

3. Sustainability and dilemmas – Theory for practice

Preceding the metacriteria, this part introduces the concepts of sustainability and dilemma. On the one hand, this serves as a background for the structure of this guide but can also be used for more in-depth information.

3.1 Sustainability – Analytical understanding of sustainability

The social discourse on sustainability in the context of the normative model of sustainable development has been characterised from the beginning by a complexity of problems and a multitude of heterogeneous actors with very different, partly implicit, partly explicit interests, normative orientations, values and knowledge bases. In science alone, the guiding principle of sustainable development is translated into different concepts. Thus, the one-pillar model (ecological perspective), the triple-bottom-line (with ecological, economic and social components), which is referred to most often, as well as a triple-bottom-line, in which, for example, an additional cultural component is added, co-exist (cf. Renn et al. 2007). Grunwald and Kopfmüller (2012, p. 58) speak of a “sustainability model”, “more concrete action guidelines” for approaching the model and “multi-pillar concepts” as a basis for this (cf. also Grunwald 2016). The concept of “planetary boundaries” is focused on the global-ecological aspects (Rockström et al. 2009), whereas Schellnhuber and Bruckner (1998) for climate impact research and the German Advisory Council on Global Change (WBGU 2014) describe a general ecological model (see also Keil/Hummel 2006).

Although in the course of the debate a certain basic understanding of sustainable development has gradually emerged on a very general level – oriented along the Brundtland Report and the above mentioned models – this understanding quickly proves to be blurred and potentially leads to conflicts in concrete research processes. Different scientific and non-scientific professionalisations and experiences lead to a narrowing of the problem of (non-)sustainable development and can lead to focusing on or prioritisation of partial aspects with sometimes rather superficial or particular interpretations of the concept of sustainability for the respective practical purpose.

In the project “Dilemmas of Sustainability” (Henkel et al. 2018), this state of the discourse (only roughly sketched here) has led to the fact that our own research work does not start from one comprehensive definition but from an “abstract-analytical understanding of sustainability” that is determined by three assumptions or premises that can be found – spelled out differently – in most understandings of sustainability (Henkel 2016):

Firstly, the assumption of a coupled relationship between society and nature. This entails the task for sustainability research to – for a critical analysis of hybrid initial problems – first distinguish between ‘nature’ and ‘society’.

Secondly, the premise of temporal development. This raises the question of the continuity of the social development process with the well-known problems of spatial, temporal and social scales and the fundamental, prospectively raised questions of intra- and intergenerational justice, e.g., as a claim to a *good life for all*.

Thirdly, the assumption of a transformation potential of knowledge. This gives science a central significance in its dual role as part of the problems of sustainability and as part of alternative solutions.

This abstract-analytical understanding of sustainability served primarily as an initial heuristic for identifying dilemmas in research projects and their funding and is explicitly not normative. This was important precisely because the guiding principle of sustainable development – and within it, as an object of study, the question of the dilemmas of sustainability – is connected with strong normative assumptions, especially intra- and intergenerational justice.

In this understanding, the concept of sustainability in the context of sustainable development describes a complex situation. (i) Sustainability refers to relations – specifically to social relations with nature – and is thus a concept that is shaped by relations.

(ii) Sustainability refers to the continuity of desirable processes and not to conditions;

(iii) Sustainability depends on knowledge, especially the transformative power of scientific knowledge.

Three fundamental tensions characterising the structure of the problem can be derived for sustainability research from this (Jahn 2012):

Societies depend on natural, ecosystemic preconditions that they cannot generate themselves but in whose (self-)regulation they nevertheless intervene massively. Sustainability research is thus confronted with the hybridity and systemic character of the problems it addresses.

Temporal and spatial jumps in scale play an essential role in (non-)sustainability but can only be controlled and planned to a limited extent and are closely linked to questions of power and the varying capacity for action of the actors concerned or involved. Sustainability research must take into account different spatial, temporal and social scales and focus on transition effects and path dependencies.

The creative power of science increases. At the same time, it loses its privileged position in the sustainability discourse. Science becomes – among other actors – a participant observer. This makes self-reflexivity in research practice a crucial prerequisite.

Due to the lack of a generally binding definition of sustainability, it can therefore be particularly important at the beginning of a research process to jointly develop a working definition that is valid for the project and appropriate to the specific problem context and the desired alternative solutions.

3.2 Dilemmas – On the basic structure of practical dilemmas

Practical dilemmas emerge when a *decision has* to be made in concrete *situations of action* against the background of *subjective premises* (usually based on real-life problems), but the decision is or appears impossible due to the *nature of the alternatives*. In the case of a dilemma, an actor is faced with two (in the case of a tri- or polylemma, three or more) mutually exclusive options, each of which – measured against the premises – has negative consequences and none of which can be considered with good reasons to be better than the other. In moral philosophy, very drastic thought experiments, such as the so-called “trolley problem” (Thomson 1976) or “Sophie's Choice” (Styron 1980; McConnell 2022) are usually used to illustrate this. Here, the person in a situation of decision-making is always faced with the two alternatives of having to choose between at least two human lives. At the same time, however, this person is confronted with the (implicit) premise of ensuring the survival of all human beings. Yet, the only two possible decision alternatives always lead to the death of at least one person. This, in turn, means that every choice between the given alternatives leads to the violation of the premise.

