

# IN SEARCH OF TRANSDISCIPLINARITY

PROBLEMS OF  
SUSTAINABILITY SCIENCES  
AND EPISTEMOLOGIES OF  
THE PROBLEMATIC

Esther Meyer



In search of transdisciplinarity

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**Abstract**

Both sustainability and transdisciplinary research can change academic research, especially with regard to its relevance for, and relationship with, its environments. Transdisciplinary sustainability research (TSR), thus, offers the opportunity to change non-sustainable development paths of sciences themselves. In order to fully exploit this possibility, this PhD project addresses the question of how TSR, in the first place, *does* conceptualize and, in the second place, *could* conceptualize knowledge, research, and science. Firstly, this PhD project analyzes, from a discourse studies perspective, the term *problem* in TSR, against the background of discourses on sustainable development. Secondly, it explores the historical-analytical and transformative concept of *the problematic*. The results, firstly, show the consequences of a problem-solving focus for TSR, and secondly, differentiate it from a transformative direction of *problematic designing*, as a more appropriate view on the dimensions of transformation and their qualities of change that matter for TSR. This PhD project aims to contribute to a self-understanding of, and a philosophical communication about, TSR, as a research form in the sustainability sciences.

**Keywords**

Discourse studies, problem-solving, transdisciplinary sustainability research, transformative potential, dimensions of transformation



### List of abbreviations

CADS	Computer assisted discourse studies
CCP	Complexity or Control? Paradigms for Sustainable Development
NGO(s)	Non-governmental organisation(s)
SD	Sustainable development
SDG(s)	Sustainable development goals
TD	Transdisciplinarity
TR	Transdisciplinary research
TSR	Transdisciplinary sustainability research
UN	United Nations

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# 1.

## 1. Introduction

### 1.1. Objectives and motive

“Despite the growth and influence of environmental history, sociology, and the humanities, these approaches to sustainability exist far too often on parallel, not intersecting, tracks with environmental science research. Some of this lack of confluence arises from epistemological and disciplinary differences” (Sze et al. 2018, 8).

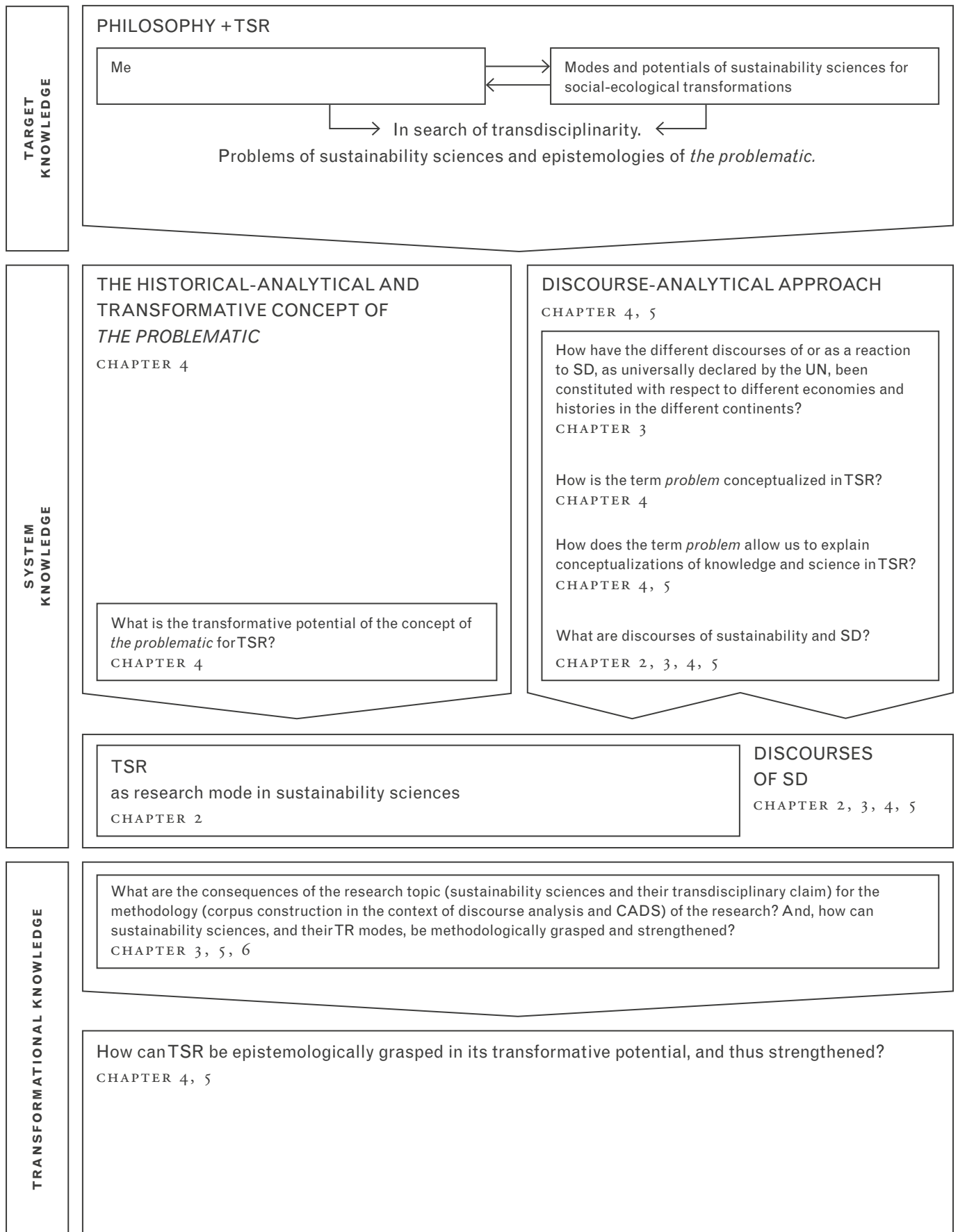
The above statement by Sze et al. describes in an appropriate way my experience of the past five years: this PhD project has been part of the collaborative interdisciplinary research project managed jointly by the Faculty of Sustainability and the Faculty of Humanities and Social Sciences at the Leuphana University of Lüneburg, *Complexity or Control? Paradigms for sustainable development* (CCP)<sup>1</sup>. Among other things, one major goal of the PhD project has been to start with those “epistemological and disciplinary differences” (ibid.) in order to work out the epistemological elements of transdisciplinary sustainability research (TSR) as a transformative research mode in sustainability sciences.

To this end, the PhD project analyzes conceptualizations of the term *problem* in TSR to find out how the term *problem* allows to explain conceptualizations of knowledge and science in TSR. A focus on problems is considered one of the fundamental justifications of the emerging TSR (Becker and Jahn 2006; Pohl and Hirsch Hadorn 2006; Thompson Klein 2014; Osborne 2015; Engbers 2020). Thompson Klein said in 2004: “The difference between older, linear approaches to problem-solving that combined existing disciplinary approaches and new transdisciplinary research is illustrated by the paradigm shift of sustainability. The concept of sustainability challenged the dominant Western paradigm of social transformation, embodied in older interdisciplinary concepts of modernization and development. It moved beyond narrow indicators of economic efficiency to include social justice” (Thomson Klein 2004, 6). Also, it has been underlined that the approaches to problems of and in transdisciplinary research (TR) modes have “epistemological implications” (Krohn et al. 2017, 341). However, the discursive conceptualizations and the constitution of problems in TSR, and their discursive interweavings both with discourses of sustainability and sustainable development (SD) and with conceptualizations of knowledge and science, have hardly been researched so far (Bührmann and Franke 2018). This reflection of TSR aims to detect blind spots in the conceptualizations of problems, which may hinder the implementation of sustainability. This is important, especially against the background of a diagnosed hegemonic discourse of SD (Albán and Rosero 2016), influencing sustainability sciences and TSR. In referring to TSR, especially to Bergmann et al.’s paper from 2012, Strasser et al. point out: “As many concepts can be interpreted in multiple ways and are, at the same time, used in every day communication, it is important to carefully explore their theoretical constitution in order to avoid misleading assumptions of apparently mutual understanding” (Strasser et al. 2014, 182).



Due to the listed research needs, one of the aims of this PhD project is to analyse the conceptualizations of the term *problem* in TSR. Furthermore, the results of the discourse analysis are brought into conversation with the epistemology of French philosophy from the second half of the 20th century, which is associated with the concept of *the problematic*. Both, the discourse-analytical results on the term *problem* in TSR and the philosophical-historical access to the concept of *the problematic*, contribute to the discussion on how TSR can be epistemologically grasped in its transformative potential, and thus, strengthened. FIGURE 1 summarizes this research perspective of the framing paper.

FIGURE I. Graphical representation of the framing of the research (own representation).



Reflexivity<sup>2</sup>, “as the very operational mode of philosophy” (Scott 2014, 3) is a step for approaching futures of sustainability (Jahn 2013; Maniglier 2012). The analysis and explications of reproducing unsustainable patterns and blind spots in sustainability sciences, and in their transformative endeavors, indicate a transformative and epistemological step of “good scientific practice” (Krohn et al. 2017, 346): “Finally, a research program for a sustainable Anthropocene would have to be (self)reflexive and (self)critical with respect to the double role of science as a provider of evidence and a driver of problems” (Hummel et al. 2017, 2; Sievers-Glotzbach and Tschersich 2019). About 20 years after the establishment of sustainability sciences, network events on their institutionalizing structures (for example, *German Committee for Sustainability Research Future Earth*, *IPCC*, *GAIA*, *IASS*, *HochN*, *Faculty of Sustainability Leuphana University Lüneburg*, *Td-Net*) point to a current self-reflexive phase (see also Adamson 2018, 54). The conceptualization and financing of CCP itself underlines a movement within sustainability sciences to question, learn, and transform themselves. This motivation fits with a researcher who is, partly, a sustainability scientist herself.<sup>3</sup>

Therefore, this PhD project’s research goal is threefold, according to the three, much quoted, *knowledge forms of TSR* (for the first time ProClim 1997; Vilsmaier and Lang 2014). The knowledge forms, usually understood as design elements, are applied to structure some self-reflection on TSR: The discourse-analytical approach, as well as the transfer of the epistemological concept of *the problematic* to TSR, correspond to *system knowledge*, and the presentation of a sustainability(-ethical) framing to *target knowledge*. The answers to the question of how the results from the system knowledge can be conceptualized with regard to the target knowledge so that TSR can be explained by, and strengthened in, its transformative potential epistemologically, correspond to *transformational knowledge* (see FIGURE 1).

2 “To be reflexive means that an entity, system or structure bends back or refers to itself” (Zienkowski 2017, 2). “[R]eflexivity is a precondition – be it an insufficient one – for the development of political awareness, critique and social change. It should therefore be accorded a central place in the field of critical discourse studies without losing sight of the fact that the notion can be deployed in different – and sometimes contradicting – ways” (ibid., 8).

3 “Even critical reflexivity can be commercialized. This goes just as much for the works of novelists, producers, artists and comedians, as for our own work as paid academics” (Zienkowski 2017, 10).

## 1.2. Structure of the framing paper

Chapter 2 gives basic conceptual explanations on the research topic. Furthermore, the state of research, underlying hypotheses, and the research questions are formulated. The methodology is explained in chapter 3. In the first sub-chapter (3.1.), the methodological emphasis lies on discourse studies and sustainability, interculturality, and transdisciplinarity (TD). The second sub-chapter (3.2.) argues how sustainability sciences as research topic materialize corpus linguistically in a corpus. The discourse studies foci in the publication projects of the PhD project<sup>4</sup> are formulated on the basis of the table in the third sub-chapter (3.3.). My pronounced methodological interest is also reflected in the sixth chapter on the critical evaluation of the PhD project. The chapter on results (4.) brings together the outcomes from the individual PhD publication projects into an overall narrative. The three sub-chapters differ, as in the last paragraph in 1.1. described, in target (4.1.), system (4.2.), and transformational (4.3.) knowledge. In the following chapter, results on the analysis of the term *problem* (5.1.) as well as on dimensions of transformations and their qualities of change (5.2.) in sustainability sciences are discussed. Chapter 5.3. gives an outlook on methodical consequences. The framing paper concludes with a critical evaluation (6.), outlook (7.), and a conclusion (8.). Throughout the framing paper, it is indicated if and which topics are to be found in which publication projects in more detail. Table 1 shows the numerical assignment of the publication projects and their titles, authors and keywords.

4 Referred to as "articles" within this framing paper.

TABLE I. Articles in the context of the PhD project.

Article number	Title	Authors	Keywords
BOOK CHAPTER 1	Ökonomistische Diskurse der Nachhaltigkeit Bestimmende Momente und die Frage nach Alternativen (German)	Esther Meyer, Ulli Vilsmaier	
PAPER 2	Modeling normativity in sustainability: a comparison of the sustainable development goals, the Paris agreement, and the papal encyclical	Gregor Schmiege, Esther Meyer, Isabell Schrickel, Jeremias Herberg, Guido Caniglia, Ulli Vilsmaier, Manfred Laubichler, Erich Hörl, Daniel Lang	Temporal qualities, dynamical system, levels, heterarchy, norms
BOOK CHAPTER 3	The Problematic of Transdisciplinary Sustainability Sciences	Esther Meyer	
PAPER 4	<i>Solvable problems or problematic solvability?</i> Problem conceptualization in transdisciplinary sustainability research and a possible epistemological contribution	Esther Meyer	Computer-assisted discourse studies (CADS), epistemology, wicked problems, omplexity, thinking the problematic
PAPER 5	Designing a transformative epistemology of the problematic: A perspective for transdisciplinary sustainability research	Esther Meyer, Daniela Peukert	Problematic thinking, design research, futurity, complexity
PAPER 6	Economistic discourses of sustainability: determining moments and the question of alternatives (published in English and Spanish)	Esther Meyer, Ulli Vilsmaier	Sustainability sciences, sustainable, transdisciplinary, discourse analysis, hegemonic discourses, intercultural

# 2.

## 2. Research topic, hypotheses, and research questions

Two major topics are the focus of this research: on the one hand, the conceptualizations of *problems* in sustainability sciences; and epistemology in French philosophy, drawing on the concept of *the problematic*. Both topics will be related to TSR, which is prominently represented in sustainability sciences. Sustainability sciences and TSR, as well as TD and TR, are briefly characterized here. The elaboration of the problematic, as epistemology, is an integral part of the articles and will be presented in the results and discussion chapters.

### TSR

The German environmental and sustainability scientist Joachim Spangenberg distinguishes between the conceptions of sustainability sciences as a “more traditional disciplinary-based science for sustainability and the transdisciplinary science of sustainability” (Spangenberg 2011, 275). TSR falls in the category of the science of sustainability (ibid), and has been emerging from German-speaking Europe (Engbers 2020). TSR is a mode of research that connects distinct scientific and societal institutions or organizations. In this regard, techno-scientific norms dominate both the cognitive processes (problem-solving) and the organization of the collaborative processes.

Engbers has derived several characteristics of TSR, out of five definitions of TD that decisively shaped the current discourse in German-speaking countries (Thompson Klein et al. 2001; Pohl et al. 2007; Scholz 2011; Jahn et al. 2012; Lang et al. 2012). These characteristics are:

- an orientation towards societally-relevant, complex problems,
- the heterogeneity of the involved actors and their specific knowledge,
- learning as part of the research process, and
- a strengthened relationship among involved actors with their specific knowledge (Engbers 2020).

TSR is constituted by the separation between science and society (ibid.). At the same time it appeals to a (re-)connection between science and society and seeks for research-driven interventions towards societal transformations<sup>5</sup> with a normative orientation (Popa et al. 2015) towards sustainability or SD. The normative positioning is a starting point for intense, mainly German-speaking, scientific-political debates on the autonomy and democratization of science (Guattari 2015; Grunwald 2015; Rohe 2015; Schneidewind 2015). The explication of normativity, in turn, is one of the tasks of sustainability ethics that should feed in the target knowledge of TSR. In other words, a (situated) working definition of sustainability is part of what TSR creates as a process-sensitive result. This discourse of TSR is one discursive strand of what is considered as TD or TR<sup>6</sup> by Thompson Klein (Thompson Klein 2014). For a few years, there has been an international trend in TSR in which different geographic histories of TSR (as, for example, the Latin American strand

5 See knowledge forms of TSR, p. 19.

6 Used in this work as a synonym, without exclusively thinking about research within academic institutions – even if TD plays little role outside of academic institutions (Merçon et al. 2018).

of participatory action research, Merçon et al. 2018) are mutually referenced and perceived (Vilsmäier 2017; De Eguia Huerta 2018).

### **TD and TR**

A discussion on the contents of what had been emerging as TR started on the first international conference on interdisciplinarity, co-sponsored by the Organisation for Economic Co-operation and Development (OECD) in 1970 (Thompson Klein 2014)<sup>7</sup>.

In this research mode, in the different stages of a research process, scientific researchers collaborate with individuals or groups “from multiple disciplines and societal sectors” (Neuhauser 2018, 30) not primarily institutionalized in science. The research topics (for example, sustainability or health), subject areas, methods, and the degrees of participation in the decisions on those and their namings, vary in the different cultures of the research mode (Kagan 2014).

Transdisciplinary modes open up a platform on which the boundaries that constitute the sciences are shifted. The genesis of knowledge in TR processes is, thus, explicitly based on communication processes beyond academic boundaries or institutionalization. TD takes different approaches to the world as its flexible starting point. Consequently, TR calls for quality criteria for scientific progress and again scratches at legitimizing and demarcating scientific research services. For me, this is a major argument for conceptualizing TR as transformative research.

Transdisciplinarity, as the term itself implies, goes beyond – “is radically different from” (Nicolescu 2018, 74) – interdisciplinarity and disciplinarity, “even while being entirely complementary” (ibid.) to it. Thus, TD can also stand for a movement beyond established paradigms within single disciplines (Neuhauser 2018). However, this epistemological feature plays a marginal role in TSR so far (see *HYPOTHESES*, p. 24), but it is fundamental to this PhD project’s perspective on TSR.

### **Sustainability sciences**

Sustainability sciences “try to answer the question of how we can conceptualize and analyse the complex relations between nature and society” (Hummel et al. 2017, 1).

In this PhD project, sustainability sciences are taken up as a scientific-sociological discourse (Keller 2008, 2010). In the constitution of sustainability sciences there are two striking parallel developments: projects focusing on the theory of science, such as inter- or transdisciplinarity, and international negotiations. In both cases, shifting boundaries in the collaboration between scientific and non-scientific actors is a central aspect of the discussions (Abson et al. 2017; Vilsmäier 2018), in order to pursue sustainability on a world-scale or aid “humanity in its transition towards sustainability” (Abson et al. 2017, 37; *BOOK CHAPTER 3*). Yet, in addition to TSR, there is still disciplinary research within sustainability sciences.

7 Welch speaks of the interdisciplinary approach to knowledge “[a]s a logical evolution of the history of Western thought and an innovative answer to the epistemological project” (Welch 2011, 1). Thompson Klein also emphasizes that “interdisciplinarity and complexity are modern ideas” (Thompson Klein 2004, 2).

A historic reference point, prepared in a series of negotiations at United Nations (UN) level, has been constituted by the 2030 Agenda for Sustainable Development *Transforming our world*, including 17 Sustainable development goals (SDGs). This is the result of a comprehensive gathering of diverse knowledges from science, non-governmental organizations (NGOs) and public institutions (PAPER 2). Since the publication of the SDGs in 2015, sustainability projects have been addressing these 17 goals. They are considered relevant in teaching and research, as well as in other areas of public funding. Thus, various knowledge resources, as a feature of TR, have influenced the choice of the research topics and agendas of sustainability sciences (Hummel et al. 2017) (FIGURE 2).

An inquiry into the topic of conceptualizations of the term *problem*, and their connections to epistemology, in, and for, sustainability sciences discloses:

- the philosophical question about conceptualizations of the term *problem*, which is considered as the “motor of thinking and practice” (Bowden and Kelly 2018, 3) and has “significant implications for policy development and societal outcomes” (Abson et al. 2017, 35)
- that the conceptualizations of the term *problem* are discursively interwoven with the conceptualizations of knowledge and science themselves (Krohn et al. 2017)
- the reduction to solution orientation as the sole goal of TD (Nicolescu 2010)<sup>8</sup>,
- the question of the content-wise definition of problems in sustainability related discourses (Blühdorn 2000)<sup>9</sup>,
- questions about TR and sustainability in different socio-cultural, economic and historical situations (Pellow 2018; Van Breda and Swilling 2019; Meyer and Vilsmaier 2020).

The following hypotheses are derived from the inquiry on the topic:

- TSR, as a relatively young mode of research, tends to refer to a superficial conceptualization of *problems*, which is not discussed epistemologically. However, the epistemological disassembly of the notion of the term *problem* can release the transformative and interventionist potential of TSR, to explore sustainable ways of living together in a radically different way (BOOK CHAPTER 3; PAPER 4, 5).
- Although the term “ecological crisis” is formulated as “problematic” in social-ecological research (Becker and Jahn 2006, 65), it is not traced back to an epistemology of *the problematic*<sup>10</sup>.

Based on the stated motive, hypotheses and research needs, as outlined in the first two chapters, research questions are formulated and direct this PhD project (see also FIGURE 1).

8 “It is difficult for us to understand why ‘joint problem solving’ must be the unique aim of transdisciplinarity. It is certainly one of the important aims but not the only aim” (Nicolescu 2010, 23).

9 “The important question is rather for what reasons and to what extent such empirically measurable phenomena and developments can be conceptualised as problems and crises” (Blühdorn 2000, 10).

10 A dialogue between Frankfurt Social Ecology (Hummel et al. 2017) and an epistemology of *the problematic* can be targeted in a next project.



The official announcement of the PhD position is referring to the question of the modes and potentials of sustainability science for societal transformation<sup>11</sup> that will be discussed in chapter 5.

For orientation, the research questions are assigned to the articles in the following table 2<sup>12</sup>.

TABLE 2. **Articles and addressed research questions.**

Addressed research questions	Article number
How can sustainability sciences, and their TR modes, be methodologically grasped, and strengthened?	PAPER 2 BOOK CHAPTER 3 PAPER 5 PAPER 6
What are discourses of sustainability and SD?	BOOK CHAPTER 1 PAPER 2 BOOK CHAPTER 3 PAPER 6
How can TSR be epistemologically grasped in its transformative potential, and thus, strengthened?	PAPER 2 BOOK CHAPTER 3 PAPER 4
“What are the elements of a critical transdisciplinary methodology for sustainability sciences and practice?” (Hörl et al. 2014, 5)	BOOK CHAPTER 1 BOOK CHAPTER 3 PAPER 6
What is the (transformative) potential of the concept of <i>the problematic</i> for TSR?	BOOK CHAPTER 3 PAPER 4 PAPER 5
Is there a way of thinking about sustainability in a not economic way?	BOOK CHAPTER 3 PAPER 4 PAPER 6
How is the term <i>problem</i> conceptualized in TSR?	BOOK CHAPTER 3 PAPER 4 PAPER 5
How does the term <i>problem</i> allow us to explain conceptualizations of knowledge and science in TSR?	PAPER 4 PAPER 5
“What are the necessary elements of a critical and historical epistemology and methodology of sustainability sciences?” (Hörl et al. 2014, 5)	BOOK CHAPTER 3
How have the different discourses of or as a reaction to SD, as universally declared by the UN, been constituted with respect to different economies and histories in the different continents?	PAPER 6

11 I will speak of social-ecological transformations (for example, Sievers-Glotzbach and Tscherrich 2019) and sustainability sciences in the plural (Rose and Cachelin 2018).

12 Note that there is one questions not included in figure 1 because although it is processed in the articles, it does not feed into the structure of the framing paper (Is there a way of thinking about sustainability in a non-economic way?). The same applies to one question, only the other way round, which is only discussed in the framing paper (What are the consequences of the research topic (sustainability sciences and their transdisciplinary claim) for the methodology (corpus construction in the context of discourse analysis and CADs) of the research?).

# 3.

## **3. Research methodology: discourse studies foci and corpus construction in sustainability sciences and TSR**

At this point, the discourse studies foci in the publication projects of the PhD project are explained (3.3.) and the discourse that is worked with described (3.1.), also based on the corpus construction in sustainability sciences (3.2.). Thereby, the leading methodological question reads: What are the consequences of the research topic (sustainability sciences and their transdisciplinary claim) for the methodology (corpus construction in the context of discourse analysis and CADS) of the research? The term *corpus* comes from the corpus linguistic and describes the analysis material, such as texts from journal articles<sup>13</sup>.

### **3.1. Discourse studies and sustainability, inter-culturality and TD**

Approaching sustainability in a discourse-analytical way may productively irritate on several levels. Sustainability has been constituted as a normative orientation towards and due to a perceived increasing complexity (for example, Hummel et al. 2017). The complexity and globality of the topic to be analysed can be emphasized in the discourse studies methodology, if the historical and cultural dimensions are worked out (Vanhulst and Hevia 2016, 174). This is a means of meeting the challenge of exploring collaboratively and inter-culturally, as well as understanding the discursive dynamics of sustainability between different economies and the histories of different continents. Insights into discursive formations in certain regions and their historical contingencies allow us to see differences and interlinkages between discourses (ibid., 210). This helps to contribute to an exchange across (national) linguistic discourse communities (Vilsmäier 2017; De Eguía Huerta et al. 2018; PAPER 6).

For Albán and Rosero, there is a need to interculturalize relations to nature because only different forms to the occidental, Eurocentric rationality of living together will guarantee future living on the planet (Albán and Rosero 2016, 30, 34). Albán and Rosero claim interculturality as a historical political movement against monoculturalism and a de-memory that is constructed as a strategy to forget, discriminate and marginalize the historical processes of excluded, externalized, and separated other cultures, as well as nature itself, in order to sustain modern hegemonic power (ibid., 33, 34)<sup>14</sup>. Further, they claim interculturality as an ethical way of listening to these other narratives, their cosmologies, knowledges, ways of relating to nature, ways of alimentation, and pedagogies for understanding the world, as well as modes of organizing existence and re-existence. And, they claim interculturality as an epistemic project in respect of former and current forms of knowledge that are not necessarily correspondent to the occidental scientific form and system of representing reality (ibid., 34).

13 “Discourse analytical data can include verbal and/or textual language use but may also include multimodal data and observations about the practices that allow for their articulation. The category of discourse can be used in order to describe various levels of linguistic, textual, semi-otic and/or socio-political organisation” (Zienkowski 2017, 401). My own discourse-analytical research is influenced by critical discourse analysis. According to Adele Clarke critical discourse analysis pays special attention to the ways in which dominant theories emerge and, through their discourses, (re)produce power relations (Clarke 2012).

14 See also, in this context, the conceptualization of unjust resilience (Pellow 2018).

The PhD project therefore includes Latin American discourse analyses, complementary to German- and English-speaking discourse-analytical work, and publishes the findings on the intercultural dimension of discourse-analytical work on sustainability in Spanish, in order to formulate questions for further interlinguistic research demand: How have the different discourses around SD as universally declared by the UN been constituted with respect to different economies and histories in the different continents? How have different discourses that have reacted to the universal national economic discourse by the UN been differentiated (PAPER 6)? Additionally to, and based on, analyzing discourse analyses on sustainability and SD in different languages, workshop methods in an international setting<sup>15</sup> made it possible to discuss and raise inter-linguistic and inter-cultural issues of sustainability or SD (De Eguia Huerta et al. 2018).

When writing and discussing in the different languages, it became even clearer that *sustainability* can only be translated with the help of historical and inter-cultural discourse dimensions<sup>16</sup>.

### 3.2. Corpus construction in sustainability sciences

The intra- and intergenerational justice-related properties of sustainability, and thus, sustainability sciences, as “multiplicities”/“manifolds” (Deleuze and Guattari 1992, 18)<sup>17</sup>, change the methodology of their investigation (Thompson Klein 2004). Their normativity therefore questions the objectivity of sustainability sciences as an object of investigation, and therefore opens up the area for TR (Popa et al. 2015).

One main question, guiding research on sustainability, can be summarized as follows: how can we identify and understand (system) boundaries in sustainability situations? In my PhD project, sustainability situations explain the encounter of people at a certain time in a certain place, which is determined by the needs of the people in relation to the 17 SDGs. I will develop the concept of sustainability situations in this context methodologically and in more depth after my PhD project.

The question, stated in this paragraph, is explained by means of approaching sustainability sciences. The interest for the determination or localization of sustainability sciences is interwoven with the definition of a corpus for the history of sustainability thinking, and thus drawing an analytical boundary, in the sciences as a research- and writing-project that connects CCP. This PhD project has been constructing a sub-corpus in sustainability sciences. It represents English-language article publications in the journal GAIA, which constitutes a necessary component of the establishment of TSR (PAPER 4). The sustainability sciences articles in the corpus of the

15 An *Agenda Setting Workshop on Transdisciplinary Research and Sustainability Within an Intercultural Orientation* was organized by CCP and took place at Leuphana University Lüneburg between September 11–13, 2018 (De Eguia Huerta et al. 2018).

16 In Spanish – unlike the German analogue to English, where there are the words *Nachhaltigkeit* and *nachhaltige Entwicklung* – the discourses on sustainability and sustainable development have been constituted in different ways, such as *sostenibilidad* and *sustentabilidad* or *desarrollo sostenible* and *sustentable*. “If *sostenible* in the hegemonic model refers to the economic, *sustentable* must be considered as the guarantee of all forms of life and of all the ways in which that life is culturally expressed” (Albán and Rosero 2016, 38, own translation). *Strong sustainability* corresponds to the term *sustentable*, and *weak sustainability* to the term *sostenible* (ibid. 2016; PAPER 6).

