaeger, J.D. Tàbara, and J. Jaeger, eds. *European research on sustainable development*. Berlin: Springer, 73–90.
- Markard, J., Raven, R., and Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. *Research policy*, 41 (6), 955–967. doi:10.1016/j.respol.2012.02.013
- Marvin, S. and Guy, S., 1997. Creating myths rather than sustainability: the transition fallacies of the new localism. *Local environment*, 2 (3), 311–318. doi:10.1080/13549839708725536
- Meadowcroft, J., 2009. What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy sciences*, 42 (4), 323–340. doi:10.1007/s11077-009-9097-z
- Miller, T.R., 2013. Constructing sustainability science: emerging perspectives and research trajectories. *Sustainability science*, 8, 279–293. doi:10.1007/s11625-012-0180-6
- Mock, M. and Feiner, G., 2012. Lebensklima in Finkenstein: systemanalyse. Task: System analysis. InContext.
- O’Riordan, T., 2009. Reflections on the pathways to sustainability. In: N. Adger and A. Jordan, eds. *Governing sustainability*. Cambridge: Cambridge University Press, 307–328.
- O’Riordan, T. and Voisey, H., eds, 1997. *The transition to sustainability. The politics of agenda 21 in Europe*. London: Earthscan.
- Omann, I., et al., n.d. Evaluationsbericht für das Projekt LebensKlima Finkenstein. Unpublished report.
- Rauschmayer, F., Bauler, T., and Schöpke, N., 2013. Towards a governance of sustainability transitions: giving place to individuals. In: SCORAI Europe workshop proceedings: pathways, scenarios and backcasting for low carbon and sustainable lifestyles, 7–8 October 2013, Rotterdam, 97–121.
- Raven, R., Schot, J., and Berkhout, F., 2012. Space and scale in socio-technical transitions. *Environmental innovation and societal transitions*, 4, 63–78. doi:10.1016/j.eist.2012.08.001

- Reason, P. and Bradbury, H., 2008. Introduction. In: P. Reason and H. Bradbury, eds. *The Sage handbook of action research. Participative inquiry and practice*. 2nd ed. London: SAGE.
- Rittel, H. and Webber, M., 1973. Dilemmas in a general theory of planning. *Policy sciences*, 4 (2), 155–169. doi:10.1007/BF01405730
- Rotmans, J. and Loorbach, D., 2009. Complexity and transition management. *Journal of industrial ecology*, 13 (2), 184–196.
- Schäpke, N., et al., 2013. Supporting sustainability transitions by enhancing the human dimension via empowerment, social learning and social capital. In: SCORAI Europe workshop proceedings: pathways, scenarios and back-casting for low carbon and sustainable lifestyles, 7–8 October 2013, Rotterdam, 277–293.
- Schot, J. and Geels, F., 2008. Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology analysis & strategic management*, 20 (5), 537–554. doi:10.1080/09537320802292651
- Shove, E. and Walker, G., 2007. CAUTION! Transitions ahead: politics, practice, and sustainable transition management. *Environment and planning A*, 39, 763–770. doi:10.1068/a39310
- Truffer, B. and Coenen, L., 2012. Environmental innovation and sustainability transitions in regional studies. *Regional studies*, 46 (1), 1–21. doi:10.1080/00343404.2012.646164
- United Nations Conference on Environment and Development, 1992. Agenda 21 [online]. New York, UNCED. Available from: <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> [Accessed 18 February 2014].
- Van Buuren, A. and Loorbach, D., 2009. Policy innovation in isolation? Conditions for policy renewal by transition arenas and pilot projects. *Public management review*, 11 (3), 375–392. doi:10.1080/14719030902798289
- Van den Bergh, J., Truffer, B., and Kallisa, G., 2011. Environmental innovation and societal transitions: introduction and overview. *Environmental innovation and societal transitions*, 1 (1), 1–23. doi:10.1016/j.eist.2011.04.010
- Van Steenberghe, F. and Wittmayer, J., 2012. Carnisse in transitie? Een verkenning van het verleden, het heden en de toekomst van een Rotterdamse wijk. DRIFT-uitgave. E 2012.05 [online]. Available from: <http://www.drift.eur.nl/> [Accessed 1 Augustus 2014].
- Voß, J. and Bornemann, B., 2011. The politics of reflexive governance: challenges for designing adaptive management and transition management. *Ecology and society*, 16 (2), 9.
- Wagenaar, H., 2011. *Meaning in action. Interpretation and dialogue in policy analysis*. London: M. E. Sharpe.

WCED (United Nations World Commission on Environment and Development), 1987. Our common future [online]. Available from: <http://www.un-documents.net/wced-ocf.htm> [Accessed 28 April 2014].

Westling, E., et al., 2014. Developing adaptive capacity through reflexivity: lessons from collaborative research with a UK water utility. *Critical policy studies*, 8 (4). doi:10.1080/19460171.2014.957334

Wittmayer, J. and Schöpke, N., 2014. Action, research and participation: roles of researchers in sustainability transitions. *Sustainability science*. doi:10.1007/s11625-014-0258-4

Wittmayer, J., et al., 2011a. The community arena: a co-creation tool for sustainable behaviour by local communities methodological guidelines. Deliverable 4.1. InContext.

Wittmayer, J., et al., 2011b. Pilot projects getting started. Year 1 status report. Deliverable 4.2. InContext.

Wittmayer, J., et al., 2012. Pilot projects on a roll. Year 2 pilot specific reports. Deliverable 4.3. InContext.

Wittmayer, J., et al., 2013a. Action research for sustainability. Reflections on transition management in practice. Research Brief. InContext.

Wittmayer, J., et al. 2013b. Pilot projects rounding up. Year 3 pilot-specific report. Deliverable 4.4. InContext.

Wittmayer, J., et al., 2013c. Taking stock – three years of addressing societal challenges on community level through action research. Pilot specific synthesis report. Deliverable 4.5. InContext.

7 LINKING TRANSITIONS TO SUSTAINABILITY: A STUDY OF THE SOCIETAL EFFECTS OF TRANSITION MANAGEMENT

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Abstract

Sustainability transitions as processes of fundamental change in societal systems are open-ended, nonlinear and uncertain. Respective research and governance approaches, e.g., transition management, propose a reflexive way of governing, aiming for a number of societal effects to help facilitating a transition. Effects include empowerment, social learning and social capital development. Jointly mentioned effects shall allow for reflexivity and innovation in developing socially robust and contextualized solutions to sustainability challenges that work in practice. But, understanding the mentioned societal effects and their interplay in more depth is necessary to design and assess transition management processes. While such understanding and related assessment framework is under development in the transition management literature, transdisciplinary sustainability research can provide a rich body of tools and experiences. Building on a review of the literature, this article develops an evaluation framework focusing on social learning, empowerment and social capital as important and hitherto under-conceptualised aspects of the sustainability transition literature. This framework is used to empirically investigate the effects of two specific transition management processes at the local scale. In doing so, the article provides a conceptual and empirical understanding of how social learning, empowerment and social capital contribute to a transition towards sustainability. The three effects are shown to be interrelated, mutually supportive and bridging different scale levels from individuals to groups, niches and beyond. Results highlight possibilities to facilitate and assess societal effects, addressing sustainability as their inherent quality.

KEYWORDS

assessment; case study; empowerment; social capital; societal effects; social learning; sustainability transition; transition management; sustainability transformation

Status

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7.1 INTRODUCTION

More than 20 years after the international community agreed upon sustainable development as a major principle to strive for [1,2], the environmental, social and economic challenges addressed by it have not lost their relevance (cf. [3,4]). Recent international attempts to strive for sustainable development, including the SDG [5], are calling for transformational change. Related societal challenges, such as climate change, biodiversity loss or poverty, are characterized as being complex, highly interrelated and subject to uncertainties, and unfold their impacts over long time horizons. Challenges can be regarded as ‘ill-defined’ problems, which are defined, perceived and valued differently and persist over time [6,7].

The emerging field of transition research proposes that solving mentioned problems requires a fundamental change in the structures, cultures and practices of a societal system for the system to become (more) sustainable [8,9]. While these transitions do not automatically lead to sustainability, an adequate facilitation may nevertheless work in favour of it [10,11]. Rather than assuming that societal change processes can actually be ‘managed’, transition governance frameworks including transition management, hold that sustainability transitions cannot be governed in a regular way. Due to their open-endedness, non-linearity and uncertainty, they require an iterative, reflective and explorative way of governing [12,13]. In this transition management shows similarities to other reflexive governance approaches, such as adaptive co-management (e.g., [14,15]).

Transition management is further outlined in specific process methodologies, for example for policymakers in cities [16] or for transdisciplinary/action researchers [17]. When being implemented in close collaboration between scientists and stakeholders and aiming to solve real-world problems, transition management shows commonalities with other approaches of transdisciplinary (sustainability) research [12–14,18,19]. It is the latter, the transdisciplinary and operational application of transition management, that we focus on in this paper.

Learning and empowerment are core societal effects that transition management aims for [12,13]. The approach postulates the systematic development and empowerment of actors, developing alternatives in societal niches as a key instrument to facilitate sustainability transitions [20–22]. In its essence, it “focuses on [...] organizing an interactive and selective participatory stakeholder searching process aimed at learning and experimenting” [6] (p. 140). This asks for processes that on the one hand allow for empowerment and learning and on the other hand assure a contribution to sustainability (transitions). This relationship is not self-evident and has been under conceptualized [23–26].

To guide the contribution of transition management to sustainability, appropriate assessment frameworks are needed. There is an inherent tension when assessing the outputs and outcomes of transition management—the tension between the open-endedness and complexity of transitions and the attempt to govern it in direction of sustainability. This tension gives rise to evaluation proposals focusing on adaptive, process-oriented criteria capturing mechanisms of solving the mentioned wicked problems. These criteria are empowerment [27], learning [28–30] and a better understanding of complexity or the development of a shared narrative [31]. All contrast to positivist, impact-

oriented evaluation approaches. A shared and comprehensive transition management evaluation framework is nevertheless still under development [32].

Recent contributions developing evaluation frameworks for transition management and related approaches face limitations in assessing the societal effects of transition management processes in relation to sustainability. Contributions from the field of transition management studies are directed towards the evaluation of transition programmes, thus applying a policy-oriented perspective [33,34]. The same holds true for alternative approaches, e.g., those directed towards the evaluation of policy effectiveness and legitimacy (e.g., [35,36]). This policy orientation hinders the application of frameworks to the project and process level of transition management. Reflexive evaluation approaches (cf. reflexive monitoring, [37,38]), to the contrary, are directed at supporting the ongoing learning process of those involved in experiments, projects or programmes. As they focus on reflexivity, these evaluation approaches are coherent with the open-endedness and complexity of transitions. Nevertheless they fall short of explicitly assessing the sustainability quality, and therefore the normative aim, of the transition.

Assessments of strategic niche management, a neighbouring approach to transition management, also highlight the relevance of learning, networking and expectations [39]. As with transition management, a broadly used assessment frame is still under development. Furthermore, current studies either focus attention on setting up and managing niches (e.g., via policies) [40,41] instead of applying strategic niche management as a transdisciplinary approach [39], or do not explicitly include sustainability in the evaluation framework (e.g., [42]). In sum, there is a lack of understanding as to how the core societal effects of transition management are related to sustainability as well as the lack of a framework from the field of transition studies to assess this.

Thus, we turn to the field of transdisciplinary sustainability research for suitable approaches that help to assess the societal effects of research projects in relation to sustainability (e.g., [43–46]). We made this choice for two reasons: first, it allows for a focus on the actual practice of applying transition management. Thereby we start from an understanding that transition management can be put into practice in form of a transdisciplinary research approach. Second, transdisciplinary sustainability research offers expertise on the structured and broad assessment of societal effects, and on their relationship to sustainability. It aims to develop actionable knowledge to solve real-world sustainability challenges. A key avenue to achieving this is collaboration with stakeholders from outside academia, aiming to allow for mutual learning and creating socially robust solutions that can be transferred to scientific and societal practice [19].

To further address the mentioned gap, we focus our article on the following core research question: What are relevant criteria to assess the contribution of transdisciplinary transition management processes towards sustainability, focusing on core societal effects and the local level? To answer this question, we state four interrelated objectives. First, to conceptualize a framework to assess societal effects of transdisciplinary transition management, including their relationship with sustainability. Second, to operationalize this framework for empirical application at the local

level. Third, to test and apply it empirically to local transdisciplinary transition management processes. Fourth, to critically reflect on the suitability of the framework, taking into consideration conceptual and empirical insights.

According to the four objectives, this article is structured into four main sections as follows. In the first section (Chapter 7.2) we develop a conceptual framework to assess the societal effects of transition management, building on a review of the relevant literature. In the second section (Chapter 7.3), we operationalize this framework for empirical application and present two case studies of local transition management as well as data collection and interpretation methods. In the third section (Chapter 7.4), we present the results of an empirical analysis of both cases, applying the framework. In the fourth section (Chapter 7.5) we recapitulate, compare and reflect the results of both conceptual and empirical works, including an assessment of the core societal effects of transition management in relation to sustainability. We close the paper by outlining our conclusions regarding the core research question (Chapter 7.6).

7.2 ASSESSING THE SOCIETAL EFFECTS OF TRANSITION MANAGEMENT PROCESSES

Transdisciplinary approaches differentiate between the societal and scientific effects of transdisciplinary research: scientific effects are e.g., new scientific insights, theory development or similar, while societal effects include a wide range of effects of the research on society [46]. The latter are of primary interest for us here as they contribute directly to the core aim of transition management, a sustainability transition as societal change. The following subchapters present a review of the literature in two steps. First a broad conceptual frame of the different societal effects of transdisciplinary sustainability research including transition management is presented. In so doing we build on the transition management and transdisciplinary sustainability research literature. Effects of primary importance to the assessment of transition management processes are identified. Second, identified effects and their relationship to sustainability are discussed in depth, taking into account additional literature relating effects and sustainability. Results are summarized in the form of an overview table.

7.2.1 Societal Effects of Transition Management and Transdisciplinary Sustainability Research

For assessment purposes, the various societal effects of a transdisciplinary program, project or experiment can be differentiated with regard to how immediately the effects occur [43,45,46]. Different terminologies exist to differentiate between effects. We adopt a differentiation into outputs (What was generated?), outcomes (What was accomplished?) and impacts, which mediate between outputs and outcomes [43,45,46].

Outputs are immediate, directly traceable achievements of a program, project or experiment. Impacts are the changes induced when participants are involved in creating the outputs. Generated outputs and impacts can lead to further societal effects (outcomes), such as changes of action and decision-making of larger collectives and related structural changes of institutions or infrastructures. Thereby, impacts are assumed to mediate between outputs and outcomes, e.g., enhanced capacities (impacts) developed by participants when producing a product or service (outputs) can lead to changed decision-making or collective action (outcomes). Outcomes in turn are related to the further societal and ecological achievements of the transdisciplinary processes. While impacts and outputs

tend to be tangible, outcomes happen outside the spatial and temporal boundaries of most projects, programs and experiments [37].

In this article we focus on outputs and impacts for two reasons. First, being tangible, they are relatively easy assessed. Second, they are indicative of outcomes being accomplished [35,37]. Thus, and although the relationship of outputs and impacts to outcomes is not straightforward, we assume they can be used as qualitative indicators to assess transition trajectories [30], for example regarding their orientation towards sustainability.

According to Wiek et al. [45,46], the impacts and outputs of transdisciplinary sustainability research projects can be differentiated into three basic categories:

- (1) Outputs in the form of usable products such as (innovative) goods, services and action plans or publications as well as production-related experiences of participants.
- (2) Impacts in the form of
 - a. Enhanced capacities such as knowledge gains and problem-solving capacities and
 - b. Network effects, such as new relationships, trust or accountability.

In the following, we discuss how these three categories come back in the transition management processes.

(1) The first category refers to the creation of usable products as a concrete and tangible output of solution-oriented sustainability research, which in design, production and delivery themselves should be oriented towards sustainability principles [45]. At the very least, in transition management processes, vision documents and related pathways are produced [32]. The processes can also lead to other artefacts, such as websites (see e.g., www.lebensklima.at, the website of one of the case studies) or new products (e.g., a floating building, cf., [47]) and services (e.g., a public lecture series on participation and sustainability, cf., [48]). The intensity (quality and frequency) of being involved in creating products and having experiences can be seen as an indicator for the creation of impacts such as enhanced capacities and network effects [46]. Experiences may include methodological experiences and organizational experiences, such as experiencing new ways of working, planning and organizing as well as social experiences, such as interactions with others [44].

(2a) The second category refers to enhanced capacity, which includes the acquisition of knowledge by individuals and collectives as well as of skills (know-how) for applying the new knowledge. Capacity is built through participatory research features, “as they organize and encourage information exchange, mutual, and joint learning” [45]. Rather than on ‘enhanced capacity’, transition management focuses on (social) learning and empowerment of participants in the transition arena setting [13,49].

Transition management aims for “transformative change in societal systems through a process of searching, learning, and experimenting” [32] (p. 1006). Learning is considered as core to overcoming lock-in situations, allowing for innovations and systems change [29]. Loorbach highlights the value of learning-by-doing as a core process within transition management, allowing for an experimental and explorative attitude to social innovation and change [22,25]. Social learning, as a reflexive learning process that involves and goes beyond individual participants, is considered a precondition of change within the transition management literature. It is based on bringing together different actors’ perspectives and a variety of options in participatory settings. Joint learning of participants can contribute to the development of alternative and visionary solutions to complex challenges. This results in new types of discourse as well as changing perspectives [32].

Besides social learning, the empowerment of civil society in locally addressing sustainability forms a second core effect of TM processes. As stated by Loorbach [13] (p. 284), “The ultimate goal of transition management should be to influence and empower civil society in such a way that people themselves shape sustainability in their own environments, and in doing so contribute to the desired transitions to sustainability”. This refers to the finding and realizing of (new) ways to solve social challenges in a local and sustainable way—and turn the visions of the future (sustainable) communities developed as part of the TM process into reality. Avelino highlights the empowerment of change agents and frontrunners in niches to challenge, transform or replace (unsustainable) regimes as a core strategy of transition management [49].

(2b) The second category includes as well network effects. These refer to the creation or expansion of stakeholder networks and relationships (e.g., new contacts) as well as other qualities of human interrelations such as trust, identity, and accountability [45]. Via participation, transdisciplinary research does help to develop networks and structured interrelations. Similarly, transition management aims at the forming of new coalitions and networks [32] and more broadly new social relationships (such as new actors) to address societal challenges and contributing to sustainability transitions [48]. Transition management is centred around participatory spaces, e.g., transition arenas, which bring together a diversity of change agents or frontrunners for joint envisioning and collective action (e.g., [16]). The development of trust, shared goals and mutual expectations benefits the functioning of the transition arena process. The developed vision and respective images of change then need to be translated to wider networks, organizations and institutions [22]. Altogether, networks and relationships of trust and reciprocity are main determinants of social capital, whose increase is a third core societal effect of transition management processes—and an important precondition of collective action to address societal challenges [50].

Figure 15 summarizes the different societal effects of transdisciplinary sustainability research as well as their temporal interplay. Core impacts of transition management, namely social learning, empowerment and social capital development, are located within this broad conceptual frame. This explains how these core impacts are created with participants (by creating outputs) and how impacts contribute to a societal transformation towards sustainability (as predecessors of outcomes).

Impacts are put central stage in the transition management literature as core processes of transitions and change. Their process character corresponds to the reflexive character of transition management [32] and the underlying nature of sustainability transitions as complex, open-ended processes. Transition management methodologies propose the facilitation of an open ended process and do not outline how ‘sustainability’ is to be introduced. Rather, defining sustainability is left to the transition arena group. The participating frontrunners essentially shape the understanding and valuation of sustainability in the transition management process [10] (p. 10). Therefore, they play a crucial role in directing the process towards sustainability—and not only them, but also the process managers who are actually selecting these frontrunners and framing the process (a practice that has been critiqued by Shove and Walker [25]). Rauschmayer et al. [24] draw attention to the need to design a proper process that makes sustainability meaningful to the frontrunners and to later critically evaluate the process outputs, impacts and outcomes.

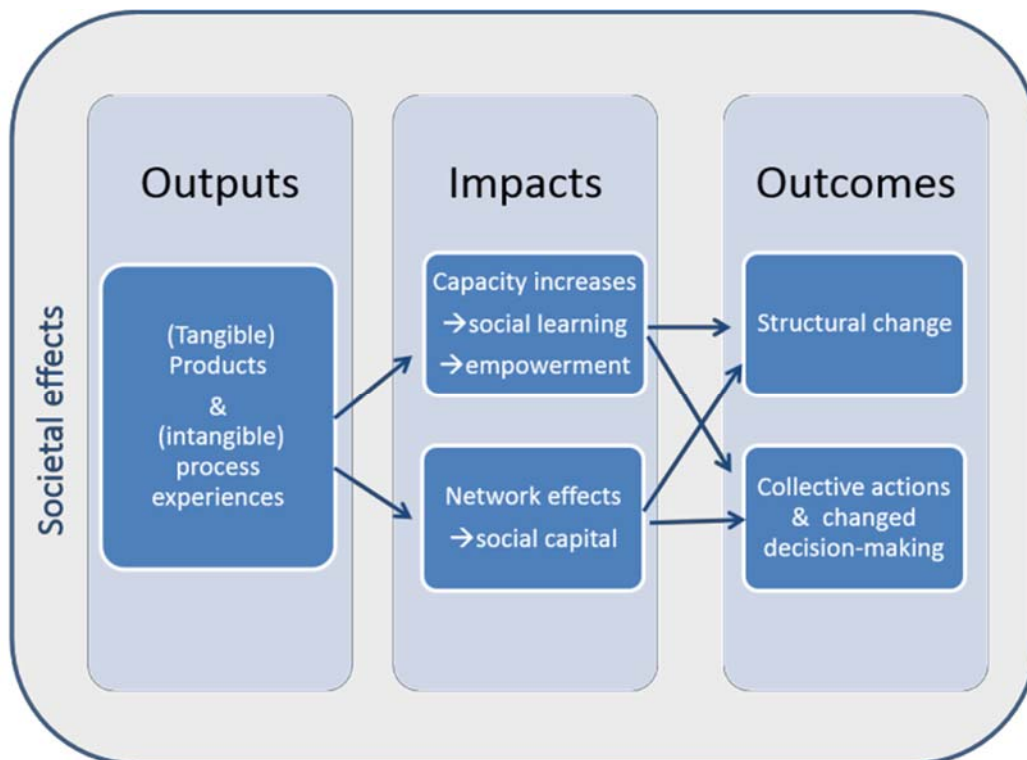


Figure 15: **Effects of transdisciplinary transition management processes.** This figure shows the interplay of outputs, impacts and outcomes, jointly referred to as societal effects. Outputs are directly created by transdisciplinary processes. Impacts are the changes induced with participants being involved in creating the outputs. Outcomes arise with a temporal and/or spatial distance from these processes and can include societal as well as environmental aspects. Impacts mediate between outputs and outcomes. Both impacts and outputs are tangible and indicative of outcomes.

In the following we deepen our understanding of the impacts and their relationship to sustainability. Due to their mediating function, it is crucial to understand their relationship to sustainability for assessing the overall orientation of the transition towards sustainability. While the output level is not explicated in conceptual terms here, it will be considered again when it comes to discussing and assessing concrete empirical examples in later sections.

7.2.2 Relating Social Learning, Empowerment and Social Capital to Sustainability

To expand our understanding of social learning, empowerment and social capital in relation to sustainability, we reviewed additional literature from the field of sustainability science (e.g., [51,52]). To identify relevant literature, Scopus has been searched using the following search strings: “social learning AND sustainability”, “empowerment AND sustainability”, “social capital AND sustainability”. Due to the quantity of all sources displayed (N = 1895, 6.3.2017), only a number (N = 65) of seminal, highly cited works as well as systematic literature reviews and recent empirical studies have been selected. This selection aims for a broad overview of the three impacts. It claims neither comprehensiveness nor representativeness. Relying on the literature, each impact is discussed with regard to three questions: (1) what constitutes it? (2) who is the subject of it? and (3) how does it contribute to sustainability transitions?—including critical reflections.

Social Learning

A core role in many sustainability-related disciplines is granted to social learning, e.g., in adaptive co-management of social and ecological systems in general [14,53] or with more specific foci such as water [54], agriculture [55], resource governance [15], ecological economics [56], transformation and participation studies [57–60] or with regard to broader political responses to global change [61]. Although social learning enjoys great interest from sustainability-related scholars, and albeit recent attempts to clarify the concept [53], the understanding of what social learning is and what it contributes to is unclear [56,62].

(Add 1) What is learned is understood in different ways [14], but at its core it involves a lasting change in the interpretive frames (belief systems, cognitive frameworks, etc.) guiding the actions of a person [63]. A frequently made distinction separates first- and second-order, lower- and higher-order or single- and double-loop learning [14,46,53]. In the following we use first- and second-order learning. First-order learning is understood as the simplest mode of learning, basically involving the acquisition of new cognitive knowledge. First-order learning allows for doing things in a better way. The kind of social learning most relevant in the context of transitions can be defined as second-order learning [57]. This indicates learning processes aiming at changes in values, worldviews and assumptions underlying the actual behaviour: learning to do new things or “old” things in a fundamentally new way.

(Add 2) Individuals are the subject of learning, but as indicated by the term social, their learning is happening in a form of social exchange, e.g., within a group. Furthermore, as Reed et al. [53] point out, learning cannot be considered social if the learning content only stays with one person. Social learning therefore relates to the transmission of individual learning to wider social groups at smaller or larger scales.

(Add 3) How may social learning contribute to sustainability transitions? Reed et al. contend that “social learning may lead to pro-environmental or sustainable behaviour but this is not guaranteed” [53] (p. 3). Siebenhüner et al. [56] put forward that (social) learning contributes an orientation towards transformation and to creating paths and routines for individuals and collectives that contribute to sustainability. We elaborate on this relationship in three steps:

First, several authors have emphasised second-order learning as a way to adapt to a continuously changing and increasingly complex environment through collaborative action and dialogue [54,55,64–68]. In transition management, social learning allows to deal with complexity and uncertainty, based on individual and collective experimentation and reflection. Considering collective actions e.g., of sustainable grassroots organisations, social learning contribute to a more successful achievement of group aims [68]. Thus, we assume that second-order learning is one aspect of voluntary behavioural change as well as the development of innovative and successful solutions to persistent local problems. Schäpke and Rauschmayer [69] hold that (social) learning can be understood as one major source of empowerment (e.g., via new skills).

Second, social learning is connected to changes in values, assumptions and worldviews and relates to the awareness and valuation of sustainability topics in the arena process. Overall, the social learning process should increase the transition mindedness of the people involved [70]. Social learning, in this regard, can contribute to sustainability by raising awareness of sustainability-related problems as well as by increasing the feeling of responsibility and capacity of people to react to these sustainability problems (cf., [69]). It can also function as a process of spreading sustainable practices from alternative niches to the broader societal mainstream (the regime) [24].

Third, social learning processes may go beyond individual interests and/or values and allow for “shared understanding and joint action” [67] (p. 1713) and may strengthen intrinsic values [71]. In addition, Crompton [72] shows that people with high intrinsic value tend to have more and better social relationships (cf. section on social capital).

Critical remarks point towards social learning (pre-)conditions: To come across in participatory setting, social learning is dependent on a trustful atmosphere and intensive, open exchange between participants, combined with a willingness to reflect on one’s own position. When focussing on mutual understanding and shared goals, and thereby emphasizing consensus, this may potentially limit the space for radically new and more sustainable solutions.

EMPOWERMENT

Empowerment is a multidimensional and multi-scalar concept and transition studies [49,73] as well as sustainable resource management and development studies (e.g., [74–79]) outline various aspects of it, based on different disciplinary traditions, such as psychology, management studies, social as well as political studies, and critical theory. Issues of power and politics in transition management have generated growing interest among scholars [25,73,80].

(Add 1) Empowerment is discussed in various disciplines (see [41] for an overview). Psychological research understands empowerment as a perceived increase of intrinsic motivation and control of the situation [49]. Here empowerment may be accompanied by increased feelings of self-esteem and pride [75]. An intrinsic motivation (to do something) is dependent on positive task assessments, such as the perceptions of choice, impact, meaningfulness and competence on what a person does [49] (p. 377), [81]. Such intrinsic empowerment increases the capabilities of a person to lead a valuable life [74]. Management studies interpret empowerment as a process of sharing decisional power (against hierarchies), delegating decisional power [82] and providing people (individuals and groups) with the power to make decisions [83]. In this regard, empowerment is linked with leadership and innovation. In broader political terms, empowerment is linked to participation in decision-making and the development of leadership, which may be granted to or gained by certain groups [76,77]. In economic terms, it is related to gaining control of resources [75,76,79]. In social terms, empowerment is related to better education, the development of social capital or improved local organizations [75,78].

(Add 2) Depending on the context of the analysis and the scale level, various actors are proposed for empowerment, such as individuals as well as groups and communities. Frequently the question of whom to empower is linked to observation of the (unequal) distribution of power, resources and opportunities—with empowerment being a process of redistribution or at least gains of resources and opportunities by formerly less well-off individuals or groups.

(Add 3) Empowerment can contribute to a transition to sustainability in various ways and on different scales. At an individual psychological level, empowerment processes do offer the possibility to increase the motivation and capacity of individuals to act sustainably. Here, Schöpke and Rauschmayer [69] highlight the role of values and awareness when it comes to how people ‘use’ a respective empowerment: engaging for sustainability or not. Engagement is likely if a felt empowerment is linked to an increase in awareness of and felt responsibility for sustainable behaviour—or simply, if sustainability-oriented actors feel empowered. A similar relationship between empowerment and sustainability transitions can be assumed at the organisational and political level, e.g., understood as gains in decision-making capacities. These are likely to be used for sustainability, if (newly or already) sustainability-oriented actors are given more decision-making power on sustainability-related issues.

More broadly speaking, a transition to sustainability as a fundamental change necessarily entails a shift in existing power constellations. In this regard, Avelino [73] distinguishes between different types of power as a capacity of actors, such as transformative power (the capacity to invent and develop new structures and institutions, e.g., legal structures, infrastructure or norms) or innovative power (the capacity to invent and create new resources, such as natural resources or technologies). Gains of innovative and transformative power may lead to a change towards more sustainability, if empowered actors change structures and institutions to become more sustainable. In this line of thought, frontrunners or change agents, as empowered individuals, are the first to realize possibilities for solving sustainability challenges, e.g., by establishing consumption and lifestyle alternatives. Solutions developed by change agents at the micro or niche level transfer to wider social groups by processes of upscaling and broad-

ening [40,84]. Frontrunners function as the drivers behind innovation, trendsetting, mainstreaming and institutionalization processes of sustainable alternatives [23,24,85,86]. Still, critical theory holds that the power of an individual or group depends on its position within the system—and empowerment could therefore only happen in connection to changes in the system. It also holds that the very attempt to empower somebody creates a dependency relationship that is reinforcing the dualism between the powerful and the powerless—and therefore is ultimately dis-empowering [49]. This calls for critical reflection on the development of dependencies in contrast to system changes as part of the research process.

Social Capital

Social capital is a broad concept that is used in several sustainability-related disciplines, such as adaptive collaborative governance [87], resource governance [88,89], collective action [90], community development [91] studies on socio-ecological systems [92] and sustainability management [93].

(Add 1) Social capital is a broad concept that describes relationships, relationships of trust, reciprocity, and exchange, the evolution of common rules, and the role of networks and of social ties [87,90,94,95]. Thus, a distinction can be made between structural aspects of social capital, such as networks and groups, and content-related aspects, such as values, norms or trust [87,96]. Important dimensions of social capital, according to [97], are bonding vs. bridging social capital. “Bonding” social capital describes the links within a homogeneous group (e.g., people with common interests, worldviews, and social background). “Bridging” social capital refers to ties between people belonging to different societal groups. This distinction depends on the perspective taken and both processes can happen simultaneously [96].

(Add 2) Social capital development basically can occur with every individual and group. Depending on the subject of social capital analysis, e.g., an individual or a certain group, the different types of social capital development (bridging and bonding) can be observed—what constitutes bridging for one person may constitute bonding for another, as groups of people known to one person vary from those of another. The kind of social capital development process observed is therefore related to the object of analysis.

(Add 3) Social capital can have positive and negative effects on persons or groups. In positive terms, social capital facilitates collective action [88,90] and increases the probability of mutually beneficial, cooperative behaviours [98]. In this way, social capital functions as a productive resource allowing us to achieve (additional and joint) benefits [89,99]. This explains how individuals and groups use their relationships with other actors in societies for their own and the collective good [100]. In negative ways, social capital e.g., by excessive bonding may result in exclusion and island groups [101], which may hamper innovation [102] and obscure power and class relationships [91,103]. A strong community is characterized by solid bonding but should still remain flexible, not leading to exclusion of others [104].

Social capital is frequently linked to sustainability, especially to its social aspects [101,105,106]. Social capital thereby contributes to the wellbeing of communities, their sustainability and ability to function. Social capital and ‘social cohesion’, as concepts, are associated with social networks, norms of reciprocity and features of social organization [99], and the integration of resulting social behaviour [101]. More precisely, social capital influences social innovations and their potential impacts. Social capital is regarded as a “sustainable investment in the common good and the capacity of societies to innovate” [97] (p. 10). In terms of an environmental focus of sustainability, Chang et al. [107] (p. 232) point out the critical role of social capital in sustaining and developing community initiatives and environmental protection efforts, while Garcia-Amando et al. [88] highlight the positive relationship between social capital and collective action for sustainably governing common resources.

As an intermediate conclusion we propose a conceptualization of a framework to assess societal effects of transdisciplinary transition management (Table 6). This includes three impacts, aspects composing them, qualitative indicators of their potential contribution to sustainability as well as potentially adverse effects. Impacts are suitable for assessment, as they are both tangible and indicative for (later) outcomes of transition management. All three impacts may contribute to the orientation towards sustainability, e.g., in its ecological or social dimension.

Impacts show conceptual overlaps as well as interlinkages in a number of aspects (Table 6, arrows). Overlaps and interlinkages originate from how aspects are described in the literature. They are particularly frequent when it comes to how aspects are assumed to contribute to sustainability. They may indicate different relationships between aspects, e.g., potential synergies, mediating effects and positive feedback loops. As the concrete relationships are unknown, we do not erase them from the framework, but make the potential overlaps and interlinkages explicit. These observations, based on a literature review, will be further explored in empirical case studies, starting with the operationalization of the concepts in the next step.

Table 6. Summary of review and conceptual overview of impacts. The first three columns show how the effects are conceptualized in the literature and how they are assumed to contribute to sustainability. The numbers indicate aspects that are used in the framework. Numbers correspond to Figure 2. Aspects used in the fourth column are used as critical reflexive questions. References correspond to the literature reviewed (Sections 2.1 and 2.2.1–2.2.3). Arrows indicate potential interlinkages and synergies between the aspects of different societal effects, e.g., →sl 7 = is linked to aspect 7 of social capital. Abbreviations: sl = social learning, em = empowerment, sc = social capital.

Impact	Description (Subject and Object of Impact)	Potential Contributions to Sustainability (Result of Impact)	Adverse Effects (Critique)
Social learning	<p>Social learning comprises processes of individual and collective experimentation, reflection and innovation [22,32], which lead to lasting changes in the interpretive frames (such as belief systems, cognitive frameworks, etc.) guiding the actions of a person [63]. In detail, it can include:</p> <p>(1) (a) First- (new knowledge, skills) and (b) second-order learning (changes in values and assumptions) [43,46,53] cf. [14,15].</p> <p>(2) Transmission of individual learnings to wider social groups at small or larger scales [15,53].</p>	<p>(3) Raising awareness on sustainability-related problems [56,58,69,70]; (→em 6)</p> <p>(4) Increasing the feeling of responsibility and capacity of people to react to these sustainability problems [54–56,58,69], e.g., by overcoming unsustainable lock-in situations [31]; (→em 6,7)</p> <p>(5) Allowing for the development of joint visions in direction of sustainability [32,34];</p> <p>(6) Allowing for the development of collective action in direction of sustainability [29,67,68] (→sc 7);</p> <p>(7) Spreading of (sustainability) insights from individuals and groups to wider groups is possible [15,22,24] (→em 9, sc 4).</p>	<p>A focus on consensus building, shared goals and trust/respect to foster social learning may limit the space for radical change (towards sustainability) [108]</p>
		<p>(6) When process of (psychological) empowerment are linked to increases in awareness and motivation on/for sustainability (→sl 3,4) [69];</p> <p>(7) If psychological empowerment raises capacity to react to sustainability problems (→sl 4) [13,69],</p> <p>(8) Giving sustainability interests more decision-making power;</p> <p>(9) Contributing to changing structures, if new structures are more sustainable, e.g., sustainable niches become mainstream (transformative power) [40,49,73,109], e.g., when frontrunners trend set sustainable alternatives [23,24,85,86]. (→sl 3,4,7, sc 7).</p> <p>(10) Contributing to the development of new, more sustainable resources (innovative power) [73] (→sc 6).</p>	
Empowerment	<p>Empowerment refers to:</p> <p>(1) Increases in intrinsic motivations via choice, impact, meaningfulness and competence [49,74,81],</p> <p>(2) Increases in decision-making capacities [82,83],</p> <p>(3) Gains in control over resources and possibilities [73,75,76,79],</p> <p>(4) (Beneficial) changes in the overall position of individuals and groups within the system [76],</p> <p>(5) Development of new resources [73,75,78].</p>	<p>(6) Empowerment paradox: the attempt to empower somebody establishes a dependency relationship and therefore may ultimately be disempowering [49]</p>	

Table 6. Cont.

Impact	Description (Subject and Object of Impact)	Potential Contributions to Sustainability (Result of Impact)	Adverse Effects (Critique)
Social capital	<p>Social capital structurally refers to relationships between individuals, groups and networks [87,96]. Two dimensions can be distinguished [97]:</p> <p>(1) Bonding amongst people in a group (2) Bridging to people outside a group.</p> <p>Relationships have a quantitative (e.g., number of contacts) and a qualitative side (trust, common rules and values as well as norms of reciprocity) [45,87,90,94,95].</p>	<p>(3) Building and maintaining strong ties within a group (e.g., via trust, shared rules and values) is contributing to a strong local community, which can be considered one of the social aspects of sustainability [89,98–101,105,106]</p> <p>(4) Group remaining flexible and inclusive; openness towards other groups or across groups, networking (bridging) [22] (-sl 7, em 9);</p> <p>(5) Supporting to develop and sustain community initiatives [107] (sl6, em 10);</p> <p>(6) Increasing the capacity of the community for (sustainability) innovations (-em 10) [97];</p> <p>(7) Positively relating to collective action for sustainability (-sl 6, em 9) [48,51,88,90,92,100]</p>	<p>Strong increase of social capital within a group may create exclusion tendencies towards “outsiders” [101], hamper innovation [102] and obscure power relationships [91,103]</p>

7.3 MATERIALS AND METHODS

In this section we operationalize the three impacts for application in the context of transdisciplinary transition management. We first describe the case studies the framework gets applied to. Secondly, the impacts are operationalized for direct and indirect measurement and the methods of data collection and interpretation are outlined.

7.3.1 Case Description

In our cases we focus mainly on the application of a core governance instrument of transition management, the transition arena. This is a protected space for social learning, where participants meet outside of their usual habits and roles and engage in a deliberative process and transformative action regarding a specific persistent problem [22]. The deliberative process of the transition arena includes a common problem framing, envisioning a sustainable future as well as participatory back-casting to define concrete steps for realizing future visions. Setting up experiments so as to carry out these steps is part of the process. Once finished, the transition arena group presents their transition narrative to a broader public and reconnects it with political, social and economic realities [22]; the group is its ambassador.

We focus on two specific transition management processes that we were involved in: one in the village of Finkenstein in Austria and one in the urban neighbourhood of Carnisse in Rotterdam, The Netherlands (for details see Box 1). These processes were initiated as part of the EU FP7 funded research project “InContext” (2010–2013), which (amongst others) developed and applied a transition management approach for local communities, the community arena [17]. This was done by adapting the transition arena approach outlined above to the local level.

Box 1. The case study communities (taken from, [110], modified).

Finkenstein am Faaker See is located in Austria, on the border between Slovenia and Italy. It is one of the largest communities in Carinthia (one of the nine Austrian Länder). About 8500 people live in Finkenstein, spread over about 28 villages, and settlements divided into a Slovenian-speaking minority and a German-speaking majority. The main economic sectors are tourism and (small) industry and agriculture. Societal challenges at the local scale include limited political participation, low social cohesion and over-individualization as well as un- or overused natural heritage. The focus of the community arena process was on quality of life. The process was co-financed by the municipality of Finkenstein and a supporting group to the community arena, including local politicians, was established. The vision is put into practice through action-oriented projects or deliberative processes in a number of working groups, e.g., on economics, sustainability and social issues. These working groups realized various activities, such as workshop series on gardening or participation, welcoming brochures for new arrivals and local journalism.

Carnisse is an urban neighbourhood in the city of Rotterdam, situated on the western coast of The Netherlands. Some 10,000 (out of Rotterdam's 600,000) inhabitants live in Carnisse. It is known as a deprived neighbourhood, scoring low on a number of municipal indexes and marked by a high turnaround of inhabitants, who together represent about 170 nationalities. Severe budget cuts in the municipality are threatening the continuation of social work as well as community facilities. Societal challenges at the local scale include economic hardship, over-individualization, poor building stock, and a lack of social cohesion and public spaces. The focus of the community arena process was on the quality of life in the neighbourhood and it was co-financed by the Dutch government. The local city administration was informed of the arena process, but it did not officially support the process. The vision is put into practice by a group that aims to re-open one of the community facilities, a community centre and a related community garden under self-management. In addition, members of the community arena are also organising a number of deliberative meetings with different stakeholder groups.

Using an action research approach, researchers systematically facilitated a collective search to explore opportunities for joint action in Finkenstein and Carnisse [48]. The process was participatory and reflexive in nature, aiming to allow for intensive learning amongst the participants. Participatory processes lasted 16–17 months and included 13 (Carnisse) and 16 (Finkenstein) participatory meetings (see Supplementary Material Description S4 for details). Researchers took diverse roles including as knowledge brokers, reflexive scientists and process facilitators (see [22] for a comprehensive analysis of researchers' roles). All authors have been involved in the case studies, albeit to different degrees (see the author contributions declared below). Reflexive elements included a focus on the values,

needs, thoughts and feelings of the participants, as they were supposed to be essential drivers for behavioural change and collective actions.

The InContext project consortium agreed that a predefined sustainability goal with targets for the case studies would be counterproductive to the idea of an open process of experimentation and learning. The case studies were conceived of as a learning journey to render the concept meaningful in the local context [48]. Rather than focusing on the concept of sustainability, the community arena process aimed to play into local dynamics and was centred on a good quality of life for all now and in the future. The consortium hoped to capture the essence of sustainability without falling into quarrels about the notion itself. The researchers operationalized the concept of sustainability in four dimensions:

- (1) Environmental thinking (awareness of nature and natural resources),
- (2) Social thinking (consideration and acknowledgement of self and others),
- (3) Time horizon (short and long term) and
- (4) Interregional thinking (connection with other parts in the world, near and far).

These dimensions of sustainability thinking were to be used in the facilitation of the processes (Wittmayer et al. 2012). For the action research practice, this meant that the researchers provided space for the participants to decide what is important for them and their local community. In the discussions the four dimensions were used to motivate people to think in the direction of sustainability (for details, see [110]). The term sustainability was used, though it was not given a very prominent role in the process.

