Summary of Overarching TransImpact Results

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We synthesised the empirical results of TransImpact by summarising the detailed findings on which conditions foster and which inhibit the societal effects of transdisciplinary research (TDR) across case studies and thematic clusters. These clusters were focused on problem definition (Marg et al. 2020a), participation (Nagy et al. 2020a), knowledge integration (Marg et al. 2020b) and transferability (Nagy et al. 2020b). We found that societal effects arise from the activities connected with TDR processes and the results of these, but they may also develop out of the framework conditions in which the transdisciplinary projects are embedded. We established historicity, the heterogeneity of the actors, the general environment and funding conditions as the major framework conditions of relevance. We identified five main fields for the adaptive shaping of effective transdisciplinary processes: the relevance for the problem, interests and concerns, roles and responsibilities, connectivity, and the collaboration culture (see figure). You can find the recommendations for developing the potential for effectiveness in TDR in our key publications Lux et al. (2019) and Schäfer/Lux (2020), and you can also read about them online on this website via the four thematic clusters mentioned above.

Relevance of Framework Conditions

It was clear that the framework conditions were relevant across all thematic clusters and shaping processes. They can foster the societal effectiveness of TDR – but they can also inhibit it. Initially, the framework conditions must be seen as a given, and the possibilities for influencing them as limited. They can be relatively stable (e.g. biogeological factors), but also dynamic (e.g. political majorities, urban development). In the TransImpact project, we identified four crucial framework conditions:

Historicity emphasises the history of the problem at hand and the history of the actor constellation. What previous contact and relationships existed between the relevant actors (cooperative, conflicting, non-existent)? What previous approaches were used to solve the problem, and how far were these successful – or not? Is it possible to build on existing relationships of trust, or was trust compromised in the past? These histories make a difference when it comes to generating potential effectiveness. Similarly, if there are possible ways of continuing to investigate the problem and the proposed solutions in the form of a follow-up project, this may also have a bearing on potential effectiveness.

In addition, the case-study actors emphasised how important it is to be aware of the **heterogeneity of the actors**. They pointed out that there are major differences in actors' interests, expectations and rationales for action, not only between scientific and practice-oriented actors but also within the respective actor groups. For example, representatives of companies operate in a very different context to administrative staff or civil society actors, and they also have different resources available to them. This aspect is often neglected when considering different actor groups, but it plays an important role in effective TDR. These differences can be seen as a framework condition, since organisational and institutional rationales (for action) cannot be changed over short periods of time.

Environmental conditions describe the relevant wider context of the problem at hand. These are to be seen as complementary to historicity; they include situational factors such as current societal discourses, legal regulations, exceptional phenomena (e.g. the Fukushima disaster – in terms of how it relates to energy system transformation projects) or the current state of research. The challenge is to make the specifics of the problem accessible for TDR, particularly when the research is within a new or relatively under-researched field. The environmental conditions influence the possibilities and limits of generating potential effectiveness in two ways: firstly, the characteristics and dynamics of the environment should be taken into account in the conception and planning of the project. Secondly, the characteristics of the environment (e.g. changing political power relations or new legislation) can change in such a way that the project objectives are, to either a greater or lesser extent, called into question and therefore need to be adapted over the course of the project.

Funding conditions are characteristics that frame a project's scope of action in multiple ways: the research programme agenda, the additional expectations and requirements on the part of the funding provider, the available resources, and the way in which the necessary adaptations are handled over the course of the project have a positive or negative influence on the project's reach and potential effectiveness (Newig et al. 2019). Our empirical studies showed that one main challenge for effective TDR is to be aware of the funding conditions of a project in order to be able to negotiate for adaptivity in project management.

According to our results, it is very important to focus on the external framework conditions in the prospective, project-specific assessment of how to foster societal effects. The descriptions of the framework conditions above show that one main challenge for effective TDR is recognising and understanding the framework conditions of a project in order to be able to deal

with them productively. We explain the relevant aspects of as a result of TDR in the next section.

Overarching Conclusions on the Shaping of Effective Transdisciplinary Research

The aim of TransImpact was to identify ways in which transdisciplinary researchers can shape their research processes in such a way as to strengthen the potential societal effectiveness of their activities.

