Chapter 2
Theoretical and Methodological Pluralism in Sustainability Science

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Abstract Sustainability science is an integrative scientific field embracing not only complementary but also contradictory approaches and perspectives for dealing with an array of sustainability challenges.

In this chapter we distinguish between pluralism and unification as two main and distinctly different approaches to knowledge integration in sustainability science. To avoid environmental determinism, functionalism, or overly firm reliance on rational choice theory, we have reason to promote pluralism as a way to better tackle sustainability challenges. In particular we emphasise two main benefits of taking a pluralist approach in research: it opens up for collaboration, and ensures a more theoretically informed understanding of society.

After a brief introduction to how we interpret the field of sustainability science, we discuss ontology, epistemology and ways of understanding society based on social science theory. We make three contributions. First, we identify important reasons for the incommensurability between the social and natural sciences, and propose remedies for how to overcome some of the difficulties in integrative research. Second, by suggesting a frame that we call 'social fields and natural systems' we show how sustainability science will benefit from drawing more profoundly on – and thus more adequately incorporate – a social science understanding of society. As such, the frame is a foundation for pluralism. Third, by suggesting a new theoretical typology, we show how sustainability visions and pathways are associated with particular theoretical and methodological perspectives in geography, political science, and sociology; and how that matters for research and politics addressing sustainability challenges. The typology can be used as a thinking tool to frame and reframe research.

Keywords Incommensurability · Knowledge integration · Social fields · Social change · Unification

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2.1 Introduction – What Has Become of Sustainability Science?

The fact that sustainability science is 'dealing with interconnected problems' (Kauffman and Arico 2014) requires that researchers in the field take a comprehensive, integrated, and participatory approach to science and reality (Sala et al. 2013). In line with this explicit ambition to integrate knowledge – across scales, sectors, and substance domains; and across the divides of nature-society, science-society and knowledge-action – sustainability science must build on several foundational disciplines and inherently advocate theoretical and methodological pluralism (Persson et al. 2018a, b).

The focus in early sustainability science was threefold. It centred on elucidating nature–society interaction, providing scientific knowledge for sustainability, and elaborating normative discussions on sustainability. For this purpose it gave prominence to problem-driven and solutions-oriented research on human-environmental interaction – or what some call socio-ecological dynamics – while envisioning sustainable futures. In that endeavour, Cash et al. (2003) asked sustainability scientists to apply *credibility, legitimacy*, and *saliency* in research, especially when it comes to *data and methods, focus and findings, and outreach and solutions*. These quality features are not necessarily exclusive to sustainability science but remind us of critical theory which also aims at social change and on which ideas sustainability science can build. What is more typical is perhaps that sustainability scientists are expected to ask pertinent questions: what to sustain, for whom, for how long, and at what benefit or cost?

In the absence of any universal criteria that define sustainability science (Shahadu 2016, p 2) we wish to point out some common denominators that unite the field. Starting from interdisciplinarity while striving for transdisciplinarity, sustainability science takes a broad approach to understanding and improving social life *within* the broader context of earth's life support systems. Sustainability science researchers are expected to pose integrated questions that capture human-environment conditions; and while doing so, develop theoretical and methodological frames for overcoming constraining differences in research methods and procedures across disciplinary boundaries. A sustainability science community would, ideally, bring together researchers with a variety of disciplinary (or interdisciplinary) repertoires to discuss and negotiate the multiple meanings of concepts and phenomena that are significant in sustainability science research – and crucial for sustainability. Beyond that, and again ideally, stakeholders other than academics would be called upon at various stages in the research process to inspire problem formulations and help sharpen the focus on conditions for and implications of human-environment interaction and interdependence.

At the risk of denying, ignoring, or limiting diversity and pluralism, some sustainability scientists have called for a certain degree of standardisation in sustainability science. This **can** take the form of a 'core set' of assumptions, concepts, ideas, and understandings that would speak across research studies (Shahadu 2016).

