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Fanny A. Kluge

Transdisciplinarity

A Research Mode for Real-World Problems

**POPULATION
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THE NETWORK OF EUROPE'S LEADING
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Contents

| | |
|---------------------|----------|
| Introduction | 4 |
|---------------------|----------|

| | |
|--------------------------------------------------------------------------|----------|
| The Theory – The Evolution of the Transdisciplinary Research Mode | 6 |
|--------------------------------------------------------------------------|----------|

| | |
|------------------------------------------------------------------------------------------------------------------|----------|
| The Transdisciplinary Research Mode – How to Promote Societal and Scientific Effects Matthias Bergmann | 8 |
|------------------------------------------------------------------------------------------------------------------|----------|

| | |
|-------------------------------|-----------|
| Approach and Framework | 12 |
|-------------------------------|-----------|

| | |
|------------------------------------------------|-----------|
| Quality Criteria, Evaluation and Impact | 14 |
|------------------------------------------------|-----------|

| | |
|----------------------------------------|-----------|
| Challenges, Critique and Ethics | 16 |
|----------------------------------------|-----------|

| | |
|------------------------------------------------------------|-----------|
| Co-creation (Including Co-production and Co-design) | 18 |
|------------------------------------------------------------|-----------|

| | |
|----------------------------------------------------------------------------------------------------|-----------|
| The Critique of Co-Creation: Democratic Dialogue or Displaced Politics? Jeremias Herberg | 24 |
|----------------------------------------------------------------------------------------------------|-----------|

| | |
|--------------------------------------------------------|-----------|
| Further Formats of Transdisciplinary Engagement | 38 |
| Citizen Science – Engaging Society | 38 |
| Real-world Laboratories (<i>Reallabore</i>) | 39 |
| Other Formats | 41 |

| | |
|-------------------------------------------------------------------------------------------------|-----------|
| Citizen Science – A Silver Bullet for Transdisciplinary Research? Hans-Liudger Dienel | 42 |
|-------------------------------------------------------------------------------------------------|-----------|

| | |
|---------------------------------------------------|-----------|
| Beyond the Theory – Best Practice Examples | 44 |
|---------------------------------------------------|-----------|

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Methods for Transdisciplinary Integration – Lessons Learned from Case Studies in Different Cultural Contexts Marion Mehring | 46 |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Growing Up in Digital Europe/EuroCohort: Developing a Comparative Longitudinal Survey of Child Well-being in Europe Gary Pollock Jessica Ozan | 48 |
| A Co-design Approach to Explore Housing Decisions for People Living with Dementia in the Netherlands Jodi Sturge | 49 |
| Opportunities and Challenges of Participation in Research and Research Policy Gordian Haas | 52 |
| Shaping Transformation Processes in the Field of Mobility Together with Local Stakeholders Gabriele Wendorf, TU Berlin | 54 |
| Stakeholder Analysis | 56 |
| Policy advice | 60 |
| How to Speak Truth to Policy Makers Birte Fährnich | 62 |
| A Model for Co-creative Policy Advice | 66 |
| Summary and Outlook | 68 |
| Bibliography | 72 |
| The Authors | 82 |



Introduction

We are living in turbulent times; societal change and progress is moving at an unprecedented pace. Society faces information overload (Bawden & Robinson, 2020; Heylighen, 2004) thanks to an ever increasing number of newly generated channels bearing information, news and opinion pieces. At the same time, society faces a dilemma regarding expertise, in that expert knowledge, although indispensable and more vital than ever, is also hotly contested (Nowotny, 2003b). Many scholars keep to their own spheres and methodologies, producing knowledge that is isolated and does not take other valid perspectives into account. It is not simply knowledge production that has been challenged in the last few decades, but also the communication of knowledge, owing to a faster exchange of ideas and a pluralisation of opinions in social media and internet articles and forums (Edel et al., 2020).

**A complex world
facing
wicked problems**

Today's societal questions are complex and typically involve many actors with different or opposing desires and ideas for how society can or should be transformed to ensure sustainable development in the future. Risk and uncertainty are inherent in modern societies, making predictions about the future even more difficult (Luhmann, 1996). All of this results in a challenging process for political decision-makers, who are seeking advice, but also for scientists and other affected individuals. Still, a better understanding of the drivers and dynamics of societal change is essential for evidence-based decision-making. This demand is not trivial in a globally connected setting. The increased complexity of real-world questions and higher

uncertainty calls for new approaches to generating knowledge that go beyond traditional academic knowledge production (Funtowicz & Ravetz, 1993; Nowotny, Scott & Gibbons, 2013).

In recent decades, the transdisciplinary research mode has been seen as a promising response for solving 'wicked' problems (V. A. Brown, Harris & Russell, 2010), addressing complex societal and sustainability challenges, and advancing social innovation (Hirsch Hadorn et al., 2008; Lang et al., 2012). Inherent in this approach is the uncertainty of how a given problem can be solved, as there are different pathways that may be equally qualified and justified for reaching a solution. The approach is suitable for a number of research questions, especially when there are varying consequences for the individuals affected by the research. This is, for example, true for questions of climate change and how to adapt society to save our environment, but at the same time, employment opportunities in non-environmentally friendly sectors are at stake. With regard to the change in populations, there are a number of fundamental questions that need to be answered for our future society, ranging from the implications of smaller kinship networks for care arrangements, living arrangements, sustainable transportation opportunities and liveable city design to migration patterns and successful integration. The increase in population diversity and the development towards smaller and more heterogeneous groups in future society hints at complex distribution questions and population inequality issues, which raise various points for debate. Political decision-makers, scientists and other affected parties must find the best options for future societal arrangements within a cooperative framework, while considering opposing views in a balanced manner.

Some scholars argue that in the future, it will be necessary for the scientific approach to be adapted, at least in everyday societally relevant areas, transforming from a '*science for society*' into a '*science with society*' (Scholz & Stauffacher, 2009; Seidl et al., 2013). The future of the EU, according to Vasbinder et al. (2010), depends on the funding of transdisciplinary scientific collaboration. On the European level, we see an openness for participatory forms and a shift towards reforming European governance (Abels, 2002; S. C. European Commission, 2013). The required change in knowledge production calls for new temporary alliances to solve relevant research questions (Mittelstraß, 2005).

The transdisciplinary research mode is not viewed without scepticism, especially with regard to feasibility and time constraints, a critique we want to address at a later stage in this paper. Still, we feel that this approach can contribute greatly instilling in our society a more direct focus on the predominant problems that need to be solved. What's more, new insights can be gained from the participation of practitioners or the involvement of different agents or parties with varying focusses and innovative ideas.

The discussion paper aims at presenting the theoretical roots of the transdisciplinary research mode, which is widely used today to address societally relevant research questions. We offer an overview of the literature, the facets that need to be observed and taken into account when research is designed in a transdisciplinary way, and the problems and limitations of this holistic approach. We illustrate how results are generated in transdisciplinary research projects, mainly using the concept of co-creation, which means expanding the expert network to engage practitioners, citizens or other stakeholders in the research process. We provide an overview of the most popular tools and methods. In the remaining part, we present best practice examples for transdisciplinary research to assess common features of success. We collect a number of approaches for stakeholder engagement and policy advice, not neglecting the challenges such an approach entails. Throughout the manuscript, contributions from eminent scholars in the field of transdisciplinary research offer valuable insights on key topics.

**The scope of
our discussion paper**

The Theory – The Evolution of the Transdisciplinary Research Mode

Seeds can be found in the 1970s when the OECD conference on 'Interdisciplinarity: Problems of teaching and research in universities' put the topic on the agenda. This might be seen as the birth of discourse about transdisciplinarity (Jahn, 2008; J. T. Klein, 2004). The term 'transdisciplinarity' was invented for the purposes of educational reorientation in universities (Jantsch, 1972). For Jantsch, transdisciplinarity is the most complex and abstract synthesis of disciplines, surpassing multidisciplinary and interdisciplinarity (ibid.).

Difficult delimitation of concepts

The definition criteria used to distinguish between inter-, multi- and transdisciplinarity were (and sometimes still are) blurry. Multidisciplinary refers to a research mode where several disciplines work in parallel with limited interaction (J. H. Spangenberg, 2003). Interdisciplinarity is sometimes referred to as a mode in which different disciplines work together in such a way that their results can be integrated, as opposed to transdisciplinarity, which conveys cooperation as a concept that leads to an ongoing systematic scientific order that itself changes the subject and disciplinary orientations (Mittelstraß, 2005). While interdisciplinarity relies on boundaries and disciplinary research, transdisciplinarity truly transgresses or transcends (Russell, Wickson & Carew, 2008). It goes further than mere interdisciplinarity and develops a shared conceptual and methodological framework (Stokols, Hall, Taylor & Moser, 2008). Transdisciplinarity is a pragmatic, complementary and mainly demand-driven research mode (J. T. Klein et al., 2001). Still, transdisciplinarity involves disciplinary practice (J. T. Klein, 2004). A common approach to describing transdisciplinarity is to combine interdisciplinarity and the participation of extra-scientific actors (Aeberhard & Rist, 2009; Hirsch Hadorn et al., 2008; Jahn, Bergmann & Keil, 2012); the differentiation occurs on the level of cooperation (Jahn et al., 2012).

Increasingly, scholars have argued for a move away from traditional forms of disciplinary and authoritatively organised science (Mode-1) in order to solve real world problems. More momentum was gained in the 1990s with the publications on post-normal sciences (Funtowicz & Ravetz, 1990, 1991, 1993) and Mode-2 of knowledge production (Gibbons et al., 1994). This represents a novel approach in science for questions relating to uncertainty where urgent decisions are needed. In their research, the transdisciplinary research mode is organisationally non-hierarchical, socially accountable and reflexive. The societal need impacts knowledge production and the contextualisation of knowledge: in their language, 'society speaks back to science.' The research mode is marked by contextualisation, but also by openness to external needs and validity criteria; a co-existence of the disciplinary and transdisciplinary research modes is expected (Brinkmann, Bergmann, Rödder & Schuck-Zöllner, 2015). The triple helix model refers to a set of interactions for connecting the three players – universities, industry and governments – in order to foster innovation (Ernø-Kjølhede, Husted, Mønsted & Wenneberg, 2001; Etzkowitz & Leydesdorff, 1998). A more direct focus should be placed on the concrete problems that require solutions.

A world too big to know

With ever increasing global connectedness, the world has become increasingly complex and, of late, 'too big to know' (Weinberger, 2011), which also calls for new intelligent approaches and research modes. According to the literature, scientific research needs to be democratised (Lövbrand, Pielke Jr & Beck, 2011), and co-produced (Pohl et al., 2010) in order to achieve a better acceptance of research results in a world of information overload. In addition, it should

be anticipatory, reflexive, inclusive and responsive (Herberg, Schmitz, Stasiak & Schmiege, 2021; Stilgoe, Owen & Macnaghten, 2013). The democratisation of expertise is important as society increasingly demands greater accountability of expertise (Nowotny, 2003a). Transdisciplinarity complements the disciplinary approaches, and as complexity is the fundamental feature of reality, scientists must rethink their approaches (Nicolescu, 2010). Transdisciplinarity is characterised more by the research purpose and less by a common set of methods or objects (J. Spangenberg, 2011).

In spite of the long history of academic discourse on transdisciplinarity, it is only recently that it has enjoyed a significant increase in promotion as a means of addressing pressing societal problems (e.g. climate change as the most prominent). However, even until recently, a universally accepted definition has been absent (Jahn et al., 2012). Thus, quality standards for the guidance of all project partners were also lacking. A comprehensive and inclusive definition of transdisciplinarity is offered by Lang, Wiek et al. (2012) and frequently cited in the latest literature:

Transdisciplinarity is a reflexive, integrative, method-driven scientific principle aiming at the solution of transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge. The aim is to enable mutual learning processes between science and society where integration is the main cognitive challenge of the research process (ibid. p.4).

This definition requires several conditions: the research has to focus on societally relevant problems; it should enable mutual learning processes among researchers from different disciplines, while creating knowledge that is solution-orientated, socially robust and transferable to scientific and societal practice (Lang et al., 2012). Transdisciplinary research in its strongest iteration goes beyond the 'primacy of science' and the 'primacy of practice', establishing a third epistemic way (Jahn, 2008; Wiek, 2007). In this new mode, with a coordination of all disciplines along common axioms and under a superordinate normative guiding principle, it would be possible to achieve a stronger application orientation for scientific research (Brinkmann et al., 2015).

Some scholars note the distinction between 'weak' and 'strong' transdisciplinarity (Max-Neef, 2005; Ross & Mitchell, 2018). Max-Neef (2005) describes transdisciplinarity as more than a new discipline or super-discipline, but rather a different manner of seeing the world, one that is more systematic and more holistic. Iterative or recursive cycles are very important for transdisciplinary research and reflectivity is likewise a very prominent feature (J. Spangenberg, 2011). The internal reflexivity is an essential aspect (Miller et al., 2008). The different actors must constantly reflect and reintegrate their knowledge back into the research process. Another key characteristic of the transdisciplinary research mode is that research questions are investigated in an open-ended manner (Balsiger, 2005; Bergmann, 2008). This can also be of major importance for strengthening the credibility of the results.

A thorough overview on the history of transdisciplinarity can be found in Bernstein (2015) and Stichweh (2021). The research mode stresses the mutual learning between science and society; it envisions a process of exchange, generation and integration of existing or newly developing knowledge in different parts of science and society, embedded in societal and scientific discourse (Scholz, 2001; Siebenhuner, 2004). The transdisciplinary process can be distinguished by a true participatory transdisciplinarity, where all actors are involved on equal terms in the knowledge production process as compared to consulting transdisciplinarity, where individuals outside academia react to research findings (Mobjörk, 2010).

The Transdisciplinary Research Mode

How to Promote Societal and Scientific Effects

Brief summary of a keynote speech held on 12th November 2021

Matthias Bergmann

ISOE – Institute for Social-Ecological Research

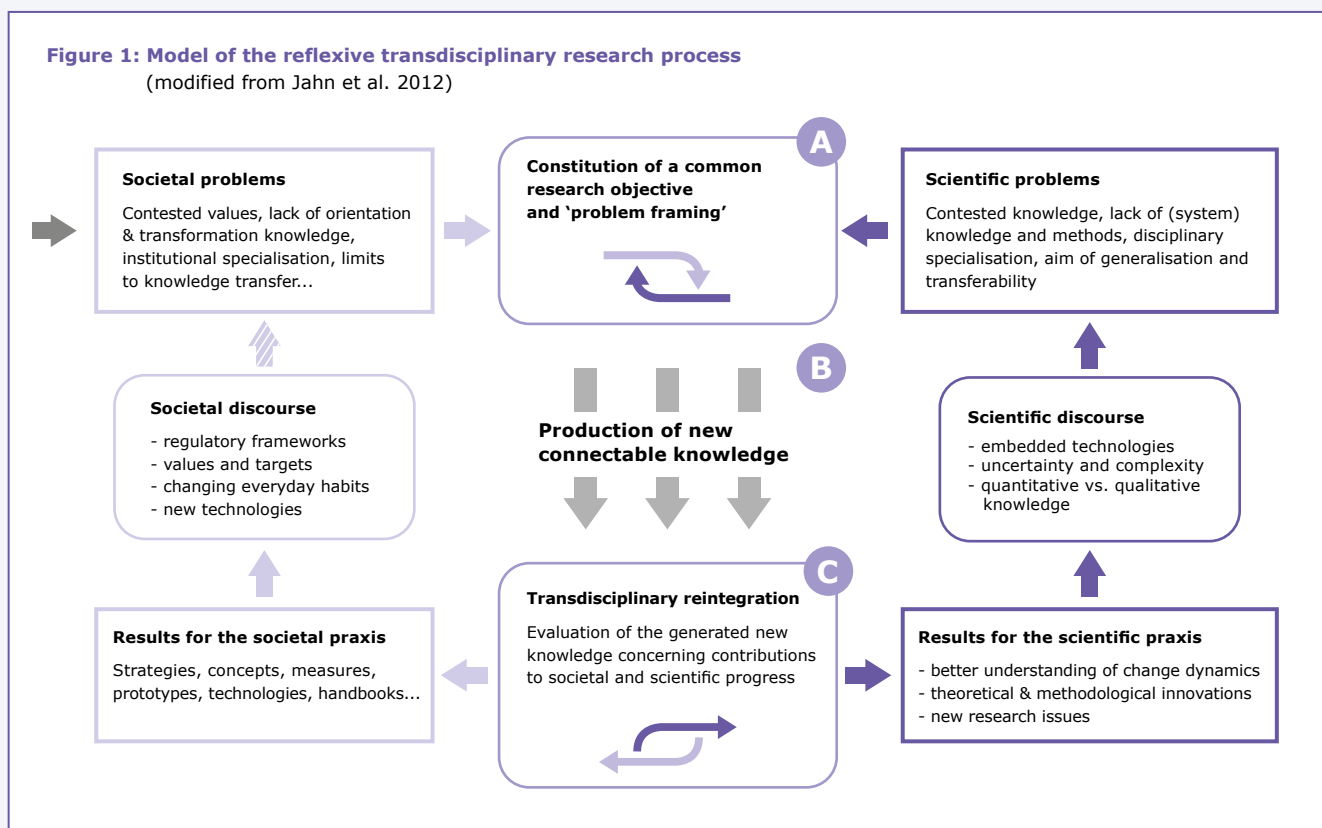
The transdisciplinary research (TDR) mode is now widely recognised as a critical-reflexive and participatory approach to research on complex social problems and issues. While it was initially used primarily in sustainability research, other fields of research have since come to use it, such as participatory health research and development research.

A complex (wicked, ill-defined) societal problem, not a question purely generated by science, forms the starting point of each TDR project. In this context, cooperation and joint learning processes between different scientific disciplines and between scholars and practitioners (representing different epistemologies) are central. In this participative research process, new knowledge concerning solutions or transforma-

tions of the complex societal problem is generated. At the same time, the research team faces the need to develop novel conceptual and methodological approaches that synthesise and extend discipline-specific theories, methods, and concepts. Integration is the essential challenge during the research process (see below).

A model for the transdisciplinary research process

At the Institute for Social-Ecological Research (ISOE) in 2004, a model for the TDR process was developed and subsequently refined (Fig. 1). The intention of



this model is to guide researchers through the complex research process.

The models' basic proposition is to develop solutions for complex societal problems. Consequently, these problems must be connected to gaps in existing bodies of knowledge, that is, to scientific problems. This proposition allows one to conceptualise the contributions of research to societal (loop to the left in Fig. 1) and scientific (loop to the right) progress as the two epistemic ends of a single integrative process. This process consists of four tasks (problem constitution, knowledge integration, the participation of societal actors and preparing the transferability of learning outcomes and results) spread across three consecutive phases (A to C).

Phase A, which includes establishing the constitution of the problem and the project structure, comprises several important conceptual steps (not shown in Fig. 1):

- the identification of a societal problem (upper left in Fig. 1);
- identifying the required scientific and societal expertise and knowledge;
- building a research team of scientists and experts from the problem field (practitioners) who can provide the required knowledge;
- developing a common understanding of the societal problem and related scientific problems (perceptions of the problem usually differ between actors);
- translating the societal problem into an epistemic object that can be treated by scientific means;
- formulating research questions that are problem-orientated (and not discipline-orientated).

This initial groundwork is an extremely significant first step in the research process and is often time-consuming. Decisions taken here substantially influence the quality, efficiency and impact of the research results. Three dimensions of integration must be considered throughout phases A, B and C:

- the knowledge-integration dimension, comprising the distinction between and connection of disciplinary knowledge bases, as well of scientific and practical real-world knowledge;

- the social and organisational dimension, comprising the distinction between and the correlation of the participating researchers' and societal experts' different interests and activities and supporting the willingness to learn;
- the communicative dimension, concerning the distinction between and linking of different conceptual understandings, with the aim of developing something like a common discursive practice. (Bergmann et al. 2012: 45).

