Managing group processes in transdisciplinary future studies: How to facilitate social learning and capacity building for self-organised action towards sustainable urban development?

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Challenges for future urban development are complex and characterised by ambiguous problem definitions or unclear, conflicting and dynamically changing goals. Transdisciplinary research promises new ways of dealing with uncertainty and complexity by including non-academic actors into the research process and fostering social learning for better and more effective research. Depending on the level of participation and the number and heterogeneity of actors involved, appropriate designs for group processes but also associated skills are essential. In this article, we scrutinise the dynamics of groups to better understand how to effectively promote social learning and capacity building for self-organised action beyond project enc. Based on experiences of a participatory scenario planning process in the city of Korneuburg and substantiated with theories on groups and their development, we conclude with five propositions emphasising researchers’ responsibility in processes of societal change, the role of external facilitators, the scope and time needed for group building, the acknowledgement of various phases of group processes as well as requirements for social learning.

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1. Introduction

Challenges for future regional and urban development – such as climate change, secure, sustainable and competitive energy, demographic change, globalisation or social polarisation – are often complex and characterised by ambiguous problem definitions or unclear, conflicting and dynamically changing goals (EU REGIONS, 2008). Therefore, the task of designing long-term guidance for local governments is particularly challenging. Furthermore, decisions based on these orientations usually affect many people and involve high costs and low reversibility. High levels of complexity, uncertainty and high decision stakes call for new forms of knowledge production. Transdisciplinary research focuses (Hirsch Hadorn et al., 2008; Hirsch Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006; Lang et al., 2012) on context-specific real-world problems and facilitate inter- and transdisciplinary collaboration between scientists and actors outside academia.

Scholars in future studies, who are willing to take responsibility for the fate of future generations and to contribute to actual solutions for real-world problems, start questioning the linear innovation model, where scientists produce objective
knowledge that is communicated by consultants, media or the education system to citizens, policy makers or businesses, who should embrace the scientific knowledge in a rather unquestioned manner. Adaptive, self-organising societies instead benefit from reflexive citizens and decision makers caring for innovation systems that foster social learning processes and direct interactions with scientists. Thus, decision-making has become a social issue which embraces the mobilisation of different knowledge sources (Edelenbos, van Buuren, & van Schie, 2011).

Lozano (2011) appraises transdisciplinarity, among other collaborative approaches, as one key element to contribute to a new paradigm towards sustainability as it helps finding new ways of learning and fostering creativity. Transdisciplinary research promises to foster learning processes and facilitates capacity building concerning local self-organisation (Elzinga, 2008; Lang et al., 2012; Mobjörk, 2010).

But which process designs encourage learning processes and thus improve the quality and societal effectiveness of transdisciplinary future studies? Several authors of the growing body of transdisciplinary literature propose analytical frameworks and factors of success which emphasise the importance of the quality of processes (Hegger, Lamers, Van Zeijl-Roezema, & Dieperink, 2012; Walter, Helgenberger, Wiek, & Scholz, 2007; Wiesmann et al., 2008) and mention the management of participatory group processes as a main challenge (Enengel et al., 2012; Mobjörk, 2010; Truffer, 2007; Wiesmann et al., 2008). Various papers call for attention to the design and quality of science/non-science interface, by, for example claiming an epistemmediator (Wiek, 2007), boundary management (Cash et al., 2003; Pohl et al., 2010), interface management (Truffer, 2007), or the development of adequate methods and skills (Edelenbos et al., 2011; Pohl et al., 2010). But there has been little reflection on the “how to” and the needs occurring on individual and group level in learning processes. In his review of relevant literature on effective participation, Newig (2007) addresses the fairness of the procedures, transparency, open communication, early involvement, joint determination of process rules, impartiality of mediation and openness regarding the decision to be made. This article adds dynamics of groups as another perspective to better understand effective designs for transdisciplinary future studies that promote social learning and capacity building for self-organised action beyond guided research activities.

Our reflections are substantiated by theoretical expertise on groups and learning from psychology, sociology and educational science as well as by empirical experiences from a transdisciplinary scenario project on future urban perspectives for the city of Korneuburg, Austria. This project, initiated by citizens and co-financed by the city, embraced broad local involvement (representatives of all political parties and administration, civil society groups, business representatives and citizens), an interdisciplinary scientific team and professional facilitators for participatory process design, moderation and post processing after the end of the research project.

After shortly presenting our methodology, this article starts with a brief introduction to transdisciplinary research and highlights participatory group processes and social learning as two core characteristics of transdisciplinarity. Subsequently, Section 4 adds insight into some core theories on groups, group development and social learning, and introduces the concept of Theme Centered Interaction (TCI) as a framework for working and learning with groups. Section 5 outlines the transdisciplinary scenario project “Korneuburg 2036” and discusses the empirical insights from the perspective of group and learning theories. Finally, we conclude with some lessons learned (Section 6) on researchers’ responsibility in processes of societal change, the role of external facilitators, the space and time needed for group building and the acknowledgement of various group processes along the different project phases.

2. Methodology

This article addresses the quality of participatory group and learning processes in the context of transdisciplinary research and the need for corresponding knowledge, skills and competences of scientists involved. The empirical basis of the article is a scenario project on future urban perspectives for the city of Korneuburg in Austria (Section 5). When designing the project, we considered theoretical and practical insights into group processes, as briefly sketched in Section 4 (the first author is trained in Theme Centred Interaction and is also familiar with other recent participatory approaches such as Art of Hosting, on which we did not expand within this article). As outcome of our analysis, we derived five propositions (see Section 6) from group theory (Section 4) and our own implementation experiences of the scenario project (Section 5). Our propositions rest upon four working steps:

- Regularly reflection of the project status during the project within the interdisciplinary team (including facilitators) regarding project progress but also group and learning processes, occurring difficulties, etc.
- Ex-post document analysis of written sources (protocols, presentations).
- Questionnaire-based mid-term and final project evaluation by local project partners (steering wheel), supplemented by reflective conversations. This survey allowed us to analyse satisfaction with process design, learning possibilities, individual learning outcomes, etc.
- Substantiation of our findings by theoretical expertise on group processes and social learning from psychology, sociology and educational science (Section 4).