The presented case studies have been selected as they represent two of a small number of transition management processes that have been applied at the local level so far (e.g., [31,48]). Regarding the research process, both cases followed the typical transition management methodology, the transition arena adapted to the local level. In this regard the cases allow us to explore the societal effects of typical transition management processes. Besides the methodology, cases show similarities with regard to the number of inhabitants and being located in a Western European context. Regarding the type of settlement, they differ strongly: One case is located in a rural area and consists of an agglomeration of a number of villages, while the other is located in a neighbourhood of a larger city. Thus, Finkenstein and Carnisse may be used as contrasting cases [111] to explore the bandwidth of potential applications and the effects of transition management at the local level.

7.3.2 Operationalization of Impacts, Data Collection and Interpretation

We propose operationalizing and assessing the three key concepts outlined in Figure 16, summing up the various aspects related to the outlined impacts (cf. Table A1 in the Appendix A for details). While the proposed operationalization could generally be used for the assessment of the transition area instrument in various contexts (e.g., companies, cities or regions), it specifically suits the local level, as outlined in the consecutive case study analysis. The operationalization builds on the literature reviewed (Sections 2.1 and 2.2) and the derived descriptions of impacts (Table 6). Each impact is differentiated into a number of aspects, some of which describe the impact per se, and some of which try to capture its relationship to sustainability. Thereby impacts are sensitizing concepts. Their meaning needs to be explored in empirical research.

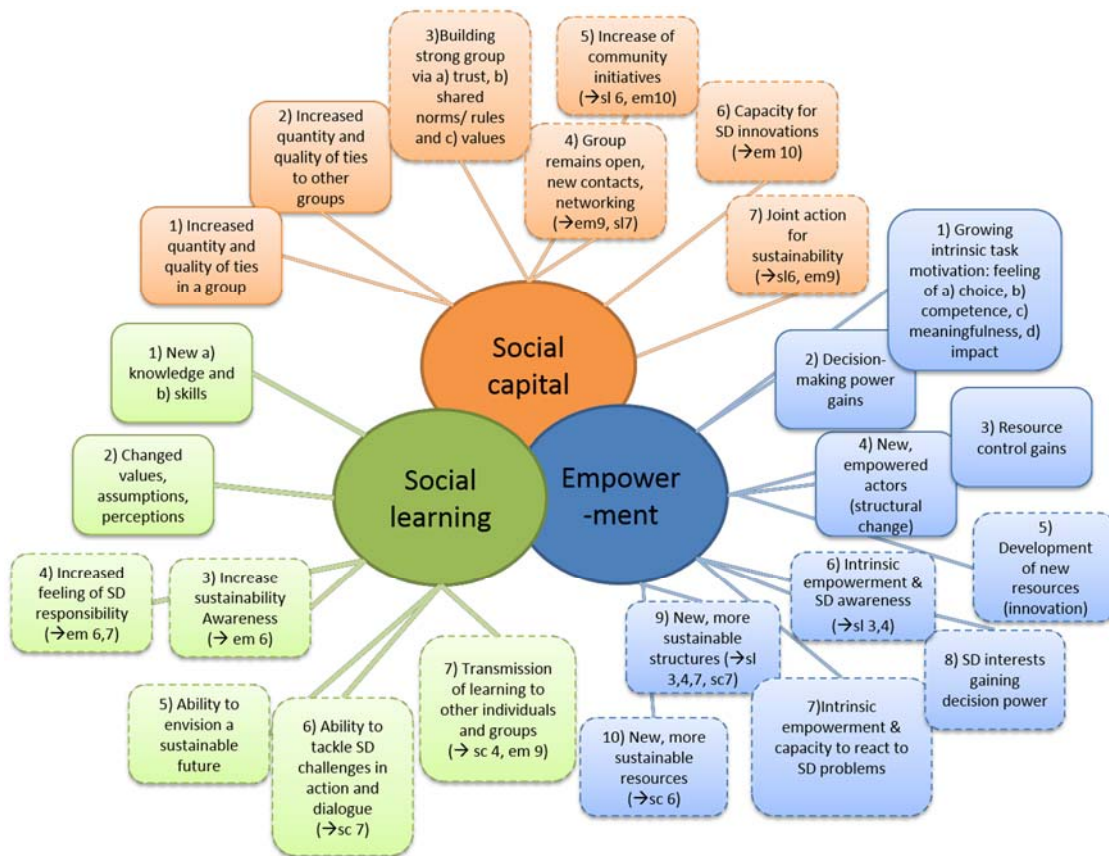


Figure 16: Graphical overview of operationalizing different societal effects for assessment. This figure shows the operationalization of each impact in two areas: first, it depicts aspects to generally characterize the effect (regular borders). Second, it includes aspects allowing us to assess the relationship of the societal effect to sustainability (dashed borders). Aspects are drawn from the review of the literature (Table 6). Small arrows indicate conceptual overlap and therefore possible interlinkages between different aspects (e.g., → sl 6 means “related to aspect 6 of social learning”). Abbreviations: sl = social learning, em = empowerment, sc = social capita, SD = sustainability. Each aspect is substantiated for its direct (building on participants’ self-reporting) and indirect (building on document analysis and participant observations) assessment (see Table A1 in the Appendix for details)

Our empirical analysis is focused on research activities and the data generation that took part during the lifetime of the two local case study projects (see Supplementary Material Description S4 for details on processes). When research projects ended, processes initially facilitated by researchers were handed over to local participants. Participatory evaluation workshops marked the end of the research process in both communities. Setting boundaries for the analysis was necessary for practical, e.g., funding reasons. While this allows us to capture a range of impacts, the mid- and long-term effects generated by the project are excluded (for the outcomes, see Figure 9).

For gathering and interpreting data on impacts, various methods were used (see Supplementary Material Description S5 for details on methods). This included participatory evaluation workshops and qualitative and semi-qualitative interviews (for detailed reporting see project deliverables [17,110,112–115]). Evaluation workshops were approximately five hours long and included group discussion, discussions in smaller groups, plenaries, a world café and joint assessments and ratings. Reflections included questions on learning, empowerment and social capital developments as well as the overall community arena process, content and results and an outlook on the future. In Finkenstein 25 persons participated, in Carnisse 7. In Finkenstein the workshop was prepared with a preceding semi-structured online survey (15 responses) as well as in-depth qualitative telephone-interviews (eight interviewees).

In Carnisse it was prepared and enriched by 13 semi-structured interviews (seven mid-term interviews and six interviews at the end). In both cases the core outputs of the case studies at the level of products are additionally used as data sources. This includes the vision documents as well as concrete and experimental services developed by participants (see Supplementary Materials Description S6 for a detailed outline).

The consecutive assessment does both: it directly assesses impacts and it indirectly gathers information about them by analysing the outputs generated by project participants. For direct assessment, participants were asked to report on various aspects of the impacts as part of the participatory evaluation workshop and respective interviews in the final phase of the case studies. For indirect assessment and reflection of direct data sources, researchers analysed a) participant observations of the arena process creating these outputs and, where possible b) the indication of developed outputs (e.g., the vision documents) with regard to the impacts. Jointly, these three assessments form a triangulation, complementing one another to a multifaceted picture on the creation of impacts. Due to the nature of the data (self-reported observations of participants, participant observations, and document analysis of visions) and the small sample size, the analysis is of a qualitative and explorative nature.

7.4 RESULTS

Results for each impact are presented in the form of an overview table (Tables 7–9), capturing core insights regarding each impact and aspects from the two cases. (For a detailed report of empirical observations please see Supplementary Materials Tables S1–S3.) These results are then discussed alongside four questions in two steps. First it is discussed: (A) was the impact observed? (B) how was the impact empirically related to sustainability? (C) what adverse or limiting effects occurred (see Table 6, right column)? Second, a comparative discussion addressed:

(D) what were the similarities and differences between the two cases? Conceptual overlaps and potential interlinkages between aspects that originated from the literature review are taken into account for data collection and attribution. If the data from overlapping aspects appear relevant to the aspect in question, they are reproduced and the overlap is indicated.

Table 7: **Overview of social learning results.** (Aspects are assessed using both direct reporting of participants (formatting: regular) and indirect assessments based on researcher observations and analysis of secondary sources (formatting: italic). Underlying operationalization of each aspect includes brief propositions for direct and indirect assessment (see Appendix A for details). Abbreviations used are P = Participants, R = Researchers, sc = social capital, em = empowerment, SD = sustainability; interlinkage with aspects of other impacts are indicated (→)).

No	Aspects	Finkenstein	Carnisse
1a	New skills	Several survey R discovered new competencies: speaking one's own mind in public, better communication, creativity, organisation, leadership, an increase in self-reflexivity and the feeling of responsibility as well as the ability to work in a team and the understanding for political work— <i>R made similar observations.</i>	Diverse new skills reported: speaking one's own mind in public, sharing knowledge and perspectives, put things in a broader perspective, <i>R made similar observations. Additionally observed skills: working respectfully together, chairing group session, reporting outcomes.</i>
1b	New knowledge	P reported some surprises, insight that individual worries (but also ideas) are shared by others; a general increase in knowledge. <i>Ps learned about the idea of transitions, sustainability transitions, participatory methods and issues related to different areas such as mobility, energy, local economic affairs; knowledge repercussions in outputs generated.</i>	P reported more knowledge and awareness on what was happening around them, the neighbourhood and its dynamics and the history of Carnisse. Legal, financial and institutional know-how related to a community centre was gained. <i>R observed participants getting acquainted with new perspectives.</i>
2	Changed values, assumptions and perceptions	P reported increased trust, more openness, fewer prejudices, positive attitudes to change and more long-term thinking, personal growth and a higher motivation to engage. <i>No particular observations.</i>	P reported awareness that they can make a difference; arena re-affirmed their current perspectives and values; vision gave them nice ordering of their assumptions and perspectives on change. <i>R observed P starting to feel that change is necessary and possible, a continuous process that comes from within.</i>
3	Increased sustainability awareness	P stated sustainability is a very important issue. <i>Working groups explicitly or implicitly deal with sustainability; experiments address sustainability challenges; the vision includes sustainability goals.</i>	All P found a clear connection between sustainability and the vision; interpretations of sustainability differed, but the common denominator was a focus on the long term. <i>Sustainability was multi-interpretable, no consensus on priorities was reached, the vision created awareness of the interconnectedness of different scales.</i>
4	Increased feeling of responsibility for sustainability	P partially feel responsible; in general increased feeling of responsibility of own actions. <i>Working on a common vision including sustainability increased sustainability awareness; the vision attributes responsibility to the current generation. It was agreed upon by all participants.</i>	P reported tackling neighbourhood problems (not specific sustainability problems), felt responsible for participating in the arena and lamented the absence of institutional actors from the arena process and the outsourcing of responsibility. <i>N/A</i>

Table 7 cont.

No	Aspects	Finkenstein	Carnisse
5	Ability to envision a (sustainable) future	N/A. <i>A joint vision was developed, agreed upon by all, to include sustainability. Radical change was constantly promoted by single participants only; participants reacted rather annoyed, and the arena stuck to envisioning soft changes.</i>	All P found a clear connection between sustainability and the vision; interpretations of sustainability differed, but the common denominator was a focus on the long term. Some reported the vision was too utopian, while others stated that it wasn't radical enough. <i>A joint vision was developed, with input from group discussions and 1-on-1 interviews. It includes ecological and mostly social aspects of sustainability. Vision was agreed upon in the arena; however, most participants did not own the vision.</i>
6	Tackling sustainability in actions & dialog	P stated that the project would be beneficial for future generations and other regions and would benefit sustainability in Finkenstein. <i>Eight working groups, several actions and events in many parts relating to sustainability were developed.</i> Nine out of 15 participants stated that the project implements measures that are future-oriented and benefit other parts of the world. <i>A "climate energy model-region" was applied for and got accepted. Working groups are related to sustainability. An institutional structure for further implementation of the vision has been built, establishing a local steering committee. (→sc aspect 7).</i>	For most P neighbourhood development (so not SD) was a collaborative effort par excellence and working collaboratively was the guiding principle of the vision. Sustainability was operationalized in relation to social challenges. <i>Collaborative actions were initiated in the experiments.</i> Directly: No explicit joint action for sustainability was mentioned; the community centre reopening was a reaction to local, social problems. <i>Indirectly: three newly arena-initiated experiments related to social aspects of sustainability. (→sc aspect 7)</i>
7	Transmission of (sustainability) learning	P stated that they have frequently talked with other citizens about the project, and met with some interest and some scepticism. <i>Results presented to the transition team (local politicians) as well as to the interested public. Following the arena process, a successful application was launched to become a "climate-energy-model-region", building on insights from the arena process and supported by local officials. (→sc aspect 4).</i>	Vision was being distributed during a network event. P talked to other residents about 'Bloeiend Carnisse', the development vision for Carnisse. People who were not engaged in the process were mainly sceptical; although they liked the vision, but considered it too abstract. <i>Similar observations, plus the vision was presented in the media. General focus on internal group process. The experiment of reopening a community centre under self-maintenance attracted the interest of officials of the Rotterdam municipality and was interpreted as a potential model for mitigating the crisis of the welfare state within the city. (→sc aspect 4)</i>

Table 8: **Overview of results regarding empowerment.** (Aspects are assessed using both direct reporting of participants (formatting: regular) and indirect assessments by researchers (formatting: italic). Underlying operationalization of each aspect includes brief propositions for direct and indirect assessment (see Appendix A for details). Abbreviations: P = Participants, R = Researchers, sl = social learning, sc = social capital; interlinkage with aspects of other impacts are indicated (→)).

No	Aspects	Finkenstein	Carnisse
1	Growing intrinsic task motivation via A) choice, B) competence, C) meaningfulness and D) impact.	(A) P reported they were able to choose the agenda. <i>Vision written by researchers but developed and agreed upon by the community arena, with working groups and actions led by P.</i> (B) Cf. social learning/new skills; <i>P took roles depending on competences they became aware of during the arena, and new skills got developed.</i> (C) Good scores for bringing in their own input and topics, open agenda, majority of P had the feeling of doing something meaningful; <i>R made similar observations.</i> (D) P believe they have an impact on the local environment; the steps taken were quite small; some changes were based on assumptions about their own ability to impact development; 50% of P reported increase in possibilities to shape Finkenstein; attitudes towards the future changed in a positive way; <i>experiments impacted upon local developments in the form of raising attention, attracting additional participants and finally the validation of the climate energy model region in Finkenstein.</i>	(A) All P reported being able to choose the agenda. <i>The arena process helped to voice perspectives on the state of Carnisse.</i> (B) P reported gains in confidence to speak in public (see 'skills' in social learning table); <i>P took different roles, could employ their competences in the arena when necessary.</i> (C) Scores P gave for being able to bring in their own input and topics were good; P felt vision was a great result, appreciated the exchange of perspectives. <i>Motivation in group was very apparent during the whole process, a symptom of a meaningful process.</i> (D) Scores P gave to level of impact they are having were good. P stated they were able to make a difference. Some had this feeling prior to the arena. Others stated the arena-process did not develop sufficient tangible actions for people to make an impact. P, in re-opening of the community centre, stated they can make a direct impact in the here and now. <i>Re-opening the community centre made a direct impact; presentation of vision to broader audience had impact.</i>
2	Gains in decision-making power with regard to local developments	Change in perception of local politics: realizing own ability to shape local politics, taking responsibility for local developments, recognition of the value of local politics. The majority of P agreed that they can bring their own requests/ideas to the municipality. <i>No formalized decision-making power granted by local politics, but increased influence on local development; working groups started activities, organized courses and events, brought new ideas to the community council.</i>	Most P reported being decision-makers with power, but also reported that the most important decision-makers were not present in the arena process and that they needed to be involved. <i>Arena had strong emphasis on 'power to the people', managed to influence a large-scale networking event and to put its transition agenda on the table.</i> (See also aspect 1/impact above)
3	Gains of control over resources by arena participants	Nothing to report. <i>Very few concrete resources granted; intangible resources difficult to observe. Actions by arena P frequently undertaken without waiting for permission or resources from the community council.</i>	Direct effect was generated by taking control over the closed community centre, participants stated actors who control resources should step up. <i>Resource of symbolic legitimization, financial and physical capital to re-open and manage the community centre. New social capital (ties and networks of engaged residents and volunteers) and symbolic capital (the group became a powerful actor in the institutional network of Carnisse).</i>

No	Aspects	Finkenstein	Carnisse
4	Changes in local structures (e.g., new actors)	Nothing to report: <i>Arena established itself as a new, but temporal actor in the local system. It gained more and more publicity; supporting group of local officials (the transition team); a local steering committee was elected</i>	Nothing to report. <i>Community arena did not appear as a new actor much, because it was kept in the shadows/margins. But group action-around the community centre gained considerable influence (because of their central position in the neighbourhood and influential networks).</i>
5	Development of new resources (innovation)	Nothing to report. <i>Nothing to report.</i>	Nothing to report. <i>Symbolic capital: vision and the arena became a symbol to relate to. See aspect 3/resource gains on new social capital and symbolic capital strengthening the new actor.</i>
6	Empowerment contributes to sustainability if increasing meaningfulness (aspect 1) relates to sustainability	R stated sustainability is a very important issue. <i>Working groups explicitly or implicitly deal with sustainability; experiments o address sustainability challenges; the vision includes sustainability goals.</i> P partially feel responsible; in general they have an increased feeling of responsibility for their own actions. <i>Working on a common vision including sustainability increased sustainability awareness; the vision attributes responsibility to the current generation. It was agreed upon by all participants. (↪sl aspect 3, 4)</i>	All respondents found a clear connection between sustainability and the vision, but the interpretation of sustainability differed. Focus on the long term and local problems such as social challenges. Some participants reported that they were engaged because they felt responsible for solving these challenges. Long-term thinking and awareness of the interlinkages between different scale levels were strengthened. <i>Sustainability was interpreted in different ways by the different participants, but the vision created awareness on the interconnectedness of different scales. Vision shows sustainability in social, ecological and economical dimensions. This potentially was influenced by the writing by the researchers.</i> →social learning 3 P reported on tackling neighbourhood problems (not specific sustainability problems), felt responsible for participating in the arena and lamented the absence of institutional actors from the arena process and the outsourcing of responsibility. <i>N/a</i> →social learning 4
7	Feeling of (increased) capacity to react to sus. problems	The vision exerted pull and encouraged participants to build pathways for reaching the vision; attempts to directly influence the decisions of the community council were only partially successful. <i>Rs made similar observations.</i>	P reported community centre reopening as a reaction to local, social problems. <i>Vision of arena and arena process focussed on “power to the people”, independence from local institutional structures, embeddedness of new actions in the local communities.</i>
8	New sustainability related decision-making capacities	Nothing to report; <i>working groups influenced local developments with their actions, including sustainability-related experiments.</i>	Nothing to report. <i>Only with regard to social aspects of sustainability as part of the re-opened community centre.</i>



9	A sustainability orientation of new actors and changing of local structures	<p>P stated sustainability is a very important issue and they partially feel responsible for it; in general they have an increased feeling of responsibility for their own actions. <i>Indirectly: The arena group and related working groups established themselves as new local actors. The developed vision shows the high value of sustainability; Some working groups and activities highlighted the value of sustainability (→sl aspect 3, 4)</i></p> <p>P stated that they have frequently talked with other citizens about the project, and were met with some interest but also some scepticism. <i>Results presented to the transition team (local politicians) as well as to the interested public. Following the arena process, a successful application was launched to become a climate energy model region, building on insights from the arena process and supported by local officials. (→sl aspect 7)</i></p> <p>P stated that the project was beneficial for future generations and other regions and could benefit sustainability in Finken-stein. <i>Eight working groups; several actions and events in many parts relating to sustainability were developed.</i></p> <p>Nine out of 15 participants stated that the project implements measures that are future-oriented and benefit other parts of the world. <i>A "climate-energy-model-region" was applied for and got accepted. Working groups are related to sustainability. An institutional structure for further implementation of the vision has been built, establishing a local steering committee. →social capital 6</i></p>	<p>Nothing to report. <i>The foundation board, as a new local actor, had a certain (implicit) sustainability orientation. The experiment run by the foundation board of reopening a community centre under self-maintenance attracted the interest of officials of the Rotterdam municipality and was interpreted as a potential model for mitigating the crisis of the welfare state within the city.</i></p> <p>All P found a clear connection between sustainability and the vision; the interpretation of sustainability differed, but the common denominator was a focus on the long term. <i>Sustainability was interpreted in different ways; no consensus on priorities was reached, but the vision created awareness of the interconnectedness of different scales.</i> →social learning 3</p> <p>P reported on tackling neighbourhood problems (not specific sustainability problems), felt responsible for participating in the arena and lamented the absence of institutional actors from the arena process and the outsourcing of responsibility. <i>N/a→social learning 4</i></p> <p>Vision was being distributed during a network event. P talked to other residents about 'Bloeiend Carnisse', the development vision for Carnisse. People who were not engaged in the process were mainly sceptical; although they liked the vision, it was considered too abstract. <i>Similar observations, plus the vision was presented in the media. General focus on internal group process. The experiment of reopening a community centre under self-maintenance attracted the interest of officials of the Rotterdam municipality and was interpreted as a potential model for mitigating the crisis of the welfare state within the city.→social learning 7</i></p> <p>Directly: No explicit joint action for sustainability was mentioned; the community centre reopening was a reaction to local, social problems. <i>Indirectly: three newly arena initiated experiments, related to social aspects of sustainability.→social capital 7</i></p>
10	Developed resources to contribute to sustainability	Nothing to report	<p>Nothing to report. <i>Vision as a symbol including sustainability aspects may implicitly promote sustainability in neighbourhood development. (→sc aspect 6)</i></p>

Table 9: Overview of results regarding social capital. (Aspects are assessed using both direct reporting of participants (formatting: regular) and indirect assessments by researchers (formatting: *italic*). Underlying operationalization of each aspect includes brief propositions for direct and indirect assessment (see Appendix A for details), Abbreviations: P (Participants) and R (Researchers), sc (Social capital), em (Empowerment); interlinkage with aspects of other impacts are indicated (→)).

No	Aspects	Finkenstein	Carnisse
1	Quantity and quality of ties within a group, i.e., the community arena	Approximately 60 P meet regularly; many of them did not know each other before. Collaboration with like-minded people was appreciated. P perceived themselves as “one group”; development of very good relationships, more trustful relationships and connection to new milieus. <i>The group was quite diverse; participants did not know each other; trustful atmosphere; group feeling.</i>	67 P in total made contact with each other. Participants did not know each other beforehand and were quite diverse. They did not see the arena as a stable group with a lot of cohesion and interactions were very informal, loose and short-term. A shared feeling of responsibility for Carnisse was expressed. <i>The arena group was exclusive in participation. Ties within the arena group were rather distant. Different phases can be observed: from open and flexible to a closed core group that was opening up again.</i>
2	Quantity and quality of ties with other groups, i.e., other groups within or beyond the community	Quantity not concretely assessed. P frequently talked with other citizens about the project and met with some interest and some scepticism. Criticism of P regarding lack of public interest. <i>Arena connected to public in three broadening events; connected with policy makers in three meetings. Ties to Slovenian minority in Finkenstein could not be established.</i>	Quantity not concretely assessed. Outside contact on the topic of the arena did not really take place. In regard to the experiment, there was a lot of exchange. <i>One public broadening event with 100+ participants, contact established with local municipality and government. Work on the opening of the community centre established further contact with the Rotterdam municipality, housing cooperations, local schools, etc. Ties to inhabitants with immigrant backgrounds were difficult to establish and maintain in deliberative processes, but for visitors of the community centre and participants in workshops and activities new ties were established</i>
3a	Building strong group via a) development of trust within the group	Growing trust was reported, as well as working together in a respectful and constructive way. <i>Trust could be observed.</i>	Group feeling was not really created. <i>Not observed.</i>
3b	Building strong group via b) development of shared rules and norms within group	Similar concerns among the participants; communication became more appreciative. <i>The steering committee was elected by a mutually agreed voting procedure; communication guidelines were developed.</i>	Not assessed. <i>The common denominator of the group was a shared connection and responsibility to the neighbourhood.</i>
3c	Building strong group via c) development of shared values within the group	Initially divagating interests and aims were transferred into a shared vision and actions benefitting the common good. <i>Some activities show shared values (mostly social); the vision includes a number of value statements and was endorsed by the whole arena group.</i>	Not assessed. <i>Shared values of group centred around social morals for community; also apparent in the vision.</i>

No	Aspects	Finkenstein	Carnisse
4	Group shows openness towards new contacts, networking	<p>Process sparked interest in and respect for other persons, increased self-reflexivity and led to fewer prejudices. <i>Working groups focussed on establishing exchange.</i></p> <p>P stated that they have frequently talked with other citizens about the project, meeting with some interest and some scepticism. <i>Results presented to the transition team (local politicians) as well as to the interested public. Following the arena process, a successful application was launched to become a “climate-energy-model-region”, building on insights from the arena process and supported by local officials. (→sl aspect 7, em 9)</i></p>	<p>Some participants reported that they had sparked interest in other participants. <i>Efforts were made by the arena group to invite new contacts to each meeting, but these were not very effective.</i></p> <p><i>The experiment run by the foundation board of reopening a community centre under self-maintenance attracted the interest of officials of the Rotterdam municipality and was interpreted as a potential model for mitigating the crisis of the welfare state within the city (→sl aspect 7, em 9)</i></p>
5	Quantity and quality of sustained or new community initiatives	<p>Quantity: 60 participants in eight working groups meet regularly; eight arena workshops with 10–30 participants each took place; Quality: new ways of working together. <i>Quantity: eight collective actions were started. Quality—nothing to report. (→sl aspect 6)</i></p>	<p>N/A <i>Three types of innovative practices: newly arena initiated experiments; participants engaged in own (innovative) activities; innovative ideas communicated through the vision and a networking event. (→sl aspect 6)</i></p>
6	Capacity for sustainability-related innovations	<p>Nothing to report. <i>Nothing to report.</i></p>	<p>Nothing to report. <i>Vision as a symbol including sustainability aspects may implicitly promote sustainability in neighbourhood development. (→em aspect 10)</i></p>
7	Joint action for sustainability	<p>Nine out of 15 participants state that the project implements measures that are future-oriented and benefit other parts of the world. <i>A “climate-energy-model region” was applied for and got accepted. Working groups are related to sustainability. An institutional structure for further implementation of the vision has been built, establishing a local steering committee. (→em aspect 9)</i></p> <p>P stated project was beneficial for future generations and other regions and would benefit sustainability in Finkenstein. <i>Eight working groups, several actions and events in many parts relating to sustainability were developed. (→sl aspect 6)</i></p>	<p>Directly: No explicit joint action for sustainability was mentioned; community centre reopening was a reaction to local, social problems. <i>Indirectly: three newly arena initiated experiments, related to social aspects of sustainability. (→em aspect 9)</i></p> <p>For most P, neighbourhood development (so not SD) was a collaborative effort par excellence and working collaboratively was the guiding principle for the vision. Thereby, sustainability was operationalized in relation to social challenges. <i>Collaborative actions were initiated in experiments. (→sl aspect 6)</i></p>

The following analysis builds on Table 7 to discuss social learning results:

(Add A) In Finkenstein first- and second-order learning was observed (aspects 1a,b and 2). Furthermore, participants' learning was partially transmitted to wider groups (aspect 7). Thus, social learning took place. In Carnisse mostly first-order learning was reported, complemented by some second-order learning. Both types of learning were observed by researchers, while the transmission of learning to wider groups was reported and observed only to a limited extent. Overall, social learning took place.

(Add B) Via the learning process in Finkenstein, sustainability gained an important role: participants learned to counter sustainability challenges by developing a joint vision prominently including sustainability and initiated actions and dialogue towards realizing this vision (aspects 5, 6). Therefore, it is likely that learning on sustainability-related issues got transferred into the vision and actions. Some aspects of second-order learning, e.g., increased attribution of responsibility for one's own actions (aspect 4), as well as increased openness to change and a positive attitude towards the future, are likely to positively affect participants' motivation for sustainability-related actions. An increase in sustainability awareness was not reported, but awareness was generally high (aspect 3).

It remains difficult to evaluate the relationship of learning and sustainability in Carnisse, since sustainability was open to different interpretations in the arena process. Sustainability was mainly linked to 'the social' and 'the local' (aspects 4 and 6). In addition, there was some awareness gained on long-term processes and different scales related to local development (aspect 3). Overall, social learning can only be partially related to sustainability. For both cases critical aspects of social learning, like the blocking of radical change by a strong impetus on consensus, are difficult to decide upon (aspect 5). There are some indications that the vision developed in Finkenstein includes rather soft but radical changes. In Carnisse different opinions were raised with regards to the developed vision being either too utopian or not radical enough.

The following analysis builds on Table 8 to answer the outlined questions for empowerment:

(Add A) In Finkenstein there was empowerment happening in different areas. A psychological empowerment of participants was observable on all four indicators (aspect 1). On the organization and political level, some aspects of empowerment were observable (aspects 2–4). Participants perceived their influence on local politics to be growing and reported a growing appreciation of the work of local politicians (aspect 2). A new actor (the community arena and related working groups) was established and its decision-making capacities increased during the lifetime of the project (aspect 4). At the end of the project this actor got institutionalized in the form of a self-standing local steering committee. Still, resources were developed or gained control on very little (aspects 3 and 5). Critically reflecting empowerment in Finkenstein reveals the establishment of dependency relationships between more and less powerful participants as well as with regard to local politics. Still, this dependency was limited since the arena acted largely independently of local politics, e.g., not drawing on resources provided by local politics.

In Carnisse a psychological empowerment of participants was observed and reported with regard to all four indicators (aspect 1). In organizational and political terms, empowerment took place to a certain degree when the transition arena and the respective vision gained symbolic capital (aspects 4 and 5). A stronger empowerment took place via the re-opening of the community centre, which included a gain in decision-making power, new resources and establishing a new actor in the local community (aspects 2–4). A limiting factor was the low connection of the arena to current policy and governmental structures, with important decision-makers being absent from the process (aspect 3). Dependency relationships in Carnisse can be observed in the toleration of the actions, e.g., the squatting at the community centre, by the municipality and the high-level political support of this.

(Add B) In Finkenstein, sustainability is part of the new actors' agenda and actions. As part of the social learning process, sustainability became more important to the participants. Participants felt capable of actively influencing local development, including sustainability-related activities (aspect 7). An increase in sustainability awareness was not reported, but awareness was generally high (aspect 6). The orientation of the newly developed actor towards sustainability was high and influenced local structures to some extent (aspect 9). Therefore, sustainability and empowerment emerged simultaneously. Sustainability-related formalized decision-making power or resources were nevertheless not gained (aspect 8).

In the community arena in Carnisse, its vision and experiments, sustainability was considered in limited and more implicit ways (aspect 6). Rather, the focus was on local and social challenges. In this way, sustainability was part of the empowerment that took place via resource and decision-making power gains as well as the establishment of a new actor (aspects 8–10). Beyond this, generic sustainability dimensions can be traced in the vision, which functioned as a symbol for local development (aspects 6 and 9). While the community centre did not appear as a new local actor, the foundation board running the major experiment did gain influence in local development as well as support from city officials. It had a certain sustainability orientation, focusing on social issues (aspect 9). Relatedly, participants increased their capacity to react to local social problems (aspect 7).

The following analysis builds on Table 9 to answer the aforementioned questions related to social capital:

(Add A) In Finkenstein there was social capital development clearly visible with regard to the arena group itself. Formerly, unknown persons developed new relationships characterized by trust and shared communication guidelines, and self-selected a steering committee (aspects 1, 3a–c). The group was able to perform joint actions (aspects 5, 7). Prejudices against unknown persons and politicians were reduced (aspect 4). More people got involved in working groups adhering to joint guidelines and the vision (aspect 3). Still, establishing contacts beyond the scope of the arena and working group participants was only partially successful (aspect 2). In Carnisse social capital was developed in terms of establishing new contacts and the ability to work together with a group of quite diverse people (aspect 1). Still, a group feeling was not developed and the group was loose rather than cohesive. Thus developing new shared rules, trust or values was not really visible (aspects 3a–c). Participants were initially led by shared

social concerns for the community and developed joint actions as well as individual actions to tackle social challenges (aspects 5 and 7). Contact with people beyond the group was somewhat established, e.g., in a large public event. Different stages of the process can be differentiated and bridging beyond the arena was mostly part of the latter stages (aspect 2). The community centre experiment created far more connections and relationships than the actual arena meetings. Experiments seem crucial for social capital development as well as (public) places where people meet and develop activities together.

(Add B) In Finkenstein sustainability was clearly supported by a number of newly formed community initiatives, building on shared vision, communication guidelines and a trustful and cooperative atmosphere as well as shared understandings of, e.g., local challenges (aspect 5). Openness towards new contacts, fewer prejudices and networking attempts supported the communication and local support for sustainability-related joint actions (aspect 7). The process in Carnisse was not explicitly oriented towards sustainability, but towards addressing local social problems. Working together was oriented towards a common goal, to take responsibility for the neighbourhood (aspect 7). Newly formed initiatives may support the social sustainability of the community (aspect 5).

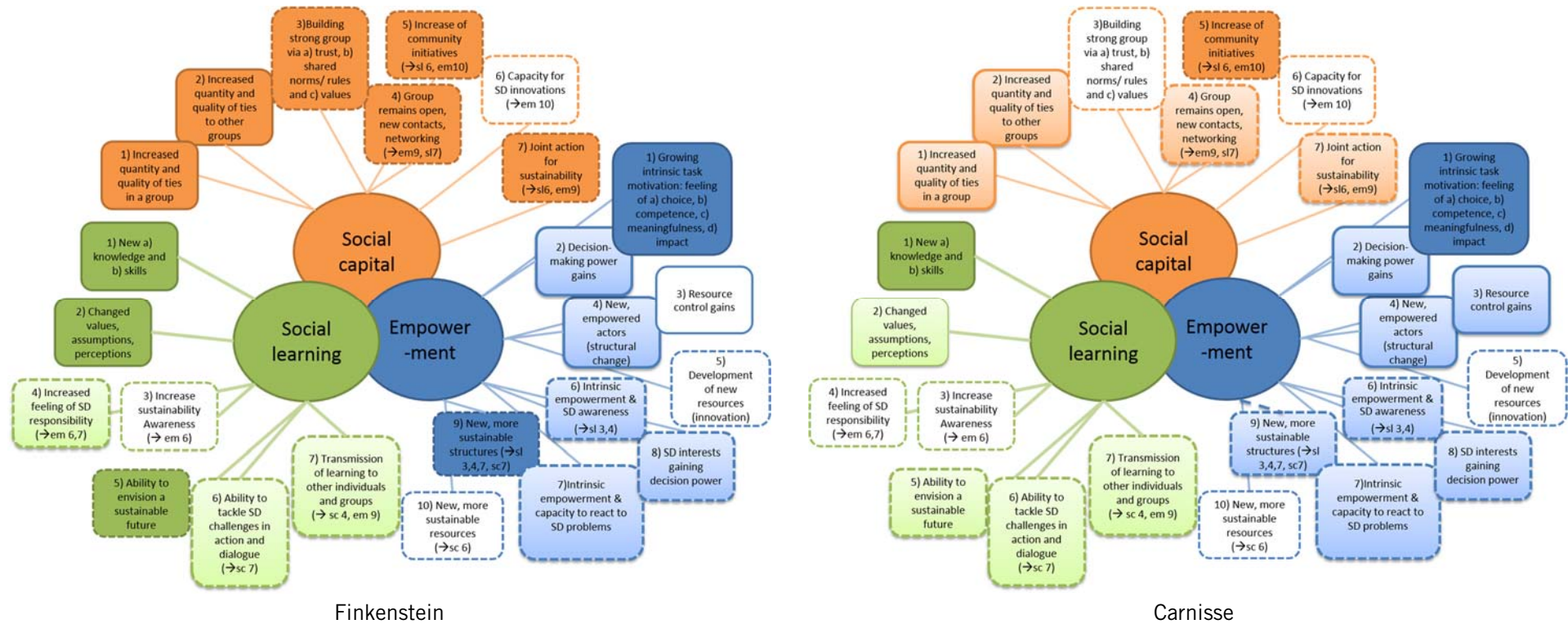


Figure 17: **Impacts of transition management processes in Finkenstein and Carnisse.** The figures give an overview of the results of both case studies. Indication: fully coloured boxes: impact observed/reported; light coloured: impact not or little observed or no assessment possible. Arrows (→) indicate interlinkages between aspects

(Add C) The comparison of both cases builds on results for all three impacts as outlined above. The comparison of the cases reveals the following (see Figure 17 for an overview):

Aspects of social learning could be reported for both cases—most strongly first-order learning (SL aspect 1). Although transmission of learning was aimed for, this remained limited in Carnisse and Finkenstein (sl aspect 7). A major difference is how sustainability was related to learning: while awareness and felt responsibility for sustainability potentially increased in Finkenstein, the arena in Carnisse had a more open focus, directed towards neighbourhood problems and social issues with a mixed attribution of responsibilities (sl aspects 3 and 4). Joint action for solving local challenges was given in both communities, while the underlying vision was embodied more by participants in Finkenstein than in Carnisse (sl aspects 5 and 6). None of the arenas developed alternatives as part of the vision or experiments that could be considered radical (sl aspect 5).

Regarding empowerment, the cases show similarities and differences. In both cases, participants felt psychologically empowered and established a new actor to influence local developments (em aspect 1, 4). This was achieved in different ways. While participants in Finkenstein gained insight to be capable of influencing local politics, increasingly appreciating local political work and collaborating with local politics via a supporting group, the participants in Carnisse partially perceived themselves as powerful actors from the beginning, focusing on “power to the people” instead of institutionalized collaboration, and squatted in a municipality-owned building (em aspects 2, 3 and 5). Finally, sustainability was related to empowerment in quite diverging ways: being an essential part of the ongoing empowerment in Finkenstein, and being rather implicitly and in limited ways related to empowerment in Carnisse (em aspects 6–9). Innovation towards sustainable resources was not seen in either case (em aspect 10).

Regarding social capital, in both processes a relatively small and diverse number of people were engaged, developing bonds between them (sc aspect 1). In later process stages, these groups reached out to the public, albeit with some difficulties (sc aspect 4). Both groups performed joint actions (sc aspect 7). Besides similarities, some differences exist. In Finkenstein there was more cohesion and trust building was visible (aspect 3). Later a large number of working groups were established, involving more people (sc aspects 2 and 5). In Carnisse, cohesion was lower, and besides collective actions there were individual actions pursued as well (sc aspect 3). A core action, the reopening of the community centre, relied on a small number of individuals only (aspects 2, 5). While actions related more broadly to sustainability in Finkenstein, sustainability did play a major role in Carnisse, primarily with regard to social aspects (sc aspect 7). Innovation of products towards sustainability was not achieved in either case (sc aspect 6).

The developed framework allows us to discern, describe and systematically address the impacts of transition management. Direct and indirect assessment led to complementary results. Observed overlaps and interlinkages of impacts do not significantly differ between the two cases. On a general level, interlinkages occurred mostly with regard to sustainability-related aspects in general (boxes with dashed borders). They mostly occurred in relation to aspects that connected scale levels, e.g., transmission of learning to more people or changing local structures when

small projects gain more influence (sl aspect 7, em aspect 9, sc aspect 4). In addition, the transmission of sustainability-related learning results to social capital and empowerment aspects relating to sustainability occurred (sl aspects 3, 4, 7).

7.5 DISCUSSION

The core research question we address in this paper is: What are relevant criteria to assess the contribution of transdisciplinary transition management processes towards sustainability, focusing on core societal effects and the local level? To answer this question, in the preceding section we addressed three interrelated objectives: first, to conceptualize a framework to assess societal effects of transdisciplinary transition management, including their relationship with sustainability. Second, to operationalize this framework for empirical application at a local level. Third, to test and apply it empirically to local transdisciplinary transition management processes. In this section we address our fourth objective, critically discussing our findings regarding the core research question, taking into consideration conceptual and empirical insights.

Our main results indicate that the societal effects of transdisciplinary transition management projects can be divided into different categories, namely outputs, outcomes and impacts mediating between outputs and outcomes. For an analysis of transition trajectories these impacts (including social learning, empowerment and social capital) are of key importance, as they are tangible and indicative of an orientation towards sustainability. The impacts can be differentiated into numerous aspects to capture both their essence as well as their contribution to sustainability. This is done by taking into account the transdisciplinary sustainability literature, as well as transition management and sustainability science literature. Empirical analysis shows development of all three impacts for both cases studied. Aspects of impacts contributing to sustainability were found in both cases, although with a lower frequency. Overall, the developed framework allows us to discern, describe and systematically address the impacts of transition management. The following discussion focuses on three crosscutting aspects regarding the contribution of transdisciplinary transition management processes to sustainability. These are the interplay of impacts, their multi-scalar nature and their suitable facilitation.

7.5.1 Interplay of Societal Effects Contributing to Sustainability Transitions

The transition arena process can be understood as a social experiment aimed at societal effects. The developed framework allows us to assess changes regarding these societal effects, focusing on the impacts, which in turn reflect the ability of participants to shape their local context (e.g., via growing innovation capacities of participants, increasing networks, trustful cooperation, etc.). The three societal effects are in small ways overlapping, but do highlight complementary aspects of how transition management facilitates sustainability transitions. Broadly speaking, social learning changes the orientation of the process towards sustainability and increases the capacity to successfully deal with sustainability challenges. Empowerment makes sustainability-oriented actors and initiatives more powerful. Social capital, finally, may support sustainability attempts to be more resilient and innovative. Nevertheless, these sustainability contributions are dependent on the character of the social learning, on who is being empowered to do what, and on whose social capital is increased.

On a general level, societal effects' development may be mutually supportive, e.g., social learning supports social capital development when the new insights of collaborators allow for a trustful exchange. Social learning in terms of new skills may benefit empowerment. Social capital, e.g., in the form of new networks, may benefit empowerment as well. This interplay is particularly apparent when we focus on the normative orientation of the societal effects, meaning their relatedness to sustainability. As an example, social learning contributing to growing sustainability awareness and a feeling of responsibility may strengthen the sustainability orientations of empowered actors. This was visible in the cases: empowerment and sustainability-related social learning emerged together. The interplay—potentially multiplying facilitated changes via positive feedback loops between societal effects—should be taken into account when designing and facilitating transition management processes.

Interplays between impacts are a complex matter that warrants more investigation, e.g., to differentiate between conceptual overlap and synergies. Future analysis should include empirical work to test the hypothesis on relationships between societal effects more broadly. This would require going beyond in-depth studies on single impacts that exist in large numbers (compare Section 2) and could build on the limited number of existing studies linking diverse societal effects (e.g., [45,46,101]).

7.5.2 Multi-Scalar Effects

All three concepts are bridging different scale levels, from the individual to the group, the community and beyond. Thus, the impacts show a multi-scalar character. This (a) has a procedural dimension, and (b) influences the overall societal effect of the transition management project.

With regard to the procedural dimension, the observed developments were not linear, but dependent on process steps. Social capital, for example, developed differently in the initial arena process (bonding with like-minded people) and the later experiments of respective working groups (bridging with others). Similarly, sustainable community initiatives were first developed at a small scale and then became more public. Gaining power for sustainability-oriented action in both cases was a process of giving and taking when facing local politics. On the one hand, arena groups were supported; on the other hand they were “just acting” without the permission of local politicians (e.g., when squatting at the community centre in Carnisse). In both cases people started to “use” the local (power) system differently and gained a new understanding of their potential role(s) in shaping the local context. While this is generally in line with transition management scholarship [49,116], our sustainability-related perspective in this article helps us to understand what the empowerment gained is used for.