It is important to note here that practical dilemmas are always conditioned by two sides: firstly, by the *subjective premises or norms of action* that provide the standard for decision-making/action, and secondly, by the

external conditions of action, which are expressed in the structure of the situation, i.e., the available options.

Practical dilemmas contain contradictions on two levels: firstly, the concrete premise of action (q is a goal to strive for) contradicts the expected consequences of action (a and b; both lead to non-q). An actor in a dilemmatic situation wants to or should do something that he cannot do in view of the existing alternatives. This creates a second contradiction on a higher level. The implicit request in the premise to make a decision and act on the basis of it (assumption that action must be taken) contradicts the simultaneous impossibility of deciding and thus acting (action cannot be justified). Due to this *simultaneity of implicit demand for action* and the *impossibility of deciding on a course of action*, dilemmas can quickly have a paralysing effect. As in a situation of constraint, one is confronted with a set of bad alternatives but is unable to identify the lesser evil. In this respect, dilemmas make one incapable of action.

Dilemmas always refer to *expected* consequences of action which always only occur with a certain probability. Dilemmas are therefore not only dependent on the underlying norms of action but also on the limited and perspectival knowledge of the actors as well as the meaningful framing of their situation. However, this does not mean that they are mere subjective constructions. Actors can be mistaken about the existence of dilemmas. A situation not recognised as a dilemma, just like an unrecognised constraint, becomes apparent in practice in the form of the occurrence of negative consequences. The subjective interpretation of the situation cannot therefore arbitrarily (de)construct negative consequences that will occur in the future, but it decides whether these present themselves to an actor as part of a dilemma.

The basic structure of a practical dilemma is that a single norm of action cannot be realised in the face of existing alternatives. This is the case when, of two (or more) possible alternatives for action, each predictably leads to the violation of a particular norm of sustainability (I shall q; either a or b; a leads to not-q, b leads to not-q; thus not-q). For example, the applicable norm of sustainability may be to permanently preserve biodiversity in a certain area. A dilemma may emerge if, due to climate change, certain species are acutely threatened with extinction and any known intervention in one way or another would lead to the same result, namely, the loss of biodiversity.

3.3 Dilemmas – Determinations of dilemmas of sustainability

In the context of sustainable development, *six constellations of dilemmas* are frequently encountered. Typical *conflicts* that exist here can cause *dilemmas* if the implied different perspectives are to be implemented at the same time, which, however, is not possible due to the nature of the conflict.

3.3.1 Conflicting goals as a potential cause of dilemmas

Because sustainability is usually a complex norm of action consisting of several interdependent partial norms, one often encounters dilemmas that result from conflicts between two (or more) partial norms or partial goals of sustainable development (dilemmas as results of conflicting *goals*). Here, sustainability as a premise q contains several partial norms ($q = q_1$ and q_2), which then in practice can be expressed in several goals that are valid but in *conflict* with each other at the same time. Many of the UN's Sustainable Development Goals (SDGs) are in a conflicting relationship with each other. If the situational conditions are such that the realisation of one goal precludes the realisation of the other goal, a dilemma occurs ($q =$ both q_1 and q_2 ; either a or b ; a leads to q_1 and non- q_2 , i.e. non- q ; b leads to q_2 and non- q_1 , i.e. non- q). For example, large hydropower plants can provide electricity on a renewable basis (SDG 7) but at the same time endanger ecosystems and biodiversity (SDG 15).

3.3.2 Conflicts of time as a potential cause of dilemmas

Secondly, because sustainability always has a temporal dimension, dilemmas often arise between different temporal instances of the same goal of action (dilemmas as a result of *conflicts of time*). The premise q then implies q at several points in time ($q = q$ at T_1 and q at T_2). For example, a measure to increase the economic efficiency of a company can reduce the economic benefit in the short term (measures increasing efficiency cause costs), contribute to an improvement of the balance sheet in the medium term (the measures pay off), but in the long term result in comparatively increased costs (accumulated negative side effects of the measure become noticeable). In such a case, actors are confronted with the dilemma of

having to decide between short-, medium- and long-term limitations of the economic benefit. What is economically sustainable from the company's point of view cannot be clearly decided ($q = \text{both } qT1 \text{ and } qT2$; either a or b; a leads to $qT1$ and non- $qT2$, i.e. non- q ; b leads to $qT2$ and non- $qT1$, i.e., non- q).

3.3.3 Conflicts of interest as a potential cause of dilemmas

Furthermore, in the context of sustainability, one often encounters multi-actor dilemmas that arise from constellations of interrelated actors (dilemmas as a result of *conflicts of interest*). In dilemmatic constellations, *each* individual actor (A, B) can realise their subjectively desired course of action (viewed in isolation, there is no dilemma), but because the different courses of action conflict with each other, not *all* actors can realise their goals (McConnell 2018). The resulting conflict of interests is a dilemma if one sets as a premise that all actors in a constellation should be able to realise their respectively preferred goals at the same time [$q = qA$ (realisation of A's premise) and qB (realisation of B's premise); either a or b; a leads to qA and to non- qB ; b leads to qB and non- qA ; thus non- q]. Thus, under conditions of scarcity, an officially announced upper limit on the consumption of a particular resource, such as water, leads to the question of who should restrict his/her consumption and to what extent. If this is decided centrally, policy-makers may be confronted with the dilemma of deciding which interest group they want to frustrate and antagonise and to what extent.