As a next step we discussed our empirically derived propositions against the literature on transdisciplinary research in order to figure out (Fig. 1), whether our experiences are in accordance with or in contradiction to the actual transdisciplinarity discourse and what aspects are new and innovative (Section 6).
3. Transdisciplinary research in sustainability sciences – entering the agora of social learning

The emergence of transdisciplinarity as a form of research is driven by the need to solve problems of the real world and has changed the relationship between science and the real world (Hirsch Hadorn et al., 2008). Individual disciplines and experts increasingly fail in providing comprehensive answers to the complex challenges of the 21st century, which thus makes way for interactive ways of knowledge production and solution finding (Max-Neef, 2005; Pohl et al., 2010). Especially in the field of sustainable development, integrative and participatory approaches gain in importance in order to create socially robust solutions (Gibbons et al., 1994; Lang et al., 2012).

In a broad sense, transdisciplinarity can be captured as a reflexive, integrative and method-driven research practice, “aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge” (Lang et al., 2012). Thus, knowledge production takes place within an interactive learning process, involving discussion and negotiation, and leading to a common knowledge base which may fulfil scientific standards (validity), demands of the political and administrative system (policy relevance) but also social robustness (societal relevance) (Edelenbos et al., 2011). Structuring this “agora” for social learning calls for an epistemological, methodological and conceptual framework that goes beyond disciplinary research (Walter et al., 2007) and also requires a different understanding of roles, competences and skills. Pohl et al. (2010) identified three major challenges to scientists: (1) the “need to advocate the co-existence of thought collectives and thought styles”, (2) the “need to interrelate the perspectives of the different thought collectives on the issue at stake” and (3) the “need to promote the orientation towards sustainable development”.

Thus, transdisciplinary research might not only offer a way to bring up case-specific policy and societally relevant results but – seen as a holistic learning process – also fosters capacity building for transforming knowledge into action, as it allows for personal development, value changes, development and testing of alternative action strategies.

Within the scope of this article, we focus on two core dimensions of transdisciplinary research: the involvement of different actors (participation), which implies working with individuals and groups, and the dimension of social learning.

Participation of actors outside academia is a defining characteristic of transdisciplinary projects. As transdisciplinary projects deal with complex (real-world) problems, the involvement of scientists and societal actors is critically to ensure “that the essential knowledge from all relevant disciplines and actor groups related to the problem is incorporated” and not least “to increase legitimacy, ownership, and accountability for the problem, as well as for the solution options” (Hirsch Hadorn et al., 2006; Lang et al., 2012). Depth and purpose of actors’ participation in transdisciplinary research nevertheless may differ substantially and interaction between societal practice and scientific practice may be arranged in different ways. Wiek (2007) suggests four levels of interaction, building upon Arnsteins ladder of participation and decision-making processes by Arnstein (1969) and Krüttli, Stauffacher, Flüeler, and Scholz (2006) as shown in Fig. 2.

While at consultatory, informational levels (1 and 2), societal actors are involved as consultants and hold a mandate to respond and react to research, in participatory approaches (levels 3 and 4) they are active participants in the knowledge production process and their knowledge is equally valuable to scientific knowledge (Mobjörik, 2010).

Fig. 2 also shows that participation is inextricably linked with social learning, although in different intensity. There is a broad range of contributions in literature highlighting participation processes as a field for social learning (Albert, Zimmermann, Kieling, & von Haaren, 2012; Dlouhá, Barton, Janoušková, & Dlouhý, 2013; Carmendia & Stagl, 2010). Learning is recognised as a key skill for sustainable development as it may change mental models and behaviours (Senge, 2010), and allows dealing with new circumstances and changes (Lozano, 2011; Peer & Stoegelehner, 2013). The willingness of the participants to adjust their perceptions and openness to a learning process are fundamental conditions to reach these goals (Mobjörik, 2010).

Subsequently our interest focuses on how to involve multiple actors into common group and learning-processes on eye-level and how to facilitate capacity building and action ability beyond project run-time?
4. To play a symphony it takes an orchestra – what we know about groups

Living in groups is inextricably linked to our human existence and highly affects our everyday life – we work, socialise, share our interests, make decisions and frame our realities in groups (Hogg & Vaughan, 2008). What we do, where and how we live, is largely determined by groups, e.g. government bodies, committees or juries. We are even influenced by those groups, which we do not belong to, either by choice or by exclusion (Hogg & Vaughan, 2008; Stahl, 2007). Group competences and willingness to include ourselves into group contexts over and over again are vital social necessities (Stahl, 2007).

Various theories explain the characteristics of groups, group development stages and roles allocation within groups. Certainly, these theories differ depending on the scientific background (psychologies, psychoanalysis, education, sociology, etc.) as well as the context of the groups explained, e.g. therapy groups, groups that aim at individual development, learning groups or working teams (Shaffer & Galinsky, 1989). The following sections provide a brief insight into how groups can be characterised in general and how they evolve in time.

4.1. Coming together is a beginning; keeping together is progress – basic principles on groups and their development

When we talk about groups, what exactly do we mean? There is not a single, broadly accepted definition. The social psychologists Johnson and Johnson (Johnson & Johnson, 1987) give the following definition: “A group is two or more individuals in face-to-face interaction, each aware of his or her membership in the group, each aware of others who belong to the group, and each aware of their positive interdependence as they strive to achieve mutual goals”. From a system perspective, a group is assumed as an independent living social system which “is born of the interactions of its members; however, the behaviour of the system is more dependent on the arrangements, relatedness and interconnectedness of the members than on just the members themselves” (Spindler & Wagenheim, 2013). Among sociologists a group is defined as a “set of people who interact more or less regularly with one another and who are conscious of their identity as a group” (Newman, 2010). Further their communication and interaction is geared to the achievement of a common goal and therefore a group requires common norms and group specific roles (Korte & Schäfers, 2010).