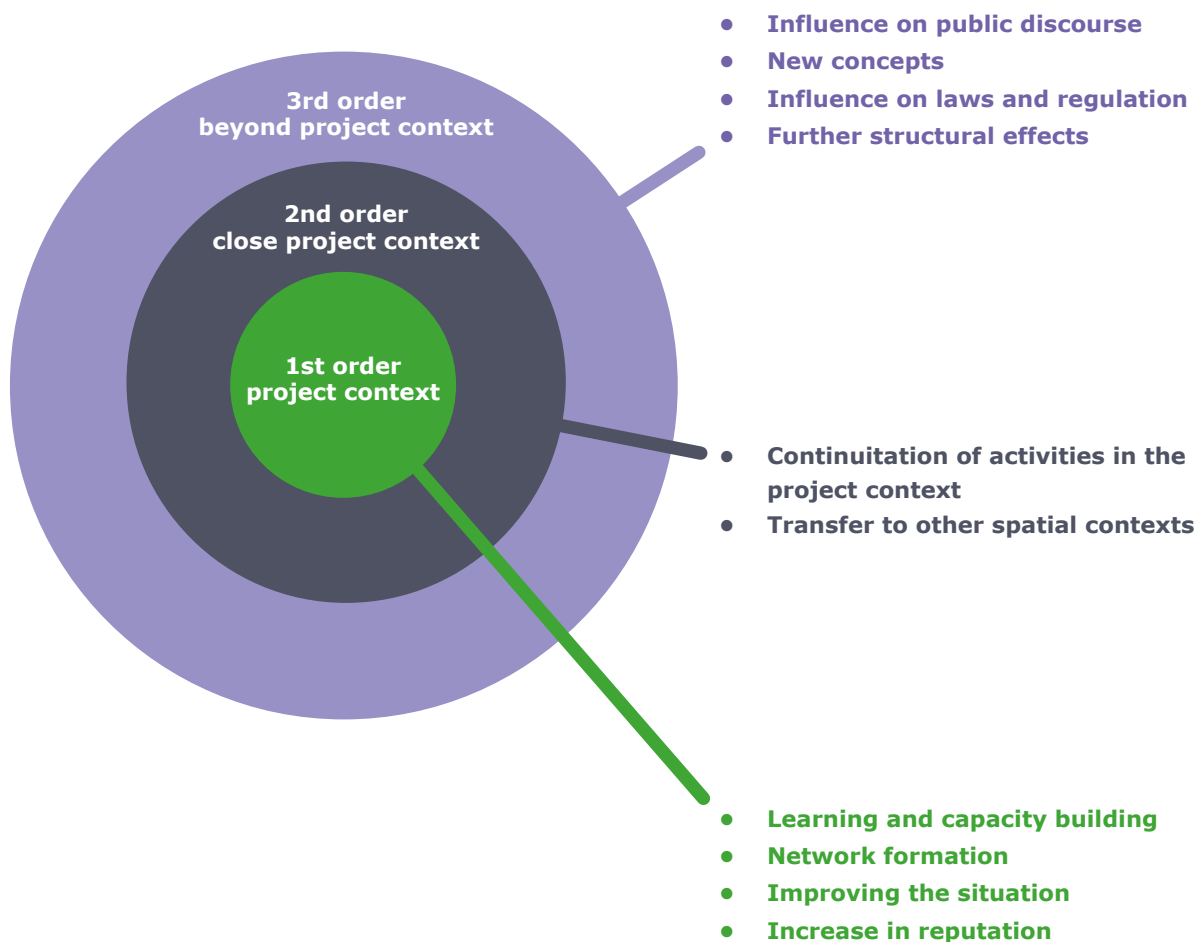
This requires methods of knowledge, social and communicative integration to be applied (Bergmann et al. 2012). Consequently, joint research between scholars and practitioners needs a broader conceptual methodology. Specific methods are necessary for integrating knowledge from very diverse epistemologies (in science and practice) to support very diverse communication practices and to enable the scholars to take on unknown roles in the context of research processes on an equal footing with practitioners.

Promoting societal and scientific effects of TDR

Recent and ongoing research projects on transdisciplinarity investigate how best to promote the societal and scientific effects of TDR. Lux et al. (2019) describe the results of a study (TransImpact) that analysed 16 completed TDR projects. The study was guided by the main research question: 'Are there concrete practices and methods that can generate a high degree of societal impact potential?'. To report on just a few key findings¹:

a) At the very end of this analytical process, they were able to distinguish between different forms and orders of societal effects (Fig. 2, page 10): first-order effects occur during the research process, for example, in the form of learning and capacity building processes among team members, of network building and increases in reputation. Second-order societal effects occur 'in the close temporal and spatial context of the TDR project' (Schäfer et al. 2021: 493) and could be monitored 'as follow-up projects in other regions' (ibid.: 494). Third-order societal effects 'occur at a greater temporal or spatial distance to the original TDR project' (ibid.: 493).

Figure 2: Overview of the proposed categories for the analysis of societal effects of TDR
(Schäfer et al. 2021)



b) Some key issues concern the question of how to support societal effects

- The findings of the case-study analysis emphasise the connection between framework conditions that cannot be influenced by the research project and the processes that shape the research. For example, the funding conditions, the environment and the historical development of the problem and the research on it are central aspects of the framework conditions that cannot be influenced, while clarification, observation and adaptation of interests, roles and collaboration culture within the team are processes that can be used to strengthen societal effectiveness. In order to maintain the essential connection

between the framework conditions and the adaptive shaping of TDR processes, researchers must continually relate the problem description defined within the project ('project framing') back to the 'original' complex societal problem.

- One of the most important findings is that a project team needs to address the societal effects it is aiming to achieve very early on, i.e., when planning or starting a project. Expectations in this regard must then be regularly reviewed during the course of the research. This is because societal effects arise out of complex interdependencies between research processes and the results produced. When it comes to generating potential effectiveness, research processes and their results are closely intertwined.

Another study examined, among other things, questions about interdependencies between the participatory approach and societal as well as scientific impacts by analysing 81 third-party-funded research projects. Two important findings were:

- The involvement of practitioners does not generally increase societal effectiveness, but if practitioners are involved at a very early stage ('co-design'), then the depth of the impact increases significantly.
- The intensive involvement of practitioners often leads to a reduction in scientific impact (e.g., publication and qualification), but the use of structured methods to integrate non-academic and academic knowledge is a very important supporting factor for academic effects which increases the scientific yield. (Newig et al. 2019)

This shows that TDR needs to be carefully planned in terms of participation structures and make targeted use of specific methods for knowledge integration.

Finally, in the ongoing tdAcademy project, among other aspects, the rarely investigated question being researched is: what effect does TDR generally have on academia? A few examples of initial insights are: TDR provides new perspectives on the object of research, greater validity of survey instruments and interpretations of results, and the observation of processes in the societal problem field in real time. For new and upcoming results, see <https://www.td-academy.org/en/tdacademy/topic-lines/topic-line-2-scientific-effects2/>

New formats of TDR such as the real-world laboratory (RWL) approach strive to further strengthen societal transformation through proximity to places and actors in the problem area and through an experimental approach. For recent research on the key success factors and methods for the RWL approach, see Bergmann et al. (2021).

Footnote

¹ View these findings, as well as a comprehensive synopsis of the results of the study TransImpact and a list of about 50 methods supporting the societal effectiveness of TDR at <https://www.td-academy.org/en/tdacademy/transimpact>.

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Approach and Framework

In a transdisciplinary research process, appropriate and tailored techniques have to be identified; a transdisciplinary case study design can employ diverse analytical methods, initiating a process of mutual learning between science and people outside academia (Stauffacher, Flüeler, Krütli & Scholz, 2008). Within this research mode, a major cognitive challenge is integration. Integration is understood as the process that leads to a change in the structure and organisation of a problem context by extending and constraining both the relations between its entities and their respective characteristics (Becker & Keil, 2006). Typically, transdisciplinary research calls first for differentiation and then, in a second step, for integration (Brinkmann et al., 2015).

Integration at different levels

Integration of knowledge should be present at the problem level, research level and solution level (Burger, Kamber, Schindler & Henry, 2003). Three types of integration can be distinguished: thematic integration of knowledge, problem- or product-orientated integration of knowledge and social integration (Zierhofer & Burger, 2007). Social integration refers to integrating different actors from science and the real world, including laypersons and experts. Of equal or greater importance is the integration of knowledge from different disciplines and practical areas, since in transdisciplinary projects, existing knowledge has to be interrelated and structured in a new way (Bergmann & Schramm, 2008). Thematic integration refers to coherent and systematic ordering of information regarding a theme or topic (ibid.). A differentiation between social, organisational and communicative integration is also sometimes made (Godemann, 2008; Hunecke, 2011).

Bergmann and Schramm (2008) argue that numerous publications offer guidance on how to carry out interdisciplinary research (Defila, Di Giulio & Scheuermann, 2006; Pohl & Hirsch Hadorn, 2006), but lack explicit information on why transdisciplinary research should be pursued. A common framework for transdisciplinary research projects does not exist. Therefore, we want to present common features that are frequently described in the literature. The model corresponds to the concept of an ideal-typical transdisciplinary research process illustrated and briefly described in the contribution of Matthias Bergmann (page 8–11).

Society and Science

The model operates on the basis of societally relevant problems that imply and trigger scientific research questions (Lang et al., 2012). There are two pathways committed to the development of new knowledge, methods, or general insights related to the problem field. The societal arm and the scientific practice arm should collaborate to solve real world problems in a cooperative and simultaneous manner. Societal problems refer to problems that are relevant for everyday life, yet these are actor specific. From this, an actor-specific societal discourse is initiated with different non-scientific actors such as institutions, policy and media. Results from this discourse can either be strategies, concepts or measures. The scientific practice path starts from a scientific problem facing uncertainty, lack of methods and disciplinary specialisation. Within a scientific discourse between institutions of higher education or industrial research, scientific results such as generic insights or methodological and theoretical innovations are generated. The core of the model, phases A to C, illustrates the transdisciplinary research process. The structure and design of a transdisciplinary research process with three such phases is described in a similar manner in several publications (Carew & Wickson, 2010;

Dienel, 2020; Lang et al., 2012; Scholz, 2000; Scholz, Lang, Wiek, Walter & Stauffacher, 2006; Wiek, 2007). A detailed overview of design principles for transdisciplinary research is given in Lang, Wiek et al. (2012, p. 30). We find the following three phases throughout all publications:

Phase (A)

Most researchers point to the critical importance of the first project phase to the success of transdisciplinary research. In phase A, the focus is on collaboratively framing the problem and building a team of scientists and real world actors 'with everybody who has a stake' (Pohl & Hirsch Hadorn, 2007). Transparent criteria and justifications have to be given as to why the different actors were selected. The problem should be defined as a societally relevant one that implies and triggers scientific research questions. The project concept is ideally developed together with all participants on an equal footing. Overall objectives should be collaboratively formulated to enable the tracking of progress and realignment of research activities (Blackstock, Kelly & Horsey, 2007; Defila et al., 2006). In this way, it can be ensured that all partners are integrated and fully aware of the different facets of the project, and that all individual perspectives are reflected. The envisioned societal impact should be addressed in the very beginning. If the scientific problems linked to societal problems are not recognised and successfully addressed there, a positive societal impact cannot be expected; this is especially true for wicked problems (Bergmann, Schäfer & Jahn, 2017).

Phase (B)

In the execution phase of the project, the involved stakeholders co-produce solution-oriented knowledge and transferable results through collaborative research. The involved parties clarify their understanding of the problem and basic terms. The planned methods are used to answer the research question that have been agreed upon. Integration is crucial for designing a methodological framework and adjusting integrative research methods and transdisciplinary settings for collaborative knowledge production. Equally important is that the different actors in the research process, including practitioners and researchers, are assigned appropriate roles to which they can contribute and leverage their potential and knowledge and thus contribute to the value added by the project and its overall success. The project work and co-generation of knowledge leads to different types of actor involvement across the separate steps in order to achieve the overall goal. Here, we want to note that not all aspects of knowledge generation have to be transdisciplinary (Binder, Absenger-Helmli & Schilling, 2015).

Phase (C)

In phase C, the produced knowledge is (re-)integrated and applied to scientific and societal practice. Targeted products for all involved parties are generated and distributed to the respective interest groups or scientific community. The project is evaluated using objective evaluation criteria and the scientific and societal impact. The project is concluded and possible follow-up projects might be discussed. All results are to be fed back into both the research process and the societal discourse. The transdisciplinary research process is not meant to be linear, but rather recursive and iterative (Lang et al., 2012; Pohl & Hirsch Hadorn, 2007) and stresses the need for reflexivity in transdisciplinarity (J. Spangenberg, 2011). The different steps taken by all actors must be reflected and evaluated several times throughout the process. This goes together with creating quality criteria, permanent evaluation of different steps within the research process including all relevant actors and evaluating the impact and value added by the specific transdisciplinary research process.

Quality Criteria, Evaluation and Impact

Scholars repeatedly argue how astonishing it is, given the societal significance of trans-disciplinary research, that there is hardly any debate about the quality of the results or criteria that must be taken into account to evaluate successful research within this mode (Bergmann & Schramm, 2008). And indeed, very different approaches to this question are followed; there is no universal guide in this respect. With the increasing attention trans-disciplinary research is receiving, this issue in turn is gaining visibility. We want to present the guidelines underpinning criteria for the formative evaluation and quality assurance of transdisciplinary research projects as proposed by Bergmann, Brohmann et al. (2005) with regard to the EVALUNET project. With a questionnaire comprising basic and detailed criteria, they offer a thorough overview for quality criteria throughout the three different project phases.

Tailored solutions

Defining quality criteria and deciding how to deal with the different forms of knowledge and work is challenging, as they cannot typically be aligned with disciplinary quality standards and break new conceptual and methodological ground. The guide presented stresses the importance of project-specific quality control and evaluation setting. As a normal peer-review process is hardly possible, owing to the involvement of too many disciplines and practitioners, they suggest expert reviews for the separate process stages and demand input from actors such as ministries, foundations and other project agents. We lay out the most important basic quality criteria and refer for more detail to Bergmann, Brohmann et al. (2005). For the different phases of the project, different questions should be answered for quality control (selection only):

A. Project construction, formulation, actors and acquisition

For the initial project phase, questions related to the actors involved, the goals and success criteria of the project and the planning and financial setting should be in focus. These include:

- Are the competencies of the actors in the respective areas sufficient to deal with the research question?
- Has the relevant everyday life problem been translated into an appropriate scientific question?
- Did the actors work out plausible success criteria?
- Do the methods, results and models match the solution strategies?
- Were financial resources allocated for coordination, integration and organisation?

B. Project implementation and methodology

Within the second phase, project implementation, questions centre on work planning, project management, methods and reflection, such as:

- Does the coordinated work planning integrate all involved actors?
- Are project management and decision-making structures promising?
- Are the methods suitable for combining science and practice?
- Does regular reflection on the collaboration take place, and is there an option to adjust the research process?

C. Results, products and publications

The wrapping-up phase deals with questions related to the results of the transdisciplinary research process, tailored products and publications. Examples are:

- Were the scientific objectives achieved?
- Do the results contribute to solving the problem posed by the initial societally relevant question?
- Are there methodological or conceptual innovations?
- Were the self-imposed success criteria met?
- Do the publications and other products provide an adequate return, and have they been tailored to the target group needs?

The detailed questionnaire as proposed in Bergmann, Brohmann et al. (2005) offers a small-scale evaluation opportunity addressing all issues related to a transdisciplinary research process. It is critically important to ensure that all involved actors are aware of the difficulties and challenges of such a mode and are enthusiastic about the added value this approach can provide.

Dealing with conflict and the asymmetry of power, with respect to the involved agents, represent additional quality criteria. Agents involved in the process should acknowledge both the irreducible plurality of points of view, and the necessity of common existence, in order that they may provide a valuable solution to decision-making challenges (Van Den Hove, 2006). This solution must emphasise the mitigation of conflicts and negotiation. Furthermore, it is important to ensure balancing control and accountability for all agents involved in the process (Talwar, Wiek & Robinson, 2011). Power asymmetry is also an incredibly significant factor, as real empowerment is rare across case studies (Brandt et al., 2013). Power differentials can exist between disciplines, as well as between scientists and non-scientists, stakeholders or communities.

The evaluation of the research process and the separate project phases is of major importance. There is a wealth of general criteria (Bergmann et al., 2005; Carew & Wickson, 2010; Defila et al., 2006; Jahn & Keil, 2015). Bergmann, Brohmann et al. (2005) that stress the importance of the discursive nature of evaluation; evaluators and the evaluated should work together in analytical discourse to conduct a formative evaluation. The evaluation must be carried out with regard to the conclusions of research work and the learning objective should be emphasised. Additional evaluation frameworks offer detailed criteria, not only for science, but for all project partners involved (J. T. Klein, 2008; Walter, Helgenberger, Wiek & Scholz, 2007; Wolf, Lindenthal, Szerencsits, Holbrook & Heß, 2013). The evaluation can be as varied as the research process itself. Binder, Absenger-Helmli et al. (2015), for example, offer a framework based on a detailed self-reflection process.

Judging the scientific and societal impact is also important for transdisciplinary research projects as described earlier in Matthias Bergmann's contribution (pages 8–11). A major difficulty in research practice in general is that it is rarely possible to establish clear causality between research activities and impacts. For transdisciplinary projects, effectiveness (*Wirksamkeit*) can give an indication of a successful project (Bergmann et al., 2017). Three different dimensions of effectiveness have to be distinguished. The analytic descriptive dimension details how the effects originate and conditions under which they can be expected. The normative dimension concerns what effects are intended and what is societally desired. Finally, the operative–strategic dimension addresses how to build impact potential and achieve actionable, scientifically tested, socially acceptable results (Jahn, 2012).

The effectiveness of results is connected to societal change as the key outcome and strengthens the importance of scientific and societal impact in transdisciplinary research (Bergmann et al., 2017). Societal effects can be distinguished into outputs, impacts and outcomes (Walter et al., 2007). Outputs can be meetings, hearings and workshops as well as reports, publications and other tangible results. Impacts can be changes in the knowledge, attitude or behaviour of stakeholders. The outcomes are the long-term effects of the transdisciplinary research (ibid.). These can be either intended or unintended (Wiek, Talwar, O'Shea & Robinson, 2014). Figure 2 on page 10 illustrates categories for the analysis of societal effects of transdisciplinary research as proposed by Schäfer, Bergmann et al. (2021), differentiating along first-, second- and third-order effects.

A high-quality research process is indispensable for ensuring the effectiveness of results (Jahn & Keil, 2015; Reitinger & Ukowitz, 2014). It is crucial to involve all relevant actors in the early stage of problem statement, description of goals and research questions (Bergmann, 2010; Defila et al., 2006). The involvement of practice actors differentiates between who is involved for what reason and to achieve what goal at what point in time and with what intensity (Bergmann et al., 2017; Krainer & Winiwarter, 2016; Walter et al., 2007; Wiek et al., 2014).

Both the research process and its results should be of high quality. Offering socially robust and accepted knowledge (Nowotny et al., 2013) that is relevant to the initial problem description is equally as important as the reflection and transferability of results (Bergmann et al., 2017). In addition, the scientific yield should include new interdisciplinary methods, models and concepts, while advancing transdisciplinary theory (ibid.).

Challenges, Critique and Ethics

The voices calling for a new research approach that broadens the expert base and looks beyond single disciplines are numerous. Funding is increasingly being allocated to research that not only takes into account interdisciplinary aspects of science, but is also concerned with societal problems and promotes cooperation with partners from industry, local authorities, associations or other areas of society (Bergmann & Schramm, 2008). Still, transdisciplinary research is not easy to execute for a number of reasons. It entails a higher risk for research outcomes if practice actors are given full equal treatment in the research process. The process will take longer and results might not be publishable in conventional peer-reviewed journals, as such journals hardly exist in the transdisciplinary world (Kueffer, Hadorn, Bammer, Van Kerkhoff & Pohl, 2007). Publication and reputation systems are primarily disciplinary (Giacomini, 2004; Minkler, 2000).

The lack of a common framework and unified definition also plays an important role in the difficulty of comprehending transdisciplinarity. It is noted in the literature that transdisciplinary research does not represent a specific mode of knowledge production, but rather a heterogeneous conglomeration of different research activities (Zierhofer & Burger, 2007). Others articulate a general mistrust that transdisciplinary research can really provide any new insights (Weingart, 2001), while at the same time the effort needed to successfully design a transdisciplinary research project is high. Luhmann (1996) goes even further and states that participation under modern conditions is a utopian idea.

More moderate critique of the research mode centres on process, power and generalisability (Knapp, Reid, Fernández-Giménez, Klein & Galvin, 2019), questioning the latter (Westberg & Polk, 2016). While there are certainly advantages and potential for such an approach, we do not want to conceal that this research mode is challenging. Suitable research questions have to be carefully identified for this demanding mode in order to generate added value. Empirically derived challenges for transdisciplinary research structured around the three different transdisciplinary research phases (A-C) are described in the literature (Lang et al., 2012):

Phase (A)

- Lack of problem awareness or insufficient problem framing
- Unbalanced problem ownership
- Insufficient legitimacy of the team or actors involved

Phase (B)

- Conflicting methodological standards
- Lack of integration across knowledge types, organisational structures, communicative styles or technical aspects
- Discontinuous participation
- Vagueness and ambiguity of results
- Fear of failure

Phase (C)

- Limited case-specific solution options
- Lack of legitimacy for transdisciplinary outcomes
- Capitalising on distorted research results
- Tracking scientific and societal impacts

Another major challenge is the absence of a common language. The role of language is typically discussed in transdisciplinary or co-creation research as a boundary; inter- and transdisciplinary languages imply a high degree of semantic ambivalence and normative ambiguity (Herberg et al., 2021). While broad collaborations are often seen as good practice, this also requires an agreement on certain terms and language. The clear definition of terms is required at the very beginning of the research process. Participants have to agree on a common vocabulary (Bruce, Lyall, Tait & Williams, 2004; Horwitz, 2003; J. T. Klein, 2008) and apply a disciplinary multilingualism (J. H. Spangenberg, 2003).