Regarding the overall societal effect in view of the scalability of analysed impacts, the effect of transition management expanded beyond the original process participants, and thus may have contributed to the overall aim of facilitating a transition as a larger process of systemic change [39]. Empirical examples from the cases relating the local process to higher scale levels include, e.g., the successful application of Finkenstein to be a “climate-energy-model-region,” as well as city officials referring to the Carnisse community centre experiment as a flagship for

overall Rotterdam development. This supports the hypothesis of transition management and strategic niche management scholars on the transfer of learning results via networks, e.g., in the form of visions, narratives or expectations [39,109]. However, upscaling processes may have adverse influences on the original transition management process, such as losses in ownership, the disempowerment of participants or losses of the original sustainability character of developed solutions. While our approach generally allows us to capture these tendencies, more research is needed to develop strategies for influencing them appropriately. To do so, action research scholarship [117,118] and recent transition management [22,116] contributions may be a suitable starting point.

7.5.3 Facilitating and Assessing Sustainability in Relation to Societal Effects

There is, as mentioned, an inherent tension present when aiming to evaluate transition management's contribution to facilitate a sustainability transition. This is the tension between the open-endedness and complexity of transitions and the attempt to govern them in direction of a normative goal, namely sustainability. In our research we have tried to discern the interrelations between sustainability and societal effects, so to develop qualitative indicators for assessing the direction of transition trajectories (cf., [32]). When exploring these links in more depth, we found that it is possible to include sustainability as an inherent quality of the aforementioned societal effects. Our analysis, furthermore, suggests that transition management in the cases studied contributed to the enhancement of the communities' potential to respond to societal challenges and shape sustainability locally. In these cases we used an open yet reflexive facilitation technique to discuss the future of Finkenstein and Carnisse, bringing in sustainability considerations via reflexive questions. This contributed to the discerned effects on the level of social learning, empowerment and social capital and their relationship with sustainability.

Therefore, we propose a conceptual as well as empirically tested approach to link the "open-endedness" and the direction towards sustainability in transition management approaches by adding a normative orientation to the processes. This way the impacts of transition management processes can be empirically and systematically researched. Still, we conclude that there is no inherent relationship between the societal effects and sustainability. They remain two different things, which may be related (conceptually, empirically and process-wise). As such, processes can be oriented toward bringing about societal effects and sustainability together. However, this draws attention to the character of the learning that is facilitated, to the selection of the participants and the overall framing of the process goals, visions and experiments. How sustainability was approached differed in the empirical cases and showed the context dependency and pluralistic nature of how sustainability takes form locally. To further develop a facilitation approach that fruitfully combines open-endedness and normative orientations in pluralistic settings, existing work on facilitating learning in transition management [29] and reflexive monitoring [37] may offer valuable insights. This may be combined with empirically applying the scheme to other types of transdisciplinary sustainability research, which allows for comparing facilitation techniques with different grades of openness, reflexivity and normative orientation.

7.6 CONCLUSIONS

We conceptually developed and empirically tested an approach to understand and assess the contribution of trans-disciplinary transition management processes to sustainability. The approach allows us to discern, describe and systematically address the impacts of transition management. It also allows us to capture a semi-open and reflexive approach to facilitating sustainability transitions. Contrasting approaches relying on a small set of indicators, it draws a broad picture including interplays between societal effects and the various aspects composing each effect.

Empirical results highlight the possibility of addressing sustainability as an inherent quality of the societal effects aimed for. When so doing, the focus on the three impacts as criteria to assess the contribution of transition management processes towards sustainability may provide a number of advantages: first, to gain synergies from jointly addressing impacts – instead of treating them as separate concepts as often done in the literature; second, to intentionally influence changes towards sustainability at higher levels (e.g. the niche and regime) when working with individuals and groups in the community arena; third, to use the tension of open-ended facilitation and sustainability reflection as a fruitful tension for nurturing sustainability oriented change in community arenas.

Thus, our results contribute to broadening the understanding of how transition management contributes to sustainability (e.g., [24,25]) and therefore has implications for the overall policy and governance of transition processes. The results suggest that we should include normative aspects in the processes and assessment of transition management and other reflexive governance approaches in general. In so doing, approaches would correspond to the dual nature of the topic they are dealing with, as being both a normative aim (sustainability) and a process of realizing this aim (a transition) [48]. A central research demand remaining is the analysis of the long-term effects of transition management regarding societal change. This longitudinal research would further allow us to substantiate the claim that societal effects have an indicator function for the direction of change.

SUPPLEMENTARY MATERIALS: The following are available online at www.mdpi.com/link, Table S1: Detailed results social learning, Table S2: Detailed results empowerment, Table S3: Detailed results social capital, Description S4: Process steps of the community arena methodology, Description S5: Data collection and interpretation. Description S6: Detailed outline of experiments in Finkenstein and Carnisse, Description S7: Vision documents from Finkenstein and Carnisse.

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workshop proceedings; see Schäpke et al. (2013). Finally, we are very thankful for the constructive remarks of three anonymous reviewers.

AUTHOR CONTRIBUTIONS: The first author (Niko Schäpke) was responsible for the paper writing process, wrote large parts of the paper, and led the development of the framework as well as the data analysis. He was engaged in the evaluation process of the Finkenstein case study. The second author (Ines Omann) contributed to the development of the framework and the data analysis. She contributed data, and facilitated and supervised the Finkenstein case study. The third author (Julia Wittmayer) contributed to the development of the framework and the analysis. She contributed data and planned, facilitated and evaluated the Carnisse case study. The fourth author (Frank van Steenbergen) contributed to the analysis. He contributed data and planned, facilitated and evaluated the Carnisse case study. The fifth author (Mirijam Mock) contributed data and planned, facilitated and evaluated the Finkenstein case study.

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APPENDIX A

Table 10/ A1: Operationalization of societal effects for assessing transition management projects. (Formatting: regular—effects directly reported, italic—effects indirectly assessed by researchers.)

Societal Effect	Aspects Composing the Societal Effect	Operationalisation of Aspects
Social Learning	1. (A) New skills (B) New knowledge	1. (A) Directly: People report new skills, new types of tasks completed; <i>Indirectly: Production of outputs includes new tasks and skills.</i> (B) Directly: People report to have acquired new knowledge, insights, etc.; <i>Indirectly: Developed outputs include generation of knowledge.</i>
	2. Changes of values, assumptions and perceptions	2. Directly: People report changes of values, assumptions and perceptions; <i>Indirectly: Changes in the arena discourse are observable, changes of ways of behaviours of participants observable.</i>
	3. (Increased) Awareness of sustainability problems and persistent problems in the area and in general	3. Directly: People (increasingly) express concern about/awareness of sustainability problems; <i>Indirectly: Developed products address sustainability problems (explicitly or implicitly).</i>
	4. (Increased) Feeling of responsibility of people to react to these sustainability problems	4. Directly: People report themselves to be (increasingly) responsible for causing and/or solving sustainability problems; <i>Indirectly: Developed products attribute responsibility for sustainability problems (explicitly or implicitly) to the local community, developed products outline the role of the community in causing/solving sustainability problems.</i>
	5. Ability to jointly develop a vision of a sustainable future (including radical change)	5. Directly: Participants report the development of a joint vision of a sustainable future; <i>Indirectly: A shared vision and narrative of a sustainable future is developed including radical change.</i>
	6. (Increased) Ability to adapt and react to sustainability challenges through collaborative action and dialogue	6. Directly: Participants report increased collaborative action and dialogue on sustainability challenges; <i>Indirectly: Developed outputs include collaborative action and dialogue towards solving sustainability challenges; changes of reactions of participants to problems become visible.</i>
	7. Spreading of (sustainability) insights from individuals to further group members and beyond	7. Directly: Participants report that they have learned from one another. Participants report the uptake of learning from the arena by other local actors, e.g., as part of the working groups; <i>Indirectly: Outputs involve participation of other local actors; observation of uptake of arena ideas by other local actors.</i>

Em-
power-
ment

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| <ol style="list-style-type: none"> 1. A growing intrinsic task motivation via (a) choice, (b) competence, (c) meaning and (d) impact 2. Gains in decision-making power with regard to local developments 3. Gains of control over resources by arena participants 4. Changes in local structures (new, empowered actors/decreased dependencies) 5. Development of new resources (innovation) 6. Empowerment involves sustainability, if increased meaningfulness (aspect 1) relates to sustainability 7. Feeling of (increased) capacity of people to react to these sustainability problems 8. New decision-making capacities with regard to sustainability-related issues 9. A sustainability orientation of new actors and changing of local structures 10. Developed resources contribute to sustainability | <ol style="list-style-type: none"> 1. (a) Directly: Participants report their arena-related behaviour as self-determined (choice); <i>Indirectly: Products are decided upon and/or carried out by participants in self-determined ways</i>; (b) Directly: Participants report a feeling of competence with regards to their arena-related behaviour; <i>Indirectly: Participants possess the skills needed for the tasks they are to carry out in the arena; participants are observed to be carrying out their arena-related behaviours/tasks successfully</i>; (c) Directly: Participants report appreciation for the activities performed in/by the arena; <i>Indirectly: Participants are observed as being intrinsically motivated for arena activities</i>; (d) Directly: Participants report a feeling of having an impact on the output of the arena and the local environment; <i>Indirectly: Actions performed by participants create impact.</i> 2. Directly: Participants report increased decision-making capacities with regards to local development; <i>Indirectly: Transfer of decision-making capacities to the community arena is observed; output development builds on (new) decision-making capacities.</i> 3. Directly: Participants report themselves of resources they gain control upon; <i>Indirectly: outputs involve usage of (new) resources.</i> 4. Directly: Participants report themselves/the arena as a new, influential local actor with low dependencies on other actors; <i>Indirectly: Output realization involved establishing new, independent actor(s).</i> 5. Directly: Participants report that they have developed new resources as part of the arena process; <i>Indirectly: Outputs generated involve new resources (e.g., natural or cultural resources, technologies).</i> 6. Directly/<i>Indirectly</i>: cf. Social learning 4/5. 7. Directly: People report an increasing capacity to react to sustainability problems. <i>Indirectly: Changed and more motivated discourse in group on solving SD problems is observable; developed products address sustainability problems (explicitly or implicitly);</i> 8. Directly: People report gains in decision-making capacity over sustainability-related issues as part of the arena process; <i>Indirectly: Realisation of outputs involves making decisions about sustainability-related issues (formerly decided by other actors);</i> 9. Directly: Participants forming new actors highlight sustainability as a goal of the new actor; <i>Indirectly: Outputs related to the actions of the new actor make the sustainability orientation explicit;</i>
Directly: Participants report mainstreaming and trendsetting alternatives; <i>Indirectly: Generated outputs are taken up by actors beyond the participants.</i> 10. Directly: Participants report the development of a sustainable resource; <i>Indirectly: Outputs generated include sustainable resources.</i> |
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**Social
Capital**

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| <ol style="list-style-type: none"> 1. Quantity and quality of ties within a group, i.e., the community arena 2. Quantity and quality of ties with other groups, i.e., other groups within or beyond the community 3. Building a strong group via: <ol style="list-style-type: none"> a. Development of trust within the group b. Development of shared rules and norms within the group c. Development of shared values within the group 4. Openness towards new contacts/networking 5. Quantity and quality of sustained or newly developing sustainability-oriented community initiatives 6. Capacity for sustainability-related innovations 7. Joint action for sustainability | <ol style="list-style-type: none"> 1. Directly: Quantity—Participants report (increased) meetings and information exchange with other members of the community arena; Quality—Participants describe the working atmosphere within the arena; <i>Indirectly (quantity and quality): Observable meetings and working atmosphere in the arena and when experimenting.</i> 2. Directly: Quantity—Participants report (increased) meetings and information exchange (in relation to the arena process) with people from the community and beyond; Quality—Participants describe the type of exchange with others; <i>Indirectly (quantity and quality): Observable meetings and working atmosphere of arena with other groups.</i> 3. Building a strong group: <ol style="list-style-type: none"> (a) Directly: Participants report (growing) trust amongst each other; <i>Indirectly: Outputs highlight the value of trust or depend on the development of trusting relationships.</i> (b) Directly: Participants report that they have established common rules amongst them; <i>Indirectly: Outputs highlight or are based upon common rules.</i> (c) Directly: Participants report that they have developed shared values; <i>Indirectly: Products build or express shared values (e.g., vision).</i> 4. Directly: Participants report openness towards new contacts and networks; <i>Indirectly: products build upon or value new contacts and networks.</i> 5. Directly: Quantity—Participants report on community initiatives; Quality—Participants report initiatives as being oriented towards joint purposes. <i>Indirectly (quantity and quality): Outputs include the establishment or maintenance of (joint, purpose-oriented) initiatives.</i> 6. Directly: Participants report that they have developed new, sustainability-related resources as part of the arena process; <i>Indirectly: Outputs generated involve new resources (e.g., natural or cultural resources, technologies) with relation to sustainability.</i> 7. Directly: Participants report joint activities for sustainability; <i>Indirectly: products build upon joint action and relate to sustainability.</i> |
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7.7 REFERENCES

1. United Nations Conference on Environment & Development. Agenda 21; United Nations: New York, NY, USA, 1992.
2. WCED. Our Common Future: Report of the 1987 World Commission on Environment and Development; United Nations: New York, NY, USA, 1987.
3. Crutzen, P.J. Geology of mankind. *Nature* 2002, 415, 23.
4. Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.S.; Lambin, E.F.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.J.; et al. A safe operating space for humanity. *Nature* 2009, 461, 472–475.
5. United Nations General Assembly. Transforming Our World: The 2030 Agenda for Sustainable Development; United Nations: New York, NY, USA, 2015.
6. Grin, J.; Rotmans, J.; Schot, J. Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change; Routledge: New York, USA, 2010; Part 1.
7. Rittel, H.W.J.; Webber, M.M. Dilemmas in a general theory of planning. *Policy Sci.* 1973, 4, 155–169.
8. Frantzeskaki, N.; de Haan, H. Transitions: Two steps from theory to policy. *Futures* 2009, 41, 593–606.
9. Bosman, R.; Rotmans, J. Transition Governance towards a Bioeconomy: A Comparison of Finland and the Netherlands. *Sustainability* 2016, 8, 1017.
10. Rotmans, J.; Loorbach, D. Complexity and transition management. *J. Ind. Ecol.* 2009, 13, 184–196.
11. Vandevyvere, H.; Nevens, F. Lost in Transition or Geared for the S-Curve? An Analysis of Flemish Transition Trajectories with a Focus on Energy Use and Buildings. *Sustainability* 2015, 7, 2415–2436.
12. Rotmans, J.; Kemp, R.; Van Asselt, M. More evolution than revolution: Transition management in public policy. *Foresight* 2001, 3, 15–31.
13. Loorbach, D. Transition Management. New Mode of Governance for Sustainable Development; International Books: Utrecht, the Netherlands, 2007.
14. Armitage, D.; Marschke, M.; Plummer, R. Adaptive co-management and the paradox of learning. *Glob. Environ. Chang.* 2008, 18, 86–98.
15. Pahl-Wostl, C.; Becker, G.; Knieper, C.; Sendzimir, J. How Multilevel Societal Learning Processes Facilitate Transformative Change. *Ecol. Soc.* 2013, 18, 58.

16. Roorda, C.; Wittmayer, J.; Henneman, P.; van Steenberg, F.; Frantzeskaki, N.; Loorbach, D. *Transition Management in the Urban Context: Guidance Manual*; DRIFT, Erasmus University Rotterdam: Rotterdam, the Netherlands, 2014; 49p.
17. Wittmayer, J.; Van Steenberg, F.; Quist, J.; Loorbach, D.; Hoogland, C. *The community arena: a co-creation tool for sustainable behaviour by local communities methodological guidelines*; Deliverable 4.1; Ecologic Institute: Berlin, Germany, 2011.
18. Miller, T.R. Constructing sustainability science: Emerging perspectives and research trajectories. *Sustain. Sci.* 2013, 8, 279–293.
19. Lang, D.J.; Wiek, A.; Bergmann, M.; Stauffacher, M.; Martens, P.; Moll, P.; Swilling, M.; Thomas, C.J. Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustain. Sci.* 2012, 7, 25–43.
20. Frantzeskaki, N.; Loorbach, D.; Meadowcroft, J. Governing societal transitions to sustainability. *Int. J. Sustain. Dev.* 2012, 15, 19.
21. Loorbach, D.A. *Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework*. *Gov. Int. J. Policy Adm. Inst.* 2010, 23, 161–183.
22. Wittmayer, J.M.; Schöpke, N. Action, research and participation: Roles of researchers in sustainability transitions. *Sustain. Sci.* 2014, 9, 483–496.
23. Rauschmayer, Felix; Bauler, Tom; Schöpke, N. *Towards a Governance of Sustainability Transitions: Giving Place to Individuals*; UFZ Discussion Papers; Helmholtz Centre for Environmental Research: Leipzig, Germany, 2013.
24. Rauschmayer, F.; Bauler, T.; Schöpke, N. Towards a thick understanding of sustainability transitions—Linking transition management, capabilities and social practices. *Ecol. Econ.* 2015, 109, 211–221.
25. Shove, E.; Walker, G. CAUTION! Transitions ahead: Politics, practice, and sustainable transition management. *Environ. Plan. A* 2007, 39, 763–770.
26. Smith, A.; Stirling, A. The politics of socio-ecological resilience and socio-technical transitions. *Ecol. Soc.* 2010, 15, 1–13.
27. Hölscher, K.; Wittmayer, J.; Avelino, F.; Giezen, M. *Seeds of Change? Exploring (Dis-) Empowerment in Transition Management*; DRIFT, Erasmus University Rotterdam: Rotterdam, the Netherlands, 2014.
28. Bussels, M.; Happaerts, S.; Bruyninckx, H. *Evaluating and Monitoring Lessons from a Field Scan*; Policy Research Centre TRADO: Leuven, Belgium, 2013.

29. Bos, J.J.; Brown, R.R.; Farrelly, M.A. A design framework for creating social learning situations. *Glob. Environ. Chang.* 2013, 23, 398–412.
30. van Mierlo, B.; Leeuwis, C.; Smits, R.; Woolthuis, R.K. Learning towards system innovation: Evaluating a systemic instrument. *Technol. Forecast. Soc. Chang.* 2010, 77, 318–334.
31. Roorda, C.; Wittmayer, J. *Transition Management in Five European cities—An Evaluation*; DRIFT, Erasmus University Rotterdam: Rotterdam, the Netherlands, 2014.
32. Rotmans, J.; Kemp, R. Detour ahead: A response to Shove and Walker about the perilous road of transition management. *Environ. Plan. A* 2008, 40, 1006–1012.
33. Taanman, M.; Wittmayer, J.M.; Diepenmaat, H. Monitoring On-Going Vision Development in System Change Programmes. *J. Chain Netw. Sci.* 2012, 12, 125–136.
34. Creten, T.; Happaerts, S.; Bachus, K. *Evaluating Long-Term Transition Programs on a Short-Term Basis towards a Five-Step Transition Program Evaluation Tool*; Policy Research Centre TRADO: Leuven, Belgium, 2014.
35. Nocera, S.; Cavallaro, F. Policy Effectiveness for containing CO2 Emissions in Transportation. *Procedia Soc. Behav. Sci.* 2011, 20, 703–713.
36. Hogl, K.; Kvarda, E.; Nordbeck, R.; Pregernig, M. *Environmental Governance: The Challenge of Legitimacy and Effectiveness*; Edward Elgar Publishing: Cheltenham, UK, 2012.
37. van Mierlo, B.; Regeer, B.; van Amstel, M. *Reflexive Monitoring in Action. A Guide for Monitoring System Innovation Projects*; Communication and Innovation Studies, WUR: Wageningen, The Netherlands; Athena Institute, VU: Amsterdam, The Netherlands, 2010; pp. 3–104.
38. Regeer, B.J.; Hoes, A.-C.; van Amstel-van Saane, M.; Caron-Flinterman, F.F.; Bunders, J.F.G. Six Guiding Principles for Evaluating Mode-2 Strategies for Sustainable Development. *Am. J. Eval.* 2009, 30, 515–537.
39. Schot, J.; Geels, F.W. Strategic niche management and sustainable innovation journeys: Theory, findings, research agenda, and policy. *J. Tech. Anal. Strateg. Manag.* 2008, 20, 37–41.
40. Smith, A.; Raven, R. What is protective space? Reconsidering niches in transitions to sustainability. *Res. Policy* 2012, 41, 1025–1036.
41. Sengers, F.; Wieczorek, A.; Raven, R.P.J.M. Experimenting for sustainability transitions: A systematic literature review. *Technol. Forecast. Soc. Chang.* 2016, doi:10.1016/j.techfore.2016.08.031.

42. Regeer, B.J.; De Wildt-Liesveld, R.; Van Mierlo, B.; Bunders, J.F.G. Exploring ways to reconcile accountability and learning in the evaluation of niche experiments. *Evaluation* 2016, 22, 6–28.
43. Wiek, Arnim; Kay, Braden; Forrest, N. Worth the trouble?! An evaluative scheme for urban sustainability transition labs (USTL) and an application to the USTL in Phoenix, Arizona. In *Urban Sustainability Transitions*. Routledge Series on Sustainability Transitions; Frantzeskaki, N., Coenen, L., Broto, C., Loorbach, D., Eds.; Routledge: London, UK, 2016.
44. Binder, C.R.; Absenger-Helmli, I.; Schilling, T. The reality of transdisciplinarity: A framework-based self-reflection from science and practice leaders. *Sustain. Sci.* 2015, 10, 545–562.
45. Wiek, A.; Talwar, S.; O’Shea, M.; Robinson, J. Toward a methodological scheme for capturing societal effects of participatory sustainability research. *Res. Eval.* 2014, 23, 117–132.
46. Walter, A.I.; Helgenberger, S.; Wiek, A.; Scholz, R.W. Measuring societal effects of transdisciplinary research projects: Design and application of an evaluation method. *Eval. Program Plan.* 2007, 30, 325–338.
47. Frantzeskaki, N.; Wittmayer, J.; Loorbach, D. The role of partnerships in “realising” urban sustainability in Rotterdam’s City Ports Area, The Netherlands. *J. Clean. Prod.* 2014, 65, 406–417.
48. Wittmayer, J.M.; Schöpke, N.; van Steenbergen, F.; Omann, I. Making sense of sustainability transitions locally: How action research contributes to addressing societal challenges. *Crit. Policy Stud.* 2014, 8, 37–41.
49. Avelino, F. Empowerment and the challenge of applying transition management to ongoing projects. *Policy Sci.* 2009, 42, 369–390.
50. Schöpke, Niko; Omann, Ines; Mock, Mirijam; Wittmayer, J.M.; Von Raggamby, A. Supporting sustainability transitions by enhancing the human dimension via empowerment, social learning and social capital. In *Proceedings of the SCORAI Europe Workshop, Rotterdam, The Netherlands, 7–8 October 2013*.
51. Miller, T.R.; Wiek, A.; Sarewitz, D.; Robinson, J.; Olsson, L.; Kriebel, D.; Loorbach, D. The future of sustainability science: A solutions-oriented research agenda. *Sustain. Sci.* 2014, 9, 239–246.
52. Wiek, A.; Ness, B.; Schweizer-Ries, P.; Brand, F.S.; Farioli, F. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. *Sustain. Sci.* 2012, 7, 5–24.
53. Reed, M.; Evely, A.C.; Cundill, G.; Fazey, I.R.A.; Glass, J.; Laing, A. What is social learning? *Ecol. Soc.* 2010, 15, 4, r1.
54. Muro, M.; Jeffrey, P. Time to Talk? How the Structure of Dialog Processes Shapes Stakeholder Learning in Participatory Water Resources Management. *Ecol. Soc.* 2012, 17, 3.

55. Shaw, A.; Kristjanson, P. A Catalyst toward Sustainability? Exploring Social Learning and Social Differentiation Approaches with the Agricultural Poor. *Sustainability* 2014, 6, 2685–2717.
56. Siebenhüner, B.; Rodela, R.; Ecker, F. Social learning research in ecological economics: A survey. *Environ. Sci. Policy* 2016, 55, 116–126.
57. van de Kerkhof, M.; Wieczorek, A. Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations. *Technol. Forecast. Soc. Chang.* 2005, 72, 733–747.
58. Rodela, R. Social Learning and Natural Resource Management: The Emergence of Three Research Perspectives. *Ecol. Soc.* 2011, 16, 30.
59. Rodela, R. The social learning discourse: Trends, themes and interdisciplinary influences in current research. *Environ. Sci. Policy* 2013, 25, 157–166.
60. Schauppenlehner-Kloyber, E.; Penker, M. Between Participation and Collective Action—From Occasional Liaisons towards Long-Term Co-Management for Urban Resilience. *Sustainability* 2016, 8, 664.
61. Group, T.S. L. Learning to Manage Global Environmental Risks: A Comparative History of Social Responses to Climate Change, Ozone Depletion, and Acid Rain; MIT Press: Cambridge, UK, 2001.
62. Wals, A.A.E.J. Social Learning towards a Sustainable World: Principles, Perspectives, and Praxis; Wageningen Academic Publishers: Wageningen, the Netherlands, 2007.
63. Grin, John; Loeber, A. Theories of learning. Agency, structure and change. In *Handbook of Public Policy Analysis: Theory, Politics, and Methods*; Fischer, F., Miller, G., Sidney, M., Eds.; CRC Press: Boca Raton, USA, 2006; pp. 201–222.
64. Argyris, C.; Schön, D.A. *Organisational Learning II: Theory, Method and Practice*; Addison-Wesley: Reading, MA, USA, 1996.
65. Schein, E.H. On Dialogue, Culture, and Organizational Learning. *Reflections* 1993, 4, 27–38.
66. Isaacs, W.N. Taking flight: Dialogue, collective thinking, and organizational learning. *Organ. Dyn.* 1993, 22, 24–39.
67. Garmendia, E.; Stagl, S. Public participation for sustainability and social learning: Concepts and lessons from three case studies in Europe. *Ecol. Econ.* 2010, 69, 1712–1722.

68. Grabs, J.; Langen, N.; Maschkowski, G.; Schöpke, N. Understanding role models for change: A multilevel analysis of success factors of grassroots movements for sustainable consumption. *J. Clean. Prod.* 2015, 134 A, 98–111.
69. Schöpke, N.; Rauschmayer, F. Going beyond efficiency: Including altruistic motives in behavioral models for sustainability transitions to address sufficiency. *Sustain. Sci. Pract. Policy* 2014, 10, 29–44.
70. Taanman, M.; Diepenmaat, H.; Cuppen, E. Reflection for targeted action. The use of transition monitoring in innovation programs. Presented at the Easy-eco Vienna Conference, Vienna, Austria, 11–14 March 2008.
71. Crompton, T.; Kasser, T. Human Identity. A Missing Link in Environmental Campaigning. *Environment* 2010, 52, 23–33.
72. Crompton, T. *Common Cause: The Case for Working with Our Cultural Values*; WWF-UK: London, UK, 2010.
73. Avelino, F. *Power in Transition: Empowering Discourses on Sustainability Transitions*; 2011; 405.
74. Pick, Susan; Sirkin, J. *Breaking the Poverty Cycle: The Human Basis for Sustainable Development*; Oxford University Press: Oxford, UK, 2010.
75. de Araujo Lima Constantino, P.; Carlos, H.S.A.; Ramalho, E.E.; Rostant, L.; Marinelli, C.E.; Teles, D.; Fonseca-Junior, S.F.; Fernandes, R.B.; Valsecchi, J. Empowering Local People through Community-based Resource Monitoring: A Comparison of Brazil and Namibia. *Ecol. Soc.* 2012, 17, 22.
76. Chomba, S.W.; Nathan, I.; Minang, P.A.; Sinclair, F. Illusions of empowerment? Questioning policy and practice of community forestry in Kenya. *Ecol. Soc.* 2015, 20, 2.
77. Fraser, E.D.G.; Dougill, A.J.; Mabee, W.E.; Reed, M.; McAlpine, P. Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *J. Environ. Manag.* 2006, 78, 114–127.
78. Mayoux, L. Tackling the Down Side: Social Capital, Women's Empowerment and Micro-Finance in Cameroon. *Dev. Chang.* 2001, 32, 435–464.
79. Kellert, S.R.; Mehta, J.N.; Ebbin, S.A.; Lichtenfeld, L.L. Community Natural Resource Management: Promise, Rhetoric, and Reality. *Soc. Nat. Resour.* 2000, 13, 705–715.
80. Meadowcroft, J. What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy Sci.* 2009, 42, 323–340.

81. Thomas, K.W.; Velthouse, B.A. Cognitive Elements of Empowerment: An “Interpretive” Model of Intrinsic Task Motivation. *Acad. Manag.* 1990, 15, 666–681.
82. Boje, D.M.; Rosile, G.A. Where’s the Power in Empowerment? Answers from Follett and Clegg. *J. Appl. Behav. Sci.* 2001, 37, 90–117.
83. Randolph, W.A. Re-thinking empowerment. *Organ. Dyn.* 2000, 29, 94–107.
84. Van de Bosch, S.; Rotmans, J. Deepening, Broadening and Scaling Up; DRIFT, Erasmus University Rotterdam: Rotterdam, the Netherlands, 2008.
85. German Advisory Council on Global Change. A Social Contract for Sustainability; WBGU: Berlin, Germany, 2011.
86. Kristof, K. Models of change. Einführung und Verbreitung Sozialer Innovationen und Gesellschaftlicher Veränderungen in Transdisziplinärer Perspektive; vdf Hochschulverlag: Zürich, Switzerland, 2010.
87. McDougall, C.; Banjade, M.R. Social capital, conflict, and adaptive collaborative governance: Exploring the dialectic. *Ecol. Soc.* 2015, 20, 44.
88. Rico García-Amado, L.; Ruiz Pérez, M.; Iniesta-Arandia, I.; Dahringer, G.; Reyes, F.; Barrasa, S. Building ties: Social capital network analysis of a forest community in a biosphere reserve in Chiapas, Mexico. *Ecol. Soc.* 2012, 17, 3.
89. Bebbington, A. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. *World Dev.* 1999, 27, 2021–2044.
90. Ostrom, E.; Ahn, T. The meaning of social capital and its link to collective action. In *Handbook of Social Capital: The Troika of Sociology, Political Science and Economics*; Svendsen, G.T., Svendsen, G.L., Eds.; Edward Elgar: Northampton, MA, USA, 2008; pp. 17–35.
91. Mansuri, G. Community-Based and -Driven Development: A Critical Review. *World Bank Res. Obs.* 2004, 19, 1–39.
92. Menzel, S.; Buchecker, M. Does Participatory Planning Foster the Transformation Toward More Adaptive Social-Ecological Systems? *Ecol. Soc.* 2013, 18, 13.
93. Dyllick, T.; Hockerts, K. Beyond the business case for corporate sustainability. *Bus. Strateg. Environ.* 2002, 11, 130–141.
94. Pretty, J.; Ward, H. Migration, Social Capital and the Environment. *World Dev.* 2001, 29, 209–227.

95. Pretty, J.; Smith, D. Social Capital in Biodiversity Conservation and Management. *Conserv. Biol.* 2004, 18, 631–638.
96. Adler, P.S.; Kwon, S. Social Capital: Prospects for a New Concept. *Acad. Manag. Rev.* 2002, 27, 17.
97. Gehmacher, E.; Kroismayr, S.; Neumüller, J.; Schuster, M. *Sozialkapital: Neue Zugänge zu Gesellschaftlichen Kräften*; Mandelbaum Verlag: Vienna, Austria, 2006.
98. Uphoff, N. Understanding social capital: Learning from the analysis and experience of participation. In *Social Capital: A Multifaceted Perspective*; Dasgupta, P., Serageldin, I., Eds.; The World Bank: Washington, DC, USA, 2000; pp. 215–249.
99. Coleman, J.S. Social Capital in the Creation of Human Capital. *Am. J. Sociol.* 1988, 94, 95–120.
100. Adger, W.N. Social capital, collective action, and adaptation to climate change. *Econ. Geogr.* 2003, 79, 387–404.
101. Dempsey, N.; Bramley, G.; Power, S.; Brown, C. The Social Dimension of Sustainable Development: Defining Urban Social Sustainability. *Sustain. Dev.* 2011, 19, 289–300.
102. Ballet, J.; Sirven, N.; Requier-Desjardins, M. Social Capital and Natural Resource Management: A Critical Perspective. *J. Environ. Dev.* 2007, 16, 355–374.
103. Harriss, J. *Depoliticizing Development: The World Bank and Social Capital*; Anthem Press: London, UK, 2002.
104. Omann, Ines; Grünberger, S. Quality of life and sustainability. Links between sustainable behaviour, social capital and well-being. In *Proceedings of the 9th Biennial Conference of the European Society for Ecological Economics (ESEE): Advancing Sustainability in a Time of Crisis*, Istanbul, Turkey, 14–17 June 2011.
105. Cuthill, M. Strengthening the “social” in sustainable development: Developing a conceptual framework for social sustainability in a rapid urban growth region in Australia. *Sustain. Dev.* 2010, 18, 362–373.
106. Roak, M.; Hospers, G.-J.; Reverda, N. Searching for Social Sustainability: The Case of the Shrinking City of Heerlen, The Netherlands. *Sustainability* 2016, 8, 382.
107. Chang, C.T. The disappearing sustainability triangle: Community level considerations. *Sustain. Sci.* 2013, 8, 227–240.
108. Cuppen, E.; Pesch, U.; Remmerswaal, S.; Taanman, M. Normative diversity, conflict and transition: Shale gas in the Netherlands. *Technol. Forecast. Soc. Chang.* 2016, in press.

109. Van Den Bosch, S.; Rotmans, J. Deepening, Broadening and Scaling up: A Framework for Steering Transition Experiments; 2008.
110. Wittmayer, J.; Mock, M.; van Steenbergen, F.; Baasch, S.; Omann, I.; Schöpke, N. Taking Stock—Three Years of Addressing Societal Challenges on Community Level through Action Research; Pilot specific synthesis report; Ecologic Institute: Berlin, Germany, 2013.
111. Flyvbjerg, B. Five Misunderstandings About Case-Study Research. *Qual. Inq.* 2006, 12, 219–245.
112. Wittmayer, J.; van Steenbergen, F.; Bohunovsky, L.; Baasch, S.; Quist, J.; Loorbach, D.; Hoogland, C. Pilot Projects Getting Started Year 1 Status Report; Ecologic Institute: Berlin, Germany, 2011.
113. Wittmayer, J.; van Steenbergen, F.; Bohunovsky, L.; Baasch, S.; Quist, J.; Loorbach, D.; Hoogland, C. Pilot Projects on a Roll—Year 2 pilot Specific Reports; Ecologic Institute: Berlin, Germany, 2012.
114. Wittmayer, J.; Schöpke, N.; Feiner, G.; Piotrowski, R.; Van Steenbergen, F.; Baasch, S. Action Research for Sustainability Reflections on Transition Management in Practice; 2013; Ecologic Institute: Berlin, Germany, pp. 1–24.
115. Wittmayer, J.; van Steenbergen, F.; Baasch, S.; Feiner, G.; Mock, M.; Omann, I. Pilot Projects Rounding up Year 3 Pilot-Specific Report; Ecologic Institute: Berlin, Germany, 2013.
116. Avelino, F.; Wittmayer, J.M. Shifting Power Relations in Sustainability Transitions: A Multi-actor Perspective. *Submitt. J. Environ. Policy Plan.* 2015, 7200, 1–23.
117. Wicks, P.G.; Reason, P. Initiating action research Challenges and paradoxes of opening communicative space. *Action Res.* 2015, 7, 243–262.
118. Coghlan, D.; Shani, A.B. Roles, politics, and ethics in action research design. *Syst. Pract. Action Res.* 2005, 18, 533–546.

8 ACTION, RESEARCH AND PARTICIPATION: ROLES OF RESEARCHERS IN SUSTAINABILITY TRANSITIONS

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Abstract

In sustainability science, the tension between more descriptive—analytical and more process-oriented approaches is receiving increasing attention. The latter entails a number of roles for researchers, which have largely been neglected in the literature. Based on the rich tradition of action research and on a specific process-oriented approach to sustainability transitions (transition management), we establish an in-depth understanding of the activities and roles of researchers. This is done by specifying ideal-type roles that researchers take when dealing with key issues in creating and maintaining space for societal learning—a core activity in process-oriented approaches. These roles are change agent, knowledge broker, reflective scientist, self-reflexive scientist and process facilitator. To better understand these ideal-type roles, we use them as a heuristic to explore a case of transition management in Rotterdam. In the analysis, we discuss the implications of this set of ideal-type roles for the self-reflexivity of researchers, role conflicts and potentials, and for the changing role of the researcher and of science in general.

KEYWORDS

Roles of researchers; Process-oriented; Sustainability science; Transition management; Action research; Transdisciplinarity

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It is reproduced here in the version that was published in the journal. Enumerations of sections and tables got slightly adapted to fit thesis format.

8.1 INTRODUCTION

The debate on the nature of science and its role in society has gained new ground in relation to sustainability transitions (e.g. WBGU 2011; ICSU Future Earth 2014). In it, science is at the service of society, which suggests that interdisciplinarity, transdisciplinarity and social relevance are the key elements of a science supporting sustainability transitions. These discussions are echoed in the growing attention paid to the role and nature of sustainability science (Miller et al. 2013; Wiek et al. 2012a; Lang et al. 2012; Komiyama and Takeuchi 2006; Miller 2013; Loorbach et al. 2011; Spangenberg 2011; Scholz 2011; Ness 2013).

Changes in understandings of what a researcher does and is supposed to do are emerging in this context, with researchers asked to “recognise and accept their social responsibility” (Cornell et al. 2013:67). In addition to answering research questions (Salas-Zapata et al. 2012) and providing “the best evidence available” (Kajikawa 2008:233), researchers now also engage in process and action-oriented activities: they guide collective learning processes (Pohl et al. 2010), mediate between different frames (Pohl et al. 2010), commit themselves to transforming reality (Salas-Zapata et al. 2012) and put sustainability into action (Loorbach et al. 2011). These are not typical activities for researchers, they lead to questions such as: What activities should researchers engage in and why? Which challenges, tensions and conflicts are likely to occur when engaging in more process and action-oriented research activities and how can these be addressed? How can the normative orientation of sustainability research be dealt with?

The tension between a “descriptive-analytical and a transformational mode” of sustainability science stands out in most contributions (Wiek et al. 2012a:5). This has repercussions not only on the discipline, but also on the roles of its researchers. In particular, frictions may emerge from a role understanding as descriptive analyst or activist (Wiek et al. 2012a, b; Salas-Zapata et al. 2012; Kajikawa 2008). In conceptualising the science–society interface for sustainability science, Miller (2013) distinguishes between ‘knowledge-first’ and ‘process-oriented’ approaches, relating these to different role understandings for scientists. The former views the scientist as a knowledge provider; the latter adds “establishing, facilitating and participating in mechanisms or dialogues for change” (Miller 2013:287). With these extra activities, come new challenges: they blur traditional role understandings and raise questions with regard to training requirements (i.e. Which competencies are needed?), quality criteria (i.e. What are appropriate quality standards for this kind of research?) and intervention legitimacy (i.e. What kind of intervention is legitimate by whom and why?). To date, the roles of researchers in process-oriented approaches to sustainability science have received insufficient attention (see Lang et al. 2012). This situation often leaves researchers without the appropriate vocabulary to explain and navigate the tensions and potentials that come with their ‘new’ activities and roles. As such, it hinders the reflexivity of practice and practitioners. Learning from experience, as well as developing and improving appropriate research methods is also limited.

This article establishes a more systematic understanding of the activities and corresponding roles of researchers in process-oriented approaches to sustainability science. To achieve this, we reviewed literature of action research

(Greenwood and Levin 2007; Reason and Bradbury 2008) and transition management (Rotmans et al. 2001; Loorbach 2010; Grin et al. 2010). We chose action research for its longevity and experience as a process-oriented approach to science, and transition management as a specific example of process-oriented sustainability science that uses an action research approach.

By focusing on action research, we build upon a longestablished process-oriented approach to science that aims at “the transformation of power relationships in the direction of greater democracy” (Greenwood and Levin 2007:73). Action research dates back to the early 20th century (e.g. the work of John Dewey or Kurt Lewin), only later becoming known as mode-2 knowledge production and transdisciplinarity (Levin and Greenwood 2008). In general, action research can be understood as the collaborative production of scientifically and socially relevant knowledge, transformative action and new social relations through a participatory process (Reason and Bradbury 2008; Dick 2004; Bradbury and Reason 2003; Ramos 2006; Chandler and Torbert 2003). A rich research tradition, it has not been substantively linked to sustainability science (a start is being made by Miller 2013; Wiek et al. 2012a; van Kerkhoff 2013).

The broadness of action research is complemented with transition management, a specific process-oriented approach to sustainability science (Miller 2013). Transition management is about how actors (can) influence sustainability transitions. Building on complexity, governance and social theory, Loorbach (2007, 2010) suggests a number of tenets for this iterative, reflexive and exploratory governance approach. These principles can be put into practice through an action research approach: transition management can therefore link sustainability science and action research.

Following Miller’s (2013) conceptualisation of the science–society interface, we differentiate between process-oriented and knowledge-first approaches. In the “Addressing key issues when creating and maintaining space for societal learning” Section, we outline the creation and maintenance of spaces for societal learning as a core activity of process-oriented approaches. In creating and maintaining these spaces for societal learning, researchers are confronted with numerous issues, as a review of sustainability science, action research and transition management literature showed (for an early version of this review see Wittmayer et al. 2013a). We concentrate on four key issues that differ in process-oriented versus knowledge-first approaches to sustainability science, as these offer insights into the new and unconventional activities of researchers. The issues are ownership, sustainability, power and action. While this is not intended to be an exhaustive list, it covers challenges characteristic of researchers activities and roles in process-oriented sustainability science. This makes them adequate to systematically analyse and establish respective roles and activities. In the “Roles for researchers in process-oriented sustainability science” Section, we connect these activities to a set of ideal-type roles for researchers in process-oriented sustainability science: change agent, knowledge broker, reflective scientist, self-reflexive scientist and process facilitator. These ideal-type roles are partly based on role descriptions proposed in sustainability science literature. In the “Action research for sustainability transitions in Carnisse” Section, these roles serve to examine an empirical example of transition management in Carnisse, a neighbourhood of Rotterdam. This leads us to a discussion of self-reflexivity,

role conflicts and potentials, and transformative action in the “Discussion” Section. We conclude by highlighting the importance of action research for sustainability, the institutional implications of new researcher roles in process-oriented sustainability science, and further avenues of research.

8.2 ADDRESSING KEY ISSUES WHEN CREATING AND MAINTAINING SPACE FOR SOCIETAL LEARNING

What distinguishes process-oriented approaches to sustainability science from what Miller (2013) calls knowledge-first approaches is the process through which knowledge contributes to society. The latter envisions a boundary zone between science and society, where the salience, credibility and legitimacy of knowledge are negotiated. Researchers contribute the scientific knowledge and societal actors the goals and values. In contrast, process-oriented approaches see science and society as overlapping— as having created a space for collaboration and joint knowledge production. Researchers are (only) one of the knowledge providers in this space, but they also facilitate the exploration of sustainability pathways and actively participate (Miller 2013).

We argue that creating and maintaining this ‘space’ is one of the core activities of researchers in process-oriented approaches: this is where science and society address real-world problems, generate knowledge, formulate solutions and pilot actions for a more sustainable future. A number of fields describe this spatial idea in different terms: in transition management, it is a transition arena, which is conceptualised as a protected space (Loorbach 2010); in writings on transdisciplinary science, it is an agora (Pohl et al. 2010 drawing on Nowotny et al. 2001); in action research, it is a communicative space (Wicks and Reason 2009 drawing on Habermas) or an arena for dialogue (Greenwood and Levin 2007); and in writings on participatory processes, it is a participatory space (Sinwell 2012). These spaces aim to contribute to learning on a societal level, which is why we refer to them as spaces for societal learning.