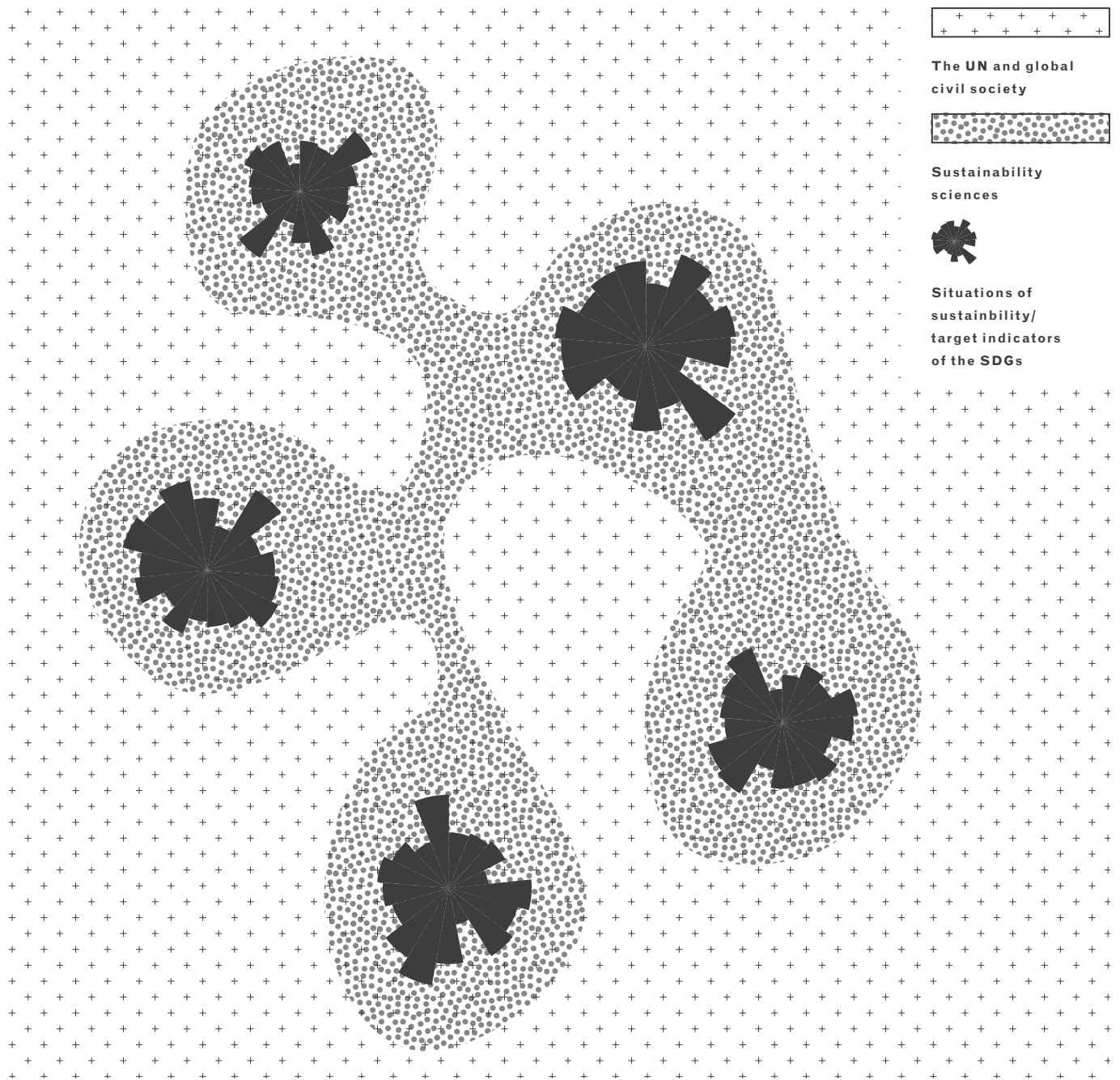
17 as “multiplicities”/“manifolds” (Deleuze and Guattari 1992, 18, own translation): “Mannigfaltigkeiten werden durch das Außen definiert: durch die abstrakte Linie, die Flucht- oder Deterritorialisierungslinie, mit deren Verlauf sie sich verändern, indem sie sich mit anderen verbinden” (ibid., 19).

history of sustainability thinking, again, represent a sub-corpus characterized by discursive messiness, since the emerging sustainability sciences themselves form part of complex dynamic sustainability situations, being evaluative of and reflexive to them (Satanarachchi and Mino 2014). According to Deleuze and Guattari, sustainability sciences would not be “an image of the world. [Rather, they] form [...] a rhizome with the world” (Deleuze and Guattari 1992, 22, own translation). “[...] Unlike the copy, the rhizome refers to a map that must be produced and constructed, which can always be disassembled, connected, reversed and modified, which has many alignment lines, entrances and exits” (ibid., 36, own translation). So, how can sustainability sciences be delineated for the construction and analysis of a corpus? The goal, and the next step in the corpus construction, is to identify exemplary models of sustainability sciences that allow the selection of the corpus material. In the attempt to describe and model sustainability sciences, it is noticeable that the observation of complex dynamics is not practiced, and not practicable in a one-dimensional scientific way (Popa et al. 2015; Kovacic 2017), or models are lacking, and *one* – (scientific-philosophical) observation level, into which the research project for the construction of a corpus might be incorporated, cannot fulfill its function accordingly (Satanarachchi and Mino 2014) – quite apart from the fact that “a rhizome can not be assigned to a structural or generative model” (Deleuze and Guattari 1992, 23, own translation). Therefore, Satanarachchi and Mino outlined six dimensions that allow the description of multiple different temporal and spatial sustainability situations that generate the dynamics of TSR: 1. knowledge; 2. worldview; 3. resource limitation and availability; 4. well-being views; 5. policies; rules, regulations, and governing practices; and 6. new creations, innovations, and artifacts (Satanarachchi and Mino 2014, 5f.).

A further differentiation of dimensions is provided by the SDGs, as an important document of the sustainability discourse. The resolution of the SDGs is “directed by the United Nations through a deliberative process involving its 193 Member States, as well as global civil society, in order to provide a diversity of perspectives and experience” (Schmieg et al. 2018, 787). Our transdisciplinary team constructed search strings based on each of the SDGs, and thus identified the 150 most cited papers per goal, in order to bring the multidimensionality and complexity of sustainability sciences into the corpus.

For example, we create the search string “TITLE-ABS-KEY *sustainab\** AND (*poverty* OR *vulnerab\**) AND (*protect\** OR *equal\** OR *rights* OR *access\** OR *owner\** OR *property*) AND (*climat\** OR *shock\** OR *disaster\** OR *event\**) AND (*develop\** OR *poli\** OR *strateg\**) AND *eradicat\** AND DOCTYPE (*ar*)” from the SDG 1 *No Poverty* and its targets. By generating search strings, from each of the 17 SDGs, a seventeen-dimensional corpus will be created to narrow the current discourse on sustainability, and thus focus on certain publication formats. The targets of the respective dimensions, thus, represent the limiting factors for the discourse.

FIGURE 2. A snapshot of sustainability sciences (own representation).



In an attempt to differentiate sustainability sciences, as well as the discourse of sustainability, and to make them workable in a corpus, this approach goes beyond the *pillars of sustainability* – that is, ecologic, social and economic – as written in the final report of the German Enquete-Commission *Schutz des Menschen und der Umwelt*, for example (Enquete Commission of the 13th German Bundestag 1997; BOOK CHAPTER 3)<sup>18</sup>. The approach also differs, in terms of content, to the discourses of strong or weak sustainability (Ziegler and Ott 2014; Williams and Millington 2004). Weak sustainability assumes few,

18 In addition, the cultural, institutional or political are to be mentioned as prominent (Michelsen and AdomBent 2014).

isolatable sustainability pillars or dimensions, as well as their interchangeability, whereas in the concept of strong sustainability, nature as an ecological basis for the living is not considered substitutable. The discourse on strong sustainability identifies planetary boundaries (Rockström et al. 2009), within which all human endeavor and striving, the mode of economic activity, has to happen (Ekins 2014). On the other hand, drawing boundaries around or along the **SDGs** (FIGURE 2) allows the identification and understanding of boundaries in sustainability thinking from a complexity approach.

### **3.3. Discourse studies foci in the articles of the PhD project**

A discourse studies focus runs through the publication projects of the PhD project. However, its methodical implementation is reflected in different forms in the publication projects: first, in the meta-analytical review of discourse-analytical work and, second, in self-conducted discourse analyses (see TABLE 3).

TABLE 3. Articles with their methodological framings.

Article	Methods	Material/data/corpus/discourse
BOOK CHAPTER 1	<ul style="list-style-type: none"> <li>• Meta-analytical review of discourse-analytical publications</li> <li>• Self-conducted discourse analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Discourse-analytical publications on sustainability</li> <li>• German language texts on social sustainability in the period between the years 2003 and 2013</li> </ul>
PAPER 2	<ul style="list-style-type: none"> <li>• Comparison of documents</li> <li>• Discourse is defined by the modeling ability of its normativity</li> </ul>	<ul style="list-style-type: none"> <li>• English-speaking documents of the sustainability discourse: <ul style="list-style-type: none"> <li>• Laudato Si'</li> <li>• Sustainable Development Goals (SDGs)</li> <li>• Paris Agreement</li> </ul> </li> </ul>
BOOK CHAPTER 3	Meta-analytical review of discourse-analytical work	<ul style="list-style-type: none"> <li>• Sustainability sciences as influenced by discourses on sustainability such as the hegemonic discourse of SD</li> <li>• Material/data/corpus used by the referenced analyses: Hajer 1995, Höhler and Luks 2004, Brown 2016, Vanhulst and Zaccai 2016, Albán and Rosero 2016, Castree 2002, Dingler 2003</li> </ul>
PAPER 4	Computer-assisted discourse studies	English-language contributions published in the journal <i>GAiA</i> up to and including the year 2017
PAPER 5	Discourse analysis of PAPER 4 as a starting point for an interdisciplinary, generative, philosophical dialogue	TSR as a discourse
PAPER 6	Meta-analytical review of discourse-analytical work from an intercultural perspective	Discourse-analytical publications on the terms and meanings of sustainability and SD in German, English and Spanish

# 4.

## 4. Results

The outcomes of the publication projects in the PhD project, listed in the table 4, are interrelated and this results in the following narrative:

Discourse analyses of sustainability and SD constitute a starting point, that bundle in the description of a hegemonic discourse of SD (BOOK CHAPTERS 1, 3; PAPER 2, 6), as well as discursive movements outside the hegemonic discourse (BOOK CHAPTERS 1, 3; PAPER 6) (Hajer 1995; Höhler and Luks 2004; Albán and Rosero 2016; Brown 2016; Vanhulst and Zaccai 2016).

The hegemonic discourse of SD is characterized by neoliberal aims and ways of organizing (environmental) policies towards profit maximization of market enterprises “that [...] presuppose the existing capitalist system” (Sze et al. 2018, 7). Furthermore, within the hegemonic discourse, SD equals the justice theory of equal opportunities, namely, having the chance of private asset protection, or state resource security, and its intergenerational transfer. Nature and ecology are conceptualized as economically manageable and controllable environments, divided into scarce resources. In turn, the hegemonic discourse of SD acts as motivation for the self-conducted discourse analysis as part of this PhD project (PAPER 4). In this, the focus lies on TSR, which is influenced by the overarching discourses on sustainability and SD. In turn, the focus of the analysis of influences of discourses on sustainability and SD on TSR, lies on the term *problem* (PAPER 4, 5). The results, obtained from a collocation and concordance analysis (PAPER 4), are summarized in this chapter.

Including the topic of sustainability sciences within a discursive analysis (see CHAPTER 3) results in a specific problematic, which I have differentiated (BOOK CHAPTER 3; PAPER 4) and made usable for TSR (PAPER 5) by an *epistemology of the problematic* (BOOK CHAPTER 3; PAPER 5). This epistemological attitude is formulated interdisciplinary, together with a perspective from design research (PAPER 5), as a transformative epistemology of *problematic designing* for TSR. The dimensions of transformations and their qualities of change are discussed, related to those of the SD discourse (SUB-CHAPTER 5.2.; BOOK CHAPTER 3; PAPER 2, 5).

Table 4 summarizes the outcomes of the respective PhD publication projects, based on the analyzed discourse strands:



TABLE 4. Articles and their respective outcomes.

Article number	Analyzed discourse strands
BOOK CHAPTER 1	<ul style="list-style-type: none"> <li>• Economic hegemony within modernity</li> <li>• Exploring alternatives</li> <li>• Implications for sustainability sciences</li> </ul>
PAPER 2	<p>Structure of SD</p> <ul style="list-style-type: none"> <li>• Macro-level: transnational institutions, humanity, mother earth</li> <li>• Meso-level: nations, societies</li> <li>• Micro-level: subnational organizations, individuals</li> </ul> <p>Dynamics of change</p> <ul style="list-style-type: none"> <li>• Acceleration and centralization: macro-level → meso-level</li> <li>• Deceleration and decentralization: micro-level → meso-level, macro-level → micro-level</li> </ul> <p>Norms in the discourse of SD: ethical norms, techno-scientific norms</p>
BOOK CHAPTER 3	<ul style="list-style-type: none"> <li>• Hegemonic discourse of SD</li> <li>• Exemplary conceptions of problems in sustainability sciences <ul style="list-style-type: none"> <li>• Controversial problem contents as justification moments for sustainability sciences</li> <li>• The concept of <i>challenge</i></li> </ul> </li> <li>• The problematic in TSR</li> <li>• Methodological problematic</li> </ul>
PAPER 4	<ul style="list-style-type: none"> <li>• The term “problem” in TSR is determined by the term “solution”</li> <li>• TSR focuses on problem-solving by analyzing its own research processes</li> </ul>
PAPER 5	Transformative epistemology of problematic designing for TSR
PAPER 6	<ul style="list-style-type: none"> <li>• “Latin American environmental thinking” (Vanhulst et al., 2008, own translation)</li> <li>• Struggle for the cultural autonomy of indigenous groups</li> </ul>

Following on from the narrative, which links the PhD articles, the results of the PhD project are explained along the different epistemic forms of TSR. System knowledge is of the greatest importance in a PhD project, as it is a qualification for obtaining an academic title.

#### 4.1. Target knowledge

From a sustainability ethical perspective, the following results can be derived from my work:

First, this research's sustainability ethical premise is as follows: sustainability demands the opening of enabling social spaces, in which people can and want to decide generatively and creatively on forms of living together. This local interpretable explanation of sustainability is framed by inter- and intragenerationality in terms of justice theory (Sievers-Glotzbach and Tschersich 2019).

Second, book chapter 3 points out that sustainability "calls for an ethical research practice, protected against neo-liberal re-enclosure (Meckesheimer 2013; Strong et al. 2016) to enable td researchers to make decisions without competitive pressure [...] as a standard" (Meyer 2020a, 82).

"TD sustainability research must distinguish itself from a concept of science that evaluates the progress of knowledge, as well as researchers on the basis of an impact factor (Schmidt 2011) and that always excludes other forms of research (Meckesheimer 2013), as well as unpredictable insights – which, however, are relevant to sustainability research and, thus, to sustainability." (Meyer 2020a, 82).<sup>19</sup>

#### 4.2. System knowledge

The discourse-analytical part of the PhD project falls under system knowledge. The following results are found:

According to the initial thesis, the term *problem* is not connected to epistemological nor ethical questions. Rather, the epistemological peculiarity of normativity seems to be addressed only by the naming of the goal of solving a problem, connected with appealing to urgent, immediate, collective sustainability action (BOOK CHAPTER 3; PAPER 5). Problem-solving is a declared research goal that TSR should achieve (PAPER 4). Methodologically, this is reflected in the following question: How can we bring about an efficient solution by pooling all forces and integrating knowledge stocks? Problem-solving is, thus, implicitly conceptualized as knowledge. There is an objectified conceptualization of societal problems through their – and the researchers – placement and integration in the context of research process steps (PAPER 4). This problem-solving discourse conceptualizes the future as research process steps. The structure *problem – solution* determines the directionality of change.

That is structurally insufficient for social-ecological transformations. In addition, consequences of this problem-solving framing include a tendency towards de-problematizing and veiling conflicts over sustainability. It carries the danger of implicit problem-content restrictions, which, again, also limits knowledge about, and thus the futures of sustainability. No time is taken for participation, either in research or in politics, and reactions to political needs are taken up as acceptance and formalized research by a techno-scientific elite in the sense of a fitting into technical, market-orientation, picked up by politics in a crisis managerial mode (Swyngedouw and Ernstson 2018), believing in efficiency. So, this kind of problem-solving framing inscribes itself into the hegemonic discourse of SD, which proves to be ethically unsustainable (Rose and Cachelin 2018). Furthermore, my research shows that the hegemonic discourse of SD has constituted the concept of (societal) *challenge* (BOOK CHAPTER 3). Besides the analysis of problems, further system knowledge results of the PhD project highlight, in paper 2, three levels as the basic structure of norms and their dynamics in the discourse of SD. These analysis results are taken up again in the discussion (CHAPTER 5.2.).

In addition to the discourse-analytical approach, this PhD project transfers a historical conceptualization of epistemology, and its epistemological approach to *the problematic*, to TSR. The concept of *the problematic* becomes an intellectual bridge in my PhD project. It allows me to borrow from the evolution of epistemological debates in the European philosophy of science for TSR. The concept was invented in the French-speaking philosophy of the 20th century. The collective and interdisciplinary reading and a corresponding workshop with media scientists and philosophers in CCP gave me selected access to the concept, so I know individual authors and constituent texts. I used the following texts in my PhD project: Bachelard 2012, Barnett 2015, Bowden and Kelly 2018, Defert and Ewald 2005, Deleuze and Guattari 1992, Fichant 1975, Foucault 1978, Harrasser and Solhdju 2016, Maniglier 2012, Savransky 2016, Scott 2014, Simondon 2007, Simondon 2017, Stengers 2005, Stengers 2010, Tiles 2012, Voss 2018, Welch 2011, Wulz 2014. The results are presented as speculative impacts on TSR.

An epistemology of *the problematic* sees knowledge in the tension between the conditions of knowledge generation and its research results (PAPER 5). It breaks with epistemological, basic assumptions, “ideologies” (Nicolescu 2010), of modern science, as with a specific separation of subjects and objects and their functions in knowledge processes, (Fichant 1975; Maniglier 2012; Vilsmaier et al. 2017), and thus “enables the development of an epistemology of complexity” (Welch 2011, 17; BOOK CHAPTER 3; PAPER 5). The specific separation, as an ideological assumption, could be questioned by knowledge, inter alia, from biology and psychology, by developing other theories (Scott 2014). Simondon assumes a “principle of individuation” (ibid., 5) as a condition for an “operation of individuation” (ibid.), and thus, the emergence of the individual. He does not focus on a deterministic, romantic genesis of an individual, for example, but on the principle and the operation that can produce

individuals. Individuation, and not the individual, is the starting point of knowledge. We “know the individual *through* individuation rather than [...] individuation starting from the individual” (Simondon in Scott 2014, 5). Correspondingly, “[b]ecoming is not the becoming of individuated being but the becoming of the individuation of being” (ibid., 6). The becoming of the individuation of being “occurs in the form of a putting into question of being, in other words, in the form of the element of an open problematic” (ibid.), and is “proceeding via crises, and as such its sense is in its center, not at its origin or end” (ibid.). The discovery of dimensions, as a condition that can bring about knowledge, is regarded as an epistemological starting point: not a subject and its conceptualization of the world, but a principle and its operation are at the center. Looking back a bit further in history, Bachelard’s epistemological conceptualization of *the problematic* replaces the view of an objectively given problem with a post-modern subject-object mediated view. In contrast to a solution, *the problematic* offers the insight of always being part of the problem (Rose and Cachelin 2018; BOOK CHAPTER 3; PAPER 5) and for TSR to reflect on its own conditions (Popa et al. 2015; Hummel et al. 2017) as those of problem-solving thinking (BOOK CHAPTER 3; PAPER 4, 5). As result, problematic research can conceptualize concepts such as complex or transdisciplinary, where TSR would not face problems, but is within the problems.

*The problematic* sets *possibility* as a key epistemological term (Stengers 2005; Maniglier 2012). This, related to TSR, would have discursive consequences, compared to the epistemological key-concept of problem-solving: *possibility* can give the organization of decisions and reasoned decision-making within dilemmatic and living situations moral importance. This can free from an epistemological and moral compulsion to see sustaining structures as a goal, be it problem-solving as epistemological compass, or that of a cost-benefit or price valuation as moral compass. So, the scientific-ethical and political, as transformative impacts of thinking in problematic terms, consists of a variety of movement possibilities and directionalities, which also includes being able to change unsustainable, hegemonic structures, and the possibility of creating different dynamics of change, as “options for solutions” (Neuhauser 2018, 32), being elementary for TSR (SUB-CHAPTER 5.2.; PAPER 5).

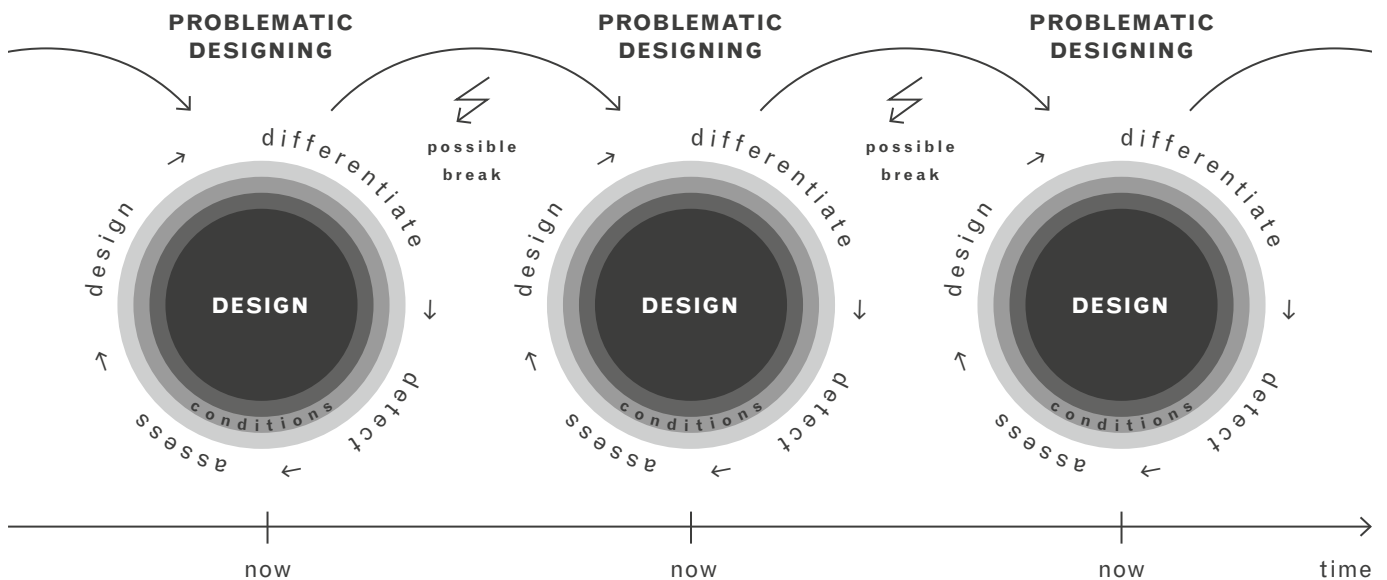
Through complex relationships in TR different epistemologies are brought into play. An epistemology of *the problematic* makes them into distinguished epistemological qualities: movements as open problematics between conceptualizations of science and understandings of the world – from the transformation in the conceptualizations of science to decolonial epistemic disobedience (Mignolo 2011)

### 4.3. Transformational knowledge

Under transformational knowledge falls, in this PhD project, the addressing of the question of how can TSR be epistemologically grasped in its transformative potential, and thus, strengthened?

To address this question, I was engaged in an interdisciplinary dialogue that built on the conceptualization of epistemology, described under system knowledge, with Daniela Peukert, who is a design researcher, having worked in a sustainability research project<sup>20</sup>. As a result, we have been developing what we call, the transformative epistemology of problematic designing (PAPER 5). This perspective – of problematic designing – starts with the idea that designs<sup>21</sup> are embedded in different environmental conditions<sup>22</sup>:

FIGURE 3. Transformative epistemology of problematic designing (Meyer and Peukert 2020, 351).



<sup>20</sup> *Leverage Points for Sustainability Transformation*

<sup>21</sup> "Designing is constituted by a nexus of conceptual thinking and creative making, and so designs are drafts themselves" (Meyer and Peukert 2020, 346).

<sup>22</sup> Environmental conditions also includes epistemic conditions.

*The problematic* is the differentiation between the design, in the sense of a designed draft<sup>23</sup>, and the conditions that generate it and that in turn can be generated by the designed draft. The transformative factor inherent in problematic designing, its differentiation momentum, can be conceptualized by four analytical steps, for the sake of comprehensibility: differentiate, detect, assess, design. The little flashes in figure 3 describe one dimension of transformation, namely an epistemological break. Instead of a one-dimensional solution-oriented directionality to eliminate problems that have been identified in the past, a variety of dimensions of transformation are inherent in a design. They may vary between adaptations to epistemic conditions and epistemological breaks. These breaks extend the horizon of a description of knowledge generation to a change in the generation of knowledge itself (meaning the way knowledge is conceptualized), like designs that can grow beyond the condition of their production (PAPER 5).

TSR is conceptualized as changing through its research. By opening up these many possible dimensions of transformation, the epistemological approach of problematic designing is oriented towards complexity, with its simultaneities and multiple levels, towards a change that changes change. This visual mental framing understands sustainability in its temporal (intergenerational) and spatial (intragenerational) dimensions, for research into a planet under conditions of climate change. Also on a micro- and research-process level, problematic designing allows for the dynamics of a research process – that is to say, different speeds, directions, intensities and qualities of changes – “through an iterative and adaptive process in which theoretical refinement and practical experimentation are connected” (Popa et al. 2015, 3; PAPER 5).

23 For more about the concept of the drafts, see Peukert and Vilsmaier 2019.

# 5.

## 5. Discussion: in search of transdisciplinarity

Again, this PhD project analyzes on both problems that are used in and for TSR and a conceptualization of epistemology, associated with the concept of *the problematic*. The results are presented in chapter 4, in relation to TSR and its knowledge forms. In this chapter (5), first, the results of the conceptualizations of the term *problem* in TSR are discussed, against the background of the genesis of sustainability sciences (5.1.). The subsequent sub-chapter (5.2.) is dedicated to the question of dimensions of transformations and their qualities of change. Here, the PhD project strives to find an answer to its overall question in referring to system, target, and transformational knowledges, as well as to its methodology: The third sub-chapter (5.3.) illuminates methodological directions for TSR resulting from the PhD project.

### 5.1. The term problem in TSR against the background of the genesis of sustainability sciences

The results of the critical discourse analysis, focusing on the conceptualizations of the term *problem* in English-speaking GAIA articles published up to and including the year 2017, show that the term *problem* mainly derives its meaning from being integrated in research process analyses, oriented towards societal and scale-related problem-solving.

This problem-solving orientation may be related to historical dynamics in the constitution of SD. The first UN conference on the human environment in Stockholm in 1972, as a reference point in sustainability sciences, showed that what are regarded as environment-related societal problems were in conflict between measures to limit industrial pollution and the catch-up of prosperity and medical and educational concerns (UNCHE 1972; Michelsen and Adomßent 2014, 8). The contradictions resulted in a compromise, which flows into the thesis of the hegemonic discourse of SD, in which SD is conceptualized as a market-based societal challenge, and in which the contradictions dissolve (Hopwood et al. 2005; Sneddorn et al. 2006; Vanhulst and Beling 2014; BOOK CHAPTERS 1, 3; PAPER 6). The problems that led to the conceptualizations of SD were negotiated at the conference held in Stockholm in 1972. The expectations of the conference resulted in a solution, under the overarching goal of the governability of states, which in turn depends on their economies, and thus on people's trust in their governments.

According to many analyses, similar dynamics can be found in TSR. Here, a problem and solution orientation, and their integration into research process steps in order to create societal outcomes can be highlighted (PAPER 4). Problems, thus, have an agenda setting function, both in collective sustainability policy and sustainability scientific efforts for internationality and inter- and transdisciplinarity.

Inherent in problem-solving is the processiveness, which in turn is the basis for certain decision-making policies, such as in democracy. However, in order to be able to pursue the projects of internationality and inter- and transdisciplinarity, the differentiation of problems – such as planetary boundaries (Rockström et al. 2009) in view of future uncertainties to be speculated, or the term dilemma (BOOK CHAPTER 3), or causes of problems (Wiek and Lang 2016; Abson et al. 2017; PAPER 4) – are not yet prominently articulated in the discourse.

Communication about problems adheres to the norm of solution for historical and strategic reasons, rather than opening up for epistemological or ethical questions in international and interdisciplinary sustainability policy and science projects. Questions in this direction would be, for example, how to deal with manifold and conflicting epistemologies or moral norms, or which ethical legitimacy is accepted and how (Kovacic 2017; BOOK CHAPTER 3; PAPER 4, 5)?

## **5.2. Dimensions of transformations and their qualities of change**

The PhD project is focused on the question of the modes and potentials of sustainability sciences for social-ecological transformations. The specific sustainability sciences question about change (social-ecological transformations) is addressed in two ways in this PhD project: first, in a speculative-transformative fashion within the proposal for a transformative epistemology of problematic designing for TSR (PAPER 5; SEE SUB-CHAPTER 4.3.). But secondly, this was developed in the face of the hegemonic discourse of SD (BOOK CHAPTERS 1, 3; PAPER 6) and the analyzed dynamics of change in the SD discourse on the basis of the three documents – the Paris Agreement, the Sustainable Development Goals, and the Papal Encyclical Laudatory Sí (PAPER 2) – and the term problem in TSR (BOOK CHAPTER 3; PAPER 4, 5). Similar to the problem-solving structure and in its genesis (BOOK CHAPTER 3; PAPER 4, 5) and to the hegemonic constitution of SD (BOOK CHAPTERS 1, 3; PAPER 6), the (threefold) structure of the SD discourse and the significance of its levels (PAPER 2) determine its transformative potential. In the SD discourse this is shown at the meso level (BOOK CHAPTER 3; PAPER 2).

The speculative approach to problematic designing proposes drafts as norms or norm catalysts, and these are never to be thought of outside their environment or as not being in constant alignment with it (PAPER 5). Drafts, as norm elements, are much more dynamic than the analyzed norms and levels in the SD discourse, the hegemonic discourse of SD, or the conceptualization of problems with regards to their solvability. They have an open, but also reflexive direction of movement, combining normative objectives and outcomes within complex relationships. Problematic designing is therefore suitable as an epistemological approach to TSR, oriented towards complexity, which also includes being able to change unsustainable hegemonic structures as path dependencies that control futures. The transformative epistemology of problematic designing allows for “futures” (Raven and Elahi 2015), the possibility for futures (PAPER 5).



The possibility of social-ecological futures appears as a productive and creative force and therefore a useful motivation in and for TSR.

The institute for social-ecological research created the knowledge of “second order problems” (Becker and Jahn 2006, 58) that describe solutions to environmental problems that cause undesirable, other problems<sup>24</sup>. The findings of problematic designing may describe second-order transformations and introduce them into sustainability discourses as a working basis: changes that cause change allow for multiple or manifold directions of change (Görg et al. 2017; Sievers-Glotzbach and Tschersich 2019) to be thought or modeled.

Both the discourse analysis in sustainability sciences and the epistemological design developed on this basis reveal the range of modes and potentials of sustainability sciences.