Absence of common language and ethics

The research ethics are another challenge presented by a non-disciplinary research process. Big projects with several stakeholders involved lack unique, tailored and suitable procedures. Research takes place beyond the bounds of procedural ethics, meaning that ethics clearance procedures cannot be integrated and work throughout the entire process (Cockburn & Cundill, 2018). Timelines, structures and institutional arrangements which govern research ethics committees do not allow for flexible, preliminary and open-ended arrangements required for the pre-proposal research steps which were necessary for a transdisciplinary research process (ibid).

Procedural ethics challenges based on the literature (Cockburn & Cundill, 2018; Locke, Alcorn & O'Neill, 2013; Parsell, Ambler & Jacenyik-Trawoger, 2014; Smith, 2008) include:

- Research ethics committees lack experience in dealing with and reviewing unconventional research projects.

- The nuanced and complex relationship between the researcher and the researched is not often appreciated.
- Key role of good relationships and trust between researchers and research participants as a means of mediating ethical practice is not realised.
- Overemphasis on individual autonomy, whereby informed consent is seen as an individual, one-off activity, rather than a collective, negotiated, ongoing process.
- 'Informed consent', 'beneficence', and other principles of procedural ethics cannot be clarified at the start.
- Unclear boundaries around the 'ownership' of research data and findings.
- Difficulties faced in guaranteeing confidentiality of data in a collaborative research process.

All participants need to contribute to creating an effective trust-based research approach. Therefore, communities of practice should be installed and researchers should openly communicate with scholars facing similar problems. In addition, requests for feedback and consent, ongoing reflection and discussion with peers can help to resolve ethical questions (Cockburn & Cundill, 2018). Confidentiality and citizen misuse are additional problematic issues. Another ethical challenge is presented by the increasing call for transdisciplinary research from funding agencies. Those responsible for projects are forced to state that their research approach is transdisciplinary to be eligible for funding. This creates tensions for reviewers mainly trained in disciplinary evaluation (Bergmann & Schramm, 2008; Hornbostel & Olbrecht, 2007).

Following the overview of the literature regarding different aspects of transdisciplinary research, we must now turn our focus to the individual process phases and their importance. The central question in transdisciplinary research, how to generate transdisciplinary research results, is typically answered with the concept of co-creation, which consists of separate phases, engages very different tools and faces varying challenges. Scholars typically differentiate three phases of collaboration in a transdisciplinary process: co-design, co-production and re-integration (Bergmann et al., 2021; Schöpke et al., 2018). The next chapter offers a definition, common tools and methods used in co-creation, which includes co-production and co-design.

Co-creation (Including Co-production and Co-design)

The aim of co-creation is to develop solutions and generate results together with decision-makers, scientists and practitioners in a truly collaborative manner. The approach should be an opportunity to discuss, develop and implement projects or ideas to achieve new, inclusive, forward-thinking research strategies (ORION Open Science, 2021). Co-creation can be a method (Rekrut, Tröger, Alexandersson, Bieber & Schwarz, 2018), a specific project phase (Franz, Tausz & Thiel, 2015) or the result of a joint creation process with different stakeholders or groups. It is an act of collective creativity led by a group of people, and includes the two separate elements of co-production and co-design (Gebhardt, Brost & König, 2019). A formal definition of co-creation goes as follows: 'Co-Creation is enactment of interactional creation across interactive system environments, entailing agencing engagements and structuring organizations' (Ramaswamy & Ozcan, 2018). The European Commission defines co-creation as 'an approach where heterogeneous actors collaborate to produce knowledge, instruments, technology, artefacts, policy, know-how, etc.' (Robinson et al., 2015). The results are created through an ongoing process among these heterogeneous actors (von Schönfeld, Tan, Wiekens,

Salet & Janssen-Jansen, 2019). Von Schneidmesser et al. (2018) add a processual aspect and define the concept of co-creation based on the following three dimensions:

- **In a social dimension**, co-creation describes a reciprocal exchange-based collaboration between heterogeneous actors.
- **In a material dimension**, co-creation describes how the interaction between different perspectives generates something unexpected, which the actors involved can utilise.
- **In a temporal-spatial dimension**, co-creation describes those processes that enable relatively autonomous actors to exchange ideas or to create values together.

While the concept of co-creation originated in the 1970s, it became increasingly popular in the 1990s as a new business strategy in marketing (Leading Cities, 2014). This approach aims to encourage consumers to collaborate in a playful and spontaneous manner; the creation of meaning was a major concern of co-creation from the very beginning (Ind & Coates, 2013). In recent years, co-creation has evolved into a common concept in the context of urban planning, integrating various actors in the planning process (Franta & Haufe, 2020; von Schönfeld et al., 2019) and sustainability research (Bergmann et al., 2021). The move away from products to co-created value has become more and more important over the decades (Grönroos, 2011). Substantial improvements in factors like engagement and quality of feedback resulting from concrete enhancements (Rekrut et al., 2018) were increasingly connected to this approach.

Moreover, as in transdisciplinary research in general, the idea of democratising research plays an important role in co-creation (T. Brown, 2008). This is of course inherent, as co-creation is a part of the transdisciplinary research process. There should be commitment to the knowledge democracy and the concept of equalising power in the process of creating and sharing knowledge (Knapp et al., 2019). The role of the participants may be ambiguous and not clear cut. In addition, there is a need to rethink these roles and relationships in the process of knowledge co-creation and allow hybrid roles for 'Pracademics' (ibid.). The process allows for and should foster mutual influence of the interested parties in a decision-making process (Meyer-Soylu, Parodi, Trenks & Seebacher, 2016).

In a digital, highly connected, networked world, where individuals educate themselves and engage increasingly in passing their own knowledge on to others, active participation of different stakeholders becomes more and more prominent (Bhalla, 2010). Co-creation offers a more open approach to innovation (Chesbrough, Vanhaverbeke & West, 2006) and has fuelled the open-source movement (Raymond, 1999). The new technologies also reduce information asymmetries and can help to ensure engagement on an equal footing with all stakeholders.

Table 1 (see page 20) shows the methods and objectives in co-creation as identified in the ORION Open Science project. In the original publication, other important variables for the different co-creation methods are displayed, for example, the type of audience the approach might be suitable for, the single event and total time needed for the different steps and the entire process, as well as budget needs and case studies for further information (ORION Open Science, 2021). We see a gradual increase in the engagement of stakeholders. The first methods are purely consultative in nature, for example, citizen hearings or summits, expert panels and planning cells. The more participative methods include perspective workshops, focus groups and public dialogue. Conferences and surveys are valuable methods for integrating stakeholders. Forms and functions of participation and the different approaches are displayed in Brinkmann et al. (2015) in more detail.

Origins in marketing

Types of involvement

Table 1: Methods and objectives in co-creation

Source: ORION Open Science (2021)

| Method Type | Method Name(s) | Objective |
|--------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Deliberative | Citizens' Hearing | To inform and create discussion among citizens |
| | Citizens' Summit/ Assembly | To find out the citizens' attitudes about political priorities and possible courses of action provided on an informed basis |
| | Civic Dialogue | To encourage innovation, trust and confidence to facilitate the creation of a legitimate roadmap for moving forward in a particular direction |
| | Deep Democracy/ The Lewis Method | To access and bring out the wisdom within a group, and particularly to release the creative potential that results from conflict |
| | Deliberative Mapping | To provide a more robust, democratic and accountable decision-making process which better reflects public values |
| | Democs Card Game/ Play Decide | To enable small groups of people to engage with complex public policy issues |
| | Distributed Dialogue | To develop ongoing, embedded discussions around a topic |
| | Expert Panel | To synthesise a variety of inputs on a specialised topic and produce recommendations |
| | Interdisciplinary Work Groups | To take professional stock of the situation and partly to propose possible courses of action to ensure, initiate, promote or check development in the area |
| | Multi Criteria Decision Analysis (MCDA) | To rank a set of options from the most preferred to the least preferred option; policy formulation, programme development |
| | Planning Cells/ Citizens' Jury | To develop a set of solutions to a problem delegated to the participants by a commissioning body |
| | Q Methodology | To gain insight into the diversity of perspectives |
| | Scenario Building Exercise | To plan and prepare for an uncertain future; vision building |
| World Café & Science Café | To facilitate public debates on societal issues relating to science and technology | |
| Conferences & Forums | Consensus Conference | To enrich and expand a debate on a socially controversial topic |
| | Future Search Conference | To encourage participants to think about a problem or conflict in a new way |
| | Online Forums | To provide some form of consensus and collective decision |

| Method Type | Method Name(s) | Objective |
|----------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participative | Community-Based Participatory Research (CBPR) | To involve CSO members in all stages of the research process, from setting the questions, to framing and doing the research, interpreting the results and communication |
| | Participatory Action Research (PAR) | To engage citizens in a practical and transformative way by involving them in the scientific exploration of their living conditions and everyday problems in order to induce a change in these conditions |
| | CrowdWise | To encourage consensus-based decisions |
| | Demand Driven Research in Curriculum | To place research projects for CSOs in the curriculum |
| | Focus Groups | To determine the preferences of people or to evaluate strategies and concepts |
| | Open Space Technology | To enrich programme development, project definition, policy formulation and research activity and generate political empowerment among citizens |
| | Perspective Workshop | To explore possible myths, generate new perspectives, and put forward guidelines on a given technology or technological development |
| | Public Dialogue | To gather social intelligence to inform policy, anticipate regulation, exchange opinion or raise awareness |
| | Public Participation in Developing a Common Framework for the Assessment and Management of Sustainable Innovation | To develop priorities in research programmes |
| | User committee / Valorisation panels | To involve users and other stakeholders in the formal monitoring and steering of the research and innovation process |
| Surveys | Deliberative Polling | To get both a representative and an informed (deliberative) view of what the public thinks and feels about an important public issue |
| | Delphi Method | To enable anonymous, systematic refinement of expert opinion with the aim of arriving at a combined or consensual position |
| | Group Delphi | To consolidate expert opinion in a short time period |
| Prizes | Challenge Prizes | To define a project, incentivise innovation, focus attention on a particular issue and unlock financing and other resources |

Participatory action research (PAR) involves practice actors in the research process in order to jointly shape problematic conditions or developments in their respective institutional or social environment. The method is used in action research and research on the discrimination of minorities, and promotes mutual learning processes and interview techniques. It has demonstrated important outcomes in research on health and education (Knapp et al., 2019), such as more effective public health campaigns (Minkler, 2000). Community-based participatory research, similar to PAR, works with socially oppressed groups on the basis of parity between lay and expert knowledge, for example, in health science, population-specific health risks, sharing knowledge and skills, empowerment of affected groups and concrete interventions. In participatory policy-making, practitioners are involved in policy planning management and decision-making processes. Further approaches are transition management using existing capacities to solve sustainability problems, and the model of the Institute for Social-Ecological Research using the integration approach described earlier (Lang et al., 2012).

An informative overview on supporting research methods, participatory visualisation methods and concrete activities is provided by the project documentation SmartUp Labs (Michelini et al., 2021):

Supporting research methods of co-creation tools

- Prototyping
- Structured questionnaire
- Case study
- Observations
- Team building
- Personal discussions
- Living lab evaluation methods
- Data analysis
- Literature review
- Survey
- Action research study
- Content development/narratives
- Scenario development

Participatory visualisation methods and online co-creation

- Participatory workshops
- Visualisation workshops
- Gamification
- Living lab
- Public events
- Online co-creation

Concrete activities

- Brainstorming
- Design thinking
- City walks
- Co-creation of narratives
- Co-creation of workshops
- Working groups
- Interdisciplinary workshops
- Joint development process
- Co-design
- Participatory design
- Crowd-sourcing
- Design game

The methods allow for quite different levels of interaction and engagement for stakeholders. The entities and actors involved in the process are defined by research objectives or statements in a participatory design, with target groups taking on an active role in the process. A careful choice of methods and incorporation of suitable stakeholders is key to the success of the research. However, the chosen methods are not only important with regards to the overall success of a project; they might also determine the results of a research process. According to studies conducted by IASS Potsdam, there can be differences in the outcome of citizen councils, for example, depending on the moderation type chosen for the process (designated moderator role vs. self-moderation).

We should again articulate the practical constraints that make it impossible to integrate every opinion and type of expertise within a co-creative process. There will always be various stakeholders with different wishes and there can be no guarantee that all voices will be heard. The project leaders will decide on the actors involved and they might prefer to collaborate with a certain type of non-expert. Moreover, they may have full control over the choice of measures, although in an ideal-typical transdisciplinary project that should not be the case. These difficulties could result in power imbalances that should be addressed and avoided wherever possible.

In the framework of this paper, we cannot illustrate the richness of all projects in detail, but only outline its highlights. Innovative solutions for the tasks in the different project phases are offered by the EU-funded Governing Nanotechnologies Through Societal Engagement project (GoNano, see <http://gonano-project.eu/toolkits-for-co-creation/>). The project enabled co-creation between citizens, civil society organisations, industry, researchers and policy-makers across Europe to align future nanotechnologies with societal needs and concerns. They offer playful co-creation toolkits such as a Responsible Innovation Kit, a Co-Creation Navigator and the Science2Design4Society toolkit.

The Critique of Co-Creation: Democratic Dialogue or Displaced Politics?

Keynote lecture at Max Planck Institute for Demographic Research,
Workshop about 'Co-creation and Transdisciplinarity', 12th November 2021

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It is difficult to place all the co-terminologies that have recently emerged in various debates about science, innovation and social change. Co-design and co-production are among the most prominent and most highly discussed examples. Both terms are, for example, used in the field of transdisciplinary sustainability studies to describe the moments in research when scholars and citizens define a shared problem or bring together diverse insights to shape solution pathways. In some visual depictions of transdisciplinary research, co-creation is literally at the centre of the encounter between actors in science and society (Jahn, Bergmann & Keil 2002). Moreover, in training documents and management schools, and practices such as Design Thinking, Agile Management or Theory U, co-creation refers to the very core of a collaborative process. But what does co-creation mean and, more critically, how to assess its political value?

Broadly speaking, co-creation can be seen as the practical expression of a collaborative trend in the corporate world, in public policy institutions and in environmental and science policy. In various discourses, it has become commonplace to argue that co-creation is necessary when dealing with complex problems. In addition, practitioners and researchers in fields like community organising or public participation refer to co-creation as a desirable ethos for collaboration. In a conventional understanding, co-creation often refers to the collaboration of heterogeneous actors from civil society, academia, policy and industry in shaping solutions to thorny problems relating to sustainability or innovation.

However, the specific definitions of the term strongly vary according to the respective sectors or fields of application. For example, there is a whole field of business scholarship that writes about value co-

creation, usually without touching upon the participatory procedures that scholars and practitioners in public policy seem to emphasise. In public administration as a field of practice and research, co-creation is seen as a way of citizen involvement in the implementation of public services (Brandsen & Honingh 2018, Voorberg et al 2015). The multidisciplinary of co-creation is also reflected in fragmented languages (Herberg et al. 2020; Ryszawska et al. 2021). The call for unifying definitions therefore seems naïve as it ignores the social differentiation of political discourse, which co-creation has increasingly become part of (cf. Brandsen & Honingh 2018). A more exploratory and revealing way to deal with this pluralism is to search for the diversity of origins and the practical applications of co-creation. This may lead to an ideal-typical understanding of co-creation, while allowing for critical discussions about the right conditions and best practices. In this keynote, I can only make an initial step in that direction.

What trend(s) do I assign to, and which biases do I encounter when using the co-terminologies? What are the promises and practices of co-creation? My contribution implies, but transcends, the knowledge dimension. By contrast, looking at transdisciplinary practices of knowledge generation, I want to trace the politics of co-creation. That is, I want to describe the conditions under which co-creation may be a good idea. Co-creative collaboration may be a way to tackle issues of public interest, or it may be a insincere trend of involving various voices while lacking accountability or lasting effects. I thus argue that, before becoming a co-creator, it helps to channel your inner social critic.

In the first section, I describe the practice and expertise behind co-creation. The second section deals with some of the origins of the co-creation discourse,

elaborating on the business and academic side. The third section discusses a critical context in recent knowledge economies: the discourse of creativity and networking. In the fourth section, I discuss the social spaces where co-creation takes place, while providing both a more optimistic and a more cautious reading. Finally, in section five, I argue that the co-creative trend represents a normatively open-ended wave of the creativity discourse that is focused on the distribution and design of public goods. Overall, then, the essay articulates a dissatisfaction with co-creation that, once explicitly described, can serve as a more solid foundation for transformative collaboration.

1. Why are we here? The practice of 'process expertise'

In communities of process facilitation, citizen participation and other practices, the term co-creation implies a certain practical wisdom. When collaborating with practitioners in the fields of Art of Hosting or Dynamic Facilitation, for example, I noticed how they keep returning to the same questions. These questions underlie a certain ethos that the practitioners seek when they assume an active role in the interaction process. Lately, throughout the many digital gatherings that took place during the Covid-19 pandemic, it became clear that a good meeting should start with shared clarity regarding why we are here. (see table below).

In my experience, these questions often hit the mark, as they help to counter a naïve collaboration set-up. They indicate a critical understanding of the fact that initiators, facilitators and participants of co-creative

processes often face intricate social conflicts or hidden power dynamics. Giulia Molinengo, Dorota Stasiak and Rebecca Freeth term this critical understanding from an ethnographic point of view as 'process expertise'.

Process expertise in the context of science-policy interfaces unfolds in interaction with other types of knowledge and fulfils its task by generating a weakly institutionalised 'in-between space', in which researchers and policymakers interact to find more inclusive ways of tackling complex challenges. (Molinengo et al. 2021, 1)

This knowledge comprises learnable skills, personal dispositions and a collective team effort. The authors argue that researchers specifically can bring a critical discussion to the backstage of participatory processes, can broker between diverse groups and can structure the combination of diverse insights and experiences. Co-creation is also a popular term in practical fields of change management and group facilitation, such as Theory U, Design Thinking, Deep Democracy, Art of Hosting and Dynamic Facilitation. What these approaches have in common is the idea that general conversations, business meetings and emancipatory processes of collaboration and participation need to be facilitated in a structured, dialogical and inclusive manner. Some practitioners in these fields earn a living by facilitating dialogical processes, or by acting as vendors for public or private participation processes. Practitioners can read handbooks, enrol in training and obtain certificates (as I have done) in order to become part of those co-creation communities. Certainly, the practices and communities of co-creation deserve critical scrutiny, and as I discuss in the following there have been initial critical publications in sociology and the field of Science and

| Dimensions of co-creation | Aspects to look out for |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Social: how? | Who should be there, who is missing? Whose resources? Whose rules? Whose language? |
| Spatio-temporal: where & when? | Placing and meaning of the site? Setting in the room? Temporal order and time pressure? Who is host, who is the guest? |
| Substantive: what? | What purpose? Which currency? Which moments of convergence? |

Technology Studies (STS). Scholars in critical and interpretative policy analysis, in contrast, have often discussed co-creation in rather appreciative ways. Frank Fischer, for example, describes an emerging community of practice that embraces 'participatory expertise'. Jason Chilvers similarly speaks of 'deliberating competence' (2008), and Oliver Escobar sees a growing awareness for 'the micropolitics of public participation and deliberation' (2019), which co-creation is part of. Ryszawska and colleagues discuss co-creation and similar practices as exercises of 'participative leadership' (2021).

The more cautious insights in this literature often point towards the danger that participation – by being outsourced to businesses and/or by being defined and dominated by policy experts – itself becomes a technocratic practice. 'Process expertise', in this reading, may currently be in the process of becoming a mere political instrument or even an economic service and standardised product that can be bought and sold. For example, you may wonder if the recent fashion of citizen councils simply is a welcome opportunity for standardising politically risky and labour-intensive processes of citizen participation. Indeed, process facilitation is regularly outsourced to for-profit consultancy firms, and a frequent visitor will recognise the same standardised formats applied in very different contexts. Moreover, a number of sociological studies critically reframe co-creation on a micro-level. Practices such as participatory prototyping are described as performative and ambiguous enactments of technological futures (Dickel 2019), Design Thinking as a restored ethos of capitalist labor (Seitz, 2019), and dialogic approaches of change management as mere simulations of organizational openness (Kühl, 2020). This critical literature paints a picture in which co-creation pretends to be an emancipatory practice, but really fulfils the function of a figleaf for dominant power structures. The organizational setting of co-creative practice often is ambivalent, too: One STS group, which embraces the co-productionist tradition, recently argues that co-creation is part of a toolkit that transnational institutions such as the OECD or the EU use to mechanically mask the democratic deficits of innovation policy. In their reading, the laudable gesture of dialogue indirectly helps to stabilize market-liberal orders (Frahm et al. 2022). Others argue that the critique of a 'social deficit' generally lost its analytical footing as experimentalist forms

of collaboration and inquiry have long incorporated integrated viewpoints (Marres 2020): Co-creative processes may actually – by design or by chance – articulate issues and publics that cannot be explored by conventional analysis or policy making.