Overall, these spaces are characterised by the co-construction of social reality by their participants—common futures, lived reality, social identities and roles are all negotiated within them. Boundaries are also blurred, meaning for example that there is no clear separation between the activities of a researcher, an inhabitant or a policy maker. Spaces for societal learning allow for reflexivity and the questioning (and possible integration) of assumptions, knowledge, goals and values. The openness and uncertainty thereof nonetheless poses “an overall challenge for sustainability researchers” (Pohl et al. 2010:270). To create and maintain this kind of space, a set of key issues needs to be addressed: ownership, sustainability, power and action. In addressing these, researchers engage in activities that differ from more conventional research activities. To describe these activities, we reviewed action research and transition management literature.

8.2.1 Ownership

This issue concerns the ownership of (parts of) the problem, the process, its outcomes and its possible continuation. These questions tend to arise in process-oriented approaches to sustainability science, as science and society are seen as collaborating within the framework of (research) projects to define problems, desirable futures and immediate actions. In knowledge-first approaches, society is instead seen as the problem owner, and science as taking

these up in the form of research questions. Science remains in charge of the research process and scientific outcome, which can be used by societal actors to resolve given problems.

Ownership notions in an action research process are strongly linked to the intensity of stakeholder involvement: from mere information giving, to collaborative decision making and empowerment (Stauffacher et al. 2008). Ownership (as involvement) cannot be imposed or assumed: it evolves over a projects' lifetime, assuming different shapes as a result of multiple factors (e.g., the nature of the problem, the project context and the skills of the facilitator) (Greenwood et al. 1993). In practice, researchers are frequently one of the problem co-owners, initiating the process with varying sources of funding and goals (Roorda et al. 2012; van den Bosch 2010; Loorbach 2007).

At the outset of a transition management process, researchers carry out system and actor analyses to learn about them and their challenges (Loorbach 2007). The focus is on 'frontrunners', persons who already address issues in their sector or community (through action or deliberation) and can therefore be considered as having a sense of problem ownership. Research participants are selected on the basis of knowledge, competencies and worldviews, rather than on hierarchical power, representativeness or authority (van der Brugge and van Raak 2007; van Buuren and Loorbach 2009; Loorbach 2010). In the subsequent participatory process, the system analysis is shared, contested and collectively re-developed.

Ownership also relates to questions of process leadership—researchers facilitate processes in a variety of ways. For example, they can depend entirely on skills and knowledge (as preferred by Greenwood and Levin 2007), or they can use a methodological guideline (as is done in transition management). The collective negotiation, modification and adaptation of this guideline often enhance process ownership. In addressing 'ownership', researchers carry out a number of activities to create and maintain space for societal learning: they analyse the dynamics and actors of the system in question, initiate the process, select and motivate participants, facilitate the process so as to make participants co-owners of the process and empower them to lead it.

8.2.2 Sustainability

In process-oriented approaches to sustainability science, sustainability is negotiated and defined through the interaction of different parties in spaces for societal learning. This is where a shared understanding of possible pathways for sustainability is established. In knowledge-first approaches, science is seen as value-free (cf. Miller 2013)—fundamental research takes place on the basis of the problems that society has defined (e.g. unsustainability).

The action research literature does not frequently refer to sustainability, with the exception of Kemmis (2010) who calls for 'action research for sustainability'. More commonly, the goals of action research are the enhancement of human flourishing, emancipation, democracy and the empowerment of those involved through critical reflection (Greenwood and Levin 2007; Reason and Bradbury 2008).

Transition management, in turn, explicitly refers to the Brundtland definition of sustainability (Frantzeskaki et al. 2012): “sustainability [is] the baseline from which dialogue begins” (van Buuren and Loorbach 2009:387). Still, transition management scholars contend that a definition needs to be contextualised and agreed upon. Sustainable development, in turn, is conceptualised as an open-ended process with an open agenda, which includes a continuous redefinition of goals and a diversity of pathways. Scientists need to acknowledge that this is not a value-free endeavour and that its normative implications have to be considered (see also Miller 2013). This acknowledgement should be accompanied by a self-reflexive attitude on the role and power of the scientist in shaping the process and its outcomes (Wittmayer et al. 2013a).

In operational terms, transition management creates spaces for shared learning about sustainability (both process and content): “in transition arenas, a vision, an agenda and a social commitment to sustainability values for a specified issue are formed” (Frantzeskaki et al. 2012:27). Action researchers can initiate these spaces and be seen as an integral part of the process unfolding within them. This can be done by providing analytical input and normative orientations towards sustainability, rather than by remaining an outside observer (Loorbach et al. 2011).

In addressing sustainability, researchers initiate and participate in a learning journey based on sustainability values and support in making sustainability meaningful within a given context. They provide knowledge based on a system analysis related to sustainability, while providing space for participants to critically reflect on the roles and meanings associated with sustainability. They also engage in a (self-) reflexive practice on the possible consequences and implications of their normative orientation towards sustainability.

8.2.3 Power

In a space for societal learning, which blurs the boundaries between participants, an important question is who determines the contours of the space and sets its direction: power-free spaces do not exist. As power influences internal group dynamics and external relations, it is essential for researchers involved in creating spaces for societal learning to consider it and its effects. This is arguably less the case in knowledge-first approaches, in which roles are defined from the outset.

In terms of internal group dynamics, participants (including the researcher) very likely differ in their ability to influence the research process and its outcome (e.g. Grant et al. 2008). Action research aims at allowing all voices and (unconventional) viewpoints to be expressed (Bradbury and Reason 2003). Researchers do so by developing a quality relationship to and among participants (Clinton 1991), or following up on emerging contradictions and finding ways to address “undiscussables” (Bradbury and Reason 2003:165). To interact appropriately with power holders external to the participating group, researchers need to understand the political context and its underlying power relations, which they can be said to manage (Greiner and Schein 1988). Researchers “need to be prepared to work the political system” (Coglan and Shani 2006:537). As such, action researchers should become political entrepreneurs (Buchanan and Badham 1999) with a “reflective self-critical perspective” (Coglan and Shani 2006:537).

Internal group dynamics are influenced in a variety of ways in transition management processes, for example by selecting and inviting participants. To reach the highest potential for fundamental change, actor selection should involve both moderate and radical actors, as well as those with the capacity to develop new structures and institutions (i.e. transformative power) and those with the capacity to create new resources (i.e. innovative power) (Avelino 2011). Other means of influencing group dynamics are the use of specific facilitation methods (see e.g. Wittmayer et al. 2011a; Roorda et al. 2012). In transition management, the researcher facilitates the process and is responsible for condensing, analysing and mirroring back the outcomes of each meeting to the participants (Loorbach 2007; van den Bosch 2010; van Buuren and Loorbach 2009). In terms of external power dynamics, the transition arena is outside of regular policy arenas (van Buuren and Loorbach 2009). Whether power struggles and politics are made explicit and debated depends on the context. Once formulated, the resulting sustainability vision is re-connected to political, social and economic realities (Loorbach 2010) with the group acting as its ambassador. For Loorbach (2007):284, “the ultimate goal of transition management should be to influence and empower civil society in such a way that people themselves shape sustainability in their own environments, and in doing so contribute to the desired transitions to sustainability”.

When addressing ‘power’ in the creation of spaces for societal learning, the researcher selects participants, facilitates the learning process, mediates between different perspectives, encourages the expression of all viewpoints, analyses and condenses the outcomes of each meeting and networks with other stakeholders that are not (directly) involved in the group. The researcher also engages in selfreflexive practice with regard to his/her role in internal and external power dynamics.

8.2.4 Action

Action is one of the distinguishing features of process-oriented approaches. Researchers actively facilitate research processes, which are aimed at fostering action or real-world change. This also allows learning about sustainability pathways. In knowledge-first approaches, the aim of real-world change is seen as ‘contaminating’ research results by mixing scientific and normative elements.

Understanding and changing relations are not the only goals of action research; Kemmis (2010):425 proposes action or the changing of history as the “principal justification for action research”. This action component is one of the approach’s distinguishing features, and as put by Greenwood and Levin (2007):6: “action is the only sensible way to generate and test new knowledge”. The concept of action in terms of real-life change should be directed towards distinct goals and expressed through specific activities.

Transition management focuses on ways to influence sustainability transitions (Grin et al. 2010)—this involves prescriptive governance tenets, as well as processes directed at real-world change. To this end, researchers facilitate an iterative, stepwise process of problem structuring, visioning, backcasting and short-term action formulating. Through these actions, also considered as transition experiments (van den Bosch 2010), actors “either recreate

system structures or they choose to restructure or change them” (van Buuren and Loorbach 2009). These experiments allow researchers and participants to create spaces for learning about long-term visions and the challenges associated with realising them—action is thereby directly connected to learning. For a researcher, transition management is a process-oriented approach that “goes beyond collaborative or participatory research to facilitating or actively participating” (Miller 2013). Specific activities in this regard include creating interdisciplinary teams for research projects, being a knowledge broker, putting sustainability in action through informing and aiding in policy formulation, and creating paradigms or lifestyle icons of sustainability (Loorbach et al. 2011).

In both action research and transition management, the explicit goal of ‘action’ is real-life change. Researchers actively facilitate or participate in the learning process and in the actual experiments (e.g. the creation of paradigms or lifestyle icons of sustainability), they support in policy formulation, while at the same time observing, reflecting and analysing these actions and their relations to the longterm vision.

8.3 ROLES FOR RESEARCHERS IN PROCESS-ORIENTED SUSTAINABILITY SCIENCE

In what preceded, we have deepened the understanding of process-oriented approaches to sustainability science by reviewing the literature on action research and transition management. We proposed to take the creation and maintenance of spaces for societal learning as their overarching aim. These spaces include the collaborative production of scientifically and socially relevant knowledge about persistent problems, transformative action and experimentation with new social relations. Action research adds a necessary critical orientation to addressing persistent societal challenges to sustainability science.

Based on this review, the following table (Table 11) summarises the different activities of researchers in addressing the four key issues in creating and maintaining space for learning, and proposes corresponding researcher roles. To introduce these roles, we either refer back to and build on role designations employed (but not further outlined or explained) in the broader field of sustainability science, or suggest new ones. As sustainable development is the bottom line (Kates et al. 2001; Cornell et al. 2013), all these roles have a normative starting point, but engage differently with normativity.

Table 11: The activities and roles of researchers in sustainability science

Key issue	Activities of researchers	Proposed roles for researchers
Ownership	- Analyse dynamics and actors	Reflective scientist
	- Initiate process	Process facilitator
	- Select participants	
	- Facilitate process	
	- Motivate participants	Change agent
	- Empower participants to lead/ own the process	
Sustainability	- Initiate and participate in a learning journey based on sustainability values	Change agent
	- Support in making sustainability meaningful in the given context	Knowledge broker
	- Provide space for critical reflection	
	- Provide knowledge on the basis of analysis	Reflective scientist
	- Engage in a (self-) reflexive practice with regard to own normative orientation	Self-reflexive scientist
Power	- Select participants	Process facilitator
	- Facilitate learning process	
	- Encourage expression of all viewpoints	
	- Mediate different perspectives	Knowledge broker
	- Analyse outcomes	Reflective scientist
	- Network with stakeholders outside the group	Change agent
Action	- Engage in self-reflexive practice with regard to internal and external power dynamics	Self-reflexive scientist
	- Facilitate process and experiments	Process facilitator
	- Participate in process and experiments	Change agent
	- Support in policy formulation	
	- Observe, reflect and analyse actions	Reflective scientist

- Following the initial role understanding of Pohl et al. (2010), the researcher as reflective scientist performs a number of activities closest to what is conventionally understood as 'research'. These include systematically collecting, analysing, interpreting and reporting data from an observer point of view. Researchers aim to gain scientific knowledge in accordance with the quality criteria of their disciplines (Pohl et al. 2010). This can include striving for objective or intersubjectively recognisable results, while generally not engaging in normative questions. While dominant in knowledge-first approaches to sustainability science, the reflective scientist (or knowledge provider, Miller 2013) also plays a role in process-oriented ones.
- The role designation of process facilitator is also borrowed from Pohl et al. (2010), referring to the activity of facilitating the learning process. In the context of process-oriented sustainability science, this role includes the initiation of the process, the selection of participants, as well as the initiation and facilitation of concrete short-term actions. The societal learning process, as understood by transition management, includes learning from thinking (through a deliberative problem formulation process, visioning and the

definition of strategies) and learning from doing (through short-term actions or experiments). Both kinds of learning processes can be initiated and facilitated by researchers in a normative way, namely through designing a 'sustainable' process (e.g. just, inclusive, future oriented).

- The role designation of knowledge broker is used by Miller et al. (2013) in the context of solutions-oriented research and by Loorbach et al. (2011) for scientists wanting to assume an active role in sustainability transitions. As a knowledge broker, the researcher mediates between different perspectives—an 'intermediary' according to Pohl et al. (2010). He/she also provides space for critical reflection and engages in making sustainability relevant and tangible in different contexts. This entails the mediation of contextual perspectives on sustainability, and relates to Wiek's (2007) notion of 'epistemediator': someone who "would facilitate the (epistemic) process of joint knowledge generation". Next to traditional mediation, in the sense of organising the process, this would include organizing "peer reviews of the knowledge generated" (Wiek 2007:57). The process of brokering and mediating knowledge should result in what Miller et al. (2011):177 refer to as 'sustainability knowledge', which is socially robust, recognises system complexity and uncertainty, acknowledges multiple ways of knowing and incorporates normativity and ethics.
- Similarly to the knowledge broker, the role of change agent has been presented but not further specified by Miller et al. (2013) in the context of solutions-oriented research. Rather than 'only' initiating and facilitating learning processes or experiments, this role also includes the explicit participation of the researcher in processes aiming to address real-world problems. By assuming the role of change agent, the researcher seeks to motivate and empower participants, for example, to address local (sustainability) challenges, and networks with stakeholders outside the protected space. These activities are similar to those that Stoecker (1999) ascribes to the roles of animator (helping to develop a sense of importance) and community organiser (catalysing, stimulating and enabling people) in participatory research. The researcher, as all other participants, becomes part of the problem and the solution, thereby highlighting the importance of the process as a site of trust building, motivation and empowerment.
- The last role is the self-reflexive scientist, which refers to being reflexive about one's positionality and normativity, and to seeing oneself as part of the dynamic that one seeks to change. Using a mirror analogy, Stirling (2006) offers a useful distinction between reflection and reflexivity. Reflection refers to the "faithful reflection of all that lies in the field of view" (Stirling 2006:227), whereas reflexivity includes the recognition that the subject, when looking into the mirror, is a big part of the object. Reflexivity is therefore "the way in which the attributes of the subject help condition the representation of the object and how these representations themselves can help recondition the subject" (Stirling 2006:227). Engaging in process-oriented research includes being one's own research instrument. This instrument, oneself, can also change throughout the research process. Most action research includes a self-reflexive practice with regard to the one's own normative orientation and to internal and external power dynamics. Rauschmayer et al. (2011) even consider experiences in personal transformation and awareness practices as being a pre-condition for facilitating transformation processes.

This account of process-oriented approaches to (sustainability) science proposes that researchers engage in a wide range of activities, which can be abstracted into idealtypes roles that in practice necessarily overlap, change over time and are context-dependent. Although there are no detailed rules or guidelines connected to social roles, they may direct one's actions, as well as the expectation of others. Actual behaviour is not necessarily bound by a certain role definition; it is based on the interpretation and improvisation of the person occupying the role. The competences and skills of researchers therefore become important when navigating the research field (see Loorbach et al. 2011; Levin 2012). In the "Discussion" Section, we further analyse trade-offs and conflicts, as well as potentials between and within different roles and activities.

8.4 ACTION RESEARCH FOR SUSTAINABILITY TRANSITIONS IN CARNISSE

In this section, the ideal-type roles are used as a heuristic for analysing an empirical case of transition management. We introduce the methodology and the local context, as well as a short summary of the transition management process, before analysing the roles taken in addressing each of the four key issues.

8.4.1 The community arena: action research in practice

The community arena methodology is a first attempt to contextualise the transition management process for local communities as part of the EU-funded InContext project (Wittmayer et al. 2011a). This project aimed not only to better understand the internal and external contexts that influence the ability of individuals and local communities to deal with societal challenges, but also to facilitate and learn about processes that can enhance their transformative potential towards sustainability. Both authors were involved in this project. The first author led the action research work package and was part of the action research team in Carnisse from September 2010 to March 2013. The research consisted in some 60 interviews, participant observation and informal contacts on numerous occasions. In addition, seven deliberative meetings and six actionoriented meetings were organised and facilitated. The process and outcomes are documented in a number of project deliverables (see Wittmayer et al. 2011a, b, 2012, 2013a, b, c). The second author was involved in the theory and synthesis work packages.

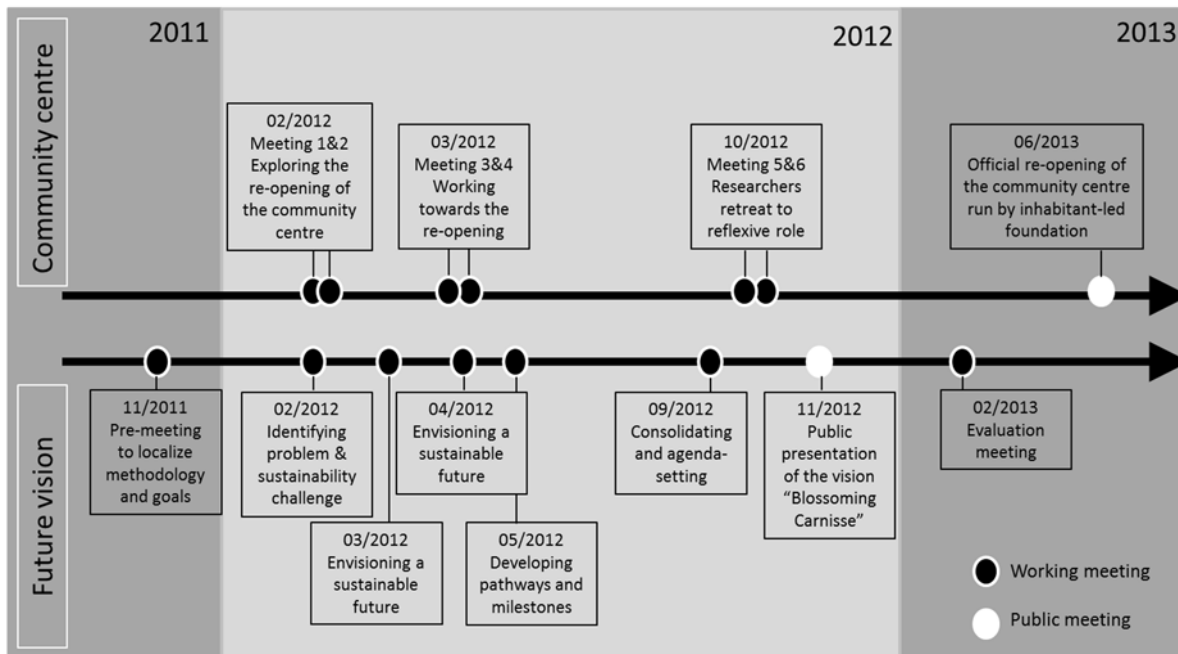


Figure 18: Timeline of the transition management process in Carnisse

Carnisse is an urban neighbourhood in which some 10,000 out of Rotterdam’s 600,000 inhabitants are living. It is known as a ‘deprived’ neighbourhood scoring low on a number of municipal indexes and is marked by a high turn-around of inhabitants, which represent about 170 nationalities. Severe budget cuts in the municipality threaten the continuation of social work, as well as community facilities. The focus of the community arena process (see Fig. 18 for a timeline) was on quality of life in the neighbourhood and was co-financed by the Dutch government. In the beginning, the activities were to be of a more deliberative nature (e.g. problem structuring, envisioning, pathway development) and were to be followed by others of a more practical nature (e.g. short-term projects to (learn about how to) reach a long-term goal). In the Preparation and Exploration phase (phase 1), a transition team was assembled consisting of two InContext action researchers and members of a partner project through which co-financing was secured. This team prepared, documented, analysed, monitored, coordinated, facilitated and evaluated the whole process. It brought together various parties, was responsible for internal and external communication, acted as an intermediary in disagreements and had an overview of all activities taking place in and between arena meetings. Until February 2012, the researchers were very active in the neighbourhood, interviewing, attending meetings and getting acquainted with the locality, as well as reviewing literature about the neighbourhood, i.e. doing a system and actor analysis. They also had initiated a pre-meeting to discuss the localization of the approach for Carnisse. As of February 2012, in phase 2, the Problem Structuring and Visioning phase, the researchers invited 15 out of about 40 local interviewees to take part in the community arena. These frontrunners met in total seven times in the community arena setting. Their first meetings focused on discussing the status quo (identifying problems and current sustainability challenges) and envisioning a sustainable future, which they named ‘Blossoming Carnisse 2030’. By May 2012, the third phase, Backcasting, Pathways & Agenda Building, had also been completed. Backcasting

was used to come up with pathways and milestones to realise the arena's vision. As part of the fourth phase, Experimenting and Implementing, the vision was presented to a broader audience in the neighbourhood in November 2012. After this broadening, the methodology prescribed that a number of innovative projects should start. Due to the local context, one of these projects had already started in parallel with the deliberative process in February 2012. It concerned the reopening of a local community centre that had been closed due to the bankruptcy of the local welfare organisation. This centre was officially re-opened in June 2013 and is now run by an inhabitant-led foundation. As part of the last phase, Evaluating and Monitoring, the researchers held a number of reflective monitoring interviews and organised an evaluation meeting in February 2013, where all participants evaluated the process and outcomes and formulated future ambitions.

8.4.2 Ownership in Carnisse

As outlined above, ownership relates to the intensity of participant involvement and process leadership. The researchers had not been invited by the community to support them in addressing a certain challenge; instead, the neighbourhood had been chosen through negotiations between the public administration and the research institute during the writing phase of an EU FP7-funded research project. As such, there was no local ownership at the beginning of the process. The researchers started by performing a system and actor analysis (i.e. reviewing literature, interviewing community change agents) to establish an initial understanding of the transition challenges faced by the neighbourhood. These activities can clearly be attributed to the reflective scientist. To increase process ownership and address local weariness of participatory processes, the research team organised a first meeting to discuss the localization of the process design. This led to (a) an intensive discussion about the role of the researchers: a researcher who collaboratively instigates action was different from previously known ones, (b) a change in the process design by putting deliberating and experimenting in parallel rather than in consecutive order, and (c) an explicit agreement on a shared goal for the process. Empowering the local community to design a process that fits their purposes and allows them to put their own questions on the agenda is part of the change agent role, which also included motivating participants to take part in the process. Later on, activities attributable to the role of process facilitator became dominant. The research team facilitated the process following adapted methodological guidelines, selected and invited participants, prepared the meetings and monitored progress. Activities linked to the ideal-type role of self-reflexive scientist were also important. Working in a team of two, the researchers engaged in (self-) reflection and reflexivity with regard to their own position (e.g. the discussion during the meeting on process design) and to their new role as action researchers. They were searching for ethical boundaries in terms of what can be asked from or expected of community members, and of how their own expectations thereof shaped the collaborative research process.

8.4.3 Sustainability in Carnisse

Sustainability becomes meaningful through the interaction of different parties in and for a specific context. In Carnisse, the concept 'sustainability' had a negative connotation for some who assumed that it would force them to give up certain things or that they would not be in a position to change anything. Others considered 'sustainability' an academic and abstract term, rather than an everyday concept that they could relate to. A minority thought that

it was a worn-out term, and as such meaningless in the local context. Rather than focusing on the term ‘sustainability’, the community arena process aimed to play into local dynamics (i.e. a good quality of life) as a starting point—thereby hoping to catch the essence of sustainability without falling into quarrels about the notion itself. The researchers took this decision as reflective scientists based on an analysis of local attitudes. In their role as knowledge brokers, they refrained from imposing any preconceived ideas or values on participants, but instead helped to make sustainability meaningful locally. The researchers operationalized it into four dimensions: environmental thinking (awareness of nature and natural resources), social thinking (consideration and acknowledgement of self and others), time horizon (short and long term) and interregional thinking (connecting the local with other parts of the world). As process facilitators, the researchers introduced these dimensions as questions in the facilitation to ensure that discussions included a critical reflection on sustainability values. Again, the normative concept of sustainability was accompanied by the reflections of the researcher (acting according to the role of self-reflexive scientist) on, for example, how open or closed the agenda of the process could be and should be or on what sustainability meant for the individual researcher. Based on this reflexivity, the researchers outlined their self-understanding of an action researcher as being self-reflexive, postponing judgment and aiming to increase the reflexive capacity of individuals and the group.

8.4.4 Power in Carnisse

The issue of power includes mediating internal group dynamics, as well as relations to the political and institutional context. In Carnisse, the research team initiated, organised and facilitated the process—all activities clearly attributable to the role of process facilitator. Though meaningful for processes at a sectoral level (e.g. energy, long-term care), the ‘frontrunner’ concept turned out to be rather problematic to operationalize on a community level. Taking into account the more intimate relations and (hidden) power structures, the researchers had to develop more explicit criteria for selecting participants. The research team used a set of general criteria for group composition (e.g., diversity in gender, age, occupation), rather than focusing exclusively on individual capacities and skills. Once the group was formed, facilitation techniques took the lead role in mediating power dynamics. In smaller groups as in plenary rounds, the quieter participants were carefully encouraged to express themselves (for example, by taking turns). The role of process facilitator gave the researchers a prominent and lead role within the group. This, however, mainly concerned the deliberative part of the process (i.e. problem framing, envisioning and pathway development)—the community drove the more concrete activities, including the re-opening of the community centre. As reflective scientists, the researchers analysed each meeting’s discussions, as well as their relation to the earlier system analysis, feeding their analyses back into subsequent arena meetings for further discussion and consolidation. During meetings, the researchers acted according to the role of knowledge broker, mediating between worldviews with the aim of establishing a common problem perception, as well as a shared vision of the future. Mediation also took place with actors outside the community arena; the researchers networked with other actors in the field within a change agent role, for instance, through regular contact with municipal officers or other neighbourhood institutions. This role was enacted by connecting actors interested in re-opening the community centre, to build confidence in translating ideas into action. Activities corresponding to the role of self-reflexive scientist were

present in dealing with power dynamics and the role of the researcher on the community level: this included field-notes, as well as discussions in the research team.

8.4.5 Action in Carnisse

Action implies that researchers take an active part in the research process and contribute (to) activities leading to real-life changes. While co-designing the process in Carnisse, it became clear that ‘taking action’ would be a key element of the transition management process. The researchers were initiating and partly facilitating the action-oriented project focusing on the community centre, activities attributable to the role of process facilitator. The researchers took the role of change agent by participating in processes which aimed at real-life changes (e.g. the reopening of a community centre, creating a future vision for the neighbourhood and a network of ambassadors). Not everybody saw these outcomes in a positive way; some participants felt that large-scale action was missing, such as physical change in terms of renovated or new houses, or the involvement of all inhabitants. Based on an analysis of the monitoring interviews and of the evaluation meeting, activities belonging to the role of reflective scientist, the researchers concluded that the overall process led most participants to feel empowered. They learned about their neighbourhood and, at times, gained insights that led to self-reported changes in beliefs and values. Again, in addressing action, the researchers also took the role of self-reflexive scientist, reflecting on the implications of their actions throughout the process and their decisions on the community level.

8.5 DISCUSSION

Researchers, especially those engaging in process-oriented sustainability science, are not only players in the scientific arena (and bound to the corresponding rules), but are also “active in other arenas as well, which makes them responsible and accountable for other activities, such as their role in societal change processes” (Rotmans 2005:20). In the following, we discuss the challenges and potentials that emerged in developing and applying the set of ideal-type roles, and reflect on their wider implications.

8.5.1 Importance of self-reflexivity

The activities and corresponding ideal-type roles, sketched on the basis of the literature review, can be considered adequate for describing the research practice that took place in Carnisse. One prominent outcome of the case analysis is that the role of the self-reflexive researcher was present in addressing all four issues, rather than only in addressing sustainability and power. The personality and training of the researchers (with backgrounds in social anthropology and sociology) encouraged this, as did the importance given to self-reflexivity in the action research literature (e.g. Reason and Bradbury 2008). Such an attitude increased the researcher’s awareness of his/her own position in terms of time, place, background and normativity. This also allowed the researcher to understand herself/himself as part of the dynamic that he/she was aiming to change. Reflexivity makes it possible to re-adjust principles, goals and processes by inviting multiple interpretations in the common knowledge production process (Stirling 2006; Miller et al. 2011). It further gives the researcher the means to deal with the multitude of activities and roles that arise throughout the research practice.

8.5.2 Role conflict and potential

Obviously, the five ideal-type roles that we describe are abstractions: they are not easily distinguishable, overlap in practice and are dependent on individual understanding and performance. The neat ideal-type roles are also in opposition to the messiness of the actual collaborative research process: it is not straightforward, includes numerous actors, perspectives and values, and can only be planned to a certain extent. Decisions are often taken on the spot with researchers facing information deficits and contradicting interest—they are constantly engaging in “skilful improvisation” (Greenwood and Levin 2008:130).

Nevertheless, we propose that these ideal-type roles and their possibly conflicting aims can help explain some of the dilemmas, challenges and choices experienced by researchers in the research process. In Carnisse, the researchers faced a dilemma when having to decide on how to deal with the issue of ‘sustainability’. They were aware of the scientific evidence for pressing sustainability concerns (as reflective scientist) and were prepared to spark actions to address them (change agent). However, they were equally aware of the limits of their knowledge (self-reflexive scientist), and aimed to empower participants to develop their own understanding of sustainability (as process facilitator). This situation calls for ways that safeguard the overall goal of the research approach (e.g. the learning space), as well as the personal and professional integrity of the researcher. Assuming a ‘third’ role, and thereby using a different role as a resource, is one possibility. In our example, the researchers took the role of knowledge broker: they refrained from introducing sustainability based on their own understanding, and opened the discussion to the different dimensions of sustainability (e.g. aspects of time and place as part of inter- and intergenerational justice). Another strategy is to make an explicit choice in which activities (not) to engage in as a researcher.

Quite simply, engaging in activities (i.e. adopting different roles) inevitably has a range of consequences for the process, the outcome and the wider societal context. Analysing challenges, dilemmas and choices in actual research practice through the lenses of the ideal-type roles allows us to interpret these as conflicting aims of different roles—and potentially as conflicting aims of the overall research project. Doing so allows the researcher to consciously and explicitly decide how to navigate these dilemmas, challenges and potentials in everyday research design. It provides a heuristic to enhance reflexivity.

8.5.3 The challenge of integrating a change agent’s role

The change agent role is furthest away from the more common role of a (supposedly) neutral, reflective scientist. Our case study showed that this role is crucial when aiming to empower participants in a community transition management process. However, positioning oneself may give rise to tenuous positions. For the researchers in Carnisse, giving voice to and acting upon concerns about the closure of the local community centre, led to a confrontation with the local administration, which felt threatened. This situation highlighted questions of communication, group dynamics and power imbalances. It is in this context that we see the added value of getting immersed in the field: one can analyse and understand challenges and opportunities from within and from different perspectives. Reflexivity provides a sensible basis for action in such a context.

While the role of the change agent was crucial in this instance, it might not be for all transition management (or process-oriented sustainability science) research. The concrete context and goals, as well as the competences and willingness of the researcher, are decisive for the roles and activities (not) to perform. We see that the set of ideal types provides a vocabulary for researchers to define their self-concept and can be used for transparency towards others with regard to roles (not) taken. A sensitive consideration and transparency are important: it is not about one or the other role, but much more about a complementary integration of different roles, using them as resources. This can take place within one person or within a team of researchers, where each one adopts a different role. As process-oriented sustainability science has multiple facets and serves a diversity of aims, the activities and roles of researchers must necessarily be plural and multi-faceted—they must go beyond being purely reflective scientists.

8.5.4 Institutional implications

Most of the identified activities and related roles have conventionally not been part of the scientific repertoire. Scientists experiment and improvise with new activities and roles to deal with the challenges of actual research practice and evolving concepts of science. Our suggested set of ideal-type roles also has institutional consequences. Three aspects need to be taken into account to ensure informed decision making and high-quality research design beyond the scale of the individual researcher: firstly, process and action-oriented scientists have different training and competence needs (Levin 2012; Wiek et al. 2011; Loorbach et al. 2011; Pohl et al. 2010; Stauffacher et al. 2006). Secondly, separate quality criteria exist for processoriented sustainability science (Cornell et al. 2013; Bergmann et al. 2005, for action research see: Reason and Bradbury 2008; Greenwood and Levin 2007). This closely relates to the third point, the re-orientation of higher education, which is needed to equip researchers to deal with the new activities and roles outlined in this article. Key aspects include the design of education programmes, career opportunities for researchers in universities and beyond, grant and funding schemes building on the principles of process-oriented sustainability science, and formats for inter- and transdisciplinary cooperation during study and research (Yarime et al. 2012; Fadeeva and Mochizuki 2010; Holm et al. 2013; Schneidewind and Singer-Brodowski 2013).

8.6 CONCLUSION

In sustainability science, the re-definition of the role of the researcher warrants thoughtful examination and lively discussion within and beyond the scientific arena. While researchers' trainings and research quality criteria are hotly debated, their role understandings have been passed over until now. In this article, we focus on process-oriented approaches to sustainability science, including transition management and action research. What these approaches have in common are the creation and maintenance of spaces for societal learning. In engaging with these spaces as a form of science–society interface, researchers need to address four key issues: ownership, sustainability, power and action. These issues are addressed through a number of activities, which we have clustered to correspond to five ideal-type roles for researchers engaging in process-oriented sustainability science: reflective scientist, knowledge broker, process facilitator, change agent and self-reflexive scientist.

This article deepens the understanding of process-oriented sustainability science, based on the analysis of two research approaches: (1) zooming in on one specific example of process-oriented sustainability science—transition

management; and (2) zooming out of sustainability science by turning to action research, as a related and longstanding process-oriented approach to science. While transition management represents a relatively new approach, action research offers experiences in navigating the actual research practice and exploring new roles for science and researcher. In accepting their social responsibility, scientists from both approaches aim to create spaces for societal learning by, *inter alia*, giving space to participants, fostering mutual learning about sustainability challenges and possible solutions, and being critical of power relations and implicit ideologies. Transformative action and real-world change are the overarching directions of these activities. As such, we advocate action research for sustainability (Kemmis 2010). First, it emphasises the action and outcome orientation of research: its orientation towards solutions (cf. Miller et al. 2013) and the changing of history (cf. Kemmis 2010). Secondly, as opposed to pure activism, it highlights the role of research, which links different modes of science and different epistemologies based on systematic experimentation and reflexivity. And finally, it links outcomes and research to the normative concept of sustainability.

This article also formulates a set of ideal-type roles for researchers engaging in process-oriented sustainability science. By drawing out these ideal types, rather than glossing over the messiness of actual research practice, we provide researchers with a language and framework for distinguishing different activities and roles. We thereby aim to contribute to informed decision making on how to design research processes. We encourage researchers to further explore, contest, experiment and develop the roles. This language and framework can help researchers in analysing their own research practice, and in becoming aware of the kind of roles fitting personal competences, skills and interests, as well as the situation at hand. It therefore has the potential to increase the reflexivity of researchers and sustainability science. As abstract concepts, the roles are helpful to compare different instances of process-oriented approaches to sustainability science, for example, other transition management practices (less focused on social sustainability or the local level), or other approaches such as the transdisciplinary case study approach (Scholz 2011). Other challenges lie in including different issues—such as ethics or politics—and in exploring the appropriateness of the discussed roles beyond sustainability science.

Finally, developing a new understanding of what it means to be a researcher needs space: space in terms of time for individual experimentation and skill development, which we mentioned above, but also institutional space. It is up to universities to rethink their relation to society, to support (rather than hinder) their professionals in defining research outputs—for example, in terms of publications and societal relevance—and to offer opportunities for young and socially engaged scholars. This call also goes to funding bodies or research schemes, such as the initially mentioned Future Earth programme or the EU-Horizon 2020; these should allow researchers to take on different roles, rewarding rather than punishing them for doing so. Furthermore, selection criteria in funding programmes ought to acknowledge skills and training for researcher roles other than the reflective scientist.

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8.7 REFERENCES

- Avelino F (2011) *Power in Transition*. Erasmus University, Rotterdam, *Empowering Discourses on Sustainability Transitions*
- Bergmann M, Brohmann B, Hoffmann E, Loibl M, Rehaag R, Schramm E, Voß J-P (2005) *Quality Criteria of Transdisciplinary Research. A guide for the formative evaluation of Research Projects*, Institute for Social-Ecological Research, Frankfurt am Main
- Bradbury H, Reason P (2003) Action research. An opportunity for revitalizing research purpose and practices. *Qual Soc Work* 2(2):155–175
- Buchanan D, Badham R (1999) *Power, Politics and Organizational Change: Winning the Turf Game*. Sage, London
- Chandler D, Torbert B (2003) Transforming inquiry and action: interweaving 27 flavors of action research. *Action Res* 1(2):133–152
- Clinton RL (1991) Grassroots development where no grass grows: small scale development efforts on the Peruvian Coast. *Stud Comp Int Dev* 26(2):59–95
- Coglan D, Shani AB (2006) Roles, politics, and ethics in action research design. *Syst Pract Action Res* 18(6):533–546
- Cornell S, Berkhout F, Tuinstra W, Tabara JD, Jaeger J, Chabay I, De Wit B, Langlais R, Mills D, Moll P, Otto IM, Petersen A, Pohl C, Van Kerkhoff L (2013) Opening up knowledge systems for better responses to global environmental change. *Environ Sci Policy* 28:60–70
- Dick B (2004) Action research literature themes and trends. *Action Res* 2(4):425–444
- Fadeeva Z, Mochizuki Y (2010) Higher education for today and tomorrow: university appraisal for diversity innovation and change towards sustainable development. *Sustain Sci* 5(2):249–256
- Frantzeskaki N, Loorbach D, Meadowcroft J (2012) Governing societal transitions to sustainability. *Int J Sustain Dev* 15(1):19–36
- Grant J, Nelson G, Mitchell T (2008) Negotiating the Challenges of Participatory Action Research: relationships, Power, Participation, Change and Credibility. In: Reason P, Bradbury H (eds) *Handbook of action research: Participative inquiry and practice*. Sage, London, pp 589–601
- Greenwood DJ, Levin M (2007) *Introduction to Action Research. Social Research for Social Change*, 2nd edn. Sage, Thousand Oaks

- Greenwood DJ, Whyte WF, Harkavy I (1993) Participatory action research as a process and as a goal. *Hum Relat* 46:175–192
- Greiner LE, Schein VE (1988) *Power and Organization Development*. Addison-Wesley, Reading, MA
- Grin J, Rotmans J, Schot J, Loorbach D, Geels FW (2010) *Transitions to sustainable development; new directions in the study of long term transformative change*. Routledge, New York
- Holm P, Goodsite ME, Cloetingh S, Agnoletti M, Moldan B, Lang DJ, Leemans R, Oerstroem Moeller J, Buendia MP, Pohl W, Scholz RW, Sors A, Vanheusdenm B, Yusoff K, Zondervan R (2013) Collaboration between the natural, social and human sciences in global change research. *Environ Sci Policy* 28:25–35
- ICSU (2014) Future Earth Website, see <http://www.icsu.org/futureearth>. Accessed April 2014
- Kajikawa Y (2008) Research core and framework for sustainability science. *Sustain Sci* 3:215–239
- Kates RW, Clark WC, Corell R, Hall JM, Jaeger CC, Lowe I, McCarthy JJ, Schellnhuber HJ, Bolin B, Dickson NM, Faucheux S, Calloprn GC, Grübler A, Huntley B, Jäger J, Jodha NS, Kaspersen RE, Mabogunje A, Matson P, Mooney H, Moore B III, O’Riordan T, Svedin U (2001) Sustainability science. *Science* 292:641–642
- Kemmis S (2010) What is to be done? The place of action research. *Edu Action Res* 18(4):417–427
- Komiyama H, Takeuchi K (2006) Sustainability science: building a new discipline. *Sustain Sci* 1:1–6
- Lang DJ, Wiek A, Bergmann M, Stauffacher M, Martens P, Moll P, Swilling M, Thomas CJ (2012) Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustain Sci* 7(Supplement 1):25–43
- Levin M (2012) Academic integrity in action research. *Action Res* 10:133–149
- Levin M, Greenwood DJ (2008) The future of universities: Action research and the transformation of higher education. In: Reason P, Bradbury H (eds) *Handbook of action research: Participative inquiry and practice*. Sage, London, pp 211–226
- Loorbach D (2007) *Transition Management*. Erasmus University, Rotterdam, *New Mode of Governance for Sustainable Development*
- Loorbach D (2010) Transition management for sustainable development: a prescriptive, complexity-based governance framework. *Governance* 23(1):161–183

- Loorbach D, Frantzeskaki N, Thissen WH (2011) A transition research perspective on governance for sustainability. In: Jaeger CC, Ta'bara JD, Jaeger J (eds) *European Research on sustainable development, Vol 1. Transformative Science Approaches for Sustainability*. Springer, pp 73–90
- Miller TR (2013) Constructing sustainability science: emerging perspectives and research trajectories. *Sustain Sci* 8:279–293
- Miller TR, Munoz-Erickson T, Redman CL (2011) Transforming knowledge for sustainability: towards adaptive academic institutions. *Int J Sustain High Educ* 12(2):177–192
- Miller TR, Wiek A, Sarewitz D, Robinson J, Olsson L, Kriebel D, Loorbach D (2013) The future of sustainability science: a solutions-oriented research agenda. *Sustainability science*. doi:10.1007/s11625-013-0224-6
- Ness B (2013) Sustainability science: progress made and directions forward. *Chall Sustain* 1(1):27–28
- Nowotny HS, Gibbons Scott PM (2001) *Rethinking science: knowledge and the public in an age of uncertainty*. Polity, Cambridge
- Pohl C, Rist S, Zimmermann A, Fry P, Gurung GS, Schneider F, Speranza CI, Kiteme B, Boillat S, Serrano E, Hirsch Hadorn G, Wiesmann U (2010) Researchers' roles in knowledge coproduction: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Sci Public Pol* 37(4):267–281
- Ramos J (2006) Dimensions in the confluence of futures studies and action research. *Futures* 38:642–655
- Rauschmayer F, Muenzing T, Frühmann J (2011) A plea for the self-aware researcher: Learning from business transformation processes for transitions to sustainable development. In: Rauschmayer F, Omann I, Frühmann J (eds) *Sustainable development: Capabilities, needs, and well-being*. Routledge, London, pp 121–143
- Reason P, Bradbury H (eds) (2008) *Handbook of Action Research*, 2nd edn. Sage, London
- Roorda C, Frantzeskaki N, Loorbach D, van Steenberg F, Wittmayer J (2012) *Transition Management in Urban Context - guidance manual, collaborative evaluation version*. Erasmus University, Rotterdam, Drift
- Rotmans J (2005) *Societal innovation: between dream and reality lies complexity*. Erasmus University, Rotterdam
- Rotmans J, Kemp R, Van Asselt M (2001) More evolution than revolution: transition Management in public policy. *Foresight* 3(1):15–31
- Salas-Zapata WA, Rios-Osorio LA, Troughon-Osorio AL (2012) Typology of scientific reflections needed for sustainability science development. *Sustainability science*. doi:10.1007/s11625-012-0183-3

Schneidewind U, Singer-Brodowski M (2013) *Transformative Wissenschaft : Klimawandel im deutschen Wissenschafts- und Hochschulsystem*. Metropolis, Marburg, Germany

Scholz RW (2011) *Environmental literacy in science and society: from knowledge to decisions*. Cambridge University Press, Cambridge, UK

Sinwell L (2012) Transformative Left-wing parties and grassroots organizations: unpacking the politics of 'Top-Down' and 'Bottom-Up' development. *Geoforum* 43(2):190–198

Spangenberg JH (2011) Sustainability science: a review, an analysis and some empirical lessons. *Environ Conserv* 38:275–287. doi:10.1017/S0376892911000270

Stauffacher M, Walter AI, Lang DJ, Wiek A, Scholz RW (2006) Learning to research environmental problems from a functional socio-cultural constructivism perspective. The transdisciplinary case study approach. *Int J Sustain High Educ* 7(3):252–275

Stauffacher M, Flüeler T, Kru"tli P, Scholz RW (2008) Analytic and dynamic approach to collaboration: a transdisciplinary case study on sustainable landscape development in a Swiss prealpine region. *Syst Pract Action Res* 21(6):409–422

Stirling A (2006) Precaution, foresight and sustainability: reflection and reflexivity in the governance of science and technology. In: Voß JP, Bauknecht D, Kemp R (eds) *Reflexive governance for sustainable development*. Edward Elgar, Cheltenham, pp 225–272

Stoecker R (1999) Are academics irrelevant? Roles for scholars in participatory research. *Am Behav Sci* 42:840–854

van Buuren A, Loorbach D (2009) Policy innovation in isolation? Conditions for policy renewal by transition arenas and pilot projects. *Pub Manag Rev* 11(3):375–392

van den Bosch S (2010) *Transition Experiments. Exploring societal changes towards sustainability*. Erasmus University, Rotterdam

van der Brugge R, van Raak R (2007) Facing the adaptive management challenge: insights from TM. *Ecol Soc* 12(2):33

van Kerkhoff L (2013) Developing integrative research for sustainability science through a complexity principles-based approach. *Sustainability science*. doi:10.1007/s11625-013-0203-y

WBGU (2011) *Welt im Wandel Gesellschaftsvertrag für eine Große Transformation*. WBGU, Berlin

- Wicks PG, Reason P (2009) Initiating action research Challenges and paradoxes of opening communicative space. *Action Res* 7(3):243–262
- Wiek A (2007) Challenges of transdisciplinary research as interactive knowledge generation. *Gaia* 16(1):52–57
- Wiek A, Withycombe L, Redman CL (2011) Key competencies in sustainability: a reference framework for academic program development. *Sustain Sci* 6:203–218
- Wiek A, Ness B, Schweizer-Ries P, Brand FS, Farioli F (2012a) From complex systems analysis to transformational change: a comparative appraisal of sustainability science projects. *Sustain Sci* 7(Supplement 1):5–24
- Wiek A, Farioli F, Fukushi K, Yarime M (2012b) Sustainability science: bridging the gap between science and society. *Sustain Sci* 7(Supplement 1):1–4
- Wittmayer, J., M. Mock, F. van Steenberg, S. Baasch, I. Omann & N. Schöpke (2013c) Taking stock – Three years of addressing societal challenges on community level through action research Pilot specific synthesis report. Deliverable 4.5. InContext: EU ENV.2010.4.2.3-1 Grant agreement no. 265191
- Wittmayer J, Van Steenberg F, Quist J, Loorbach D, Hoogland C (2011a) The Community Arena: a co-creation tool for sustainable behaviour by local communities Methodological guidelines. Deliverable 4.1. InContext: EU ENV.2010.4.2.3-1 Grant agreement no. 265191
- Wittmayer J, van Steenberg F, Bohunovsky L, Baasch S, Quist J, Loorbach D, Hoogland C, (2011b) Pilot projects getting started. Year 1 Status Report. Deliverable 4.2, InContext: EU ENV.2010.4.2.3-1 Grant agreement no. 265191
- Wittmayer J, van Steenberg F, Baasch S, Feiner G, Omann I, Quist J and Loorbach D (2012) Pilot projects on a roll. Year 2 pilot specific reports. Deliverable 4.3. InContext: EU ENV.2010.4.2.3-1 Grant agreement no 265191
- Wittmayer J, Schöpke N, Feiner G, Piotrowski R, Baasch S (2013a) Action Research for Sustainability. Reflections on Transition managementM in practice. Research Brief/Deliverable 5.2. InContext: EU ENV.2010.4.2.3-1 Grant agreement no 265191
- Wittmayer J, van Steenberg F, Baasch S, Feiner G, Mock M, Omann I (2013b) Pilot projects rounding up. Year 3 Pilotspecific report. Deliverable 4.4. InContext: EU ENV.2010.4.2.3- 1 Grant agreement no 265191
- Yarime M, Trencher G, Mino T, Scholz RW, Olsson L, Ness B, Frantzeskaki N, Rotmans J (2012) Establishing sustainability science in higher education institutions: towards an integration of academic development, institutionalization, and stakeholder collaborations. *Sustain Sci* 7 (Suppl 1):101-113

9 SYNTHETIC DISCUSSION OF RESULTS

In this thesis, I respond to the call for more transformative and transdisciplinary forms of research to engage with societal transitions. Thus, I focus on the dimension of 1) transformation knowledge, and the respective role of transdisciplinary and transformative research. That is, methods and processes of **transdisciplinary collaboration** which contribute to the facilitation of transformations of societal systems. In doing so, I build on investigations in the two other knowledge areas with a focus on current debates. These include 2) systems knowledge regarding the role of **agency** (e.g., actions of individuals and groups) in shaping and transforming the systems in question, as well as 3) target knowledge on the desired, normative goal of the transition, namely **sustainability**. Thus, transdisciplinary collaboration, individual agency and sustainability are the main research themes in this thesis. For a synthesizing discussion of results, I build on the research aim, question, objectives and specific tasks, as developed in the introduction (chapter 1.3). For ease of reading, I reproduce them here.