This was attempted in the early days of sustainability science when pioneering front-figures launched the research field through a suite of urgent questions and suggested actions (Kates 2011; Kates et al. 2001). These intentions and questions have since then been followed up by articles on framing, knowledge structuring, and the many methodological concerns in sustainability science research (Jerneck and Olsson 2011; Jerneck et al. 2011; Spangenberg 2011; Thoren 2015; Wiek et al. 2012). In that mission scholars have emphasised the need for acknowledging values and social learning processes when imagining desirable futures (Miller et al. 2013). In this chapter, we take the knowledge structuring further by calling for ontological, epistemological and theoretical awareness in problem formulation; and by providing a thinking tool to compare, frame, and juxtapose theoretical approaches in sustainability science.

To further expand and refine the field, researchers in sustainability science must continually discuss the significance of its substance, scrutinise its approaches, and confront internal conflicts while searching for synergies (Isgren et al. 2017). As suggested by Shahadu (2016), we can do this under the heading of an 'umbrella science' that is distinct in focus while inclusive in welcoming subfields (see also (Miller et al. 2013). For that we could consider sustainability science research in terms of its mission and mandate, its achievements, and its challenges and conflicts (Isgren et al. 2017). Further, Lang et al. (2012) call for evaluative, qualitative and quantitative meta-studies of sustainability to make use of existing evidence and experience more systematically.

In the actual practice of doing sustainability science, we suggest with many others that researchers in the field should pay particular attention to three core aspects – collaboration and communication, reflexivity, and research design – and below we offer some justifications.

2.1.1 Collaboration and Communication

Integrated research that seeks to build knowledge across divides and between disciplinary domains can be 'a response to the complex demands of the modern world' as well as 'a source of competitive advantage' (Siedlok and Hibbert 2014). Notably, integrated collaboration between communities enhances the understanding of 'what is the problem' while also advancing learning and innovation around 'what can and should be done', 'within what time frame', and 'by whom'. Bearing that process in mind, studies on integrated research show that a high degree of communication and interaction is necessary in creating such diverse groups (Hage and Hollingsworth 2000).

2.1.2 Reflexivity

Sustainability science is defined less by its disciplinary content – and more by its purpose, the problems it studies, the types of solutions it seeks, its applicability (Clark 2007), and the role of reflexivity in interdisciplinary and transdisciplinary research (Spangenberg 2011). As a core competence in integrative research, reflexivity means to question assumptions such as those about the ability to predict future events, the objectivity of the observer, and the value neutrality of science (Spangenberg 2011). It will also require the acceptance of ignorance, uncertainty, and the impossibility of knowing all relevant aspects of evolving systems or foreseeing emergent system properties (Spangenberg 2011, p 279). Finally, and owing to its attributes, sustainability science is 'a shared learning endeavor' within which participants must **also** include the learning from failures and setbacks (Barth and Michelsen 2013).

2.1.3 Research Designs

An appropriate research design for sustainability science must be ***general*** enough in scope to include various sustainability challenges and contexts, ***flexible*** enough to include a process of ongoing revision that allows (or even ensures) a reconstruction of methods and practices when needed (van Kerkhoff 2014, p 149), and ***specific*** enough 'to offer genuine guidance' (van Kerkhoff 2014, p 145). In the process of developing a (format for a good) research design, inspiration can be gained from various sources. Onto-epistemological reflections are inspirational for identifying and defining relevant and interesting research problems and for selecting particular units of analysis to focus on. Theoretical-conceptual reflections are helpful for developing concepts, theories, and perspectives that may promote our understanding of a broader range of issues (Salas-Zapata et al. 2013). This can also include thoughts on how to plan and organise stakeholder participation, how to deal with uncertainty and the limits to knowledge and data construction, and what to expect from explorative science. *Instrumental-methodological* reflections will help us *apply* theories and concepts to real-world conditions, events, and situations – and thus facilitate the analysis.