The following figure shows the relation between the relevant framework conditions and the project-related shaping processes. In order to maintain the essential connection between the framework conditions and the adaptive shaping of TDR processes, researchers must continually relate the problem defined within the project to the complex societal problem (white arrow in the figure). The findings of the case-study analysis emphasise the connection between framework conditions and process shaping. These show that effects are rarely generated by isolated projects, rather that transformation processes always build on historical development and therefore on existing possibilities for further change.
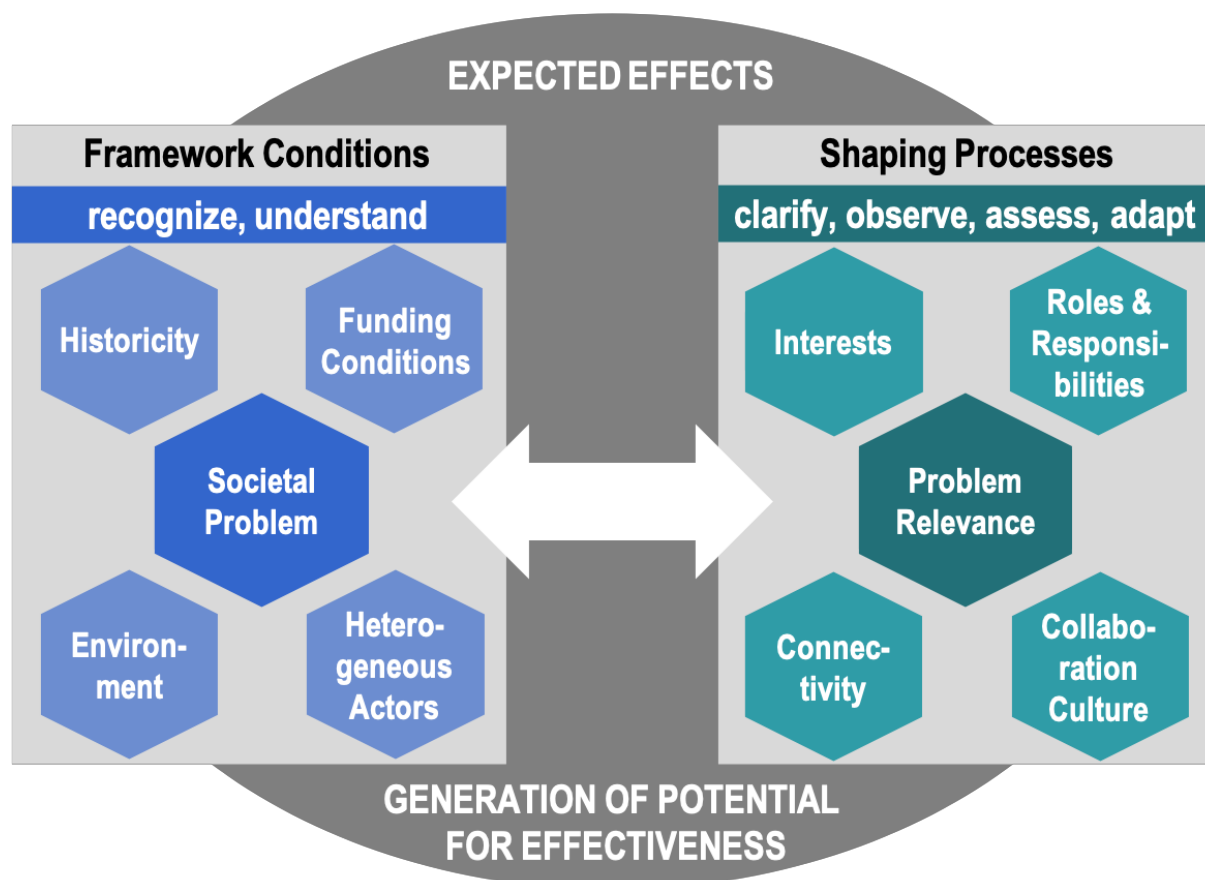

Figure: TransImpact approach to fostering potential societal effectiveness of transdisciplinary research (Lux et al. 2019: 189).

The most important finding is that the whole project team (scientific and societal partners) needs to address the societal effects it is aiming to achieve **very early on**, i.e. when planning or starting a project. This is because societal effects arise out of complex interdependencies between research processes and the results produced by these. In the planning phase, it is important to identify the real-world problem, recognise and assess the external framework conditions, build an appropriate project team, formulate a joint and transdisciplinary problem description, as well as clarify the effects the project aims to achieve. In addition, it may sound paradoxical at first, but before starting on the actual study, it is important to look both backwards – reflecting on a problem and its history – and forwards, agreeing on a vision for the possible effects of, and even follow-up processes to, the TDR process underway. This also involves distinguishing between different forms and orders of effects (cf. Schäfer/Lux 2020) and between objectives, results and effects. Although our case-study partners rarely took this approach, the discussions in the project forums revealed a higher potential for societal effects if these are considered early on. Our results also indicate synergy effects: engaging early on with the expected effects provides a provisional basis for developing strategies linked to participation, integration or transfer, which are crucial principles in process shaping and reflecting on processes, results and products (e.g. publications, guidance notes or prototypes). These strategies should therefore not be seen as consecutive activities, rather as closely linked and mutually dependent in terms of generating societal effects. This is important, for our empirical findings show that effects cannot be 'planned' in their entirety. The case studies confirmed that the generation of effects at a greater spatial or temporal distance, or across spheres of activity, is subject to multiple influences that cannot be entirely foreseen and controlled by a single project. At the same time, the case-study partners reported seeing unexpected (often positive) effects such as learning loops, and therefore that they were able to transfer approaches and concepts to other spheres of activity. This reflects the fact that societal effects are not necessarily only connected with the results and products of a project.

Processes and results are therefore equally important. The main fields for the shaping of processes and the challenges these inherently pose for effective TDR create scope for actively developing potential effectiveness. This is because they provide a point of orientation for process shaping and for compiling relevant results. Our case studies show that neither the results nor a robust research process alone are responsible for generating societal effects. Our conclusion is that research processes and their results are closely intertwined when it comes to generating potential effectiveness.

When it comes to process shaping, adaptivity becomes particularly important – this means **clarifying, observing, assessing and adapting**. The results on shaping processes indicate how important it is to consider interests, establish clear roles, and ensure connectivity and a culture of collaboration within a project. Here, clarification, observation, assessment and adaptation are activities that generally support reflectivity in TDR processes. If researchers are to derive consequences for further process shaping, they must continually relate the problem defined within the project to the complex societal problem. They may sometimes need to change the participant set or reformulate the project objectives or expectations regarding (societal) effects. However, this also assumes that, **right from the start, all partners develop a shared (provisional) understanding** of the project's approach, organisation (integration, participation) and reach (effects, transfer). This provisional understanding should then be firmed up over the course of the project. The analyses in our case studies showed that potential effectiveness diminishes if too much background knowledge and too many assumptions remain implicit, i.e. if there is a lack of transparency or the reception of the results is neglected.

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