The transformational approach of this PhD project has been trying to rethink sustainability sciences in their transformative research modes, as TSR, for and in a world undergoing forced, violent and complex transformations under the planetary condition of climate change. The transformative potential of sustainability sciences lies in TR modes, if they help in changing situations to open and enable social spaces in which people can and want to decide creatively on forms of living together, under the condition of becoming ethically moved by social-ecological or intra- and inter-generational justice. This also means politically re-economizing the question of the relationship between individuals and collectives with regard to non-violent ways of living together and not subjecting it to the unconditional preservation of a market structure (BOOK CHAPTER 1, 3; PAPER 6). That means “situational, contextualised decision-making and responsiveness, “local values, traits, beliefs, and arts for action” (Fals Borda 1995), entrepreneurial creativity, and humor, as Martin Savransky wrote (Savransky 2018), attitude and ethics (Meckesheimer 2013), as well as an (algorithmic) learning, which recognizes temporally and spatially related, multiple different sustainability contexts and continues the resulting decisions as limiting moments, instead of universal, methodical programs (Harrasser and Solhdju 2016)” (Meyer 2020a, 81).

This is helped by theories and practices, such as Stenger’s ecology of practices, Haraway’s speculative fabulation (Haraway 2013), poly-centric, different local markets with different values, multi-currencies, “critical sustainabilities” (Rose and Cachelin 2018, 521) and decolonial de-linking (Mignolo 2017) (PAPER 5, 6).

The conceptualization and legitimation of science may not do justice to the dynamics that emanate from TSR if it is based on non-variable parameters, instruments, and models, and thus, on researcher-independent objectivity. TD functions as a platform, which is able to move between different degrees of institutionalization and thereby influences the institutionalization itself. For example, in local research projects between bottom-up and top-down, and in international research projects between different state organizations. Thus, structural insights from transdisci-

24 This raises questions of how, and what does change mean for problem-solving? Is it the problems that have to be changed or the solutions that promote change towards sustainability?

plinary (sustainability) research can be used for sustainability policy efforts. Moreover, consumption through economic interpretations of sustainability and sustainability sciences, as described in the hegemonic discourse of SD, would counteract the goal orientation of TSR (Becker and Jahn 2006; Thompson Klein 2014; Rose and Cachelin 2018; BOOK CHAPTER 3)<sup>25</sup>.

Becker and Jahn write “Sustainable development can therefore not be thought and designed one-dimensionally economically because it is a multi-dimensional concept that encompasses ecological, economic, political and social development dimensions” (Becker and Jahn 2006, 59, own translation).

### 5.3. Methodical lines

Building on the question of dimensions of transformations and their qualities of change and their potential for social-ecological futures, starting from TSR, the question arises of effective methods for and in TSR through which TSR claims to make change its basis. Which methods could arise concretely from the transformative epistemology of problematic designing? Celya Lury reminds us of Simondon seeing “methodology as an operation, that is itself constituted as it happens” (Lury 2020). Nevertheless, I show some directions at this point.

Problematic designing aims at a multi-dimensional methodology. In creating it, the following questions may help: how can we include the conditions of our research into the research itself? How can we recognize and discover dimensions in our own research? Engbers has worked out some dimensions of cultural differences in TSR: culture as a research topic, the cultural backgrounds of the participants, culture as a way of cooperating, socio-cultural contexts, interculturality, and knowledge cultures (Engbers 2020). Van Breda and Swilling write in this regard, “[i]t is better to use a research approach that ‘absorbs complexity’ (i.e., make it work for you), rather than reducing it when working in complex, real-world contexts” (Van Breda and Swilling 2019).

The originally feminist methodological approach of intersectionality linked to sustainability dimensions, as they were worked out in the framework of the SDGs, for example, are a promising start, I want to go for. Besides, narrative (Engbers and Meyer 2018), photographic (Brandner 2020) or design methods help to recognize problematics and their dimensions. Here I refer to the work of my colleagues at the methodology center and formerly chair for transdisciplinary methods at Leuphana University Lüneburg.

25 “Sustainable development can therefore not be thought and designed one-dimensionally economically because it is a multi-dimensional concept that encompasses ecological, economic, political and social development dimensions” (Becker and Jahn 2006, 59, own translation).

# 6.

## 6. Critical evaluation of the PhD project

This chapter outlines limitations that lie within the methodology. Nevertheless, the limitation of the content must not be omitted at this point: as a matter of philosophy, I took up explicitly in my PhD project a selection of authors who have been thinking *the problematic*. This selection could be extended, by including other thinkers.

I will now proceed with the methodological criticism concerning corpus construction in sustainability sciences. “Linguistics [...] has always made only copies [...] of the language, with all the adulterations that go with it” (Deleuze and Guattari 1992, 25, own translation). The endeavor of the discourse-analytical perspectives is to contribute to sustainability ethics and their political enforcement supplying arguments that are also based on quantitative methods and their possibility of graphical representability giving connection to different receptors – scientific communities, people on Earth, computers or political bodies. Nevertheless, the critical question arises here: How does my own choice of method influence the research and strengthen certain technocratic rational privileged, dominant tendencies in the sciences that reproduce and convey power relations<sup>26</sup>? As Rohe published in the journal GAIA: “More and more, it becomes clear that the quantitative performance of science does not behave neutrally with respect to the nature and circumstances of scientific production, but intervenes deeply in it” (Rohe 2015, 158, own translation). How exploring, reconstructing and questioning the strategy of efficient solution orientation in sustainability sciences via computational, corpus-linguistical thinking as “thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent” (Wing 2006 in Laubichler et al. 2013, 120)? Quantification of both scientific quality and the quality of ways of living together in general, which is then reflected, for example, in science policy decisions or in certain methodologies (with reference to computational analysis), is in line with the hegemonic discourse of SD. Ziegler and Ott have highlighted criteria for sustainability sciences from an ethical perspective. As a key criterion or “dogma of sustainability science” (Ziegler and Ott 2014, 52), they name the “inclusion of nonscientists” and analyze the arguments in favor of this (ibid., 50). One of the arguments is that in order to be able to recognize paradigmatic, dominant perspectives within sustainability sciences or sciences in general, an external perspective is also needed, to modify unsustainable developmental structures. Another argument for incorporating non-academic perspectives into sustainability sciences is that the people most affected by environmental phenomena are more likely to work on them, although they cannot be expected to be scientists<sup>27</sup>. Sustainability-related knowledges are also generated by social media such

26 The same question applies to my choice to introduce and work with the knowledge forms of TSR, which build on modern separability notions but enable communication within and about TSR. (see p. 19).

27 See local communities and indigenous peoples' organizations.

as blogs or by networks, where people physically meet to influence policy-making or scientific knowledge processes, or both (for example, De-growth, Fridays for Futures movements). Of course, civil society political and epistemic participation can also be institutionalized in NGOs or non-university research institutions, of which there are many, especially in the field of ecopolitics, supplemented by foundations and social enterprises. Then, the following premises arise for the methodology of TSR:

- Knowledges must also be sought beyond standardized journals or documents read in the sustainability sciences and politics communities.
- Knowledges are therefore also in the qualities of the relations between the scientific and the broader social, and this is exactly where research relevance lies.

The explicated intercultural and historical dimensions of the discourse-analytical methodology of the PhD project (see CHAPTER 3; PAPER 6) try to approach these premises<sup>28</sup>.

The task of corpus construction has been methodologically elementary, as it helps to conceptualize sustainability sciences in its transformative qualities. Based on the methodological critique, suggestions for further research will follow.

<sup>28</sup> Through the search strategy starting from the SDGs, as well as through the historic corpus part, various knowledge resources are included in the corpus project of the history of sustainability thinking in the sciences, as a feature of TR (environmental politics, reports, resolutions, programs, magazines and other outreach materials of non-, inter- and governmental institutions such as the UN, NATO, the OECD, UNESCO, specific commissions and panels, think tanks, and the Vatican), plus relevant science policy developments from before the 1980s that provide information on the meaningful preforms of sustainability sciences.

# 7.

## 7. Further research demand

First, a qualitative and transdisciplinary complementation is proposed, according to the methodological criticism in chapter 6, concerning corpus construction in sustainability sciences: asking how it is possible to conceptualize a method design for discourse-analytical research in and on sustainability sciences and their TR, with the claim of a plurality of knowledge-generating processes that can condense artistic or political-activist performances and forms of political participation. An answer to this question must include transdisciplinary ways of assessing academic performance<sup>29</sup>, including qualification work, to expand the criteria for measuring scientific progress and thus the potential of academic career paths.

In addition to qualitative and TR perspectives on sustainability sciences, their corpus construction is expandable and updatable where journals are concerned.

Furthermore, the results can be linked to conceptualizations of learning, teaching research, curricula, and higher education development, and their relation to TSR again can be differentiated<sup>30</sup>.

The transfer of philosophers into TSR discussed in the PhD project, including their transformative and intercultural aspirations, should additionally be worked out historically and interculturality<sup>31</sup>.

The economic anthropologist Alf Homborg introduced his keynote lecture at the International Degrowth Conference in Malmö in 2018 with the question of the problem: What is the problem? Capitalism, growth, modernity, money? To say then: We cannot see the problem without alternative solutions. Depending on whether we conceptualize capitalism, growth, modernity, or money as mindset, value system, moral compass, hegemonic discourse, big story, paradigm, ideology, or world-making (including material worlds) and worldviews (symbols, stories), we implicitly assume different dimensions of transformations and their qualities of change because these different concepts emerged from the different qualities and dynamics of change. That, in turn, has consequences on how we can approach the alternatives, as social-ecological transformations or “critical sustainabilities” (Rose and Cachelin 2018).

The interweaving of the conceptualizations of problems in sustainability sciences with economics and the planet’s economic conditioning is a further research topic to focus on in more detail.

In order to be able to analyze what the potentials of TSR could be for sustainability transformations of societies, the meanings and accesses to social and societal problems in TSR will have to continue to be (discursively) analyzed.

Further research potential lies in the dimensions of transformations and their qualities of change in sustainability-related discourses.

29 “To do justice to this joint process aimed at societal impact, evaluation can only be a joint effort too. Such evaluation is aimed in the first place at improving the collaborative understanding of the joint process and secondly at the progress towards the common societal goal” (Van Drooge and Spaapen 2017).

30 Approaches to be found in Fam et al. 2019 or Vilsmaier and Meyer 2019.

31 “An-other history” (Mignolo 2011, 51), “ways of life and cosmologies, beyond the European, should be explored against the background of European perspectives and theories on the concept of the problematic” (Vanhulst and Beling 2014)” (Meyer 2020a, 84), and against a sustainable – “non-capitalist and imperial/colonial future” Mignolo 2011, 51.

# 8.

## 8. Conclusion

This framework paper draws links between the six articles of the PhD project. The articles are numerically abbreviated and attached with keywords in order to make them recognizable and distinguishable (see TABLE 1). The results of the critical discourse analysis, focusing on the conceptualizations of the term *problem* in English speaking articles of the journal GAIA, show that the term *problem* mainly derives its meaning from the analysis of research processes that are normatively oriented towards societal problem-solving (PAPER 4). This problem-solving orientation of TSR, as a research mode of sustainability sciences, is also supported by other literature (PAPER 4).

Besides the analysis of the problem-solving orientation in and of TSR (PAPER 4), the epistemology of *the problematic* is examined, constituted in twentieth century French philosophy (BOOK CHAPTER 3; PAPER 4, 5). On the one hand – methodologically – this results in the “problematic constitution of the hegemonic discourse of SD” (Meyer 2020a; Harrasser and Solhdju 2016; Acosta and Brand 2018) as a historical, problematizing discourse-analytical approach towards sustainability sciences. On the other hand, *the problematic* is – conceptually, in collaboration with design – , spelled out for TSR (PAPER 5), in order to address the research question of how TSR can be epistemologically grasped in its transformative potential, and thus strengthened. Designing is associated with a creative planning, embodying process, as well as the finished product. Based on this, the epistemological approach of *problematic designing* is developed, which is capable of reaching beyond solution-oriented conceptualizations of problems. Problematic designing is open, as designing is embedded in reflexive movements and constituted by epistemological breaks in a way that allows design results to grow beyond their conditions. “*The problematic* is just as well a force to initiate a transdisciplinary and ethical way of relations between entities, which can unfold according to the hegemonic conditions” (Meyer 2020a, 84). In particular, works on TD make reflexivity (Jahn et al. 2012; Popa et al. 2015) strong and can orient in this conditionality of change in research.

In the results, the PhD project deals with the transformative potential (see CHAPTER 4) and discusses its qualities of change (see CHAPTER 5.2.). These are laid out on three levels: 1. *the SD discourse*; 2. *the transformative epistemology of problematic designing for TSR*; and 3. *discourse studies of, and in, sustainability sciences*. Accordingly, the question that this PhD project addresses is focussing on the modes and potentials of sustainability sciences for social-ecological transformations. The premise of sustainability sciences, and thus of this PhD project, is that social-ecological transformations should be sought. Sustainability sciences can respond to this premise, when they conceptualize themselves as transformative, as changing, as suggested by the transformative epistemology of problematic designing (PAPER 5; see CHAPTERS 4.3., 5.2.). The project of TSR thereby offers the problematic potential for its own transformation: “Through complex actor relationships in transdisciplinary

sustainability research different epistemologies are brought into play. This is why this form of research generates manifold epistemological breaks, simultaneously represents such breaks, and thus extends the horizon of a description of knowledge generation to a change in the generation of knowledge itself” (Meyer and Peukert 2020, 353). The PhD project is primarily intended to contribute to a self-understanding of TSR, and to further communication about it. Therefore, this PhD project proposes further work on the question of how to deal with manifold and conflicting epistemologies and moral norms, as well as which ethical legitimacies are accepted and how (Kovacic 2017; BOOK CHAPTER 3; PAPER 4, 5). The progressive goal is to strengthen the transformative claim that hides behind societal problem-solving. This should not be left to the strategic purpose of research legitimization or agenda setting of (transdisciplinary) research- or policy processes.

Sze writes “[o]ur task is to [...] *situate* sustainability” (Sze et al. 2018, 3). The potential of TSR becomes TSR in its respective situation. Its outcomes are relationships, and their evaluations (currencies) in their current situations, become its modes. Here, communication plays the elementary role. It is the condition for the potential for a “transformation of mentalities” (Guattari 2015, 131).





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## Appendixes



# Ökonomistische Diskurse der Nachhaltigkeit

## Bestimmende Momente und die Frage nach Alternativen

*Esther Meyer, Ulli Vilsmaier*

### *1. Einleitung und Struktur des Beitrags*

„Sustainability“ erreicht den Mainstream in der Forschung.<sup>1</sup>

Mit dieser Artikelüberschrift wird vor einem Jahr in der ‚taz‘, einer der größeren deutschsprachigen Tageszeitungen, eine Dynamik öffentlich benannt, welche es innerhalb der und für die Nachhaltigkeitswissenschaft vertiefter zu analysieren gilt. Für manche vermag das Benennen dieser Dynamik den Anschein erwecken, Nachhaltigkeit und Nachhaltige Entwicklung seien nun in Wissenschaft und Öffentlichkeit angekommen und damit ein weiterer Schritt in Richtung einer Nachhaltigen Entwicklung getan. Andere werden durch solch einen Titel darin bestärkt, dass es notwendig ist, den Wahrheitsgehalt der Aussage zu erforschen: Was bedeutet Nachhaltigkeit oder Nachhaltige Entwicklung in welchen Kontexten?

Der vorliegende Beitrag beleuchtet Nachhaltigkeit, Nachhaltige Entwicklung und Nachhaltigkeitswissenschaft aus diskursanalytischer Perspektive. (Kritische) Diskursanalysen können besonderes Augenmerk auf das Herausbilden dominierender Theorien legen, die die (Re)Produktion von Machtverhältnissen durch Diskurse konstituieren (Clarke 2012, 188).

<sup>1</sup> Ronzheimer 2014.

Dass Nachhaltigkeit sowie Nachhaltige Entwicklung von anderen, übergreifenden und dominierenden gesellschaftlichen Diskursen beeinflusst werden, zeigen diverse diskursanalytische und -theoretische Erkenntnisse. So befinden sich Nachhaltigkeit und Nachhaltige Entwicklung im Spannungsverhältnis zwischen neoklassischer Ökonomik und alternativen ökonomischen Theorien. Auf diesem wiederum bauen Spannungen zwischen Schwacher und Starker Nachhaltigkeit sowie den Leitlinien der Effizienz, Konsistenz und Suffizienz auf, die Gegenstände nachhaltigkeitswissenschaftlicher Studien bilden. Die Positionierung von Nachhaltigkeit oder Nachhaltiger Entwicklung innerhalb dieser Spannungsverhältnisse bestimmt gleichsam normativ-politische Implikationen, die im Hinblick auf gesellschaftlichen Wandel aus nachhaltigen Ansprüchen erwachsen können.

Einige Diskursanalysen beschreiben Thesen eines dominierenden Diskurses um Nachhaltigkeit und Nachhaltige Entwicklung, der zur Lösung sozialer Probleme ökonomische Strategien der Substituierung des Sozialen durch Ökonomisches anstrebt. Damit einher gehe z.B. eine Priorisierung der intergenerationellen Dimension (Generationengerechtigkeit) und eine Marginalisierung der intragenerationellen Perspektive.

Das Erforschen solcher Verdrängungsdynamiken von Diskursen – wie beispielsweise dem Wachstumsdiskurs (Steurer 2002) – sollte auch Bestandteil nachhaltigkeitswissenschaftlicher Arbeit sein, um u.a. diskurstheoretisch zu begründende Ursachen für Nichtnachhaltigkeit zu erkennen. Wir begründen eine diskursanalytische Betrachtung von Konzepten und Theorien zur Nachhaltigkeit also mit der Annahme, dass sich übergeordnete gesellschaftliche Diskursdynamiken auf die Arbeit mit Nachhaltigkeit/Nachhaltiger Entwicklung in Politik, Wirtschaft und eben in der Nachhaltigkeitswissenschaft selbst auswirken. Das hat u. U. zur Folge, dass sich bestimmte Argumente aber auch Kulturen der Nichtnachhaltigkeit durch diese Bereiche hindurch reproduzieren.

Der Beitrag liefert Einblicke in diskursanalytische Erkenntnisse über den Nachhaltigkeitsdiskurs und gibt einen Überblick über Stränge und Thesen, die es vertiefter zu verfolgen gilt.

Aufbauend auf einer Recherche nach Publikationen über Nachhaltigkeitsdiskurse<sup>2</sup>, werden Verschränkungen und Linien aufgegriffen, die von Autor\_innen diskursanalytisch als dominierend herausgearbeitet wurden. Sie werden hier zusammenfassend dargestellt. Den Ausgangspunkt bildete eine eigene Untersuchung (Meyer 2014), in der deutschsprachige Texte über Soziale Nachhaltigkeit im Zeitraum zwischen den Jahren 2003 und 2013 auf marginalisierte Problemwahrnehmungen in Bezug auf Nachhaltigkeit diskursanalytisch untersucht wurden. Die Rezeption nachhaltigkeitswissenschaftlicher Papers sowie Arbeitserfahrung im nachhaltigkeitswissenschaftlichen Feld fließen ergänzend in die Ergebnisdarstellung der Recherche mit ein. Der Fokus liegt auf (Re)formulierungen von Thesen, die Nachhaltigkeit als durch gesellschaftlich übergeordnete ökonomistische Diskurse konstituiert beschreiben.

Der Beitrag ist wie folgt aufgebaut: In Kapitel 2 erfolgt zunächst eine Bestimmung von Nachhaltigkeit, Nachhaltiger Entwicklung und Nachhaltigkeitswissenschaft im Sinne einer Arbeitsdefinition. Im dritten Kapitel werden Momente der Verortung von Nachhaltigkeit und Nachhaltiger Entwicklung innerhalb diskursiver Spannungsverhältnisse bestimmt. Anhand von Begriffen und Konzepten, die Nachhaltigkeitsverständnisse erklären, werden diskursive Verschränkungen skizziert. Mit diesen werden im vierten Kapitel Implikationen für die Nachhaltigkeitswissenschaft und Forschung aufgezeigt.

## *2. Nachhaltigkeit, Nachhaltige Entwicklung und Nachhaltigkeitswissenschaft: Einführung, Geschichte, Bestimmungsmomente*

Nachhaltigkeit adressiert als Konzept gegenwärtige und zukünftige Lebensbedingungen. Die Nachhaltigkeitswissenschaft nimmt diese Lebensbedingungen als ihren Ausgangspunkt. Sie wird derzeit als eine „Arena“ beschrieben, die „von der normativen Idee einer Nachhaltigen Entwick-

<sup>2</sup> Als Suchterm galt folgender: („Sustainability\* AND discourse“). Diskursverständnisse bzw. die verschiedenen diskursanalytischen Ausrichtungen der Publikationen werden hier nicht zum Thema gemacht.

lung geleitet wird und diese als Rahmen für wissenschaftliche Analysen nutzt“ (Michelsen/Adomßent 2014, 42).

Der Begriff der Nachhaltigen Entwicklung hat seinen Ursprung in der Übersetzung von *sustainable development* ins Deutsche anlässlich des Abschlussberichts *Our Common Future* im Jahre 1987. Dieser sogenannte Brundtland-Bericht war das Ergebnis der

„von der UNO als ‚*World Commission on Environment and Development*‘ unter dem Vorsitz der langjährigen norwegischen Ministerpräsidentin Gro Harlem Brundtland mit Sitz in Genf einberufene[n] Kommission. [...] Eine deutsche Übersetzung, herausgegeben von dem früheren Bundesforschungsminister Volker Hauff, erschien im selben Jahr. Die deutsche Übersetzerin, die deutsch-amerikanische Anglistin Barbara von Bechtolsheim, hatte sich dabei ausdrücklich für die Übersetzung von ‚*sustained development*‘ mit ‚nachhaltiger Entwicklung‘ entschieden“ (Klippel/Otto 2008, 56, Hervorhebungen nachträglich hinzugefügt durch EM; s. Höhler/Luks 2004).

Die normative Idee „eines neuen Zielrahmens der Weltgemeinschaft“ (Kleine 2009, 5), die im Brundtland-Bericht beschrieben und mit „Nachhaltiger Entwicklung“ zusammengefasst wird, stammt demnach aus der Politik. Substantiell vermittelt der Brundtland-Bericht die regulative Vorgabe einer weltweiten sozialen und ökologischen Wirtschaftsentwicklung, gerechtfertigt durch die Ermöglichung gleicher Chancen auch für zukünftige Generationen (intergenerationell). Zudem solle die Entwicklung so gestaltet sein, dass gleiche Zugangschancen zu Ressourcen für alle jetzt lebenden Menschen ermöglicht werden (intragenerationell) (Hauff 1987; Dingler 2003, 221ff; Michelsen/Adomßent 2014, 14). In den Reaktionen auf den Bericht zeigt sich der Charakter eines globalen regulativen Appells, was im Besonderen mit der Offenheit und damit Instrumentalisierbarkeit der Begriffe Nachhaltigkeit und Nachhaltige Entwicklung begründet wird.<sup>3</sup> So lässt sich intra- und intergenerationelle Gerechtigkeit je nach politischer Wertvorstellung definieren (Grunwald 2011, 24).

Mit Blick auf die Verständnisse von Nachhaltigkeitswissenschaft publizierte Spangenberg in einem Review die Unterscheidung zwischen

<sup>3</sup> Siehe beispielsweise Verweis auf „Ausgabe des ‚Brundtland-Reportes‘ im ‚Staatsverlag der DDR‘“ im Jahr 1988 (Klippel/Otto 2008, 56).

„more traditional disciplinary-based science for sustainability [mode-1 science] and the transdisciplinary science of sustainability [mode-2]“ (Spangenberg 2011, 275).

Dieser Unterscheidung zufolge trägt Nachhaltigkeitswissenschaft neben einer inhaltlichen Fokussierung auf Nachhaltigkeit durch ihre normative Zielorientierung auch zur weiteren Herausbildung eines alternativen Forschungsmodus bei, bekannt als Mode-2 (Michelsen/Adomßent 2014, 41). Der Begriff der Mode 2-Forschung taucht erstmals 1994 durch Gibbons et al. in *The New Production of Knowledge* in der wissenschaftlichen Literatur auf (Gibbons et al. 1994; Vilsmaier/Lang 2014, 93; Hunecke 2006, 40). Unter die Kategorie der *science of sustainability* (Spangenberg 2011) fällt transdisziplinäre Nachhaltigkeitsforschung, die eine Kritik an wissenschaftlicher Objektivität und Fortschritt (Klein 2014, 69) mit der Zielorientierung an Nachhaltigkeit oder Nachhaltiger Entwicklung zu verbinden vermag.

### 3. Diskursstränge zu Nachhaltigkeit und Nachhaltiger Entwicklung

#### *Ökonomische Hegemonie innerhalb der Moderne*

Diskursanalytische Erkenntnisse zeigen, dass es einen hegemonialen Diskurs zur Nachhaltigen Entwicklung gibt. Charakteristika des hegemonialen Diskurses sind: Kapitalistische Wachstumstheorie bzw. kapitalistische Wohlfahrtstheorie bzw. neoklassische Wachstumstheorie inkl. ihrer methodischen Umsetzung durch die Ökonomik und dem Ziel der Steigerung des Wirtschaftswachstums sowie die Schwache Nachhaltigkeit mit der Annahme einer prinzipiellen Substituierbarkeit verschiedener Nachhaltigkeits-Säulen oder -Dimensionen<sup>4</sup> (Dingler 2003; Tremmel 2003;

<sup>4</sup> Der Endbericht der Enquete-Kommission ‚Schutz des Menschen und der Umwelt‘ schlägt eine Unterteilung in drei Säulen vor: ökologische Säule, ökonomische Säule, soziale Säule. Daneben haben sich Mehr-Säulen-Modelle bzw. Ein-Säulen-Modell entwickelt („von einer Dimension bis zu acht Dimensionen“, Tremmel 2003, 116). Es sind zusätzlich die kulturelle, institutionelle oder politische als prominent zu nennen (Michelsen/Adomßent 2014, 30). Zudem sprechen nicht alle von Säulen, sondern, anstelle dessen von den verschiedenen Dimensionen (ebd., 28ff.; Kleine 2009, 2). Das Konzept der Starken Nachhaltigkeit (s. Ott/Döring 2004) hin-

Steurer 2002). Kommt es zu einer Priorisierung der ökonomischen Dimension, werden die anderen Zieldimensionen nur unter dem Apriori der Wirtschaftsförderlichkeit zum Diskurs zugelassen.

„Der hegemoniale Diskurs der nachhaltigen Entwicklung steht in der diskursiven Tradition der [...] Moderne“ (Dingler 2003, 484), deren gesellschaftliche Entwicklung jedoch in eine Krise, die die Lebensgrundlagen heute und zukünftig lebender Menschen bedroht, geführt haben könnte („These der Nichtnachhaltigkeit der Moderne“, ebd., 493). Diese Verfasstheit von Nachhaltigkeit als spezifisch moderner Begriff<sup>5</sup> mit seinen ökonomischen Einprägungen waren Ausgangspunkte für weitere Analysen.

Das Forschungsprojekt ‚NEDS – Nachhaltige Entwicklung zwischen Durchsatz und Symbolik‘ analysiert den Brundtland-Bericht auf die These einer ‚ökonomischen Konstruktion ökologischer Wirklichkeit‘ hin. Durch die Analyse stellt das Forschungsprojekt sieben kohärente Thesen auf – und differenziert damit die These der Nichtnachhaltigkeit der Moderne aus. Sie legen dar, wie „ökonomische Logik, natur- und technikkwissenschaftliche Erwartungen und juristische, administrative Regelungen ineinander greifen und wesentlich zu einer diskursiven Fassung von Nachhaltigkeit als Managementproblem beigetragen haben“ (Höhler/Luks 2004). Die Autor\_innen sehen Nachhaltige Entwicklung durch eine Verschiebung von Verständnissen und Verständigungen über Natur, Ökologie zu ökonomisch steuer-, manage- und kontrollierbaren Umwelten, aufgeteilt in knappe Ressourcenbestände, bestimmt.<sup>6</sup>

Eine eigene Analyse untersucht aktuelle deutschsprachige Publikationen, die im Zeitraum von 2003 bis 2013 veröffentlicht wurden, „Soziale Nachhaltigkeit“ im Titel tragen und sich dieser konzeptionell annähern und nicht auf einen konkreten Gegenstand beziehen. Auch hier werden

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gegen befindet sich nicht innerhalb des Säulendiskurses. Natur als ökologische Lebensgrundlage wird nicht als substituierbar angesehen.

<sup>5</sup> Als diskursiver Ursprung kann hier die Benennung einer *Ecological Modernization* durch Hajer (1995) gelten. Ebenso ist die Kritik von Eblinghaus/Stickler ‚Nachhaltigkeit und Macht. Zur Kritik von *Sustainable Development*‘ aus dem Jahr 1996 zu nennen.

<sup>6</sup> Andere Autoren erfassen die These der „Nichtnachhaltigkeit der Moderne“ (Dingler 2003) oder die „ökonomische Konstruktion ökologischer Wirklichkeit“ (Höhler/Luks 2004) als Dispositiv (s. Timpf 2000).

eine hegemoniale<sup>7</sup> Durchdringung sowie aktuelle Diskursdynamiken im Hinblick auf alternative Diskurse, Problemwahrnehmungen und Lösungsstrategien erforscht (Meyer 2014). Im Ergebnis befassen sich fünf der elf analysierten Texte zu Sozialer Nachhaltigkeit mit marginalisierten Problemwahrnehmungen in Bezug auf Nachhaltigkeit. Sie empfehlen Wirtschaftsweisen derart zu gestalten, dass sie jenseits einer kapitalistischen Wachstumsökonomie operabel werden: Diese Alternativen liegen vor in den Theorien der Suffizienz, Postwachstum, Subsistenz oder Regionalisierung inkl. einer zu ändernden Art und Weise von ‚Arbeit‘ im Rahmen des Konzepts der Sozialen Ökologie. Diese Konzepte erörtern aus liberaler bzw. moralphilosophischer Position heraus den normativ-substantiellen Gehalt Sozialer Nachhaltigkeit und elaborieren aus diesen die Grundlagen für Theorien, Handlungsnormen, Appelle und Politikoptionen. Es bleibt also zu konstatieren, dass innerhalb der wissenschaftlichen Texte zur konzeptionellen Annäherung an Soziale Nachhaltigkeit alternative Sichtweisen auf die und zur neoklassischen ökonomischen Theorie behandelt werden. Hinsichtlich einer Suche nach Theorien zu Sozialer Nachhaltigkeit bzw. zur Entwicklung von Fragestellungen in der Nachhaltigkeitsforschung kann daran angeknüpft sowie zu einem Theorienpluralismus beigetragen werden, der hegemoniale Diskursordnungen durchbricht.

In einer weiteren Analyse kontrastiert María Evelinda Santiago Jiménez (*Polis – Revista de la Universidad Bolivariana*, 2009) zwei Diskurse zu Nachhaltigkeit, die sich „im Krieg“ (*en guerra*) befinden: Der eine baut auf einer Kultur der Vermarktung und Vermarktbarkeit auf:

„discourse strand of maintaining existing strategies for controlled liberal development under hierarchy of knowledge and power and, now painted in green“ (Jiménez 2009, 359).