3.3.4 Conflicts between different forms of knowledge as a potential cause of dilemmas

In addition to *scientific knowledge*, whose general validity is based on inter-subjective verifiability and independence from individual interests, other forms of knowledge based on the *experiential knowledge of practitioners*, *indigenous knowledge* or *traditional knowledge* also come together, especially in transdisciplinary projects with a participatory approach. When actors with different forms of knowledge encounter each other, dilemmas can occur – especially when the forms of knowledge lead to different recommendations for action, and it is unclear how content in one form of knowl-

edge can be translated into the language of the other (incommensurability) (dilemmas as a result of *knowledge conflicts*).

In the context of transdisciplinary research, different *types of knowledge* also play a role: in addition to the commonly developed ‘systems knowledge’, i.e., knowledge about the functioning of and causal relationships in concrete, real-world systems such as e.g., ecosystems, ‘target-’ and ‘transformation knowledge’ also play a role (Hirsch-Hadorn/Hoffmann-Riem et al. 2008, Karrasch/Grothmann et al. 2022). Target knowledge concerns the dealing with targets, e.g., the priorities within the framework of the Sustainable Development Goals. On the other hand, transformation knowledge is concerned with how goals can be achieved on the basis of systems knowledge, i.e., how ecosystems can be designed in such a way that they can withstand future challenges. Especially in transdisciplinary contexts, the integration of such different forms of knowledge poses special challenges (Vilsmäier/Engbers et al. 2015, Hoffmann/Pohl et al. 2017) since not only different logics of scientific disciplines have to be brought together but also forms of knowledge that have to meet other criteria such as practicality, suitability to concrete experiences or traditions and belief systems.

3.3.5 *Conflicts between different understandings of sustainability as a potential cause of dilemmas*

While conflicting interests as the cause of a dilemma of sustainability can also affect the implementation of a *shared* sustainability goal, dilemmas can also emerge from *different* understandings of sustainability. Among co-workers in the context of projects, in transdisciplinary dialogue or in interdisciplinary projects, there may be agreement on the necessity of sustainability. If, however, sustainability is understood by some participants as reducing CO₂, for example, but by others as reducing the consumption of resources in the sense of post-growth overall, this harbours potential for conflict. In one case, the expansion of renewable energy and the use of nuclear power is desirable as an element of sustainable development, so that the expansion of electromobility can also be pursued. In the other case, only a reduction in energy consumption as a whole can be understood as sustainable, so that a reduction in individual mobility is indicated. A dilemma emerges here under the condition that all concepts of sustainability represented in a project are to be implemented. This can lead to fundamental differences that cannot be resolved through a discussion of the

negotiated issue itself and that only become apparent in concrete attempts of implementation in the absence of prior agreement.

3.3.6 Conflicts over responsibility as a potential cause of dilemmas

Sustainability is closely related to the *negative effects of progress* in the broadest sense. Accordingly, responsibility in the context of sustainability plays a role in two respects: first, by attributing responsibility for *damage* that has *already occurred* – and second, by attributing responsibility for preventing *future damage*.

Depending on the understanding of sustainability, however, there is a difference as to where such responsibility is seen and to whom it is *attributed* (cf. also Henkel/Luedtke et al. 2018; Henkel 2020). For example, consumers may be viewed as having the responsibility to consume simply less overall, more regional products, less packaged and more vegetarian food – or research and development may be viewed as having the responsibility to develop better thermal insulation, more resource-efficient production processes or energy sources with lower emissions. Like sustainability itself, responsibility can be strategically asserted and denied (cf. Section 3.5: Clarification: Strategic assertion and denial of dilemmas). When responsibility is attributed – whether by an actor himself or by others, whether strategically or not – this changes the *conditions of action*. This is all the more true since responsibility could often be attributed differently in the face of complex circumstances (Bayertz 1995; Heidbrink 2006; Grunwald 2012) but nevertheless implies a strong normative obligation (Henkel/Åkerstrøm-Andersen 2013 / 2014).

When responsibility is attributed, this can itself be both a *conflict* about responsibility and *exacerbate* the above-mentioned conflicts as the cause of dilemmas – for example, by justifying goals or interests with existing responsibility. The *emotionality* often associated with the *normativity* of responsibility also contributes to this. For this very reason, a strategic assertion or denial of responsibility is obvious. *Dilemmas* can emerge from this mixture of ambiguous attribution of responsibility, effects on action and possible emotionality if the attributed responsibility exceeds the capacity to act, if causal factors and perpetrators are excluded from the attribution of responsibility, or if different basic ideas about responsibility emerge from different understandings of sustainability.