2.2 Ontology – On Reality, Systems and Fields

Ontology is concerned with assumptions, claims, and questions about what exists in the world, how reality presents itself, and to what extent that reality is observable. Differences in ontology and epistemology constitute a main obstacle to the integration of knowledge across the boundaries of scientific disciplines (Jerneck et al.

2011). By knowledge integration we mean a process where the best available knowledge from two or more scientific disciplines or fields is used to understand a complex problem. A central challenge to knowledge integration in sustainability science is how to deal with seemingly incompatible assumptions deriving from varied ontological claims in the natural and social sciences. This involves a concern for how to ensure that the best available social science knowledge is used in combination with the best available knowledge in natural sciences, engineering, and medicine. A concern following from that is how to study issues such as the consequences of climate change impacts on society without resorting to environmental determinism. To clarify here, environmental determinism is a foundational element of colonialism referring to the belief that natural conditions shape societies. Another concern refers to the frequent use of indicators which illustrates a tendency to emphasize that reality is observable and measurable.

Systems and system boundaries are core ontological components of the natural sciences, both in theory such as stocks and flows models and in practice for describing a quantifying bio-geo-chemical fluxes. Meanwhile, in contemporary social science inherent obstacles to systems thinking abound. Researchers studying social phenomena based on social theory may be reluctant to use systems as an ontological description of society but may decide to use it analytically to study a specific aspect of the economy, polity, or society such as the tax system, the party system, the energy system, or the social security system. However, the neo-liberal zeitgeist has made it so natural to speak in systems terms such as resilience and self-organization of socio-ecological systems as well as adaptive management because of climate change that we fail to see the contradicting political forces behind it. But following Colin Hay (2002, p 3) 'All events, processes and practices which occur within the social sphere have the potential to be political and, hence, to be amenable to political analysis'. What makes an analysis political is its focus and emphasis on 'the political aspect of social relations' and in particular the 'attention to the power relations implicated in social relations' (Hay 2002, p 3). This implies, for example, that the 'sociology of structural inequality' is a subject of political analysis (Hay 2002, p 3). If translated into a sustainability science context it means that the many socially, spatially and temporally uneven impacts of and responses to climate change ought to be studied while remembering that politics are concerned with 'the distribution, exercise and consequences of power' (Hay 2002, p 3).

To bridge ontological barriers in sustainability science research while avoiding not only the risk of scientific imperialism associated with unification meaning that one discipline dominates another but also the risk of de-politicisation of socio-ecological issues, we suggest the use of two explicit ontological assumptions: *social fields and natural systems* (Olsson and Jerneck 2018). Below, we will return to a more specific description of social fields and a discussion of how to justify its use. Such an approach has the potential to overcome ontological differences between the social and natural sciences, and is also useful for avoiding three common weaknesses of knowledge integration across the natural and social sciences as mentioned above, namely the use of environmental determinism, functionalism, and rational choice theory to explain social change. In combination, they often result in a

de-politicisation of environmental problems and even scientific justification of particular policies (Olsson et al. 2015; Wellstead et al. 2016; Newton 2016). Jared Diamond's stories about human development and collapse (Diamond 1999, 2005) and Jeffrey Sachs' explanation of underdevelopment (Sachs and Warner 1995) exemplify a resurgence of determinism, or neo-environmental determinism (Sluyter 2003).

2.3 Epistemology – On Pluralism and Unification in Sustainability Science

Epistemology is concerned with assumptions, claims, and questions about how to gain knowledge about the world, who is a 'knower', and how to combine or integrate different types of knowledge. We identify two types of scientific knowledge integration – pluralism and unification (Olsson et al. 2015; Geels et al. 2016). *Scientific pluralism* is a process in which several disciplines contribute particular theories, methods, and/or questions to address or solve a problem. According to scientific pluralism, the ultimate goal of scientific inquiry is not (necessarily) to establish a single theory (Kellert et al. 2006). Rather, pluralism is useful in situations where no unified theories are available to explain a phenomenon or where the phenomenon can only be explained through the lens of multiple theories (Dupre 1991; Mitchell 2009). Undoubtedly this is the situation in a comprehensive context such as that of climate change or geopolitics.