Der andere, alternative Diskurs, fokussiert auf die sozialen Produktionsbedingungen der Menschen. Er setzt an den sozialen und lokalen Auswirkungen globaler Ressourcenextraktion an. Letztere Diskurslinien und Perspektiven – die überwiegend aus dem globalen Süden kommen – lassen sich mit folgenden Begriffen, Ansprüchen und Werten beschreiben:

<sup>7</sup> Die Verwendung des Begriffs ‚Hegemonie‘ zielt darauf ab, aus nachhaltigkeitsethischen Gesichtspunkten kritisch zu beurteilende hegemoniale Realität offenzulegen, ohne ‚Gegenhegemonien‘ etablieren zu wollen.

Kultur, historische Perspektiven, Diversität, Pluralismus, lokales Wissen/Bewegungen/Partizipation/Kontrolle, Strategien für eine nicht-kapitalistische Zukunft, Autonomie, Suffizienz, Widerstand gegen Privatisierung, Design, Komplexität, horizontale Netzwerke, die auf Vertrauen, Gegenseitigkeit, Kooperation als ethische Koordinaten aufbauen (ebd., 359ff.).

Weitere Diskursanalysen fokussieren sich auf politische Interpretationen von Nachhaltigkeit und Nachhaltiger Entwicklung insbesondere auf politische Diskurse, die in einer neoliberalen Politikgestaltung münden.<sup>8</sup> So untersucht eine kritische Diskursanalyse, die im Jahr 2014 veröffentlicht wurde, Diskursstränge Nachhaltiger Entwicklung in den jeweiligen Strategiepapieren britischer Regierungen in den 90er und 2000er Jahren und kommt zu dem Ergebnis:

„In this way, the political discourses of neo-liberalism, Thatcherism and New Labour are reflected in the discourse of sustainable development and sustainable development is presented from within the paradigm of neo-liberalism and neoclassical economics“ (Kambites 2014, 344f.).

Hier ist wichtig und spannend zu analysieren, wie Neoliberalismus im Verhältnis zu einem Management und Steuerungsideal, so beispielsweise im Brundtland-Bericht, steht:

„Die starke Ausrichtung des Berichts auf Beobachtung, Messung – und daran anschließend – auf Managementstrategien und -lösungen ist zu betonen, passt diese Programmatik doch in der Tat *nicht* zu einem „neoliberalen“ Politikverständnis, das dem Brundtland-Bericht und ihm folgenden Nachhaltigkeitsinterpretationen oft unterstellt wird. Im Gegenteil weist der Management-Ansatz der Kommission eher eine Nähe zu den Debatten der 1970er Jahre auf, die von einem (sehr) starken Vertrauen in gesellschaftlich koordinierte Steuerung und Planung geprägt waren“ (Höhler/Luks 2004, 52).

Zur weiteren Erforschung der Spannungsverhältnisse zwischen Neoliberalismus und Steuerung, in Bezug auf verschiedene Nachhaltigkeitskon-

<sup>8</sup> Bzw. expliziten Empfehlungen, s. Kubon-Gilke 2010: „Revitalisierung neoliberaler Vorstellungen“ (ebd. 236).



zepte, empfiehlt sich zum einen, im Rahmen einer Dispositivanalyse<sup>9</sup>, zu der diskursiven Analyseebene, die materieller und institutioneller Settings bzw. Praktiken hinzuzunehmen. So können zum einen begriffliche Bestimmungen und theoretische Bezüge mit (umwelt)politischen Implikationen in Zusammenhang gebracht werden. Zum anderen erinnert dieses Spannungsverhältnis an die Komplexität, die mit dem Leitbild Nachhaltiger Entwicklung einhergeht. Es bedarf einer Analyse verschiedener diskursiver Muster und deren – auch geschichtlich kontingenter – Verwobenheit.

*Gerechtigkeits-theoretische Implikationen: Entwicklung = Wachstum*

Nachhaltigkeitsstrategien lösen Verdrängungseffekte und Verschiebungen gerechtigkeits-theoretischer Natur aus und wurden durch diese beeinflusst. Der Brundlandt-Bericht, als Bestimmungs-Moment, wie auch seine nachfolgenden Interpretationen mögen dazu beigetragen haben. Durch die hegemoniale Strategie eines für möglichst alle Nationalstaaten anzustrebenden Wirtschaftswachstums soll sowohl inter- als auch intragenerationelle Gerechtigkeit hergestellt werden. Bemessungsgrundlage bleibt zunächst die quantitativ ausgedrückte staatliche Wohlfahrt. Das hieße, Ziel einer Nachhaltigen *Entwicklung* wäre, dass alle Länder immer einen möglichst hohen Wert, ein *Nachhaltiges Wachstum*, erreichen (Höhler/Luks 2004, 29; 58). Zudem knüpft die Bestimmung Nachhaltiger Entwicklung als Leitidee an Entwicklungstheorien an, die eine Expansion westlicher Werte anstreben (ebd. 37f.). Durch Steuerung, Kontrolle und Management der „Umwelt“ sollen sich diese nachhaltig entwickeln können (intergenerationell) und in andere Regionen auf der Welt übertragen werden bzw. sich dort entfalten können (intragenerationell).<sup>10</sup>

Die Analyse von Dingler zu Nachhaltiger Entwicklung aus dem Jahr 2003 zeigt, dass eine „Abnahme der Betonung intragenerationeller Gerechtigkeit“ (Dingler 2003, 255) zu erkennen sei. Es handelt sich dabei nicht um eine, wie politisch-normativ festgesetzt, Erweiterung, sondern vielmehr um eine „diskursive [...] Verschiebung hin zu umweltökonomi-

<sup>9</sup> S. hierzu Bührmann/Schneider 2008.

<sup>10</sup> Zu dem Aspekt der Globalisierung westlicher Entwicklungstheorien s. insb. Escobar 1995; Sachs 1993; 2002.

schen Ansätzen. [...] Intragenerationelle Gerechtigkeit wird so mehr und mehr auf Chancengleichheit reduziert und unter marktwirtschaftliche Instrumente subsumiert“ (ebd.). Der hegemoniale Diskurs eines ökonomistischen<sup>11</sup> Verständnisses ging mit einer Priorisierung der intergenerationellen Gerechtigkeit einher, der den „Diskurs um soziale Gerechtigkeit innerhalb Deutschlands“ oder den „Diskurs um die Dritte-Welt-Problematik“ (Tremmel 2003, 30) wie auch den Wachstumdiskurs „folgenswer“ (ebd., 29) ersetzte.

Betrachtet man diese Bestimmung Nachhaltiger Entwicklung als gerechtigkeitstheoretische Modellierung, verfolgt das normative Ziel Nachhaltiger Entwicklung eine hegemoniale Strategie zur Erreichung *gleicher* Ziele (Maximierung quantitativ dargestellter Bruttoinlandsprodukte).

Der hegemoniale Diskurs führt zum Ausgrenzen „andere[r] Problemwahrnehmungen und Lösungsansätze“, (ebd.) sowie ethisch inakzeptabler Marginalisierung von Menschenrechten.

Es scheint, dass die politische Begriffssetzung Nachhaltiger Entwicklung zu einer Begriffsbesetzung im freien Spiel der Mächte geworden ist,<sup>12</sup> in dem die Wissenschaft als ein Spielball auf Kosten von Ethik und Theorie (Schultz et al. 2008, 467; Stieferle 2007, 16) sowie eines ursachenadäquaten Problembewusstseins fungiert.<sup>13</sup>

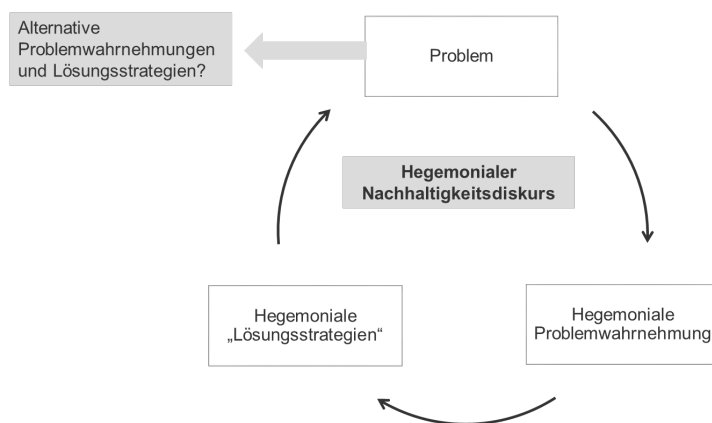
<sup>11</sup> „Eine [...] Analyse zeigt sehr klar, dass de facto ausschließlich Generationengerechtigkeit als normative Begründung herangezogen wird“ (Tremmel 2003, 126f.). Dies gilt für die Finanzwissenschaft. In der Volkswirtschaft wird die intragenerationelle Gerechtigkeit im Sinne eines allokatonsperfekten Marktgleichgewichts thematisiert.

<sup>12</sup> Siehe ergänzend Wengeler (2008): Analyse des Sprachgebrauchs der ‚Initiative Neue Soziale Marktwirtschaft‘ (INSM), als der zentrale Akteur des neoliberalen Lobbyismus: „Nachhaltiges Wachstum ist etwa im ‚INSM-Wachstumsmanifest‘ vom 15.9.2006 das programmatische Schlüsselwort neben der Kollokation dynamisches und stabiles Wachstum, die der stilistischen Abwechslung wegen synonym verwendet wird“ (106).

<sup>13</sup> Im Brundtland-Bericht findet sich der Diskursstrang wieder, der Armut als Ursache für Naturzerstörung ansieht (Dingler 2003, 224): „*Global crisis is not a technical problem, nor even an economic problem. It is, fundamentally, a cultural and political problem, where we need new epistemological and ethical tools*“ (Ayestaran 2011, 213).

Zudem ist anzuführen, dass Nachhaltigkeitswissenschaft explizit einen pluralistischen Anspruch formuliert (siehe Merkmale Mode 2, Kap. 2). Wenn nun Nachhaltigkeitsstrategien von ökonomistischen Diskursen durchdrungen sind, werden diese einem solchen Anspruch nicht gerecht. Es ist eine Unmöglichkeit, unter einer hegemonialen „herrschenden Kultur der Nichtnachhaltigkeit [...] Abhängigkeitsmuster zu erfassen“ (Kagan 2012, 11), was zu einer zirkulären Selbstverstärkung nichtnachhaltiger Situationen (s. Abb. 1) führt:

Abbildung 1: Hegemonialer Zirkel



Eigene Darstellung

#### *Erforschen von Alternativen*

„Als Ansätze, die zwar teilweise diskursive Elemente der Moderne reproduzieren aber auch Diskurskomponenten der postmodernen Theoriebildung beinhalten, können solche nicht-hegemonialen [und nachhaltigkeitsethisch legitimierten] Ansätze der nachhaltigen Entwicklung als Ausgangspunkt einer ausgearbeiteten Konzeption von Nachhaltigkeit dienen“ (Dingler 2003, 484).

Den bisherigen Ausführungen zufolge können Pole sowie dazwischen liegende hegemonial beeinflusste Spannungsverhältnisse ausgemacht

sowie anhand der in den beschriebenen Beiträgen vorkommenden Begriffe veranschaulicht werden. Auffallend ist auf den ersten Blick, dass die lateinamerikanische Analyse die alternativen Diskurse/den Alternativpol tendenziell am ausdifferenziertesten benennt. Die genannten deutschen Analysen fokussieren auf das Herausarbeiten des hegemonialen Diskurses der Nichtnachhaltigkeit als einen spezifisch modernen (Dingler 2003; Höhler/Luks 2004) um einen Bedarf an alternativen Theorien, die einen Wandel der Wirtschaftsweise aufzeigen, zu signalisieren bzw. diese auch aufzudecken und zu benennen (Meyer 2014). Es stellt sich die Frage, wie und wo innerhalb eines nachhaltigen Bezugsrahmens nach Alternativen zu suchen ist.

Dabei ist zum einen besonderes Augenmerk auf das Herausbilden anderer Dominanzen zu legen, wie dies durch neoliberale Politiken geschieht. Zum anderen aber auch darauf, dass diese alternativen Nachhaltigkeitskonzepte möglicherweise moderne Denkmuster nicht verlassen können und politisch-normativ nicht wollen<sup>14</sup>.

Sabine Höhler und Fred Luks betonen die Schwierigkeit der damit kritisch (oder womöglich nachhaltigkeitsethisch) zu prüfenden Suche nach „richtigen“ Lösungspfaden und nachhaltigen Alternativen:

„[O]b freilich diese modernen Konzepte im Hinblick auf Nachhaltigkeitsziele zum Scheitern verurteilt sind, lässt sich in einer kontingenten Welt schlicht nicht angeben“ (Höhler/Luks 2004, 63).

Neben der Analyse von Diskursen über ‚Wandel‘<sup>15</sup> und ‚Alternativen‘, können Erkenntniszugewinne komplementär durch Analysen von Prakti-

<sup>14</sup> Beispielsweise unter linken Nachhaltigkeitszielen zu verstehen, an strukturellen Änderungen innerhalb moderner Gesellschaften – und deren Denkkategorien – anzusetzen: „an die Moderne anschlussfähige[n] Alternativen zur aktuellen Dominanz der Kapitalmärkte“ (Schachtschneider 2007, 137) (Höhler/Luks 2004, 62). Aber auch das Denken in „innerhalb – außerhalb der Moderne“, bleibt der modernen Denkklogik verhaftet.

<sup>15</sup> „So gehören in mancher Hinsicht auch der Glaube an immerwährendes Wachstum, geradlinigen Fortschritt und das schrankenlose Auskosten individueller Freiheit ohne jede Verantwortung zu Werten, die sich unter dem Label ‚Prozess‘ und ‚Wandel‘ zusammenfassen lassen“ (Kagan 2012, 38), beispielsweise „das Phänomen Wirtschaftswachstum [...] als Synonym für Fortschritt und Veränderung“ (Steurer 2002, 114).

ken, Situationen (Clarke 2012) und Fällen (Vilsmaier et al. 2015) erlangt werden (Höhler/Luks 2004, 61).

Wir möchten im Nachfolgenden das Potential transdisziplinärer Nachhaltigkeitsforschung skizzieren. Durch diese Art der Forschung wollen wir zu einem kritischen und differenzierten Diskurs über Nachhaltigkeit beitragen und alternative Lösungsorientierungen hervorbringen. Entgegen dominanter Nachhaltigkeits-Theorien, Politiken und Problemlösungsstrategien speist sich eine *kritische* transdisziplinäre Nachhaltigkeitsforschung aus einer konsequenten Berücksichtigung heterogener Perspektiven und kultureller Selbstbestimmtheit. Sie nimmt Differenzen explizit auf, ist auf Kooperation und wechselseitiges Lernen ausgerichtet. Sie versucht so Marginalisierungen entgegenzuwirken sowie nachhaltigkeitsethischen<sup>16</sup> Ansprüchen gerecht werden zu können.

#### 4. Implikationen für Nachhaltigkeitswissenschaft und -forschung

Der Mode 2-Forschungstyp bettet gewissermaßen die transdisziplinäre Forschung mit ihren „eigenen theoretischen Strukturen, Forschungsmethodiken und -praktiken“ (Hunnecke 2006, 42) in ein Forschungsumfeld ein, dass durch weitere Merkmale gekennzeichnet ist (Gibbons et al. 1994, 3ff.; Hunnecke 2006, 41ff.). „Die Mode 2 Diskussion hat einen wichtigen Beitrag geleistet, Aufmerksamkeit für transdisziplinäre Forschung zu erregen“ (Vilsmaier/Lang 2014, 94). Der Übergang des Merkmals Transdisziplinarität zu den anderen Mode 2-Merkmalen ist demnach fließend.<sup>17</sup>

<sup>16</sup> Vorliegende Arbeit beschäftigt sich nicht mit der Definition einer normativ-präskriptiven Ethik der Nachhaltigkeit. Der Arbeit liegt jedoch die Prämisse zu Grunde, dass es eine solche anzuerkennen gilt. Als Minimalziele einer normativen Ethik der Nachhaltigkeit seien ‚Einhaltung der Menschenrechte‘ sowie ‚Erhalt der Natur als Lebensgrundlage‘ (Carnau 2011, 169) zu nennen. S. hierzu Carnau 2011; Schüßler 2008; Ott/Döring 2004.

<sup>17</sup> Die Bedeutung der transdisziplinären Forschung für die Nachhaltigkeitswissenschaft ist zentral: „Die aufkommende transdisziplinäre Forschung stellt die [...] wissenschaftliche Bewegung dar, auf der die Entstehung der Nachhaltigkeitswissenschaften beruht“ (Michelsen/Adomßent 2014, 41). „[T]he emergence of transdisciplinarity is dated conventionally to the first international seminar on interdisci-

Transdisziplinäre Nachhaltigkeitswissenschaft adressiert sogenannte *sustainability challenges* als lebensweltliche Probleme (auch als *real world problems* bezeichnet). Sie erhebt den Anspruch mit eben dieser Lebenswelt in einem bestimmten Forschungsmodus zu interagieren, um lösungsorientiertes Wissen für bestimmte nachhaltigkeitsbezogene gesellschaftliche Probleme generieren zu können. Im transdisziplinären Forschungsmodus erforschen akademische Wissenschaftler\_innen mit Individuen oder Gruppierungen (aus Politik, Wirtschaft, Zivilgesellschaft; ebenso als „Praxis“ bezeichnet), die nicht im akademischen Bereich tätig sind, in *einem* Prozess gemeinsam gesellschaftliche Probleme bzw. deren Lösungen mit Hilfe wissenschaftlicher Methoden (ebd., 73f.). Alle Beteiligten sollen in der transdisziplinären Nachhaltigkeitswissenschaft Forschende darstellen und den gesamten Forschungsprozesses mitgestalten.

In Prozessen transdisziplinärer Nachhaltigkeitsforschung sollen dabei verschiedene Wissensformen generiert werden (erstmalig ProClim 1997; Nölting et al. 2004, 254; Pohl/Hirsch/Hadorn 2006, 32ff.; Vilsmaier/Lang 2014):

1. *Systemwissen*: Unter Systemwissen wird das Einspeisen von (Erfahrungs-)Wissen der Forscher\_innen über gesellschaftsrelevante Problemstellungen und Phänomene in den Forschungsprozess verstanden. Unter der Wissensgenese sind dabei Suchprozesse des Verstehens, Erkennens, Identifizierens, Analysierens und Fragens zu verstehen.
2. *Zielwissen*: Unter Zielwissen wird verstanden, Normativität in Form von (unbewussten) Bewertungen sowie politische Überzeugungen/Paradigmen zu explizieren. Dies bedeutet Differenzarbeit, Auseinandersetzungen öffentlich und transparent auszutragen und es nicht einer akademischen Elite zu überlassen, auf bestimmten Werten basierende Richtungen vorzugeben (Ziegler/Ott 2015, 51).
3. *Transformationswissen*: Transformationswissen soll dann das Erreichen der Zieldimensionen (Appelle, Handlungsempfehlungen) gewährleisten. Für Publikationen bedeutet das auch Medien jenseits des orthodox Akademischen zu bespielen.

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plarity (ID), co-sponsored in 1970 by the Organization of Economic Cooperation and Development (OECD)“ (Klein 2014, 69).

Besonders beim Zielwissen zeigt sich, dass in transdisziplinärer Nachhaltigkeitswissenschaft dominierende Diskurse eine komplexe Problemwahrnehmung verhindern können. Wenn nämlich gesellschaftlich dominierende Paradigmen Evidenzen herbeiführen und Meinungen, Richtungen, sowie ganz grundsätzlich das Sagbare – auch in Bezug auf Problemverständnisse<sup>18</sup> – bestimmen, steht das einer auf Differenzen und Komplementaritäten beruhenden Transdisziplinarität entgegen. Gleichzeitig eröffnet die Forschungsform – und darauf möchten wir nun eingehen – einen Raum diese Problematik sichtbar zu machen.

Die aufgezeigten Verdrängungseffekte und Verschiebungen in Diskursen zu Nachhaltigkeit und Nachhaltiger Entwicklung fordern das junge Feld der Nachhaltigkeitswissenschaft als *science of sustainability* (Spangenberg 2011) heraus, diese Mechanismen aktiv zu adressieren. Ein vielversprechender Ansatz dafür ist die transdisziplinäre Nachhaltigkeitsforschung dann, wenn sie sich diesen Herausforderungen kritisch und explizit zuwendet. Prinzipien transdisziplinärer Nachhaltigkeitsforschung (Lang et al. 2012) bergen aufgrund ihrer perspektivenpluralistischen, heterarchischen und reflexiven Struktur das Potential, Hegemonien im Nachhaltigkeitsdiskurs sichtbar, sagbar und bearbeitbar zu machen. Entsprechend können sie auch Lösungsorientierungen hervorbringen, die jenseits aktueller hegemonialer Strukturen gelagert sind. Dazu ist es jedoch nicht nur notwendig, sie in der Forschungspraxis konsequent umzusetzen. Ebenso nötig ist es, eine solide wissenschafts- und gesellschaftstheoretische, epistemologische und methodologische Grundlage zu erarbeiten. Nur so kann sich die transdisziplinäre Nachhaltigkeitswissenschaft als Forschungsform in komplementärer Weise zu disziplinärer und interdisziplinärer Forschung und als ein Forschungsmodus an der Schwelle zwischen akademischer Forschung und alltäglicher Wissensproduktion sowie der Institution Wissenschaft und anderen gesellschaftlichen Institutionen positionieren. Denn transdisziplinäre Nachhaltigkeitsforschung zielt nicht ausschließlich auf epistemische Ziele ab, wie

<sup>18</sup> Forschungsbedarf zeigt sich demnach in der Untersuchung der Bedeutungen, die v.a. Gesellschaftlichem und gesellschaftlichen Problemen in transdisziplinärer Nachhaltigkeitswissenschaft zugeschrieben wurden und werden, um analysieren zu können, was die Potenziale dieses Forschungsmodus für eine nachhaltige Transformation von Gesellschaften sein könnten.

sie der Wissenschaft eigen sind, sondern trägt auch einen interventionistischen Anspruch in sich, der auf gesellschaftliche Transformationen im Sinne der Umsetzung nachhaltigkeitsethischer Ansprüche abzielt. Dieses Selbstverständnis bildet aktuell Anlass zu intensiven Auseinandersetzungen, die davon zeugen, dass Wissenschaft und Wissensproduktion selbst in einem Spannungsfeld hegemonialer Strukturen verfangen sind (Schneidewind/Singer-Brodowsky 2014; Strohschneider 2014; Grunwald 2015; Schneidewind 2015; Rohe 2015).

Mit der Positionierung einer kritischen transdisziplinären Nachhaltigkeitsforschung in einem Zwischenraum gesellschaftlicher Institutionen, die in polyloger und mediativer Weise Erkenntnisse und Praktiken hervorzubringen sucht, kann ein Ort geschaffen werden, an dem epistemische und transformative Ziele in verschränkter Weise behandelt werden. Ergebnisse von Forschung tragen so nicht nur wissenschaftlichen Gütekriterien Rechnung. Sie erlangen auch eine soziale (und kulturelle) Robustheit (Gibbons 1999; Nowotny 2000; Vilsmaier et al. 2015), indem die Pluralität von Wissens- und Erkenntniskulturen Anerkennung und Berücksichtigung findet und unterschiedliche Zielhorizonte als Spannungsfeld adressiert werden, das es in nachhaltigkeitsethischer Perspektive zu bearbeiten gilt.

In Anlehnung an Homi Bhabhas *Third Space* (Bhabha 2004) kann eine kritische transdisziplinäre Nachhaltigkeitsforschung als ein Raum begriffen werden, in dem „bestehende Strukturen, Machtverhältnisse und Abhängigkeiten zumindest für kurze Zeit ausgehebelt werden, nämlich dann, wenn erfahrbare Differenz artikuliert und damit greifbar wird“ (Brandner et al. 2015). Räume transdisziplinärer Nachhaltigkeitsforschung rekurrieren auf und überwinden zugleich etablierte gesellschaftliche Strukturen. Dies geschieht indem Räume kooperativen Forschens zwischen Beteiligten unterschiedlicher gesellschaftlicher Domänen, Wissens- und Erkenntniskulturen geschaffen werden. Sie suchen Machtverhältnisse in der Wissensproduktion zu überwinden indem sie unidirektionalen Wissenstransfer und Entscheidungsstrukturen durch kooperative, auf wechselseitiges Lernen und Aushandlung ausgerichtete Gefüge ersetzen (vgl. Vilsmaier et al. 2015). Differenzen werden dabei nicht egalisiert, sondern im expliziten Rekurrieren auf Unterschiede in der Qualität und Reichweite von Wissen, Rollen in gesellschaftlichen Gefügen sowie interessens- und ideologiegeleiteten Positionen als raumauf-



spannend begriffen und zur Grundlage einer kritischen transdisziplinären Nachhaltigkeitsforschung.

### 5. *Schlussfolgerungen und Ausblick*

Anhand diskursanalytischer Arbeiten wurde die Verwobenheit der Begriffskonzepte der Nachhaltigkeit und Nachhaltiger Entwicklung in dominierende diskursive Zusammenhänge sowie Implikationen, die für eine Nachhaltigkeitswissenschaft und -forschung daraus erwachsen, skizziert. In aktuellen Forschungsarbeiten innerhalb des Projektes *CCP – Complexity or Control? Paradigms for Sustainable Development*<sup>19</sup> richtet sich unser Hauptaugenmerk auf die systematische Analyse diskursiver Bezüge zu der zuletzt skizzierten kritischen transdisziplinären Nachhaltigkeitsforschung sowie deren konzeptionellen und methodologischen Ausgestaltung. Dabei geht es auch um ein Aufspüren verdrängter Diskurse zu Nachhaltigkeit, Nachhaltiger Entwicklung und Nachhaltigkeitswissenschaft und um Analysen zur Frage, woran eine bestimmte Diskursdynamik gelegen haben mag oder worin sie sich ausdrückt.

Die konzeptionelle, rekonfigurative Arbeit wird an Fragestellungen zu Alternativen anknüpfen. Neben eines generellen Plädoyers für die Stärkung von Theorienpluralismus in der Wirtschafts- und Nachhaltigkeitswissenschaft sollten die ontologischen, epistemologischen und moralischen Grundlagen für eine Weiterentwicklung von alternativen Theorien über Transformationen menschlichen Zusammenlebens überdacht werden. Diese berücksichtigen gleichzeitig sowohl substantiell-normative Ansprüche der Nachhaltigkeit (die da sein könnten: ‚Einhaltung der Menschenrechte‘ sowie ‚Erhalt der Natur als Lebensgrundlage‘) als auch prozedurale, sich (aus)differenzierende Normativitätsverständnisse. Auch hier gilt es, philosophische Ansätze aufzuspüren und auszuarbeiten.

Bezugnehmend auf die oben geschilderten Wissensarten transdisziplinärer Nachhaltigkeitswissenschaft tragen Fragestellungen einer kritischen transdisziplinären Nachhaltigkeitsforschung, die kulturelle und ethische Aspekte adressieren, zur Generierung von Zielwissen bei. Komplementär zu Systemwissen und Transformationswissen stellen so Erkenntnisse im Bereich des Zielwissens, aufbauend auf ethischer Argumentation, durch

<sup>19</sup> <http://complexitycontrol.org>

Kooperation und wechselseitiges Lernen, transformative Momente dar. Kritische transdisziplinäre Nachhaltigkeitsforschung stärkt somit als *science of sustainability* (Spangenberg 2011) oder als transformative Forschung (WBGU 2011, 23) das Aufbrechen von hegemonialen Ordnungen und komplementiert so Erkenntnisse über (nicht-)nachhaltige Lebensweisen.

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## Modeling normativity in sustainability: a comparison of the sustainable development goals, the Paris agreement, and the papal encyclical

Gregor Schmieg<sup>1</sup>  · Esther Meyer<sup>1</sup> · Isabell Schrickel<sup>2</sup> · Jeremias Herberg<sup>1</sup> · Guido Caniglia<sup>1</sup> · Ulli Vilsmaier<sup>3</sup> · Manfred Laubichler<sup>1,4</sup> · Erich Hörl<sup>5</sup> · Daniel Lang<sup>6</sup>

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**Abstract** The idea of sustainability is intrinsically normative. Thus, understanding the role of normativity in sustainability discourses is crucial for further developing sustainability science. In this article, we analyze three important documents that aim to advance sustainability and explore how they organize norms in relation to sustainability. The three documents are: the Pope's Encyclical *Laudato Si'*, the *Sustainable Development Goals* and the *Paris Agreement*. We show that understanding the role of different types of norms in the three documents can help understand normative features of both scientific and non-scientific sustainability discourses. We present the diverse system of norms in a model that interrelates three different levels: macro, meso, and micro. Our model highlights how several processes affect the normative orientation of nations and societies at the meso-level in different ways. For instance, individual ethical norms at the micro-level,

such as personal responsibility, may help decelerate unsustainable consumerism at the aggregate meso-level. We also show that techno-scientific norms at the macro-level representing global indicators for sustainability may accelerate innovations. We suggest that our model can help better organize normative features of sustainability discourses and, therefore, to contribute to the further development of sustainability science.

**Keywords** Temporal qualities · Dynamical system · Levels · Heterarchy · Norms

### Introduction

Normativity defines a significant research field within sustainability science, where scientific knowledge and normative orientations are intrinsically linked (Carnau 2011; Miller et al. 2014; Ziegler and Ott 2011). However, it

Handled by Shiqiu Zhang, Peking University, China.

✉ Gregor Schmieg  
schmieg@leuphana.de

<sup>1</sup> Faculty of Sustainability, Center for Global Sustainability and Cultural Transformation (CGSC), Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>2</sup> Faculty for Humanities and Social Sciences, Institute of Culture and Aesthetics of Digital Media (ICAM), Center for Global Sustainability and Cultural Transformation (CGSC), Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>3</sup> Faculty of Sustainability, Institute for Ethics and Transdisciplinary Sustainability Research (IETSR), Center for Methods, Center for Global Sustainability and Cultural Transformation (CGSC), Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>4</sup> School of Life Sciences and Center for Biology and Society, Arizona State University, ASU-SFI Center for Biosocial Complex Systems, Tempe, AZ 85287-4501, USA

<sup>5</sup> Faculty for Humanities and Social Sciences, Institute of Culture and Aesthetics of Digital Media (ICAM), Center for Digital Cultures (CDC), Center for Global Sustainability and Cultural Transformation (CGSC), Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

<sup>6</sup> Faculty of Sustainability, Institute for Ethics and Transdisciplinary Sustainability Research (IETSR), Leuphana University Lüneburg, Center for Global Sustainability and Cultural Transformation (CGSC), Universitätsallee 1, 21335 Lüneburg, Germany

is still unclear how we can understand, or even model, normativity similarly to how we understand and model knowledge about complex biosocial or earth systems (Grunwald 2011, p. 26). In this paper, we suggest ways to understand and model norms in sustainability discourses based on the analysis of three documents: the Pope's Encyclical *Laudato Si'*, the *Sustainable Development Goals* (SDGs) and the *Paris Agreement* (PA) (see Table 1).