3.3.7 Dilemmas as a touchstone for the feasibility of norms of action

Whether *tensions* between heterogeneous partial goals, between different temporal perspectives of the same goal or between diverging interests or understandings of sustainability of different actors can be *balanced* or whether they lead to practical *dilemmas* can only be seen against the background of certain socio-material contextual conditions. In this respect, dilemmas provide a good touchstone for the feasibility of norms of action under real conditions. Dilemmas can be used to discuss obstacles to action, their causes and ways to overcome them. This also explains their significance in the sustainability discourse.

3.4 Early recognition: areas of tension with potentials for dilemmas

Based on a qualitative, empirical analysis of funding programmes and projects dealing with sustainability research, typical areas of tension in that field can be distinguished in connection with the dilemmas of sustainability described above: such areas can be found in various fields of sustainability research when subjective premises in the form of heterogeneous perspectives of different actors and their socio-material contextual conditions meet. These premises are initially independent of each other as individual logics but must be combined in the context of sustainability research. If several perspectives are to be brought together or realised at the same time, this harbors the potential for typical conflicts and contradictions that manifest themselves in situations of action and can thus become practical dilemmas. This contextual situation characterises the areas of tension. Accordingly, areas of tension offer an increased potential for dilemmas since the negotiation of heterogeneous premises increases the probability that conflicts and contradictions emerge. This in turn can cause a practical dilemma. When critically examining these areas of tension in sustainability research, the metacriteria and reflection questions formulated in this guide offer a good orientation. With them, tensions can be made explicit and their effects on the project work can be reflected upon.

The following typical areas of tension in sustainability research can be derived from the empirical study of sustainability research projects and funding programmes (Müller/Müller 2023) and shall be presented below:

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3.4.1 Implicit assumptions in the project context

3.4.2 Cooperation and participation in inter- and transdisciplinary research contexts

3.4.3 (Transdisciplinary) research in structures of funding and science

3.4.4 Research in the context of social framework conditions

3.4.1 *Implicit assumptions in the project context*

Areas of tension related to implicit assumptions in the project context can occur when (1) actors in interdisciplinary and transdisciplinary research networks bring in different understandings of sustainability and these are not reflected upon and adjusted to the joint project work, or (2) disciplinary conceptual understandings are assumed to have sovereignty of interpretation. This is due to the fact that each individual, as an actor in the research process, brings his or her own goals, norms, expectations, interests and conceptual understandings into research projects. These implicit assumptions initially coexist as heterogeneous premises and need to be adjusted to each other in order to work on a common research object and to shape a research process that can be participatory. In these negotiation processes, conflicts of goals or interests can occur (see above), the result of which can either be agreement on common research objectives and interests or a practical dilemma.

(1) *The actors involved bring different understandings of sustainability into a project, which are subsequently not jointly reflected upon and aligned with the project.* The diversity of understandings of sustainability brought into the project is often accepted as an “empirical fact” and work is carried out openly. If, however, in the course of the project clear indicators or criteria are needed, for example, to determine a transformative potential, those involved in the project reach their limits. At this point (at the latest), it becomes clear in how far understandings of sustainability differ and what is considered sustainable or non-sustainable. However, this also leads to the fact that no agreement can be reached at such a late stage. A project member explains this in more detail:

“And what are the own criteria as to what is sustainable and what is not? That is why this question will remain unanswered at the project level. Or [...] at least there will be no uniform answer to it. [...] [Depending on]

the understanding of sustainability, there will be different answers, and, of course, you can summarise and present them because I think there is simply no way out” (project 9)¹.

(2) Tensions can also arise through the introduction of *disciplinary conceptual understandings* whose meaning is not questioned in the project context and for which no common conceptual understanding is developed. Due to an unspoken variety of understandings when using the same word with different implicit meanings, attributions of meaning and thus also potentials for tensions continue to be present throughout the research process and carry with them a strong potential for contradictions, conflicts and also dilemmas at a later point in the project. Our investigation of the research projects has shown that an early agreement on concepts/terms is particularly important in order to prevent such potential. As the project leader of an interdisciplinary project puts it:

“Of course, there are always discussions, discussions about understanding and so on. You always have to find a common denominator. It's always a bit of work, but, of course, it's also interesting” (project 17).

However, a high degree of communication and willingness to discuss is also relevant here in order to clarify conceptual understandings and, moreover, to find common ground for cooperation in the project. This was shown in one project:

“We had relatively long discussions at the beginning: what do we understand by different terms, and we also have very different ideas about them. This requires a lot of good communication” (project 14).

These examples make it clear that an area of tension emerges when, on the one hand, the implicit assumptions are not communicated and are brought into the research process without being reflected upon, so that conflicts or even dilemmas can occur in the further course of the project. On the other hand, an area of tension can also develop as a result of the discussion that takes place about conceptual understandings and implicit assumptions since agreement on common understandings does not always proceed without tense or conflict-laden communication and compromises.

1 The quotations refer to the interviews with project leaders, project staff and -coordinators as part of the empirical study conducted on research funding programmes and research projects on sustainability in Germany.