To sum up, we differentiate three group-constituting characteristics for this article:

(1) interaction between individuals, consciousness of other members and a common identity,
(2) common-goal-orientation, and
(3) specific patterns of interaction (norms and roles).

Groups, of course, may differ in every sense: in their number of members (large vs. small groups), span of life (short-lived vs. long lasting groups), structural pattern (informally vs. highly structured and organised), spatial dimension (concentrated vs. dispersed), purpose (more general vs. highly specific) to name but a few (Hogg & Vaughan, 2008).

According to the above mentioned, groups are highly characterised by interaction. “Groups […] do not exist as established, pre-defined units. They develop through communication, which means the relation between elements” (Schüller & Zvacek, 2013). In other words, “groups move both as a unit, and through the interaction of the various elements within them” (Jaques & Salmon, 2007). Even if groups are unique systems, whose evolution depends on the specific internal interactions and external context conditions, groups usually go through typical generic stages. These group development stages are commonly explained by the five-stage developmental sequence of forming-storming-norming-performing-adjourning (Bion, 1961; Guirdham, 1995; Hogg & Vaughan, 2008; Tuckman, 1965). Each stage is characterised by specific observable behaviours, feelings, needs and as a consequence calls for particular roles of leadership. Fig. 3 gives a synopsis of the different stages.
In real life, groups very often do not go through a definite chronology of stages as suggested above, but rather follow an iterative process, stages go hand in hand and interlace with one and each other. Yet within each single meeting or workshop, some or even all of these phases may be passed through, so an awareness of attached needs and possible expressions may be useful at each point of a group process.

To sum up this section, groups are all about interaction and dynamically evolve over time. But how can we use this knowledge for actively working with groups in transdisciplinary future research? The following section introduces a practical framework for balancing between individual and group needs and the progress of the common issue during a process.

4.2. Working together is success – Theme-Centered-Interaction (TCI) as a practical framework for working in and with groups

During the 1950s and 1960s the German psychoanalyst Ruth Cohn established the concept of Theme-Centered-Interaction (TCI). Although its roots are in psychoanalysis and humanistic psychology, TCI was intended for non-therapeutic settings and work contexts, too. TCI defines basic principles for personal development and working with groups. It fosters an active, creative and discovering process of social learning, which Ruth Cohn called living learning®. Living learning refers to a holistic perception of learning, including intellect, emotionality and body, thought, feelings and action (Stollberg & Schneider-Landolf, 2009).

During the 1970s, TCI became appreciated in social-therapeutic processes targeting at societal but also ecological awareness.

Traditional leader-centred structures, such as hierarchical or expert bodies, often are not an adequate way to deal with complex sustainability concerns that affect a broad range of people involved. By bringing the common concern (instead of the central leader or expert) to the centre stage, the theme becomes the leading structure, offering a productive focus for communication, cooperation and learning in groups on eye-level. Cooperative learning and negotiation processes replace traditional hierarchical structures. Instead of leading the discussion, leaders start creating and holding the space for productive cooperation (facilitating vs. steering). TCI therefore provides a practical framework that can be applied to a number of group settings (Jaques & Salmon, 2007).

Part of TCI’s theoretical basis is the four factor model, which offers a compass for planning, organising, conducting and reflecting group processes. The model differentiates four factors that influence group processes: each single person with his/her interests and needs, including the leader (called I), the interaction and relational pattern between all participants (We), the theme, purpose, objective on behalf of which the individuals get together (It) and the framework, the physical or virtual, social and temporal environment, conditions, constraints and circumstances in which cooperation takes place (Globe). The globe therefore includes elements, which can actively be influenced by the leader or the group, such as the size of the room or the arrangement of the furniture but also externally driven factors like emotional, political or social backgrounds (Jaques & Salmon, 2007; Langmaack, 2004; Spielmann, 2009).

The four factors must have equal weight and get equal attention to facilitate living learning, Cohn’s term for action oriented, social learning, cooperation, transparent interaction and growth-enhancing communication (Kügler, 2009). This does not mean that all factors have to be balanced at each time and individual step, yet dynamic balance should be kept in consciousness throughout the process. Whenever one side prevails, obstructive side effects may occur (Hornecker, 2001). A domination of the theme, for example, may lead to tediousness or a lack of personal relation to the topic, individual and
group needs will be ignored, individuals may lose their sense of participating. An undue concentration on group dynamic concerns and feelings – positive as well as negative – may inhibit work progress. Too much focus on individual needs, on the other hand, will prohibit a sense of cohesiveness, collaborative insights and common relevance of work (Hornecker, 2001). Also neglecting globe-factors can lead to difficulties in participation and social learning.

In addition to the theoretical considerations of TCI discussed above, the postulate “disturbances take precedence” shall also be briefly introduced. It states, that any disruption to the groups working capacity, whether it derives from the I, We, It or the Globe, has to be addressed before continuing with the work (Dietrich, 2013). Neglecting disturbances at any time of a process may lead to recurring trouble and thus obstruct social learning processes.