Works in the field of science studies have shown that social and cultural norms affect scientific theories, institutions, and practices thus challenging simple positivistic conceptions of science (Funtowicz and Ravetz 1993; Gibbons et al. 1994; Putnam 2004; Stengers and Lissack 2004). Norms in the sustainability discourses are both ethical and techno-scientific and relate to relevant actors and entities at different scales—from global and national institutions to local communities and individuals. In our article, we analyze the three important documents produced in 2015 and look at how they structure and organize the ethical and techno-scientific norms that characterize current discourses in sustainability. The norms governing these documents define the broad social, political, and scientific direction of sustainability discourses and interventions in the near future (Nature 2015; Edenhofer et al. 2015).

By focusing our analysis on norms in relation to global development, research programs in sustainability, national policies and individual conduct we carve out a meta-structure of norms. This model-like result conceptualizes the expected performance and impact of the documents in the “age of sustainable development” (Sachs 2015) and helps in the further development of critical understanding of norms in sustainability science.

The broad conception of sustainability and sustainable development embraced here justifies the inclusion of a religious text, such as *Laudato Si'*, in our analysis. We understand *Laudato Si'* as a contribution to the sustainability discourse that goes beyond its own doctrinal and institutional background (Latour 2016). Therefore, we focus heuristically on its ethical rather than religious dimensions (Perkiss and Tweedie 2017).<sup>1</sup> This emphasis allows us to focus on guiding norms expressed in the Encyclical and related to SD. Our analysis is based on an analytical and yet comprehensive model of norms that integrates the ethics of *Laudato Si'* with the structural importance of normativity in the two UN documents that focus more on techno-scientific issues. Hence, we analyze

the role of both ethical and techno-scientific norms in significant contributions to the SD discourse. We show that the three documents are complementary to each other in this perspective. Clarifying normative orientations in sustainability discourses helps to progress towards SD by making more transparent the connection of ethical, socio-political, and scientific dimensions of sustainability (Jerneck et al. 2011; Kläy et al. 2015; Popa et al. 2015). In this sense, our results aim to clarify the potential performance and impact of the three documents in SD discourse. It is still too early to fully assess their actual impact and performance on SD as this implies a retrospective approach.

In what follows, “Material” section gives an overview of the three texts' genesis and content. “Methods” section outlines our analytical approach for capturing the system of norms embedded within these texts. “Results” section presents the results of the analysis. “Discussion” section discusses our results in relation to specific models used in sustainability science. “Conclusion” section concludes that adequate models in the context of sustainability should incorporate a critical conception of normativity.

## Material

*Laudato Si', on the Care of Our Common Home* is the second encyclical by Pope Francis. For the first time a Papal encyclical is devoted to environmentalism. Whereas encyclicals are usually addressed to the bishops of the Catholic Church, *Laudato Si'* is addressed to every person on the planet. A summit at the Vatican on April 28, 2015 with the title “Protect the Earth, Dignify Humanity—The Moral Dimensions of Climate Change and Sustainable Development” led to the “Declaration of Religious Leaders, Political Leaders, Business Leaders, Scientists and Development Practitioners”<sup>2</sup> which foreshadowed the main content of *Laudato Si'*. The Encyclical was then introduced on June 18, 2015 in a press conference at the Vatican attracting extraordinary attention. Speakers were the Ghanaian cardinal of the Roman Catholic Church Peter Turkson, the Eastern Orthodox metropolitan of Pergamon John Zizioulas, who is one of the most influential Orthodox Christian theologians today, the climate scientist and director of the Potsdam Institute for Climate Impact Research (PIK) John Schellnhuber, and Carolyn Woo, CEO and President of Catholic Relief Services and former dean of the Mendoza College of Business, University of Notre Dame, USA.

The report *Transforming our world: the 2030 Agenda for Sustainable Development* is the result of a process that

<sup>1</sup> In fact we could have considered, e.g., the Islamic, the Hindu, and the Buddhist 2015 declarations on climate change as well, because there is a basic interfaith agreement on the normative value of ecology as a global issue and its relation to SD (see <http://www.hinduclimatedeclaration2015.org>; <http://islamicclimatedeclaration.org>; <https://gbccc.org> accessed 28.09.2017).

<sup>2</sup> See <http://www.endslavery.va/content/endslavery/en/events/protect/declaration.html> (Accessed 28 September 2017).

**Table 1** Synopsis of the three 2015 documents analyzed in this paper

	UN Development Group <i>Transforming our world: the 2030 Agenda for Sustainable Development (SDGs)</i> A/RES/70/1 Adopted by the General Assembly: September 25, 2015 Start: January 1, 2016	UN Framework Convention on Climate Change <i>Paris Agreement (PA)</i> FCCC/CP/2015/L.9/Rev.1 Sealed: December 12, 2015 Signed: April 22, 2016–April 21, 2017. Start: November 4, 2016	Encyclical Pope Francis <i>Laudato Si', on the Care for Our Common Home</i> Published: June 18, 2015
Authorship	Directed by the United Nations through a deliberative process involving its 193 Member States, as well as global civil society, in order to provide a diversity of perspectives and experience	Drafted during the 21st Conference of the Parties (COP21), November 30, 2015–December 12, 2015 in Paris; France's foreign minister Laurent Fabius on behalf of the COP21	Pope Francis, drafted by Cardinal Peter Turkson. Precursor summit on April 28, 2015 at the Vatican: "Protect the Earth, Dignify Humanity. The Moral Dimensions of Climate Change and Sustainable Development"—summoned the world religions' leaders, political leaders, and leading scientists
Words	~ 15.000	~ 16.200	~ 40.500
Languages	Arabic, Chinese, English, French, Russian, Spanish (official languages of the United Nations)	Arabic, Chinese, English, French, Russian, Spanish (official languages of the United Nations)	Arabic, English, French, German, Italian, Polish, Portuguese and Spanish, later Latin and Chinese
Addressee	"[T]his Agenda is a plan of action for people, planet and prosperity; as we embark on this collective journey, we pledge that no one will be left behind" (Preamble); "the future of humanity and of our planet lies in our hands" (§ 53)	Parties of the UNFCCC (member states of the UN)	"[E]very person living on this planet" (p. 4); "enter into dialogue with all people about our common home" (p. 4); "Future generations" (p. 18)
Performance	A resolution is a non-binding intergovernmental agreement "setting out a supremely ambitious and transformational vision" (§ 7). Implementation of: "nationally owned sustainable development strategies", "enabling international economic environment, including coherent and mutually supporting world trade, monetary and financial systems, and strengthened and enhanced global economic governance", "availability of appropriate knowledge and technologies globally", "capacity-building", "global partnership". (§ 63)	The Agreement is not legally binding but aims at: "strengthening the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty" (Art. 2.1); "common but differentiated responsibilities and respective capabilities, in the light of different national circumstances" (Art. 2.2); "Facilitative dialogue" (§ 20); "global stocktake" "to assess the collective progress" (Art. 14)	"[A] conversation which includes everyone, since the environmental challenge we are undergoing, and its human roots, concern and affect us all" (p. 14); "act of cooperation with the Creator" (p. 80); "critique of the "myths" of a modernity grounded in a utilitarian mindset (individualism, unlimited progress, competition, consumerism, the unregulated market)" (p. 154); dialogues on "the environment and the international community" (p. 121ff), "new national and local policies" (p. 129ff), "transparency in decision-making" (p. 134ff); "ecological education" (p. 155f)
Time horizons addressed	2016–2030; "seek to build on the Millennium Development Goals" 2000–2015 (Preamble); "decision of great historic significance" (§ 50)	Recalling the UNFCCC in 1992 (Art. 1); first global stocktake in 2023, then every five years (Art. 14); holding the increase in the global average temperature to well below 2 °C above pre-industrial levels (Art. 2); projecting emissions levels for 2030 (§ 17)	"Genesis" (p. 47ff); "the last two hundred years" (p. 39); "future generations" (p. 118ff)
Values	Sustainable development; education; cooperation; capacity-building; universalism; empowerment; the "Goals and targets are integrated and indivisible, global in nature and universally applicable" (§ 55)	"[N]oting the importance for some of the concept of 'climate justice' [...] of education, training, public awareness, public participation, public access to information and cooperation at all levels" (Annex, p. 21); "environmental integrity", "transparency", "accuracy", "completeness", "comparability and consistency" (Art. 4)	"Human development" (p. 14), "justice" (p. 10), "universal solidarity" (p. 13), "common good" (p. 40), "scientific consensus" (p. 18), "ecological debt" (p. 36), "differentiated responsibilities" (p. 38), "ecological ethics", "ecological citizenship" (p. 154)



was launched in 2012 at the United Nations Conference on Sustainable Development held in Rio de Janeiro. The member states agreed to develop a set of SDGs that should succeed the UN Millennium Development Goals (MDGs) established in 2000. While the MDGs were mainly geared toward the developing countries, the SDGs apply for all nations. A 30-member Open Working Group (OWG) of the General Assembly was tasked with preparing a proposal for the sustainable development goals. The OWG was established on January 22, 2013. In a new representational mechanism, several countries shared most of the OWG seats. The outcome document of the Rio Conference *The Future We Want* stated that, at the outset, the OWG was to decide on its methods of work, including developing modalities to ensure the involvement of relevant stakeholders and expertise from civil society, the scientific community, and the UN system in its work. The aim was to provide an integrated set of diverse perspectives and experience. On this basis, the intergovernmental negotiations were completed at the UN Sustainable Development Summit in New York (September 25–27, 2015) and the SDGs were adopted by the General Assembly of the United Nations.

The PA was the outcome of the twenty-first session of the Conference of the Parties (COP21, November 30–December 12, 2015) to the United Nations Framework Convention on Climate Change (UNFCCC), an international environmental treaty negotiated in 1992 in order to achieve the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” The framework convention does not contain any enforcement mechanisms nor does it impose binding limits on greenhouse gas emissions for individual countries. Instead, the framework outlines how specific international treaties (“protocols” or “agreements”) may be negotiated to limit the increase of global average temperature. The PA is such a negotiated outcome. It will enter into force if joined by at least 55 countries representing at least 55 percent of global greenhouse emissions. On 5 October 2016, this threshold was reached.

## Methods

The analytical approach in this paper makes use of the three documents as an entry point for an analysis of the complex system of normativity related to sustainability discourse (Oppermann 2011). To analyze the system of norms in the three documents, we systematically identified the main entities and actors that are guided and influenced by norms. We could identify entities at three different levels: 1. Macro-level, 2. Meso-level, and the 3. Micro-

level. We took the three levels as representing the discursive structure of the three texts and focused on specific norms related to the entities on each level as well as their dynamical interactions.

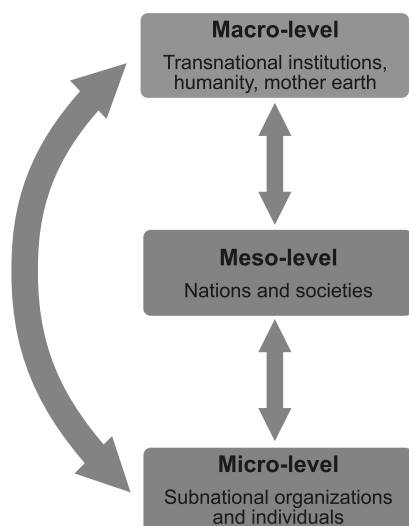
Entities on the macro-level are, for instance, global institutions like the UN, transnational trade organizations, and the Catholic Church while norms are value laden universal ideals such as humanity as a whole and Mother Earth. The ideal of globally valid indicators for measuring SD exemplifies a techno-scientific norm at this level. Entities on the meso-level are nations and societies while relevant norms are accountability, cohesion, or national ownership. Entities on the micro-level are communities, individuals, and more generally subnational entities; an important norm here is moral responsibility.

The three levels of entities and norms are both intra-related (inside one level) and inter-related (between two different levels). We focused largely on inter-level relations and their dynamical properties. Focusing on the relationships between different levels allowed for the emergence of dynamical features related to conceptions of change in the three texts. Thus, entities and respective norms were analyzed with respect to their dynamical effects on other levels within the system. In the course of our analysis, we identified a specific fraction of these relations and the meso-level as the normative core and the focus of action and interventions.

We also focused on dynamical relations that describe processes that refer to acceleration and deceleration vis-à-vis SD. For instance, the acceleration of techno-scientific innovation for climate change mitigation and adaptation is one such process. The deceleration of technical products’ obsolescence rates and private consumerism are examples of a second temporal process. The method of temporal classification of prevalent processes is standard and crucial in complex systems analysis (Simon 2002; Walker et al. 2012). Moreover, studying temporal diversity may lead to operationalizing conceptual models and is important in addressing sustainability problems. This is recognized for example in the fields of sustainable chemistry and health services (Weiser et al. 2017; Sarriot and Kouletio 2015; Cash et al. 2006).

Figure 1 shows the approach used to capture and model the system of norms in the three texts, focusing on entities and norms at the three different levels as well as the temporal diversity of inter-level processes.

Methodologically, our approach resonates with social-ecological systems (SES) models. These models include socio-political norms and rules as inter-related variables and they can serve as a diagnostic tool for studying sustainability problems (Ostrom 2007). A fundamental feature of such models is their interpretation of the complex systems property of near-decomposability (Ostrom 2007).



**Fig. 1** Approach used to capture and model the normative system in the three texts

Near-decomposability means that a system is composed of several subsystems and their dynamic interactions. Furthermore, a system is said to be near-decomposable, if its subsystems are interacting but to a considerable degree autonomously functioning entities (Holland 2012, pp. 15–18; Mitchell 2011, 109–111; Simon 2002, 1962). Figure 1 shows the quasi near-decomposable architecture of our model.

## Results

### The structure of sustainable development

We begin with exposing the structural levels in more detail. By treating entities and norms as descriptive phenomena on each level, we gain a strong perspective on how the three texts conceive of normativity in SD.

#### *The macro-level*

Universal in scope, the PA states that, “climate change is a common concern of humankind” (PA, preamble). The SDGs address “the human race” as a whole by stating the “critical importance for humanity and the planet” of SD (SDGs, preamble). The Encyclical seeks to “enter into dialogue with all people about our common home” (Enc., 3). All three texts thus relate macro-level entities to universalistic ethical norms and pleas for global frames, such as concern, justice, and commitment. Regarding their

scope, the macro-level entities and norms are equally universal and holistic in the three texts. Humanity and the entire planet Earth are the macro-level parameters of normativity in all three documents, while techno-science dominates the PA and the SDGs; metaphysical ethics prevails in the Encyclical. However, the documents differ in the way they interconnect macro-level norms.

In the PA, SD is understood holistically. Pointing out environmental norms at its very core, the PA emphasizes the “importance of ensuring the integrity of all ecosystems” in the sense of safeguarding “Mother Earth” and of achieving “climate justice” (PA, preamble). An intricate connection of ethical and techno-scientific norms occurs when referring to the notions of “ecosystems”, “Mother Earth”, and “justice”. With regard to the techno-scientific side of the PA’s macro-level norms, the focus on numerical restriction of global average temperature rise in Article 2 is even more instructive for understanding the normative architecture. It is evident that it links ethical norms of “justice” and preservation of “ecosystems” with quantifiable information, highlighted through the norm of transparent techno-scientific measurement and the “global stocktake” (PA, 14). The PA presents the correlated scientific process as a means for more equity among the signing parties—as “a facilitative, non-intrusive, non-punitive manner, respectful of national sovereignty, and avoid placing undue burden on Parties” (PA, 13).

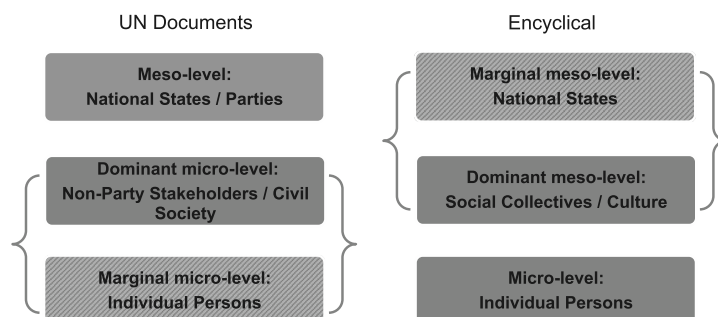
The SDGs are in line with the PA, when proposing a “robust, voluntary, effective, participatory, transparent and integrated follow-up and review framework” (SDGs, 72) while stressing the inclusive ethos of leaving no one behind. The envisioned holistic and equitable data system is here called the “global indicator framework” (SDGs, 75).

The Encyclical is guided by super-ordinate norms defined as “categories which transcend the language of mathematics and biology [...], intellectual appreciation or economic calculus” (Enc., 11). Summarized under the ethical notion of “love” (Enc., 77) for nature and humankind macro-level norms in the Encyclical countervail the allegedly prevailing “techno-economic paradigm” (Enc., 53, 203), more prominent in the PA and the SDGs.

#### *The meso-level*

Nations, cultures and societies are the entities at the meso-level. The three texts address techno-scientific and ethical norms at this level in different ways. The Encyclical presents “society” as key entity and “solidarity” as key norm on the meso-level. Whereas in the PA and the SDGs norms strongly relate to techno-scientific issues (refer to “Acceleration and centralization of change” section for the details), the Encyclical promotes “a different cultural

**Fig. 2** Illustration of discursive dominance and marginalization across the three documents



paradigm“ (Enc., 108). In this formulation climate actions on the meso-level are performed by “society” at large, less so by political entities. The Encyclical even envisions society and culture to be the antipodes of the national state by imposing “regulatory norms” (Enc., 173, 177) on it: “Society [...] must put pressure on governments to develop more rigorous regulations, procedures and controls” (Enc., 179).

An altogether different emphasis occurs in the PA and the SDGs. In the PA, “nationally determined contributions” are the most recurrent formula. The related national “climate actions” are meso-level responses to “climate change”. The general focus on the member States that are Parties to the Agreement (PA, preamble) points to the meso-level as the document’s normative focal system. Also the SDGs “will respect national policy” (SDGs, 21). The implementation process outlined by this agenda entails consistency “with the rights and obligations of States under international law” (SDGs, 18) and “national ownership” of the means for SD (SDGs, 46, 66, 74, 76).

#### *The micro-level*

On the micro-level, the UN documents tend to locate all those entities that represent a non-state approach. Here the PA, for instance, registers subnational entities such as “non-Party stakeholders, including civil society, the private sector, financial institutions, cities and other subnational authorities, local communities and indigenous peoples” (PA, preamble). The SDGs address the same entities on the micro-level although with a stronger emphasis on inclusion compared to the PA. In contrast, the Encyclical explicitly addresses individuals guided by universal norms as the relevant actors at the micro-level.

Altogether, the structural and normative tendencies reveal a key difference in the way the UN documents and the Encyclical refer to structural layers and their interactions that also highlights an overall normative difference: While the UN documents remain elusive on social and explicitly ethical matters and aim for meso-level national

institutions, the Encyclical takes a strong ethical stance focusing on the micro-level, especially on individual persons as prime agents of SD.

Figure 2 illustrates the three texts’ differing elaborations of normativity on the micro and meso-level. The brackets in Fig. 2 illustrate the complementarity of the three texts related to the different foci on specific entities. While the UN documents marginalize the role of individuals, they formulate a pronounced regulation of national contributions to SD. Respectively the Encyclical marginalizes national policy matters and introduces a strong account of individual contributions to social concerns in SD.

The argument in Fig. 2 becomes evident in different approaches to education in these three texts. In this regard, the PA defines “climate change education, training, public awareness, public participation and public access to information” (PA, 12) as a politico-scientific norm on the micro-level. The SDGs are complementary here in pointing to the lifestyle aspect of the information norm when pledging that “[b]y 2030, [we] ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature” (SDGs, preamble). Lifestyles relate to cultural norms adopted by individuals, but they are not prominent in the SDGs.

This latter aspect is reinforced in the Encyclical. Pope Francis “calls for greater attention to local cultures when studying environmental problems, favoring a dialogue between scientific-technical language and the language of the people. Culture is [...] a living, dynamic and participatory present reality, which cannot be excluded as we rethink the relationship between human beings and the environment” (Enc., 143). Thus, micro-level norms rely not only on “scientific information” (Enc., 210) but considerably on “ecological conversion” (Enc., 216–221). The individual “desire to change” does not depend on top-down dissemination of information from the “global stocktake”. Rather micro-level norms in the Encyclical express the individual exigency “to become painfully aware, to dare to turn what is happening to the world into

our own personal suffering and thus to discover what each of us can do about it” (Enc.,19). Nevertheless, the Encyclical acknowledges the need for “objective” and “new information” and non-ideological assessment (Enc., 186, 187). But its complementary approach to scientific findings remains a deeply individual and ethical knowledge of individual responsibility. Hence the Encyclical does not lay emphasis on “infinite capacities for activism” (SDGs, 51) based on global information. Instead it highlights relative to the UN norms a provoking and subversive ethics, which “protects human action from becoming empty activism” (Enc., 237).

### The dynamics of change

The next sections analyze temporality in the model by showing that meso-level implementation of SD comes about through dynamics initiated from above (macro-level/top-down) and simultaneously from below (micro-level/bottom-up). The temporal qualities are accordingly top-down acceleration and bottom-up deceleration.

#### *Acceleration and centralization of change*

The UN documents focus on the implementation of the macro-level techno-scientific ideal of informational transparency on the meso-level. In the PA, implementation is seen as an “accelerating” (PA, 10.5) process. It can “mobilize”, “scale up”, “catalyze” and “increase” meso-level “climate actions”. These processes again depend on “collaborative approaches to research and development, and facilitating access to technology” (PA, 10.5). But the regulative “incentives” deriving from accelerative “mechanisms” refer exclusively to the meso-level national states as parties of the agreement (PA, 5). They do not relate to non-Party stakeholders’ activism on the micro-level. Equally so, the accelerative pattern of implementation applies for the “follow-up and review framework” of the SDGs (SDGs, 36 pp.) depending on a unique universal and “global indicator framework”. Therefore, this macro-meso process of SD can be considered a highly centralistic top-down control mechanism that is assumed to mechanically trickle down and accelerate even collective action on the micro-level.

Notably, this form of control and informational surveillance is translated into an “infrastructure” (SDGs, Goal 9) of technological and financial international facilities operating on “nationally determined contributions”. Accordingly, a just international finance and capacity-building system is presented as a major aim of the PA (PA, §131; see also PA, § 109). Also the norm of transparency relates to a regulative system of “accountability” in political institutions governing the meso-level (SDGs, 16,

17). Mere numerical accounting practices thereby become a normative pivot in the UN documents. As a consequence, accountability as a form of ethical responsibility is reduced to processing and communicating numerical data. Hence, this form of reduction or rationalization corresponds with an accelerated generation of transparent, techno-scientific activity. The latter, according to the UN accounts, is conducive of “adaptive capacity, strengthening resilience and reducing vulnerability” (PA, 7.1) in facing the challenges of SD.

At this point, our analysis reveals an important nuance related to the dynamical quality of acceleration and reduced ethical normativity. The SDGs express this nuance when acknowledging its agenda’s “historic” and “far-reaching” character anno 2015 (SDGs, 2). In the PA and in the Encyclical, the same perspective is formulated as the “long-term global response” (PA, 7.2) related to the macro-level norm of the “long-term common good” (Enc., 178). In this sense, a long-term process corresponds with reducing or slowing down the rate of change at the meso-level, which is challenging to some extent the accelerative reduction of ethical accountability to mere techno-scientific countability. This very significant transformation of accelerative centralistic processes on the meso-level into more decentralized dynamical patterns helps to avoid a lock-in situation in SD. We will show that temporally diverse and truly decentralized meso-level SD depends on autonomous bottom-up processes. As laid out in the following, all three documents indicate that deceleration, the inverse of acceleration, has to be accounted for in relation to the micro-level.

#### *Deceleration and decentralization of change*

While the SDGs and the PA first and foremost address representative state actors, the Encyclical, when appealing to “every person living on this planet”, follows a much more direct logic. Pope Francis infers that “sustainable and integral development”, and equivalently “authentic social and moral progress” depends on every individual becoming aware of her personal “responsibility” for the ongoing socio-ecological crisis (Enc., 16, 64). The difference relative to the UN accounts is a strong deductive link that establishes the norm of “responsibility” as a direct relation from the universal humanism to the individual person. To state this observation more formally, an autonomous bottom-up micro-level dynamic is introduced by circumventing the meso-level in the first phase of the process rooted in the macro-level. To observe this, one needs to keep in mind the translation of the religious and metaphysical language of the Encyclical into the topology of our model. Otherwise, the dynamics remains vague.

The point is that macro-level normativity is integrated into moral awareness and individual conduct on the micro-level: By “a direct action of God” and by means of the often mentioned “dialogue [...] with God himself” (Enc., 81) individuals are said to make “the leap towards the transcendent which gives ecological ethics its deepest meaning” (Enc., 210). The envisioned effect of this normative dynamics is to “develop a different lifestyle and bring about significant changes in society” (Enc., 208), i.e., on the meso-level. The micro-level moral awareness that brings about change on the meso-level correlates with ethical “responsibility” and not with its reduction to techno-scientific “accountability”. The strong emphasis on individuality in this dynamic process implies, however, a decentralized structure of the Encyclical’s normative scheme; every individual is understood as freely responding to a universal (macro-level) normative call.

From a temporal perspective, the individual’s agency is adverse to the top-down acceleration process that is meant to control the “risk” of unforeseeable events through “integrated, holistic and balanced” techno-economic measures (PA, 6.8). In turn, the bottom-up process conveys an inverted normativity that reinforces “social cohesion” as the core of “sustainable and integral development” (Enc., 13). Thus, the Encyclical accounts for SD by means of decelerating the otherwise excessive “acceleration” of human affairs (Enc., 18, 61). The general macro-level norms humanity, divine love, and creation are intended to contribute to a higher sense of collective identity by limiting the pace and speed of individual conduct on the micro-level—an adverse but complementary process relative to the UN documents’ account.

### Summary

We summarize our results using the following three schemas. Table 2 presents the most important norms in the multi-level perspective. In addition, we index the norms according to the texts they occur in. Figure 3 shows the distribution of the two normative categories in the different texts, i.e., ethical and techno-scientific norms. The figure highlights that there is considerable overlap in the normative orientation of the three texts on the macro-level (see also “The macro-level” section). It also shows that the two UN documents have a rather similar normative approach to meso-level issues, i.e., especially their focus on national sovereignty. Finally, Fig. 3 shows that both SDGs and Encyclical have a much stronger and more balanced normative orientation than the PA on the micro-level. In fact, the SDGs emphasize the importance of “empowerment” and the Encyclical has the topic of

“responsibility” as a central one, whereas the Paris Agreement leaves more personal dimensions of change untouched. Therefore, Fig. 3 reveals some normative symmetry between the SDGs and the Encyclical on the micro-level. However, the normative polarization between the Encyclical and the UN documents observed in Fig. 2 dominates the comparison.

Figure 4 shows that the normative dynamics behind change processes at the level of nations and societies (meso-level) are based on a stimulus or incentive aiming at simultaneous acceleration and deceleration. This is a temporal expression of the polarized distribution of ethical and techno-scientific normativity in the three documents. Acceleration of socio-political change is primarily introduced through macro-level techno-scientific and economic innovation policy programs. Deceleration on the other hand is introduced primarily through micro-level action based on individual empowerment, ethical commitment, and responsibility. This result is important because accelerating niche or micro-level activity is often recommended in order to catch up with and eventually counteract or transform fast unsustainable processes on other levels (Ostrom 2009; Geels 2011).

Hence, Fig. 4 shows the dynamics of normativity based on the three texts and their focus on the meso-level. The labeled arrows highlight the most eminent phases or sub-processes of the combined normative system’s dynamics. We call these processes dynamic because they feature different temporal qualities of change across different processes. To differentiate these temporal qualities is crucial to a systemic understanding of sustainability problems and processes (Weiser et al. 2017; Sarriot and Kouletio 2015; Grunwald 2011; Cash et al. 2006). Process a is called techno-scientific acceleration in “Acceleration and centralization of change” section while b and c are called socio-ethical deceleration in “Deceleration and decentralization of change” section. The meso-level is thus the center of a dynamic socio-scientific system including global indicators and accounting practices as well as individual responsible action.