In contrast, *unification* may easily result in scientific imperialism, a process usually thought of as an illicit infringement such as when one discipline attempts to explain phenomena or solve problems in a domain belonging to or associated with another discipline (Dupré 1994, 2001; Mäki 2013). Serious cases of scientific imperialism are reductive in the sense that they aim, or tend, to exclude alternative (even compatible) explanations and solutions (Clarke and Walsh 2009; Midgley 1984; Thoren 2015) resulting in a situation where inferior explanations or problem solutions outcompete superior ones (Thoren 2015). All kinds of unification are not necessarily imperialist (in this negative sense), but there is always reason to worry about imperialism in situations where a single theory (or discipline) is claimed to account for major or persistent social problems such as inequality, poverty, and social unrest, or for complex phenomena such as geopolitics or climate change impacts on society and its responses to that. In contrast, in the context of geopolitics, pluralism has not only scientific value, but can also help sustain cultural, ecological, and social diversity (Norgaard 1989). In practice, this can be pursued through research that harnesses both scientific and indigenous knowledge while also seeking to reconcile them (Agrawal 1995; Parsons et al. 2017; Persson et al. 2018b).

2.4 Ways of Understanding Society

2.4.1 Theory

Theory serves as a main guide to empirical exploration. It serves to simplify reality and to describe and explain it in terms that are appropriate for – and thus comparable between – different contexts. Theory can be descriptive, prescriptive, or predictive and can be used to challenge stated and unstated assumptions. Theories are characterised by their distinct perspectives and are (often) conceived of and expressed to represent a special subject-position or vantage-point (Hay 2002, p 24). This means that theory is not necessarily neutral, but often imbued by values and interests.

Inspired by Colin Hay (2002) we will discuss three particular issues relating to theory: the role of consensus and conflict theory in sustainability science; the tension between parsimony (the world is assumed to be simple and can be abstracted, explained, and predicted) and complexity (the world is assumed to be nuanced and can mainly be described concretely and only with some degree of plausibility); and finally, the interaction between agency and structure in society.

2.4.2 Consensus or Conflict

An important source of incommensurability between the social sciences and most natural sciences interested in the processes of environmental degradation, exploitation, or pollution, is how society is understood. We can identify two main types of approaches to understand society, resembling what in sociology is called consensus theory versus conflict theory.

According to consensus theory, shared norms and values are the foundation of a stable harmonious society in which social change is slow and orderly. For example, when using the concept of coupled social ecological systems, resilience can be seen as the equivalent of stability, harmony, and the 'good norm' (Olsson et al. 2015; Hatt 2013). In contrast, conflict theories emphasise competing interests between groups in society meaning that social order is maintained by (material or discursive) manipulation and control by dominant and powerful groups, and that transformational change develop from the tensions between these groups and the redistribution of power (Meadowcroft 2011). According to conflict theory, institutions are shaped by existing power imbalances, values, and social stratifications in society. This implies that governance is executed and understood differently in consensus theories versus conflict theories.

2.4.3 Parsimony or Complexity

The choice between complexity and parsimony is important in the selection of analytical perspective (Hay 2002, p 29). A parsimonious model is as simple as possible but explains as much as possible. However, at some point the merits of parsimony may be outweighed by greater complexity (Hay 2002, p 32). At one end of a spectrum pure description may capture real complexity without explaining much; whereas at the other end, abstract theoretical reasoning may be forceful in explaining and predicting a lot without capturing layers, nuances and crucial details (Hay 2002, p 35).