3.4.2 Cooperation and participation in inter- and transdisciplinary research projects

Areas of tension in cooperation and participation occur (1) in interdisciplinary and transdisciplinary research projects due to the focus on social problems, (2) the design of processes of participation and (3) the equal selection of groups of actors. The area of tension of cooperation and participation described below is thus primarily due to the necessity of the inter- and transdisciplinary research process, while at the same time the complexity of this process is increased.

(1) In order to be able to deal with the complex problems in the context of sustainability and to create solutions, sustainability research is often transdisciplinary. In most cases, sustainability research requires a *focus on societal problems* and thus also the involvement of societal actors along with their knowledge and their forms of knowledge in dealing with these problems in order to find solutions. Since the circle of actors involved is thus expanded, the potential for dilemmas of the implicit approaches is increased. This is due to the increased number of individuals involved and the increased heterogeneity of the respective contexts and knowledge bases, normative assumptions as well as the associated subjective premises. Here, too, possible dilemmatic decisions are based on conflicts of goals and interests that can be traced back to the heterogeneous premises in the research network.

(2) If research processes are designed in a transdisciplinary way, there is also potential for conflict in the *processes of participation*. If, for example, there is a lack of motivation and willingness to participate in such processes, this can have an effect on the research process as an external condition for action: depending on the nature of the alternative courses of action, a practical dilemma can be perceived in such situations since the options for action in research processes are limited and alternative ways of implementation must be sought. This becomes clear, for example, in the following quotation by a project member:

“At the very beginning we tried to make general participation very strong and we had frustrating results. We actually had what has been described in the literature as participation fatigue. [...] We actually underestimated how much people were no longer willing to take part in an event. [...] So we actually had a problem” (project 5).

(3) Researchers and transdisciplinary research networks also face similar challenges when it comes to the *representative, equal participation of social actors*. For example, a member of a transdisciplinary research project points out:

“These are good people, they are mostly people who go in with great enthusiasm and with the best thoughts and goals [...]. They take over the representation of other people in order to decide where to go. And the dilemma is, of course, to get the others, the silent ones, to find out what they actually think” (project 15).

Work in interdisciplinary and transdisciplinary research projects poses the challenge that conflicts, contradictions and, eventually, clear dilemmas can emerge in the research process, especially due to the participation of heterogeneous groups of actors or the difficulty of implementing or fairly shaping processes of participation (cf. Bergmann/Jahn 2023).

3.4.3 (Transdisciplinary) research in structures of funding and science

Another area of tension is revealed by transdisciplinary research in structures of funding and science. These include (1) the disciplinary requirements of academic qualification in a transdisciplinary context and (2) the implementation of transdisciplinary cooperation in existing structures of funding. The field of primarily transdisciplinary research in already established disciplinary structures of science described below is fraught with tension because the expectations and the associated framework conditions for funding transdisciplinary research projects in particular run counter to the actual course of events in the projects.

(1) For example, *disciplinary requirements* of academic qualification and scientific publications as external conditions for action in situations of decision-making are in partial conflict with transdisciplinary ways of working. This can lead to practical dilemmas at the individual level since neither the transdisciplinary nor the established, more disciplinary approach in the system of science can be taken into account. Thus, two conflicting norms confront each other. In the projects on transdisciplinary research, a clear contradiction in feasibility then becomes apparent, which is described by a doctoral student as follows:

“The requirements of [...] disciplinary academic qualification were often [...] so contradictory [...] to what transdisciplinary work actually means. So to include the perspective of practice or society right at the beginning in the formulation of research questions or in general [...] [of] the problem and the object of study, that does not go well with a very academic approach” (project 11).

(2) A further manifestation of the area of tension can be seen in the *implementation of transdisciplinary research processes in connection with the structures of research funding*. In this case, the structures of funding as external conditions for action run counter to the processes in and expectations of research. The following quotes from research projects illustrate this. For example, one project member mentioned the contradictory logic of research funding to requirements of transdisciplinary projects:

“I think this is the biggest dilemma for me, [...] we have research funding that is competitive. [...] [T]his competitive logic comes up against the limits of what living labs actually want to do. Namely, to be experimental spaces in which things are tried out. Which can then fail and so on and so forth. And here the funding logic in competitive and strictly time-limited projects is indeed dilemmatic, when research for sustainable development and living labs are actually supposed to help build processes and structures that are oriented towards the long-term” (project 5).

In another research project, the project management referred to the conflictual impact on the ongoing processes in the project in the context of the funding:

“It has something to do with the funding, that with transdisciplinary projects it is sometimes difficult to write project proposals [...] and you have to say: “What do I want to do? What question? What methods? What do I want to get out of it?” And that transdisciplinary research doesn't always work that way, or that it is sometimes contrary to what transdisciplinary research is and that is also a conflict [...] that runs through the project a bit” (project 14).

The embedding of transdisciplinary research processes in the current structures of the system of science thus creates another typical area of tension, which is accompanied by contradictory demands for temporal, monetary, but also individual resources.

3.4.4 Research in the context of social framework conditions

The final area of tension that can be derived from the data is related to the social framework in which research takes place. This can be seen in the fact that (1) sustainability research is embedded in the societal context and (2) different processes can lead to conflicts of goals and interests between the actors.