4.3. Involve me and I learn – social learning in transdisciplinary groups

Transdisciplinary research is about more than generating facts and data to support decision-making. It is also about capacity building for action by encouraging intense learning processes (Elzinga, 2008; Lang et al., 2012; Mobjörk, 2010). Learning thereby “involves the enrichment of existing knowledge and the creation of new knowledge”, whereas knowledge can be outlined as “a function of information, experience, skills and attitudes” or in other words the “capacity that enables a person to execute a certain task” (Van Der Veen & Korthals Altes, 2012). Senge and Scharmer (2001) outline knowledge creation as an “intensely human, messy process of imagination, invention and learning from mistakes, embedded in a web of human relationships” (Arnstein, 1969). This characterisation links to the concept of social learning, which is increasingly discussed in sustainability science (Collins & Ison, 2009).

Social learning occurs through collective engagement and interaction with others, fosters co-creation of knowledge and means, required to transform a situation and therefore leads to concerted action (Collins & Ison, 2009). Thus, social learning stands for a change in understanding and skills taking place in groups of actors (communities of practice) through social interactions (Albert et al., 2012). Collins and Ison (2009) even propose social learning as the highest level of participation, i.e. adding to the sequence of information, consultation and participation the level of social learning. Social learning takes effect, where information, consultation and participation may be necessary but insufficient for improving complex situations.

To better understand different qualities of learning, we take a closer look at the learning loops of Argyris and Schön (Albert et al., 2012; Argyris & Schön, 1978; Lozano, 2011; Peer & Stoeglehner, 2013). While single-loop learning refers to detecting and correcting errors and adjusting procedures (adaptive learning; Are we doing things right?), double-loop learning involves evaluation, reflection of and changes in underlying assumptions, norms, objectives and visions (generative learning; Are we doing the right things?) (Garmendia & Stagl, 2010; Senge, 2010; Tosey, Visser, & Saunders, 2012). Garmendia and Stagl (2010) highlight “the relevance of the second type of learning as a way to adapt to a continuously changing and increasingly complex environment, through collaborative action and dialogue that rests in the reflection of pre-existing values and assumptions”. In theory we also find triple-loop learning, which is not consensually defined at the same extent (Tosey et al., 2012), but more generally interpreted as a third level. Taking it as an equivalent to Argyris and Schön’s concept of deuteron learning, it refers to the learning ability itself (double reflective learning). This means “to learn how to carry out single- and double-loop learning” (Argyris & Schön, 1978) and to continually reflect the learning process, the contexts within which learning occurs, as well as assumptions and values motivating learning and influencing its outcomes (Yuthas, Dillard, & Rogers, 2004).

Basically, learning starts at an individual level (Gubbins & MacCurtain, 2008; Van Der Veen & Korthals Altes, 2012), which forms the vital base for group, organisational and societal learning (Garavan & McCarthy, 2008; Lozano, 2011), whereby in a group the “combined intelligence in the team exceeds the sum of the intelligence of its individuals, and the team develops extraordinary capacities for collaborative action” (Lozano, 2011). Thus, the focus of learning in groups “is on synergy and advantages for the collective … a shared understanding and meaning about the learning process and that new knowledge is developed as a result of this” (Gubbins & MacCurtain, 2008). Outcomes may be cognitive as well as behavioural in nature (Garavan & McCarthy, 2008).

For the design of transdisciplinary research we can subsume that learning processes have a social dimension and are greatly influenced by the interactions of people involved (Dlouhá et al., 2013). Facilitating agoras for social learning with an open and creative atmosphere for learning loops that go beyond adaptive learning may therefore be crucial for fostering capacity for transformative action.

5. Shaping future together – transdisciplinary scenario project “Korneuburg 2036”

The following chapters provide a short overview of the transdisciplinary project “Korneuburg 2036”, conducted from April 2012 to December 2013. Our propositions, formulated in Section 6 are based upon our experiences gained by this research project.

5.1. Project frame and goals

Korneuburg, a medium scale district capital in Lower Austria (approx. 12,000 inhabitants) next-door to the metropolis of Vienna, grappled with identity finding between the poles of urbanity and village quality of living, while low municipal budget, considerable population increase, heterogeneous interests and perceptions of its self-image challenged the city.
A group of involved citizens ("Future Initiative Korneuburg") felt the urge for a common orientation for future, and convinced the municipal government to develop a mission statement for urban planning in close collaboration with citizens and external experts. This mission statement should build a binding guideline for decision-making in future urban planning (e.g., zoning of building land, traffic planning, social infrastructure planning) to ensure a targeted development of the city, instead of uncontrolled growth. Scientists from two universities and various disciplines, as well as professionals in facilitation and moderation, were invited to negotiate a methodological proposal for a participatory planning process according to the city's goals and questions. In addition to the mission statement, a master plan, containing guidelines for implementation of the desired vision for the next fifteen years, is actually being elaborated within a follow-up-project.

5.2. Methodological framework of participatory scenario planning

In urban planning, decision makers are challenged to create forward-thinking strategies, which comply with highly complex issues. In this context, participatory scenario planning offers a method, which does not only rely on scientific and quantifiable expert knowledge (in contrast to prognoses and simulations) but rather integrates context-specific knowledge of local actors (Graf, 2004; McDonald, Deane, Bammer, & McDonald, 2009). Within the “Korneuburg 2036”-project, we relied on building stones of formalised scenario analysis, a structural and development analysis combined with normative future visions of stakeholders (creativity workshops) and a participatory process giving special attention to community building. Several knowledge levels – quantitative and qualitative system knowledge, target knowledge on how the future of Korneuburg could look like in the eyes of the citizens as well as transformation knowledge for achieving the aspirated state – were integrated within this process, in order to obtain a sustainable, broadly accepted and socially robust result. The interactive project design, which was supported by professional facilitators, especially aimed at facilitating social learning processes and thus contributed to community and capacity building. The scientific team carried out mid-term and final evaluations of the participatory process.