My main aim in this thesis is to contribute to the enhancement of transdisciplinary sustainability transitions research. I aim to do so with particular regard to developing a better understanding of transdisciplinary collaborations as facilitators of sustainability transitions, the role of human actors in transitions, and the explicit consideration of the normative aim of transitions, namely sustainability.

Building on an in-depth analysis of the state of the art of research regarding the three research themes and the core aim, I developed my main research question:

How can we better understand the transdisciplinary collaboration process by which transition management contributes to sustainability transitions, particularly regarding consideration of normative sustainability aspects, individual agency, as well as creating and maintaining a societal learning space and the roles of researchers therein?

To address this question, I follow **three sub-objectives**, addressing gaps in the different **core themes**:

- d. To achieve a psychologically enriched understanding of individual and sustainability related **agency** in conceptual and empirical understandings of transition management, taking social learning and empowerment as agency related core aspects into account
- e. To include normative considerations, namely **sustainability**, into transition management on conceptual and empirical levels with regard to substantive, procedural and intentional aspects
- f. To conceptualize and explore the **transdisciplinary collaboration** in transition management of creating an arena as an interactive learning space, and the roles of the researchers therein

These sub-objectives are approached via nine specific tasks, each combining a core theme and a core research focus (e.g., theme: agency and focus: conceptual development). The consecutive synthesis of results has the following structure: it begins with a synthesizing discussion of results from different chapters on each of the specific tasks, clustered around each of the three themes. Thereby, I primarily describe key results of chapters and integrate

them to the degree possible. This includes conceptual, case study based and reflexive insights. The two cases studied represent 'typical' transition management cases (see chapter 2 on methods), though focusing on local applications. Due to existing similarities and differences between them, they enable an exploration of the bandwidth of local applications. Insights on agency, sustainability and transdisciplinary thus primarily relate to the specific cases and local transition management, but can be seen as indicative to some degree for transition management practice more broadly.

In a second step, I discuss possibilities for synthesizing all results gained on the three core themes, combining conceptual, empirical and reflexive arguments. This step proceeds more analytically and interprets the results towards the sub-objectives above and develops theme related key insights. Results from step one and two are summarized in form of a table (table 12), as well relating back to the initial framework developed in chapter 1 (figure 1). Thereby I take up key areas of conceptual and empirical work (bolded terms in the elaboration on tasks below) and the key insights synthesized for the different themes in step two. Finally, I relate back to the main aim and research question of this thesis and synthesize the overall results in form of proposed principles for sustainability transition management.

9.1 INSIGHTS ON TASKS RELATED TO AGENCY

9.1.1 Conceptualization of individual agency and its' development via empowerment and social learning, including sustainability motivations (task a1)

Two main contributions are made in this thesis: first, individual agency is conceptualized in a way that fits the needs of transition management as an open-ended, reflexive process focusing empowerment and social learning of participants. Concurrently, it **adds intentional sustainability aspects in understanding agency**, so as to allow for guiding the reflexive process towards sustainability. Secondly, individual agency development as facilitated in transition arenas is conceptually related to larger scales. Therefore, this thesis developed a conceptual meta-heuristic to analyze sustainability transitions that includes individual agency within a comprehensive picture of transitions at different levels (chapter 4). Micro-level action is dependent on the realized capabilities of persons, understood as real freedoms to live a valuable life. Individual agency thus is embedded into social practices on a meso, regime level. Transition and community arenas that create niches at intermediate levels can act as interrelating elements between individual agency and social practices.

The conceptual core, focusing on individual agency, is a behavioral model suitable to understand sustainability related behavior in transitions and related transdisciplinary collaborations (chapter 5). Therefore, the model builds on processes of empowerment as a central aim of transition management to contribute to transitions (Loorbach 2007), and combines empowerment with a normative orientation of action towards sustainability. Thus, the so-called '**dynamic-norm-activation-capability model**' of individual behavior, combines the capability approach and environmental psychology. A person's capability set defines her behavioral alternatives. Decisions on behavior are taken based on self-centeredness and other types of motivations. Behavioral alternatives can be increased by in-

trinsic (changed assumptions or skills) or extrinsic (changed resources) empowerment. The model outlines possibilities to increase the **freedom of actors to behave pro-socially**, e.g., sustainably. That is, to empower them and increase their behavioral options, as well as augment their motivation to use this empowerment for sustainability. This depends on processes of norm-activation, via increased attention and motivation for sustainability, in turn building on increased self-efficacy and awareness, as well as sustainability related norms and attitudes. The behavioral model can be used to orientate design, process and assessment of facilitating sustainability oriented increases in agency through transition management. It highlights the effectiveness of providing information or addressing norms and motivations. Social learning, a second core aim of transition management, is drawn out as a very promising approach to increase both the behavioural freedoms of actors (their agency) and their motivation to use their freedoms for sustainability. This contributes to including intentional sustainability aspects into transition management, and to go beyond understandings of actors as rational, self-interested only, as primarily underlies the multi-level perspective (see table 1).

Social effects of transition management are further conceptualized, including empowerment, social learning and social capital development (chapter 7). It becomes clear that they are prerequisites for changed collective actions and decisions made, as well as structural changes. This interrelates individual agency with higher-level changes going beyond transition arenas in niches. In addition, it emphasizes the importance of learning and empowerment processes at niche level for larger scale change and thus sustainability transitions. Social effects are created when participants engage in creating products of transition management processes, such as visions or experiments, and gain related experiences. **Social effects are conceptualized to inherently include sustainability qualities**, particularly via awareness, motivation and self-efficacy increases. Thus, sustainability oriented empowerment as described in chapter 7, is largely oriented towards factors of sustainability oriented capabilities increases in chapter 5. In summary, motivations and drivers of individual actors in transition management and their orientation towards sustainability are further conceptualized, responding to an existing gap in the literature (Scholz 2011, see section 1.2). Making sustainability an inherent quality of social impacts additionally allows for a qualitative tracing of the direction of transition trajectories – towards sustainability or not.

In addition, this thesis draws attention to how action research processes contribute to the creation of new ideas, practices and actors, allowing for transformative action (chapter 6). It also draws out key issues to open and run a community arena process, namely ownership, power and action, that impact upon agency development (chapter 8). The latter points are elaborated on below (tasks c).

9.1.2 Empirical analysis of social effects, including empowerment and social learning in relation to normative aims, namely sustainability (task all)

The analysis of two transition management cases (chapter 7) empirically grounds the conceptualization of individual agency and related social effects. Both cases represent typical transition management cases (see chapter 2 on methods), though focusing on local applications. Due to existing similarities and differences between them, they enable an exploration of the bandwidth of local applications. Insights on agency thus primarily relate to the specific

cases and local transition management, but can be seen as indicative to some degree for transition management practice more broadly. A primary result here is the observation that **the community arenas in both cases contributed to the development of social learning, empowerment and social capital**. This was **in large part related to sustainability** awareness, motivations or capacities to act sustainably. Expanding conceptual insights revealed how social effects are synergic, reinforcing one another – a fact that should be taken into account in facilitation. Furthermore, **effects showed a multi-scalar character**, expanding from individual to group levels and beyond. Thus, empirical evidence supports the conceptual assumptions that the development of social effects increases the capacity to take decisions and actions on more collective levels. This corresponds to conceptual insights (chapter 4) providing more details on how transition management interrelates individual action and regime practices: facilitated social learning, empowerment and social capital expand from the individual to the niche and potentially the regime level. How expanding social effects then may change social practices at the regime level as conceptualized (chapter 4), however, remains beyond the scope of this research.

The development of social effects (chapter 7) partly related to sustainability, proceeded hand in hand with the **development of alternative ideas, practices and social relations** in both cases studied (chapter 6). New ideas primarily related to social learning, alternative actions to empowerment and new social relations to social capital. Ideas, practices and social relations could be associated with the transdisciplinary community arena process (e.g., open facilitation, experimentation, reflexive questions). This provides additional empirical support for the effectiveness of the approach used to contribute to the development of sustainability related agency and action. Researchers taking the role of change agents proved essential for empowerment of participants in the case of Carnisse, for instance, via motivation and providing space for action to participants (chapter 8).

9.1.3 Individual agency related critical reflection, regarding the role of agency for understanding sustainability transition and their facilitation (task all)

A number of critical insights towards understanding individual, sustainability related agency and cautiously working with it in transition management arose. Conceptually, agency is embedded in social practices, based on shared meanings, skills and artifacts (chapter 4). While tracing changes of practices is possible, possibilities to deliberately influence practices remains underexplored (Rauschmayer *et al.* 2015). This cautions against overestimating the possibilities of influencing the regime practice via niche activities such as in transition management. Conceptually, agency increases via **intrinsic empowerment** by changed psychological factors, is more durable and broadly effective than extrinsic empowerment (e.g., providing resources). Additionally, intrinsic empowerment can better relate agency increases to sustainability motivations. Social learning, compared to nudging, for instance, provides a promising entry point for intrinsic empowerment. This conceptually underpins transition management's approach to facilitate empowerment via processes of experimentation, testing and learning (e.g., van den Bosch 2010). Correspondingly, on a conceptual and empirical level, **social learning has a core function to increase sustainability oriented decisions-making and action** (e.g., by raising awareness and motivations, chapter 7). This function should be taken into account in facilitation. Yet, empirically, the effective creation of transition arenas as interactive space, depends on arrangements with powerful incumbent actors. This makes the empowerment of participants dependent

on the collaboration of and with powerful actors (cp. empowerment paradox) and potentially limits the scope for (intrinsic) empowerment. This highlights the importance of finding the right balance of engaging with local power holders. Overall, the potential **downsides of social effects** on participants, such as the empowerment paradox or isolation tendencies due to strong social capital development, **require further monitoring and remedial strategies** (chapter 7). While the observed interdependency between different social effects can be used for win-win oriented, synergistic facilitation, this requires further investigations to differentiate synergies from conceptual overlaps.

9.2 SYNTHESIZED INSIGHTS REGARDING 'AGENCY'

Regarding **sub-objective a** and the **theme of agency**, the thesis contributes three complementary main insights.

Individual agency can be added explicitly to the multi-level-perspective, both to better understand transition dynamics as well as to increase the effectiveness of facilitations aiming to support sustainability transitions.

This agency can be added in the form of a fourth, micro level to the multi-level perspective, contributing to understand niche and regime level dynamics (see figure 2 below). As Geels (2011) rightly claims, the multi-level-perspective is 'shot through' with agency. This thesis contributes to making this role explicit providing an understanding that corresponds to the overall research unit: sustainability oriented transitions. Thus, this thesis goes beyond ideas of rational, self-interested actors that underlie understandings of agency in current multi-level-perspectives. Individual agency in this thesis is conceptualized as the behavioral freedoms of actors. To better understand how these freedoms are used, I draw on the capability approach that highlights self- and other types of motivations of behavior and enrich it with environmental psychology. The reliance on the concept of freedom places emphasis on the idea of conscious behavior and free will. This is complemented by the concept of taking responsibility, which relates to the capacity and motivation of actors to use gained agency not only for themselves, but also for other types of motives such as sustainability. Based on the developed behavioral model (chapter 5) and the concepts of social effects (chapter 7), it becomes clear that various psychological factors, including pro-social and even altruistic motivations, sustainability awareness and the perceived self-efficacy, are important. They allow individual agency to be captured, as addressed in transition management in the context of sustainability transitions. This understanding of agency as a combination of behavioral freedom and the willingness and capacity to take responsibility also for other motives, enables an understanding of individual actors as initiators of alternative, more sustainable action. It adds a normative orientation when individuals play a role in consciously creating niches, building on new principles of action (Göpel 2016) and developing radical innovations (Westley *et al.* 2011). It also expands our understanding of transition management as an emancipatory, democratic endeavor of reflexive governance centring on the freedom and responsibility of actors for achieving sustainability transitions.

The community arena methodology, relying on semi-open and reflexive approaches, has proven successful to effectively work with individual, sustainability related agency as a fourth level in sustainability transitions. This thesis explains the development of agency in relation to a number of social effects (social learning, empowerment and social capital) and related development of alternative ideas, practices and social relations. Community arena processes that combined open and exploratory elements (such as an open agenda, transition experiments) and

reflexive elements (e.g., sustainability related reflexive questions) facilitated both social effects and alternatives. Social effects thus can inherently be related to sustainability, via awareness, motivations and capacities to take action. The elegance of this combination lies in its capacity to both track learning and empowerment as drivers of innovation and change and the qualitative orientation of this change towards sustainability. Thus, sustainability enriched social effects provide a suitable yardstick to track the success of transition management, dealing with the underlying tensions of sustainability transitions as open ended processes with normative orientations. Accordingly, this thesis proposes and tests an assessment framework to track the development of the aforementioned social effects.

Individual and collective agency may be linked in transition management through consecutive steps, building on the community arena group. By adding an individual level to the multi-level perspective, an in-depth understanding of processes within transition management as niche creation becomes possible. This contrasts with current trends in transition studies to focus on regime level aspects, such as the power of incumbent actors, as central for understanding and facilitating transitions in the form of regime shifts (e.g., Geels 2017). Empirical observations and conceptual work thus provide a micro-perspective on the interplay of individual and collective agency. Conceptually and empirically it is revealed how the social effects of transition management, in the form of learning and empowerment, expand in consecutive steps from the individual to the group level and beyond. Effects are considered multi-scalar, bridging different scale levels from the individual, the arena group towards the broader niche and regime. Therein the community arena functions as an interlinking element to both develop individual and (small) group agency, including normative orientations, and to connect smaller scale agency towards niche and regime. Insights on social effects can be related to knowledge on the role of networks and transition narratives to amplify the influence of transition management beyond the transition arena (Loorbach and Rotmans 2010). In this context, the inherent consideration of sustainability aspects as qualitative indicators for the direction of transition trajectories towards sustainability (Rotmans & Kemp 2008) appears particularly interesting. Moving towards agency as a collective, aggregated phenomenon corresponds to the attempt of Geels (2017b) to conceptualize agency for understanding larger scale societal change. Here, the thesis adds, in an exploratory way, to understanding the intentional dimension of behavior; while it is far from proposing an empirical understanding of aggregated societal phenomena. First building blocks are presented in the form of a heuristic that stretches from individual agency to group activities in transition arenas towards social practices at regime level (chapter 4). How sustainability oriented individual and collective agency influences regime practices, and thus achieve a structuring influence themselves, remains to be explored.

9.3 INSIGHTS ON TASKS RELATED TO SUSTAINABILITY

9.3.1 Conceptual enrichment of transition management with normative components, particularly regarding sustainability in procedural, substantive and intentional dimensions (task b1)

The primary conceptual contribution of the thesis regarding this task is the **combination of substantial, procedural and intentional dimensions when enriching transition management**. In all three dimensions, an analysis of the

state of the art in sustainability transitions research had shown considerable gaps (see section 1.2, table 1). Substantial sustainability considers effects of for instance behavior on sustainability, intentional sustainability on the intended outcome to contribute to sustainability and procedural sustainability on the change process towards sustainability (chapter 5). Accordingly, sustainability transitions are conceptualized as processes of change with a normative aim in sustainability. Thus, sustainability transitions are described as societal phenomena that enhance inter- and intragenerational justice through radical transformation, solving persistent societal problems (chapter 4). Transition management is conceptualized as a process allowing large-scale societal challenges and related universal sustainability understandings to acquire meaning and relevance in local context (chapter 6). Thereby, thin sustainability morality, i.e. the abstract aim of inter- and intergenerational justice, acquires contextualized meaning – and is transformed into thick morality. Sustainability appears as a key issue that process-oriented sustainability science, such as transition management, has to deal with (chapter 8). Different actors need to negotiate meaning and the value of sustainability within the created societal learning space, with researchers initiating a learning journey to make it meaningful.

Adding a substantial sustainability understanding to this procedural perspective, this thesis proposes **capabilities as a normative yardstick** for developments related to sustainability. Capabilities are defined as the real freedoms of a person to live a valuable life and have been successfully used to assess quality of life and intra-generational justice (chapter 5). In fact, the concept of capabilities has been developed and established as a partial theory of justice (cp. Sen 2009, Nussbaum 2011). Capabilities, as related to what matters for living a valuable life, can be seen as an expression of people's underlying needs. Thus, they pose a link to for instance the needs-based sustainability definition of the Brundtland-Commission (WCED 1987). Sustainability effects of transition management could be measured via capability assessments.

This thesis conceptually elaborates on the need to consider intentional sustainability aspects in sustainability strategies and related governance activities, by revealing possible flaws, such as rebound effects, when such intentional aspects are neglected (chapter 5). This is taken up in two ways: first, a behavioral model is proposed combining the capability approach and sustainability psychology. This allows an understanding of empowerment as capability increases in relation to intents of behaving pro-socially and sustainably. At the intersection of substantial and intentional sustainability, a **new well-being model** is proposed, based on increased freedoms to live a valuable life and behave pro-socially/ sustainably. Secondly, conceptual arguments are grounded in empirical exploration (chapter 7). Therefore, the thesis proposes an assessment frame to discern, describe and systematically address the social effects of transition management, such as empowerment and social learning, in relation to sustainability. This is done both on a general level and operationalized for the local level. Therein, sustainability is related as an inherent quality to the impacts of transition management. This allows a broad assessment of the results of the transition management process, and to focus on assessing tangible, sustainability related results.

9.3.2 Empirical analysis of processes to contextualize sustainability (procedural sust.) and move from thin to thick morality (substantive sust.), and to facilitate sustainability oriented learnings (intentional sust.) (task bII)

Empirical analysis provides an understanding of the procedural dimension of sustainability and related facilitation, by exploring how to move from thin to thick sustainability. This process was portrayed as a learning journey to make sustainability meaningful locally. Here, this thesis furthers our **understanding of the process of directed incrementalism** as proposed by Franzeskaki, Loorbach *et al.* (2012). Transition management as action research allowed large-scale societal challenges and related universal sustainability understandings to acquire meaning and relevance in local contexts (chapter 6). This included reflexive questions on four sustainability related dimensions (e.g., the long-term or the global). This research then adds detailed and empirics-based orientations for transition management, substantiating the advice of Loorbach *et al.* (2011) to include sustainability principles in transition management. The process in the cases studied resulted in the creation of alternative ideas, practices and social relations tackling challenges locally. Therein, the four sustainability dimensions can be traced back. Thus, empirical results supported the effectiveness of the conceptual approach. Depending on context and specific challenges, sustainability took different forms in the two local cases (chapter 6). When addressing sustainability as a key issue and negotiating its meaning and value in the community arena, participants' attitudes were critical. In one case, participants had a rather critical attitude towards sustainability (chapter 8) and, thus, processes were oriented towards quality of life and implicitly related to sustainability via the reflexive questions of researchers acting as knowledge brokers.

This thesis also contributes a framework for the **structured assessment of the effects** of these processes to contextualize sustainability (chapter 7). The framework combines the intentional dimension to processes of change, by adding sustainability as a qualitative dimension of learning, empowerment and social capital developments. It allows assessment of the direction of the process and to capture the **semi-open, reflexive and normatively oriented facilitation** approach. To a degree, this framework also allows consideration of substantial sustainability effects, by assessing the empowerment of participants as sustainability related increases in their capabilities (see task bI). Respective analysis revealed that the community arena methodology applied, contributed to the development of social learning, empowerment and social capital development, and increased the capacity of participants to take action. In addition, analysis revealed that social effects are interrelated and complementarily contribute to sustainability transitions. Sustainability orientation, related to four dimensions of sustainability reflections, was also observed in the outputs of processes (e.g., vision documents). Analysis showed a number of upscaling processes of sustainability related results from the cases studied. In sum, this thesis adds to an understanding – and proposes a concrete operationalization – of how social effects can be used as qualitative indicators for transition trajectories during early developments. This is done by including sustainability aspects as an inherent quality of these social effects for instance by relating social learning to sustainability related contents, and thus linking process and content of transitions. It therefore confirms and further explores the respective claim of Rotmans and Kemp (2008), both conceptually and empirically. Yet, how this plays out in later stages of transitions needs to be further explored.

9.3.3 Critical reflection on possibilities and challenges of addressing sustainability procedurally, substantially and intentionally in transition management (task bIII)

A key reflexive insight of this thesis relates to how societal challenges and sustainability are related in transitions, by explicitly adding normative considerations (chapters 4 and 6). Therefore, it sheds light on the tautology that sustainability is a process of solving societal challenges through inducing fundamental change. That is: sustainability equals solving societal problems, precluding normative considerations on what is defined as a problem and how to agree upon how and when it is solved (see section 3.8). Case studies showed that societal challenges and sustainability only acquire meaning through practice and interaction, and are inherently context dependent. But, simultaneously, local understandings of challenges and sustainability can only be understood in relation to other scales. This understanding is based on a **two-directional collective sense making process**, for instance, in the community arena. The process of contextualization is of an essentially political character. Solving societal challenges via transitions appears as a process of negotiations and conflicts, trade-offs and synergies. Case studies showed that the right scale of the process is important so that societal challenges and local identities and possibilities to take action, are effectively combined. Complementarily, analysis has shown that all the ideal type roles taken by researchers engaged in transition management, engage with normativity (chapter 8). Roles only differ in their stance as to how to deal with normativity: for instance, by aiming for a value free position or to support change towards a normative goals. This creates tensions between approaches and aims, as well as potentials for complementarity. Researchers themselves are thus part of the sense-making and negotiation process. While I elaborate on this sense-making process, case studies do not engage in assessment as to what degree societal challenges were actually solved. That is, the assessment of local developments against the backdrop of larger scale understandings of societal challenges and universal sustainability morality. Exploring assessment possibilities in more detail would be a valuable future task, possibly requiring longer-term horizons.

A second reflexive insight relates to the identified need to **consider intentional aspects of sustainability behaviour in sustainability strategies**, to avoid the flaws of strategies that merely build on self-interested behaviors (chapter 5). Such flaws included high possibilities for rebound effects. On the other hand, it became clear that sustainability strategies merely building on procedural and intentional sustainability, run the risk to miss out on the effectiveness of their attempts - contributing to sustainability or not doing so. Substantial sustainability dimensions thus also require attention in sustainability transitions research and respective facilitation. Social learning approaches were identified as preferable possibilities to increase sustainability oriented agency and capabilities, in contrast to manipulative or regulating approaches interfering with behavioral freedoms. Nevertheless, analysis also highlighted that **social effects**, such as learning and empowerment, **and sustainability, have no inherent relation** (chapter 7). They are two different things that can be related, which requires respective facilitation and monitoring as tested in this thesis. Complementarily, upscaling of sustainability impacts via social effects proved possible (e.g., learnings spread via networks), but this requires monitoring and strategies to remedy adverse effects (e.g., loss of the quality of sustainability when scaled), besides adequate supporting activities. Building on exploratory insights from this thesis, facilitation methodologies can be developed further for pluralistic contexts.

9.4 SYNTHESIZED INSIGHTS RELATED TO 'SUSTAINABILITY'

Regarding **sub-objective b** and the **theme of sustainability**, the thesis contributes three complementary main insights.

The emphasis on procedural sustainability prevalent in transition management can be complemented with intentional and substantial perspectives on sustainability, creating synergies and a balanced approach to sustainability transitions. Questions about the right perspective on sustainability in sustainability transitions research, according to the insights from this thesis, are less about an 'either-or', but rather an 'and' approach. This thesis thus proposes a comprehensive approach to all three understandings of sustainability that is consistent with the dialectical nature of sustainability transitions, combining an open-ended process of fundamental change with a normative orientation – and their facilitation. While the focus of conceptual and empirical work remains on understanding key mechanism of transition management aiming to contribute to transitions – that is social learning and empowerment of frontrunners – this approach is complemented through various steps. On a meta-heuristic level, social learning and empowerment taking place in transition arenas, are complemented with capability and capability assessment, to add intentional and substantial sustainability dimensions (chapter 4). Conceptually, this combination is deepened by proposing a behavioral model that allows for understanding both empowerment and quality of life increases of transition management (that is substantial sustainability), and relates empowerment to increased sustainability intents (chapter 5).

Empirical work shows how to both facilitate the development of sustainability related social effects (social learning and empowerment), and to propose ways to assess the success of such facilitation (chapter 7). That is, key aspects of procedural sustainability are enriched to also capture intentional sustainability. On a conceptual level, they could be used to capture substantial sustainability as well, linking to empowerment and capabilities. Analysis also revealed the effectiveness of contextualizing universal sustainability morality and large scale societal challenges via reflexive and experimental work (chapter 6). Reflection on the researchers' activities and ideal type roles once more centres around the procedural dimension, consisting of the creation of a community arena as a learning space. But, therein it considers sustainability as a key issue to deal with and spark action for contribute to it, bringing in aspects of intentional and substantial sustainability. In sum, this thesis presents a successful approach to skillfully work with the tension inherent to sustainability transitions, open-endedness and normative direction, by balancing intentional, substantial and procedural perspectives on sustainability.

Aiming for increased well-being and quality of life provides a broad entry point for normative orientations in transition management processes and allows to implicitly relate the process to sustainability, while starting from pressing societal challenges at the local level. In the cases studied, the orientation towards quality of life was also a response to the low esteem some of the participants held the term of sustainability in. Furthermore, the aim of enhancing quality of life was understood as being sufficiently open, to not predetermine the agenda of the community arena, but to provide space for a learning journey and high ownership of process and content by participants. In both cases, this approach proved successful in bringing in the fundamentals of universal sustainability

into the process: meaning the consideration of the interplay of local well-being with social and ecological aspects, geographically distant places and longer-term developments. Yet, as suitable and broadly fitting as this entry point to addressing sustainability in community arena processes appears, the framings and facilitation of the processes to capitalize on well-being is critical as a possible hinge. That is, to not run the risk of replacing one buzzword (sustainability) with another perhaps even more fuzzy one (well-being), and thus lose the normative orientation of the overall process. While this thesis provides exemplary evidence on how this can work in transition management practice, further methodological and empirical work is needed to develop a more robust understanding.

Conceptualizing sustainability on the basis of the capability approach does, in principle, allow for understanding the impacts of transition management on the capabilities of current (and future) generations to live a valuable life. Empirically, increases in this capability can be assumed to have happened with participants of community arena processes, as empowerment was strongly reported (chapter 7). Through proposing a capability based behavioral model, this research builds on the idea of a double-dividend, a win-win-win effect in facilitating sustainability (cp. Jackson 2005). That is, transition management contributes to increase well-being of community arena participants by increasing their capabilities and, at the same time, makes a use of these capabilities for enhancing sustainability. This potentially benefits further people in other places or later in time. When formulating this idea as the increasing in the freedom to behave pro-socially, this thesis points out the fundamentally emancipatory character of related transition management attempts, working towards social learning instead of restricting or influencing behavior (cp. Barth 2012). Again, respective learning and empowerment effects related to sustainability intents have been traced in the cases studied – pointing towards the effectiveness of the applied community arena process (chapter 7). In the present state, limitations of the approach developed in the thesis exist with regards to assessing the substantial sustainability outcome of a transition management project; that is, its longer term and larger scale impact. While this thesis proposes orientating respective capability assessments towards the capabilities of currently impoverished or future generations, corresponding to the idea of intra- and intergenerational justice embedded with sustainability (chapter 4), it remains to be explored how this can be done in practice.

The learning journey of contextualizing universal sustainability understandings should have an iterative character, including various learning loops. The journey has the character of a permanent back and forth movement, from contextualizing universal sustainability to assessing the performance of local activities, to contribute to the advancement of sustainability on broader scales and longer-time horizons. This iterative learning cycle is, for instance, included in certain understandings of backcasting (Holmberg and Robèrt 1998), and generally embedded into the transition management cycle (Loorbach 2010). Indeed, it is proposed by Loorbach *et al.* (2011) as exchange between back-casting and fore-casting. The developed assessment framework of social effects (chapter 7) can trace two dimensions of the effectiveness of this learning journey. These are first in how far social learning, empowerment and social capital as results of the learning journey are actually related to sustainability and in which form. Secondly, the framework allows to conceptually understand the link between social effects and structural changes and collective actions effects precede. The procedural side of the learning journey is explored by focusing the processes of making sustainability meaningful locally via a community arena as an interactive space for societal learning

(chapter 6 and 8). In this process, sustainability is both contested and plural, as well as having a universal core. However, empirical accounts of a successful back-and-forth process remain scarce, and this thesis provides a first step towards understanding this process, while calling for further research to be undertaken. Thus, Loorbachs' *et al.* (2011) request for reflexive and adaptable transition governance to better engage with long-term processes and their uncertainties can only be partially addressed here.

9.5 INSIGHTS ON TASKS RELATED TO TRANSDISCIPLINARY COLLABORATIONS

9.5.1 Conceptualization of transition management as transdisciplinary collaboration in form of an interactive space and the roles of researchers in opening and maintaining this space (task c1)

The core conceptual contribution of this thesis to the theme of transdisciplinary collaboration is the **community arena methodology**, which forms part of process oriented sustainability science. The arenas core activity is to establish and maintain an **interactive space** (an agora) at the intersection of science and society, to allow for **societal learning** (chapter 6,7,8 and 4). In this space, a threefold action research process is applied in the form of open-process design, future envisioning and practical experimentation – combining a transdisciplinary process and a normative agenda. Through this process directed towards contextualization and systematic exploration of sustainability visions and action, sustainability acquires localized meanings. This process creates alternative ideas, practices and social relations in contrast to dominant regime patterns. In creating these alternatives, participants are guided to address societal challenges locally and potentially contribute to sustainability transitions. The community arena is thus portrayed as a social experiment aiming at societal effects.

Complementing the community arena methodology, this thesis presents an empirically tested **framework to capture the societal effects of transdisciplinary transition management**, contributing to sustainability transitions. This framework consists of a conceptual overview of societal effects in the context of sustainability transitions and operationalizes it for application at the local level. Social effects include: 1) immediate outputs of transition management processes in terms of products and participants' experiences; 2) more long-term outcomes as changes in collective decision-making and action; and 3) impacts/ social effects, mediating between the outputs and outcomes. When assessing the results of the transition management process, the framework focuses on tangible and sustainability related impacts. In addition, outputs generated by transition management (e.g., vision documents) are used for indirect assessment of impacts, including sustainability aspects. The framework indicates possibilities to facilitate social effect development with sustainability as an inherent quality: for instance, by raising participants' sustainability awareness and related capacity to take action via reflexive exercises and concrete experimentation. Scientific effects of transdisciplinary transition management, however, have not been explored here.

To further understand the actual practice of researchers who open and maintain societal learning spaces, this thesis proposes a **researchers' role heuristic**, including a number of ideal type roles for researchers. Roles include reflective scientists, process facilitators, knowledge brokers, change agents, and the self-reflexive scientist. They are conceptualized based on a number of activities researchers perform to address key issues when creating and maintaining learning spaces. These issues include ownership, power, action and sustainability. Ownership concerns

ownership of research process, aims and results by participants; Power relates to an arena's internal and external power relations, as well as dynamics influencing process and content; Action relates to the real world experimentation performed by arena participants, to explore ways of realizing and envisioning futures, and solving societal challenges. Researcher activities to address issues fundamentally differ in process oriented sustainability research in comparison to knowledge first approaches (cp. Miller 2013). Thus, the role heuristic also contributes to further conceptualize process oriented sustainability science.

The community arena methodology and the heuristic of ideal type researchers' roles in opening and maintaining the arena as a space for societal learning, are embedded into a **thick description of sustainability transition governance** (chapter 4). This thesis draws on established concepts within transdisciplinary research (e.g., Hirsch-Hadorn *et al.*, 2006). Thus, it argues for the importance of drawing on systems, transformation and target knowledge when aiming to govern sustainability transitions generally, and contributing with transdisciplinary processes to it more particularly. It thus highlights the need to combine methods and processes in named transdisciplinary collaborations that provide a complementary picture of the present state of the system in question, its desired future state and the pathway combining both. Current gaps in transition management practices were identified in the relation to target and systems knowledge. Avenues to complement this were also explored, providing a framework for assembling the different parts of this thesis. Thus, sustainability transitions conceptualized as originating from the interplay of transition management at niche level, facilitating a space for learning about and experimenting with sustainable practices, increased (individual) agency of niche actors, spreading and upscaling alternatives to alter the regime practice(s). The concept of second order governance is proposed to describe transition management that focuses on niche creation and support, as well as reflexively coping with the learning and engagement dynamics of individuals.

9.5.2 Empirical analysis of process and content of creating and maintaining interactive learning space, and respective roles of researchers (task cII)

Empirically, this thesis deepened our understanding of the community arena as a procedural approach for local transition management, applying a **three-fold action research** process combining an open-ended process, reflexive facilitation and experimentation (chapter 6). The interactive spaces as the core of the community arena were dynamic and temporal, coming into existence through the dialogical encounters between people and facilitated collaborations of science and society. Therein, the community arena method allowed the abstract idea of an interactive space to be embedded in concrete geographical, social and political contexts, by making terms and processes explicit and adapting them to the local context. The approach proved successful to create alternative ideas, practices and social relations by which participants approached societal challenges at the local level. These ideas, practices and social relations developed alongside social effects in the community arena cases.

Another contribution is an empirically tested **toolkit for the structured assessment of the social effects** of the community arena approach, with a particular focus on the intersection of key mechanisms of change (learning, empowerment and social capital development) and their relation to sustainability (chapter 7). This toolkit builds on

work by transdisciplinary scholars such as Wiek *et al.* (2014) and Walter *et al.* (2007), and adapts their assessment schemes to fit the unit of analysis: social effects of transition management in the context of sustainability transitions. The toolkit consists of an assessment framework depicting societal effects of transition management more broadly, the operationalization of social effects and outputs of transition management for the local level – and a suggested triangulative approach to data generation and interpretation. This triangulative approach combined direct (interviews, surveys) and indirect (observations, document analysis) assessment with participatory evaluation. It contributes to closing the gap of missing assessment frameworks in transdisciplinary transition management, particularly with relation to sustainability. This is further explored in the sections on the theme of agency above (see section 9.3.2 and 9.3.3).

The **researchers role heuristic** (chapter 8) proved useful to explain the performed activities of researchers in the case of Carnisse, based on understanding key issues of the community arena process. It helped to draw out conflicting aims of different researcher roles performed in Carnisse, and highlighted potentials to handle these conflicts. For instance, by using different roles as resources and to search for suitable combinations for performing different roles and respective activities. It was shown how researchers' activities allowed for the key issue of creating interactive space to be handled. For example, was the ownership of participants increased with facilitation focusing on collective negotiation and co-creation. Internal power asymmetries were mediated by facilitation techniques, such as communicating rules and taking turns in participatory meetings. Action was motivated by providing space for participants' own ideas and encouraging them to taking action. Sustainability, finally, was addressed in various activities, e.g., by providing sustainability related information and by asking reflexive questions.

Thus, empirical investigations further helped to explore second order governance as an approach focusing niche creation and reflexively coping with learning and individual engagement dynamics. Results show the possibility to work with normative aspects and individual agency in a reflexive fashion. This provides the basis for normatively-oriented transition management, and for addressing individual actors, their learning and empowerment.

9.5.3 Critical reflection on possibilities and challenges of opening and maintaining an interactive learning space and respective researchers roles (task cIII)

Experience from the case studies show how contextualizing sustainability takes place as a **collective sense making process**, for instance in the community arena. This takes form as a transdisciplinary process with a normative agenda, and has the character of an inherently political act, requiring the self-reflexive and critical attitude of researchers related to facing tensions and dilemmas related to finding new forms of social relationships and practices. The proposed researchers' role heuristic allows for reflexive decisions on which roles (not) to take, and to understand conflicts between goals in research practice. Roles can be used complementarily and as resources to handle challenges. However, unconventional roles in research (including self-reflexivity and change agent roles) emerged as highly important for process oriented sustainability. When developing the role heuristic, we built on ideas and concepts from transdisciplinary scholars (such as Pohl *et al.* 2010, Wiek 2007 and Miller *et al.* 2013), and

systematized and expanded on their proposals, particularly with regard to the mentioned unconventional roles. Nevertheless, the performance of unconventional roles poses substantial challenges to the respective researchers, which not only relate to dealing with the expectations of participants and other local stakeholders regarding which roles researchers should (not) perform. They also relate to the inadequate training researchers may possess to perform roles, or conflicting incentive systems existing in the science system (e.g., benefitting reflective researchers publication outputs over change agents contribution to locally addressing societal challenges).

As outlined in the sections reflecting on the themes of agency and sustainability, **working with social effects** as core results to be achieved in societal learning spaces, **poses some challenges**. This includes the fact that the identified interdependency between different social effects can be used for win-win oriented facilitation, but requires investigations to differentiate assumed synergies from conceptual overlaps of social effects. Likewise, potential downsides of social effects (e.g., the empowerment paradox) on participants requires further monitoring and remedial strategies. Social effects and sustainability have no inherent relation, but are two different things that can be related. This again requires respective facilitation and monitoring that can be developed further for pluralistic contexts. An upscaling of sustainability impact via social effects appears possible (e.g., learnings spread via networks), but requires monitoring and strategies to remedy adverse effects (e.g., loss of sustainability quality). All these aspects caution against premature enthusiasm for working towards social effects as all-encompassing to facilitate transitions via transdisciplinary collaborations. Further conceptual and empirical work appears needed to deepen our understanding of interrelations.