(1) Since individuals do not act in a vacuum, this can lead to dilemmatic situations of decision-making. It becomes clear that research embedded in this *social context* finds itself in the area of tension of having to provide scientific findings for problems of sustainability within the social framework conditions and contribute to political decisions, while at the same time having to negotiate the internal constellations and processes of the project. Accordingly, sustainability research is not detached from social contexts but is directly and to some extent indirectly integrated into them, especially through transdisciplinary research. A connection can also be drawn here to the previous area of tension: structures of science also interact with social, especially economic and political decisions. Accordingly, various couplings emerge that shape the area of tension and immensely increase the potential for getting into actual dilemmas in practical action.

(2) In the transdisciplinary projects studied, *conflicts of interest and conflicting goals of the groups of actors involved* were repeatedly mentioned. For example, cooperation with municipalities was often characterised by the fact that the effects of decisions in the project could also have political consequences and that the course of the project depended on political decisions. One project leader described this as follows:

“And if the municipal council does not support it, then the project can be scaled down overnight. There was also a time when there was displeasure among the population and it was very clear: you have to find a solution and you have to make sure that this displeasure is gone, because otherwise those are simply all votes” (project 7).

Even within the projects, interests, goals and political views have often developed into an area of tension. In another project it was stated:

“For some of the colleagues, the question of the transformative potential alone is politically very explosive, yes, a question that should not be followed at all. [...] Exactly, and this results in constant friction in the

project, which can also be productive in some way. But I have the impression that there is nevertheless a gap that is insurmountable. You could say that there is a kind of division in the project (...) we can't talk about certain things together” (project 9).

It becomes clear that the social framework conditions as external conditions for action have an impact on situations of decision-making in research processes. There are often fundamental conflicts with respect to goals and interests that can arise in research processes since transdisciplinary research in particular is integrated into constantly changing social framework conditions.

3.5 Clarification: Strategic assertion and denial of dilemmas

If, in contrast to these areas of tension, which under certain conditions *can develop into* dilemmas, we now look at the dilemmas explicitly *named in the sustainability* discourse, it becomes apparent that dilemmas often have a *strategic function*. With the help of the dilemma figure, the conditions of individual and collective agency are negotiated and strategies for solving socio-ecological problems are justified or criticised. The reference to dilemmas of sustainability can be used both to rhetorically close and open up spaces for action – across the distinction between affirmative and negative references to the existence of dilemmas.

Thus, the *assertion of a necessary and under no circumstances avoidable “tragic” dilemma* (Foster 2017) makes all doors in the space of possible courses of action appear closed. If the driving forces that inevitably push beyond the planetary limits are so deeply anchored inside us that we cannot possibly neutralise them in time, then any search for solutions seems hopeless. The dilemma figure here serves the intention of freeing ourselves from illusions and facing the coming catastrophes.

But even the opposite *assertion that there are no dilemmas or that they have already been overcome* can have the effect of closing off the space of possibilities if it is used to justify the lack of alternatives to the status quo or a certain pathway of technological development. Thus, the reference to dilemmas that have been overcome can have the rhetorical function of making exactly one door appear to be open because all others lead to a dilemma. In this framing, only one's *own* strategy, for example, a certain biotechnology, a more efficient production method or a state measure, can

save us from an otherwise threatening dilemma (such as the impossible decision between food security or preservation of the ecosystem).

On the other hand, the *denial* has the effect of opening up a space of possibilities if it is used to criticise the rhetorical limitation of the scope of options by referring to a dilemma.

The deconstruction of “false” dilemmas aims to question the often only implicit frame of reference of an alleged dilemma, and thus to point out solutions on a “higher level”. For example, the claim that only certain technical solutions lead out of the dilemma of food security and preservation of the ecosystem can be countered with the argument that this dilemma only exists under very specific conditions – such as a certain form of economic growth and corresponding cultural values.

Positions that use the *assertion of dilemmas to point to structural or systemic blockades to the ability to act* also indirectly have the effect of opening up a space of possibility if, at the same time, they want to point out the conditions of possibility for resolving dilemmas at a higher level – be it by changing the norms of action or the social conditions of action. Thus, the reference to the inherent potential for dilemma of certain cultural values or social institutions and structures can make it clear that promising strategies of transformation must start at a very fundamental level because this is the only way to eliminate the deeper causes that repeatedly bring us into situations in which we are confronted with impossible decisions. Dilemmas, such as the “growth dilemma” (Jackson 2017), are thus used here to justify the need for certain structural changes. Insight into their strategic use makes it clear that *dilemmas do not exist in an absolute sense but only within a certain frame of reference*. Whether we are in a dilemma depends, firstly, on the norms on which action is based. This includes, for example, the assumption that the current level of prosperity should be maintained, which in turn contains numerous implicit assumptions (what does prosperity mean? For whom? And when?). Secondly, dilemmas presuppose a certain interpretation of the situation: under which conditions, assumed to be unchangeable, are there only two mutually exclusive and equally undesirable alternatives? And how high would one estimate the risks associated with each of the two alternatives to be, i.e., how likely is it that certain negative consequences will occur? By changing the underlying norms and interpretations of the situation, tensions and conflicts can be rhetorically elevated into dilemmas or, conversely, alleged dilemmas can be rhetorically resolved into manageable tensions and conflicts.