One thing that many observers remark upon is the peculiar language of co-creation and its tendency to mushroom into very diverse fields of practice – be it public policy-making or academic research. As Melanie Smallman has it in her abstract for a presentation at the recent gathering of the STS community (Society for the Social Studies of Science, 2021):

Like all the best epistemic imaginaries, co-creation eludes easy interpretation. Researchers have shown that for some, co-creation merely grants the cover of participation to business as usual. While for others, it opens up possibilities for radical collective knowledge making. But co-creation does other work too. It mobilises funding. It creates convening space for scholars, firms and civil society. (4S programme)

Academic terminology, management discourses and civic movements seem mangled up in a colourful discourse of collaborative culture. Yet, the term co-creation can easily become an empty signifier. Despite the difficulty of agreeing on its meaning (Voorberg et al 2015, Brandsen & Honingh 2018), it is certainly difficult to decline the invitation to co-create. The implied promise, after all, is very tempting: Conflicts supposedly are overcome, knowledge is integrated and solutions are found. Often the 'hosts' of a co-creative process even embrace the vagueness of co-creation as a pragmatic approach: the collaboration is intended to be open-ended and entirely context dependent. This way, even critical questions can be re-framed as welcome contribution to 'the process'. This emphatic openness can nonetheless add to discontent with co-creation. Understandably, participants may suspect that the undefined character leaves room for manipulation or false promises. The desire for solutions and collaboration, which characterizes the co-creation craze, may overshadow important problems or conflicts. Even the optimistic reader and the willing collaborator may thus see a growing need to come to terms with the underlying motifs and the potential consequences of co-creation. Such a critique, however, is not easy to place;

scholarly criticism may in fact become a ritual, in which social scientists affirm their position by distancing themselves from the pragmatic practitioner (Irwin et al 2013).

In the following, I give some initial pointers as to how the discontent with co-creation can be formulated in a meaningful way. This also implies that critics should not throw the baby out with the bathwater: where is the buzz around co-creation coming from? What are some of the historical contexts and political reasons behind its recent emergence? Where are co-creative principles being applied? What motives and effects resulting from co-creative practices might be worthwhile after all?

2. Where is co-creation coming from

Co-creation has multiple origins. Two specific contexts indicate how contradictory the term really is: the IT industry and interdisciplinary research. In both contexts, it is important to understand the historically specific culture and political economy that gives rise to the co-creation fad.

Management fads and spiritual roots

Firstly, the ethos of playful, media-based and solution-orientated collaboration is a defining feature of recent discourses about 'new work'. This ethos first developed in places where clusters of knowledge-based manufacturing and bohemian lifestyles overlap (Florida 2002). Especially in the IT industries of California, but also in other hotspots of the post-industrial economy in the late 20th century, creativity is not only seen as the desirable outcome, but also as a style of work. Media historian Fred Turner argues that the spiritual features of this fad – a do-it-yourself kind of productivity and a desire for radical transparency and non-hierarchical relationships – are a long-term off-spring of American counterculture (Turner 2006). Barbrook and Cameron (1996) famously referred to this connection between pop culture and capitalism as the 'Californian ideology': Emancipatory notions of creative (self-)development that emerged with the hippie communes of the 1960s have been commodified in and popularised through IT firms such as Atari, Apple and later Google and others. A current expression of this phenomenon is the Burning Man

festival, for example (Turner 2009). Recent knowledge economies and digital technology corporations have broadly institutionalized an ethos of 'new work' that ostensibly goes against linear ideas of planning and product development. It is not far-fetched to place those management trends – a widely accepted example is Agile Management – in this mixture of corporate identity and communal values. Co-creation, from this angle, not only stems from experiments of participatory democracy, but can also be seen as the expression of a post-industrial and highly competitive work culture. It is obvious to assume normative tensions between the call for democratic dialogue, on the one hand, and the economic and cultural origins of co-creation, on the other.

The underlying values of co-creation become concrete, for example, when agile managers argue against the linear mode of planning that they call 'the waterfall approach': The desired agility of collaboration is intended to counter any kind of hierarchical process that consists of sequential, conditional and regulated steps. The principles of bureaucratic organisations thus represent as a jump-off-point for co-creative practitioners to call for an 'organic' process of coordination. Also the idea of shared problem solving, which often is 'scaled-up' to large-scale issues such as war, climate change and space travel, is a historical line between 20th-century counterculture, the tech sector, and recent policy discourses. Critics of 'solutionism' recently address these and many other sectors, while often pointing out that dialogue is naïvely invoked as a panacea (Nachtwey & Seidl 2020, Herberg 2018, Pfothenauer et al. 2017).

This also shows how contradictory co-creation is: despite anti-institutionalist and anti-utilitarian intuitions, co-creation is often seen as a management technique that everybody can learn in order to be efficient and solution-oriented. One of the most explicit examples that integrates these ideas is called Theory U, founded by management theorist and consultant Otto Scharmer at MIT. Organisational theorist Stefan Kühl sees Theory U as a short-lived and esoteric management fashion that 'conceals its reliance on purposive rationality' (Kühl 2020). According to Kühl, a rationalist and productivist concept of social action undermines the values it claims to support – be that the diversity of interests, the community value and/or the importance of functional differentiation as a

core idea of systems thinking (Kühl, 2020). In his response, Otto Scharmer (2020) points to the later work of theoretical biologists Maturana and Varela in order to highlight epistemological differences to sociological system theory. His interest lies with individuals and collective agency, with social change rather than institutional stability. These references, or the brief quotation of Schumacher's 'small is beautiful', indicate how Scharmer draws on countercultural intellectuals of the 1970s and 80s. Co-creation in Scharmer's theory is the opposite of 'self-destruction', leading to 'evolution' instead of 'trauma'. One of his more worldly goals according to a recent text on Trump's election successes, is to 'deepen democracy' in order to avoid the 'architectures of separation' that he attributes to 'post-democracy' (2020a). Scharmer cites practical applications in business consultancy, or sustainability and education policies in the UN and OECD (2020).

These multiple references in Theory U indicate that Kühl's critical intuition is instructive, but too focused on the organisational side. What are the political intentions and potential consequences of co-creation approaches? In a favourable reading, you could recognise a sense of responsibility, problem-solving capacity and procedural fairness that, according to co-creative practitioners, should be re-introduced to collaborative spaces. Scharmer and others like him may even want to counteract the methods of lobbying and bargaining that often dominate the interstices of policy, science and industry. Scharmer's mention of 'post-democracy' points in that direction. If this is the underlying intention, it is worthwhile to describe the problem statement more specifically. A further and even deeper criticism of co-creation would discuss the peculiar language that brims with organic metaphors: collaborative results are 'harvested', institutional environments are referred to as 'ecologies', and management processes are seen as 'regenerative flows'. What does it mean to describe public policy issues or political confrontations with the organic metaphors of natural harmony and balance? Which concept of responsibility and which space for conflict remains when political processes are depicted as an ecology? These questions point at some of the spiritual ideas that underpin approaches like Theory U: They combine systems thinking, spiritual reflection and notions of enlightenment. Disparate contexts such as German idealism (e.g.

Pestalozzi's distinction of head, heart and hand), anthroposophy (e.g. reference to Rudolf Steiner), cybernetic thought (e.g. autopoiesis in Maturana and Varela), North American counterculture (e.g. the ritual of conversing in a circle) and the recent platform economy (e.g. project management tools based on 'agile' methodology) have shaped the co-creation discourse. Sometimes co-creation language is even mixed with traditional forms of conflict resolution, for example, when the hosts at the global climate negotiations in 2017 speak of the Fijian tradition of *Talanoa* (Herberg 2017). This indicates that co-creation is a recent iteration of much deeper ideas. They go back to the internal contradictions of modernity, such as organic and mechanical forms of management and solidarity. Nevertheless, it can be said that the managerial understanding of co-creation makes an unjustified claim to democratic dialogue. It remains unclear how organic forms of change management contribute to the resolution of conflicts of interest, the formation of political will, or the legitimacy of democratic decision-making.

Co-terminologies in interdisciplinary research

A more distinct origin of the recent co-terminologies is academic and possibly less problematic: co-production is a term to describe collaborative processes, not only in recent sustainability studies, but also in a tradition of science and technology studies (STS) that Michel Callon (1999) and other scholars initiated in the 1980s and 90s. A little later, Sheila Jasanoff (2004) and other scholars introduced a form of so-called co-productionist STS that captures the constitutional interplay of the sciences and state institutions analytically. Co-production, in this school of thought, contradicts any linear understanding of political problem solving, scientific knowledge construction or science-society-policy collaboration. Silke Beck summarises that '(T)he analytic concept of co-production helps in recognising these implicit and often unintended framing effects of practical-procedural efforts to use co-production as a strategic instrument.' (Beck 2019, p. 191). In that view, STS is an approach to somewhat dismantle the co-creation discourse. Indeed, recent discussions among STS scholars are driven by a certain puzzlement about co-creation and co-production practices. When studying so-called living labs or other formats of innovation policy on a local level, scholars notice that the vocabulary of heterogeneous collaboration is

now part of the hegemonic policy discourses of our time (Engels et al. 2019, Beck 2019). What used to be a critical, or even subversive way to show the problematic involvement of scientific expertise in shaping public policy is now a method of stakeholder engagement. Scholars at recent STS conferences therefore wonder: how can researchers critically engage with self-proclaimed co-creative communities in policy-making, which apparently use the co-terminology to legitimate exclusive innovation policies? Both in industry and academia, co-creation may actually be an expression of moving political decision-making beyond the realm of democratic accountability. It may not necessarily be a toolkit for collectively shaping inclusive policies or questioning the underlying assumptions behind innovation policies. Specifically in STS, the idea of heterogeneous collaboration has always included prescriptive ideas about inter- and transdisciplinary research. That specific tradition of STS, which in the broader Zeitgeist since the 1980s was driven by a more human-centric and emancipatory approach to science and technology, has left a lasting impact in helping to establish the traditions of Mode-2 research (Limoges et al. 1994) or postnormal science (Ravetz 1999). The systemic thought and communal ideals behind these reform programmes indicate a potential overlap with the countercultural roots of co-creation. Co-production in STS, on the one hand, and co-creation in policy offices or corporate culture, on the other, are distinct, but closely intertwined practices.

The confusion is complete when co-productionist STS is used to study co-terminologies. Indeed, 'the co-production of co-creation' would have been a fitting title for the present contribution. Yet such a critique would likely be tautological. It would even worsen the danger of 'STS accounts run[ning] the obvious risk of reinforcing the very activities and tendencies they criticize' (Irwin et al. 2013, 133). This brings me to an important distinction that avoids an overblown criticism: on the one hand, there is the buzzword that practitioners legitimately use to frame their collaborative ethos. Vague language is a normal phenomenon, especially when unconventional collaborations are forged that would otherwise easily lapse into rigid battles over conceptual and thus cultural distinctions. Of course, when using the term 'co-creation', I want to know which trend I am subscribing to. Yet vague discourse and co-creation parlance can encourage

collective orientation and a generous mutual understanding. On the other hand, co-creation is often used to systematically describe, analyse or improve spaces of collaborative transformation. Excessive use of the phrase, in this context, can dismantle the whole project of establishing a culture of sincere collaboration. Sociological critique, but also political action needs to be specific and, more importantly, specific critique can become a basis for political action and scholarly engagement. It is therefore necessary to bring forth the critique that is underneath the co-creation fad. In the following, I give a reading of recent sociological theory that may serve this purpose.

3. Why does it matter? The post-Fordist background of co-creation

Be it in management or research, co-creation is part of a general 21st-century Zeitgeist that revolves around creativity and connectivity. The co-prefix indicates a relational emphasis, while the aspect of creation indicates a desire to be productive and original. The German sociologist Andreas Reckwitz (2018) claims that this desire – he even calls it the 'dispositif' of creativity – goes back to the notion of originality in artistic fields in early modern times (first wave), later shaping the 1960s and 70s counterculture as well as urban planners and creative industries in the 1980s (fourth wave). You can see yet another iteration of the creativity discourse in policies surrounding innovation and sustainability, where co-creation has become a popular term (Voorberg et al., 2015). In approaches to group facilitation, co-creation signifies the moments in a process when problems are solved, collective creativity is unleashed and a broadly humanist style of work and social life is nurtured. This set of values broadly overlaps with the 'new work' ethos, too. As Boltanski and Chiapello pointed out, the values of efficiency are replaced by a generalized need to remain flexible and adaptable (2005). While belonging to the creativity Zeitgeist, co-creation moreover is an expression of something that sociologist Urs Stäheli calls the 'connectivity bias' (own translation, Stäheli 2021). In times of ubiquitous social and digital networks, it is hard to resist the urge or even social pressure to connect. Raising one's voice to claim dialogical inclusion and

emphatically relating to broader discourses of recognition has arguably become the dominant register of societal integration. Stäheli indicates that even the idea of purposeful silence and disconnection, for example, during countryside retreats or digital-detox practices, are often formulated in the language of a society that is obsessed with self-styled identities and collective networks. Interestingly, both Reckwitz and Stäheli seem to depart from the observation that a significant amount of creativity and solidarity cannot actually thrive in a society that is obsessed with collective networks. They insinuate that true originality takes place when individuals or groups do not constantly affirm and recognise each other. Stäheli refers to this problem on the basis of Michel de Certeau's concept of 'tactics', which implies that even the effort to leave urban centres of the network society is a mere adaptation to, or even a passive acknowledgement of 'network fever' (Stäheli 2021, de Certeau 2011). Consequently, the project of transformative practices of co-creation would need to turn from 'tactics' to 'strategies'. That is, to reform, or break with the dominant conventions of collaboration requires more than another form of creative networking. In turn, this also means that discussions about a good life or about democratic reform can and should not be limited to local face-to-face encounters. Dialogue is not a panacea for large-scale political problems.

Reckwitz and Stäheli thus show how emancipatory discourses are embroiled with a dominant post-industrial culture. Yet, beyond this macro-sociological diagnosis, I argue that co-creation is not easy to evaluate from a normative and empirical standpoint. On the one hand, locally embedded collaborative spaces especially, which are currently being revived by citizen movements in various local and national settings, may actually be part of reconfiguring the democratic capacity for creative problem solving (Fischer 2017, Taylor et al., 2020). By contrast to more institutionalised arenas of deliberation, such as expert commissions or cross-sector policy platforms, you could argue that the ideas and/or coping-strategies which can be identified through co-creative processes may help to counter the zero-sum negotiation or the 'least common denominator – quality' of political deliberation and collaboration (Van Bommel et al. 2009). Yet, this requires more than collective creativity. Not only process expertise, as described by the co-creative researchers Molinengo, Stasiak and Freeth (2021), but

also a certain transformation expertise would need to be part of meaningful co-creation exercises.

I suggest that a couple of re-interpretations of co-creation are necessary for co-creative communities of practice to go beyond the shallow discourse of networking and creativity. One interpretation is presented in the following section: Co-creation is part of a broad trend that does not transform but culturally manifests the dispersion and fragmentation of political space. That is, the rise of in-between spaces motivates but, at the same time, undermines co-creative practices. In this context, two very different registers of normative social theory can be applied, which I outline below.

4. What are the spaces of co-creation? The in-between is everywhere

Co-creation does not take place in some sort of vacuum. If proponents are serious about the need for collaborative governance and transformative change, it is helpful to understand change processes in the context of differentiated fields of action. Field sociologists, most prominently Pierre Bourdieu, present social space as a set of fields of action that shape the language, rules and conventions of cooperative or conflictual interactions (Bourdieu & Wacquant 1992). From this perspective, you can see co-creation as part of a proliferation of cross-sector collaboration, participatory arenas and interdisciplinary terminologies. This observation can be related to transdisciplinary research (Vilsmäier et al. 2017), to local environmental change (Schneidmesser et al. 2021), or to a broader conception of political space that sees co-creation as part of the 'ecologies of participation' (Chilvers et al. 2018). That is, the collaborative practices, which are supposed to re-integrate policy and expertise with 'affected communities', take place in between various and increasingly dispersed spheres of power and discourse.

Whether co-creation is a good idea in this context, however, depends on one's diagnostic stance: if you see the proliferation of in-between spaces as a problem of the post-Fordist economy, you may be more sceptical. If you see it as an opportunity for democratic reform, you may be more optimistic. This the-

oretical and normative yardstick may even serve the search for a better practice: the proponents of co-creation, in my observation, have a genuine intuition about the need to understand in-between spaces in a broad sociological sense. Otto Scharmer in his public speeches even uses the term post-democracy, agile management starts with a critique of bureaucratic hierarchies, and Design Thinking is often meant to subvert the blueprint solutions of policy and planning. However, such critical intuitions need to be more explicit and they should involve a self-critical take on the limitation of local change management in order to truly inform political action.

Co-creation as promoting 'creative democracy'?

A good starting point to discuss the optimistic reading of co-creation is an essay called 'creative democracy' that John Dewey wrote at the age of 80. Originally delivered as a speech on Dewey's birthday dinner by the philosopher Horace Kallen, the essay reminds the audience of democracy as an open-ended and personal project, or even as the new frontier of American civilization. The sweeping exploitation of resources, the institutionalization of political life and the contemporary contexts of Nazism according to Dewey require the intensified cultivation of collective creativity. The limitations of American society and 'the task before us' did not primarily seem physical, but mostly moral in nature. Dewey therefore sought to "get rid of the habit of thinking of democracy as something institutional and external and to acquire the habit of treating it as a way of personal life (...)". This can be read as a plea for a deeply collaborative culture to become a moral underpinning of democratic life. If institutions and daily encounters would promote experiences of collective problem solving, democracy would be firmly rooted in daily life. Dewey even prioritizes the process as such: "(d)emocracy is the faith that the process of experience is more important than any special result attained" (ibid.)

The more elaborate version of this thought, including the role of scientific knowledge in this context, is described in 'the public and its problems':

The essential need, in other words, is the improvement of the methods and conditions of debate, discussion, and persuasion. That is the problem of the public. We have asserted that this improvement depends essentially upon free-

ing and perfecting the processes of inquiry and the dissemination of their conclusions. Inquiry, indeed, is a work which devolves upon experts. But their expertness is not shown in framing and executing policies, but in discovering and making known the facts upon which the former depend.... It is not necessary that the many should have the knowledge and skill to carry on the needed investigation; what is required is that they have the ability to judge of the bearing of the knowledge supplied by others upon common concerns. (Dewey & Rogers, 208-209)

Be it the prioritization of the process, the appeal to collaborative culture or the inventive methods of deliberation – many democratic principles that undergird the co-creation discourse today arguably go back to pragmatist thought in the tradition of John Dewey (Dewey & Rogers, 2012) or Mary Follett (1924), as they have been elaborated in secondary literature at length (Caspary, 2018, Marres, 2007). Contemporary approaches of course also transcend Dewey, particularly when it comes to science-society dialogues. From a recent standpoint, he maintained a relatively orthodox view on epistemic authority that preserves the status of scholars as the primary creators of the democratic knowledge base. Although his biographer Robert Westbrook argues that Dewey's principles were not implemented in mainstream liberalism (Westbrook 1991), they certainly were generalized, simplified and translated across ideological and political scales and contexts. Especially, the recent trend towards political inclusion in the making of scientific knowledge and institutional policies is a long-term descendent of pragmatist theories of democracy.

Today, the idea of democratising democracy can arguably be recognized in recent applications of citizen councils, or other forms of participatory democracy. There are indications that these concepts have reached a high institutional level of national and international governance, while co-creation is often used as a practical term to promote this process in practice. Beyond parliaments and institutions, the German government, for example, launched an online hackathon at the beginning of the Covid-19 pandemic, a concept based on solution-orientated collaboration that goes back to the IT sector and other fields where co-creation is part of everyday

parlance. Against this background, non-critical practitioners of co-creation could see themselves on top of a positive trend. Moreover, co-creation in political institutions was recently promoted by scholars and politicians that promoted 'citizen councils' in order to improve the responsiveness of political institutions and to institutionalise formats of participatory governance. Most prominently going back to John Dewey and Jürgen Habermas, and more recently adopted by Patrizia Nanz and Claus Leggewie (2019) and many others, public consultation formats and other 'democratic innovations' are supposed to re-connect deliberative public discussions with institutional decision-making (Smith 2009, Escobar et al. 2014, Escobar 2019, Fischer 2017).