## Discussion

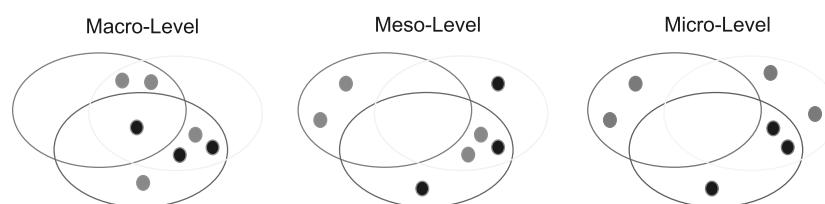
### Topology

As the relationships between macro-level and meso-level are mediated by the micro-level, the normative structure of the sustainability discourse emerging from the three documents is different from the structure of standard and (near-)decomposable (ND) systems. In fact, the latter

**Table 2** Systematic index of the most significant norms found in the three documents

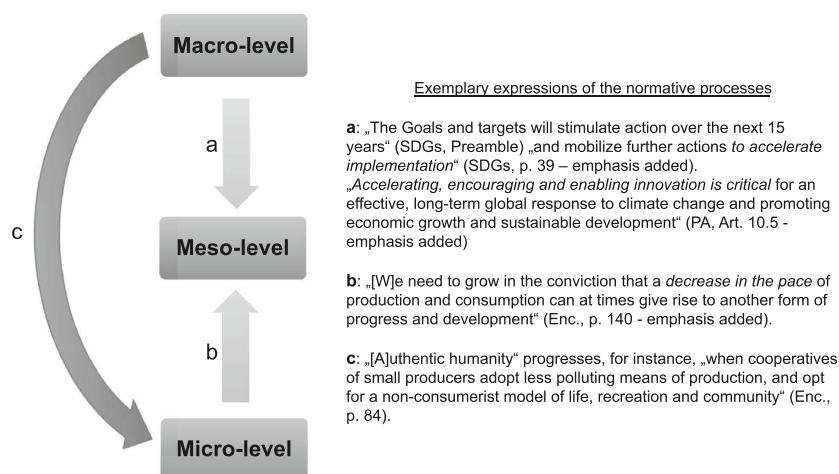
	Ethical norms	Techno-scientific norms
Macro-level	“Universal”/“global solidarity” (Enz/SDGs) “Climate justice” (PA) “Human rights” (SDGs/PA) “Human dignity” (Enz/SDGs)	Global “indicators” (SDGs)/“stocktake” (PA) “Transparent information” (SDGs/PA) “Global average temperature” (SDGs/PA/Enz)
Meso-level	“Social cohesion” (Enz) “Social and moral progress” (Enz) “Mutual trust” (SDGs/PA) “Common but differentiated responsibilities” (SDGs/PA)	“Accountability” (SDGs) “Capacity-building” (SDGs/PA) “Inform the global stocktake” (PA)
Micro-level	“Responsibility” (Enz) “Empowerment” (SDGs) “Desire to change” (Enz) “Contribution” to change (SDGs)	“Traditional knowledge” (SDGs/PA) “Knowledge of indigenous peoples” (SDGs/PA) “Local knowledge systems” (PA)

The parentheses show the relevant documents



**Fig. 3** The distribution of the two categories of norms derived from Table 2. Ethical norms (red dots) and techno-scientific norms (black dots) are distributed across the three levels of each document: Encyclica (green), SDGs (yellow), Paris Agreement (blue)

**Fig. 4** The complex dynamics of change processes in sustainable development according to the three documents' normative scheme. *a* Stands for techno-scientific acceleration, while *b* and *c* together stand for ethical deceleration of the socio-political realm on the meso-level



allows only for direct inter-level relations (Simon 2002). As opposed to this formal hierarchy of ND systems, i.e., box-in-box-in-box systems, the scheme in Fig. 4 possesses main features of a heterarchy type models (McCulloch 1945), also used as models for corporate management in sustainability, such as the Viable System Model (Beer

1959; see also Espinosa and Walker 2011, pp. 8–14). The heterarchy approach to normativity as a cross-scale, cross-level process “can play an important role in engendering shared understanding of different and similar perspectives on how transitions to sustainability may take place” (Peter and Swilling 2014, p. 1616).

### Relation to other models

Figure 4 proposes a heterarchic topology relating fast variables (acceleration processes) to the macro-level and slow variables (deceleration processes) to the micro-level. This result is the exact inverse of prominent model architectures in research on social-ecological or socio-technical systems in the sustainability context (Cash et al. 2006; Ostrom 2007, 2009; Geels 2004; Geels and Schot 2007; Holling 2001; Allen et al. 2014). All these approaches include social phenomena and norms while adopting a fundamental premise related to the biological study of ND systems by Simon (2002, 1962): the relation of fast variables to lower levels, also called niche level, and slow variables to higher levels, also called landscape and sometimes regime level. Here, we propose a complementary approach based on the insight that combining modeling techniques is epistemologically promising in sustainability contexts (Peter and Swilling 2014).

### Transferability of results

The specific heterarchic topology in Fig. 4 depends on the integration of *Laudato Si'* in the analysis. It thus differs from a straightforward SES or socio-technical systems approach. However, Geels (2011) presents a socio-technical model of sustainability transitions that basically also represents a heterarchy. We think that this formal resemblance is necessary in order to transfer our topology of normative dynamics into other contexts of sustainability and improve our understanding of systemic interactions in different sustainability contexts. Therefore, for the purpose of analyzing other sustainability relevant non-scientific documents, especially those related to policy, we suggest that our approach should be directly applicable.

Also, in the international governance context an exciting trend that is increasingly well documented might be studied using our approach. According to this research, there is considerable and growing direct interaction of international environmental bureaucracies (macro-level) with non-state actors (micro-level) for implementing international norms and rules (Hickmann and Elsässer 2017). Specifically, our approach allows us to learn more about the temporal diversity of institutional processes and thus resolve some apparent contradictions within sustainability communities related to techno-scientific and ethical norms. Our approach can also be applied to practical sustainability processes and transformations. It is widely understood that neither these processes nor their outcome can be strictly controlled, “but the speed and focus can be influenced, aiming to facilitate the process” (Espinosa and Walker 2011, p. 276). Knowing how to adapt our knowledge to changing realities means to influence the speed of

processes in sustainability contexts. This, however, substantially depends on understanding the normative systems behind related decision-making processes (Geden 2016; Anderies et al. 2013; Jerneck et al. 2011). Confirming this, Sarriot and Kouletio (2015, p. 266) consider “time as a fundamental factor in system adaptation” when it comes to realizing health projects in multi-institutional SD settings.

Finally, our results can contribute to the development of sustainability dialogue design principles. This could help setting up regular and trustful cross-level dialogues about background values, outcome goals, and adequate actions among all project partners and stakeholders each bringing different perceptions of time frames into the dialogue.

Another prominent concept within sustainability that is related to our approach is the concept of leverage points and especially the distinction between deep and shallow leverage points and their respective effects in systems' transformations. In coupled socio-ecological systems, leverage points often reflect norms and it will be interesting to see if and how the different temporalities identified correspond to such leverage points.

### Conclusion

Socio-political norms are an essential part of current sustainability discourses, both in the form of ethical norms and in the form of techno-scientific norms. Therefore, analysis of the normative structure and dynamics of the three documents' can help the sustainability community understand how these texts portray and frame the future of sustainability. By modeling normativity in the sustainability discourse, this article will hopefully help better understand how, if actually used to inform policy decisions and practices, the three texts will end up impacting future directions of sustainable development.

Thus, analyzing the roles of norms is highly relevant to sustainability. Making such roles explicit in an adequate model that takes the complexities of multiple different levels and interactions into account is a significant new and challenging research field in sustainability science. In this article, we presented a heterarchic model that deals with norms in the sustainability discourse relying on a comparative analysis of the Pope's Encyclical *Laudato Si'*, the *Sustainable Development Goals* and the *Paris Agreement*. We argue that, understanding the complexity of normativity in scientific and non-scientific documents dealing with sustainability through our heterarchic model can help the sustainability community deal systematically with normative issues and dimensions in this field.

Because of its analytical resonance with SES and other complexity oriented approaches to sustainability our model can potentially be applied and refined as a new perspective

in the field. A vast array of well-documented empirical cases that have so far been analyzed without explicit considerations of the temporal dynamics of norms as variables at different levels can be revisited. Certainly, future research will have to be done on refining this analytical resonance. An advanced and transparent integration of normativity allows for the integration of knowledge and action in order to achieve transformative change in the context of sustainability (Popa 2015; Geden 2016). At the same time, understanding the complexity of normativity generates critical knowledge that can avoid premature “panaceas” (Ostrom 2007).

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## The Problematic of Transdisciplinary Sustainability Sciences

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*Esther Meyer*

### Introduction

Sustainable Development (SD) finds its discursive breakthrough in 1987 through the final report of the Brundtland Commission, *Our Common Future* (Vanhulst/Beiling 2014; Sneddorn et al. 2006). The Brundtland report substantially conveys the regulative specification of a worldwide social and ecological national economic development, justified by the possibility of equal opportunities also for future generations (intergenerational justice). In addition, this development should be designed in such a way that equal access to resources for all living people is possible (intragenerational justice) (Hauff 1987; Dingler 2003). Reactions to the report reveal the nature of its global regulatory appeal, because intra- and inter-generational justice can only be defined according to political values (Vanhulst/Beiling 2014; Grunwald 2011). In 2015, the United Nations set the *Sustainable Development Goals* (SDGs), differentiating and equating SD explicitly with peace and security, natural and cultural diversity, democracy, eradicating poverty, as well as equal rights and opportunities for women and men (SDGs 2015). SD simultaneously tends to be shaped by a *hegemonic discourse of SD* (Hajer 1995; Höhler/Luks 2004; Brown 2016; Vanhulst/Zaccari 2016; Albán/Rosero 2016)<sup>1</sup> that ultimately

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<sup>1</sup> Discourse understandings, or the different discursive analytical orientations of the authors who refer to the hegemonic discourse of SD, are not discussed here. My own, previously carried out, discourse-analytical research (Meyer 2020) is based on the understanding of critical discourse analysis. According to Adele Clarke (2012) critical discourse analysis pays special attention to the ways in which dominant theories emerge and, through their discourses, (re)produce power relations.

counteracts SD as it is envisaged by the SDGs. Around the 1990s, so-called *sustainability sciences* began to form and characterise themselves as inter- or transdisciplinary. Sustainability sciences are constituted by and respond to international sustainability politics and organisations, intertwined with hegemonic political interests. Transdisciplinary (td) sustainability sciences especially aim to generate topics and research questions in collaboration with representatives of diverse societal groups in order to identify pressing sustainability problems. Accordingly, questions arise concerning the entanglement with and positioning towards a superordinate hegemonic discourse of SD. Thus, transformative and interventionist approaches to exploring a sustainable cohabitation are being hampered. The questions arise, firstly, if, and, secondly, which theories towards societal transformation are missing in td sustainability sciences, and how may sustainability and td sustainability research be re-invented in order to explore and shape a sustainable cohabitation.

My contribution starts with my methodology, the problematisation of 'notions of problems' (Bowden/Kelly 2018: 3). After the introduction of the methodology follows an outline of the hegemonic discourse of SD and the consequences it produces. That leads to the introduction to td sustainability sciences. The objective is to analyze how problematisations in td sustainability sciences relate to concepts that have emerged through the hegemonic discourse of sustainability. In sustainability sciences, I suggest this is the concept of *challenge*. While the first part deals with the problematic *of* (td) sustainability sciences, the second part deals with the problematic *in* td sustainability research. The differentiated addressing of the problematic deals with methodological considerations and experiments for a td sustainability research that is aware of its entanglement of epistemological and normative dimensions. The aim of my research is to explicate reproducing discourses and constructions of handling problems in td sustainability sciences that suppress the subversive potential of radical transdisciplinary logics and comprehensions of a *generative problematic in td sustainability research*.

### **Methodology: problematisation of problem understandings**

Transdisciplinarity and td sustainability research can gain significance as a counter project to the *hegemonic discourse of SD*. However, td sustainability sciences are partly interwoven with the hegemonic discourse. Being a relatively new phenomenon within the discourse, their efficacy is limited from the outset by existing power relations. It is here that the problematic unfolds itself as a possibility to work with. The problematic of td sustainability research can be found in its in between position amid distinct, inconsistent, contradictory paradigms. Td sustainability sciences are, as Michel Foucault would say, 'always inscribed in a game of power, but always also a limitation or rather: bound to the limits of knowledge, which emerge from it, but nevertheless condition it' (Foucault 1978: 123, in Bührmann/Schneider 2008: 53, my translation).

The concept of *problem* has a major bearing on td sustainability sciences. On the one hand, td sustainability sciences tend to be considered as ethical and intellectual revolutions or innovations in the mode of thought and, thus, as solutions to sustaining global social-ecological problems. On the other hand, these problems persist and accumulate due to another hegemonic economic-political level that is often overlooked in research practice. These problems then tend to be at the same time the condition of possibility for td sustainability sciences to be constituted, legitimised, and made possible. The meanings of problems and their function for td sustainability sciences therefore seem to constitute their problematic. Starting from a *problematic constitution of problems* 'offers heuristic notions that allow the reformulation of the manner in which problems are conceived' and, as Maria Kaika further writes concerning a radical political ecology, '[t]his inclusive approach does not place itself on "managerial" ground' (Kaika 2003, in Blanchon/Graefe 2012: 47), but on a philosophical movement to pose different research questions and other problems to be investigated (Bachelard 2012; Maniglier 2019). In which contexts of meaning are problems posed? What would be a different theorisation of the problem? With Foucault problematisation means to carve out conditions of possibilities that enable different solutions to symptomatic problems (Defert/Ewald 2005). By scrutinising supposed solutions in td sustainability sciences, I will first make the problem approachable.

## The problematic of sustainability sciences

### Hegemonic discourse of sustainable development

The hegemonic discourse of SD is aligned to neoliberal forms and goals of organising (environmental) policies towards profit maximisation of market enterprises (Castree 2002). A critical discourse analysis published in 2014 by Carol Kambites examines discourse strands of SD in the respective strategy papers of British governments in the 1990s and 2000s and comes to the conclusion: 'sustainable development is presented from within the paradigm of neoliberalism and neoclassical economics' (Kambites 2014: 345). In Germany the analysis by Johannes Dingler on SD shows that a 'decrease in the stress of intragenerational justice' (Dingler 2003: 255, my translation) can be seen. 'Intragenerational justice is, thus, increasingly reduced to equality of opportunity and subsumed under market-based instruments' (ibid, my translation). At the same time intergenerational justice is prioritised, which matches well with the normative goal of having the chance of private asset protection and its intergenerational transfer. These patterns of significations of SD neglect the discourses of social redistribution within one generation.

The research project 'NEDS – Nachhaltige Entwicklung zwischen Durchsatz und Symbolik' ('Sustainable development between throughput and symbolism') analyzes the Brundtland report regarding the economic construction of ecological reality. The research project identifies seven coherent theses – thereby differentiating the thesis of the unsustainability of modernity. They outline how 'economic logic, natural and technological scientific expectations and juridical, administrative regulations intertwine and have contributed significantly to a discursive version of sustainability as a management problem' (Höhler/Luks 2004, my translation). The authors see SD shifting from an understanding of nature and ecology to an understanding of mere economically manageable and controllable environments divided into scarce resources. The hegemonic economic conception of SD is reflected in the guiding principle of *weak sustainability* (Williams/Millington 2004; Ziegler/Ott 2011), which assumes only a few, isolable sustainability dimensions, as well as their interchangeability: economic, ecological or social goals should be integrated into behaviour and economic activity. In Germany, the final report of the Enquete Commission, 'Protection of Man and the Environment', proposes a subdivision into three pillars: ecological, econom-

ic, and social (Enquete Commission of the 13th German Bundestag 1997). In addition, multi-pillar models and one-pillar models have been developed ('from one dimension to eight dimensions', Tremmel 2003: 116, my translation). Also, the cultural, the institutional and the political are mentioned as important parts (Michelsen/Adomßent 2014). Moreover, in this discourse, not all authors speak of pillars, but instead, for example, of different dimensions, like Niranji Satanarachchi and Takashi Mino (2014) or the Preamble of the SDGs. The concept of *strong sustainability* (Ott/Döring 2004; Ziegler/Ott 2011), however, is not contained within the logic of the pillar-discourse: nature as an ecological basis of life is not considered substitutable. The relative approach via goals, pillars or dimensions of sustainability has different effects as to how social or ecological target dimensions are integrated into a discourse that is governed by a priori economic ratings.

### **What are the problems of the hegemonic discourse of sustainable development?**

Human rights, which are valid for all current and future humans (Ott 2014; SDGs 2015), count as substantial minimal goals for sustainability and thus constitute the basis of normative sustainability ethics (Carnau 2011).<sup>2</sup> From a sustainability ethical perspective, human behaviour can therefore be assessed on the basis of whether it is *life-sustaining* (Carnau 2011; Olssen 2014). 'The hegemonic discourse of sustainable development is in the discursive tradition of [...] modernity' (Dingler 2003: 484, my translation). The social development indicated in the discourse, however, could have led to a crisis threatening the livelihoods of today's and future people's lives ('thesis of the unsustainability of modernity', *ibid*: 493).<sup>3</sup> SD strategies, as they refer to in the Brundtland report, aim at achieving economic growth that is desirable

2 This work is not concerned with the definition of a normative-prescriptive ethics of sustainability. Thus, the 'future', related to human rights and climate change, remains open. The work, however, is based on the premise that a normative-prescriptive ethics of sustainability is recognised.

3 The designation of an "ecological modernization" by Hajer (1995) counts as an origin in the German- and English-speaking discourse. Likewise, the criticism of Eblinghaus and Stickler from 1996 can be mentioned. Criticism of eurocentrism and the globalisation of occidental development theories, in this respect, comes from Arturo Escobar (1995) and Wolfgang Sachs (1993; 2002). Other authors grasp the thesis of the 'unsustainability of modernity'

for as many nation states as possible in order to establish both inter- and intra-generational justice. The unit in which national economic growth is measured is the quantitatively expressed gross domestic product (GDP). This means that the goal of SD is that all countries always achieve the highest possible economic parameter – sustainable growth or *green growth* (Höhler/Luks 2004; Brand/Wissen 2017; Acosta/Brand 2018). In economic theory, higher growth figures equate to more capital being available for the state to finance environmental protection or social compensation. However, in order to achieve these growth figures, nature, the environment, resources and people – life – are subordinated to economic development and consumed in life-destroying proportions (Moore 2016). This happens in an exponential way, because of the national-economic belief in higher growth numbers as a solution and in the complete governability of social-ecological problems at local and global level. Thus, national-economic theory of this kind and its politics are dysfunctional as they cannot meet the requirements of sustainability. An analysis of the SDGs shows that sustainability-relevant norms are attributed to the local and global levels, which in turn can have effects at the national-economic meso-level, ‘as the normative core and the focus of action and interventions’ (Schmieg et al. 2018). However, the non-sustainable norms of the meso-state level are not problematised in the UN documents (Parenti 2016). The transnational agenda of SD, emerging at the beginning of the 1970s from environmental and justice movements, has been incorporated into the neoliberal agenda, starting in the 1980s and 1990s with more and more success. Sustainability, therefore, under the roof of SD, serves to strengthen and spread neoliberal hegemony, leaving eco-political and human rights interests in marginalised positions. If sustainability was caught in a neoliberal hegemony, fractures within the latter are showing up and might change constellations (Brown 2016). This is also reflected in the SDGs, as important documents that aim to advance sustainability (Schmieg et al. 2018), and that differ from international sustainability documents of the late 1980s, 1990s and 2000s. And, as Julien Vanhulst and Adrián Beling write, ‘even if conservative understandings of SD remain dominant, they continue slowly to lose ascendancy over global debates in the discursive field of SD, as the growing emergence of alternative discourses (and their coalitions)

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(Dingler 2003) or the “economic construction of ecological reality” (Höhler/Luks 2004) as a dispositive (Timpf 2000).

proves' (Vanhulst/Beling 2014: 61). The very question in and beyond this contribution is how td sustainability sciences have reacted to neoliberal history and present dynamics and, thus, relate to the hegemonic discourse of SD.

### **(Transdisciplinary) Sustainability sciences**

Sustainability sciences themselves make up parts of complex dynamic sustainability contexts within the human-nature system and behave towards them in an evaluative and reflexive way (Satanarachchi/Mino 2014). In the constitution of sustainability sciences there are two strikingly parallel developments: on the one hand projects in the theory of science, such as transdisciplinarity, and on the other hand transnational negotiations. In both cases, it is a question of moving boundaries, in collaborations between scientific and non-scientific actors (Vilsmaier 2018; Schmidt 2011), in order to pursue SD. The spectrum of discursive events that constitute sustainability sciences is wide. For the sake of systematics they can be represented on five interwoven levels: 1) political with the UN conferences<sup>4</sup>; 2) theory and politics of science with concepts such as transdisciplinarity (Klein et al. 2001; Osborne 2015), mode-2 (Gibbons et al. 1994; Gibbons 1999; Nowotny et al. 2001), or post-normal science (Funtowicz/Ravetz 1993: 3) publications such as from Robert Kates and William Clark et al. in *Science* in 2001 that present sustainability sciences as a programmatic scientific research field (Kates et al. 2001); 4) non-university institutes, NGOs, civil society, companies that strongly re-

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4 'United Nations Conference on Human Environment' in 1972, 'United Nations Conference on Environment and Development' in 1992. From these conferences emerged programmes, as the United Nations Environment Program (UNEP), the final report of the World Commission on Environment and Development and the Agenda 21, the World Climate Summits, international follow-up conferences such as the World Summit on Sustainable Development in Johannesburg in 2002, or the SDGs document in 2015. There were also counter-reactions to the European and North American 'global consensual positions on ecology and development' (Vanhulst/Beling 2014: 55). The Latin American Global Model (or Bariloche Model) (Herrera et al. 1976) replied in 1976 to the MIT report 'The limits to growth' (Meadows et al. 1972), and, in 1991, the report 'Nuestra propia agenda sobre desarrollo y medio ambiente' ('Our own agenda on development and environment') of the Development and Environment Commission of Latin America and the Caribbean was published in response to the Brundtland report and in preparation for Rio 1992 (Vanhulst/Beling 2014; Vanhulst/Hevia 2016: 178). See also Meyer/Vilsmaier 2020.



acted to 5) global events that destroyed nature and called for environmental policy measures.

Joachim Spangenberg distinguishes the understandings of sustainability sciences as being between a 'more traditional disciplinary-based science for sustainability and the transdisciplinary science of sustainability' (Spangenberg 2011: 275). Td sustainability sciences fall in the category of science of sustainability. This emergent mode of research is aiming at the plurality of knowledges and perspectives, as well as process orientation combined with a normative orientation towards sustainability or SD. It is criticising modern institutionalised demarcations and understandings of research, such as scientific objectivity and progress (Vilsmaier et al. 2017; Vilsmaier 2018). Research in td sustainability sciences may open up a platform on which the boundaries that constitute research are shifted (Schmidt 2011). Relationships between the scientific and non-scientific emerge, for example in consideration of traditional or local everyday knowledge (Klein 2014).

According to Julie Thompson Klein's analysis of discourses on transdisciplinarity, the dominant understanding of and lived research cultures in td sustainability sciences is attributable to the 'discourse of problem solving' (Klein 2014: 70; Schmidt 2011). The discourse is represented by the Swiss-based 'Network for Transdisciplinary Research' known as 'td-net', that was founded at a congress held in Zurich in 2000. Thus it is sometimes classified as a 'Swiss or German school of TD because the approach was signaled in the late 1980s and early 1990s in Swiss and German contexts of environmental research' (ibid: 74). The results of a collocation analysis focusing on the concept of problem in English-speaking articles of the journal *GAIA* published up to and including the year 2017 confirm that td sustainability sciences appeal to problem-solving as their normative target (Meyer 2020).

## Exemplary problem understandings in transdisciplinary sustainability sciences

### Controversial problem contents as justification moments for sustainability sciences

The first UN conference on the human environment in Stockholm in 1972, as a reference point for sustainability sciences, showed that what are regarded as sustainability-related societal problems is contested. The countries of the Global North in particular demanded measures to limit industrial pollution, while the countries of the Global South pushed for a catch-up of prosperity and brought forward medical and educational concerns. There were therefore different ideas about this conference, which resulted in a compromise to capture everything as environment and to conceptualise human progress with the label of SD in order to dissolve the contradiction or better emphasise the compatibility between economic growth and environmental protection (Hopwood et al. 2005; Sneddorn et al. 2006; Vanhulst/Beiling 2014).<sup>5</sup>

### Challenge

The normative background against which problems are assessed is a functioning society as a prerequisite for SD. SD itself is equated with a societal challenge. The use of the concept of challenge points to the following developments: problems associated with sustainability are labeled as societal challenge(s), replacing so-called old social problems, like hunger, illness, and poverty (Rockström et al. 2009; Jerneck et al. 2011). The sustainability challenges, in their unlocalised rhetoric, refer to expected welfare losses or gains, are uncertain, speculative, and cannot be understood by social collectives from experiences (Jerneck et al. 2011). At the same time, they are communicated as alarming due to the irretrievability of unique opportunities with advancing time (Moore 2016). Within market economy thinking challenges are connoted positively as they simultaneously offer an opportunity for innovative advancement and progress for a sustainable society, if correspond-

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<sup>5</sup> The comprehensive *empirical* question about how the controversial problems found their ways into td sustainability sciences or were not assessed as relevant, must first be put aside.

ing – also positively connoted – risk-oriented performance is shown. The sustainability challenges thus fit without contradictions into the discourse of the freeing of the markets from socio-ecological policy regulations.

Sustainability challenge is a relative concept that does not diagnose any spatial and temporal limits or goals in view of future uncertainties to be speculated. Therefore the term describes the discourse of SD as a dynamic shift of boundaries or relative goal within the concept of weak sustainability. This is incompatible with the discourse on strong sustainability (Ott/Döring 2004; Ziegler/Ott 2011), which in turn *identifies* planetary boundaries (Rockström et al. 2009).<sup>6</sup> Within these boundaries all human endeavor and striving, the mode of economic activity, has to happen. This discourse was stronger in *Limits to Growth* (Meadows et al. 1972) and in the environmental concerns at the beginning of the 1970s (Williams/Millington 2004). What is also striking is another development that goes along with the terms of the ‘problem’ and ‘challenge’: ‘dilemma’ is underrepresented as a concept in sustainability-related scientific publications.<sup>7</sup> This term means that there is no solution that would be morally acceptable to all stakeholders – we remain terminologically in the discourse strand of the td sustainability sciences – to derive a conflict-free action. The concept of ‘dilemma’ indicates epistemological or ethical issues, namely, how to deal with manifold and conflicting epistemologies or moral norms, or which ethical legitimacy becomes accepted and how. These questions are not central in td sustainability sciences (Krohn et al. 2017). It therefore seems promising to work on the thesis of a repression of dilemma and conflict in discourses on sustainability and SD in light of the solution of familiar social problems with market economic strategies – rebranded as sustainability challenges. One hypothesis is that the prioritisation of intergenerational instead of intragenerational research questions and the marginalised theories dealing with differences and moral conflicts in td sustainability sciences explain each other.

After the naming of the problematic of td sustainability sciences, the next part of this chapter attempts to highlight theoretical-methodological

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6 The Rockström et al. paper, however, leaves a space for discussion open by using the term challenge.

7 No search results (August 2018) came from the terms ‘moral dilemma AND sustainab\*’ in the Web of Science, a relevant database of scientific publications (<https://login.webof-knowledge.com/>).

starting points, which answer to just that epistemic-ambiguous (Harrasser/Sohldju 2016) problematic, namely being taught to think in an even, sustainable way ‘that created today’s turbulence [and] is unlikely to help us solve it’ (Moore 2016: 1). In so doing, the figure of the problematic, as it is envisaged in French philosophy of the 20th century, is connected to td sustainability research for further development.

### The problematic *in* transdisciplinary sustainability research

In td sustainability research, moral and epistemological dimensions are interwoven. Reading about the problematic in twentieth-century French philosophy<sup>8</sup> raises the question of an *epistemology of the problematic* that can supplement the basic normative coordinates in sustainability and sustainability research – change and adaptation – with basic questions. Such as, how does td sustainability research understand, explain and perform relationships between and through the form of research itself, concerning individuality, collectivity, subjectivity, and objectivity? In the following, I take up Gilbert Simondon, because his thinking of the problematic can enrich conceptual approaches in the process- and change-oriented td sustainability research (Engbers 2020) that orient beyond hegemonic discourses and practices of SD.<sup>9</sup> With his conceptualisation of dynamics and change through close studies of the modes of functioning of the living, Simondon is able to offer a ‘radically transdisciplinary’ (Scott 2014: 3) alternative to a mechanical concept of *development* covered in the hegemonic discourse of SD. In contrast, the problematic becoming, or individuation, as he calls the dynamics as dimensions of the living, keeps moving in permanent relation to particular, multi-layered, multi-dimensional, interior and exterior (Voss 2018: 101) environments. Individuation describes the inventive finding of a partial own in the conditional higher social dimension, by transindividual participation (Simondon 1964/2007: 31; Voss 2018: 96, 104). The psychic and the collective

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8 The interdisciplinary research project ‘Complexity or Control? Paradigms for sustainable development’, in preparation for the workshop ‘Thinking the Problematic’, read together several philosophical texts.

9 I have worked with a few existing translations into German and English of his work as well as secondary literature.

are constituted by individuation (Simondon 1964/2007: 36).<sup>10</sup> Individuation, as a structural description of the dynamics and vectors of change, is neither to be understood as a sole adapting to the specific higher social dimension, nor to be understood in such a way as to be based solely on the change of the higher social dimension. Rather, individuation is explained by inventing internal structures (Voss 2018: 95), in accordance with the changed exterior structures, and, thus, inventing a new metastable, participative and symbiotic relationship state between exteriority and interiority (Simondon 1964/2007: 35). The problematic arises through resonating the exterior in the interior (Voss 2018: 94). Individuation is an ever-inventing of new problematics and always necessary dynamics of living (Simondon 1964/2007: 36). For sustainability research the recognition of Simondon's structure of individuation would provide the ability to interweave with an awareness of environmentality, the interior, the exterior, as well as with a different awareness of temporality, such as of the previous, and the future. The political-normative of sustainability is manifested in the dynamics of change, whereby these are to be thought of as, in different strengths, mutually conditional interwoven starting points: the interior, the relations and the exterior (Harrasser/Sohldju 2016; Voss 2018: 98). The problematic is generative and sustainable, because it cannot be resolved by an optimistic detachment from material conditionalities for the living such as the externalisation of the global dimensions of our modes of production and consumption, for example.

Sustainability sciences are based on ethics, because of their explicit normative orientation towards sustainability. Which policies of change, which collective normative movements (such as those contained in a normative-prescriptive sustainability ethics or in the SDGs), can we deduce from the dynamics of life described in this way? Where do I find the normative momentum with regard to sustainability? A normative momentum that is not assessing or defining the uncertainty of a problem-transformation with regard to fixed outcomes, nor talking of sustainability problems or challenges, but of sustainability-related events that provoke social changes to challenge sustainability research with the question: Why and how may sustainability researchers shape these social changes? Which normative movement can be invented in concepts 'such as ecological economics, polit-

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<sup>10</sup> Just as little is said of an initial psyche confronting an initial collective, epistemologically an initial juxtaposition of subject and object can be used (Maniglier 2012).

ical ecology, de-growth, ecosocialism, ecofeminism, environmental justice' (Vanhulst/Beiling 2014), i.e. for the preservation of life and how to work in td sustainability research?

### Methodological problematic

How can we think of methodologies for td sustainability research that are coherent with *epistemologies of the problematic* (Maniglier 2019)? How to shape conditions for transdisciplinary possibilities to unfold the problematic? How can we activate an ethical practice in td sustainability research that allows for the speculative and failure and, thus, arrive at an ecology of practices that create spaces of opportunities beyond a cling to computable decision nodes (Stengers 2010)?

The problematic in td sustainability research may be addressed by situational, contextualised decision-making and responsiveness, 'local values, traits, beliefs, and arts for action' (Fals Borda 1995), entrepreneurial creativity, humor (Savransky 2018), attitude and ethics (Meckesheimer 2013), as well as an (algorithmic) learning, which recognises temporally and spatially related, multiple different sustainability contexts and continues the resulting decisions as limiting moments, instead of universal, methodical programs (Harrasser/Sohldju 2016). Methodological approaches that go in this direction are oriented along 'a questioning perspective that does not rush for direct straightforward solutions to problems, [...] an appeal to imaginative possibilities and especially subversive imagination; a hands-on approach to experimentation which is not limited to linear logico-deductive processes [...], spaces of possibilities to play and experimentally and aesthetically engage with.' (Kagan 2015: 2) In search for a 'particular methodology in transdisciplinarity' through his Deleuze reading, Patrice Maniglier calls for 'the introduction of comparative methods across the disciplines': 'To compare consists in experiencing, within one's system of categories, a variation of the very type that functions as the heading that makes the comparison possible' (Maniglier 2019).