Seeking to preserve complexity while capturing specificity, constructivist, and institutionalists proceed with theory in close dialogue with data and details to piece together theoretically informed and empirically grounded historical narratives (Hay 2002, p 47). They suggest or establish the pre-conditions, conditions, and mechanisms of change by studying the interplay between ideas, institutions including their values, and interests pursued by actors. In so doing, they are inclined to acknowledge complexity, identify sequencing, and consider timing – all of which **are** enabled by methods of process-tracing, process-elucidation and a general open-ended approach to processes (Hay 2002, p 11). In sustainability science, constructivists and institutionalists are prone to locate and analyse the political aspects of the environment by considering how to value, prioritise, and sequence different social goals and sustainability pathways.

Acquiring and interpreting data implies a series of theoretical and methodological choices. Rather than taking regularity as a given and a basis for prediction, a constructivist or institutionalist would explore the conditions for and existence of both regularities and irregularities (Hay 2002, p 48). In such research considering whether conflict or cooperation is the norm in society is obviously important. And again, proponents of using indicators may have a tendency to seek readily observable data while also seeking regularity and stability in society, whereas those who emphasise the role of values may assume that society is divided by conflict and interests – and thus seek other types of data.

2.5 Ways of Understanding Agency, Behaviour, and Interaction

One important dividing line in the social sciences is how to define, explain, and understand human agency and behaviour, i.e. how people act and perform, the scope and limits of our agency, and based on what reasons people make decisions. As a starting point, structuralism tends to reduce social outcome to the workings of institutions and structures beyond the control of actors and their agency, whereas actor-oriented theory such as intentionalism (Hay 2002, p 55, Dessler 1989) tends to account for observable effects in purely agential terms.

In rational choice theory as the foundation of neoclassical economic theory, individuals make decisions based on maximising their own utility. The assumption of rational choice provides a reductionist basis for modelling the economy as a self-organising system. It also provides a scientific justification for the current proliferation of market-based instruments for ecosystem management. This is epitomised by The Economics of Ecosystems and Biodiversity initiative (TEEB) aiming to 'help decision-makers recognise, demonstrate and capture the values of ecosystem services & biodiversity' (Kumar 2010; Brown 2014).

Rational choice theory is widely used but contested in the social sciences. Other and more elaborated theories for explaining social behaviour have been formulated in sociology, such as various institutional theories and symbolic interactionism. In institutional theory, different scholars stress different aspects of social and economic interaction and relations (Mahoney 2000; Mahoney and Thelen 2010; Taylor 2011). In sharp contrast to rational choice theory, symbolic interactionism stresses social relations, contextual conditions, and subjective interpretation (Blumer 1986).

2.6 An Integrative Framework – Social Fields and Natural Systems

Inspired by American and French sociologists Neil Fligstein, Paul DiMaggio, Pierre Bourdieu and Loïc Wacquant, we suggest a new analytical framework for integrating knowledge across the natural and social sciences. As for now, we call it **Social Fields and Natural Systems** thus juxtaposing two ontological assumptions: the natural environment can be described in terms of systems, the social sphere is better described in terms of social fields (Olsson and Jerneck 2018). We argue that the approach has the potential to help researchers overcome ontological barriers between the social and natural sciences, and is particularly useful for avoiding the three common weaknesses in knowledge integration across the natural and social sciences that we mentioned earlier: the use of environmental determinism, functionalism, and rational choice as three theories attempting to explain social change.

In Earth System Science, the fundamental ontological assumption is that the world is a system. As long as the system is understood in primarily natural science terms such as an ecosystem, this is usually uncontroversial. Some ecologists claim that 'ecological and social domains of social-ecological systems can be addressed in a common conceptual, theoretical, and modelling framework' (Walker et al. 2006). This is the situation where a system ontology may come into conflict with ontological assumptions in the social sciences.