5.3. Actors involved and cooperation framework

As a baseline for continuous citizen participation, a representative core team (steering wheel) was formed, which comprised 14 representatives (plus 14 deputies), who collaborated on the project and were entitled to vote in project matters. Besides the present mayor, all political parties, local administration as well as representatives from civil society, business and citizens were involved. An interdisciplinary scientific team of four people (geography, architecture, landscape and regional planning, regional economics), of whom one is holding a certificate in TCI, and two professional facilitators for participatory process design, moderation and post-processing after the end of the project, accompanied the societal actors throughout the whole project.

At the beginning, cooperation rules were worked out jointly (e.g., consensual decision making as a ground rule, adjournment of decisions in case of disagreement and voting rules four persisting disagreements, procedures for changing members). In monthly workshops, external experts, facilitators and steering wheel members worked together on (1) a holistic system analysis and identification of key driving forces for future development, (2) the development and analysis of four plausible, visionary future scenarios, (3) the design and realisation of a “consultation week and citizens vote”, a broad participatory feedback process and (4) the transfer of voting results into a mission statement, complemented by indicators to allow implementation control. Fig. 4 provides an overview of project development and actor’s involvement over time (not including pre- and post-processing phase).

Apart from the steering wheel, the broader involvement of citizens varied in different project phases and ranged from information and consultation to active direct democratic voting. In addition to selective participative events, a web-blog, the city radio as well as an analogue (B)Logbuch, wandering through the cities’ shops and restaurants, allowed permanent communication with citizens.

5.4. Project results

Building upon the structural analysis, the analysis of driving forces and normative future visions of the citizens, we developed four scenarios for future urban development, each with a different key aspect such as Korneuburg as (a) a slow city, (b) being energy-self-sufficient, (c) a regional hub and (d) a water competence centre. The scenarios differed considerably regarding the key driving forces “number of residents” and “settlement development focus” and ranged from small town to rather urban identity. In their distinctness, all four perspectives experienced a high level of acceptance by local government and the acting mayor, who was completely open to the result of the citizens’ vote. During May/June 2012, a provocative campaign (“Korneuburg has no future . . . without you”) drew the citizens’ attention to the possibility of co-creating the common future by voting for their favourite scenario and ranking single elements of all the scenarios provided, respectively. All citizens from 14 years upwards received a questionnaire and about 1600 citizens (14.4%) used their right to vote. Finally, a mission statement based upon the two winner-scenarios (”slow city” and “water competence centre”) was formulated and completed by highly ranked – and suitable – elements of the other two. A chief point of the mission statement is the anchoring of a cooperation culture between citizens and city government for future urban planning. As a next step, first guidelines and indicators to measure and control implementation were defined. All four parties represented in
the local council adopted the mission statement unanimously as a binding guideline for future decision-making. They also decided to proceed with the project for another year to elaborate concrete recommendations for implementation (master plan).

5.5. Process reflection

The following section discusses the experiences we gained throughout the research process, according to actor’s involvement, team building and roles as well as learning and group processes. These experiences lead on to the formulation of five propositions as presented in Section 6. Relevant text sections are marked with references to the corresponding propositions in order to allow for traceability.

5.5.1. Actor’s involvement, team building and roles

As concerned citizens initiated the project, a high degree of motivation and identification characterised the whole process. The municipal government acted with transparency and appreciation regarding the citizens’ volunteer effort. From the beginning of the project it was unfolded, upon which commitment the results would be processed. The questionnaire-based mid-term evaluation among steering-wheel members \((n = 16\), including also deputies) showed, that 92% were confident of the appreciative handling of results by policy makers.

Nevertheless, at the beginning it took almost one year from first contacting the facilitators to the final team building and project start. Particularly at the beginning of the project we were challenged by building the interdisciplinary scientific team (embracing two sub-teams) and get a common orientation of our methods, process understanding and research goals, as we also had very different experience levels with participatory and transdisciplinary research (see Propositions 3 and 4). At two points of the project, namely when finishing the structural analysis (scientific sub team 1) and after consolidating the voted scenarios (scientific sub-team 2) scientists were prepared to back out of the project as our working packages had ended. This turned out to cause irritation to local partners, and finally both scientific sub-teams remained within the project until the end of the project (partly beyond project order) in order to maintain the steady community of learning (see Proposition 1). The presence of external facilitators in pre- and post-processing phase turned out to be particularly crucial. They took over responsibility for the overall process continuity, as they were available as the main points of contact for actors involved at any time of the project and beyond the end of the collaboration with the scientists (see Proposition 2). The facilitators guided the project throughout the whole project run time, and acted at intermediary between practice partners and the scientific team and helped to find a productive and appreciative communication base (see Proposition 2). Every single member and two deputies \((n = 16\) evaluated the quality of facilitation, the external team and it’s competences positively. They pointed out the appreciative atmosphere, a high level of trust, sufficient possibilities to inject/himself into all discussions and
solution finding and would participate again in further projects. Basically, process design and guidance was the facilitators’ task – but soon a small core team, involving one citizen, political and administration representative each, established, and jointly took over responsibility for the whole process (see Proposition 5).

5.5.2. Social learning – from a scientist’s point of view

Especially during the first steps (structural analysis and identification of driving forces) we balanced between expert-input, involvement of local actors and generating/activating group knowledge to build up a common knowledge base.

Both, scientists as well as the local partners, went through intensive learning processes regarding generation of new knowledge but also regarding our system of values. Compromises had to be found on the “right assumptions” and what would be accepted as the “truth” – external expert knowledge was at some points not immediately usable. Some inputs and data took a long time to become accepted and adopted. The driving force “number of residents” for example, was discussed rather controversially and different resentments and prejudices linked to the idea of growth took up much space. Wishes ranged from “conserving” the present village structure to affiliation to the urban system of Vienna. The external perspective and the long term orientation (2036) were particularly helpful for the communication of such delicate issues, but it took approximately one year until local partners had turned from refusal to actively configuring and harnessing their scope of action (see Proposition 5). As the final evaluation revealed, 92% of steering-wheel members (n = 16) noticed a better personal understanding of how the urban system and its government works and 68% felt increased co-responsibility for future development due to their participation.