In this tradition, co-creation can be seen as an ethos for reviving, or even re-democratising in-between spaces. However, the knowledge economy that I related to co-creation in the previous section also problematises this optimistic reading. Jürgen Habermas himself has lately revisited his take on the structural change of the public against the backdrop of platform media. While an increased fragmentation of social space calls for even more deliberative politics, he is more sceptical and sees the alleged community effects of the internet as colliding with his vision of deliberative dialogue (Habermas 2021). He uses the term '*Entgrenzung*' (displacement) to argue that the communication technologies of the knowledge economy do not act in synergy with the aspiration to democratise democracy, but are rather used as a means for commodifying public discourse. Digital intermediaries arguably control the responsive dialogue between various publics and political arenas. This may seem unrelated at first, but is puzzling when looking at co-creative practices: the very methods that originated in the context of the IT sector – be it Theory U or Design Thinking – are propagated as tools for direct and solution-oriented democratic dialogue. However, co-creative practices are unlikely to counteract the post-democratic developments that they are part of.

Co-creation as promoting post-democracy?

In the expanded view presented above, co-creation is an ambitious experiment, to say the least. Dewey himself already maintained in 'the public and its problems' that industrial societies are overwhelmed with a plurality of political spaces:

There is too much public, a public too diffused and scattered and too intricate in composition. And there are too many publics, for conjoint actions which have indirect consequences are multitudinous beyond comparison, and each one of them crosses the others and generates its own group of persons especially affected with little to hold these different publics together in an integrated whole. (Dewey 2012, 137)

Even Dewey, the eternal optimist, realised that the diffusion of politics beyond formal democratic institutions can overpower the capacity of local groups to solve their immediate problems, or the capacity of institutions to develop fair and effective regulations. This diagnosis seems very current. Noortje Marres, by combining pragmatist theory and STS methodologies, has coined the term 'displaced politics' to discuss how the boundaries and responsibilities of political spaces become blurred: displaced politics takes place '(...) when power goes unchecked by institutional mechanisms of democratic control.' (Marres 2005, 5-6). Many commentators before and after have pointed out such processes, for example, Ulrich Beck's notion of '*Entgrenzung*' (Beck 2002), or more recently Colin Crouch (2004), who argues that transnational markets undermine national democracies. The political theorist Pierre Rosanvallon (2018) claims that the often-discussed crisis of legitimacy is also related to a lack of proximity and responsiveness between elected and electorate. In this context, it is not easy to see if co-creation is the solution or part of the problem.

There are at least two post-democratic tendencies that can be observed. First, co-creation often comes hand in hand with an issue of representation. The call for co-creative processes often starts with the realisation that the democratic systems of representation through elected officials and democratically legitimated institutions do not always represent the underlying societal diversity. Democratic representation in the form of elections is itself in crisis due to increasing institutional complexity, e.g. in the European Union (Kamlage & Nanz, 2017), and societal pluralisation and the trend for presidential or even authoritative leadership (Rosanvallon, 2018). Especially in conflictual and dynamic transformation processes, there is often still the need to open up decision processes to the voices of affected communities. Yet, once co-creative processes are set up to complement

democratic institutions, another issue emerges: the space in between the respective fields – which can be problematized as a post-democratic zone – mostly lacks the institutional facilities and normative underpinnings that would stabilise the collaboration and legitimise the contribution to democratic processes (Herberg et al. 2020). In the absence of a democratically reflected ethos of facilitation, however, co-creative processes may even reiterate the problem of misrepresenting particular interest groups. The participants that were selected to contribute may not be held accountable in front of the groups that are most affected by the co-created results. Moreover, involved partners have little basis to trust the procedural justice of a rather spontaneous or emergent co-creative process; they may fear that the results are not subject to the same checks and balances as democratic institutions. It is therefore necessary to problematise the emergence of in-between spaces, while encouraging a more acute awareness for the practice of practitioners assuming an active role to promote democratic spaces of collaboration.

The second post-democratic aspect of co-creation is the creativity discourse itself, which originates in the history of the discourse about knowledge economy. Clearly, the inclusive connotation of co-creation is co-opted by the priority for cognitive work, for original thinking, or even some sense of individual genius or ‘wisdom of the crowds’. As has been observed with regard to Design Thinking (Seitz, 2019) maker-spaces (Dickel, 2019) and Theory U (Kühl, 2020), co-creative practices – despite their organic language – often endorse a non-reflexive, rationalist and teleological approach to solving collective problems. This is not only an internal contradiction and therefore a regrettable feature of practical life. The links between co-creation and the knowledge economy are even more troublesome when considering the places where they come together: The very context that gave rise to recent ‘new work’ discourses had manifest effects in accelerating socio-economic disintegration, for example, the deindustrialisation and the deinstitutionalization of local solidarity structures in places like the Rust Belt in the US (Gaventa 1982, 2019) or coal regions in Germany (Haas et al. 2022). The political result, more often than not, are disaffected communities and, in relation to dis-appointment and political apathy among affected groups, a breeding ground for right-wing populism

(Haas et al. 2022, Gaventa 2019). The resulting ‘rebel regions’, as historian Anton Jäger (2021) recently coined them, are unlikely and, in practice, extremely challenging places for experiments of transformative dialogue. The lesson of this contradiction does not only apply on industrial workers, but also on other vulnerable groups: it is difficult to imagine that the communities that do not benefit from the knowledge economy can be re-integrated by means of approaches like Theory U or Design Thinking. Processes of displaced politics produce disaffected communities that cannot easily engage in practices of co-creation. There are alternative approaches, for example the work of John Gaventa, that take local experiences as a starting point and link local knowledge structures to the political economic legacies of a particular place (Gaventa 2019). But, these approaches do not run under the discourse of co-creation and borrow their practices from civic engagement rather than the knowledge economy.

5. What to do with the critique of co-creation? A fifth wave of creativity

In this essay, I have positioned myself as a friendly critic of co-creation. Against the societal and theoretical backdrop discussed above, co-creation can be seen in a more or less critical way: It may either amount to a countervailing force that can act against the trend of displacing power beyond democratic institutions and local communities. Co-creation may thus be a practice of re-democratising the interfaces of science, policy and concerned publics. Approaches such as Art of Hosting or Design Thinking possibly provide a practical ethos that is necessary for governance processes to fulfil their inclusive promise. At worst, when the previously described pitfalls and internal contradictions are not acknowledged, co-creative settings can escalate into post-democratic zones: process facilitators may take unwarranted power, co-creation language may exclude the losers of the knowledge economy, or policy makers may borrow local legitimacy without providing transparent mechanisms of accountability.

In that sense, I argue that the jury is still undecided on the political value of co-creation. As a way of concluding the essay, I suggest that we are faced with an

open-ended development that requires practical experimentation and analytical scrutiny. More pointedly, I argue that we are dealing with a fifth wave of the creativity imperative (Reckwitz 2018), which can be shaped and re-directed by a combination of thoughtful critique or radical practice. This wave is and should be markedly different from previous waves: in contrast to the specific design or labour-orientated focus of previous debates of post-Fordist work, parts of the current practices of co-creation are directed towards the just organisation of public goods. Especially the locally embedded collaborative spaces, which are currently being revived by citizen movements, can be part of reconfiguring the democratic capacity for creative problem solving. Yet, the political variant of the creativity imperative requires a constant normative discussion and a correspondingly grounded practical ethos. Practitioner communities and social scientists may therefore take co-creation as a platform for a practical dialogue about political cleavages and emancipatory practices. This has been my main argument in this essay: If one decides to embrace the co-creation as a researcher or practitioner (or both), the respective ethos of transformative collaboration clearly requires a foundation in sociological critique.

This critical remark is also meant for the practitioners of co-creation. Beyond 'process expertise' (Molinengo et al 2021), co-creative practice must be based in transformation expertise. That is, practitioners need a critical understanding of transformations and social structures that underlie the need for collaboration and inclusion. In my experience thus far during professional training and co-creative exercises, many critical questions are frequently not discussed, or even avoided among co-creation communities such as Theory U, Art of Hosting, Dynamic Facilitation and Design Thinking. What does it mean to strive for collective problem solving – who is the collective, what is the problem, and who is responsible for solving it? Moreover, how subversive or transformative is co-creation really? When the demand to be creative, connected, and agile has long become a dominant societal pressure, the language of co-creation hardly is transformative; it can even impede meaningful dialogue with those who cannot or will not meet the creativity imperative. These and other similar questions should not be seen as signs of shallow scepticism or rigid refusal. Rather, co-creative practice can be built around political critique in order to be more

transformative. Practitioners can therefore benefit from the exchange with political theory and sociological observation, while social researchers should engage more openly with the ambiguity that is inherent in co-creative practice.

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Further Formats of Transdisciplinary Engagement

Whenever science opens up and makes itself accessible to society, there are several ways to create synergies. One approach that always holds significant potential for social impact is citizen science. Transdisciplinary research and citizen science pose comparable questions and face comparable challenges. While transdisciplinary research entails acting strategically by engaging potential implementers as stakeholders, citizen science is a very broad approach that involves quite different groups in an open format (Schäfer 2018). In the literature, citizen science is described as another way to democratise science and ensure a more active scientific citizenship (Newman et al., 2012). Citizen science differs in its conceptual understanding from citizen involvement, participation and living labs.

Citizen participation in general means that all stakeholders, individuals and organisations are involved in political decision-making and decision-making processes. Similar to citizen science, citizens are involved in processes that were previously inaccessible to them, and are granted competencies that have not been available to them until now. However, the focus here is not on involving citizens in research, but in political decision-making. In contrast to this, participation can be defined as the active involvement of citizens or of the members of an organisation, group or association in (political) affairs. Real-world laboratories, living labs or other similar formats, on the other hand, refer to a social context in which researchers carry out interventions in the sense of 'real experiments' in order to learn more about social dynamics and processes (Rückert-John et al.).

Citizen Science – Engaging Society

Citizen science refers to general public engagement in scientific research activities. Citizens actively contribute to science either through their intellectual effort, relevant knowledge or using their respective tools and resources (European Commission, 2014). This format dates to around 1900, with the first attempts to include citizens in the research process being the Christmas Bird Count. The Count is conducted annually and invites volunteer birdwatchers to engage in the process of data gathering that is subsequently used for scientific purposes, in this case primarily conservation biology (Bonney, Phillips, Ballard & Enck, 2016; Resnik, Elliott & Miller, 2015). Citizen science received broader attention in the 1990s (Bonney, 1996; Irwin, 2002) when the philosophy to engage the public more intensely in scientific discourse and policy-making gained interest (Irwin, 2002).

Citizen science is based on the collaboration of a broad network of people. Participants provide experimental data and facilities for researchers, raise new questions and co-create a new scientific culture. In addition to adding value, volunteers acquire new learning and skills and gain a deeper understanding of the scientific work in appealing ways. As a result of this open, networked and transdisciplinary scenario, science-society-policy interactions are improved, leading in turn to more democratic research based on evidence and informed decision-making (European Commission, 2014). Citizen science is unique in its diversity of scales, its naming of participants as scientists and its (often) online nature (Klenk, Fiume, Meehan & Gibbes, 2017). We can observe varying intensities of engagement with research

(Riesch & Potter, 2014) and several forms of collaboration between actors. The scientific practice of involving citizens in the scientific research process (Jaeger-Erben, 2021) is a step towards the future peer-to-peer society (Wildschut, 2017). Citizen science also creates a nexus between science and education, expanding the frontiers of ecological research and public engagement (Newman et al., 2012). It foresees a type of science that is networked and open.

The areas where citizens can engage are data collection, data processing and curriculum-based community science (Bonney et al., 2016). The European Commission has identified additional models of citizen engagement, including collective intelligence, pooling of resources, analysis tasks, serious games, participatory experiments and grassroots activities (European Commission, 2014). It increases the public awareness of the diversity of scientific research, gives them a voice and increases social well-being (Newman et al., 2012). The scientific value of these types of projects, which yield new knowledge by collecting and analysing vast quantities of data, is easily measured by the rapidly growing number of peer-reviewed publications based on volunteer-collected information (Bonney, Phillips, Enck, Shirk & Trautmann, 2015). A thorough overview of citizen science projects can be found in Dickinson, Shirk et al. (2012).

New technologies ease the integration of citizens into science through the use of mobile applications, wireless sensor networks and online computer/video gaming. As in an ideal-typical transdisciplinary research project, in citizen science different stakeholders with varying backgrounds are involved on an equal footing, too (Newman et al., 2012; Wildschut, 2017) with all the challenges such an approach entails. Typically, we do not find an evaluation process in such projects, but rather it is context and research questions that determine suitability of method or approach (Jaeger-Erben, 2021). Prototype citizen science projects and activities include co-design, co-production, virtual participation, autonomous research and educational projects with research content (Rückert-John et al.). A recent green book presents the goals, potentials and challenges of citizen science in Germany and shows options for the development of a national strategy for the involvement of citizens in science (Bonn et al., 2017). Other formats are citizen assemblies or citizen advisory councils. Differing by number of participants and duration, we find many more formats such as citizens' panels, citizens' councils, scenario workshops, world café approaches, or 'future workshops' (*Zukunftswerkstatt*) (Nanz & Fritsche, 2012). These formats are meant to strengthen democracy and support pluralism and openness within modern societies.

Real-world Laboratories (*Reallabore*)

Real-world laboratories are another popular format involving different stakeholders in the research process. Researchers carry out interventions in a social context and transfer the scientific laboratory concept to the analysis of social and political problems (Schäpke et al., 2017). Real-world labs offer networking and cooperation structures. The main principles of cooperation are co-design in the research process and co-production of knowledge (Mauser et al., 2013). Within this format, research addresses local sustainability issues within a global scope and uses an inter- and transdisciplinary research approach, building on the collaboration with societal actors and continuous methodological reflection. Real-world laboratories can be urban quarters or entire cities, regions (e.g. rural regions, biosphere reserves, national parks), projects on conversion sites, university campuses, but also industries and value chains, or a regional mobility system (MWK, 2013).

Characteristics of real-world laboratories following Schöpke, Stelzer et al. (2017) and (2018):

Transformative research approach:

The approach seeks to combine transformation and transformative research. Thus, real-world laboratories should (1) contribute to the sustainable transformation of society in a relevant problem field. They should (2) further provide evidence for a socially robust solution strategy.

Experiments as central research method:

Experiments should provide evidence for solution strategies and build a bridge from knowledge to action. This is either evidence pertaining to sustainability problems, which takes shape in descriptive-analytical knowledge, or pertaining to sustainability solutions in the form of action-orientated knowledge.

Transdisciplinarity as research mode:

Scientists and practitioners should collaborate on an equal footing. They develop the project together using co-design and co-production. The aim here is to differentiate and integrate scientific and societal knowledge in relation to a real-world problem.

Research should be long-term, scalable and transferable:

To accompany long processes of social change, projects should be envisioned over the long term (about 25 years). The results should be transferable to other contexts. Scaling concerns increasing the reach of solutions (scaling from households to districts, or beyond).

Over the entire project duration, reflection and learning is needed from all participants. Also, within this setting, tailored techniques have to be used for the specific research question, making a one-size-fits-all approach unsuitable. Nevertheless, it is possible to identify factors and provide orientation to increase the probability of success for a real-world laboratory. Bergmann, Schöpke et al. (2021) provide such recommendations for a successful design of collaborations on the basis of reviewing several projects and survey results. According to them, the success factors that contribute to well-functioning, high-quality science-practice collaborations are:

- Find the right balance between scientific and societal goals
- Address the needs, interests and restrictions of practitioners
- Make use of the experimentation concept
- Actively communicate (communication is of the highest importance for real-world laboratories)
- Develop a 'collaboration culture' between science and society
- Be site-specific
- Create lasting impact and transferability
- Provide and acquire sufficient time and financial means
- Be prepared for adaptability
- Provide research-based learning and reflection in real-world laboratory settings
- Consider dependency on external factors

Challenges to real-world laboratories are manifold and comparable to most transdisciplinary research approaches. The approach is resource intensive and requires a considerable degree of organisation. The coordination of measures, procedures and actors is ambitious. One challenge is to ensure the permanent and meaningful engagement and motivation of

stakeholders in addition to facilitating communication. It is necessary to develop sustainable networks, address social questions and prejudices and not to misuse participants (Schäpke et al., 2017). Another challenge results from the fact that changes in society are not only to be researched in real-world laboratories, but also initiated in this format. This entails ethical questions on the responsibility and legitimacy of interventions (Schäpke et al., 2018).

Other Formats

There are numerous additional formats for transdisciplinary research beyond real-world laboratories, differentiated by actors involved, research focus and/or concepts used. **Living labs** are increasingly important (Wagner, Schäpke, Stelzer, Bergmann & Lang, 2016) for generating societally accepted knowledge in order to solve real-world problems. The knowledge gained is used as an example and is assumed to be transferable to other contexts (Wagner & Grunwald, 2015). Focus is on products and services that are developed and tested in feedback loops with a combination of traditional and non-traditional research methods and the involvement of different stakeholders (Michellini et al., 2021). Within an experimental research design or network embedded in a real environment, users and producers create innovations using co-creation and co-production (Leminen, Westerlund & Nyström, 2012). Such an approach promotes open innovation and learning processes (Mück et al 2019). The advantage of this is that it provides a suitable format to assess user acceptance (Meurer 2017) and ensure a higher level of user awareness (Kressler et al 2018).

Urban transition labs (Nevens, Frantzeskaki, Gorissen & Loorbach, 2013) present another possible format. They have various foci and underlying concepts include transition management, organisational learning or action research. What is important here are concrete meeting places for realising social innovation; the aim is to facilitate social transition by fostering urban sustainability. The format 'urban living labs' have a focus on industry and research institutes using product service systems or innovation studies. Home labs, campus as laboratory or social innovation labs complement the other formats and use a huge variation of concepts including second-order learning, organisational learning, community-based action research or grassroot movements leading to changes in everyday life.

The study from Luederitz et al. (2017) provides a detailed overview of additional formats resembling real-world laboratories.

There exist further approaches, such as transdisciplinary case studies (Posch & Scholz, 2006; Scholz et al., 2006; Wiek, 2007), participatory action research (Borda, Reason & Bradbury, 2006; Bradbury & Reason, 2003; McIntyre, 2007), community-based participatory research (Hacker, 2013; Minkler & Wallerstein, 2003), field and intervention research (Krainer & Lerchster, 2012; Ukowitz & Hübner, 2018) and transition research (Luederitz et al., 2017; Schot & Geels, 2008). The parties involved vary depending on the project and research question, as do the tools and methods used. Learning from projects, scholars and institutions that have a long history of successful transdisciplinary research is therefore required. By reviewing the relevant literature and exchanging knowledge and ideas, we can identify promising approaches for concrete projects, summarise factors for adding value and improve success rates.

Citizen Science: A Silver Bullet for Transdisciplinary Research?

Workshop 'Transdisciplinarity and Co-Creation', 12th November 2021

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My talk starts with a definition of transdisciplinary research in contrast to multi- and interdisciplinary research (Item 1), then assesses the character and challenges of transdisciplinary research in the social sciences and socio-ecological research in comparison to transdisciplinary research in applied engineering projects (Item 2). Finally, I describe the three major forms of citizen science (Item 3) and culminate in proposing citizens' assemblies and mini publics as a method to give citizens a decisive role in applied research projects.

Item 1: Transdisciplinary, multidisciplinary, and interdisciplinary research

Multidisciplinary research combines different disciplines in a joint research project. It favours the specific disciplinary perspective of each of the different disciplines involved, in order to analyse a problem (e.g. the question of why the onset of electric mobility was delayed) from different points of view, (e.g. the perspectives of electrical engineering, chemical engineering, law, psychology, anthropology, economics, business administration, etc.). The university as the 'lord seal keeper' of disciplines is the appropriate and best place for multidisciplinary research.

Interdisciplinary research integrates different disciplinary perspectives in a problem-orientated approach. Applied non-university research is often interdisciplinary, and the researchers involved in interdisciplinary research replace their disciplinary identity over the long term with a holistic, problem-orientated, interdisciplinary perspective.

Transdisciplinary research demands the integration of non-academic, practical perspectives into the research project on an equal basis. Practitioners, clients and stakeholders with a non-academic, non-(inter)disciplinary perspective should have a say and contribute to the joint research goals on equal terms with academic research partners.