9.6 SYNTHESIZED INSIGHTS REGARDING 'TRANSDISCIPLINARY COLLABORATION'

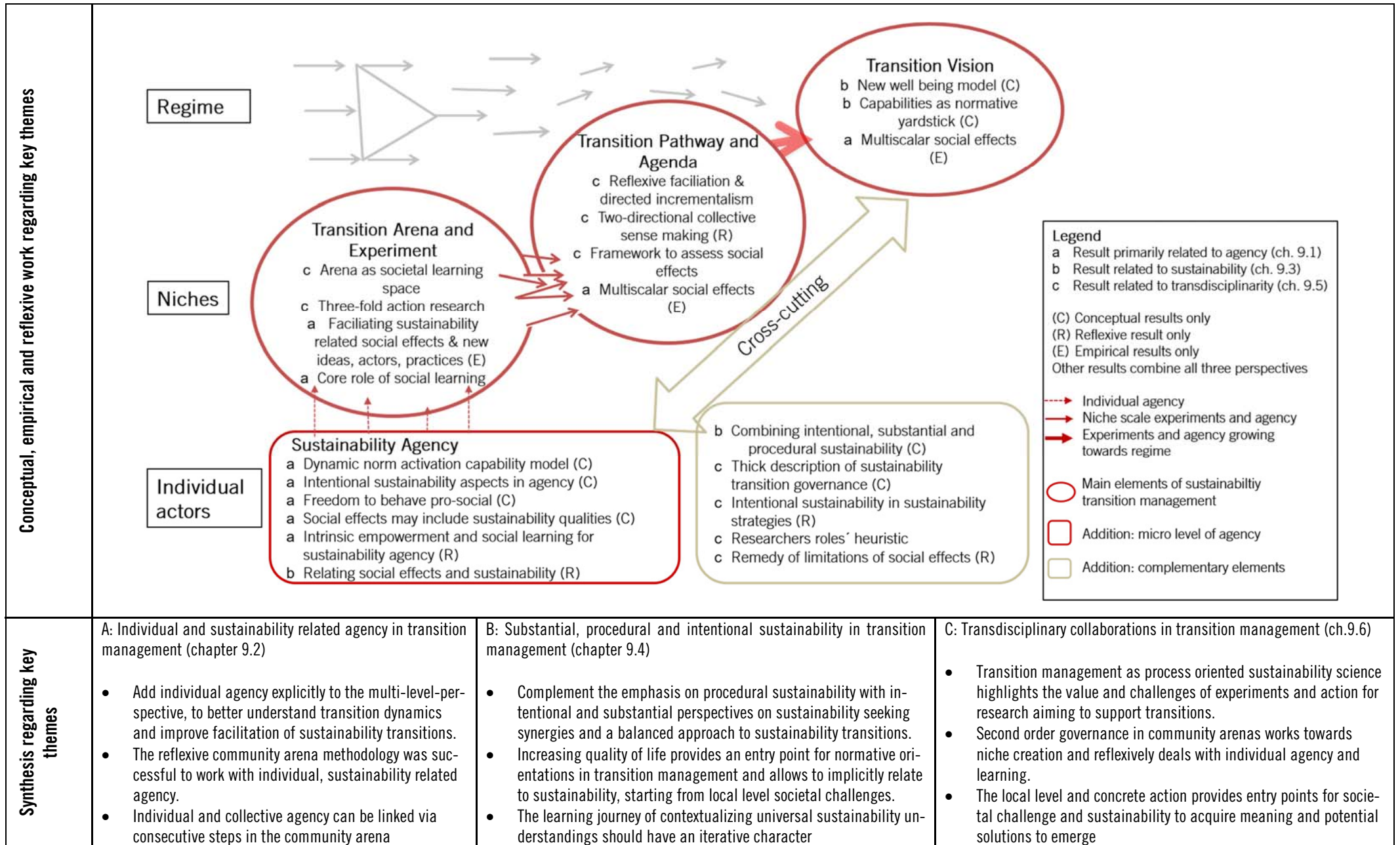
Regarding **sub-objective c** and the **theme of transdisciplinary collaboration**, the thesis contributes three complementary main insights.

Transdisciplinary transition management is an ideal type of process oriented sustainability science, that highlights the value and challenges of experiments and action for research aiming to support sustainability transitions. The developed community arena methodology allowed establishing and maintaining a space for interaction and mutual learning between scientific and societal actors. In this, we have identified a number of key issues that differ markedly in comparison to more knowledge first oriented approach in sustainability science (cp. Miller 2013), see similar distinction between descriptive-analytical and transformational sustainability research by Wiek and Lang 2016). These issues include power, sustainability, action and ownership. Action as it is for instance part of transition experiments became apparent as a primary source to actually achieve societal change – or to change history as expressed in action research. In addition, it functioned as a key source of learning about effective solutions strategies for societal challenges and contributing to empowering participants (chapters 6 and 7). When relying on the power of experimentation and taking action, transition management sets a particular focus in contrast to other process-oriented approaches of sustainability science rather producing policy recommendations and strategy derivation (Wiek and Lang 2016). This engagement in real-world action did produce value in the cases studies contributing to sustainability transitions locally. But, it as well produced particular challenges as shown by in the need to

engage with local political and power structures (for instance local administrations, chapter 6). These challenges became explicit in the analysis of ideal-type researchers roles and their activities as well: the change agent role was identified as the most unconventional and debated role (chapter 8). The role heuristic support an explicit reflection of experienced challenges and dilemmas and can support well-informed decisions on which roles to perform and how to come them in future process oriented sustainability research.

Second order governance as taking place in community arenas does include a two-directional process of working towards niche creation and reflexively dealing with individual agency and learning. Niche creation includes processes of developing alternative ideas, practices and social relations that gain a certain stability and size going beyond the community arena participants, while the arena itself may be understood as a proto-niche. This proto-niche was established as a space for societal learning, a boundary zone between research and society, to jointly explore societal challenges, and potential solutions and transition agenda towards sustainability. Development of this transition agenda shared by arena participants and setting up experiments to realize agenda and vision did function to connect the arena groups to its local context. This reconnection, including the uptake of ideas and experiments from the arenas to wider societal and political contexts got reported in both cases. Yet, individual agency dynamics, empowerment and learning processes do contribute to forming the arena and establishing its normative direction. To reflexively work with the normative orientation of the arena process and to facilitate agency development, a threefold approach combining an open agenda, reflexive questions and concrete experimentation was applied. This facilitation technique did contribute to the development of social effects and a normative orientation towards sustainability simultaneously, which partly did amplify beyond the individual and arena group level.

The local level and concrete action in form of experiments did provide entry points for societal challenge and sustainability to acquire meaning and potential solutions can emerge (cp. Wittmayer 2016). In this local setting, the threefold action research process (open design, envisioning, experimentation) allowed for new ideas, social relations and practices to emerge to tackle societal challenges. To perform transition management at this local level by combining a transdisciplinary process and a normative agenda established transition management methodologies got adapted and contextualized as part of the InContext research project (cp. chapter 2 on methods). This included to modify the transition arena into a community arena for application at the local level, demanding new approach on for instance selecting participants, demarcating a community and integrating a backcasting method. As the local level is where societal challenges ultimately manifest and need to be approached and due to the significance of particularly the urban level for causing and mediating sustainability problems, this locally oriented transition management approach appears highly promising. Nevertheless, and as stated earlier, reconnection of local solutions and sustainability understandings to larger scale challenges and universal sustainability is required. This reconnection from the local to the larger scale and vice versa poses one of the big challenges in current sustainability transition research (Lang et al. 2017).



Synthesis regarding key themes	<p>A: Individual and sustainability related agency in transition management (chapter 9.2)</p> <ul style="list-style-type: none"> • Add individual agency explicitly to the multi-level-perspective, to better understand transition dynamics and improve facilitation of sustainability transitions. • The reflexive community arena methodology was successful to work with individual, sustainability related agency. • Individual and collective agency can be linked via consecutive steps in the community arena 	<p>B: Substantial, procedural and intentional sustainability in transition management (chapter 9.4)</p> <ul style="list-style-type: none"> • Complement the emphasis on procedural sustainability with intentional and substantial perspectives on sustainability seeking synergies and a balanced approach to sustainability transitions. • Increasing quality of life provides an entry point for normative orientations in transition management and allows to implicitly relate to sustainability, starting from local level societal challenges. • The learning journey of contextualizing universal sustainability understandings should have an iterative character 	<p>C: Transdisciplinary collaborations in transition management (ch.9.6)</p> <ul style="list-style-type: none"> • Transition management as process oriented sustainability science highlights the value and challenges of experiments and action for research aiming to support transitions. • Second order governance in community arenas works towards niche creation and reflexively deals with individual agency and learning. • The local level and concrete action provides entry points for societal challenge and sustainability to acquire meaning and potential solutions to emerge
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Table 12: Overview on results of thesis. The figure locates results on the themes of agency, sustainability and transdisciplinarity from conceptual, empirical and reflexive perspectives within the initial conceptual framework, showing how the transition management framework can be enriched (see figure 1). Individual agency is added as micro level, the landscape levels is not depicted here for matters of space. Cross-cutting aspects relate to all elements of transition management. The table below summarizes synthesized results on the themes integrating the three perspectives. Figure and table summarize answers developed towards the research objectives of this thesis.

9.7 OVERALL INSIGHTS: TEN PRINCIPLES FOR SUSTAINABILITY TRANSITION MANAGEMENT

As mentioned, I respond to the call for more transformative and transdisciplinary forms of research to engage with societal transitions in this thesis. I aim to contribute to transdisciplinary sustainability transitions research regarding how transdisciplinary collaborations support sustainability transitions, understanding the role of human actors in transitions, and explicitly consider sustainability as the normative aim of transitions. In so doing, I focus on transdisciplinary transition management contributing to sustainability transitions. Linking transition and sustainability thereby provided the background melody.

A basic insight of this thesis is that the tension between facilitating a transition as an open-ended process and guiding this process towards a desired future, sustainability, cannot be resolved. It is constitutive to sustainability transition management. However, similar to the idea of a koan in buddism, by working with it, insight and development can emerge. Accordingly, and building on integrated results on the themes of agency, sustainability and transdisciplinary collaboration, I do propose ten principles for sustainability transition management. They are supposed to complement tenants formulated for transdisciplinary sustainability research and transition management to guide a successful performance (e.g. Lang et al. 2012, Loorbach 2010). Principles are based on the premise to draw on three different knowledges, systems, target and transformation knowledge, to orient sustainability transition management by providing an understanding the system in question, the desired future and the feasible ways of moving from the present to the desired future.

- (1) Take into account three perspective on sustainability, the substantial, intentional and procedural, when aiming to facilitate sustainability transitions.
- (2) Add a micro level of individual agency to the multi-level perspective and aim to think big and small, connecting the bigger and the smaller picture. Thus, work across scales, such as by expanding learning and empowerment from individual participants to arena groups and surrounding communities. Aim to address universal sustainability and larger scale societal challenges on local level and relate local approaches back to the larger scale.
- (3) Understand individuals as the subjects of transitions, the origin of potentially radical innovations, of learning and unlearning and deviating from mainstream practices at regime level. Relate to motivations, awareness, values, emotions and knowledge – thus the full person – when addressing individuals in transition management.
- (4) Search for synergies in combining both the normative orientation and the process of change, for instance by working towards social effects inherently related to sustainability.
- (5) Aim to facilitate a balanced development of both, increased freedom and empowerment of participants and their willingness and capacities to take responsibility for sustainability. This corresponds to the character

of a sustainability transition of combining a process of change and a normative orientation based on principles of justice.

- (6) To facilitate both, empowerment and responsibility, use reflection, experimentation and dialogue to establish connections and awareness: amongst participants and beyond, with individual and group values and purposes, with the local geographical, social, political context as well as with places and spaces affected by local action or non-action.
- (7) Draw on the capacity of listening and asking reflexive questions as process facilitator, knowledge broker and self-reflexive scientist to facilitate the learning journey towards rendering sustainability meaningful locally and developing ideas, practices and relations to address societal challenges.
- (8) Embrace action and experimentation as the only means to actually change something – and as a primary source of learn on possibilities of realizing envision futures (cp Wittmayer 2016). Therefore draw on experiences from action research, proposing action as the only way to change history (Kemmis 2010).
- (9) Consciously apply different and embrace unconventional roles of researchers, using roles as resources and possibilities, and find an appropriate stance towards the change agent role. Think about distributing roles within the research team and beyond, to secure fit and needed expertise and practice self-reflexivity to for instance deal with the (implicit or explicit) normative stance of all researchers roles and to acknowledge the (limited) roles of researchers to facilitate change.
- (10) Acknowledge and work the political dimension of opening and maintaining a space for societal learning and initiating a collective sense-making process that aims to contribute to societal change.

The principles are supposed to offer guidance for sustainability transition management. They build on integrated results on the themes of agency, sustainability and transdisciplinary collaboration (Figure 19). Although some principles appear to be oriented towards single themes, they are interrelated with insights on other themes as well. Applying individual principles may support successful sustainability transition management, so far primarily explored at the local scale in this thesis. Joint application of the principles generally should be of highest efficiency. But, clear recommendations require more analysis in the future. Developing methodological guidelines on how to apply the principles can build on the transition management cycle in general and guidelines for the community arena in particular (Wittmayer et al. 2011) as worthwhile next steps. This can allow for informed decision-making and application of the principles in accordance to the given circumstances, resources and aims of the applicants.

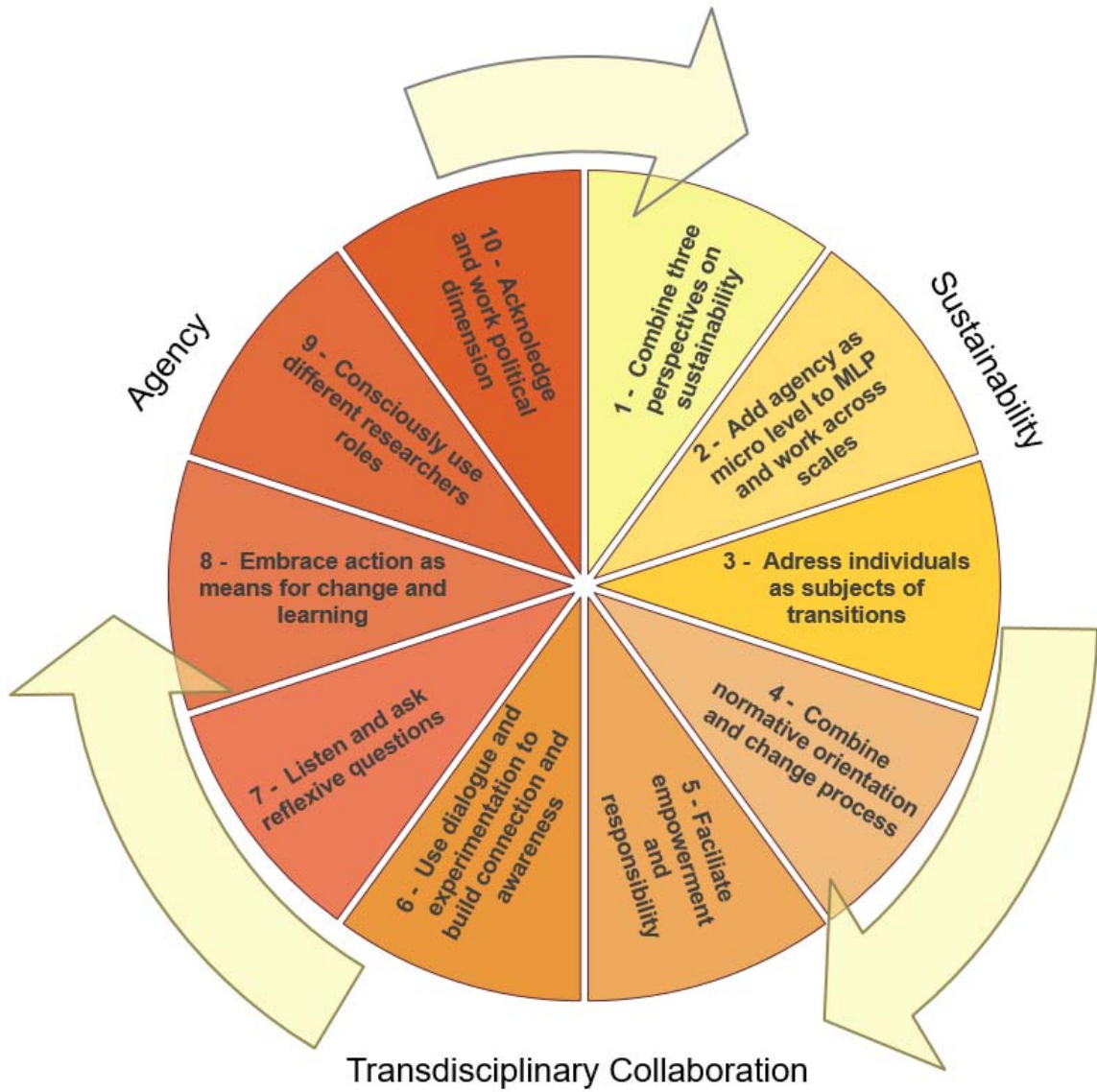


Figure 19: Ten principles of sustainability transition management. The principles are supposed to offer guidance for sustainability transition management. They build on integrated results on the themes of agency, sustainability and transdisciplinary collaboration. Although some principles appear to be oriented towards single themes, they are interrelated with insights on different themes as well. The surrounding circular arrows indicate this. See chapter for full description of principles.

10 OUTLOOK

A number of aspects related to the three key themes addressed in this thesis warrant more attention to further our understanding of transition management as transdisciplinary sustainability transitions research.

Regarding the field of agency this includes first further elaborations on the interplay of agency and structure, that is, relating individual and group agency as focuses in transition management at niche level to aggregated human behavior at larger scales. This is particularly true with regard to considering intentional sustainability aspects in more aggregated perspectives on human behavior. How could for instance theories from environmental sociology be related to communities of practice as underlying the multi-level-perspective conceptions of agency? Similarly, the interplay of collective agency as for instance generated in niche activities and social practices as mostly routinized behavior warrant further attention. Here the thesis only made first steps by building a heuristic including transition management, agency and social practices. Complementarily, to deepen the understanding of social learning and empowerment on an individual level, insights from education for sustainable development may prove helpful to better understand the process and set up of supportive learning environments and individual competence development (e.g. Barth and Michelsen 2013).

Regarding the theme of sustainability particularly the exploration of the more longer-term and larger scale outcomes of transition management require more attention. While this thesis focuses on tangible impacts, only an effective creation of named outcomes will ultimately contribute to achieve sustainability transitions as larger scale societal change. This calls for more longitudinal research on the effects of transition management as well as for sophisticated assessment of the interrelation of local to larger scale developments. A second, sustainability transitions related topic beyond the scope of this thesis is the understanding of how governance approaches could be used to tackle dominant power structures at regime levels limiting possible impacts of niche activities. Bluntly speaking, what are possibilities to purposefully destabilizing the regime and what are the risks, ethical implications and the legitimacy of such attempts. While this thesis focuses on the agency of actors for sustainability, thus to 'do the right thing', these analysis could be combined with insights on developing agency of actors that have a high capacity for change (for instance 'transformative agency', see for instance Avelino and Wittmayer 2016).

Regarding the theme of transdisciplinary collaborations particularly the 'science side' of transdisciplinary in transition management warrants more attention, for instance regarding processes and assessment of results. This could include for instance the generation of more generic insights on facilitation of change processes in transition management. Therefore, the systematic comparison of a larger number of transition management cases may provide helpful insights. This might get facilitated by the application of more broadly applicable evaluation schemes (e.g. Luederitz et al. 2017). Other aspects worth further elaboration are processes and methods of knowledge integration in transition management understood as transdisciplinary research. Here, elaborated methodological approaches from transdisciplinary sustainability research detailing methods of integration of knowledge along the phases of co-design, co-production and co-evaluation may provide useful insights (e.g. Lang et al. 2012).

10.1 REFERENCES FOR CHAPTERS 9 AND 10

- Avelino, F., & Wittmayer, J. M. (2016). Shifting power relations in sustainability transitions: a multi-actor perspective. *Journal of Environmental Policy & Planning*, 18(5), 628-649.
- Barth, M. (2012). Social learning instead of educating the other. *GAIA-Ecological Perspectives for Science and Society*, 21(2), 91-94.
- Barth, M., & Michelsen, G. (2013). Learning for change: an educational contribution to sustainability science. *Sustainability science*, 8(1), 103-119.
- Frantzeskaki, N., Loorbach, D., & Meadowcroft, J. (2012). Governing societal transitions to sustainability. *International Journal of Sustainable Development*, 15(1/2), 19. <https://doi.org/10.1504/IJSD.2012.044032>
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40. <https://doi.org/10.1016/j.eist.2011.02.002>
- Geels, F. W. (2017). Disruption and low-carbon system transformation: Progress and new challenges in socio-technical transitions research and the Multi-Level Perspective. *Energy Research & Social Science*.
- Geels, F. (2017b). Agency in sustainability transitions and the Multi-Level Perspective: Theoretical micro-foundations and crossovers between social constructivism, evolutionary economics and neo-institutional theory. In Paper presented at the International Sustainability Transitions Conference 2017. Gothenburg.
- Göpel, M. (2016). *The Great Mindshift* (Vol. 2). Cham: Springer International Publishing. <https://doi.org/10.1007/978-3-319-43766-8>
- Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., Wiesmann, U., 2006. Implications of transdisciplinarity for sustainability research. *Ecol. Econ.* 60, 119–128. <http://dx.doi.org/10.1016/j.ecolecon.2005.12.002>.
- Holmberg, J., & Robèrt, K. H. (2000). Backcasting—A framework for strategic planning. *International Journal of Sustainable Development & World Ecology*, 7(4), 291-308.
- Jackson, T. (2005). Live better by consuming less?: is there a “double dividend” in sustainable consumption?. *Journal of Industrial Ecology*, 9(1-2), 19-36.
- Lang, D. J., Wiek, A., & von Wehrden, H. (2017). Bridging divides in sustainability science. *Sustainability Science*, 12(6), 875-879.
- Loorbach, D. (2007). Transition management. New mode of governance for sustainable development. ERASMUS University Rotterdam. Retrieved from <papers2://publication/uuid/AF318B66-F63F-4953-8EFE-62B65EDC2149>

Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, 42(3), 237-246.

Loorbach, D., Frantzeskaki, N., & Thissen, W. (2011). A Transition Research Perspective on Governance for Sustainability. In C. C. Jaeger, J. D. Tàbara, & J. Jaeger (Eds.), *European Research on Sustainable Development* (pp. 73–89). Berlin, Heidelberg: Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-19202-9_7

Miller, T. R. (2013). Constructing sustainability science: emerging perspectives and research trajectories. *Sustainability science*, 8(2), 279-293.

Miller, T. R., Wiek, A., Sarewitz, D., Robinson, J., Olsson, L., Kriebel, D., & Loorbach, D. (2014). The future of sustainability science: a solutions-oriented research agenda. *Sustainability science*, 9(2), 239-246.

Nussbaum, M.C., 2011. *Creating Capabilities: The Human Development Approach*. Belknap Press.

Pohl, C., Rist, S., Zimmermann, A., Fry, P., Gurung, G. S., Schneider, F., ... & Hadorn, G. H. (2010). Researchers' roles in knowledge co-production: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Science and public policy*, 37(4), 267-281.

Rauschmayer, F., Bauler, T., & Schäpke, N. (2015). Towards a thick understanding of sustainability transitions - Linking transition management, capabilities and social practices. *Ecological Economics*, 109, 211–221.

Rotmans, J., & Kemp, R. (2008). Detour ahead: a response to Shove and Walker about the perilous road of transition management. *Environment and Planning A*, 40(4), 1006-1012.

Scholz, R. W. (2011). *Environmental Literacy in Science and Society*. *Environmental Literacy in Science and Society: From Knowledge to Decisions*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CB09780511921520>

Sen, A.K., 2009. *The Idea of Justice*. Penguin, New York.

Van den Bosch, S. (2010). *Transition Experiments*. Drift (Vol. PhD Thesis).

WCED. (1987). *Our common future: Report of the 1987 World Commission on Environment and Development*. Retrieved from <http://www.un-documents.net/wced-ocf.htm>

Walter, A. I., Helgenberger, S., Wiek, A., & Scholz, R. W. (2007). Measuring societal effects of transdisciplinary research projects: design and application of an evaluation method. *Evaluation and program planning*, 30(4), 325-338.

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., ... Van Der Leeuw, S. (2011). Tipping toward sustainability: Emerging pathways of transformation. *Ambio*, 40(7), 762–780. <https://doi.org/10.1007/s13280-011-0186-9>

Wiek, A., Talwar, S., O'Shea, M., & Robinson, J. (2014). Toward a methodological scheme for capturing societal effects of participatory sustainability research. *Research Evaluation*, 23(2), 117-132.

Wiek, A., & Lang, D. J. (2016). Transformational Sustainability Research Methodology. *Sustainability Science*, 31–41. https://doi.org/10.1007/978-94-017-7242-6_3

Wiek, A. (2007). Challenges of transdisciplinary research as interactive knowledge generation—Experiences from transdisciplinary case study research. *GAIA-Ecological Perspectives for Science and Society*, 16(1), 52-57.

Wittmayer J, Van Steenberg F, Quist J, Loorbach D, Hoogland C (2011) The Community Arena: a co-creation tool for sustainable behaviour by local communities Methodological guidelines. Deliverable 4.1. InContext: EU ENV.2010.4.2.3-1 Grant agreement no. 265191

11. Appendix

Supplement to Chapter 7: Linking Transitions to Sustainability: A Study into Societal Effects of Transition Management

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Table S1. Detailed results social learning (Formatting: regular: directly reported effects, *italic: indirectly assessed effects*, **bold: keywords for results overview table**).

No		Finkenstein	Carnisse
1a	New skills	<p>Several survey respondents stated that they discovered new competencies through the transition arena process such as: speaking one's own mind in public, better communication, creativity, organisation, leadership. Participants mentioned an increase in self-reflexivity and feeling of responsibility of own actions, particularly in interaction with other persons. In the evaluation interviews about 40% of them stated an increase in the ability to work in a team, better understanding for political work and problems that might emerge as well as respect for politicians. Writing newspaper articles was also mentioned.</p> <p><i>Researchers made similar observations: In the workshops the facilitators challenged the participants to do things they had (self-reportedly) never done before and by this, new skills were gained or started to be gained. They observed that in the working groups people applied new skills such as speaking one's own mind in public and speaking in front of a large group of people (e.g. 100 people), facilitating meetings which they have not done before, working respectfully together in diverse groups.</i></p>	<p>In the evaluative interviews respondents reported diverse new skills: One of the most prominent one was speaking one's own mind in public as well as speaking in front of a large group of people (e.g. 100 people). While some weren't that afraid to raise their voice, others needed to get out of their 'comfort zone' to do so. Another reported skill is sharing knowledge and perspectives of the neighbourhood and its dynamics (networks, initiatives, people, etc.), as well as being able to put things in a broader perspective (e.g. connect the situation of Carnisse to broader debates in Rotterdam, The Netherlands and even the world).</p> <p><i>Researchers made similar observations: Additionally they observed that participants gained skills to working respectfully together in diverse groups, being able to have small-talks with other residents, etc. Also, participants developed the skills of chairing group-sessions and reporting outcomes of these sessions to the broader group, activities they were not used to before.</i></p>
1b	New knowledge	<p>Participants reported some surprises ('eureka moments') they came across during the project, e.g., the insight that some apparently individual worries (but also ideas) are shared by others. 13 out of 15 respondents of the quantitative evaluation reported a general increase in knowledge.</p> <p><i>Researchers observed that by taking part in the process participants learned about the idea of transitions, sustainability transitions, participatory methods and issues related to different areas such as mobility, energy, local economic affairs. New knowledge repercussions in outputs generated by working groups (f.i. a sustainability</i></p>	<p>Directly: Participants reported that they got more knowledge on what was happening around them and this proved to be very useful to them (since they were lacking a certain degree of overview). The awareness and knowledge of the neighbourhood and its dynamics (present networks, initiatives, people, etc.) and also the history of Carnisse proved to be fruitful knowledge to the participants. Developing this knowledge and overview was a collective effort and learning process by the group itself, yet facilitated by the moderators who additionally gave input from their research. Also, acquiring a whole array of legal, financial and institutional know-how related</p>

		<i>related working group which organised events to discuss certain topics such as climate change, energy etc. together with experts).</i>	to keeping open a community centre , was reported by the participants during the experiment. <i>Indirectly: Researchers observed that participants were getting acquainted with new perspectives and practices of other residents and community members (and their views on migration, education, manners, morals, etc.).</i>
2	Changes of values, assumptions and perceptions	Participants reported that the workshops allowed for increased trust towards “others”, more openness , having fewer prejudices in interactions with others, positive attitudes to change and more longterm thinking . Some stated that personal growth became an important objective, as well as integration and they got more motivated to engage themselves . Most of them stated they would like to be engaged after the project. <i>Indirectly: no particular observations</i>	Directly: Participants reported that the arena gave them the awareness that they themselves (as residents and local communities) can make a difference and that people from the outside can be a stimulus for this (but that they are not necessary for this). They reported that the arena re-affirmed their current perspectives and values , and not really changed them. However, several Participants stated that the vision gave them an overview on and nice ordering of their assumptions and perspectives on change . <i>Indirectly: Researchers observed that participants started to feel that change is necessary and possible. Researchers observed participants to realize that change is a continuous process (due to reframing the current challenges from a historical view and the envisioning exercise) and that change comes from within. This became apparent e.g. in regard to the community centre where participants did not address the municipality of Rotterdam to keep the centre open, but re-opened it themselves with the help of local communities and change-agents.</i>
3	(Increased) Awareness of sustainability problems in the area	Directly: Most respondents stated that sustainability is a very important issue within the transition arena in Finkenstein as well as for all of them personally. <i>Indirectly: A sustainability working group was created. Working groups explicitly (e.g. group on sustainability, energy, social affairs) or implicitly (e.g. on culture, participation) dealt with sustainability and respective experiments do address sustainability challenges. The vision does include sustainability goals and related principles of action prominently.</i>	Directly: All respondents found a clear connection between sustainability and the vision , however their interpretation of sustainability differed . A common denominator in their responses was a focus on the long-term and that the arena fuelled this perspective. For all respondents the long-term development of the neighbourhood was of great concern. <i>Indirectly: Participants (re-)framed the problems in the neighbourhood as socially dominant (and less in economic or ecological factors). It proved that sustainability was multi-interpretable for the different participants and also considered fashionable (or trendy). Developing the vision created awareness on the interconnectedness of different scales (micro, meso and macro), i.e. ‘glocal’ dynamics as well as on the multi-interpretability of change. This resulted in a vision (Blossoming Carnisse) with several (six) transition pathways. However no clear consensus on priorities or a clear vision of a future ‘sustainable’ Carnisse was reached.</i>

4	(Increased) Feeling of responsibility to react to sustainability problems	<p>Directly: Participants only partially feel responsible for solving sustainability challenges and attribute responsibility to local and/or regional politics. But, in general participants report an increased self-reflexivity and feeling of responsibility of own actions, particularly in interaction with other persons.</p> <p><i>Indirectly: Working on a common vision for the future of Finkenstein, including sustainability goals, may have increased the sustainability awareness of participants. This vision attributes responsibility for life in Finkenstein in 2030 on to the current generation. It was agreed upon by all participants.</i></p>	<p>Directly: Participants did not specifically reported on feeling the responsibility to address <i>sustainability</i> problems. They did report on tackling neighbourhood problems in general and that they felt they had an important role to play in this and felt responsible for participating in the arena. However, several respondents referred to the absence of institutional actors like the municipality and housing corporations in the arena and these actors were needed to step up in order to address these problems (outsourcing of this responsibility).</p> <p><i>Indirectly: also due to the TM process being a sort of shadow-process freed from (too much) institutional interference or municipal control, the process was not targeted at shifting responsibilities. The responsibility was kept within the group and/or the local communities in the neighbourhood.</i></p>
5	Ability of envisioning a sustainable future including radical change	<p>Directly: n/a</p> <p><i>Indirectly: A joint vision was developed by using the following format: each participant developed his/her own vision in accordance with their values and needs. Then pairs were built and a common vision based on the two single ones was developed, than one out of 4, then 8, then 16 and a common vision was born. The vision was agreed upon by all and includes sustainability related goals prominently.</i></p> <p><i>Radical change was constantly promoted within the group by single participants only, in rather aggressive or friendly ways. Other participants reacted rather annoyed upon these claims. Thus, in the end the arena stuck to envision soft changes rather than radical ones.</i></p>	<p>Directly: Some respondents stated that the vision was rather general and was also applicable for other districts and neighbourhood. Some reported that it was too utopian, others stated that it wasn't radical enough.</p> <p><i>Indirectly: A joint vision was developed in four participatory workshops which followed these steps: 1) problem structuring, 2) envisioning, 3) pathways and 4) backcasting. The input for the joint vision was mainly derived from group discussions (also a few sub-group meetings) and 1-on-1 interviews. The vision was agreed upon in the arena before it was presented to a broader audience during a network event. However, most participants did not own the vision, it was sometimes still the vision of the moderators instead of the participant themselves. During the network-event it became clear that presenting a vision and talking about the future itself was perceived as being radical and contrasting the interest of the audience, since the audience felt that action is needed now.</i></p>
6	Increase ability to tackle SD challenges via (more and better) collaborative actions and dialogues	<p>Directly: Participants stated that that the project does include steps that are also beneficial for the future generations and other regions or even parts of the world and benefit sustainability in Finkenstein.</p> <p><i>Indirectly: In the backcasting workshop the idea of working groups became reality. 10 working groups were built, 3 of them merged later on. Within those groups actions and events were planned and successively carried out. The current social, economic and environmental situation locally and globally was discussed and built the basis for the actions.</i></p> <p>Directly: 9 out of 15 participants state that the project implements measures that are not just good for the moment but also the far future</p>	<p>Directly: For most respondents neighbourhood development (so not SD) was a collaborative effort par excellence. The notion of sustainability was primarily operationalized by participants as a social challenge. To some SD could only be realized by sharing a language and narrative and respecting different cultural values as to work effectively together. Working collaboratively was also one of the guiding principles in the vision.</p> <p><i>Indirectly: collaborative actions were initiated in experiments like the re-opening of the community centre and the 'neighborhood-guide'. New collaborations were created between residents and neighbourhood</i></p>

		<p>and that they are not just good for Finkenstein but also for other parts of the world.</p> <p><i>Indirectly: A climate-energy-model-region (German "Klimaenergiemodellregion") was applied for and accepted by the Austrian Climate and Energy Fund; new bicycle lanes or car sharing options were planned;</i></p> <p><i>One working group focussed primarily on sustainability, others are related to sustainability issues (such as social or ecological issues); an institutional structure for further implementation of the vision has been build using the method of sociocracy, establishing a steering committee.</i></p> <p>→social capital 7</p>	<p><i>professionals, but also new collaborations were created with institutions like the municipality, schools, and welfare organizations.</i></p> <p>Directly: No explicit joint action for sustainability was mentioned. Participants reported community centre reopening as reaction to local, social problems rather than sustainability problems.</p> <p><i>Indirectly: The arena-group participated in three newly arena initiated experiments, i.e. the reopening of the community centre, the reopening of the communal garden and an internship for students of Intermediate Vocational Education (community college). Those can be related to social aspects of sustainability.</i></p> <p>→social capital 7</p>
7	Transmission of learnings to other individuals and groups	<p>Directly: Participants stated that they frequently talked with other citizens about the "LebensKlima - project", its content and the working group. Interest was only partially given; there was quite some scepticism by those that were not involved in the process.</p> <p><i>Indirectly: The results of the transition process and of the first actions of the working groups were presented to the transition team and the interested public in three meetings and in the media (local newspaper, community newsletter, websites, radio).</i></p> <p>Directly: Participants reported that the process sparked interest in (opinions of) and respect for other persons and an attitude of appreciation towards other persons (e.g. representatives of community politics) was developed.</p> <p>People reported an increased self-reflexivity and attention in contact with other people. Some participants described themselves as being more open and having fewer prejudices in interactions with others.</p> <p><i>Indirectly: Several working groups focus on establishing exchange and new contacts (such as welcome neighbour-round-tables, community journalists and workshops on participators cultures)</i></p> <p>→social capital 4</p>	<p>Directly: the vision was being distributed by the participants during a network event and was used to connect to other initiatives and/or to inspire people to take action to change something. During the network event all the activities in the neighbourhood were connected to the vision (even if they weren't part of the arena) as to be able to show that change is happening already. Participants also reported that they talked to other residents about 'Bloeiend Carnisse' (title of vision), but that these people said it was too vague, not tangible, too utopian and old-fashioned/hippy. In sum, the people that were not engaged in the process were mainly sceptical about the process, although they liked the vision but it was perceived as too abstract.</p> <p><i>Indirectly: The results of the transition process were presented during a public meeting (with about 125 participants). The vision was also presented in the media (websites, twitter, etc.). General focus of attention in arena process was on group internal processes.</i></p> <p>Directly: Some participants reported that the process sparked interest in (opinions of) other participants.</p> <p><i>Indirectly: Effort was made by the arena group to invite new contacts to each meeting. This was not very effective, partly because participants were struggling with explaining the process to outsiders.</i></p> <p>→social capital 4</p>

Table S2. Detailed results empowerment (*Formatting: regular: directly reported effects, italic: indirectly assessed effects, bold: keywords for results overview table*).

No.	Indicator	Finkenstein	Carnisse
1	A growing intrinsic task motivation via a) choice, b) competence, c) meaningfulness and d) impact.	<p>a) Choice: Directly-Participants had the feeling to be able to choose what to put on the agenda of the community arena, e.g. due to this agenda being open and defined jointly by participants and researchers; <i>Indirectly: The joint vision was written by researchers but developed by the community arena and agreed upon by the arena participants; the working groups and respective actions where formed, decided upon and realized led by participants</i></p> <p>b) Competence-Directly: <i>Cp. social learning/ new skills</i> <i>Indirectly: Within the working groups the participants took over different roles (leader, coordinator, socializer, creative head, mentor) depending on their skills and competences, of which they became more aware during the arena meetings. New skills got developed-cp. social learning/ new skills.</i></p> <p>c) Meaningfulness-Directly: The scores participants gave for being able to bring in their own input and topics, they felt strongly about, were good. This positive assessment is also clearly related to the open agenda of the process as this made it possible to meet the different senses of urgency. The reason for joining the process stated most often is to maintain or increase the living quality in Finkenstein as well as personal growth. Social and justice issues as well as sustainability issues were important reasons for some to join the process. The majority of the participants had the feeling doing something meaningful. <i>Indirectly: Researchers made similar observations: the meaningfulness could be heard and seen in the participants' words and actions.</i></p> <p>d) Impact: Directly-Most of the participants asked in the evaluation phase believe they can have an impact on the local environment; they also stated that the steps taken were quite small. A number of participants reported changes on deeper assumptions on their own ability to impact the development of the community. About 50% of</p>	<p>a) Choice: Directly-All participants reported that they felt that they were able to choose what to put on the agenda of the community arena, e.g. due to this agenda being open and defined jointly by participants and researchers. Some also reported that they felt it was their 'civic duty' and societal responsibility to participate in these kinds of processes. <i>Indirectly: The arena process helped the participants to get an overview of activities in Carnisse and to voice their perspectives on the state of Carnisse. The open agenda of the arena helped in getting these diverse perspectives on the table and openly articulated.</i></p> <p>b) Competence-Directly: Participants reported gains of crucial competence to speak your voice in public (also see 'skills' in social learning table). Also, a lot of participants stated that it was not entirely clear what the actual goal of the arena-process was and that they could not always make the distinction between the envisioning-process and the process that revolved around the community centre. <i>Indirectly: Within the arena the participants took different roles (group leader, socializer, expert, listener, etc.), but it's hard to say if there were any developments in these competences. Anyway, participants could employ their competences in the arena when necessary.</i></p> <p>c) The scores participants gave for being able to bring in their own input and topics, they felt strongly about, were good (an average of 4 out of 5 points). The opinions differed in respect to whether the community arena was meaningful. However, most of the participants felt the vision was a great result of the whole process. And that they liked the fact that the future-orientation made it possible to get away from the present and the 'naysayers'. Participants reported that they appreciated the exchange of perspectives and acquiring more knowledge about the neighbourhood and its characteristics (e.g. networks, present initiatives, etc.). <i>Indirectly: The motivation in the arena group was very apparent during the whole process, which can be seen as a symptom of a meaningful process.</i></p> <p>d) The scores participants gave as an answer to the level of impact they have in Carnisse based on the arena process were good (a 4.2 out</p>

		<p>the participants reported an increase in possibilities to shape Finkenstein through the project.</p> <p>The attitude towards the future changed in a positive way.</p> <p><i>Indirectly: The experiments done by the arena group did impact upon local developments, e.g. in form of raising attention and by attracting additional participants in the working groups (about 30) and to the public events that took place during the project (about 100), the reports in the local media, the agenda points in the council meetings and concrete outputs such as the validation of the climate energy model region Finkenstein by the Austrian Climate and Energy Funds.</i></p>	<p>of 5). People stated they were able to make a difference. Some made the addition that this hadn't changed due to the arena-process, but they already had this feeling prior to the arena.</p> <p>Others stated that the arena-process did not manage to develop sufficient tangible actions for people to make an impact (or that they were too optional/without obligations).</p> <p>An exception was the opinion that the arena alone is insufficient because - although it was fruitful to participate and share experiences, perspectives and knowledge—there are 'larger/higher powers at work' to change the future of the neighbourhood.</p> <p>The people that participated in the re-opening of the community arena stated that they felt they could make a direct impact in the here and now (instead of in the future).</p> <p><i>Indirectly: The re-opening of the community centre made a direct impact on the local communities and municipality. It created conflicts, struggles and enthusiasm. Also the presentation of the vision to a broader audience had an impact, e.g. talking about future change was not something people were used to. Plus this presentations placed current discussions in a broader context and time-frame.</i></p>
2	Gains in decision making power with regard to local developments	<p>Directly: About half of the participants reported a change in perception of local politics in two directions: realizing own abilities to shape local politics and starting to take responsibility for local developments as well as increased recognition of value of local politics; the majority of the participants agreed that they can bring in their own capabilities, that each individual can participate in the community and that they can bring in their own requests/ideas in the municipality.</p> <p><i>Indirectly: no formalized decision making power granted by local politics, but increased influence on local development, since working groups started activities, organised courses and events, brought new ideas into the community council which shows that they recognised and used the power they gained. This is particularly remarkable, since the political system in Finkenstein in general is marked by high polarization, a low level of citizen participation and trust in political actors.</i></p>	<p>Directly: Most of the participants reported that they felt they could make an impact and were also decision makers with power. Some stated that it was up to the local residents and communities to actually be that change. However, most of the participants also reported that the most important decision-makers were not present (the local sub-municipality, housing corporations and welfare organizations) and that they needed to be involve, because they had the most power and impact.</p> <p><i>Indirectly: The arena had a strong emphasis on 'power to the people', in the sense that local communities can and should make a difference. In the end the arena managed to influence a large scale networking event and put their transition agenda on the table. The power balance thus shifted a bit (since the local sub-municipality, housing corporations and welfare organizations have been very dominant in Carnisse).</i></p> <p>See also 'impact' above.</p>
3	Gains of control over	Directly: Nothing to report	Directly: Direct effect was generated by taking control over the

	resources by arena participants	<i>Indirectly: There were very little concrete resources granted to be used by the arena (e.g. minor printing costs, allowance to occasionally use rooms), intangible resources (such as reputational gains, legitimizational power) were difficult to observe. In a few cases the ideas were brought to the transition team in order to get the ideas published in the community newsletter, to get allowance to use public rooms for events or to get little financial support for the brochure for a good "miteinander". Actions were frequently undertaken by the arena participants and working groups without waiting for permission or resources from the council of the municipality.</i>	closed community centre (and actually squat it for almost a year). Other effects were not reported. In order to make an impact, participants stated that the actors that control resources (i.e. the municipality) should act up . <i>Indirectly: Resource of symbolic legitimization and capital, in regard to the people that set the agenda were gained. Also financial and physical capital (e.g. a key) in order to re-open and manage the community centre, as well as new social capital (ties and networks of engaged residents and volunteers) and symbolic capital (the group became a powerful actor in the institutional network of Carnisse) were gained.</i>
4	Changes in local structures (new, empowered actors)	Directly: nothing to report <i>Indirectly: The transition arena established itself as a new, but temporal actor in the local system. It gained more and more publicity during the process, due to the three public events, media appearance, further workshops organised by the working groups on participation and on sustainability, and the meetings with the transition group. A supporting group of local officials (the transition team) was installed to secure uptake of arena results by local politics. Towards the end of the project consecutive a local steering committee was elected to further coordinate working groups and network with local politics.</i>	Directly: Nothing to report <i>Indirectly: The Community arena did not appear as a new actor much, because it was kept in the shadow/marginal. But the action-group around the community centre gained considerable influence (because of their central position in the neighbourhood and influential networks).</i>
5	Development of new resources (innovation)	Directly: Nothing to report <i>Indirectly: Nothing to report</i>	Directly: Nothing to report <i>Indirectly: Having a (alternative) vision to the institutional vision on Carnisse led to a certain symbolic capital. The vision and the arena became—to a certain extent—a symbol to relate to. This also applied to the reopening of the community centre which led to symbolic capital (new powerful actor in the local network which got back-up from high level city officials) and new social capital (new networks of engaged residents and city officials).</i>
6	Empowerment involves sustainability if increased meaningfulness (aspect 1) relates to sustainability	Directly: Most respondents stated that sustainability is a very important issue within the transition arena in Finkenstein as well as for all of them personally. <i>Indirectly: A sustainability working group was created. Working groups explicitly (e.g. group on sustainability, energy, social affairs) or implicitly (e.g. on culture,</i>	Directly: All respondents found a clear connection between sustainability and the vision , however their interpretation of sustainability differed . A common denominator in their responses was a focus on the long-term and that the arena fuelled this perspective. For all respondents the long-term development of the neighbourhood was of great concern.