However, this does not mean that dilemmas are mere subjective constructs. People can be just as mistaken about the existence of dilemmas as about that of all other socio-material conditions for action (Mader 2022). Whether tensions between partial goals, between different perspectives of time or between diverging interests of different actors can be balanced in the context of sustainability projects or whether they lead to dilemmas can only be seen against the background of the real framework conditions of the actors.

Thus, the assertion of non-existent dilemmas can be just as problematic as the denial of real dilemmas. Dilemmas that are falsely asserted can prevent possibilities for action and have a paralysing effect. They can suggest a false lack of alternatives and help to advance certain partial interests. On the other hand, overlooking real dilemmas can create a false sense of security and later prove to be a mistake that we have to pay for with very real negative consequences. Dilemmas can therefore, with critical intent, also be a touchstone for the reality of certain objectives of sustainability: can all the good objectives really be implemented in the form of a possible win-win or do they inevitably lead to dilemmas under real-world conditions and must therefore be adapted?

3.6 Processing of dilemmas: Between win-win and trade-off

Despite early recognition of dilemmas, a potential dilemma can escalate into a real dilemma, and sometimes an alleged dilemma actually turns out to be valid. In cases like these, existing dilemmas need to be dealt with. In various disciplines, an extensive and heterogeneous literature has developed for such questions of the practical handling of existing situations of dilemmas. In social and developmental psychology, for example, Piaget (1986, first 1948) and Kohlberg (1984) and Kohlberg/Kramer (1969) used dilemmas to examine the developmental status of children and young people on the basis of their reasoning strategies (Carr 2012). The approach was applied by Hoff (1992) and Hoff/Lecher (1995) to occupational biographies and the sense of ecological responsibility. In interview situations, people are confronted with hypothetical situations of dilemmas and asked about their strategies for dealing with them. The patterns of argumentation used here mostly apply laws or moral principles and indicate the level of judgement of the respondents.

Dilemmas in the form of social dilemmas and the famous “prisoner's dilemma” also play a prominent role in social science and economics literature. Social dilemmas generally emerge in situations in which individual rationality – commonly understood as the self-interest orientation of the actors – leads to collective irrationality or a worse overall outcome for all (Kollock 1998). The prisoner's dilemma represents a typical case under the assumption of incomplete information of the actors involved, which could be solved through communication. Other strategies for solving social dilemmas consist in relaxing the assumption of self-interested decision-making. Empirical research, especially in behavioural economics, has shown that these forms of cooperation or compliance with social norms can also be found in situations of economic decision-making (Ostrom 1998, Patt/Zeckhauser 2000). Forms of information provision in the sense of “nudging” can help to solve social dilemmas as well (Sustein/Reisch 2017).

In part, this literature has the character of a guidebook. On the other hand, it, in part, forms subject-specific ideal types or gives professional recommendations for action. The approach of reflexive analysis of dilemma developed here is an independent one to avoid the *inability* to act. This approach results from the identification of dilemmas of sustainability and areas of tension with potential for dilemmas and thus offers a systematisation of constellations where the capacity to act is blocked. In this context, first, two basic prerequisites for overcoming dilemmas are named. Then, four levels of processing of dilemmas are differentiated. Where approaches to processing of dilemmas exist – whether under this term or as a related issue – reference is made to them in the text.

3.6.1 Two basic prerequisites for overcoming dilemmas

Even a real dilemma does not *per se* have to represent an absolute blockade to action. Even if a dilemmatic situation of decision-making can have an effect of rigidity on individuals, in most cases it turns out that this can be overcome. However, prerequisites are necessary for this, as they were already brought to bear in the early recognition and clarification of dilemmas in sustainability research.

A first basic prerequisite is to be able to take a sufficiently reflexive distance from the immediate situation of action. One is able to recognise and examine the frame of reference of a dilemma only when one has freed oneself sufficiently from the situational pressure to act. Dilemmas often

only emerge from an urgency to act that is inherent in the perspective of practice, i.e., the perspective of actors who are confronted in *situ* with practical problems for which they seek solutions here and now in order to be able to continue their practice. Under this condition, it is often difficult to gain sufficient distance from the frame of reference that first leads into a situation that seems unsolvable. In order to be able to deal with this frame of reference, it is necessary to take a step back from the immediate practical problem and ask oneself what one's own premises of action actually are and what exactly the broader conditions of action are that have led into the predicament.

The second basic prerequisite for overcoming dilemmas is to actually have the means to change the frame of reference that is responsible for the dilemma.