Item 2: Transdisciplinarity in social sciences and engineering sciences

Transdisciplinarity has been a prerequisite in applied, problem-orientated social sciences, and socio-ecological research projects in particular, for more than thirty years. However, a closer look at most transdisciplinary research projects in the social sciences reveals that practitioners are not given attractive roles on equal terms in the research process, but rather, their function is limited to that of an object of study. They are interviewed, observed and understood. Of course, there are positive exceptions to this general observation. In contrast to this hierarchical difference between academics and practitioners in many social science projects, applied transdisciplinary research projects in engineering often offer attractive roles and opportunities for participation to practitioners. In short: the organisation of transdisciplinary research in many engineering projects, to my mind, is far ahead of transdisciplinarity in the social sciences. The transdisciplinary character of applied engineering projects is one explanatory factor for the globally leading position of German engineering in many societal and industrial segments. It is no coincidence that the most consistent version of a standard for citizen participation to date is an engineering guideline,

the VDI Guideline 7000 (early public participation in industrial and infrastructure projects). The social sciences can and should learn from these successful transdisciplinary cultures and structures.

Item 3: Three forms of citizen science

Citizen science emphasises the involvement of citizens in research projects. It is transdisciplinary by definition.

Traditional forms of citizen science have been around for centuries. In these traditional divisions of work, the citizens mainly collected and contributed data, e.g. in ornithology or astronomy. The professional academic research partners then condensed these data into scientific results or hypotheses. In zoology and faunistic studies, this traditional citizen science was and is very common. It is fitting that the president of the European Citizen Science Association, Johannes Vogel, is the director of a museum of natural history, as these museums have been hubs for this traditional citizen science for a century.

In contrast to this traditional citizen science, cooperative transdisciplinarity offers new roles for active participation in research projects on an equal basis to non-academic researchers. For a quick check of the collaborative character of research projects, I suggest examining the distribution of the research budgets between academic and non-academic partners. However, it is not easy to develop attractive roles for the active participation of non-academic research partners in research projects.

The third form of transdisciplinary research offers new roles for participation in strategic decisions about research questions and policies to academic and non-academic partners. Here, the practitioners can have an equal say.

Over the last 10 years in politics, we have experienced a boom of citizen juries, planning cells, mini publics and citizens' assemblies, all of which provide citizens a sovereign role in decision-making processes. In governmentally funded research projects, mini publics can play a similar role. While scientists, as stakeholders of their research interests, can advertise their research strategies, the citizen juries, selected at random, can discuss these suggestions and recommend strategies. Germany's National Citizens' Assembly on Research (Forschungsbürgerrat), funded by the German Research Ministry, which is currently in operation, is an attempt to gain new space for this form of transdisciplinarity. It will change our understanding of transdisciplinarity.

Further reading

— Hans-Liudger Dienel: Transdisziplinarität. In: Lars Gerhold et al. (Hg.): *Standards und Gütekriterien der Zukunftsforschung. Ein Handbuch für Wissenschaft und Praxis*. Wiesbaden: Springer VS 2015, 71-83.

— Hans-Liudger Dienel, Nicolas Bach, Christine von Blanckenburg: Mini Publics Online – geht das? In: *Rethinking Law. Legal Tech – Digital Economy*. 4(2021), H3, 45-52. (ISSN 2625-686X)

— Hans-Liudger Dienel: Klimabürger:innenräte in Europa: Eine demokratische Innovation kombinatorischer Demokratie. In: *Rethinking Law. Legal Tech – Digital Economy*. 4(2020), H5, 56-61. (ISSN 2625-686X)

— Hans-Liudger Dienel, Timo Rieg: Qualitätsstandards von Bürgerbeteiligungsverfahren mit Zufallsauswahl. In: Jörg Sommer (Hg.): *Kursburch Bürgerbeteiligung #3*. Verlag Deutsche Umweltstiftung: Berlin 2019, 191-206.

— Hannah Ulbrich, Marco Wedel, Hans-Liudger Dienel (Hg.) (2021): *Internal Crowdsourcing in Companies. Theoretical Foundations and Practical Applications*. Springer: Berlin/Heidelberg/New York.



Beyond the Theory – Best-practice Examples

The preceding chapters and contributions focused on the literature and theoretical foundations of the transdisciplinary research mode. An awareness of the scientific discourse, as well as the challenges and limitations of this approach, is of major importance for addressing a transdisciplinary project. The additional and alternative knowledge and added value gained from including several perspectives beyond scientific expert knowledge justifies engagement

with such an intense and demanding mode of research. There is still no blueprint on how to design and execute a transdisciplinary project. Consequently, we have illustrated numerous tools and methods and the choice depends solely on the actors involved and the suitability for a specific research question. As there are various pathways promising to successfully answer research questions, we want to learn from projects designed in a transdisciplinary or co-creational way and show examples of how to approach research questions in the real world. In theory, the use of transdisciplinary research is not limited to specific topics. You can think of and design many projects in a transdisciplinary context. Still, we find clusters of different topics where this approach is used more frequently and might be more appropriate for finding answers to societally relevant research questions. Typical topics include sustainability research, climate change, mobility, education and health. The questions range from future conceptions of mobility, to participatory city design, and the design of functional hospital rooms or formats for lasting student engagement.

A major problem of knowledge today is that it is available in a wide range of formats. Information and ideas are dispersed and seldom connected. Co-creation can help to improve solutions and foster innovation. We have to rethink many areas of society in an innovative way and use today's well-informed patients, customers and users to create new knowledge. This is especially true when a question has more than one possible answer. The answers depend on the individuals involved and the desired outcomes that are societally agreed upon. In relation to topics such as climate change, where there is a high degree of uncertainty, it might help to develop scenarios and follow more than just one pathway, using innovative approaches from different interest groups. This can also apply to questions with long-term implications, where immediate and deferred consequences affect different individuals.

Internet sources on specific projects offer playful and interactive tools that might be useful to researchers and stakeholders willing to engage in transdisciplinary research. The SUNRISE project ('Sustainable Urban Neighbourhoods – Research and Implementation Support in Europe', <https://civitas-sunrise.eu/>) supports readers with the setup of their own co-creation measures in a local community. The aim is to implement sustainable mobility solutions. The Happy Aging Living Lab from Belgium (<https://www.happyageinglab.com/>) focuses on senior citizens in order to test the extent to which products or apps are suitable and/or helpful for use in daily life. The aim is to shape a supportive, inclusive and attractive living environment for healthy ageing, pursuing innovative processes and tailored improvements. The Waag Co-creation navigator (<https://ccn.waag.org/>) guides you through the different stages of co-creation from preparation to execution. It offers very different tools for the separate project phases and, similar to the map of an underground train network, offers a playful, visual way to navigate through a project.

The best practices presented in detail below offer a wide range of topics and tools for giving life to transdisciplinary research projects. The case studies offer insights into how to involve people living with dementia in housing decisions, include children as experts in their own life in research about themselves, and the opportunities and challenges of citizen research councils. We can learn from case studies in different cultural contexts and the challenges of mobility transformation processes with local stakeholders. By looking at specific projects, we can identify the most important features and success criteria for the transdisciplinary research mode. All contributors stress the long time horizon needed by transdisciplinary research to develop its full potential. This requires the establishment and, more importantly, maintenance of relationships. The researchers need to develop a positive reputation and a sense of trust, while engaging in a (self-)reflexive and iterative process in order to make an impact.

Methods of Transdisciplinary Integration

Lessons Learnt from Case Studies in Different Cultural Contexts

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I. Transdisciplinary research process

The transdisciplinary research mode has a long history of academic discourse, but is now well established in sustainability science (Jahn et al. 2012). The conceptual model of an ideal transdisciplinary research process, developed at ISOE – Institute for Social-Ecological Research, Frankfurt, Germany, distinguishes three consecutive steps: 1) formation of a shared understanding of the problem and a common research object, 2) production of new knowledge and 3) transdisciplinary integration.

In the first step, the collaborative design and creation of a joint problem-framing process, with input from both science and society, is relevant. This sets the basis for further collaboration and research. This scoping phase is important for enabling the creation of scientific and societally relevant output. In the second step, the joint production of new solution-orientated and connectable knowledge is relevant. In a transdisciplinary setting between scholars and societal actors from the problem field, new knowledge is created and integrated. In the third step, the different possibilities of dissemination paths are prevalent. Besides the process and formats of knowledge transfer, social learning within and amongst scientists and stakeholders comes to the fore. Stakeholder engagement is a central pillar in transdisciplinary research. Stakeholders are seen as both interest and knowledge holders.

With this publication, I will give insights and share lessons learnt from case studies in two transdisciplinary research projects in different cultural contexts, namely Germany and Mongolia. In particular, I will focus on the first two steps of the transdisciplinary research process, co-design and co-production.

II. Project outline

The MORE STEP project is carried out in Mongolia's Eastern Steppe and seeks to identify societal development paths that will facilitate the mobility of wild animals and nomadic pastoralists and their herds in the future. Empirical social science methods (qualitative and quantitative), stakeholder engagement and integrated modelling and scenario development are used here.

The SLInBio project is carried out in Frankfurt, Germany and aims to explore the social-ecological interactions between the lifestyles and everyday practices of urban dwellers and urban insect diversity. In particular, empirical social science methods (qualitative and quantitative), stakeholder engagement, art interventions and citizen science activities are implemented.

III. Lessons learnt

A. Step one in the transdisciplinary research process: co-design

1. Pre-phase: Both projects had a one year pre-phase, financed by the funding agency. The aim of this pre-phase was to scope and jointly formulate the research aim and question, consolidate the consortium and finally, submit the full proposal for the three-year full phase. In both projects, we carried out a stakeholder workshop in order to develop the joint research question. In the MORE STEP project, this resulted in expanding the consortium to incorporate economic expertise. In SLInBio, we integrated a new topic and areas of investigation, as this was suggested by the local municipalities.

A joint excursion into the study site in Mongolia, including data collection, helped to better understand the environmental and societal conditions in the region, but also led to a better understanding among the different scientific disciplines of natural and social sciences.

2. Stakeholder analysis: As part of the pre-phase, a stakeholder analysis was carried out in both projects. The stakeholder analysis followed the consecutive steps of 1) identifying stakeholders and stakeholder groups, 2) assessing and prioritising stakeholders and 3) developing an understanding of the stakeholders (Durham et al. 2014). The main aim was to get a better understanding of whom to involve, collaborate with, inform and consult (Durham et al. 2014). For this reason, an interest/influence matrix was developed (Figure 3) (Mehring et al. 2018).

B. Step two in the transdisciplinary research process: co-production

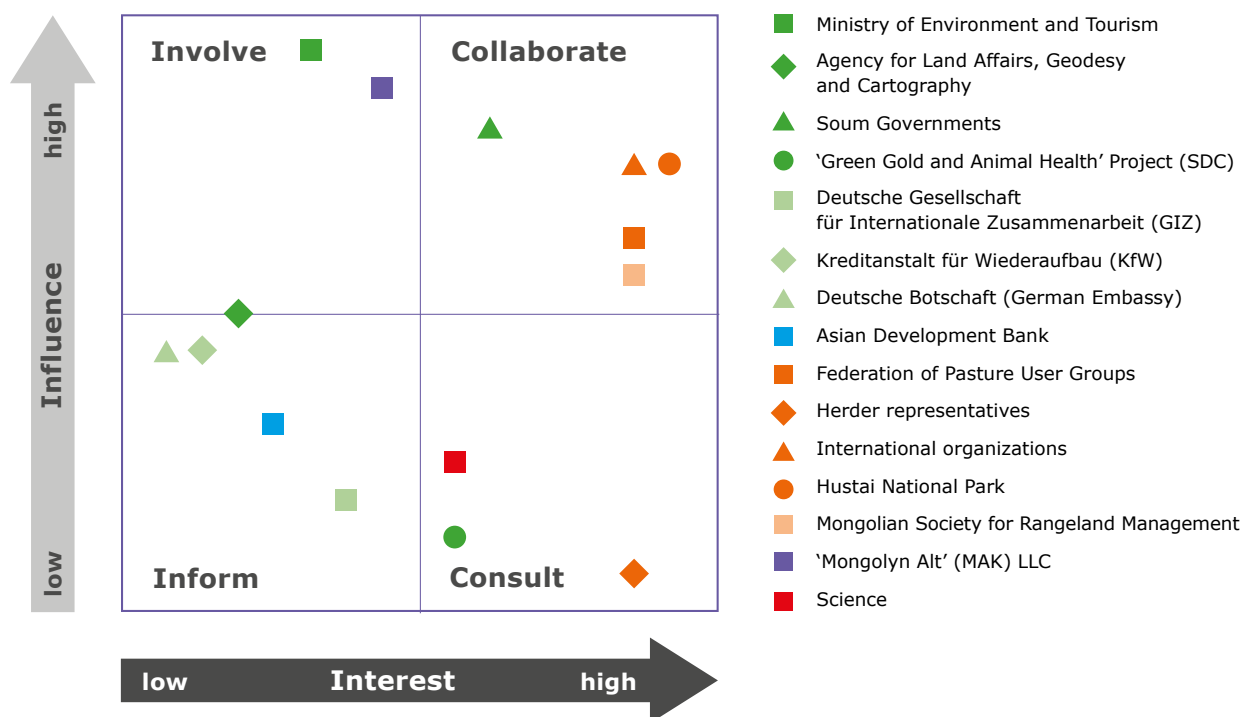
1. Stakeholder integration: For the process of co-production, namely the synthesis of expert and

scientific knowledge, both projects followed two different approaches to integrating stakeholders into this process. In MORE STEP, we developed explorative scenarios of the future of Mongolia's Eastern Steppe. For this reason, we carried out a stakeholder workshop, where participants from science, national and local government as well as (inter)national non-governmental organisations were asked to develop worst- and best-case scenarios: where do we want to go and how do we get there? Where do we fear we might go and what will bring us there?

In SLInBio, we implemented the concept of living labs (Bergmann et al. 2021) and use stimulating research formats such as citizen science and art interventions to engage the urban populations. City dwellers are invited to take part in the monitoring and, at the same time, learn how to identify insects by taking part in courses at the museum. Art interventions are meant to create opportunities for people to approach insect diversity with different senses in order to reflect on their own perception and appreciation of insects.

Figure 3: Interest/influence matrix developed in the MORE STEP project as part of the pre-phase

Source: Mehring et al. 2018



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SLInBio is an inter- and transdisciplinary research project conducted by German research and practice partners funded by the German Federal Ministry for Education and Research (BMBF), (01UT2111A).

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Growing Up in Digital Europe/EuroCohort

Developing a Comparative Longitudinal Survey of Child Well-being in Europe

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Growing Up in Digital Europe, or GUIDE for short, is Europe's first comparative longitudinal birth cohort survey, which will be an essential evidence base for policy-making with regard to the well-being of children across the UK and Europe for decades to come. It will provide data on a representative sample of babies and children from most European countries, tracking them up to the age of 24. This will make GUIDE the largest European social science research infrastructure.

GUIDE was included on the 2021 iteration of the European Strategy Forum on Research Infrastructures Roadmap alongside established research infrastructures such as the European Solar Telescope and the

European Social Survey. The ESFRI Roadmap contains the best European science facilities based on a thorough evaluation and selection procedure. This indicates the strategic importance of GUIDE to the EU scientific landscape and facilitates future political and financial support across Europe. The GUIDE project is set to continue up until the 2050s.

It is increasingly recognised that children should be directly involved in research as actors and not simply regarded as subjects or objects. Taking as a starting point such documents as the UN Convention on the Rights of the Child and the EU Charter of Fundamental Rights, we have sought to involve children in GUIDE / EuroCohort in an appropriate way.

This has been manifest in our work using participatory techniques including co-creation, where different levels and pathways of participation and co-creation seek to move far beyond processes of consultation and instead involve child-initiated elements.

We have developed child advisory groups (CAGs) in a range of countries where we conceptualise children as experts in their own lives, with lived experiences, including that of being involved in research. These CAGs help researchers to improve research design, implementation, analysis and dissemination.

The benefits of this approach to researchers include filling a gap in the early stages of participatory research, improving research design, for example, by the inclusion of research topics that are important to children and the improvement of methods used to engage children. For a survey, this will enhance response rates and reduce attrition rates. This approach benefits children in a variety of ways: it complies with their rights, empowers them, and provides leadership experience and access to training in research methods – a valuable life skill in both education and the labour market.

Successfully and ethically using co-creation and participatory methods with children and young people

poses some important challenges to researchers, including the need to provide clarity around their role and the amount of power that is given to them as advisors. Moreover, there can be ethical dilemmas, for example, where national regulations go against children's rights to participate through the need for informed parental consent. In addition, there are actual costs involved as it takes time and capacity to pursue this strategy. Finally, there are also considerations about the power dynamics between children and researcher and amongst the children themselves.

An example of how we have benefited from this approach in our project is presented by the work we did with the CAGs on how to approach asking children for their informed consent. Researchers tend to take a legalistic view of informed consent forms (and are generally advised to do so by their funders, professional bodies and employers). There is, however, a need for consent to be truly informed and not merely a 'box-ticking' exercise where the questions asked may not have been read, or if they have been read, not fully understood. By developing consent forms along with the children within our CAGs, we managed to formulate questions which were fully understood and meaningful for eight year olds such that the consent, if given, was informed.

A Co-design Approach to Explore Housing Decisions for People Living with Dementia in the Netherlands

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When the time comes to make housing decisions for people with dementia, most people are unaware of their housing options. Often, housing decisions happen in response to an incident or a crisis related to behaviours or symptoms linked to dementia. To further complicate the decision-making process, people with dementia often fear losing independence and moving to unfamiliar, institutional settings. There are decisions to be made around location,

levels of care and distance from familiar settings or family ties, and then further discussions around cost. When suitable housing is identified, this is not a guaranteed option where facilities are frequently fully occupied and have extensive waiting lists. Through our research in the Northern Netherlands, we learned that identifying housing options for people diagnosed with dementia is complicated. After receiving a dementia diagnosis, individuals and their

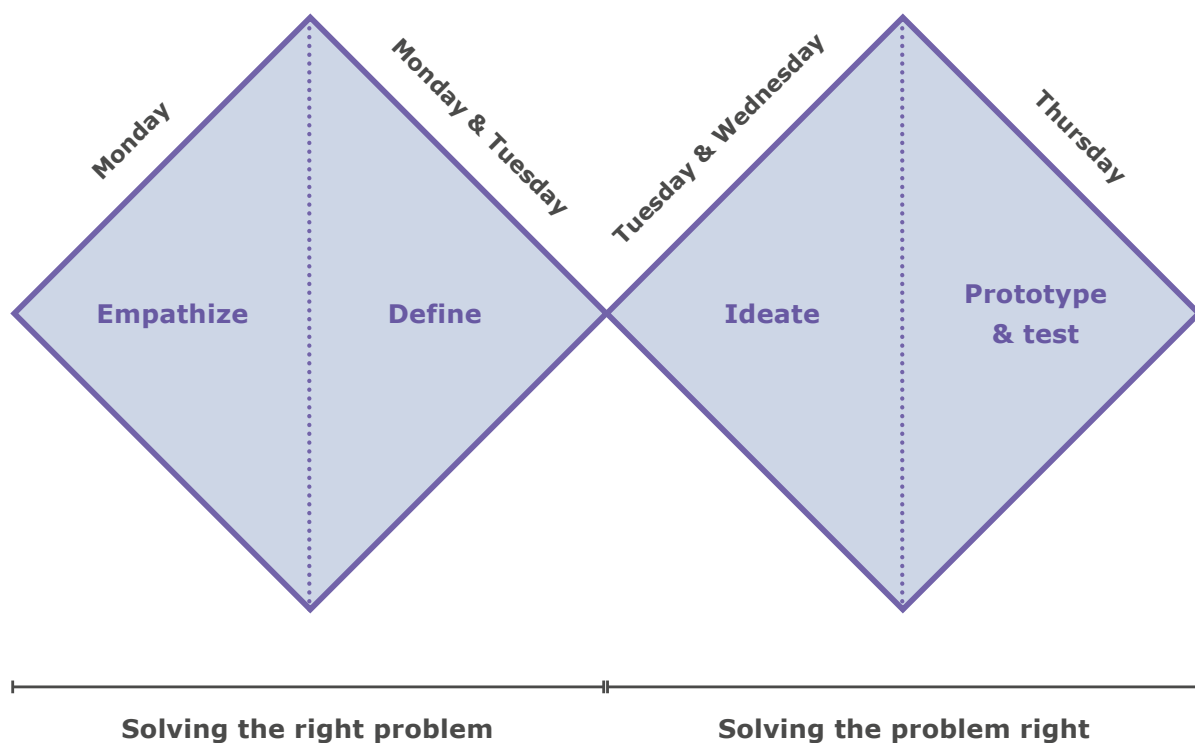
caregivers are often provided with a printed list of housing options from the doctor or specialist and then left to their own devices to navigate the complex care system.

To explore solutions to this dilemma, we planned a co-design workshop based on the Double Diamond method (West et al., 2018). The Double Diamond has four steps over two phases: empathise and define the problem, followed by ideation and testing prototypes for a solution (see Figure 4). Co-design, also known as participatory design, is an emerging research method that provides timely, valuable perspectives from a range of disciplines and levels of lived experience and expertise (Jakob et al., 2017; Treadaway, 2019).