		<p>participation) <i>dealt with sustainability and respective experiments do address sustainability challenges. The vision does include sustainability goals and related principles of action prominently.</i></p> <p>→social learning 3</p> <p>Directly: Participants only partially feel responsible for solving sustainability challenges and attribute responsibility to local and/or regional politics. But, in general participants report an increased self-reflexivity and feeling of responsibility of own actions, particularly in interaction with other persons.</p> <p><i>Indirectly: Working on a common vision for the future of Finkenstein, including sustainability goals, may have increased the sustainability awareness of participants. This vision attributes responsibility for life in Finkenstein in 2030 on to the current generation. It was agreed upon by all participants.</i></p> <p>→social learning 4</p>	<p>This focused primarily on local problems such as social challenges. Some participants reported to engage because they felt responsible to solve these challenges. Long term thinking and awareness on interlinkages between different scale levels was strengthened</p> <p><i>Indirectly: Participants (re-)framed the problems in the neighbourhood as socially dominant (and less in economic or ecological factors). It proved that sustainability was multi-interpretable for the different participants and also considered fashionable (or trendy). Developing the vision created awareness on the interconnectedness of different scales (micro, meso and macro), i.e. 'glocal' dynamics as well as on the multi-interpretability of change. This resulted in a vision (Blossoming Carnisse) with several (six) transition pathways. However no clear consensus on priorities or a clear vision of a future 'sustainable' Carnisse was reached. The developed vision shows a lot of signs of sustainability in regards to social, ecological and economical dimensions. This potentially was influenced by the writing of the vision (and selection of input) by the researchers.</i></p> <p>→social learning 3</p> <p>Directly: Participants did not specifically reported on feeling the responsibility to address <i>sustainability</i> problems. They did report on tackling neighbourhood problems in general and that they felt they had an important role to play in this and felt responsible for participating in the arena. However, several respondents referred to the absence of institutional actors like the municipality and housing corporations in the arena and these actors were needed to step up in order to address these problems (outsourcing of this responsibility).</p> <p><i>Indirectly: also due to the TM process being a sort of shadow-process freed from (too much) institutional interference or municipal control, the process was not targeted at shifting responsibilities. The responsibility was kept within the group and/or the local communities in the neighbourhood.</i></p> <p>→social learning 4</p>
7	Feeling of (increased) capacity of people to react to these sustainability problems	<p>Directly: The development of the vision had a pull effect and encouraged participants to build their pathways for reaching the vision. Some actions would have to be set by politicians, some by participants without asking for permission and that is what they started doing at the end of the transition arena phase. Still, attempts to directly influence decisions of community council were only</p>	<p>Directly: Participants reported community centre reopening as reaction to local, social problems rather than sustainability problems.</p> <p><i>Indirectly: Vision of arena and arena process focussed on "power to the people". A strong emphasis in the vision is the independence of local institutional structures and the embeddedness of new actions in the local communities. Self-organized activities were seen as most sustainable by some of the participants.</i></p>

		<p>partly successful. <i>Indirectly: Researchers made similar observations:</i></p>	
8	New decision making capacities with regard to sustainability related issues	<p>Directly: Nothing to report <i>Indirectly: No formalized decision making power gained. As far as working groups influenced local developments with their actions, including sustainability related experiments, respective decision making power was gained.</i></p>	<p>Directly: Nothing to report. <i>Indirectly: New decision making capacities only with regard to social aspects of sustainability as part of the re-opened community centre.</i></p>
9	A sustainability orientation of new actors and changing of local structures	<p>Directly: cp social learning aspect 6 and 7 <i>Indirectly: The developed vision shows the high value and meaning of sustainability for the citizens. Participants reported a strong relationship between the vision and sustainable development. Some of the working groups and their activities particularly highlighted the value of sustainability, such as the social group and the one on sustainability. In the second arena meeting they produced a little film showing Finkenstein in 2030: the citizens had new lifestyles, were aware of the responsibility and lived in harmony with nature and others. Sustainability interests were taken into account.</i></p> <p>Directly: Most respondents stated that sustainability is a very important issue within the transition arena in Finkenstein as well as for all of them personally. <i>Indirectly: A sustainability working group was created. Working groups explicitly (e.g. group on sustainability, energy, social affairs) or implicitly (e.g. on culture, participation) dealt with sustainability and respective experiments do address sustainability challenges. The vision does include sustainability goals and related principles of action prominently.</i> →social learning 3</p> <p>Directly: Participants only partially feel responsible for solving sustainability challenges and attribute responsibility to local and/or regional politics. But, in general participants report an increased self-reflexivity and feeling of responsibility of own actions, particularly in interaction with other persons. <i>Indirectly: Working on a common vision for the future of Finkenstein, including sustainability goals, may have</i></p>	<p>Directly: Nothing to report. <i>Indirectly: As far as the reopening of community centre includes social aspects of sustainability the respective foundation board as a new local actor had a certain (implicit) sustainability orientation.</i></p> <p>Directly: All respondents found a clear connection between sustainability and the vision, however their interpretation of sustainability differed. A common denominator in their responses was a focus on the long-term and that the arena fuelled this perspective. For all respondents the long-term development of the neighbourhood was of great concern. This focused primarily on local problems such as social challenges. Some participants reported to engage because they felt responsible to solve these challenges. Long term thinking and awareness on interlinkages between different scale levels was strengthened <i>Indirectly: Participants (re-)framed the problems in the neighbourhood as socially dominant (and less in economic or ecological factors). It proved that sustainability was multi-interpretable for the different participants and also considered fashionable (or trendy). Developing the vision created awareness on the interconnectedness of different scales (micro, meso and macro), i.e. 'glocal' dynamics as well as on the multi-interpretability of change. This resulted in a vision (Blossoming Carnisse) with several (six) transition pathways. However no clear consensus on priorities or a clear vision of a future 'sustainable' Carnisse was reached. The developed vision shows a lot of signs of sustainability in regards to social, ecological and economical dimensions. This potentially was influenced by the writing of the vision (and selection of input) by the researchers.</i> →social learning 3</p> <p>Directly: Participants did not specifically reported on feeling the responsibility to address <i>sustainability</i> problems. They did report on tackling neighbourhood problems in general and that they felt they had an important role to play in this and felt responsible for</p>

		<p><i>increased the sustainability awareness of participants. This vision attributes responsibility for life in Finkenstein in 2030 on to the current generation. It was agreed upon by all participants.</i></p> <p>→social learning 4</p> <p>Directly: Participants stated that they frequently talked with other citizens about the “LebensKlima - project”, its content and the working group. Interest was only partially given; there was quite some scepticism by those that were not involved in the process.</p> <p><i>Indirectly: The results of the transition process and of the first actions of the working groups were presented to the transition team and the interested public in three meetings and in the media (local newspaper, community newsletter, websites, radio).</i></p> <p>→social learning 7</p> <p>Directly: 9 out of 15 participants state that the project implements measures that are not just good for the moment but also the far future and that they are not just good for Finkenstein but also for other parts of the world.</p> <p><i>Indirectly: A climate-energy-model-region (German “Klimaenergiemodellregion”) was applied for and accepted by the Austrian Climate and Energy Fund; new bicycle lanes or car sharing options were planned;</i></p> <p><i>One working group focussed primarily on sustainability, others are related to sustainability issues (such as social or ecological issues); an institutional structure for further implementation of the vision has been build using the method of sociocracy, establishing a steering committee.</i></p> <p><i>Social capital aspect 7</i></p>	<p>participating in the arena. However, several respondents referred to the absence of institutional actors like the municipality and housing corporations in the arena and these actors were needed to step up in order to address these problems (outsourcing of this responsibility).</p> <p><i>Indirectly: also due to the TM process being a sort of shadow-process freed from (too much) institutional interference or municipal control, the process was not targeted at shifting responsibilities. The responsibility was kept within the group and/or the local communities in the neighbourhood.</i></p> <p>→social learning 4</p> <p>Directly: the vision was being distributed by the participants during a network event and was used to connect to other initiatives and/or to inspire people to take action to change something. During the network event all the activities in the neighbourhood were connected to the vision (even if they weren’t part of the arena) as to be able to show that change is happening already. Participants also reported that they talked to other residents about ‘Bloeierend Carnisse’(title of vision), but that these people said it was too vague, not tangible, too utopian and old-fashioned/hippy. In sum, the people that were not engaged in the process were mainly sceptical about the process, although they liked the vision but it was perceived as too abstract.</p> <p><i>Indirectly: The results of the transition process were presented during a public meeting (with about 125 participants). The vision was also presented in the media (websites, twitter, etc.). General focus of attention in arena process was on group internal processes.</i></p> <p>→social learning 7</p> <p>Directly: No explicit joint action for sustainability was mentioned. Participants reported community centre reopening as reaction to local, social problems rather than sustainability problems.</p> <p><i>Indirectly: The arena-group participated in three newly arena initiated experiments, i.e. the reopening of the community centre, the reopening of the communal garden and an internship for students of Intermediate Vocational Education (community college). Those can be related to social aspects of sustainability.</i></p> <p><i>Social capital aspect 7</i></p>
10	Newly developed resources are contributing to sustainability	Directly: Nothing to report; Indirectly: Nothing to report	Directly: Nothing to report. <i>Indirectly: vision as symbol including sustainability aspects implicitly may promote sustainability in neighbourhood development.</i>

Table S3. Detailed results overview regarding social capital development (*Formatting: regular: directly reported effects, italic: indirectly assessed effects, bold: keywords for results overview table*).

No	Indicator	Finkenstein	Carnisse
1	Quantity and quality of ties within a group; i.e. the community arena Directly: Quantity - Participants report (increased) meetings and information exchange with other members of the community arena; Quality – participants describe the working-atmosphere within the arena; Indirectly (Quantity and quality): Observable meetings and working atmosphere in the arena and when experimenting.	<p>Directly: Exchange and collaboration with “like-minded” people in the community arena was appreciated by the participants; participants of the community arena perceived themselves as “one group”. The majority of the participants reported the development of very good relations within the group of participants. All participants that responded to the survey stated that they had more relationships at the end of the project (characterised by trust), although they did not know each other before in most cases; about one third of the reported new relations was characterized as being more than a “project relationship”, but also private. Participants got also connected with new milieus. Feelings of communion and trust was strongly given.</p> <p><i>Indirectly: The group of the community arena was quite diverse in terms of age, gender, professions, but not in terms of ethnicity. The participants did not know each other before. With regard to the quality of relations, the vision-building process as well as the perceived trustful atmosphere were probably decisive as it contributed a lot to a group feeling, giving the group a shared aim.</i></p>	<p>Directly: Through 7 community arena meetings, 67 participants in total made contact with each other (amount of unique participants is approximately 25-30). Most participants reported that they did not knew each other before. Participants were quite diverse in terms of age, gender, professions but not so much in ethnical and cultural background.</p> <p>The participants stated that they didn’t see the arena group as a stable group with a lot of cohesion. It was seen as rather fluid and interactions were very informal, loose and short-term. But they reported that they have a shared feeling of responsibility and connection to Carnisse.</p> <p><i>Indirectly: The temporary community arena group was exclusive in that participation was depending on an invitation by the research team. Only later, after the transition narrative had been developed, the group was opened up to be more open and flexible. This is also when the community arena group stopped to exist. Ties within the arena group where rather distant, with an exception here and there.</i></p> <p><i>The community centre working group went through different phases: from open and flexible, to closed focusing on the work in a core group; and then opening up again to invite others to join in for volunteering or offering activities in the community centre.</i></p>
2	Quantity and quality of ties with other groups; i.e. other groups within or beyond the community Directly: Quantity - Participants report (increased) meetings and information exchange (in relation to the arena process) with people from the community and beyond; Quality – participants describe the character of exchange with others; Indirectly: Quantity–Observable	<p>Directly: Participants stated that they frequently talked with other citizens about the “LebensKlima-project”, its content and the working groups. Interest was only partially given; there was quite some scepticism by those that were not involved in the process. In parts criticism by participants was raised regarding lacking public interest in the project.</p> <p><i>Indirectly: The community arena connected to the general public in three broadening events with each around 30 participants. Participants of the community arenas connected with policy makers in the three meetings were the arena</i></p>	<p>Directly: In the evaluation this was not reported. Outside-contact on the topic of the arena did not really take place, according to the group members. In regard to the experiment, participants reported that there was a lot of exchange with groups beyond the arena.</p> <p><i>Indirectly: Through one public broadening event with more than 100 participants, contact got established with other groups such as the local municipality and the local government. A lot of new connections were made during this event. However, it is unclear whether the connections were continued after this event. In experiments such as the community centre (but also the</i></p>

	meetings; Quality–Working atmosphere of arena with other groups.	<i>group met the transition team.</i>	<i>communal garden) the quantity of social ties are extensive and this also increased over time. It is in working together in a practical context were ties are really being developed and even friendships are created. Also, through working on the opening of the community centre (6 official meetings plus numerous informal contacts), contact established with different departments within Rotterdam municipality, housing cooperation's, local schools, etc.</i>
3a	Building a strong group by: a) Development of trust within the group Directly: Participants report on (growing) trust amongst each other; Indirectly: Outputs highlight value of trust or depend in their development on trustful relationships	Directly: growing trust was reported in the feedback interviews and meetings; all participants reported the experience of working together in a respectful and constructive way even with previously unknown people and in a very diverse group. <i>Indirectly: The growing trust could also be observed by the research team.</i>	Directly: This was not addressed in the interviews and evaluation meeting (n/a). A group-feeling was not really created according to the participants. So developing new shared rules or trust or values was not really a direct effect. <i>Indirectly: Not directly observed.</i>
3b	Building a strong group by : b) Development of shared rules and norms within the group Directly: Participants report to have established common rules amongst them; Indirectly: Outputs highlight or are based upon common rules	Directly: The majority of the respondents reported similar concerns among the participants and all experienced an exchange of likeminded people. Some also said that their form of communication became more appreciative during the process. <i>Indirectly: The newly established steering committee was elected by a mutually agreed voting procedure. There were communication guidelines developed to be applied within the working groups.</i>	Directly: This was not addressed in the interviews and evaluation meeting (n/a) . A group-feeling was not really created according to the participants. So developing new shared rules or trust or values was not really a direct effect. <i>Indirectly: Maybe some implicit shared moral on letting each other talk and discussing in a respectful manner. Participants did state that the common denominator of the group was a shared connection and responsibility to the neighbourhood.</i>
3c	Building a strong group by: c) Development of shared values within the group Directly: Participants report to have developed shared values; Indirectly: Products build on or express shared values (e.g. vision).	Directly: Some participants perceived the TM case study itself as a learning journey with regard to developing shared understandings. Many of them realized how the initially divagating interests and aims got transferred into a shared vision and actions benefitting the common good . In the eyes of the participants the project contributed to putting the diverse needs of the citizens on the table in form of a shared vision: “something has started”. <i>Indirectly: Some of the activities started or planned within the working groups show shared values, in particular social ones; the vision includes a number of value statements and was endorsed by the whole arena group</i>	Directly: This was not addressed in the interviews and evaluation meeting (n/a) . A group-feeling was not really created according to the participants. So developing new shared rules or trust or values was not really a direct effect. <i>Indirectly: The shared values of the group centred on certain social morals of doing something for the community (responsibility). This was also apparent in the vision, it was all about collective and collaborative place-making and respecting different cultural values as to work effectively together.</i>

4	<p>Openness towards new contacts Directly: Participants report establishment or openness towards new contacts; indirectly: products build upon or value new contacts</p>	<p>Directly: Participants reported that the process sparked interest in (opinions of) and respect for other persons and an attitude of appreciation towards other persons (e.g. representatives of community politics) was developed. People reported an increased self-reflexivity and attention in contact with other people. Some participants described themselves as being more open and having fewer prejudices in interactions with others. <i>Indirectly: Several working groups focus on establishing exchange and new contacts (such as welcome neighbourhood-tables, community journalists and workshops on participators cultures)</i> Directly: Participants stated that they frequently talked with other citizens about the “LebensKlima - project”, its content and the working group. Interest was only partially given; there was quite some scepticism by those that were not involved in the process. <i>Indirectly: The results of the transition process and of the first actions of the working groups were presented to the transition team and the interested public in three meetings and in the media (local newspaper, community newsletter, websites, radio).</i> →social learning aspect 7 →empowerment aspect 9</p>	<p>Directly: Some participants reported that the process sparked interest in (opinions of) other participants. <i>Indirectly: Effort was made by the arena group to invite new contacts to each meeting. This was not very effective, partly because participants were struggling with explaining the process to outsiders.</i> Directly: For most respondents neighbourhood development (so not SD) was a collaborative effort par excellence. The notion of sustainability was primarily operationalized by participants as a social challenge. To some SD could only be realized by sharing a language and narrative and respecting different cultural values as to work effectively together. Working collaboratively was also one of the guiding principles in the vision. <i>Indirectly: collaborative actions were initiated in experiments like the re-opening of the community centre and the ‘neighborhood-guide’. New collaborations were created between residents and neighbourhood professionals, but also new collaborations were created with institutions like the municipality, schools, and welfare organizations.</i> →social learning aspect 7 →empowerment aspect 9</p>
5	<p>Quantity and quality of sustained or newly developing community initiatives Directly: Quantity–Participants report on community initiatives; Quality–Participants report on initiatives as being oriented towards joint purposes. Indirectly (Quantity and Quality): Outputs include establishment or maintenance of (collective purpose oriented) initiatives.</p>	<p>Directly–quantity: Around 60 participants in 8 working groups meet regularly; 8 workshops as activities of the working groups with each 10–30 participants <i>Indirectly–Quantity: 8 working groups were installed and within them already during the project, 8 collective actions were started, e.g. approaching one’s own neighbours and inviting them to an informal working group meeting.</i> Directly–Quality: New ways of working together (different participatory methods) could be tested. <i>Quality–One working group focussed primarily on sustainability, others are related to sustainability issues (such as social or ecological issues); an institutional structure for further implementation of the vision has</i></p>	<p>Directly: 3 types of innovative practices were pioneered by individual arena participants in more or less formalized working groups (see below): <i>Indirectly: The arena-group participated in three newly arena initiated experiments, i.e. the reopening of the community centre, the reopening of the communal garden and an internship for students of Intermediate Vocational Education (community college). These were directly related to the community arena (output). Almost all participants were engaged in their own (innovative) activities in Carnisse (since this was one of the criteria for selecting arena members).</i> <i>Also, innovative ideas about the present and future of the community were exchanged and communicated through the vision</i></p>

		<p><i>been build using the method of sociocracy, establishing a steering committee.</i></p> <p>Directly: Participants stated that that the project does include steps that are also beneficial for the future generations and other regions or even parts of the world and benefit sustainability in Finkenstein.</p> <p><i>Indirectly: In the backcasting workshop the idea of working groups became reality. 10 working groups were built, 3 of them merged later on. Within those groups actions and events were planned and successively carried out.</i></p> <p><i>The current social, economic and environmental situation locally and globally was discussed and built the basis for the actions.</i></p> <p>→Social learning aspect 6</p>	<p><i>and the presentation at the networking event.</i></p> <p>Quality-directly: Initiatives are not reported as being oriented towards sustainability, but towards social goals.</p> <p><i>Indirectly: Social dimensions of sustainability are explicitly part of the initiatives, ecological dimensions are implicitly part of the initiatives (e.g. the community garden).</i></p> <p>Directly: For most respondents neighbourhood development (so not SD) was a collaborative effort par excellence. The notion of sustainability was primarily operationalized by participants as a social challenge. To some SD could only be realized by sharing a language and narrative and respecting different cultural values as to work effectively together. Working collaboratively was also one of the guiding principles in the vision.</p> <p><i>Indirectly: collaborative actions were initiated in experiments like the re-opening of the community centre and the 'neighborhood-guide'. New collaborations were created between residents and neighbourhood professionals, but also new collaborations were created with institutions like the municipality, schools, and welfare organizations.</i></p> <p>→Social learning aspect 6</p>
6	Capacity for sustainability related innovations	<p>Directly: Nothing to report; Indirectly: Nothing to report</p> <p>→empowerment aspect 10</p>	<p>Directly: Nothing to report. <i>Indirectly: vision as symbol including sustainability aspects implicitly may promote sustainability in neighbourhood development.</i></p> <p>→empowerment aspect 10</p>
7	Joint action for sustainability Directly: Participants report joint activities for sustainability; indirectly: products build upon joint action and relate to sustainability	<p>Directly: 9 out of 15 participants state that the project implements measures that are not just good for the moment but also the far future and that they are not just good for Finkenstein but also for other parts of the world.</p> <p><i>Indirectly: A climate-energy-model-region (German "Klimaenergiemodellregion") was applied for and accepted by the Austrian Climate and Energy Fund; new bicycle lanes or car sharing options were planned;</i></p> <p><i>One working group focussed primarily on sustainability, others are related to sustainability issues (such as social or ecological issues); an institutional structure for further implementation of the vision has been build using the method of sociocracy, establishing a steering committee.</i></p>	<p>Directly: No explicit joint action for sustainability was mentioned. Participants reported community centre reopening as reaction to local, social problems rather than sustainability problems.</p> <p><i>Indirectly: The arena-group participated in three newly arena initiated experiments, i.e. the reopening of the community centre, the reopening of the communal garden and an internship for students of Intermediate Vocational Education (community college). Those can be related to social aspects of sustainability.</i></p> <p>→empowerment aspect 9</p> <p>Directly: For most respondents neighbourhood development (so not SD) was a collaborative effort par excellence. The notion of sustainability was primarily operationalized by</p>

	<p>→ <i>empowerment aspect 9</i></p> <p>Directly: Participants stated that that the project does include steps that are also beneficial for the future generations and other regions or even parts of the world and benefit sustainability in Finkenstein.</p> <p><i>Indirectly: In the backcasting workshop the idea of working groups became reality. 10 working groups were built, 3 of them merged later on. Within those groups actions and events were planned and successively carried out.</i></p> <p><i>The current social, economic and environmental situation locally and globally was discussed and built the basis for the actions.</i></p> <p>→ <i>Social learning aspect 6</i></p>	<p>participants as a social challenge. To some SD could only be realized by sharing a language and narrative and respecting different cultural values as to work effectively together. Working collaboratively was also one of the guiding principles in the vision.</p> <p><i>Indirectly: collaborative actions were initiated in experiments like the re-opening of the community centre and the 'neighborhood-guide'. New collaborations were created between residents and neighbourhood professionals, but also new collaborations were created with institutions like the municipality, schools, and welfare organizations.</i></p> <p>→ <i>Social learning aspect 6</i></p>
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Description S4. Process Steps of the Community Arena Methodology (Source: Wittmayer et al. 2014 [1], modified).

The governance framework of transition management builds the basis for the community arena methodology. Loorbach [2] does suggest a number of principles for transition management, derived from complex systems, governance and social theories. Principles do propose: “(1) process and content are inseparable (i.e., a system cannot be influenced without knowledge of it); (2) the participation of a variety of stakeholders is necessary for social learning, for a diversity of solutions and for supported outcomes; (3) a system cannot be effectively influenced from the outside; one becomes part of the system one aims to change; and (4) the creation of space is necessary for alternatives to emerge” [1].

Building on these tenets a governance framework was developed that includes activities on multiple levels: The strategic level includes problem structuring and visioning; the tactical level activities of agenda setting and coalition forming; the operational includes experimenting while the reflexive level includes monitoring and learning activities [2].

The community arena methodology spans these levels. It builds on literature from action research [3,4] and transition management [2,5,6]. In the cases studied it mainly aimed to empower local communities to become more sustainably. The heart of the community arena thereby is composed of an interactive space. In this space researchers and stakeholders meet for reflection upon their individual and collective needs, values and beliefs, and the development of joint actions. This includes the current state and future developments of the community to aim for. New ideas, practices and social relations regarding sustainability transitions are developed within the created interactive space. To transform the interactive space from an abstract idea to concrete practice it is adapted to the specific local contexts and their social, geographical, economic, ecological as well as political dimension.

Five phase mark the community arena methodology [7]:

- The first phase of Preparation and Exploration includes researchers and potentially locally relevant stakeholders to develop an actor and system analysis of the community. This builds on participant observations, interviews and document analysis. The team comprising researchers and stakeholders does prepare meetings, facilitates and analyses them and selects its’ participants.
- The second phase focusing Problem Structuring and Visioning includes the team to invite approximately 10–15 locally engaged individuals of diverse background, called change agents or front-runners. This group discusses the status quo of the community in several meetings, focusing current societal challenges and potential visions for future developments until 2030.
- The third phase is named Backcasting, Pathways & Agenda Setting. Here pathways and milestones are developed aiming to realize the future vision, casting back from the desired future to the present state of the community. A change narrative results from this process including concrete action points, referred to as transition agenda.
- Phase four includes Experimenting and Implementing. Besides presenting the transition agenda to the wider community a number of experiments or projects are realized to put the agenda into practice.
- Phase five includes Monitoring & Evaluation and aims to facilitate learning about the present situation, the envisioned future and the connecting pathways in experimentation and process.

This framework is out into practice by way of making diverse terms and processes explicit and by adapting them to the specific context.

In the concrete cases of Finkenstein and Carnisse researchers used an action research approach to systematically facilitate a collective search to explore opportunities of joint action. The process was participatory and reflexive in nature, aiming to allow for intensive learning amongst

participants. Participatory processes lasted 16-17 month and included 13 (Carnisse) and 16 (Finkenstein) participatory meetings. Researchers took diverse roles including knowledge brokers, reflexive scientists and process facilitators. All authors have been involved in the case studies, albeit to different degrees (see author contributions declared in main text).

Figure 1 provides an overview of the process in Carnisse. Thereby the initial process design was adapted, building on insights from the system and actor analysis and consultations with key stakeholders. Thus, the deliberative process and the practical experimentation started in parallel (rather than consecutive) in February 2012. Some 15 local change agents gathered to frame the current local situation and to envision the future of their neighborhood in 2030. Finally, respective pathways toward this future were drawn. During a public meeting in November 2012 the resulting future narrative, entitled ‘Blossoming Carnisse’, was shared with the neighborhood. The focus of the practical experimentation was the reopening of a local community center. This was understood as a symbol of the current and possible future state of Carnisse - thereby bridging both states. In an evaluation meeting in spring 2013 the community arena was rounded off.

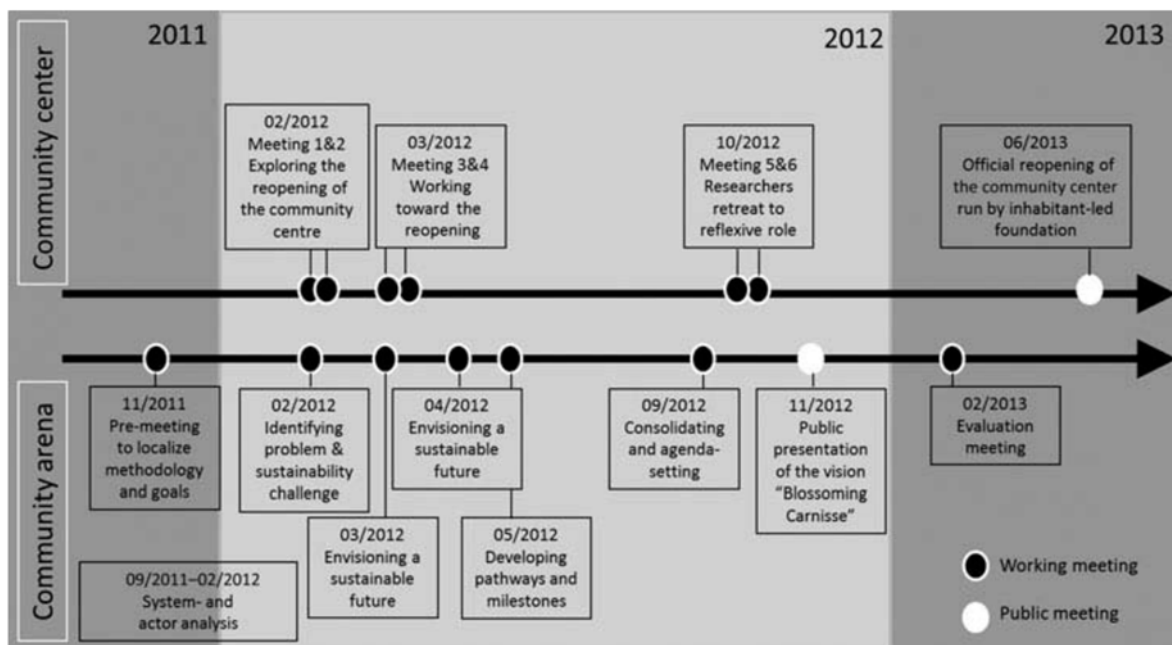


Figure S1. Timeline of the community arena process in Carnisse, Source: Wittmayer et al. 2014/1 [1], modified from Wittmayer & Schöpke 2014 [8], reprinted by permission of the publisher (Taylor & Francis Ltd, <http://www.tandfonline.com>).

The implementing team in the action research project in Finkenstein was composed of a research institute from Vienna and a consultancy specialized in regional sustainable development. Figure S2 provides an overview of the process. The project was officially supported and co-financed by the local community. To establish communication between the project, locally referred to as the ‘Lebensklimate-Projekt’ [Climate for life-project], and the city administration a consultative body was created. This body consisted of political representatives. Starting in late 2011, the project included a participatory envisioning and agenda-setting process. Going beyond the actual community arena, up to nine working groups were created in later phases of the project. Working groups aimed to realize the vision through actions and experiments. The official project ended in spring 2013. Consecutively a local coordination team was elected while some of the working groups continued to exist. The coordination team was to establish a link between the working groups, including citizens on the one side and local politicians and the administrative body on the other.

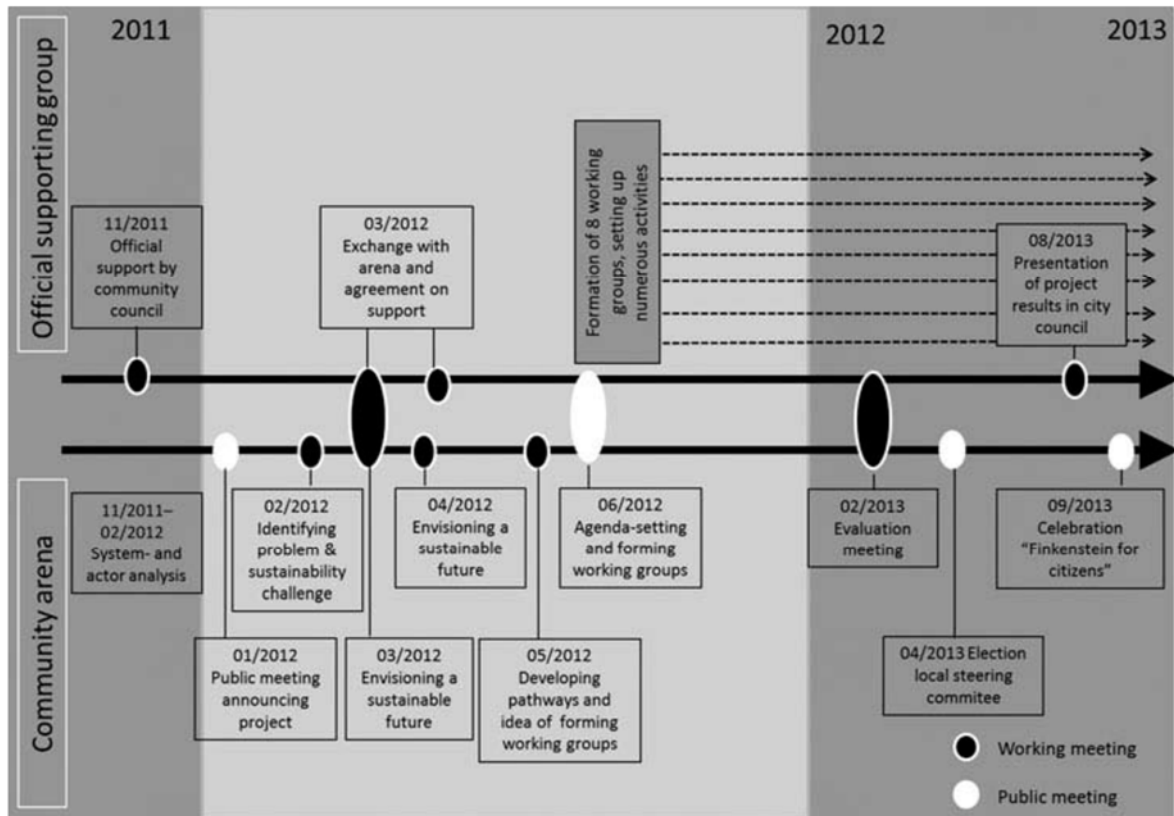


Figure S2. Overview of community arena process in Finkenstein. Source: Wittmayer et al. 2014/1 [1]. reprinted by permission of the publisher (Taylor & Francis Ltd, <http://www.tandfonline.com>)

More information on processes can be found in Wittmayer et al. 2014 [1].

Description S5. Data Collection and Interpretation

The analysis of societal effects is focused on research activities and data generation that took part during the lifetime of the two local case study projects. In Finkenstein, the community arena process took place from summer 2011 to March 2013, while in Carnisse it took place from September 2010 to March 2013. Spring 2013 was also the official ending of the overall InContext project the case studies were part of. At that moment, processes initially facilitated by researchers were handed over to local participants. Participatory evaluation workshops marked the end of the research process in both communities. In Finkenstein, this was followed by the election of a local steering committee. In Carnisse, a citizen led foundation board was formed to run the community center. Setting temporal boundaries for the analysis was necessary for practical, e.g. funding reasons. While this allows capturing a range of societal effects, mid- and long terming effects generated by the project are excluded.

The community arena followed a five step procedure (table S2), including activities contributing to data collection and generation of outputs relevant for societal effects generation in several steps. The analysis draws upon step five, including joint evaluation and monitoring interviews, as well as phase two and four regarding the vision developed and experiments generated.

Phases of the Community Arena	Key activities
0. Pre-preparation	A. Case orientation B. Transition team formation
1. Preparation & Exploration	A. Process design B. System analysis C. Actor analysis (long-list and short-list of relevant actors) incl. interviews D Set up Monitoring framework
2. Problem structuring & Envisioning	A. Community arena formation B. Participatory problem structuring* C. Selection of key priorities D. Participatory vision building*
3. Backcasting, Pathways & Agenda Building	A. Participatory backcasting* & definition of transition paths B. Formulation of agenda and specific activities* C. Monitoring interviews
4. Experimenting & Implementing	A. Dissemination of visions, pathways and agenda B. Coalition forming & broadening of the network C. Conducting experiments
5. Monitoring & Evaluation	A. Participatory evaluation of method, content and process* B. Monitoring interviews

Figure S3. Overview of process phases and related activities in both cases. *Participatory meeting, Source: [7].

For gathering and interpreting data on societal effects and related outputs various methods were used. The case studies of Finkenstein and Rotterdam-Carnisse are based on different data sources and analysis. For a detailed reporting see project deliverables: [1,7,9–13].

In Finkenstein, respective analysis draws primarily on results of a final participatory evaluation workshop (25 participants from community arena and working groups). The participatory evaluation workshop was five hours long and included discussions in smaller groups, plenaries, a

world cafe and joint assessments and ratings. Reflections included questions on learning, empowerment and social capital development as well as the overall community arena process, content and results and an outlook to the future. The workshop was led by an external consultancy. The workshop was prepared with a preceding semi-structured online survey (60 persons invited, 15 responses, including community arena and working group participants) as well as qualitative telephone-interviews (8 selected interviewees, community arena participants only). The interviews consisted of open questions regarding the process, content and results of the community arena process and were used to frame the evaluation workshop. The semi structured online questionnaire in a complementary way allowed all persons involved in the project the opportunity to express their opinions on a number of very concrete questions. Besides overall process and content questions of the arena process, questions related to perceived learning, empowerment and social capital developments as well as sustainability.

In Carnisse, the analysis draws on the final participatory evaluation meeting (7 participants) as well as 13 semi-structured interviews (7 mid-term interviews and 6 interviews at the end). Just before a public broadening event in November 2012, monitoring interviews were held with the core group of participants. A total of seven interviews were conducted in person focusing on the process, the group and the individual level as well as the future outlook. In February 2013 the evaluation meeting was held focusing on the current situation and future outlook, as well as aspects of empowerment, sustainability and pro-social behaviour. As a follow up to the evaluation meeting, participants were approached via phone and Email to answer some additional questions, deepening insights from the evaluation meeting.

In both cases core outputs of the case studies at the level of products are additionally used as data sources. This includes the vision documents as well as concrete and experimental actions developed by participants (see supplementary materials 6 for details). Attribution of elements from the vision and experiments to particular aspects of societal effects have been done in a discursive process amongst the authors. Additionally, participant observation of 13 (Carnisse) and 16 (Finkenstein) participatory meetings are taken into account. Observations are based on diaries of individual researchers as noted in the context of respective participatory meetings which have been assessed ex post with regard to societal effects. Thereby most interpretations of individual observations have been discussed and agreed upon with a second researcher attending the same meeting.

The assessment in chapter 3 does both: it *directly* assesses societal effects and it *indirectly* gathers information about them by analysing outputs generated by project participants. For direct assessments, participants were asked to report on various aspects of the societal effects as part of the participatory evaluation workshop and respective interviews in the final phase of the case studies. For indirect assessments and reflections of direct data sources, researchers analysed a) participant observations of the arena process creating these outputs and, where possible b) the indication of developed outputs with regard to the societal effects. Jointly, these three assessments form a triangulation, complementing one another to a multifaceted picture on the creation of societal effects. Due to the nature of the data (self-reported observations of participants, participant observations, and document analysis of visions) and the small sample size, the analysis is of a qualitative and explorative nature.

Description S6. Detailed Outline of Experiments in Finkenstein and Carnisse.

Title	Working group	Description	Status
« Town reporter » / « Dorfjournalist »	Participation	The participants of these workshops should acquire basic knowledge about writing articles for the community newspaper. The aim was to write the community newspaper in a more participatory way with contributions of a higher quality.	Completed: workshops held on 18 January 2013 and 1 March 2013
« Hello Neighbour » / « Hallo Nachbar »	Social Affairs	This meeting takes place once a month and aims at closing the gap between people who grew up in Finkenstein and those who moved in later. For this reason, people from the working group « Social Affairs » invite some neighbours to an informal meeting in an inn or restaurant and encourage them to invite other people along as well (snowball effect).	Ongoing: monthly meetings
« Information brochure » / « Infoblatt »	Social Affairs	This brochure should contain all relevant basic information for people who recently moved to the town, but also for people living in Finkenstein for a while. A special focus is put on the opportunities to join different groups (in the fields of sports, culture etc.), the possibilities to get locally produced food and mobility alternatives to the private car (as the GoMobil).	In Progress: Clarification of last details
“Your community needs you!” / “Deine Gemeinde braucht dich!”	Participation	The Workshop sponsored by “Kärntner Gemeindebund” is divided in two sessions: The first one concentrates on presenting possibilities of how to engage in community life, while the second one focuses on the personal level (personal strengths and weaknesses, time management, etc.).	Completed: workshops held on 8 February 2013 and 22 February 2013
“Terra amicitiae – application for a climate and energy model region “ / “Terra amicitiae – Bewerbung zur Klima- und Energie-Modellregion”	Sustainable Economy (Energy)	In collaboration with the neighbouring communities Arnoldstein and St. Jakob im Rosental, Finkenstein forms a region that aims for energy independency and for improving sustainable transport.	Completed: application was accepted, measures in progress
« Cycling around the Lake Faak » / « Radfahren Faakersee »	Sustainable Economy	A continuous bike path around Lake Faak is the goal of this measure. To realise this, existing bike paths should be improved, new sections should be built and the whole circle should be enriched by “chill places”, inviting users to relax on benches or deckchairs.	In Progress: Details to clarify and construction work to do
« Event Series Sustainability » / « Veranstaltungsreihe Nachhaltigkeit »	Environment and Sustainability	Six public talks from experts on main topics in the area of sustainability (nutrition, mobility, housing, etc.) should be organized. Through this measure awareness of topics concerning sustainability should be increased and best practices should be publicized throughout the community.	In Progress: First talk planned for mid-2013
« Participation Workshop » / « Partizipations-Workshop »	Participation	This workshop held by Bertram Meusburger, Sustainability Coordinator of the state of Vorarlberg, and Ines Omann (SERI) presents in an interactive manner different models and methods of participation and public engagement. The participants have been informed about their participation possibilities in local decision making and suitable models for Finkenstein have been used.	Completed: Workshop held on 4 April 2013

Figure S4. Overview of experimental measure approved in Finkenstein (as of end 2013, taken from [12]).

Description of Main Experiment in Carnisse, the Re-Opening of a Local Community Center (Taken from [12], Modified).

A more practice-centred process was started in parallel with the deliberative meetings of the Community Arena. Four meetings took place in February and March 2012, and afterwards the core of the local action group stayed in contact through Email and telephone. Basically, the community centre offers a number of different facilities and rooms, such as a coffee house, kitchen, rooms for sport, children, meeting rooms, which were used by primary schools, a kindergarden and a welfare organisation. The ownership-structure is unclear since the previous owner of the building, a welfare organisation, went bankrupt and the centre is built on ground owned by the Municipality of Rotterdam and it falls under the constituency of the sub-municipality of Charlois. It is the latter who decides on the development plan of the parcel. The result of these juridical and financial ownership structures (also referred to as the 'Rotterdam construction') was that the building did not exist in the administrative books and nobody took responsibility for a neglected building that has little financial value.