As such learning and group building processes took time, we could not always easily proceed with methodological steps, meetings etc. and had to adjust our common time frame. At each point we mutually reflected our progress and necessary modifications with our local partners, which lead to a jointly assumed responsibility for the whole process (see Propositions 3–5). In this context, we experienced the clear breakdown of the process to individual, delimitable steps as a high quality of the scenario method: the step-by-step approach and joint scenario development ensured the participants’ identification with the project and maintained their motivation.

The robustness check of scenarios revealed that one scenario, “Korneuburg as a water competence center”, bared higher uncertainty from an implementation perspective. Core features – such as foundation of research and education institutions – are heavily depending on external drivers like investors, policies etc. However, local participants decided to further develop this scenario. A key challenge of a transdisciplinary project may therefore lie in understanding that a scientific external view is often not enough and does not always correlate with subjective experiences and needs of locals.

Mid-term and final evaluation of the process revealed that, learning took place on different levels during project time. Besides getting deeper insights into the complexity of urban development, also values as related to how to interact, live, cooperate and decide in future urban development were discussed, negotiated and experienced (see Proposition 5). As external project partners we also recognised a transition in behaviour and communication culture, increasing trust and safeness in the cooperation between citizens and city government. Certainly, at this point, it is too early to derive final judgements on success; a long-term monitoring of the transition process would be recommended (which is already appointed in the mission statement).

5.5.3. Group processes

At each point of the project accomplishing our common output goals strongly depended on the progress of cooperation and the learning process within the steering wheel and the municipality per se. The facilitators focused on team and trust building, also including the TCI triangle, as a structuring and planning instrument for single meetings, workshops but also for the overall process. They kept an eye for varying methods and designs, allowing creativity but also intense phases of focused working (see props. 2–4). At some points steering wheel members missed longer work units to foster more creative involvement, but at the same time it was difficult to find longer time slots suitable for all participants (weekend workshops).

In general, all team members were willing to promote and develop the project highly motivated, continuously and with a great effort in time, which we inter alia ascribe to the appreciative and interactive process design and an intensive focus on group building elements at the beginning of the project, such as warming up sequences, constellation games etc. (see Proposition 4). Even the political representatives – except for one party with irregular involvement – as well as the mayor, were present in almost all workshops and backed all decisions. Therefore the municipal government was well informed of the project progress and decisions at local council were well prepared. The cross-party consensus, also on challenging issues was a significant success and is an outstanding project outcome – for Austrian urban planning in general, but in particular for Korneuburg, as the city experienced a major political change in the past and is confronted with an unbalanced city budget.

Unfortunately we could not reach enough young people – apart from steering wheel members – to engage in the project, which might be one major weakness of the process. Even if we intended to reach the youth via workshops in schools, an interactive web-application and Facebook, we obviously failed in presenting the project as attractive to them. Likewise, we failed in keeping local business representatives for the long term, which was especially due to their temporal restrictions.

6. Lessons learned

Based upon our empirical experience from the scenario project and corroborated by core group and learning theories as presented in Section 4, we formulated five propositions, which we discussed against the background of transdisciplinary
literature. We reveal new insights and substantiate many claims pointed out in previous transdisciplinary literature. Particularly insights into group development stages as well as changing individual and group needs along the project phases (Figs. 6 and 7) might provide new perspectives for transdisciplinary researchers.

Nevertheless, our conclusions probably cannot be interpreted as generally applicable and reliable as they result from very specific experiences in terms of actor’s constellations and project contexts. But yet maybe at least some lessons could be learned from this for transdisciplinary project settings in general.

Proposition 1. Transdisciplinary research activities intervene into societal systems and shape stakeholders’ experiences with science and participation. Researchers have to be aware of associated responsibilities.

In transdisciplinary projects, actors from science and society are interrelated via a shared concern, but are guided by differing purposes: while societal actors look for socially robust and feasible solutions for a problem they are affected by, scientists primarily gear towards the production of new scientific insights (Enengel et al., 2012; Hegger et al., 2012; Pohl et al., 2010). Transdisciplinary scientists strive for societal impact too, as it is crucial for the legitimisation and evaluation of transdisciplinary research (Mobjörk, 2010; Pregernig, 2007; Walter et al., 2007).

Based on our experiences, we argue, that transdisciplinary research projects cause societal impact anyway, whether they bring up intended results and competence building or not. In the worst case, scientists leave societal actors with unanswered expectations, (confirmed) prejudices against the scientific community, frustration and participation fatigue. Also Edelenbos et al. (2011) also remark that participation per se cannot be “a panacea for coproduced knowledge”, but the impact and success of methods used, strongly depends on the way they are used and the intention of the actors involved. Negative experiences affect the willingness to participate in future collaborative projects, and the overall perception of science within society. Thus, faulty transdisciplinary group processes may be more harmful than ivory tower research in the long run.

Referring to group theory and our own experience with professional process management we therefore recommend considering the following crucial aspects in future transdisciplinary research:

- Awareness of group processes and specific goals and expectations on both sides right from the start of a transdisciplinary project.
- Shifting the focus from “output thinking” (data, results, reports as outputs of a project with a clearly timed start and end date) towards “process thinking” (local partners see the project as part of an on-going process, with a specific history and the need to implement results and continue social learning and self-organisation processes beyond the end of the transdisciplinary collaboration).
- Know-how and skills on group processes go far beyond participation and moderation techniques. They involve an awareness of atmosphere, sensitivity towards specific needs of individual participants and (sub-) groups as well as the ability of disturbance management (according to R. Cohn, see Section 4).
- These skills and know-how can either be supported by professional facilitators or by trained and/or experienced transdisciplinary researchers, but nevertheless should also be activated among local partners themselves to secure long-term transformation.