Our co-design workshop sought to identify solutions for optimising housing decisions for people living with dementia. The initial plan was to have one of the academic researchers trained in the design thinking

methodology and later facilitate the co-design activities. However, despite being trained in the co-design approach, the researcher felt that their level of Dutch and co-design expertise was not strong enough to independently facilitate a co-design workshop. Therefore, the project team decided to hire a co-design company to do so. However, finding the right firm, based on this particular topic, was a challenge. First, co-design services are often part of private industries with costs for services that far exceed the funding provided by research agencies. Second, it was a challenge to find a firm with expertise in healthcare. After several discussions with design firms, Koos Service Design (koos servicedesign.com) based in Amsterdam was hired to facilitate the co-design activity. Most of the staff at Koos are industrial design engineers and some of the staff have experience exploring similar topics related to healthcare. Although the firm offered several design thinking methodologies, we chose a five-day design sprint, a commonly used design methodology (de Sá Araújo et al., 2019). This

Figure 4: An overview of the Design SPRINT Process



co-design method was determined to be the most cost-effective option to meet the project outcome. The co-design firm was provided with publications from our research project and material to appreciate the regional context of the issue.

The academic researchers were responsible for planning the design sprint, recruiting participants and identifying stakeholders. The contracted design team was responsible for facilitating the design sprint activities and compiling the results. The participants for the sessions were to be older adults with dementia and stakeholders with expertise in the dementia care sector. This decision was based on research that stipulates that co-designing alongside people with dementia is a beneficial best practice where it provides space for reflection on an individual level, regarding how they can improve their own lives and systems, for example (Wang et al., 2019; Treadaway, 2019). Participants were recruited from the Odensehuis in Groningen, a non-profit agency that provides drop-in social activities for people with dementia and their caregivers. The first step (i.e., the define step) of the sprint took place at the Odensehuis to enable the development of ideas in a familiar, context-specific environment. Participants were asked to share their experiences in making housing decisions and identifying housing options suitable for people with dementia. There were a variety of design techniques, such as 'prototyping' and 'brainstorming' (Knapp et al., 2016), used to encourage participants to share their experiences. These conversations were transcribed and later clustered into themes. Based on the themes, the academic researchers and designers identified several prototypes (through ideation methods) that could be used to solve the design challenge. The prototypes were later presented to stakeholders with experience with dementia care and evaluated to identify the most suitable solution.

The findings from this design sprint will be presented in an upcoming publication. In short, the co-design workshop successfully identified solutions for optimising housing decisions for people living with dementia. Compared to social science academic research, a co-design approach has differences in research methods and techniques. Despite these differences, the design sprint provided meaningful insights to complement academic research in a short period of time.

Acknowledgments

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The international project includes representatives from Canada, Sweden and the Netherlands. Investigators conduct this transdisciplinary research from different disciplines, including geography, nursing, medicine and physiotherapy.

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Opportunities and Challenges of Participation in Research and Research Policy

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Increasingly, citizen participation has become a quality feature of modern democratic societies in many political areas. In science, participation takes place both in research and in research policy. Besides providing access to the 'wisdom of the many' in citizen science projects and helping to set up a research agenda based on societal needs, participation also aims at fostering a research-friendly climate that is characterised by a widespread interest and trust in science. To define future forms of participation in research, the German Federal Ministry of Education and Research initiated its '*Bürgerrat Forschung*', which was the fourth national Citizens' Council. It was organised by the institutes ifok and nexus.

Citizens' Councils are a key element of deliberative democracy based on a random selection of participants. Similar forms of deliberative democracy were already in use in ancient Athens, where every year hundreds of citizens chosen by lot would discuss and make important public decisions. However, it was not until the second half of the 20th century that forms of deliberative democracy applying random sampling were introduced as a complementary element to modern democracies, most notably by Peter Dienel (1978/2002) and James Fishkin (1993, 2009).

In seven meetings between November 2021 and March 2022 (six digital, one hybrid), the 50 citizens of the *Bürgerrat Forschung* formulated five overarching guiding principles and 25 more specific recommendations. They were handed over to Germany's Federal Minister of Education and Research in May 2022.

Let us briefly review some of the success factors for Citizens' Councils in general and for the *Bürgerrat Forschung* in particular.

Random sampling: Compared to other selection methods, such as stakeholder participation and

self-selection mechanisms, random sampling has the advantage that the participants are less likely to be biased and will therefore tend to behave more rationally than persons who are more (emotionally) involved. On the downside, for the most part, randomly selected participants will have little to no prior knowledge of the topic to be discussed. It is therefore crucial to provide them with high-quality, well-balanced information. In the *Bürgerrat Forschung*, 24 talks by various experts were given and additional information was provided via a digital knowledge management system.

Representative sampling: Random sampling can also ensure that the group of participants is representative of the population as a whole with respect to certain socio-demographic dimensions. This increases the legitimacy of the council and will therefore contribute to a higher acceptance of its recommendations. In the *Bürgerrat Forschung*, the sampling aimed at representing the German population with respect to age, gender, education, residence and migration background.

Topic: Not every topic is equally suited to be addressed by a Citizens' Council. Adequate topics should be relevant, controversial and open, while at the same time specific enough to raise answerable questions.¹

Digital format: Due to the pandemic situation, the *Bürgerrat Forschung* was mainly conducted digitally. This was an opportunity and a challenge at the same time. Since attendance did not require any travel, it was far easier to recruit participants as well as experts, which in turn made it possible to attract high-profile experts, even for brief input. On the other hand, the digital format can be an obstacle for some participants. This challenge was addressed by offering digital coaching, providing electronic devices and operating a hotline.²

Tokenism: In deliberative democracy in general, it is of crucial importance to have a genuine and sincere interest in the results. Participatory projects should by no means be a purely superficial attempt to include citizens in order to achieve higher acceptance rates for decisions that have already been made. In the present case, the Ministry of Education and Research committed itself right from the beginning to use the results of the *Bürgerrat Forschung* in its 'white book process' to define its future participation strategy. By transparently addressing the process at the beginning of the Citizens' Council, higher liability and ownership from both sides can be achieved. To further increase transparency, an explanation should be given if recommendations are not being implemented.

Drop-out rate: A low level of commitment by the participants can result in high drop-out rates. In the *Bürgerrat Forschung*, an exceptionally low drop-out rate of less than 10 % was achieved, not only by paying an allowance, but also through participant management that showed appreciation and aimed at developing personal contact.

Dominant participants: The effect of ringleaders and other negative social dynamics can be minimised by moderating the discussions, implementing parallel groups and constantly mixing the groups.

Footnotes

¹ Cf. also Lietzmann et al. 2021, p.7.

² Cf. also Dienel et al. 2021 for a rather positive assess-

ment of digital forms of citizen participation and Kirby et al. 2021, p.20f.

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Shaping Transformation Processes in the Field of Mobility Together with Local Stakeholders

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ZTG (Center for Technology and Society)

The New Mobility Berlin Project (*Neue Mobilität Berlin*) started in 2016 and creates living labs to support transformation processes in the field of mobility. Focussing on two inner-city districts, we explore opportunities for finding people who are willing to get rid of their car. Our aim is to reduce the space used for driving and parking cars and thus to increase quality of life in the city.

Shaping transformation processes requires working with several different stakeholders: in our case, we work together with local residents, local initiatives, local authorities and mobility providers. Since the reduction of parking space is a very sensitive and emotionally charged issue, a sensitive approach is required. The first step is to create awareness of the space consumed by mobility and, at the same time, to discuss alternative uses of parking space for the needs of the neighbourhood.

In order to avoid conflict, we searched for people in the neighbourhood who were willing to park their cars in a multi-storey car park on the outskirts of town – this enabled us to counter protests from angry neighbours. The space freed up by these parked cars was then used for various activities. For example, parklets were established, which neighbours had the opportunity to plant together. In addition, mobility days were held, allowing participants to experiment with alternatives to cars. Despite preventive conflict avoidance measures, however, protests are always to be expected. Reducing parking space is perceived as an increase of quality of life for some neighbours, but also as a decrease for car owners. Consequently, researchers find themselves in a new

role. As soon as changes are made in a living lab, they must be prepared to take on the role of mediator. In addition to conveying factual knowledge and showing interrelations and consequences, it is thus, first and foremost, a matter of initiating a respectful dialogue between all those involved and affected.

Depending on the dynamics of the transformation process, the reactions of the stakeholders and the associated learning processes within the living lab, adjustments to the research process, methods and measures are required. Ideas, interests and framework conditions must be well balanced. In our project, we therefore not only implemented participatory measures with local residents, but also worked together with key actors from the neighbourhood and at the administrative level. After gaining experience with parklets and mobility days, we tried to change behaviour by providing vouchers for public transport and sharing offers. Subsequently, we evaluated the resulting behavioural changes and barriers to change. Last year, we were able to establish a mobility hub and engage in an intensive exchange with neighbours and users of the hub.

To what extent can the experiences from such projects be transferred to projects in other places? The 'imitation' of a process harbours the risk of overlooking the specifics of the actors and the context. Adaptation for a new context can be facilitated by involving experienced scientists. Understanding the logic of action and power structures and building a basis of trust are aspects that should not be underestimated when transferred to new contexts.

Stakeholder Analysis



The transdisciplinary literature offers guidance to approaching your own projects. In addition, numerous tools and methods are available to aid the co-creation of knowledge and innovative ideas. For all projects, a well-designed communication, engagement and dissemination strategy is of major importance throughout all project phases to create societally relevant knowledge and profit from a holistic approach. Communication in the research process is important – not only when conducting transdisciplinary research. Ensuring stakeholder engagement and giving policy advice are two crucial items in the transdisciplinary process that we want to discuss in greater detail. These tasks demand considerable skills on the part of researchers and project coordinators. Stakeholder engagement of different interest groups must be ensured; exchange with citizens, politicians, businesses or other societal players is time-consuming and demanding when performed in an appealing and efficient way. These tasks come in addition to the increasing burdens researchers face in their own work. With new technology and communication tools, it is common for researchers to promote their findings and funding agencies ask for outreach experiences from applicants. Nevertheless,

this part of research is very challenging, and many researchers are overwhelmed by the number and variety of players out there. Researchers should involve many stakeholders in their research process and ensure stakeholder engagement throughout. But they should also communicate their results in an innovative format to all kinds of interest groups with very different levels of expert knowledge, in addition to informing and speak truth to policy-makers. These expectations are high and cannot always be met; still, we may be able to identify some basic principles with regard to these challenging tasks.

Science communication and scientific political consultation have changed profoundly in the last few decades. Research questions nowadays are connected to major societal challenges such as sustainability research, climate change or worldwide demographic change. They demand cooperative research design and the involvement of many stakeholders. In these discourses, decision-makers ask for scientific expertise far earlier in the research process, sometimes even nudging researchers along (Edel et al., 2020). This is coupled with high expectations on problem-solving capabilities, while at the same time modern communication and social media offer diverse and controversial opinions. Science must engage in policy dialogue in formats such as advisory boards and committees, and we see a strong expectation for clear instructions, roadmaps and decisions. All these factors are additional challenges facing scientific actors (ibid.).

We want to start looking at the task of serious stakeholder engagement to ensure added value by employing a transdisciplinary research mode. While the word 'stakeholder' is used many times in the discussion paper, it was never formally introduced. We will make up for this now by defining the stakeholder according to Grimble and Wellard (1997):

We use the term 'stakeholders' to mean any group of people, organised or unorganised, who share a common interest or stake in a particular issue or system; they can be at any level or position in society, from global, national and regional concerns down to the level of household or intra-household, and be groups of any size or aggregation. (...) [S]takeholders may equally include policy-makers, planners and administrators in government or other organisations, commercial bodies, and more nebulous categories such as 'future generations', the 'national interest' and 'wider society'. The exact identification and degree of breakdown of such categories cannot be pre-determined and depends on the needs of the individual case (Grimble and Wellard (1997), p 197f).

Public dialogue and involving society in science calls for meaningful and impactful stakeholder engagement in fundamental research (ORION Open Science, 2021). The project documentation offers ten reflections on such meaningful involvement of very different stakeholders. These range from identifying the 'right' stakeholders for the research envisioned, through clarifying the expected level of engagement, transparent communication and flexibility, to funding and skill training; stakeholder engagement should be a criteria for academic productivity (ibid.). Stakeholder engagement is a continuous and systematic process along the entire project timeline. This has to be understood and agreed upon by all project partners to ensure successful cooperation. There are three key features of stakeholder engagement that must always be considered: first, stakeholder engagement needs a purpose. There is no value added by including individuals or parties with no clear role or expectation. Second, the participating stakeholders should be identified and selected carefully. And third, those responsible for the project should choose appropriate methods for the different tasks and interest groups. Dialogue and communication must be sincere and involve all parties on an equal footing.

Stakeholder engagement needs a purpose. The transdisciplinary research mode demands the cooperation and collaboration of very heterogeneous actors such as governments, academia, business, non-profit organisations, citizens and the media. All have their stake and relevance but may have different approaches to different topics and desired outcomes. This has to be clearly communicated and acknowledged from the very beginning, because involving additional parties can be a burden for researchers. An important first step is to refine the engagement objectives of affected individuals or interest groups. Why do we want to include stakeholders? What is the purpose and value added? In the literature, we find several objectives of stakeholder involvement in transdisciplinary research (Schmidt, Falk, Siegmund-Schultze & Spangenberg, 2020).

The objectives for involving stakeholders are based on earlier literature (Fiorino, 1990) and refer to the political decision-making processes (normative, substantive, social-learning, implementation). The normative argument refers to the democratic principle: people should be given the opportunity to contribute (Arnstein, 1969; Fiorino, 1990), those affected should have a voice (Lang et al., 2012; Pohl & Hadorn, 2007). The substantive argument comes from the fact that including stakeholders improves the quality and significance of research (Fiorino, 1990; Stirling, 2008). Through exchange and integration, research co-produces socially robust holistic understanding (Aeberhard & Rist, 2009; Jahn et al., 2012; Scholz & Steiner, 2015). Scientific knowledge is only one legitimate body (Nowotny, Scott & Gibbons, 2001) and new forms of knowledge production should give room to others (Stirling, 2008; Wessellink, Paavola, Fritsch & Renn, 2011). Social learning should improve the mutual learning of all involved parties and implementation should increase the legitimacy of results (Fiorino, 1990; Stirling, 2008). For a more detailed overview on the objectives of stakeholder involvement, see Schmidt et al. (2020). The participants in the research process cannot be viewed solely as stakeholders; they must also be seen as carriers of knowledge (Schramm, 2012), adding valuable input from their personal perspective. Nevertheless, we have to bear in mind that stakeholder involvement does not automatically add value to a transdisciplinary research process. The process needs to be carefully evaluated and allow for or require this.


Answering the question of what difference it makes is crucial to assessing the importance of citizen engagement methods. Studies find a large positive impact in 75 per cent of case studies reviewed, which contributes to the construction of citizenship, strengthened practices of participation and the building of responsive and accountable states, or more inclusive and cohesive societies (Gaventa & Barrett, 2010). In this respect, it is important to investigate the conditions under which citizen engagement methods make a positive difference. A deciding factor in this is the **identification of stakeholders**. In a research project, it is not possible to include all parties that have a stake in the research question. Choosing individuals and interest groups might result in selection bias stemming from the researchers' choice. One opinion might be overrepresented, while other important voices are missing or in the minority. Researchers should be aware of this and work on a solid foundation for knowledge creation, ensuring participation of the most important parties. Stakeholders can be prioritised to include the most important voices. After selection, balancing moderation, such as dynamic facilitation, and excellent project management are needed to ensure all parties feel equally recognised. Democratic tools can help to improve exchange.

To establish a constructive dialogue and fruitful communication, a clear strategy to engage stakeholders is required. A tailored approach for the **methods of engagement** has to be developed according to the purpose of integration of stakeholders and their careful selection. Then, those responsible for the project have to decide to what extent different stakeholders

should be involved. The intensities gradually increase from information (low engagement) to empowerment (high engagement). Information demands a low level of involvement and commitment from stakeholders as they are addressed through one-way communication, i.e. they merely receive input. Consultation allows them to provide their own views and opinions to be considered in research. The other formats demand more active roles for the stakeholders culminating in empowerment, where practitioners are in charge of the decision-making process. The exchange forms vary by participant group. Expert knowledge is meant to be discussed in scientific peer communities (advisory boards, hearings). Lay knowledge is suitable for communities involving non-scientific experts (Internet steering committees, advisory boards, consultation process) (J. Spangenberg, 2011).

There are several interesting ways to include stakeholders with very different levels of engagement, interaction, and impact. We show formats for the different intensity levels and tools in transdisciplinary research in table 2.

Table 2: Intensities of Participation of practitioners and suitable tools according to the intensity of involvement in transdisciplinary research
 Source: adapted from Stauffacher et al. (2008) and own collection from literature review



| | Information | Consultation | Cooperation/ Involvement | Collaboration | Empowerment |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participation | One-way communication by offering information possibilities to practitioners | One-way communication by practitioner survey | Exchange with transfer of decision-making powers to scientists | Exchange as collaboration on equal terms | Exchange with transfer of decision-making powers to practitioners |
| Tools in transdisciplinary research | <ul style="list-style-type: none"> - bulletins - letters - brochures - reports - websites - social media - speeches - conferences - public events - education days - field schools - courses - surveys - focus groups | <ul style="list-style-type: none"> - workshops - meetings - social media - interviews - one-on-one - telephone - semi-structured - questionnaires - citizens' juries - town hall meetings | <ul style="list-style-type: none"> - multi-stakeholder groups - advisory panels - participatory workshops | <ul style="list-style-type: none"> - participatory decision-making - participatory film-making | <ul style="list-style-type: none"> - joint projects - partnerships - online collaboration platforms - research involvement |

For each project, a clear engagement plan should be defined. It should include detailed information on specific tasks for the different actors and corresponding timelines. Contact persons should be named for the respective tasks. The technologies used throughout the project, the budget and tailored communication channels have to be determined. Monitoring and evaluation criteria as well as outputs and outcomes should be defined in advance. The plan should be implemented and revisited during all project phases. An iterative research design allows for the realignment of the separate steps. Within the project, all participants should have their appropriate role and feel integrated and act on an equal footing. Organisation and communication during the research process are important for the success of the overall project. In this respect, the importance of modern digitalised formats is not to be understated.

A project-specific plan

The importance of social media in building a relationship between citizens and institutions has increased dramatically in the past, fostering dialogic communication with citizens (Marino & Presti, 2018). Not all types of social media are equally suitable; we should highlight that particular media and content types generate higher engagement (Bonsón, Perea & Bednárová, 2019). The careful selection of social media choice according to the goals that shall be achieved by its use should therefore be considered. Gamification is another up to date approach with which solutions are found in a playful manner, for example, participating in a mobility safari (Gugerell, Jauschneg, Platzer & Berger, 2017), while addressing social questions (Michelini et al., 2021). Online co-creation is also frequently chosen (Daiberl, Höckmayr, Roth & Möslein, 2016), enabling virtual knowledge transfer with a wide range of web-based applications and a high number of participants.

Policy Advice

At last, we want to focus on the topic of **policy advice** and how researchers can speak truth to policy-makers. Political decision-makers are dependent on a solid knowledge base to make and validate their decisions. The call for science-based political decision-making is growing louder. This relates especially to sustainability research and societal transformation; the pandemic has accelerated this movement ever further. It raises several challenging questions in information societies and a world too big to know (Weinberger, 2011). How can science give recommendations when scientific knowledge is only provisionally and relationally valid? Who should play a part in the discourse; which voices should be heard? Who is an expert in the field, and how can experts be identified and their choice justified? Transdisciplinarity as a democratic concept can guide action in the knowledge jungle (Schwan, 2021).

For some societally relevant transformational research questions, policy advice is challenging. We find a great number of topics with ever increasing numbers of parties that have a stake in a certain topic. The internet and social media allow for everybody to be informed and participate in discourse. The ambient noise around research questions easily diminishes interest and overestimates side wars. A focused approach should identify the main goal and suitable approaches, identify priority stakeholders and experts, and contribute to a new form of knowledge generation. The common good (*Gemeinwohl*) should be further incorporated, an element which has been missing in the past (Wissenschaftsrat, 2015).

How to Speak Truth to Policy-Makers

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Another important nexus we want to examine in greater detail is scientific policy advice. The latest events around the Covid-19 pandemic have brought increased attention to the science-policy nexus (WHO; OECD; SAPEA). However, in our 'knowledge societies' (Stehr, 1994), the assumption that politics is dependent on scientific expertise in order to cope with highly complex issues, such as health protection, climate change, energy supply, security and migration, is nothing new. For decades, in these and many more fields, science has been regarded as a key source of political and societal decision-making. Consequently, there has been growing demand for scientific policy advice and also growing attention, both in politics and academia, on the science-policy nexus.