There are diverse and recent methodical examples and experiments that can be interpreted as problematic and transdisciplinary methodology, or that have even been designed as such: design methods (Jonas 2015; Peukert/Vilsmaier 2019), generative picturing (Brandner 2020), transformative scenario planning (Freeth/Drimie 2016), case-based mutual-learning sessions

(Vilsmäier et al. 2015), mutual listening (Meckesheimer 2013), story-telling salons (Richter/Rohnstock 2016), and remembrance work (Haug 1999). With a ‘thinking practice of problematic designing’, Daniela Peukert and I recently attempted to open an epistemological perspective in and for td sustainability research. It is designed to methodologically capture the experience of a problematic (Meyer/Peukert 2020) and for a multi-dimensional methodology allowing Simondon’s approach to be interwoven with the complexity that sustainability and td sustainability sciences demand. In addressing questions of how we can include the conditions of our research into the research itself, we can work out dimensions in and for the respective research situation. The epistemological concept of problematic designing, as a thinking practice, together with the methodological design canon, is an invitation to expand the methodological canon of td sustainability research.<sup>11</sup>

Epistemologies of the problematic start at the relation to uncertainties, be they the past, the other or the future (Vilsmäier et al. 2017) and regard ‘the effects themselves (as) the cause of the world’s development’ (Aicher 1991: 186, my translation; Harrasser/Sohldju 2016; Moore 2016). The (future as) playful-speculative remains tied back to its conditions, namely (preservation of) life itself and its ‘pre-individual nature’ (Voss 2018: 96).

That calls for an ethical research practice, protected against neoliberal re-enclosure (Meckesheimer 2013; Strong et al. 2016) to enable td researchers to make decisions without competitive pressure and not to set numerical optimal solutions but an ‘ecology of practices’ as a standard (Stengers 2005; 2010). The speculative is therefore no challenge to climb the highest mountain but to invent other mountain worlds. Td sustainability research must distinguish itself from a concept of science that evaluates the progress of knowledge, as well as researchers on the basis of an impact factor (Schmidt 2011) and that always excludes other forms of research (Meckesheimer 2013), as well as unpredictable insights – which, however, are relevant to sustainability research and, thus, to sustainability. As Andreas Kläy et al. ask in the journal *Futures*: ‘Science for sustainable development is, thus, confronted with a fundamental contradiction arising from this double normative framing of science policy: can scientists really live up to their role of contributing to sustainable development, while at the same time helping societies achieve

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<sup>11</sup> Daniela Peukert is currently working on this topic as part of her PhD, see <https://www.danielapeukert.de/>.

only greater economic growth, at the expense of equity and the environment?’ (Kläy et al. 2015: 73)

## Conclusions

The idea of sustainability allows us to reflexively refer to different ways of life on planet Earth with regard to our own behaviour and at the same time renegotiates the material conditionality for these ways of life. Being normatively oriented towards sustainability, td sustainability sciences appeal to problem-solving as their sole target. At the same time, they are characterised by a critical stance towards modern institutionalised demarcations and understandings of research, such as scientific objectivity and progress.

This contribution highlights epistemologies of the problematic for td sustainability research against the background of the problematic constitution of the hegemonic discourse of SD as a critical, problematising discourse-analytical approach towards problems in td sustainability sciences. The hegemonic discourse of SD is aligned to a neoliberal economic-political interpretation of organising a modern way of life (Castree 2002). Sustainability, thus, under the roof of SD, might serve to strengthen and spread neoliberal hegemony and is the product of a culture, based on a ‘Eurocentric Cartesian worldview’ (Vanhulst/Beling 2014: 59; Meyer/Vilsmäier 2020), that has a specific relationship, namely a separating, between the individual and the collective, humanity and nature (Moore 2016). Ecological interests, as well as the concern that ‘no one will be left behind’ (SDGs 2015: Preamble) are then left in marginalised positions. The hegemonic discourse on SD likewise requires the unsustainability of modern ways of life and economy (Dingler 2003) and does not deal with the unsustainable state of the national economy in transnational markets (Parenti 2016).

Thus, the project of td sustainability research offers a problematic opportunity for its own restructuring. A sustainability (research) ethics of the problematic will on the one hand react to (historically conditioned) dependencies and asymmetries (such as hegemony) (Harrasser/Sohldju 2016; Acosta/Brand 2018), thus recognising a true materialistic core of sustainability. But on the other hand be dynamic – as a backwardness to the dynamics of life itself – and open. Then, td sustainability research engages with its problematic of hegemonic structures in science, characterised by a ‘double normative



framing' (Kläy et al. 2015), founded in liberalism itself. But the problematic is just as well a force to initiate a transdisciplinary and ethical way of relations between entities, which can unfold according to the hegemonic conditions. Reviewing Judith Shklar's 'Liberalism of Fear', Seyla Benhabib and Hannes Bajohr write that we will have to ultimately draw 'a clear line between liberal market capitalism and the political essence of liberalism' (Benhabib 2013: 67, my translation), namely the 'ability to place oneself in the position of the victims' (Bajohr 2013: 145, my translation). In terms of td sustainability research, this means engaging 'not in the back but in the face' (Harrasser/Sohldju 2016: 86, my translation) of social change (Meckesheimer 2013), and 'studying with, and not only about social groups, or at least studying the hegemonic articulations of power' (Mato 2000), namely of ourselves (Freire 2007 [1968]; Fals Borda 1995).

Problems in the context of SD are conceptualised and essentialised differently, as the UN conferences, based on the need to decide between poverty reduction and environmental protection, show. This, in turn, testifies to their relative momentariness. Sustainability thus demands a problem definition of a case-based singularity (Maniglier 2019), in which the internal and external references in the way of individually becoming are recognised, shaped and assessed. Td sustainability research can therefore be understood as complex insofar as we see ourselves as part of the problem (van der Leeuw/Zhang 2014) and do not confront a research topic as a problem. If we reinforce this research paradigm, td sustainability research can process the interweaving of epistemological and normative dimensions. Further work towards epistemologies of the problematic, and a sustainable future, ways of life and cosmologies, beyond the European, should be explored against the background of European perspectives and theories on the concept of the problematic (Vanhulst/Beling 2014; Maniglier 2019).

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# GAIÄ 1 | 2020

ECOLOGICAL PERSPECTIVES FOR SCIENCE AND SOCIETY  
ÖKOLOGISCHE PERSPEKTIVEN FÜR WISSENSCHAFT UND GESELLSCHAFT



- VEREINTES ZIEL KLIMANEUTRALITÄT
- POWER IN TRANSDISCIPLINARY RESEARCH
- GEMEINWOHLORIENTIERTE WISSENSCHAFT

## Solvable problems or problematic solvability?

### Problem conceptualization in transdisciplinary sustainability research and a possible epistemological contribution

*Problems are a major focal point in transdisciplinary sustainability research (TSR). As a text analysis shows, the term “problem” is most commonly used in the context of analyzing research processes that are directed towards societal problem-solving. At the same time, these findings imply that TSR does not follow the idea that problems are solvable. Instead, TSR should transgress the general tension between the solution imperative and the insolubility of complex problems by rather tackling each problem as situated and specific.*

Esther Meyer

#### Solvable problems or problematic solvability?

Problem conceptualization in transdisciplinary sustainability research and a possible epistemological contribution  
GAIA 29/1 (2020): 34–39

#### Abstract

Problem orientation plays a significant role in emerging transdisciplinary sustainability research (TSR), where the assumption of solvability resonates with the term “problem” yet is not questioned from a sustainability perspective. This paper questions the meaning of “problems” in and for TSR from a discourse studies perspective. The results of a collocation and concordance analysis of the term “problem(s)” in GAIA articles show that sustainability-oriented problem-solving is explicated normatively as a key research goal. In the analyzed articles, emphasis is put on how to proceed towards this goal through research process analysis. This paper begins by analyzing the meaning of “problems” before seeking to orientate TSR in terms of how knowledge could be conceptualized. This is supported by the epistemological concept of the problematic, which originates from 20<sup>th</sup> century French philosophy. It proves helpful to discuss how TSR can be epistemologically grasped, and thereby strengthened in its transformative potential.

#### Keywords

collocation analysis, complexity, computer-assisted discourse studies (CADS), concordance analysis, epistemology, GAIA journal, problematic, transdisciplinary sustainability research, wicked problems

Esther Meyer, MSc | Leuphana University Lüneburg | Faculty of Sustainability | Center for Global Sustainability and Cultural Transformation | Methodology Center | Universitätsallee 1 | 21335 Lüneburg | Germany | esther.meyer@leuphana.de

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Exploring sustainability leads to the question of how to deal with unsustainable problem patterns and, thus, brings forth relatively new concepts in the sciences, such as sustainability sciences and transdisciplinary research. Societal problem orientation seems to be, historically, a central, defining element in transdisciplinary sustainability research (TSR) (Pohl and Hirsch Hadorn 2006, Klein 2014, Osborne 2015, Engbers 2019). The implicit assumptions underlying the societal problem orientation, in turn, have consequences for how we can identify problems in the first place. The article begins with this proposition in order to raise the question of the term “problem” in TSR.

The discursive constitutions of problems in TSR, and their implications for sustainability, though, have been researched very little so far (Bühmann and Franke 2018). An inquiry on the term “problem”, in, and for, sustainability sciences discloses the general philosophical question about the conceptualization of problems, which are considered as “motor[s] of thinking and practice” (Bowden and Kelly 2018, p. 3). The “way in which problems are framed [...] has significant implications for policy development and societal outcomes” (Abson et al. 2017, p. 35). Moreover, the direct reference of transdisciplinary research to addressing real-world problems has “epistemological implications” (Krohn et al. 2017, p. 343). There is therefore a need for an investigation of these epistemological implications of the conceptualizations of “problem” in TSR. My aims are thus twofold:

- First, to investigate the lexical contextualizations of the term “problem(s)” in TSR, and how they allow explaining what problems might mean for conceptualizations of knowledge and science. The corresponding research question is: how are problems conceptualized, contextualized, and evaluated in TSR? Therefore, an exemplary analysis of the term “problem(s)” has been conducted on English language articles in the journal GAIA, with the help of computer-assisted discourse studies (CADS).
- The second goal is to refer to the epistemological potential that lies in exploring the historical-analytical and transformative

concept of the problematic for TSR. The concept has been constituted by French philosophy from the second half of the 20<sup>th</sup> century and can contribute to a productive discussion of the problem conceptualizations in TSR.<sup>1</sup>

#### Collocation analysis

A collocation analysis reveals the constitution or formation of discourses on a word of interest, known as a node, by statistically calculating how likely it is that the node word will be accompanied

*In the articles analyzed, the term “problem” mainly derives its meaning from being integrated in research for societal problem-solving. Problem-solving is even conceptualized as research. Research into causes or concrete solution perspectives occur only sparsely.*

### Material and methods

My discourse-analytical approach is supported by CADS using collocation statistics (frequency and mutual information) embedded in the applied corpus linguistics software *AntConc*. The methodological elements that have been used to analyze the *GAIA* articles are explained in detail below.

#### Corpus and corpus construction

The corpus<sup>2</sup> contains all English language contributions<sup>3</sup> published in the journal *GAIA* up to and including 2017. In total, the corpus contains 325 articles.<sup>4</sup> The journal is Swiss- and German-based and published quarterly by the publisher oekom with English or German language articles. The first volume was published in 1992. As its two most relevant topics, the journal lists “Transdisciplinary Environmental Research” and “Sustainability Science”. *GAIA* engages explicitly “with the causes and analyses of environmental and sustainability problems and their solutions”.<sup>5</sup> The journal has been a relevant medium in the evolution of TSR, which makes the articles a meaningful corpus for studying my research questions.

#### Computer-assisted discourse studies (CADS)

Critical discourse analysis “is the analysis of linguistic and semiotic aspects of social processes and problems” (Fairclough and Wodak 1997, p. 271) in their qualitative range or in a particular society during a particular time (Jäger and Zimmermann 2010, Mautner 2005). Critical discourse analysis together with the quantitative methodology of corpus linguistics yields CADS (Partington et al. 2013).

In applying CADS, I chose a methodological approach to “take those units of language that are so frequent that we hardly notice them, and show how powerfully they contribute to the construction of meaning” (Moretti 2009, p. 156). Accordingly, my CADS approach consists of two steps: in a first step the *collocation* analysis allows me to quantitatively generate a relevant material basis, which I then conduct a qualitative *concordance* analysis on. I concentrate on contextualizations, conceptualizations, and meanings of the term “problem(s)” in the constructed *GAIA* corpus by initially calculating the so-called *collocates* of the search term \*problem\*.

by certain other words (called collocates). Collocation analysis measures the strength of the relationship between two words through determining 1. the exclusivity (how often do they appear away from each other) and 2. the statistically significant frequency of their co-occurrence (depending on the frequency of words in the corpus) (Baker et al. 2006).

#### Concordance analysis

The collocates enable the researcher to reconstruct the so-called *discourse prosody* – the “connotational colouring beyond single word boundaries” (Partington 1998, p. 68). The meaning of the combination of node and collocates, called collocation, is then constituted by the qualitative analysis of the concordances, that is, the textual contexts in which the collocations occur (Baker 2006, Stubbs 1994).

For the concordance analysis, the collocations are clustered in an intermediate step, for example, according to the same word stem. This initial clustering is then reviewed as part of the qualitative concordance analysis, and adjusted if necessary. The latter, in turn, means that collocations of little significance for the research thesis are not explained in the results.<sup>6</sup>

#### Technical settings of the tool *AntConc*

I use the collocation freeware tool *AntConc* Version 3.4.4 for Macintosh (Anthony 2014, see also Dzudzek et al. 2009). The tool offers statistical calculations for measuring the collocation strength, that is, the tendency of a word to statistically significantly co-occur with certain other words (collocates) in a corpus (Baker 2016, Ja-

1 See Meyer and Peukert (2020).

2 The term “corpus” comes from corpus linguistics and describes the material being analyzed, such as text from journal articles.

3 My broader research interest lies in analyzing the discourse of sustainability sciences. As it is dominantly constituted by its global, universal orientation, publications are written in English. There are marginalized discourses that arise in other linguistic areas, but their analysis is not a subject of this paper.

4 In the following, “articles” are (additionally) synonymously referred to as “files”. The table of contents as well as the rubrics *Abstracts* (until 2004), *Book Novelities* (from 2005 on), and *Photo Special* are not part of the corpus.

5 <https://www.oekom.de/zeitschrift/gaia-2>

6 Some of the collocates are left out of the table: real, loss, environmental, design, specific, these, many, transdisciplinary, because, when.

TABLE 1: Collocates of \*problem\* (sorted by collocation strength, measured using the *mutual information score*, MI). Fr: frequency; Fr Files: number of files in which the collocate appears; Fr L: frequency of the collocate appearing to the left of the node \*problem\*; Fr R: frequency of the collocate appearing to the right of the node \*problem\*.

FR FILES	FR	FR L	FR R	MI	COLLOCATE
5	53	50	3	10.56888	wicked
41	70	22	48	10.53096	solving
37	51	45	6	10.09224	solve
16	20	2	18	9.55368	solved
10	22	6	16	8.62844	identification
39	55	38	17	8.31020	solutions
23	29	20	9	8.20654	solution
12	38	3	35	7.80160	oriented
35	57	47	10	7.72677	complex
19	62	57	5	7.60098	societal
20	24	23	1	7.13864	address
20	39	19	20	6.43536	problem
19	28	20	8	6.24324	related
7	21	14	7	5.77607	waste
17	21	16	5	5.58064	scale
23	42	24	18	5.53189	knowledge
36	58	35	23	5.52969	global
14	20	18	2	5.46057	health

worska and Krishnamurthy 2012, Baker 2006, Sinclair 1991). The calculated ratio I used is called *mutual information* (MI). The higher the numerical value of the ratio, the greater the strength of the relationship and the association between the node and the collocate (Baker 2006, p. 101).<sup>7</sup> The following parameters have been defined to establish the framework for the statistical calculation of the *mutual information* score in the given corpus:

- collocation window or span of five words to the left and five words to the right of the node “that are considered as candidate collocates” (Baker 2016, p. 140);
- minimum frequency of the node to appear with a candidate collocate within the set span is 20 times (Baker 2016);
- threshold for statistical association is scored with a *mutual information* value of six (Baker 2016).

### Results of the computer-assisted discourse studies

The collocates of \*problem\* are represented in table 1. In the corpus, “P/problem” appears 762 times in the singular and 817 times in the plural.<sup>8</sup> The term “P/problematic” appears 54 times in the corpus, in a highly dispersed manner. The file in which the term occurs most frequently presents the English adjective form, for example “problematic development” and “problematic urbanization”. Apart from these occurrences, problems are scarcely discussed as adjectives. The lemma \*problematiz/s\*, indicating the verb form, only appears four times in the corpus.

In the following, the collocations, within their concordance profiles, are explained in a qualitative way (Baker 2006, p. 120). This results in individual, semantic or thematic groupings of collocates. The order of the collocates is roughly based on the *mutual information* value in descending order, as in the table. The concordance analysis allows for result clusters, which are highlighted in bold below, expanding the individual naming and clustering of collocates according to their word stem. The results represent exemplary meaning contexts of \*problem\* in TSR.

“Wicked” obtains the highest collocation strength with \*problem\*. Wicked as a word appears 59 times in the corpus, 53 times together with \*problem\*, and 50 times as “W/wicked P/problem(s)”. The only collocates of the node „wicked“, in turn, are “problem” and “problems”. For Rittel and Webber (1973) wicked problems mean “ill-behaved” (Rittel 1971) problems with complex interdependencies. In the corpus, only five files feature an occurrence of the combined terms.

The collocates of \*problem\* indicate that the meaning of problem in the corpus is most commonly connected to “solving”, “solve(d)” and “solution(s)”. These collocates are all among the seven highest values of *mutual information*:

- Looking at all concordances of “solving”, nearly all hits contain the collocation pair “problem solving”. What “problem solving” as an activity refers to in the concordances remains on an abstract level: “complex”<sup>9</sup>, “environmental”, “sustainability”, “real-world”, “societal”, and “wicked”.
- In contrast to “solving”, “solve” appears to the left for grammatical reasons, as in the collocation pair “solve ... problems”. The problems listed are “pressing”, “complex”, “real-world”, “relevant”, “existing practical”, “nitrogen”, “waste”, “environmental”, “transdisciplinary”, “specific”, “local”, “our fundamental”, “other communities”, “all (political)”, and even “wicked and therefore irresolvable”.
- “Solution” and “solutions” often mean (“possible”) solution(s) to/for/of “lifeworld”, “sustainability”, “environmental”, „contextualized societal”, “societally relevant”, “social”, “local”, “wicked”, “actual”, “everyday”, “pressing”, “related”, “specific”, “practical”, or “complex” problems.

All this collocations show the conceptual separation of problems from solutions, where problems are described on the one hand and the claim of solubility is mentioned on the other hand.

The concordances of the collocate “identification” show that the term “problem” is used when describing a *research process*: the

<sup>7</sup> The MI is derived from the ratio of the frequency of the collocation and the product of the single words’ frequencies (Baker 2006, p. 101).

<sup>8</sup> For comparison, “S/system” occurs twice as often in both versions, singular (1464), and plural (1564), and “systemic” 150 times. There are also 1102 occurrences of “ecosystem” and 658 incidences in the plural, “ecosystems”.

<sup>9</sup> The MI of “complex” as a collocate is lower than those of “solve”, “solution(s)” and “solving”, but the frequency of “complex” is among the five highest. Thus, “complex” tends to appear often in the corpus but less significantly together with “problem”. Complex problems are associated with spatial and temporal scales (“complex nature of today’s problems”, “global”).

research process is communicated as being divided into phases, with “joint problem identification and structuring” being the first phase (“problem identification phase”; „starting with the identification of a societal problem”), while finding solutions seems to be an endpoint (“phases of research from problem identification to finding solutions”).

“Societal”, together with “problem”, is used to describe the *relation of societal problems and (process-oriented) research*, the connection between “scientific knowledge production and societal problem handling”. This relationship is addressed by means of various dimensions:

- research for or even as societal problem-solving: the research questions relate to a societal problem but the research has to be conceptually and analytically separated from the problem;
- societal problems as a research topic “under investigation” to gain “empirical and theoretical knowledge about a societal problem field”: the “researchers reflect about what the societal problem actually is”;
- and reviewing, (science-) political strengthening of, and improving research for societal problem-solving (research about research): its “future”, “ways to better link research to societal problem solving”.

There is little *thematic labeling of the problems* in the analysis of the meaning contexts of the term “problem”. “Waste” and “health” are the only content/thematic collocates of “problem”. “Habitat-related” and “transport-related” problems appear once each in the concordances, and “water-related” problems, as, for example, “water contamination as a recognized societal problem”. As other problem topics, “values, perception and social issues”, and “problems of pollution and overexploitation” emerge.

On an abstract level, there are several notions of problems being *interrelated*, for example, “SD [sustainable development] is expected to address inter-related socioeconomic and environmental problems”. Furthermore, “scale” is a relevant collocate, and occurs a few times in the collocation pair “large-scale problems” or just as “scale problems”. In addition to the more common global scale (“global problems”), also “the Multi-scale Nature of Environmental Problems” is mentioned because “solutions change in time, space and scale”, and “transdisciplinarity acknowledges the need to address the complexity of problems”. Further collocations with terms of scale occur in the concordances, “address both local and global societal problems”, “solve problems on every scale”, “requiring regional solutions”, as well as a “local problem identification” and the statement that “technological packages cannot sufficiently address local situations and problems”.

Concerning *concrete solution perspectives* in the concordances of \*problem\* there are four: “green economy will not effectively address the problems of environmental degradation”, “efficiency is the quickest way to address water problems”, “nanotechnologies are expected to help address many of the problems facing society”, and also that there is the “necessity to change [...] lifestyles”.

However, many *research process-related solution perspectives* can be discovered, such as “research practice knowledge”, “enabling

effective problem-oriented research for sustainable development” or “reality- and problem-related learning”. They can be summarized on two different levels:

- solution perspectives that are related to the *researchers* themselves: “makes researchers aware that a societal problem is dynamic”, “engage our students in problem-oriented research”.
- outcomes of a research process: “providing problem-oriented knowledge”, namely, “appropriate indicator to reveal or address these problems”, as well as “build participation platforms which address these problems in a scientific way”.

Summing up, firstly, a solution orientation of problems is indicated by high collocation strengths of the pairings of “solving”, “solve(d)” and “solution(s)” with \*problem\*. Second, the relation of societal problems and (process-oriented) research emerges as a result cluster. That means, the problem and solution orientation is integrated into research process steps. Solution dimensions include practice, researchers, and the outcomes of a research process. Third, problems are considered interrelated and meant to be explored on different scales. Fourth, the high collocation strength of “wicked problem(s)” is explained by “W/wicked problem(s)” being a specified problem concept. Fifth, concrete solution perspectives only occur sparsely in connection with the term „problem“.

Besides, it is particularly remarkable that \*caus\*, origin\*, or \*motiv\* are missing completely from the collocations. Cause research is not linked to the term “problem”, which, among others, Wiek and Lang (2016) have already pointed out.

### Solvable problems or problematic solvability?

The term “problem”, in the articles, tends to relate to *how* to reach the goal of societal problem-solving by analyzing research processes. In addition to the analytical description of research processes, societal problem-solving orientation of TSR indicates a normative orientation. The normativity is addressed by appealing to (sustainability) action (“problems must be solved”, “there are still various problems to be solved”, “a problem that remains to be solved”).

At the same time, the findings do not seem to imply that TSR follows the idea that *problems are solvable*, even stating the contrary: “Problems without readily available solutions”, “problem hard to solve”, “(C)limate change is not a problem that can be solved”, “there simply are no solutions to some of the problems”, “sustainable and comprehensive problem solution will not be possible”, “wicked and therefore irresolvable”. Katie Ross and Cynthia Mitchell have recently published on wicked problems, stating that they “manifest from, and are driven by, the linear logic of the Cartesian-Newtonian paradigm” (Ross and Mitchell 2018, p. 40) and its “inability to grasp complexity” (Ross and Mitchell 2018, p. 41).<sup>10</sup> TSR, >

<sup>10</sup> In a similar way, Weingart (2000) has already pointed out the conditionality of understanding problems about 20 years ago.

with its orientation towards solutions and towards wicked problems, is thus embedded in a (research) paradigm that will struggle with wicked complexities, and at the same time causes their genesis (Ross and Mitchell 2018, pp. 43, 48). As Klein (2014, p. 68) writes, the pressure to solve problems marked and fostered interdisciplinary research already “in the first half of the 20<sup>th</sup> century”. Is it wise for future interdisciplinary and transdisciplinary sustainability research to cling to problem-solving as part of a communicative strategy that “still provides a strong narrative for scientists” (Van Drooge and Spaapen 2017) but may, however, be “epistemologically naïve” (Klein 2014, p. 71)? In an attempt to address this question, in the next section, I will introduce the concept of the problematic as an outlook.

### Epistemological outlook: the problematic

An *epistemology of the problematic* (Meyer forthcoming) puts to the test the frame of knowledge production itself. It addresses the “changes that [transdisciplinary research] brings into the current knowledge system” (Krohn et al. 2017, p. 341, own translation), and for which a comprehensive epistemological analysis is pending (Krohn et al. 2017, p. 341). Since the emergence of a historical epistemology by French philosophers in the 20<sup>th</sup> century, thinking around the problematic has developed further.

The concept of the problematic has questioned the subject-object dichotomy, which makes it interesting for a critique of dichotomizations, such as in the Cartesian-Newtonian paradigm, by transdisciplinary research (Vilsmaier et al. 2017, Ross and Mitchell 2018): “the concept of *problematique* initiates a critique of the subject-object relation in the explanation of thought in general and of science in particular” (Maniglier 2012, p. 21). The critique also refers to the distinction of problem and solution (Nicolescu 2010), as well as to the goal of problem-solving and the simultaneous

knowledge of the un-solvability of complex sustainability problems.

According to Maniglier (2012, p. 21), “to think is to try to solve specific, singular problems”. Similarly, Stengers (2005) introduces her concept of *ecology of practices* as a tool for thinking, which builds on situated thinking (Stengers 2005, Harrasser and Sohldju 2016). Regarding the term “problem”, Stengers (2005, p. 193) formulates, “a problem is always a practical problem, never a universal problem mattering for everybody. Problems of the ecology of practices are also practical problems in this strong sense, that is problems for practitioners”. The references to the local scale in the colloquations fit to Stengers’ definition of a practical problem.

With an epistemology of the problematic, research can intervene in ecological, communicative, social and institutional contradictions and uncertainties, thus leading the way to a political goal such as sustainability. In doing so, more steps out of the strategic planning and analysing of research processes and into the implementation of sustainability can be made.

### Conclusion

This paper is primarily intended to contribute to a self-understanding of TSR, and further communication about it, based on the analysis of the conceptualizations of “problem(s)”. The discussed results show the focus on analyzing research processes in TSR that should reach the goal of societal problem-solving. Problem solving is even conceptualized as research. Specific solutions and problems as well as their causes tend hardly to be named. The assumption of the separability between problem and solution dimensions can be read linguistically.

At the same time, however, there is a tendency towards seeing problems as interrelated and scale-related approaches, and wicked problems are discussed as well. These last-mentioned tendencies can be understood, explained, and fostered by the epistemologi-

Nachhaltigkeit

A-Z





P

wie Perspektiven

Ein sich durch grenzenloses Wachstum stabilisierender Kapitalismus wird vor allem durch Männer getragen. Die für den Fortbestand der Welt zentralen Aspekte der Lebenssorge werden als weibliche Aufgaben aus dem männlichen Denken und Handeln ausgeklammert und männlichem Expansionsstreben untergeordnet. Die in diesem Band versammelten Beiträge diskutieren das kulturell vorherrschende Selbstverständnis von Männlichkeit aus den Perspektiven von Geschlechterforschung und Postwachstumsdebatte.

S. Scholz, A. Heilmann (Hrsg.)  
**Caring Masculinities?**  
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cal concept of the *problematic*. It may strengthen the self-assurance of scientists in “real-world”, “societal” projects during implementation phases, and help us, as sustainability researchers, find more confidence to face the messy sustainability issues and the complexity of (“wicked”) “problems”, which marked the historical foundation of TSR (Jantsch 1970, Nicolescu 2002, Max-Neef 2005).

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**Esther Meyer**

Born 1987 in Fürth, Germany. Studies in philosophy, economics. 2014 MSc in sustainability science. Since 2014 doctoral candidate at Faculty of Sustainability, Leuphana University Lüneburg, Germany. 2015 to 2019 research associate, Leuphana University Lüneburg, project *Complexity or Control? Paradigms for Sustainable Development* funded by Volkswagen Foundation, funding initiative *Niedersächsisches Vorab: science and scholarship for sustainable development*. Currently, Transformative Research Project Manager of Lighthouse gGmbH Europe North, working on social-ecological sustainability action and research with civil society organisations. Research interests: teaching, making, methodological development for, and research on transdisciplinarity in the context of sustainability.







V. Paper 5

## Social Epistemology

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# Designing a Transformative Epistemology of the Problematic: A Perspective for Transdisciplinary Sustainability Research

Esther Meyer & Daniela Peukert

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## Economistic discourses of sustainability: determining moments and the question of alternatives

*Discursos economicistas de la sostenibilidad: Los momentos determinantes y la pregunta por alternativas*

*Discursos economicistas de sustentabilidade: momentos determinantes e a busca por alternativas*

Esther Meyer<sup>a</sup>

Ulli Vilsmaier<sup>b</sup>

<sup>a</sup>Leuphana University Lüneburg, Faculty of Sustainability, Lüneburg, Germany  
E-mail: Esther.Meyer@leuphana.de

<sup>b</sup>Leuphana University Lüneburg, Institute of Philosophy and Sciences of Art and Center for Methods,  
Lüneburg, Germany  
E-mail: Ulli.Vilsmaier@leuphana.de

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ARTICLE- VARIA

### ABSTRACT

Despite the worldwide increase in discourses and politics around sustainability, the meanings of the concept vary significantly in different linguistic communities and cultures. This may undermine the multidimensionality and ethical dimension of the concept and jeopardize its political status. This article aims at highlighting discourse strands on sustainability from different linguistic communities in an intercultural orientation, and how they are theoretically shaped. It comprises a revision of existing and our own discourse analyses. The results show hegemonic discourses of economic conceptualizations, as well as alternatives, which vary between communities and languages. We would like this article to contribute to an exchange and a profound discussion between the linguistic discourses, as well as to a methodological reflection on discourse analysis from an intercultural perspective. We conclude that critical transdisciplinary research, either as a science of sustainability or as transformative research, breaks with hegemonic orders, and thus, complements understandings of (un)sustainable ways of life.