Depending on the concrete dilemma, the conditions under which it occurs can be more or less far-reaching or profound. Accordingly, the means of finding a way out of the dilemma vary in complexity. Analytically, a distinction can be made between obvious and more profound conditions: the obvious conditions for the emergence of a dilemma can be dealt with within existing social institutions and values and therefore require relatively little social change, whereas the change of profound conditions requires a change in social institutions and values and thus the coordinated action of a large number of actors. If one also takes into account the distinction between subjective and objective preconditions of a dilemma, then four levels can be distinguished analytically as to which ways out of dilemmas of sustainability can be sought: 1. obvious objective conditions for action (e.g., technical solutions), 2. obvious subjective premises (justification of trade-offs through rules of prioritisation), 3. underlying objective conditions for action (change of social institutions and structures) and 4. underlying subjective premises (change of fundamental values and norms). In reality, there is no clear distinction between the four levels but rather complex connections and smooth transitions. The distinction between the four levels should only serve as a guideline as to which adjustments can be made when processing the dilemma.

3.6.2 Processing of dilemmas at the level of obvious objective conditions for action (technical solutions)

Many of the concrete dilemmas of sustainability that emerge in the practice of sustainable development can be defused, at least situationally, by technical solutions. If, for example, the manager of a company is faced with the dilemma of having to reconcile the goal of increasing economic profitability with certain goals of ecological sustainability (for example, in the sense of reducing CO₂), this can quickly present itself as an unsolvable dilemma: the given goals cannot be realised simultaneously under the given social and technical conditions. An obvious change to the objective side of the frame of reference of the dilemma is to improve the resource efficiency of production, which ideally would turn the mutually exclusive alternatives (to produce *either* more economically profitable *or* more ecologically sustainable) into mutually complementary conditions (a new, more resource-efficient technology is *both* more sustainable *and* more cost-effective). For some dilemmas, this pattern of dealing with dilemmas may offer a sensible way out. Often, however, it turns out to be illusory or even leads to the aggravation of existing problems, which is why it must not be stylised as the universal remedy for all dilemmas of sustainability.

3.6.3 Processing of dilemmas at the level of obvious subjective premises (justification of trade-offs through rules of prioritisation)

One pattern of processing of dilemmas, on the other hand, which starts on the side of underlying subjective premises, consists of introducing rules of prioritisation for dilemmatic situations of decision-making. This strategy has been dealt with in detail by Müller-Christ (Müller-Christ 2007; Müller-Christ 2011; Müller-Christ 2023). The starting point is the observation that often no technical solutions can be found that enable the transformation of a dilemma into a win-win situation. Müller-Christ therefore advocates concentrating on setting the right priorities in dilemmatic situations of decision-making, on the basis of which even difficult decisions can then be *justifiably* made. This includes, in particular, recognising the fact that we cannot always realise all our goals to the fullest extent but often have to accept trade-offs. This proposal of processing thus ultimately amounts to changing the subjective premises of a dilemma in such a way that criteria are introduced for a *justifiable prioritisation of certain partial goals* over

other partial goals. This strategy can be assigned to the level of obvious premises because it is in principle compatible with maintaining existing goals and the norms on which they are based – in the above example, the orientation towards economic profitability and a certain understanding of ecological sustainability. All that is changed here is the *weighing of* existing partial goals. However, this does not have to exclude a more fundamental change in values but can even advance it to a certain extent. For the prioritisation of ecological sustainability over economic profit in a concrete situation of decision-making has to be justified normatively itself.

3.6.4 Processing of dilemmas at the level of underlying objective conditions for action (change of fundamental social institutions and structures)

Many dilemmas of sustainability have deeper causes that require more fundamental changes in the social framework. One issue with the problem-solving strategies described above is that although they can often resolve dilemmas situationally and thus restore the ability to act in the short term, they do not necessarily eliminate the permanently existing causes that repeatedly lead to comparable dilemmas. For example, the manager's dilemma described above is rooted in the fact that companies on global markets are subject to certain profit pressures that systematically counteract efforts to make production more sustainable time and again. It is therefore not at all at their own discretion to prioritise ecological sustainability over economic profitability if this endangers the economic survival of the company. Only alterations in the broader political and economic framework conditions, for example, international regulations of corporate practices or patterns of consumption, can permanently change the framework conditions of the dilemma. The resolution of the dilemma is thus only possible to a very limited extent at the purely individual level and ultimately requires the coordinated action of many affected actors.

3.6.5 Processing of dilemmas at the level of underlying subjective premises (change of fundamental values and norms)

Finally, a fundamental change of values can also be a way to permanently and generally eliminate the causes of dilemmas of sustainability. In fact,

changes in socio-structural frameworks and values are very closely related. For example, the effective regulation of economic practices according to criteria of social and ecological sustainability can only be achieved through political decisions that, at least in democratic societies, have to be socially recognised as legitimate and therefore need a foundation of values. These include notions of prosperity and the good life but also of justice and ultimately ecological sustainability. Following the pattern described above, these values can also require a normative decision for trade-offs at the societal level, such as the renunciation of certain technologies and associated lifestyles on the basis of a new understanding of prosperity.

To present the relationship between the two levels in a less dichotomous way: appropriate problem-solving strategies for dilemmas of sustainability to restore the ability to act in very concrete situations decision-making should be formulated in such a way that, when generalised, they contribute in the long term to eliminating the underlying conditions for the dilemma to emerge, instead of merely postponing problems into the future or even exacerbating them.