In more detail, policy-makers demand consultation and advice in at least six substantive fields (Renn 2017; Renn et al. 2019):

- 1. Enlightenment:** Informing policy-makers about complex relationships
- 2. Orientation:** Providing assistance for foresight, vision and planning
- 3. Strategic planning:** Predefined goals, strategy elicitation, strategy assessment, trade-off analysis and prioritisation
- 4. Co-creation:** Developing new insights and orientation knowledge together with change agents
- 5. Integration:** Bringing various forms of knowledge – for example, scientific, experiential, anecdotal, place-based and indigenous knowledge – into a coherent framework
- 6. Monitoring:** Reviewing and evaluating the impacts of policies over time

While the importance of scientific policy advice has not been questioned for decades, the perspective on how science policy advice could and should be established and shaped has changed in the course of time. For instance, Habermas's (1968) classical conception distinguishes different models with respect to the in-

fluence of scientific advice on political decision-making. Concepts such as Pielkes's 'honest broker' (2007) emphasise the importance of the advisors' political neutrality. Despite these normative positions, other perspectives outline the complexities that might hinder effective and responsible interaction at the science-policy interface. There exist different logics and targets, workings and languages for science and politics, which necessarily lead to remarkably different epistemologies (Jasanoff, 2012). Accordingly, 'the "message" might be problematic. Scientific findings might not be immediately performative; policies cannot be "read off" certain data. (...) This implies that the connection between science and scientific knowledge production as well as its communication, perception and application in the political realm is far from straightforward.' (Fährnich & Ruser 2019) Science typically does not provide a unique and undebatable answer to societally relevant transformational research questions. Moreover, calls for trans- and interdisciplinarity have increased the complexities of communicating effectively (Schwan, 2021). This calls into question whose expertise is valid and how to identify non-contestable and unbiased experts. In an interconnected world with the internet and social media, finding experts becomes easier due to the omnipresence of experts, but at the same time it becomes more difficult, because standards for quality assurance become blurred (Fährnich 2021).

This applies all the more when scientific policy advice is considered in the context of the profound transformations of science, governance and public communication, which inevitably influence the interaction of science and politics. The digital media revolution, often referred to as mediatisation (Couldry & Hepp 2018), has not only changed the spaces and forms of interaction within society, but is also changing the order of knowledge within society (Neuberger et al. 2019). Technological developments allow more public and political involvement in all stages of the research process (Bonney et al., 2014), open science allows easy access to latest evidence for everyone (Franzen

2016), and 'new' experts such as think tanks, NGOs or lobby groups use science to advance their interests (Fähnrich & Ruser 2021).

Against the backdrop of these grand societal developments, new approaches to scientific policy advice focus on the establishment of formats that allow for effective and responsible exchange. Undoubtedly, science advice needs to overcome the traditional concept of 'truth speaks to power'. Following Renn et al (2019), policy advice today requires special discourse formats that have their own normative rules and implementation criteria. Many wicked problems call for combinations of discourses: they may start as epistemic discourses, lead to orientation and strategy discourses, and may end up as an exercise in co-creation.

Separate steps of policy advice

(Renn et al 2019; Renn 2017)

- **Step 1:** Determining what kind of discourse or what mix of discourses is required (design architecture)
- **Step 2:** Conducting or accompanying each of the selected discourses according to the professional and ethical rules associated with each discourse type
- **Step 3:** Ensuring the right dynamics and mix, including analytic, goal-oriented and catalytic knowledge together with experiential and tacit knowledge
- **Step 4:** Evaluating the experiences and outcomes of each discourse
- **Step 5:** Reflecting on this experience and modifying/revising existing theoretical and operational discourse approaches

With the changing orientation and dynamics, science advice is no longer led by the ideal of evidence-based, but rather 'evidence-informed policy making' (cf. Gluckman 2016). The transdisciplinary nature of science advice needs the input of other forms of knowledge and types of experts without compromising the methodological rigor of scientific inquiry (Grundmann 2017). The proposed taxonomy of discourses can serve as a guideline. For policy advice to be effective and responsible, basic principles of scientific quality such as transparency, openness, independence and alignment with the common good always apply.

We need a new respectful form of exchange in society, both for interactions with policy-makers, and for general communication strategies between individuals with different or shared opinions. Mutual learning plays a major role in this respect. Stephen Covey states that '(t)he biggest communication problem is we do not listen to understand. We listen to reply.' (Covey, 2012). In a world of social media, where self-presentation and promotion play an important role for societal players, including scientists, policy-makers but also businesses and citizens, this is not an easy demand. A relationship between the discourse participants needs to be established, allowing room for trust to grow. To create valid and credible results, involved actors should acknowledge uncertainty and a lack of definitive answers. But accepting the involvement of many voices in a complex and necessary iterative process, while recognising the validity of other opinions, is key to a successful dialogue and transformation process. Only a co-creative approach to policy advice can help to overcome these obstacles (Renn et al. 2019).

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A Model for Co-creative Policy Advice

Co-creative policy advice is a relatively new concept with unanswered questions. Still, this approach can help generate societally accepted knowledge together with political decision-makers and affected stakeholders. It can foster exchange and closer ties between decision-makers and affected parties and potentially bring innovation into the inert, rigid sphere of the public sector and administration. A model developed by researchers from IASS Potsdam offers guidance for such co-creative policy advice. 'Grounded action design' is the framework for a reflexive and co-creative process where stakeholders, relevant experts and decision-makers – guided by researchers from a scientific advisory organisation – explore, map and expand their understanding of the complex problem space before the political institution or decision-making body sets transformative change in motion (Bruhn et al., 2019).

The model identifies different target groups outside of science: 1) process designers and facilitators who are responsible for the design and implementation of collaborative processes and initiators of collaborative processes and 2) policy-makers and decision-makers who are interested in integrating co-creative approaches into the modus operandi of their institutions. The model includes the three pillars of analysis, reflection and design (Bruhn et al., 2019).

Analysis: Development and implementation of a research design with which co-creative practices can be scientifically recorded and relevant dimensions of observation identified.

Reflection: Establishment of a 'community of practitioners' composed of members of the above target groups. This group of people assists the research team in identifying key challenges in relevant policy areas as well as considering existing co-creative practices. They also contribute practical and theoretical experiences and provide important feedback to the research team in the context of joint reflection loops.

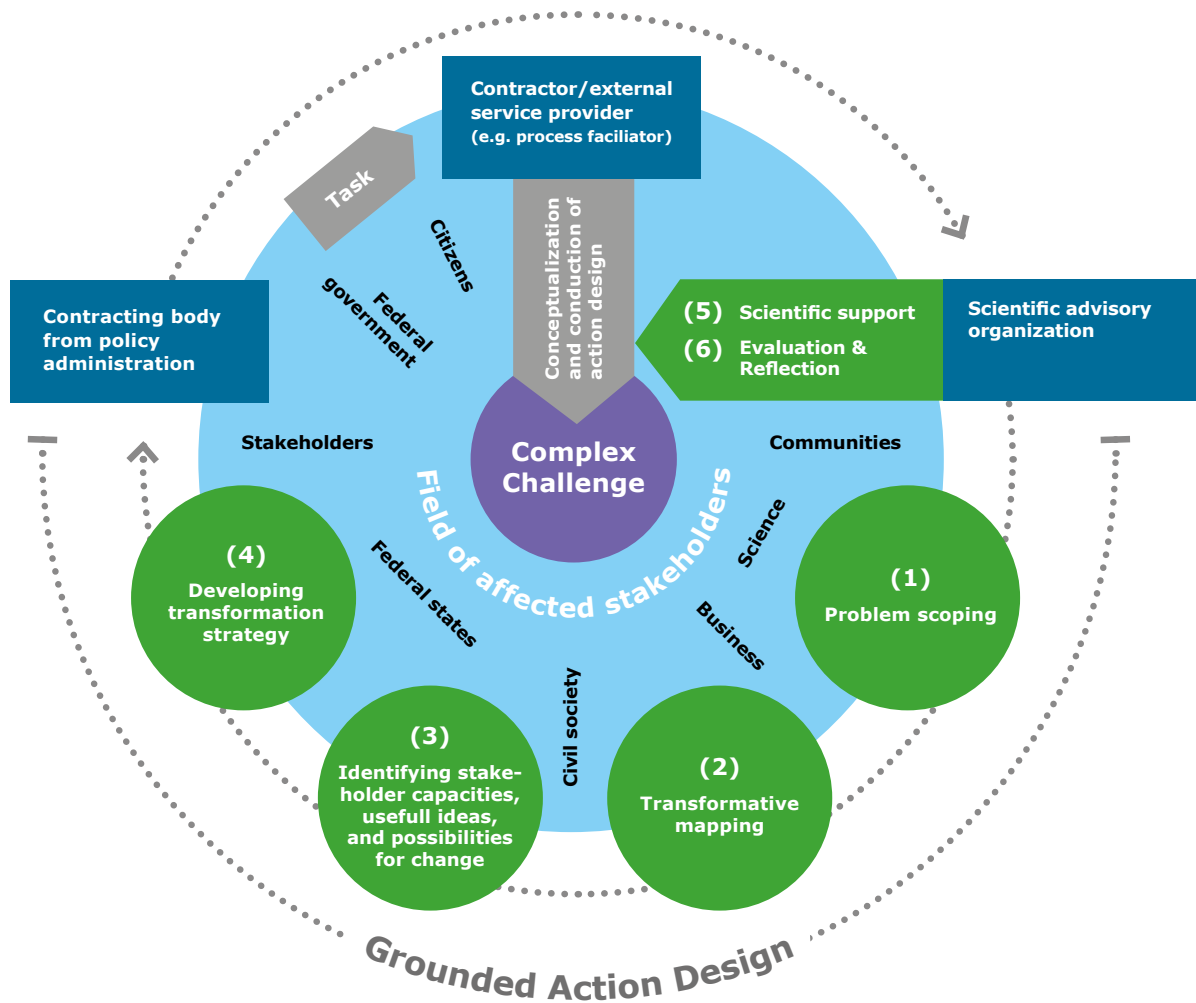
Design: Development of prototypes for co-creative approaches to policy design and consultation with the active support of the community of practitioners, who provide access to the research field and contribute to the design and implementation of these processes. Consequently, this part of the research project builds on the findings of the 'analysis' and 'reflection' pillars.

The model supports actors from policy making and public administration in addressing complex challenges in societal transformation within four phases of grounded action design. Insights can be gained in this scoping process into the development of tailored solution-generation processes and the allocation of public procurement contracts for the implementation of societal transformation processes.

Problem scoping (1) is an iterative process involving all stakeholders and decision-makers. In this step, the problem is explored and a clear understanding of the goals of all stakeholders is gained. In this very beginning of the cooperation, the commitment of all affected stakeholders needs to be established. Guiding questions in this first phase ask why stakeholders attend and/or what their hopes and expectations are. Dynamic facilitation is a deliberative format for public participation, a dynamic form of which is 'citizens' councils'. The method distinguishes between four categories of narratives: challenges, solutions, concerns and information (Nanz & Fritsche, 2012). Learning and listening to other parties builds mutual trust and understanding.

Figure 5: Grounded action design – a model for co-creative policy advice

Source: Bruhn et al. (2019)



Transformative mapping (2) follows with the participatory exploration of how (re)framing the problem will impact the field of affected stakeholders. A systematic overview of actors involved, potential conflicts, and viewpoints has to be elaborated. In this step, dialogue and local context are documented and networking of ideas links to regional projects. Graphic recordings and social network analysis are both useful tools for pursuing this.

The next step is the **identification of stakeholder capacities, useful ideas and possibilities for change (3)**. Here, events and forums for exchange are developed and implemented, knowledge gaps are identified and working groups created to develop strategic suggestions and find majority decisions. In practice, appreciative exploration or reflection can be used to 'create visions for change that build on the existing' (Nanz & Fritsche, 2012). This approach focuses on what works well in a given context as opposed to usual deficiency perspectives that focus on weaknesses and shortcomings.

Phases 1-3 lead to the **development of a transformation strategy (4)**. Here, participants create a custom-made change process. They develop a proposal and detailed plan for a

medium/long-term process including a timetable, roadmap and budget. With this, the consortium approaches a political or administrative body. The proposal is intended to facilitate the recruitment of project partners and provide the client with guidance.

The aim of co-creative policy advice is to design transformation processes that are both appropriate and effective in solving complex or even wicked problems with a diverse range of perspectives and standpoints, each justified in its own way. The invention of such a format ensures the involvement of decision-makers very early in the process and bears the potential to bring innovation to the public sector and administration. As for all transdisciplinary approaches, suitable topics have to be carefully identified, but this approach can add value, contribute alternative viewpoints and be beneficial for the envisioned social transformation process. Accompanying research can include qualitative or quantitative surveys, scientific publications, policy papers and consultation.

Summary and Outlook

The production of new knowledge is challenging in our connected, mediatised and overloaded information societies. New research approaches are key to addressing societally relevant, high-impact research questions. Participation of agents outside academia is often referred to in literature as promising, since, while not an inevitability, it does increase the chance of generating credible, widely accepted and robust new knowledge in this modern setting. One format offering such potential is the transdisciplinary research mode. Scholars work on societally relevant, solution-oriented research questions together with citizens, policy-makers, businesses – everybody who has a stake. Such open and democratic formats ensure that many voices are heard, contributing several different angles and innovative thinking in order to solve concrete real-world problems.

Grand challenges

The European Union recommends participatory formats for research, especially into grand challenges with high societal impact. The identified grand challenges include climate change, energy supply and water resources, with the two demographic topics of ageing and healthcare undoubtedly connected to environmental questions. Research in these fields is driven by societal needs already defined in 2009 by the European Research Area (ERA) Board. The ERA emphasises the shared responsibility of science, policy and society and advocates open innovation between all public and private stakeholders. The Wissenschaftsrat has published its desires to improve the scientific discourse on grand challenges (Wissenschaftsrat, 2015). Important recommendations include combining knowledge from different sources and disciplines, while also acknowledging limitations, improving the self-correction capability of the scientific system and strengthening the global perspective. An important recommendation related to transdisciplinarity and co-creation is the experimentation with approaches that allow actors from outside academia to participate in the research process (ibid, page 26).

Thus, on the political, administrative and research funding level, we find clear recommendations to follow a more participatory research approach. For funding research, for example, from the German Science Foundation or federal ministries, transdisciplinarity is an additional criterion to be met, though not without challenges. The research mode, while frequently employed, still suffers from conceptual ambiguity, lack of common language and communi-

cation, a confusing oversupply of methods and tools and blurred definitions. Only few experts and institutions try to categorise and systemise separate research steps and develop quality or evaluation criteria and instruments to assess the value added by such a research approach in order not to be arbitrary. We want to take the recommendations for an open and democratised science into account, yet not only as a buzzword. We think that the mode can add value and generate fresh new ideas and solutions.

A credible approach must be grounded in the literature on transdisciplinarity and co-creation. Therefore, it is inevitable that close ties be built with experts and institutions with a long-standing history in transdisciplinary research. In addition, it is important to engage in active communication, mutual learning and the willingness to question yourself and ask for advice. Trust is important for such an endeavour to be successful in addition to an understanding of the full scope of this holistic approach. This includes the acknowledgement by all involved actors that the project duration and commitment demand a longer time horizon. Project durations of more than 10 years are not uncommon, which poses a challenge to scientific budgets and other aspects besides. With this in mind, projects need not only to be kicked off, but, also more importantly, to be maintained.

Within the scope of cooperation, we need to reduce power asymmetries and promote the involvement of all actors on an equal footing, including those from outside academia, engaging all participants in respectful communication. All stakeholders should perceive one another as partners in making a difference and leveraging the full potential of research. Expectations of participants are sometimes high and disparate, a grounded evaluation of what the project can contribute is important. This includes appropriately assigned tasks and roles for all participants and strong relationships to decision-makers. The iterative nature of the research mode allows for the employment of a huge number of different methods and tools, all of which need to be tested, revisited and scrutinised according to their suitability for answering the problem-driven research questions.

The transdisciplinary research mode offers a wide range of tools and methods. Nevertheless, there is no one-size-fits-all solution or blueprint to tackle research questions in a coherent way. Tools and methods have to be identified cautiously and carefully, ensuring suitability for the specific research question. Researchers should be aware of their scientific bias in such a format. Typically, research seeks to influence changes in a certain direction or has an aim, such as a reduction of individual motorised traffic, increasing quality of life in urban quarters or improving health care facilities. An approach employing different methods and including actors from outside academia is not typically objective. Researchers are present and provide input into the process, they change the process and moderate it, and they need to be aware of their own perspective, engaging in a reflexive and self-reflexive process. Time and monetary constraints are major challenges as well as the maintenance-intensive processes. Not all necessary voices can always be involved; researchers need to prioritise and select.

Scientifically relevant research questions are numerous. For scientists and stakeholders, it is a very demanding task to generate and receive knowledge and input that will not be contested by stakeholders following a different agenda. This is true for environmental questions and sustainability issues, but also for questions related to big societal challenges or distortions. The worldwide challenges arising from aging populations, shifts in age structures, changes in family composition and health status differences are manifold and impact all areas of society. A major problem for demographic change is that it is not coming as a sudden weather change or tsunami (Börsch-Supan, 2011), but rather a slow and silent change of climate. The

**A mode with
thousand methods**

generations that will enter labour markets tomorrow are already born today and parents can be expected to have a related number of offspring. With the exception of migration, the key issues of our future society are already discernible to us. But due to the fact that changes occur at a slower pace, decision-makers do not feel the urgency to tackle these questions in times marked by crises. The financial crisis in 2007/08, followed by the economic crisis, the Covid-19 pandemic and the war in Ukraine are just the most severe worldwide crises politics has been forced to react to, demanding many ad-hoc decisions. Due to these developments, many slow and less visible changes are being pushed into the background, although their impact might nevertheless be fundamental in the long run. This is especially true for the two areas of climate change and demographic change.

Anticipated demographic changes, including the aging of almost all populations around the globe, might question the societal glue, the welfare state (Bengtsson, 2010; Cylus, Figueras & Normand, 2019), lead to widening inequalities (Auclert, Malmberg, Martenet & Rognlie, 2021; Dolls, Doorley, Paulus, Schneider & Sommer, 2019) and change our way of living fundamentally (Bloom, Boersch-Supan, McGee & Seike, 2011). Other important aspects of demographic change are long-term planning and sustainable maintenance of infrastructures, housing decisions, labour market, transportation, education and long-term care provision. Increasing diversity in individual ageing trajectories, but also living arrangements among individuals of different age, gender or migration history in particular call for an effort to study these questions comprehensively from a comparative perspective. Questions to be discussed in open formats can also pertain to individually longer and healthier lives, smaller kinship networks, the proximity to older parents, working migration away from the core family, retirement decisions of couples, care obligations of the sandwich generation, intergenerational ties, unemployment or the accumulation of advantages or disadvantages over individual lifetimes. Individual perspectives can help contribute valuable elements to the scientific discourse. We need a better understanding of how different groups are affected and how the different stakeholders wish to meet societal change and what options are available. A transdisciplinary research approach including practitioners and affected individuals in the transformation processes can offer societally recognised solutions and serve as solid knowledge base for evidence-based decision-making.

Lessons learned

Over the course of the last year with two workshops and an intense exchange with experts in the field, we learned about the most important aspects of how to cautiously approach this research mode without underestimating the challenges. We identified common approaches and digested the most recent literature. For population research, surveys and other data formats, such as registry data and big data, on consumers or social media users exist that typically provide solid ground on which research questions to study. Nevertheless, we feel that the transdisciplinary approach can add value to well selected, suitable demographic topics. Societal transformation in ageing and more diverse populations can benefit from innovative and open formats. This holds especially true when research gives a voice to those affected.

Key messages learned from the extensive transdisciplinary literature and exchange with long-standing experts in the field include:

- Carefully identify areas and research topics where transdisciplinarity and co-creation can provide added value – it is crucial that this is not done arbitrarily.
- Explicitly define your aims in terms of reasons to employ the transdisciplinary research mode.
- Ask for advice and communicate with experts in the respective field – choose your experts wisely.
- Find suitable project partners and stakeholders – identify everybody who has a stake.
- Think of all relevant stakeholders. In case there are too many, prioritise.
- Approach the relevant stakeholders and develop the idea and research question together from the very beginning.
- Involve all participants including practitioners or citizens on an equal footing.
- Make an effort to identify a promising method and suitable roles for all involved parties – make use of everybody’s talents.
- A holistic but project-specific concept is needed to create added value.
- Be aware of the long time horizon for transdisciplinary projects – kicking off projects is as important as maintaining them.
- Build trust and develop a relationship with all stakeholders.
- Communicate with and involve all partners over the entire project duration.
- Revisit project steps and be reflexive.
- Produce target- and group-specific results.
- Only engage in transdisciplinary research if you think it is adding value and if you have enough funding and time.

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