Proposition 2. Complex process designs for larger and more heterogeneous groups require professional communication and interface management. External facilitators, neither belonging to scientific nor societal practice, can provide a neutral corner and can support learning and implementation processes beyond the end of the transdisciplinary project.

Higher levels of participation (level 3 or 4 in Fig. 2) enhance formats for intensive knowledge transfer and exchange and deeper learning processes that are more likely to result in actual action (Peer & Stoeglehner, 2013). Cash et al. (2003) point out, that the generated knowledge will be more likely to take effect, if the knowledge itself as well as its origination process are perceived to be “salient and legitimate as well as credible” (Pohl et al., 2010), whereby legitimacy refers to the respect of different values and beliefs of stakeholders and a fair treatment of opposing views and interests. A high degree of social and communicative skills is required in order to manage such social learning processes and exchange between researchers and practice partners (Hegger et al., 2012; Pohl & Hadorn, 2008; Truffer, 2007). The call for adequate interface or boundary management between science and society in transdisciplinary literature was already introduced in Section 1. Cooperation on eye-level, is frequently emphasised as core success factor for participatory transdisciplinary research (Mobjörk, 2010), yet our experiences show, that this is hardly to be realised free of any hierarchies if the scientists themselves are responsible for the group process.

Researchers’ roles in transdisciplinary settings and the importance of role clarity are an on-going issue in literature. Pohl et al. (2010) for example identified three roles, scientists tend to adopt in order to face challenges arising at the science/non-science interface: (1) the reflective scientist, who is expected to provide expertise based on scientific validated knowledge, (2) the intermediary, who uncovers different thought styles and links them around common interests and (3) the facilitator, who enhances the communicative process, based on respect, openness and deliberation. Truffer (2007) argues, that role conflicts or multiple role ascriptions for researchers (from experts to moderators to mediators...), may impede an eye-level interaction. But as also positive experiences with researchers assuming the roles of facilitators or mediators are reported (Hegger et al., 2012; Pohl et al., 2010), at least clear role divisions seem to be the central point.
Nevertheless, the merits of neutral experts providing assistance in moderation, facilitation or conflict mediation have been already stressed in literature (Lang et al., 2012; Pregernig, 2007; Walter et al., 2007), but we rarely find them in transdisciplinary practice. This may be traced back to restricted financial and temporal resources as well as to a lack of experience (Wiek, 2007). However, based on knowledge and experience on group processes and needs, we recommend contemplating professional facilitators for the quality assurance of group processes:

- Ensuring fair interaction by taking care for a fair representation of all actors concerned or equal opportunities for all participants to voice their concerns.
- Balancing hierarchical structures through a neutral intermediary role between science and societal actors, fostering mutual understanding and taking both sides up on their promises.
- Facilitating trust and transparency in communication and cooperation by means of adequate methods.
- Paying attention to and balancing needs, progress and achievement of goals of both sides.
- Post processing after the end of the research project, supporting the implementation of results and second and third loop learning processes in the long run.

**Proposition 3.** Groups are at the core of transdisciplinary research activities. Therefore, financial and personnel resources, space and time for group building activities should be provided particularly at the beginning of the project.

In transdisciplinary research we usually deal with a hierarchy of groups. A core group involves those representatives from science and society who collaborate as a project team throughout the whole transdisciplinary research process. Each of these representatives is part of a thought collective (Fleck, Trenn, & Merton, 1981), which is characterised by specific structures, interests and norms, expressing their worldviews, their “truths” regarding problem definition and possible solutions in their specific language (Fig. 5). New knowledge and learning happens where different groups (thought collectives) meet and interact (Fleck et al., 1981). The development of transdisciplinary insights is therefore not unidirectional and is more than the accumulation of new pieces of information, but most of all includes an overthrow of old thought structures and behavioural patterns. Beyond these thought collectives we again find meta-structures such as the scientific community, the political system and or society. Even if not all of these group-levels may be visible within research activity, they wield influence on the representatives within the core group.

At the beginning of a project, the core team forms an “immature” group. Individuals represent very different backgrounds and contribute diverse levels of expertise and group experience. According to a theme-centered comprehension of leadership, the common problem provides frame and structure, yet the role of facilitation is to allow each member to feel save and acknowledged, in order to help the group to become “mature” and ready for cooperation (Blez, 2001). Insights from our own experience and theories on groups show that frequent meetings and group building activities at the initial stages can help to develop trust, group identity and the inclusion of all actors by acknowledging their specific strengths (Gubbins & MacCurtain, 2008). Scope and time for group building is crucial for facilitating information flow, insights into the reasoning of other thought collectives and the establishment of shared values and norms of group behaviour and process design in the following stages of interaction.

Fig. 5. Group levels in transdisciplinary cooperation – own processing.
Everybody having experience with participative processes will be familiar with disturbances by individual group members, e.g. by bringing in their own deadlocked opinions again and again without being willing to listen to others or by blocking the common progress with apparently trivial things. According to the TCI’s postulate “disturbances take precedence”, facilitators should dare dealing with them to avoid continuous obstructions of the future process and frustrating the disturbing participant, who might not feel adequately accepted or visible within the team.

**Proposition 4.** Considering group development stages over project time, contributes to a more effective working progress and a higher effectiveness of (learning) outcomes.

Referring to Lang et al. (2012) and Hadorn (2003), a typical transdisciplinary research process includes three major phases: (1) collaborative problem framing and (research) team building, (2) co-production of solution-oriented and transferable knowledge and (3) integration and application of the knowledge produced in scientific and societal practice. Our experience has shown, that “in real life” there is neither a distinct starting point for phase 1, nor a clear end of phase 3, even if, of course formal starting and ending dates of the project.