Keywords: Sustainability sciences. Transdisciplinary. Discourse analysis. Hegemonic discourses. Intercultural.

### RESUMEN

*A pesar del aumento mundial de discursos y políticas sobre sostenibilidad, los significados del concepto varían en diferentes comunidades lingüísticas. Esto puede debilitar la multidimensionalidad y la dimensión*

*ética del concepto y poner en peligro la política. El artículo tiene como objetivo destacar los hilos teóricos del discurso sobre la sostenibilidad y la sustentabilidad de diferentes comunidades lingüísticas en una orientación intercultural. Presenta una revisión meta-analítica de trabajos analíticos del discurso y un propio análisis. Los resultados muestran discursos hegemónicos de conceptualizaciones economicistas, así como alternativas. Aspiramos a contribuir a un intercambio y una discusión en profundidad entre los discursos lingüísticos y a la reflexión metódica de la investigación analítica-discursiva desde una perspectiva intercultural. Concluimos que la investigación transdisciplinaria fortalece, ya sea como ciencia de la sustentabilidad o como investigación transformadora, la fractura de los órdenes hegemónicos y, por lo tanto, complementa la comprensión de formas de vida (no) sustentables.*

*Palabras-Clave: Ciencia de la sustentabilidad. Transdisciplina. Análisis del Discurso. Discursos hegemónicos. Intercultural.*

## RESUMO

*A disseminação mundial da sustentabilidade aumentou de forma significativa nos discursos e na política desde a resolução da ONU Objetivos de Desenvolvimento Sustentável de 2015. No entanto, o significado do conceito varia em diferentes comunidades e culturas lingüísticas. O presente artigo apresenta uma revisão analítica-discursiva dos conceitos de sustentabilidade em uma perspectiva intercultural. Os resultados mostram discursos hegemônicos de conceitualizações economicistas, bem como alternativas, que se constituem em diferentes comunidades lingüísticas. O artigo pretende fomentar uma troca e uma discussão profunda entre os grupos lingüísticos, bem como uma reflexão metodológica sobre a análise do discurso a partir de uma perspectiva intercultural.*

*Palavras-Chave: Ciências da Sustentabilidade. Transdisciplinar. Análise de discurso. Discursos hegemônicos. Intercultural.*

## 1 INTRODUCTION

Since the resolution of the “Sustainable Development Goals” by the United Nations (UN) in 2015, the dissemination of the concept of sustainability has increased significantly in discourses and policies worldwide. It could seem that the concept has permeated science and the general public and that, with this, a further step has been taken towards the normative principle. And apparently, that is happening in different linguistic communities. At the same time, it is necessary to investigate the meaning of the concept more in depth: What does sustainable mean? And in which contexts does it acquire different meanings? How have the different discourses been constituted, in reaction to the universal, national, and economic principles of sustainable development, as declared by the UN, with respect to different sociocultural, economic, and political historical situations in the different world-regions?

We develop concepts and theories about sustainability and sustainability sciences from a review of discourse analyses. The assumption is that discursive dynamics affect the work related to sustainability in politics, economics, and even sustainability sciences. The question is whether this leads to the reproduction of certain arguments for, as well as cultures of, unsustainability. Inquiries into marginalizing dynamics—as, for example, in the discourse on growth—must also be a component of scientific work on sustainability, to recognize the constitutive causes of unsustainability.

Based on a meta-analytic review of discursive-analytic work, this article provides insights into strands of sustainability discourses, especially an overview of the strands and assumptions that need to be pursued in more depth.

The article is structured as follows: Section 2 presents the method of the analysis. The following chapters continue with considerations of contextual dependency on discourses (3) and an approach

towards the concepts of sustainability, sustainable development and sustainability sciences, in order to formulate working definitions for these terms (4). Then, the different (historic) moments of sustainability and sustainable development are specified that have been constitutive for the different discourse strands (5). Using concepts and terms that clarify the different ways of understanding sustainability (6), some of their discourse limitations are outlined (7). Thus, Section 8 presents the implications that this has for sustainability sciences and discusses the potential of transdisciplinarity. Finally, conclusions are outlined (9).

## 2 METHODOLOGY

Critical discourse analysis pays special attention to the ways in which dominant theories emerge that, through their discourses, (re)produce power relations (CLARKE, 2012). This article departs from discursive-analytical work carried out in German and English and presents discussion threads that were the results of these analyses. Part of the results was also published in German.<sup>1</sup>

Starting from the review of publications on the sustainability discourse,<sup>2</sup> we highlight limitations and strands that the authors draw as discursively dominant. Here, a previous own discourse study (MEYER, 2014) of German texts that were published in the period between 2003 and 2013, and containing the term “social sustainability” in their titles without referring to a specific object, constitutes our starting point. Our work experiences related to sustainability is also incorporated.

The emphasis is on the (re)formulation of hypotheses regarding the constitution of sustainability by social, and especially economic, discourses. We attempt to locate marginalized discourses on sustainability, sustainable development, and sustainability sciences. According to a differentiated definition of eco-linguistics, we are looking for ethical and multidimensional sustainability strands, also—and especially—beyond discourses on certain explicit terms (ALEXANDER and STIBBE, 2014). Starting from German and English discourses, we approach the Latin American discourse landscape from a European perspective.

This research is part of the project CCP—“Complexity or Control? Paradigms for Sustainable Development”<sup>3</sup>—which aims at the systematic analysis of perceptions of critical and transdisciplinary research in sustainability, and its conceptual and methodological configuration.

## 3 CONTEXTUAL DEPENDENCE OF THE DISCOURSE

Each thought and knowledge production is located and tied to conditions (HARAWAY, 1988) and therefore no one can exempt themselves from their own positionality (QIN 2016). Particularly in the case of investigating discourses and their historical and cultural dependences, this fact should guide the analyses themselves. Both the nationalized situation and the environmental, sociocultural, political, economic and sustainable are part of the analytical challenge. Therefore, we have approached the analyses of Latin American discourse from a European point of view.

In Spanish - unlike the German analogue to English, where the word *Nachhaltigkeit* exists - the discourses on sustainability have been constituted in different ways, as *sostenibilidad* and *sustentabilidad*. The same applies to *desarrollo sostenible* and *desarrollo sustentable* (*nachhaltige Entwicklung [GER]* or sustainable development [EN]).

Vanhulst has published in English (VANHULST and ZACCAI, 2016) and Spanish (VANHULST and HEVIA, 2016) a quantitative network and bibliometrics analysis and mapping (discourse analysis) on the modes of appropriation of the sustainable development discourse in Latin America in the last 40 years. The authors maintain that sustainable development has taught the effects of critical and radical counter-



hegemonic discourses regarding (post-)Eurocentrism and modernity, represented by scientists such as Escobar (1995), and by the two concepts - *sostenible* and *sustentable*:

If *sostenible* in the hegemonic model refers to the economic, *sustentable* must be considered as the guarantee of all forms of life and of all the ways in which that life is culturally expressed. (ALBÁN and ROSERO, 2016, p. 38; own translation).

In the Latin American discourse on sustainable development, “the Brundtland report ‘Our common future’ (CMMAD, 1987) and the Meadows report ‘The limits of growth’ (MEADOWS et al. 1972) were the most central references” (VANHULST and ZACCAI, 2016, p. 75). In turn, Vanhulst et al. express a specific appropriation of the political principle in Latin America, calling it “Latin American environmental thought” (ibid., p. 208; own translation). The universal principle of sustainable development is questioned by the struggle for cultural autonomy of marginalized indigenous groups as a modern techno-economic development principle originating in a reductionist rationality (VANHULST and ZACCAI 2016).

Concepts of sustainable development, found, among others, in the Brundtland Report, connect with sustainable development a “set of tools for the efficient management of the environment” (ibid., p. 73). According to Santiago (2009), this understanding results from hegemonic economic rationality, inconsistent with complex ecology. Therefore, it is economics that stands out as the central discipline in the results of the bibliometric analysis by VANHULST and HEVIA (2016).

#### **4 SUSTAINABILITY, SUSTAINABLE DEVELOPMENT, AND SUSTAINABILITY SCIENCES: DEFINITIONS, HISTORY, AND DETERMINING MOMENTS**

As a concept, sustainability focuses on current and future living conditions. Accordingly, sustainability sciences has been described as an “arena” that “is governed by normative ideas on sustainable development, which are used as a framework for scientific analysis” (MICHELSEN and ADOMBENT 2014, p. 42; own translation).

In the German language, as in Spanish, the concept of sustainable development has its origin in the translation of the term sustainable development, which was introduced in the Brundtland Report. The report presents the result of “the commission convened by the UN, called the ‘World Commission on Environment and Development,’ under the command of Norwegian President Gro Harlem Brundtland based in Norway” (KLIPPEL and OTTO 2008, p. 56; own translation). Essentially, the Brundtland Report expresses the normative requirement for economic, social and ecological development worldwide, which is justified by the possibility of equal opportunities – intergenerational - for future generations. In turn, this development should be structured in such a way as to allow access, in equal intragenerational terms, to natural resources by all human beings of the current generation (HAUFF, 1987; DINGLER, 2003). Inter- and intragenerational equity are defined depending on the political values of the day (GRUNWALD, 2011).

Due to its normative orientation towards sustainability, sustainability science, also contributes to the development of an alternative mode of research, better known as Mode 2 (MICHELSEN and ADOMBENT, 2014). This concept of research emerged in the scientific literature in 1994 with the book by Gibbons et al. *The New Production of Knowledge* (1994). Mode 2 research is characterized by contextuality, heterogeneity, reflexivity, and transdisciplinarity and thus, a research approach that acknowledges the normative nature of any kind of knowledge production. The science of sustainability (SPANGENBERG, 2011) implies transdisciplinary research, which aims to unite critique on objectivity and scientific progress (KLEIN, 2014) with the aim of moving towards sustainability or - and that is left open - towards sustainable development.

## 5 DISCURSIVE STRANDS ON SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT: ECONOMISTIC HEGEMONY

The findings of various discourse analyses have confirmed that both sustainability and sustainable development are influenced by other more general and dominant social discourses. In this way, the tension between neoclassical economics and other alternative economic theories cuts across these notions. With this, the object of scientific studies in sustainability, at least in German and English, is built on the tension between the concepts of strong sustainability and weak sustainability. Strong sustainability corresponds to the term of *sustentable*, and weak sustainability to the term of *sostenible* (ALBÁN and ROSERO 2016).

Unlike weak sustainability, in the concept of strong sustainability (ZIEGLER and OTT 2011; OTT and DÖRING 2004) nature is understood as the ecological basis of life and thus, not considered substitutable. Within these limits of strong sustainability, all human effort, in particular the mode of economic activity, has to be achieved. Likewise, the concepts of weak and strong sustainability are found in the sustainability guidelines of efficiency, consistency, sufficiency, and subsistency. Positioning sustainability or sustainable development in this tension has normative and political implications. These may have effects in terms of the social changes that are produced by responses to sustainability. The discursive analyses have indicated the existence of a hegemonic discourse of sustainable development.

The characteristics of this discourse are based on the capitalist theory of well-being, the neoclassical theory, including its methodical application in economics for the purpose of increasing economic growth (SZE, 2018). In turn, it is linked to weak sustainability, under the assumption that, in principle, the different pillars or dimensions of sustainability are integrated (DINGLER, 2003; TREMMEL, 2003; STEURER, 2002). Although the integration of ecological, economic and social objectives is called for, nevertheless, the relations that the social and ecological dimensions have to the economic discourse are unacknowledged, in such a way that these are only admitted under the premise of fostering economic growth.

“The hegemonic discourse of sustainable development is found in the discursive tradition of [...] modernity” (DINGLER, 2003, p. 484; own translation). However, its development could have led to a crisis that would eventually threaten the conditions that make life possible for human beings of the current generation and those of the future (“hypothesis of the unsustainability of modernity”, *ibid.*, p. 493; own translation). This conditionality of sustainable development as a specific concept of modernity, together with the marks it leaves on economies, were the starting point for our analyses. The discursive origin in English of this idea can be traced back to an ecological modernization by Hajer (1995). In German, the critique by Eblinghaus and Stickler (1996) is a relevant discursive event: “Sustainability and power, towards a critique of sustainable development.”<sup>4</sup> The critique is still found in current literature (ROSE and CACHELIN 2018).

The research project “Sustainable development between performance and symbolism” (for its German acronym, “NEDS”<sup>5</sup>) analyzes the Brundtland Report from the perspective of an economic construction of ecological reality. In its analysis of the report, the research project presents seven hypotheses with which the ideas of unsustainability and modernity are differentiated. These hypotheses argue that “economic logic links the expectations of the natural and technical sciences with legal and administrative regulations to contribute essentially to a discursive version of sustainability as a problem of administrative management” (HÖHLER and LUKS, 2004; own translation). The authors of the NEDS project conceive sustainable development along a shift in the conceptualization of nature and ecology. It is directed towards the idea of an economically and administratively controllable environment.

Our analysis on German-language publications on social sustainability investigates the hegemonic imposition of discourse, as well as its current dynamics in the face of discourses, the perception of problems, and alternative solutions (MEYER, 2014). As a result, 5 of the 11 texts which we have analyzed deal with the marginalized perception of problems related to sustainability. They



recommend the creation of economic forms that go beyond operationalizing the capitalist growth economy. These are alternatives that are grounded in theories of sufficiency, post-growth, subsistence, or regionalization and that include changing conceptualizations and forms of “work” within the framework of social ecology.

The results are confirmed by a recent study of Acosta and Brand (2018). These concepts debate, from the perspective of liberal moral philosophy, the substantive and normative content of social sustainability and establish the foundations for theories, norms of action, demands, and political options. It remains open how alternative perspectives to neoclassical economic theory are treated within scientific texts on the conceptual approach to social sustainability. This could be linked to the search for theories of social sustainability, that is, to the development of issues within sustainability research, and simultaneously contribute to plurality of theories that bring down the hegemonic discursive order.

In another analysis, Santiago (2009) contrasts two discourses on sustainability that are in dispute. The first of them is built on a culture of commodification:

Sustainability, under the vision of corporations, has economic rationality as its central point (Leff 1998). That is, it is the old and well-known developmental strategy transformed into a liberal development discourse (Crush 1998; Escobar 1995; Esteva 1999; Rist 1999; Sachs 1999) by the Brundtland Commission (WCED 1987), now *only in green*. (SANTIAGO, 2009, p. 359; own translation)

The second discourse of an alternative nature, focuses on the social conditions of production by human beings, based on the social and local implications that are the consequence of the extraction of resources worldwide. The perspectives and discursive strands that emerge from this alternative - which mostly come from Latin America, Africa, and Asia - can be described with the following concepts, demands, and values: culture; historical perspective; diversity; pluralism; local knowledge, movements, participation, and control; strategies for a non-capitalist future; autonomy; sufficiency; resistance to privatization; design; complexity; and horizontal networks built on trust, reciprocity, and cooperation as ethical coordinates (ibid.).

Additional analyses of the discourse have focused on the political interpretations of sustainability or sustainable development, particularly on the political discourses that lead to neoliberal policies. A critical analysis published in 2014 investigated the discursive strands of sustainable development in the British government’s public policy documents between 1990 and 2000, and concluded that:

In this way, the political discourses of neo-liberalism, Thatcherism and New Labour are reflected in the discourse of sustainable development, and sustainable development is presented from within the paradigm of neo-liberalism and neoclassical economics. (KAMBITES, 2014, p. 344 ff.)

It is important and interesting to point out how neoliberalism develops based on an ideal of administration and regulation that is part of what is contemplated in the Brundtland Report:

It should be noted that the strong orientation of the report towards observation, measurement and, consequently, towards administrative strategies and solutions, in fact do not fit in with the program of a ‘neoliberal’ policy, which are usually attributed to the Brundtland Report and its subsequent interpretations of sustainability. In contrast, the Commission’s administrative approach is rather oriented towards the debates of the 1970s, which were strongly influenced by a significant reliance on socially coordinated regulation and planning. (HÖHLER and LUKS, 2004, p. 52; own translation)

It turns out that for a further investigation into the tensions between neoliberalism and regulation, in relation to the discourses of sustainability and sustainable development, it would be of added value to approach the material, the institutional configurations and their practices from within the framework of an analysis of dispositives (BÜHRMANN and SCHNEIDER 2008). This is in order to associate conceptual definitions and theoretical perspectives with political and political-environmental implications.

## 6 JUSTICE IMPLICATIONS: DEVELOPMENT = GROWTH

Modern Eurocentric and dominant sustainable strategies cause effects of exclusion and displacement in the way of understanding nature from a theoretical perspective of equity and are equally influenced by them. The Brundtland Report, as a defining moment in the development of the sustainable development discourse, as well as its subsequent interpretations, could also have contributed to this.

Through the hegemonic strategy that seeks to obtain economic growth for all states, both inter- and intragenerational forms of equity should be configured. In principle, the indicator of these is the state welfare, expressed in quantitative terms. The goal of sustainable development would be for all countries to achieve sustainable growth values that are as high as possible (HÖHLER and LUKS 2004). In turn, the determination of sustainable development as the main idea is tied to the theories of development that seek the expansion of Western values (ibid.). Through environmental regulation, control and administration, these values should be developed intergenerationally in a sustainable way and transmitted to other regions of the world where they can be deployed (VANHULST and HEVIA, 2016; ALBÁN and ROSERO, 2016).

Some discourse analyses draw a prioritization of generational equity in sustainable development and a marginalization of its intragenerational dimension (DINGLER, 2003). This doesn't imply an expansion, as established politically and normatively, but a "discursive displacement towards economic-environmental approaches" (ibid.; own translation). The hegemonic economic discourse is accompanied by a prioritization of intergenerational equity, which replaces the discourses on "social justice within Germany" (TREMMELE, 2003, p. 30; own translation) and a critical discourse on growth. In economics, intragenerational equity is treated as a balance in the market where resource allocation is perfect. The hegemonic discourse then leads to an exclusion "of other perceptions about problems and their solutions" (ibid.) and an ethically unacceptable marginalization of human rights (MEYER, 2020, forthcoming).

It seems that in the political sphere the adoption of sustainable development has been transformed into an appropriation of this concept through the free play of powers, in which science acts as a wild card at the cost of ethical and theoretical considerations (SCHULTZ et al., 2008; STIEFERLE, 2007). Also, causal sensitivity is marginalized:

Global crisis is not a technical problem, nor even an economic problem. It is, fundamentally, a cultural and political problem, where we need new epistemological and ethical tools. (AYESTARAN 2011, p. 213)

Additionally, the sustainability sciences explicitly formulate a pluralistic claim. If the strategies for sustainable development of economistic discourses prevail, these claims would not be done justice. In this sense, it would be impossible under a "dominant culture of unsustainability [...] to capture models of dependency" (KAGAN, 2012, p. 11; own translation). This leads to the circular self-strengthening of unsustainable situations (Figure 1).

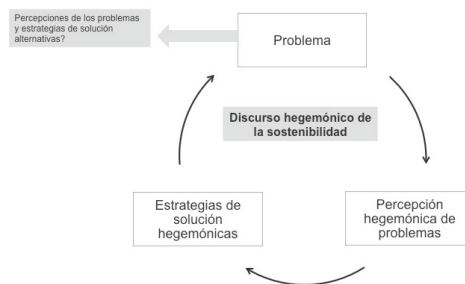


Figure 1 | Hegemonic cycle

Source: Own representation

## 7 IN SEARCH OF ALTERNATIVES - MARGINALIZED DISCOURSES

According to what has been presented, different poles can be distinguished around the discourses on sustainability and sustainable development, the hegemonic power that shapes them, and the concepts that emerge from the articles reviewed. In a first reading, it is striking that the Mexican analysis of Santiago (2009) tends to name alternative discourses in the most differentiated way. In contrast, German studies focus on inquiries into the hegemonic discourse of unsustainability, as a specifically modern pole (HÖHLER and LUKS 2004; DINGLER, 2003) to point out the need for alternative theories that imply a change in economy. Also, they seek to unveil and name these theories (MEYER, 2014).

Thus, the question arises as to how and where these alternatives can be sought within a sustainable frame of reference. On the one hand, special attention must be paid to the development of other dominances, as is done through neoliberal policies. On the other hand, however, also alternative sustainability concepts, cannot leave modern thought patterns<sup>6</sup> or, due to political-normative reasons, do not want to. Thought in terms of “inside-outside of modernity” remains equally imprisoned by the modern logic of thought.

Höhler and Luks highlight the difficulty of searching for solutions and sustainable alternatives, which are both critical (or where possible ethically sustainable) and verifiable:

If these modern concepts are definitely doomed in relation to the goals of sustainability, it cannot be indicated in a contingent world. (HÖHLER and LUKS 2004, p. 63; own translation)

In the analysis of discourses on change<sup>7</sup> of, and alternatives (ibid.) to the hegemonic discourse, insights can also be generated through the analysis of practices, situations (CLARKE, 2012), and cases (VILSMAIER et al. 2015).

In what follows, we will outline the potential of transdisciplinary sustainability research, to contribute to a critical and differentiated discourse that generates alternative strategies. This form of research explicitly embraces differences, considering heterogeneous perspectives and cultural self-determinations (VILSMAIER et al., 2017; ENGBERS 2020), and is oriented towards cooperation and mutual learning, thereby trying to counter marginalization and satisfy the ethical demands of sustainability.<sup>8</sup>

## 8 IMPLICATIONS FOR SUSTAINABILITY SCIENCES AND RESEARCH

To a certain extent, Mode 2 research laid the theoretical ground for transdisciplinary research within its “own theoretical structure, investigative methods and practices” (HUNECKE, 2006, p. 42; own translation) and new criteria for evaluating scientific qualities (HUNECKE, 2006; GIBBONS, et al. 1994).

Discussion on Mode 2 has provided an important contribution in drawing attention to transdisciplinary research. (VILSMAIER and LANG 2014, p. 94; own translation)

Transdisciplinary sustainability research addresses so-called sustainability challenges as problems of today’s world and demands to interact with this world. The research mode intends to generate knowledge oriented to transformation towards sustainability. In transdisciplinary research, scientists investigate societal problems - and their solutions - in a joint process with individuals or groups (political, economic, civil society) not involved in academic fields (ibid.). In critical transdisciplinarity, all participants are considered as researchers and jointly contribute - with different knowledges and in different roles - to the research process (VILSMAIER et al. 2017).

This type of process seeks to generate different forms of knowledge (PROCLIM, 1997; VILSMAIER and LANG 2014):

- I. System knowledge: knowledge (and experiences) of researchers about socially relevant problems and phenomena in the research process. In this way, the generation of knowledge is conceived as a process of seeking understanding, recognition, identification, analysis, and questioning.
- II. Target knowledge: normativity, understood in the form of assessments (sometimes unconscious), paradigms and political convictions, targeted at making them explicit. This implies working with differences, conducting transparent public discussions, and not leaving the orientation to an academic elite based on their own values (ZIEGLER and OTT 2011).
- III. Transformative knowledge: this type of knowledge must guarantee that the different targets proposed (for example, requests and recommendations) are achieved. In relation to publications, this means getting involved beyond the orthodox academic media.

Especially in the case of target knowledge, it is possible to observe that in transdisciplinary sustainability research, the dominant discourses can prevent a complex understanding of problems. When the dominant social paradigms generate evidence and determine opinions, orientations and understanding of the problems, as well as everything that is worth saying, they contradict the elements of transdisciplinarity, based on differentiations and complementarities.

At the same time, this form of research creates a space to make visible and actively address the problematic of dominant discourses on sustainability and sustainable development that challenge the young field of sustainability sciences as a science of sustainability (SPANGENBERG, 2011). In this regard, transdisciplinary research is a promising approach, since it explicitly and critically faces these challenges. Because of its pluralistic, heterogeneous and reflective structure, the principles of this type of research hold the potential to make the sustainability discourse visible, expressible, and actionable.

Consequently, transdisciplinary research also produces situations that are beyond current hegemonic structures. For this, its adoption is not only necessary for research practices, but also for the elaboration of theoretical, epistemological, and methodological foundations. Such foundations would position transdisciplinary research in sustainability as a complementary mode of research to disciplinary and interdisciplinary forms.

Additionally, it would be placed as a research practice in-between science-driven research and other forms of knowledge production, and between the institution of science and other societal institutions. This occurs because transdisciplinary research does not only aim at epistemic objectives, but it carries within itself an interventionist claim directed at societal transformation for the implementation of a sustainable ethic.

By positioning critical transdisciplinary sustainability research in the space between different societal institutions and highlighting its search for political and meditative ways of producing understandings and practices, a place can be created where epistemic and transformative goals can be intertwined (VILSMAIER et al. 2017). In this way, research results can take into account certain scientific quality criteria and at the same time gain social and cultural robustness (GIBBONS, 1999; NOWOTNY, 2000; VILSMAIER et al., 2015). This can be achieved on two levels: (i) the plurality of knowledges and understandings find recognition and significance; and (ii) the different objectives of sustainability are addressed as a field of tension that can be approached from a perspective of sustainability ethics.

In line with the work of Bhabha (2004), critical transdisciplinary sustainability research can be understood as a field in which "existing structures, power relations and dependencies can be suspended - at least

for a situational episode - when discrepancies are articulated and thereby made tangible" (VILSMAIER et al., 2017, p. 174). Transdisciplinary research spaces seek to overcome established societal structures, while cooperative research spaces are created between members of different societal domains (ibid.).

These seek to overcome power relations in knowledge production by giving rise to contributions of different knowledge cultures. Thus, sustainable transformations could be achieved and the unidirectionality in the transfer of knowledge and decision-making structures could be replaced by structures oriented towards mutual knowledge production and learning (VILSMAIER et al., 2015). However, thereby disparities are not equated. Instead, differences in the qualities and the scope of knowledge, roles in societal structures, and positions based on interests and ideologies open spaces for the foundation of critical transdisciplinary research in sustainability.

## 9 CONCLUSIONS AND FUTURE PERSPECTIVES

With our discourse-analytical work we outlined the interconnectivity between the concepts of both sustainability and sustainable development in the dominant discourses, as well as what this implies for sustainability sciences and research. A panorama on selected linguistic communities has been opened. It serves as a start that calls for responses due to the principal limitations given the authors own situatedness. We recognize that as authors we are positioned in a specific, cultural, historical, and linguistic situation, and therefore limited; our mother tongue is German, and we speak English and Spanish, but not Portuguese. Likewise, other limitations of our contribution are based on the methodology. Thus, the discourse-analytical schools are not differentiated in the meta-analysis, and the selection of the investigated search terms include, and at the same time exclude, specific discourse strands.

This conceptual and reconfigurative work resumes approaches for alternatives, together with a general call for the strengthening of theoretic plurality in economics and sustainability sciences. Likewise, the ontological, epistemological and ethical foundations of sustainability should be reconsidered for the further development of alternative theories on transformations in forms of human coexistence. These alternatives take into account both the substantive and normative claims of sustainability (which could be, for example, the fulfillment of human rights and the conservation of nature as a foundation for life) as well as the procedural and differentiable understandings on regulations. Corresponding philosophical approaches can already be found and will be further elaborated (MEYER, 2020, forthcoming).

A critical transdisciplinary sustainability research contributes to the generation of target knowledge, by addressing ethical and cultural aspects. In this way, and as a complement to system and transformative knowledge, the understandings produced by this knowledge represent transformative moments, which are based on ethical argumentation and mutual learning. With this, a critical transdisciplinary research strengthens the fracture of hegemonic orders and thus complements understandings on (un)sustainable ways of life - either as a science of sustainability (SPANGENBERG 2011) or as transformative research (WBGU, 2011).

The intellectual challenge is to research collaboratively and interculturally, and learn from each other about the discursive and counter-hegemonic dynamics of sustainability. Doing this between different spaces and cultures, and between different sociocultural, economic and political historical situations on different continents (ibid.), supports autonomous projects based on cultural difference (VILSMAIER et al., 2017). How do we problematize, for example, global modernity?

The understanding of the discursive formations in academic systems in different world regions and their historical contingencies facilitates the visualization of the differences and the gears between discourses. Contrary to a single historical critical deconstruction of its own European position, we consider understandings of other discursive dynamics and other narratives as the conditions for the possibility of change, motion, and reconfiguration.

Science of the emergent paradigm also claims to be a translator. That is to say, it encourages the emigration of concepts and theories developed locally to other cognitive spheres and their utilization outside their original context. It is knowledge about the conditions of possibility [...] of human action projected into the world from local time-spaces (DE SOUSA SANTOS, 1992, p. 38).

The development of normative goals, as effectively attempted in the case of the Sustainable Development Goals in 2015, must address and represent the different cultural, political, economic, and historical situations, and in particular the concepts of nature, of human beings, communities, appropriation practices, and forms of belonging.

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## NOTES

- 1 | Ökonomistische Diskurse der Nachhaltigkeit: Bestimmende Momente und die Frage nach Alternativen. En: Pfister, T.: Nachhaltigkeitswissenschaften und die Suche nach neuen Wissensregimen. Metropolis.
- 2 | The following were used as search terms: (Sustainability\* AND discourse). Discourse methodologies, as well as different orientations on the discursive analysis of publications are not discussed here.
- 3 | *CCP – Complexity or Control? Paradigms for Sustainable Development.*
- 4 | “*Nachhaltigkeit und Macht. Zur Kritik von Sustainable Development.*”
- 5 | *NEDS – “Nachhaltige Entwicklungen zwischen Durchsatz und Symbolik.”*
- 6 | For example, among the objectives of left-wing sustainability are structural changes within modern societies—and their categories of thought—which are assigned “to the ability to link alternatives to current dominance of capital markets” (SCHACHTSCHNEIDER 2007, p. 137; own translation; HÖHLER and LUKS 2004).
- 7 | “Thus, the belief in perpetual growth, linear growth [...], which meet under the labels of ‘process’ and ‘change,’ belongs to various perspectives,” (KAGAN 2012, p. 38; own translation) such as “the phenomenon of economic growth [...] understood as a synonym of progress and change” (STEURER 2002, p. 114; own translation).
- 8 | In the present work we are not concerned with the normative and prescriptive definition of sustainability ethics. Underlying this is the premise of the recognition of its existence.

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»In order to break non-sustainable paths of actors within a social transformation, it also requires playful, narrative and speculative approaches.

We have to do politics, science, journalism, education and sustainability ourselves. For this we should use the spaces of TSR.

Sustainability research happens collectively, is open and accessible. Therefore, it always looks for what is quiet and in the dark.

Sustainability research is critical and experimental because sustainability affects our future.«

(Meyer and Schmieg 2019, 81, own translation).