The action group worked on a number of strategies. It drew up a business plan, reached more than 300 people through a petition, lobbied different representatives in the sub municipality, the welfare organization and the larger municipality. When the group felt they could take it over themselves, the researchers withdrew from the process after two more broad meetings. A social entrepreneur was involved who volunteered to support the community members in setting up the daily management and operation of the centre. Four subgroups were built, working on financial questions, management construction, making an inventory of practical daily tasks and of volunteers. The inhabitants as well as the social entrepreneur were convinced that only community members and no professionals should be involved in this process. This led to some disagreements, as one of the most active people in the initial action group was a professional working at a local primary school. Also, the position of the social entrepreneur involved was not transparent enough, people became suspicious which finally led to the dismissal of the social entrepreneur. She was replaced by the professional who worked at a primary school in Carnisse. A foundation was set up as a legal entity to run the community centre which was to be effective as of January 1st, 2013. Two weeks later, the board of the foundation had insurmountable disagreements leading to the non-voluntary leave of two board members and the setting up of a second foundation with the same goal. Currently the foundation, supported by the professional, is in practice managing the community centre, taking all daily tasks through volunteer work of the board members and keeping the dialogue with the municipality. The latter has accepted ownership of the building and is now in the phase to negotiate the rental sum with the foundation.

Supplementary Material 7: Vision documents from Finkenstein and Carnisse

a) Vision document of Finkenstein case study (available only in German)



VISION FÜR FINKENSTEIN

Entwickelt vom BürgerInnenforum
des SERI-Projekts
LebensKlima in Finkenstein

-Juli 2012-



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EINLEITUNG

Dieses Leitbild für ein gutes Leben in Finkenstein wurde im Projekt „LebensKlima in Finkenstein“ vom BürgerInnenforum im Zeitraum zwischen März und Juni 2012 entwickelt. Das BürgerInnenforum besteht aus 15 Bürgerinnen und Bürgern Finkensteins aus unterschiedlichen Orten der Gemeinde, unterschiedlicher Altersstufen zwischen 20 und über 80 Jahren und mit verschiedensten beruflichen Hintergründen. Der Wille, darüber nachzudenken wie eine gute Zukunft für Finkenstein und seine Bewohnerinnen und Bewohner aussehen könnte und wie man diese mit konkreten Maßnahmen gestalten kann, einte diese buntgemischte Gruppe.

AUFBAU

Zentraler Teil dieses Leitbildes ist die im BürgerInnenforum erarbeitete Vision. Neben der Vision sind im Leitbild auch Leitsätze für einzelne Themenbereiche verankert. Diese sind bereits konkretere, auf diverse Bereiche wie Mobilität, Umwelt, Kultur usw. heruntergebrochene Ideen zur Umsetzung der Vision. Sie bilden die Grundlage für zukünftige Strategien und enthalten Handlungsaufforderungen.

WARUM EIN LEITBILD? WOZU EINE VISION?

Wir sind überzeugt von der Wichtigkeit und Kraft die von positiven Visionen und Leitbildern ausgeht. „Wer keine Visionen hat, vermag



weder große Hoffnungen zu erfüllen, noch große Vorhaben zu verwirklichen“ (Woodrow Wilson).

In diesem Sinne haben wir in Finkenstein eine Vision, also ein positives Zukunftsszenario entwickelt, denn erst, wenn wir konkrete Vorstellungen und Bilder einer positiven Zukunft vor uns haben, finden wir auch die notwendigen Schritte, um dorthin zu gelangen.

Dies ist wohl die wichtigste Funktion unserer Vision. Doch daneben ist sie auch wichtig, um Klarheit zu schaffen, denn Visionen vermögen den einzelnen Teilen und dem vielen scheinbar zusammenhangslosem Neben- und Nacheinander einen Sinn und Zusammenhang zu geben. Daher wird Visionen oft eine Leuchtturm- und Kompassfunktion zugeschrieben und auch die Finkensteiner Vision verwendet das Symbol des Sterns, des „Finkensterns“ um aufzuzeigen, dass die Vision einen guten Weg in die Zukunft weisen soll.

Außerdem sorgen geteilte Wünsche, Träume und Pläne für die Zukunft für ein starkes Gemeinschaftsgefühl und können so in einem Ort ein gefestigtes Gemeinschaftsgefühl entstehen lassen. Gerade in Zeiten, in welchen Gemeinden vor großen lokalen (knappe Budgets, Erhaltung der Infrastruktur, das soziale Zusammenleben usw.) sowie globalen (Klimawandel, Nachhaltigkeit usw.) Herausforderungen stehen, können Visionen Klarheit für die Zukunft erweisen, das Wichtige vom Unwichtigen trennen und Stabilität schaffen.



UNSERE VISION:

Finkenstein erstrahlt unter dem Finkenstein!

Der „Finkenstein“ erleuchtet uns den Weg zu unserem Ziel: Ein Finkenstein, das von uns BürgerInnen zusammen mit der Politik zum Wohle aller gestaltet wird. Zum Wohle aller Menschen in der Gemeinde und darüber hinaus und auch unserer wertvollen Natur. Durch unser Mitgestalten in diesem Sinne wird Finkenstein zu einem Ort der Freude, Freiheit und Lebenslust.



Sterne sind seit jeher verlässliche Orientierungshilfen und helfen uns Menschen die gewünschte Richtung zu finden. Diese Funktion nimmt auch der „Finkenstein“ ein: Er soll uns helfen unser Ziel, unsere Vision nicht aus den Augen zu verlieren und uns unbeirrt dorthin führen. In unserer Vision, gestalten wir Finkenstein zum Wohle aller. Finkenstein soll ein Ort der Freude, Lebenslust und Freiheit

für Alt und Jung, Zugezogene und „Alteingesessene“, im Tourismus, in der Industrie, im Gewerbe oder in der Landwirtschaft Tätige, Zugehörige unterschiedlicher Sprachgruppen, für im Osten sowie im Westen der Gemeinde wohnende sein. Wir wollen in dieser Vielfalt miteinander leben und Finkenstein gestalten. Statt uns nur von außen verwalten zu lassen, gestalten wir selbst aktiv unseren eigenen Lebensraum. Dies geschieht durch eine weitsichtige, transparente und kooperative Politik, die die aktive Beteiligung der BürgerInnen fördert. Durch dieses aktive Miteinander werden wir uns wieder unserer Talente und Fähigkeiten bewusst und setzen Passivität und Resignation außer Kraft. Wir werden uns auch bewusst, dass wir im Garten der Natur mit vielen Schätzen wie unseren Bergen und dem Faaker See leben dürfen. Diese schätzen wir und gehen dementsprechend sorgsam damit um. So schaffen wir ein gutes LebensKlima für uns und auch für unsere Umwelt. Ein LebensKlima das uns jetzt gut tut und auch sicherstellt, dass wir durch unsere Lebensweise weder andere Menschen auf dem Planeten noch unsere Nachkommen einschränken. Dadurch kann Finkenstein selbst zu einem positivem Beispiel, einem FinkenSTERN werden, der über unsere Grenzen hinaus leuchtet und begeistern kann.



UM DIES ZU VERWIRKLICHEN WERDEN WIR AKTIV!

Wir gestalten... Wirtschaft



Wir setzen uns für eine Wirtschaft ein, die stark auf regionalen Kreisläufen und auf Kooperation statt Konkurrenz basiert.

Wir gestalten... Umwelt



Wir sind uns darüber bewusst wie wertvoll unsere Natur für uns ist und setzen uns für einen schonenden Umgang damit ein. Durch den Schutz der Natur sowie der aktiven Verbesserung bisheriger Fehlentwicklungen können wir und auch unsere Gäste unsere Natur noch lange genießen.

Wir gestalten... Soziales



Durch ein aktives Miteinander können wir uns gegenseitig wertvolle Hilfe leisten und tragen gleichzeitig zu einem angenehmen LebensKlima in Finkenstein bei, das Finkenstein zu einem lebenswerten Ort macht.

Wir gestalten... Beteiligung



Wir gestalten unseren Lebensraum aktiv mit und nehmen unsere Verantwortung als Bürgerinnen und Bürger gegenüber der Politik wahr. Wir sehen uns als ein gemeinsames Team: Bürgerinnen und Bürger von Finkenstein gestalten vereint mit der Politik Finkenstein zum Wohle aller.

Wir gestalten... Kultur



Unsere reiche Kulturtradition verbindet die Finkensteinerinnen und Finkensteiner. Durch gemeinsames Gestalten im Kulturbereich wird ein Gemeinschaftsgefühl und Integration geschaffen.

Wir gestalten... Energie



Wir stellen uns der Herausforderung neue Wege im Bereich der Energie einzuschlagen und unseren reduzierten Verbrauch durch erneuerbare Energien abzudecken.

Wir gestalten... Mobilität



Wir setzen uns für Konzepte im Bereich der Mobilität ein, die umweltschonend, praktisch und für alle zugänglich sind: Geh- und Radwege sowie öffentliche und private Mobilitätskonzepte spielen dabei eine zentrale Rolle.

Wir gestalten... LebensEnergie



Wir betrachten mittels systemischen Blick die Regeln, die das Verhalten der Personen im sozialen System Finkensteins leiten, um die vorhandenen Energieflüsse zu verstehen. So stärken wir das Miteinander und entwickeln individuelle und kollektive Impulse zum Wohle von Mensch und Natur.

Wir gestalten... den Kanzianiberg



Wir achten die Lebensweisen, Kulturen und Brauchtümer unserer Heimat und gestalten Räume der Begegnung für Alt und Jung, Zugezogene und „Alteingesessene“.



LEITSÄTZE

- Sicherung der noch intakten Umwelt und aktive Verbesserung bisheriger Fehlentwicklungen!
- Verbesserung des öffentlichen Verkehrsangebotes durch öffentliche und private Mobilitätsinitiativen
- Eindeutige Positionierung der Gemeinde zu Erneuerbarer Energie und regionalen Kreisläufen
- Alternatives Mobilitätskonzept der Gemeinde bezüglich Rad- und Gehwege
- Gesundes Leben durch Eigenproduktion
- Wir lieben und leben unsere Natur und teilen diese gerne mit unseren Gästen!
- Die Wirtschaft stärkt uns und wir die Wirtschaft, so dass WIR unabhängig sind!
- Wir leben Miteinander!
- Bestehende Ressourcen werden gehegt und genutzt!
- Jung hilft Alt und Alt hilft jung
- Vorhandene Betreuungsplätze vom Kleinkind bis ins hohe Alter
- Raumplanung und Einbezug aller Beteiligten / BürgerInnen und ganzheitlicher und nachhaltiger Betrachtung
- Transparente, weitsichtige, kooperative Politik mit aktiver Beteiligung der BürgerInnen



Wir gestalten... Soziales

Leitsätze

Wir leben Miteinander!

Jung hilft Alt und Alt hilft jung

Vorhandene Betreuungsplätze vom Kleinkind bis ins hohe Alter

Bestehende Ressourcen werden gehegt und genutzt!

Erste Maßnahmeideen

1. Professionelle Ansprechperson für soziale Belange und Beratungsgespräche (fundierte Ausbildung z.B. SozialarbeiterIn) / auch Beratungsstunden außerhalb der Gemeinde (mobile Beratung) anbieten
2. Ausreichende Kindergartenplätze: Für alle Gemeindeglieder sollen genügend Betreuungsplätze zur Verfügung stehen/ sind die nicht vorhanden, werden auch weniger junge Leute in die Gemeinde ziehen / hier könnten auch Beratungsgespräche in Anspruch genommen werden.
3. Sepp Springer Heim zu neuem Leben erwecken (z.B. intergenerationelles Wohnen) / Pflegeplätze integrieren / wichtig für unsere ältere Bevölkerung, damit diese in der Gemeinde bleiben können
4. TauschKreis innerhalb der Gemeinde / Nehmen und Geben / eigene Fähigkeiten, Ressourcen "verschenken" / dafür anderes bekommen



Wir gestalten... Beteiligung

Leitsätze

Raumplanung und Einbezug aller Beteiligten / BürgerInnen und ganzheitlicher und nachhaltiger Betrachtung

Transparente, weitsichtige, kooperative Politik mit aktiver Beteiligung der BürgerInnen

Erste Maßnahmeideen

1. Schaffung von BETEILIGUNG, ANLAUFSTELLEN (für verschiedene Probleme und Fragestellungen)
2. Ideenbox für Anregungen und Austausch für Gleichgesinnte
3. JUGENDBÜRGERINNENRAT (z.B. „Wisdom Council“) / was brauchen unsere Jugendlichen / arbeiten gemeinsam an für sie wichtige Themen
4. Nutzung der Kulturhäuser für Arbeitskreise und Initiativen / für gewisse Veranstaltungen – ehrenamtliche Tätigkeiten / Räumlichkeiten stehen gratis zur Verfügung
5. Büro für Zukunftsfragen Vorarlberg: Vortrag eines Vertreters/ einer Vertreterin über Beteiligungsmöglichkeiten für die Gemeinde
6. Öffentliche Teile einer Gemeinderatssitzung



Wir gestalten... Umwelt

Leitsätze

Sicherung der noch intakten Umwelt und aktive Verbesserung bisheriger Fehlentwicklungen!

Wir lieben und leben unsere Natur und teilen diese gerne mit unseren Gästen!

Bestehende Ressourcen werden gehegt und genutzt!
Gesundes Leben durch Eigenproduktion!

Erste Maßnahmeideen

1. Das bestehende Leitbild für die Umwelt adaptieren
2. Istzustand / Befund der Umweltsituation erheben
3. Indikator „Ökologischer Rucksack“ verwenden
4. Öffentlichkeitsarbeit / Bewusstseinsbildung der Bevölkerung
5. Sanierung und Renaturierung



Wir gestalten... Energie

Leitsätze

Eindeutige Positionierung der Gemeinde zu Erneuerbarer Energie und regionalen Kreisläufen

Gesundes Leben durch Eigenproduktion!

Erste Maßnahmeideen

1. Umstellung auf Ökostromanbieter + Ökowärmeanbieter
2. Förderung neuer Technologien zur Energieumwandlung in Strom, Wärme
3. Regionale Ökoenergiekreisläufe stärker nutzen
4. Bürgerbeteiligung beim Ökostromkraftwerksbau
5. Energiespar- und Effizienzmaßnahmen



Wir gestalten...Kultur

Leitsätze

Wir leben Miteinander!
Bestehende Ressourcen werden gehegt und genutzt!

Erste Maßnahmeideen

1. Schaffung eines gemeinsamen Gremiums
 - Vertretung der Gemeinde / Kulturreferent
 - Vertretung sämtlicher Kulturvereine
 - Vernetzung mit Wirtschaft und Schulen
2. Einbindung Junger und Zugezogener durch eine gemeinsame Veranstaltung zur Präsentation der Vereine
3. Partnergemeinde Pavia: Intensivierung der Zusammenarbeit
4. Schaffen eines Kulturzentrums



Wir gestalten... Wirtschaft

Leitsätze

Die Wirtschaft stärkt uns und wir die Wirtschaft, so dass WIR unabhängig sind!

Bestehende Ressourcen werden gehegt und genutzt!

Gesundes Leben durch Eigenproduktion

Eindeutige Positionierung der Gemeinde zu Erneuerbarer Energie und regionalen Kreisläufen

Erste Maßnahmeideen

1. Gründung der Untergruppen „Nahversorgung“, „Tourismus, Landwirtschaft und Landwirtschaft“, „Wirtschaftsstandort Finkenstein und Raumordnung“
2. Aktive Vernetzung der Wirtschaftsakteure z.B. durch Wirtschaftsstammtisch
3. Innovation des Wirtschaftsstandortes Finkenstein z.B. Jungunternehmerwerkstatt
4. Ansiedlung von Nahversorgern (z.B. Ledenitzen)
5. Netzwerk „Kooperation statt Konkurrenz“



Wir gestalten... Mobilität

Leitsätze

Verbesserung des öffentlichen Verkehrsangebotes durch öffentliche
und private Mobilitätsinitiativen

Alternatives Mobilitätskonzept der Gemeinde bezüglich Rad- und
Gehwege

Erste Maßnahmeideen

1. Der „Langsamverkehr“ muss mehr gefördert werden, dafür braucht's
Konzepte:
2. Konzept für Alltagsradverkehr (auch Ortsübergreifend)
3. Konzept für öffentliche Verkehrsmittel bzw. Einzelpersonentransport (z.B.
Alternative zum Go-mobil / Abstimmung S-Bahn)
4. Pendlerzentrale für Mitfahrgelegenheit
 - a. verschiedene Möglichkeiten Internet
 - b. Anschlagtafel



ALLGEMEINER NACHSATZ

Die vorgestellten Ergebnisse des BürgerInnenrats bzw. der Arbeitsgruppen sind im Zuge des LebensKlimaprojekts in dieser Form entstanden.

Sie sind als Anregungen für die lokale Politik und die Bürger zu verstehen und als solche unverbindlich (kein Rechtsanspruch). Einzelmeinungen können aufgrund des Gruppenarbeitscharakters im Detail abweichend sein (kein Absolutheitsanspruch). Die Ergebnisse sind eine erste Sammlung von Ideen und keineswegs vollständig oder abgeschlossen. Durch die Aufnahme von weiteren Bürgern und neuer Ideen sollen sie in einem geordneten Folgeprozess ausgeweitet werden (kein Vollständigkeitsanspruch). Leitsätze, Ziele und Maßnahmen können und sollen sich langfristig ändern und werden dem jeweiligen Willen der Gemeinde entsprechend abgewandelt. entspricht. Die AGs sind ein erster Schritt dazu (kein Endgültigkeitsanspruch).



IMPRESSUM

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b) Vision document for Carnisse (available only in Dutch).

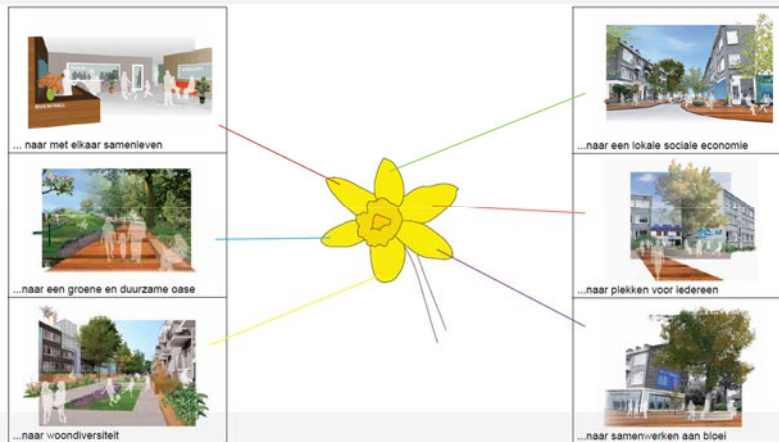
"De buurt zijn wij & wij zijn de buurt"

Een kijkje in het Carnisse van 2030



Bloeiend Carnisse

CARNISSE 2030



"Je moet de lat hoog leggen" was twintig jaar geleden in 2012 het motto. De koplopers van toen, hebben de basis gelegd voor het Carnisse van 2030. Niet dat wonen in Carnisse in 2012 een verschrikking was. Integendeel, de kernen voor een veerkrachtige wijk waren toen al aanwezig. De omstandigheden om deze kernen tot bloei te laten komen, werden toen al lerend ontdekt

Mede dankzij crises en grootschalige bezuinigingen, lag de druk bij de lokale gemeenschappen om uitdagingen als vergroening, een verslechterende woningvoorraad ende sluiting van sociale voorzieningen te lijf te gaan. Door nieuwe verbindingen aan te gaan tussen individuen, groepen, perspectieven en werkwijzen en in te zetten op alternatieven (zoals lokale energieopwekking en zelfbeheer) is die uitdaging geaccepteerd. De koplopers van toen lieten zich niet ontmoedigen door scepsis of argwaan, maar zijn aan de slag gegaan om Carnisse tot bloei te laten komen. Waartoe heeft die bloei geleid? [Hoe leeft men in 2030? Wat is er gebeurd tussen 2030 en nu? En wat gebeurt er nu?](#) Neem in dit document een kijkje in het Carnisse van 2030

Carnisse2030 (1)

naar met elkaar samenleven (3)

naar een groene en duurzame oase (5)

naar woondiversiteit (7)

naar een lokale sociale economie (9)

naar plekken voor iedereen (11)

naar samenwerken aan bloei (13)

Waarom nadenken over 2030 (15)

Hoe kan Carnisse tot bloei komen? (17)

Uitnodiging (18)

...NAAR MET ELKAAR SAMENLEVEN



In het Camisse van 2030 worden nieuwkomers van harte welkom geheten. Ze krijgen een welkomspakket, en er is een wijkbuddy bij wie ze terecht kunnen met vragen over de wijk. In Camisse kent men elkaar – en dat ongeacht achtergrond of wereldbeeld. Jongeren leren van de ervaring van ouderen en de ouderen doen gemakkelijk een beroep op de hulp van de jongeren. Ontmoetingsplekken spelen een cruciale rol bij het smeden van sterke sociale relaties en het tegengaan van eenzaamheid en veivremding. En taal is de verbindende factor in een wijk waar iedereen zich erkend en veilig voelt.

Maar mam, hoe hebben jullie dit voor elkaar gekregen?

"Alereerst zijn neutrale ontmoetingsplekken gecreeerd, net zo als Arend & Zeemeewaar waar jij ook nog creatieve taal/es hebt gehad. Dat je daar taal/es hebt gehad was niet toevallig, want taal werd als cement van het samenleven gezien. En dat ging ook om lichaamstaal en omgangsvormen. Samen werd toen gewerkt aan acceptatie van diversiteit. Ik kan me herinneren dat toen ook contact- en aanspreekpersonen binnen de straatwijk werden aangesteld, de wijk- of straatbuddy. Daar zaten toen hele actieve personen tussen waar je met van alles en nog wat terecht kon. Ook is in die tijd een van de meest succesvolle ruilwinkels gestart. Hier kon je bijvoorbeeld terecht voor hulp bij het doen van boodschappen. Ter ondersteuning van al die initiatieven zijn toen fondsen aangeschreven en vaardigheidstrainingen georganiseerd."

Burgerblauw	Bewoners surveilleren onder begeleiding van politie en stadstoezicht	Bewonersorganisatie Camisse (B.O.C)
Burgerschapstrainingen en zumbalesen	Elkaar beter leren begrijpen en respecteren door trainingendans	Stichting Krachtwijk
Buurtbemiddeling	Kleine samenlevingsproblemen laten oplossen door ervaren vrijwilligers	Buurtbemiddeling
Buurtregisseurs Camisse Gai Talent (C.GT)	C.GT – contactpersonen die talent in kaart brengen, vrijwilligers aansturen en voorrondeste ideo	Bewonersorganisatie Camisse (B.O.C)
	Begeleiding van minderjarige (hang-)jongeren en hun ouders	Marokkaanse Culturele Vereniging Charos
Jongerenbuurtbemiddeling	Buurtbemiddeling voor en door	Thuis op Straat
Kinderspeelbureau	Kinderen van basisscholen uit tv, internet en krant	Basisscholen uit Camisse
	Radio uitzendingen door bewoners over het dagelijks leven in Camisse	Werkplaats Camisse

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...NAAR EEN GROENE DUURZAME OASE



Pagina 5

Het respect in de sociale omgeving is ook terug te vinden in de omgang met de natuurlijke omgeving. De wijk is groen, en dan niet alleen het Amelandseplein, Van Swietenhof, de Lepelaarsingel of de stukken die grenzen aan het Zuiderpark. Er zijn kruidentuinen waar iedereen bieslook, peterselle of koriander kan halen. En in de moestuin naast de kerk aan de Carnissesingel worden groenten en fruit gekweekt voor de eigen en gezamenlijke keuken. Ook zijn er bloembakken voor de portiekflatjes die door de straatgemeenschap onderhouden worden. Maar het gaat verder dan kleinschalige ingrepen. Ook zijn de huizen in Carnisse geïsoleerd en hebben groene daken of zonnepanelen op het dak. Dat is niet alleen een positieve impuls tegen de klimaatverandering, maar ook voor de eigen portemonnee.

Opa, was Carnisse altijd al zo groen?

"Niet zo groen als het nu is! Natuurlijk had je ook toen al het Van Swietenhof, de Lepelaarsingel en het Amelandseplein. Voortbouwend op de ervaring rond deze groene plekken zijn straten verder vergroend. Ook is de verbinding met het Zuiderpark meer zicht- en voelbaar gemaakt. De oprichting van Burengroen (of heette het nu Burgergroen?) heeft hierin een cruciale rol gespeeld. Dit was een diverse groep van bewoners, professionals en ambtenaren die zich sterk maakten voor een groen en duurzaam Carnisse. Zo hebben zij ook ingezet op zonne-energie en isolatie van huizen. Door toen op lange termijn te denken kunnen we nu lokaal energie in en voor de wijk opwekken. En dat was toen een hele prestatie, want dit stond in die tijd nog niet op de kaart en bovendien waren hier financiële prikkels en kennisimpulsen voor nodig."

	Tuinieren voor en door de wijk en educatieve lessen voor basisscholen	
Groene Klusdagen	Onderhoud en planten van groen met groene vrijwilligers uit de wijk	
Tuinieren bij tennisvereniging Z'67	Stadskwekerij voorgroenten en fruit op zes verlaten tennisbanen	
Tuinen Driemorgenstraat	Het onder begeleiding opknappen van achtertuinen in samenwerking met bewoners	Stichting DOCK
Van Swietenhof binnentuin	Bewoners beheren binnentuin om de cohesie in de wijk te bevorderen	Bewoners rondom Van Swietenhof
Vergroenen van straten	Met bewoners straten vergroenen door middel van plantenbakken en groeituintjes	
Werkgroep Zuiderpark	Bevorderen van natuursamenstelling in Zuiderpark en natuurverbinding met Carnisse	Vrijwilligers uit Charlois en omstreken

...NAAR WOONDIVERSITEIT



Wanen in het Carnisse van 2030 is heel bijzonder, en daar zijn heel wat redenen voor te bedenken. Er is voor elke leeftijd, elke levensfase en elke portemonnee een passende woning te vinden: van een klein studentenappartement, een woon-werk-woning of een 'kangoeroewoning' tot een kleinschalige woonvoorziening met aansluiting op een zorgnetwerk. Op deze manier is het mogelijk om binnen de wijk een nieuwe woning te vinden die past bij een veranderende levensbehoefte. Zo bestaan er ook nieuwe eengezinswoningen, gerestaureerde en samengevoegde woningen in de hippe portiekflats en gerestaureerde monumenten aan de Katendrechtse agedijk

Buurtsteiger	Ter beschikking stellen van een bouwsteiger in de Klaverbuurt voor kleinschalige woningen	Bewonersorganisatie Carnisse (B O C)
Containeractie / Tuinen opruimen	Ter beschikking stellen van containers voor het opruimen van schuren en tuinen	Stichting DOCK
Fysieke aanpak Klaverbuurt	Middels WE-stimulering (en evt. aansluitingen) woningen opleggen	
Fysieke aanpak Oud-Carnisse	Renovatie en waar noodzakelijk slooptnieuwbouw van slechte	
WE Ondersteuning	Bureau dat ondersteuning biedt aan huiseigenaren bij administratieve en juridische zaken	

Hoe lang woont u al in dit mooie huis, buurman?

"Zo'n 15 jaar. We hebben dit huis helemaal opgeknapt, want het waren ooit twee aparte woningen die in mindere staat waren. We hebben die klushuizen, zo heette die toen, samengevoegd. Die mogelijkheid werd ons geboden door een stimuleringsprogramma dat als doel had om bestaande woningen te verbeteren en VVE's te activeren. Dat is straat voor straat opgestart om zich vervolgens uit te breiden over heel Charlois. Op sommige plekken was renovatie echter niet mogelijk. Zo is het huis waar jij binnenkort op jezelf gaat wonen nieuw gebouwd, waaruit blijkt dat het huidige woonaanbod levenslooptbestendig is. In die tijd is trouwens ook ingezet om de buitenruimte te verfraaien en dan niet alleen het vergoenen van de publieke ruimte, maar ook door gezamenlijke binnentuinen te creëren. Bewoners voegden tuinen samen (of adopteerden deze van burens) die zij tot de dag van vandaag samen onderhouden."

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...NAAR EEN LOKALE SOCIALE ECONOMIE



Pagina 9

Het winkeliersklimaat in 2030 is bruisend – niet alleen zijn de winkeliers goed bekend met elkaar, maar ook met hun clientele en hebben zij een sterke aansluiting met de wijk. Daardoor kunnen ze goed inspelen op nieuwe vragen en gezamenlijk acties ondernemen. Economisch staat Camisse ook sterk door de toegenomen werkgelegenheid binnen een groot aantal zorgvoorzieningen en coöperatieve ondernemingen. Daarnaast is Camisse een broedplek geworden voor innovatieve vakmensen, kunstenaars en ondernemers die nauw samenwerken en niet alleen in de wijk werken, maar er ook wonen en daardoor een lokale sociale economie vormgeven.

	Talentontwikkeling d.m.v. work shops voor en door bewoners (gratis)	Bewonersorganisatie Camisse
	Samenwerkingsverband van winkeliers om leefbaarheid te	Ondernemersvereniging
	Het ruilen van diensten en goede renbevoorraden (d.m.v. punten systeem)	Stichting DOCK
Voedselbank en kledingbank	Ter beschikking stellen van voedsel en kleding aan bewoners	Kerk van Nazarener

Wat een mooie Bed & Breakfast is dit, mevrouw!

"Dank u – daar hebben we met z'n allen hard aan gewerkt. De Bed & Breakfast draait gedeeltelijk op de enthousiaste inzet van vrijwilligers en heeft geen winstoogmerk. Het is de uitkomst van een langdurige collectieve inzet. Zo probeerde de gemeente in 2012 al meer (ambachtelijke) ondernemers naar Camisse te trekken door middel van aantrekkelijke subsidies. Daarnaast werd in dit ja ar ook het idee van een ruiddienst opgepakt door bewoners en DOCK. In Arend & Zeemeeuw werd toen een LETS-winkel geopend. Na 2015 is het gebied rond de Netto, dat altijd al de huiskamer van de wijk was, uitgebreid en is de oost- en westkant van de wijk door een hele rij winkels verbonden. Dit is toen ondersteund door het bouwcoöperatief 'samen klussen aan Camisse', dat gerund werd door ambachtslieden en werklui die op dat moment zonder werk zaten. Samen met de woningcoöperaties, VVE's en wat vroeger als de 'hangjeugd' werd beschouwd zijn er sinds 2020 niet al/een winkels maar ook veel huizen in Camisse opgeknapt en wordt het ja arlijkse onderhoud nog altijd door dit coöperatief verzorgd. In deze periode hebben wij toen ook deze Bed & Breakfast opgezet."

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...NAAR PLEKKEN VOOR IEDEREEN



Page 11

Ontmoetingsplekken zijn vanzelfsprekend in 2030. Mensen weten waar ze terecht kunnen met vragen en activiteiten. Het hart van de wijk is het vernieuwde Arend & Zeemeeuw, dat gerund wordt door de lokale gemeenschap. Hierdoor zijn de kosten laag en het profijt hoog. Daar spijkeren jongeren hun kennis en vaardigheden bij, worden professionals en vrijwilligers ingezet op specifieke vragen en wordt de plaatselijke kringloop- en ruilwinkel gerund. De ruilwinkel, daar kun je diensten en goederen ruilen en met de lokale munteenheid - 'de Zuiderling' betalen

	Groep bewoners die zich inzet voor duurzaam behoud van	Actiegroep Behoud Arend & Zee
Comissie Got Talent	Bewoners presenteren hun talenten op het gebied van zang, muziek, poëzie, etc	Bewonersorganisatie Camisse
Speeltuin Chartois	Faciliteiten bieden voor kinderen zoals speeltoestellen, bordspellen en speelgoed	Speeltuin Chartois
I'Zonnetje (Amelandseplein)	Speelcontainer bemand door bewoners voor actieve jeugd op Amelandseplein	Thuis op Straat
Zomerterras (Amelandseplein)	Heliaanbieden van bv. koffie en thee aan bewoners om cohesie in wijk te verbeteren	Amelandsepleincommissie
Werkplaats Camisse	Ontmoetingsplek voor bewoners uit Camisse met workshops en dergelijke	Werkplaats Camisse

Meester, waar kunnen wij onze presentatie over de historie van Camisse geven?

'De beste plek is Arend & Zeemeeuw. Die heeft namelijk historische en symbolische waarde. Met de opkomst van alle digitale mogelijkheden zo'n twintig jaar geleden werd duidelijk dat juist ook behoefte bestond aan persoonlijke ontmoetingsplaatsen. Dat was dan ook een van de redenen voor het behoud van Arend & Zeemeeuw. In die tijd werd het gebouw met professionele ondersteuning overeind gehouden, maar nu heeft de lokale gemeenschap het roer helemaal overgenomen. Zo ondersteun ik af en toe ook nog in de kringloop- en ruilwinkel die daar is gevestigd. Maar jullie kunnen ook in een van de roulerende cars presenteren. Die zijn ook rond die tijd bedacht. Door die cars komen mensen overal een keer binnen en kan men naast een bakje koffie, ook van de tentoonstellingen van lokale ondernemers en kunstenaars genieten. Al die ontmoetingsplekken zijn door de jaren heen betekenisvol geworden voor de wijk - iedereen kent ze en weet ze te vinden.

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...NAAR SAMENWERKEN AAN BLOEI



Camiisse is in Rotterdam bekend komen te staan om de effectieve en op gelijkwaardigheid en onderling respect gebaseerde samenwerking tussen professionals, beleidsmakers en lokale gemeenschappen. Door in te zetten op een gezamenlijk verhaal en gezamenlijke taal is gewerkt aan een Bloeiend Camiisse, waarin plaats is voor innovatieve en alternatieve praktijken. Professionals worden nu bijvoorbeeld in hun inwerktijd door de lokale gemeenschap opgevangen en wegwijds gemaakt. Ook heeft de wijk een beslissingsrecht bij het werven van nieuwe wijkprofessionals en het verdelen van middelen via een betrokken en actieve wijkraad. De wensen van de gemeenschap zijn leidend bij het vormgeven van beleid en mensen in Camiisse zijn daardoor bovengemiddeld in politiek geïnteresseerd

Die samenwerking lijkt hier wel vanzelfsprekend te gaan, is dat altijd zo geweest Raadvrouw?

"Nee! Oh, toen we zo'n kleine twintig jaar geleden begonnen was er slechts sprake van 'inspraak'. Dat hielt in dat je op bewonersbijeenkomsten je zeg je mocht doen om vervolgens af te wachten tot de volgende bijeenkomst waar je hetzelfde zeg je kon doen. Bovendien waren er zoveel projecten, partijen en professionals in de wijk actief dat niemand meer wist wie nou wat precies deed. Op een gegeven moment was de maat vol en heet men een wijkraad opgericht waar bewoners, ondernemers en instellingen zitting in konden nemen. De buurt zijn wij en wij zijn de buurt' was de slogan. In de wijkraad werd gewerkt aan een gedeeld beslissingsrecht en duurzame samenwerking. Uit dat idee een plek gegroeid waar mensen elkaar fysiek en digitaal konden ontmoeten en elkaar op de hoogte konden houden van de gebeurtenissen en activiteiten in Camiisse."

	Verbindingleggen tussendenken over de toekomst en doen in het heden	Diverse koplopersuit Camiisse
	Laagdrempelig servicepunt voor informatie en doorverwijzing	Bewonersorganisatie Camiisse (B.O.C)
Eiland van Hoop	Samenwerking tussen vrijwilligers/professionals rondom problematiek van bewoners die tussenwalen schip vallen!	Kerk van Nazarener
Schoolsport vereniging	Samenwerking tussen scholensportverenigingen voor sport bevordering bij jeugd	Sportsupport
	Verbinding tussen school, thuis, burlen ende wijk verbeteren	Creatief Beheer, Bureau Frontlijn Rotterdam Vakmanstad & DRIFT
Vraagwijzer servicepunt Charlois Noord	Informatiepunt voor vragen van bewoners over bv. zorg, gezondheid, financiën, etc	Deelgemeente Charlois

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WAAROM NADENKEN OVER 2030?



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Vandaag de dag is dit toekomstbeeld uit 2030 moeilijk voor te stellen. Het wordt gezien als idealistisch of utopisch. En dat is het in sommige aspecten wellicht ook. Tegelijkertijd geeft het wel richting: richting aan de toekomst van Carnisse, richting aan de vele verschillende initiatieven in de wijk en richting aan het samenleven in de wijk. Zie het als een soort rode lijn die de noodzakelijke continuïteit waarborgt. Weinig mensen zullen het oneens zijn met dit droombeeld van Carnisse. Maar dat is ook de kracht: het is een verhaal waar iedereen zijn eigen droom in kwijt kan en aan kan verbinden.

Dit betekent niet dat iedereen in Carnisse positief is over de toekomst. Los van de idealistische en utopische beelden in deze visie worden namelijk ook doomscearario's geschetst van een toekomstig Carnisse. Uiteraard is het onduidelijk wat de toekomst zal brengen. Dit wordt nog eens versterkt door de huidige turbulente en onzekere tijd van bezuinigingen, reorganisaties en crises. Juist in dit soort tijden is de neiging sterker om gevangen te blijven in het heden. En dat is op zich geen probleem. Tegelijkertijd kun je wel richting geven aan het heden. En dat is wat geprobeerd is met deze visie. Door een rode draad te schetsen en een brug te slaan met wat er nu gebeurt (zie acties in de tabellen op de vorige pagina's) is die richting verkend en wordt een alternatief aangereikt op de scepsis en negatieve beeldvorming.

Wat nou Bloeiend Carnisse?

Allesmaal leuk en aardig, maar we leven in 2012. In het hier en nu. Waarom zou ik me druk maken om 2030? En wie zegt dat ik er dan nog wel ben? We hebben nu last van sluitende voorzieningen, sociaal isolement, zwelldruid, te weinig inkomsten en slecht onderhouden woningen. En dit terwijl de huidige bezuinigingen en crises de situatie alleen maar meer nijpend maken. Dan hebben we niks aan een stel mooie plaatjes en lege woorden. We hebben te maken met een bom die gaat barsten. Als het zo door gaat dan wordt Carnisse een ghetto. Een ghetto waar niemand meer over straat durft, waar huizen zijn dichtgetimmerd en waar armoede en angst heersen. In zo'n Carnisse gaat helemaal niks bloeien, maar bloeden

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HOE KAN CARNISSE TOT BLOEI KOMEN?

Dat is de vraag waarover een groep koplopers uit Carnisse zich de afgelopen maanden heeft gebogen. In een zoektocht naar de kernen van een Bloeiend Carnisse heeft deze groep bewoners, ondernemers en professionals uit de wijk Carnisse de toekomstvisie Bloeiend Carnisse geformuleerd. Deze visie geeft aan wat nodig is voor een toekomstig Carnisse en hoe daar nu al mee begonnen kan worden. Het is mede gebaseerd op meerdere bijeenkomsten, interviews, eerder onderzoek in Carnisse en een analyse van bestaande initiatieven. De coördinatie van deze visievorming lag bij een team van DRIFT & TU Delft, bestaand uit Frank van Steenberghe, Julia Wittmayer en Jaco Quist, en werden uitgevoerd als onderdeel van Veerkracht Carnisse (www.veerkrachtcarnisse.nl) en het FP7-project InContext van de Europese Unie.

VEERKRACHT
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Bloeiend Carnisse

UITNODIGING TOT MEEBLOEIEN!

UITNODIGING

Wat betekent dit droombeeld voor het heden? Hoe kunnen we stappen zetten in de gewenste richting? Hoe kunnen we mensen en partijen mobiliseren? Waar geven we nu prioriteit aan? Door te experimenteren en in te zetten op alternatieven voor het bestaande, kunnen we gezamenlijk werken aan een Bloeiend Carnisse.

Dit kan door het heden en de toekomst van Carnisse te bediscussieren met elkaar. Door dit toekomstbeeld uit te dragen en met elkaar te delen. Door aan te sluiten bij de huidige acties in Carnisse of door nieuwe projecten op te starten. Nieuwe 'icoonprojecten' die de bloei van Carnisse verder inzichtelijk maken.

Oftewel: Wil je de visie verrijken met andere toekomstbeelden of perspectieven? Wil je aansluiten bij de huidige acties in Carnisse? Of wil je de toekomst dichterbij halen en een nieuw project opstarten in Carnisse?

Bloei dan mee in Carnisse!

MOGELIJKE ICOONPROJECTEN

In de visie worden mogelijke 'icoonprojecten' genoemd. Dit zijn omvangrijke en vernieuwende projecten die Carnisse op de kaart zetten en laten bloeien. Hieronder een overzicht:

- Lokaal bouwcoöperatief met klusmannen en vrouwen uit de wijk die werken aan de woondiversiteit in Carnisse.
- Het (her-)openen van ontmoetingsplekken, zoals een hernieuwd AZ voor en door de wijk.
- Burengroen of Burgergroen: groente en fruit verbouwen voor en door de wijk, tuinen adopteren, etc.
- Bed & Breakfast zonder winstlogoemerk.
- Creatief taallab (bv. taal, theater, poëzie).
- Wijkraad met beslissingsrecht.
- Ruilwinkel en/of ruildienst.
- Schone energie opwekken door middel van zonnepanelen en groene daken.
-?

CONTACT

Geïnteresseerd om mee te bloeien in Carnisse of in meer informatie over Bloeiend Carnisse? Neem dan contact met de groep koplopers uit Carnisse en/of de coördinatoren via: bloeiendcarnisse@live.nl

UITNODIGING TOT MEEBLOEIEN
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References

1. Wittmayer, J. M.; Schöpke, N.; van Steenbergen, F.; Omann, I. Making sense of sustainability transitions locally: how action research contributes to addressing societal challenges. *Crit. Policy Stud.* **2014**, *8*, 37–41.
2. Loorbach, D. A. Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance, An Int. J. Policy, Adm. Institutions.* **2010**, *23*, 161–183.
3. Greenwood, D. J.; Levin, M. *Action research. Social research for social change.*; 2nd ed.; Sage: Thousand Oaks, CA, 2007.
4. Kemmis, S. What is to be done? The place of action research. *Educ. Action Res.* **2010**, *18*, 417–427.
5. Loorbach, D. Transition management. New mode of governance for sustainable development 2007.
6. Grin, J.; Rotmans, J.; Schot, J. Transitions to sustainable development: new directions in the study of long term transformative change. 2010, Part 1.
7. Wittmayer, J.; Van Steenbergen, F.; Quist, J.; Loorbach, D.; Hoogland, C. *The community arena: a co-creation tool for sustainable behaviour by local communities methodological guidelines. Deliverable 4.1*; 2011.
8. Wittmayer, J. M.; Schöpke, N. Action, research and participation: roles of researchers in sustainability transitions. *Sustain. Sci.* **2014**, *9*, 483–496.
9. Wittmayer, Julia; Mock, Mirijam; van Steenbergen, Frank; Baasch, Stefanie; Omann, I.; Schöpke, N. *Taking stock – Three years of addressing societal challenges on community level through action research. Pilot specific synthesis report*; Berlin, 2013.
10. Wittmayer, J.; Steenbergen, F. van; Bohunovsky, L.; Baasch, S.; Quist, J.; Loorbach, D.; Hoogland, C. *Pilot projects getting started Year 1 Status Report*; Berlin, 2011.
11. Wittmayer, J.; Steenbergen, F. van; Bohunovsky, L.; Baasch, S.; Quist, J.; Loorbach, D.; Hoogland, C. *Pilot projects on a roll - Year 2 pilot specific reports*; Berlin, 2012.
12. Wittmayer, J.; van Steenbergen, F.; Baasch, S.; Feiner, G.; Mock, M.; Omann, I. *Pilot projects rounding up Year 3 Pilot-Specific Report*; Berlin, 2013.
13. Wittmayer, J.; Schöpke, N.; Feiner, G.; Piotrowski, R.; Steenbergen, F. Van; Baasch, S. Action Research for Sustainability Reflections on transition management in practice Authors : **2013**, 1–24.