To help us dealing with this paradox we take up Wiek (2007) proposal of a pre-phase, encompassing a latent and informal emergence of a need for a process that successively evolves and finally leads “to an explicit call for transdisciplinary research by either science or society”. As already discussed in Proposition 3, we suggest to give special attention to this pre-phase, as it forms the fundament for later cooperation and highlight the relevance of all groups of actors involved at this early stage (Edelenbos et al., 2011). In this phase, unguided interaction takes place between the different actors, who might slowly converge to form the core team. At this initial stage group processes of forming, storming already take place (Figs. 6 and 7). Probably, first decisions are made on who is inside and who is outside the core group (norming) and clarification of the common problem takes place. At official project start, formal structures replace informal processes: role definitions, communication and cooperation rules are negotiated and those responsible for process design assume the responsibility for a productive and appreciative work atmosphere. After the initial storming and norming phase, group members can jointly reach a productive phase of performing and social learning. The new insights and competences can be transferred to their thought collectives (disciplines, political parties, profit or non-profit organisations, etc.) and their daily life, respectively. External facilitators or group members who are experienced in leading group processes, can support time-consuming but highly relevant team building processes in the pre-phase and early phase of the project as well as the transfer of results and new learning modes into practice (post-processing phase).

Recalling the stages of group development as introduced in Section 4.1, Fig. 7 sums up the presence of individual (I), group (We) and task (It) needs at different stages of group development. It shows a shift from individual needs prevailing at the start of the process, to group needs when negotiating common rules and norms (norming) and to task needs when collaborating on the shared problem (performing).

All these process-related challenges demand a great deal from scientists, who are mostly familiar with and interested in task-related concerns (It). External facilitators, focusing on process leadership, individual and group needs (I, We), can support scientists, contribute to clear roles and allow actors from science and practice to concentrate on learning and collaboration progress.

![Fig. 6. Group and project phases within a td research project (own processing; based on Lang et al., 2012; Wiek, 2007).](image-url)
**Proposition 5.** Turning results into (long term) action requires learning processes, which facilitate a shift in values, structures and processes and lead to empowerment for self-organised action and learning processes.

Walter et al. (2007) postulate a causal chain in terms of societal impacts of transdisciplinary research by “linking the involvement in the transdisciplinary process to impacts on the stakeholders, which in turn affect their decision making capacity”. This correlates with three types of societal effects of transdisciplinary research projects, namely outputs (immediate results, procedural and product related), impacts (intermediate effects, changes in knowledge, attitude or behaviour of societal actors and the thought collectives they represent) and outcomes (long-term effects, such as a new culture of learning and interaction, new competences and values in order to trace the path towards desired future) (Walter et al., 2007). It may seem self-evident, that latter effects require more-in-depth ways of cooperation and social learning, than the “mere” production of tangible results (in awareness of this being already quite challenging in transdisciplinary research teams).

Whereas information can be easily transferred, actually we rarely see empowerment and competence building in transdisciplinary projects (Brandt et al., 2013) resulting in new structures for local cooperation, discourses or decision-making. These need high quality group processes fostering double and triple-loop learning, involving cognitive but also emotional and physical dimensions. Thus, making local intermediate and long-term change possible, means balancing between output driven progress (It, according to TCI), collaboration with local partners and facilitating practice space for finding new ways of negotiating and social learning (We, social double and triple loop learning, see Section 4.3) and encouraging individual development (I, individual competences, values, behaviour). Behavioural change results from social learning through group experiences and concerted action (Collins & Ison, 2009). Starting from individual experiences of actors within transdisciplinary core teams, the initiated learning processes can be transferred into their reference groups and thought collectives and thus can trigger long-term transformation beyond the core team.

### 7. Conclusion

Transdisciplinary future studies as a framework for social learning actually open up new ways for knowledge production and innovation, which show a much deeper reflection and integration of societal needs and re-design the interface between science and practise. This implies a shift from expert-user-hierarchies towards a shared learning culture, which requires

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Fig. 7. Individual, group and task needs in different project stages and the role of leadership (own processing, based on Jaques & Salmon, 2007).
novel approaches, role understandings and competences of both, scientific and practice partners and thus challenges traditional structures of scientific research and education.

Based on insights from psychology, sociology and educational sciences and empirical insights from a scenario project on urban development, this article adds knowledge and skills referring to dynamics of groups and social learning to existing frameworks focusing on the quality of transdisciplinary processes. Our empirical experience confirmed insights on group processes from psychology, sociology and educational sciences, according to which the acknowledgement of individual and group needs leads to motivated and fruitful cooperation and profound long-term learning processes. If providing an open, respectful and appreciative working atmosphere, building a new culture of understanding between scientists and non-scientific actors on eye-level, even supported by professionals in group processes (facilitators), such processes may allow for the personal development of all actors involved and supply a secure social learning space to initiate, test and embed new forms of cooperation and negotiation. Thus they may contribute to involvement, feeling of co-responsibility and capacity building for self-organised action beyond project-runtime.

The propositions we formulated can only be understood as a starting point for further investigation and require deeper involvement in theoretical reflection and practical endeavour. Nevertheless, they are not only based on the presented participatory scenario project, but also reflect theories on group processes and social learning as well as previous experience with transdisciplinary research, so they may actually have a more general relevance for transdisciplinary future studies. Still, many questions remain open such as “How can we succeed in involving all relevant actors into social learning processes (such as the youth, businesses etc.)?”; “What are the implications for higher education and training of future scientists in order to meet the requirements of a changing science/society relationship?”; “Which related knowledge, competences and skills should scientists acquire during their education?”.

We regard further reflection and examination of these and other questions, grounded by empirical practice and embedded into an intense interdisciplinary discourse, to contribute to good practices of “how to do” transdisciplinary research in a most fruitful way.

References