To Bourdieu, a *field* is a network of relations among actors and objects and their objective positions in the field (Ritzer 2011). John Levi Martin is another contemporary scholar who theorises fields. This quote describes his view (Martin 2003):

> I make the case that field theory is something quite different that has the potential to yield general but nontrivial insights into questions rightly deemed theoretical and to organize research in a productive fashion. Finally, field theory allows for the rigorous reflexivity that is necessary in all cases in which sociology attempts large-scale political and institutional analyses.

In their study of transnational migration, Levitt and Schiller (Levitt and Schiller 2004) applied field theory to highlight and study hidden institutions and social processes, and, importantly, challenge a routine notion of geographical scales (Levitt and Schiller 2004):

> The concept of social field also calls into question neat divisions of connection into local, national, transnational, and global. In one sense, all are local in that near and distant connections penetrate the daily lives of individuals lived within a locale.

Sociologists Fligstein and McAdam (2012) aim to construct a comprehensive and general theory of fields. Even if fields may lend similarities from systems and from institutional logics (Scott 1995), fundamental differences exist. They see *strategic action fields* as meso-level social orders which are the basic structural building blocks of modern political and organisational life. The identification and understanding of these *strategic action fields* are the basis for studying stability and change in society. Importantly, relations exist independently of whether people are aware of them or not, and whether people want them or not. Bourdieu was primarily interested in fields such as culture, education, and religion. In their general theory of fields, Fligstein and McAdam expand the notion of fields to become a more or less universal concept for studying social change and social order. In doing so, they expand the conceptual vocabulary and the horizon for what to study as a field.

The concept of incumbents and challengers was first introduced in field theory in the 1970s by William Gamson (1975) in his investigations of social movements. Incumbents have disproportionate power in or over a field and where the field in turn supports them. In contrast, challengers are less privileged in the field and are either in opposition to, or are more often suppressed by the field.

As an important argument against rational choice explanations of social change in a field, Fligstein and McAdam strongly argue that '*the material and the existential cannot be disentangled'* (Fligstein and Fligstein and McAdam 2012, p 49). They also stress the importance of social skills, defined as capacity for intersubjective thought and action in social relations. The concept of social skill is rooted in symbolic interactionism which rests on three main assumptions (Blumer 1986):

1. individuals act toward things on the basis of the meanings they ascribe to those things (i.e. things have no universal value in themselves),
2. the meaning of such things is derived from, or arises out of, the social interaction that one has with others and with society implying that decisions are primarily relational rather than individual, and
3. these meanings are handled in, and modified or recreated through, an interpretative process used by the individual in dealing with the things s/he encounters.

To exemplify the use of social fields and natural systems, we look at the issue of adaptation to current and future impacts of climate change. The number and severity of climatic extremes have clearly increased in recent years as a result of climate change (Field et al. 2012). Many of these events are associated with great losses of people, livelihoods, and property (Olsson et al. 2014) as well as with displacement and migration (Ionesco et al. 2016). The social responses to climate impacts are

diverse and complex and do not follow any simple cause-effect pattern. Adaptation studies thus provide a good illustration of how multiple ontologies, i.e. fields and systems can support and promote the production of actionable knowledge.

To take an example, the climatic event affects a clearly defined geographical space or system. In the case of a flood, the impact is usually defined by the watersheds affected, i.e. a hydrological system. Using hydrological process models (e.g. SWAT, MIKE_SHE, or TOPMODEL (Devia et al. 2015)) the extent and severity of flood impacts can be understood and predicted. But neither the social repercussions nor all social drivers follow the natural system boundaries. Here strategic action fields can effectively be used to analyse and explain how social dynamics interact with the natural systems. In the figure below we try to illustrate how increasing frequency and intensity of floods, as a consequence of climate change in combination with social drivers, can be analysed through interacting multiple ontologies: systems for the natural science aspects (here represented by the Indus river basin in a systems model) and strategic action fields for the social aspects (here represented by climate politics in interacting horizontal and vertical fields). Some fields are interrelated and/or interact directly with some systems components, whereas others are independent, indirect, or diffuse (Fig. 2.1).

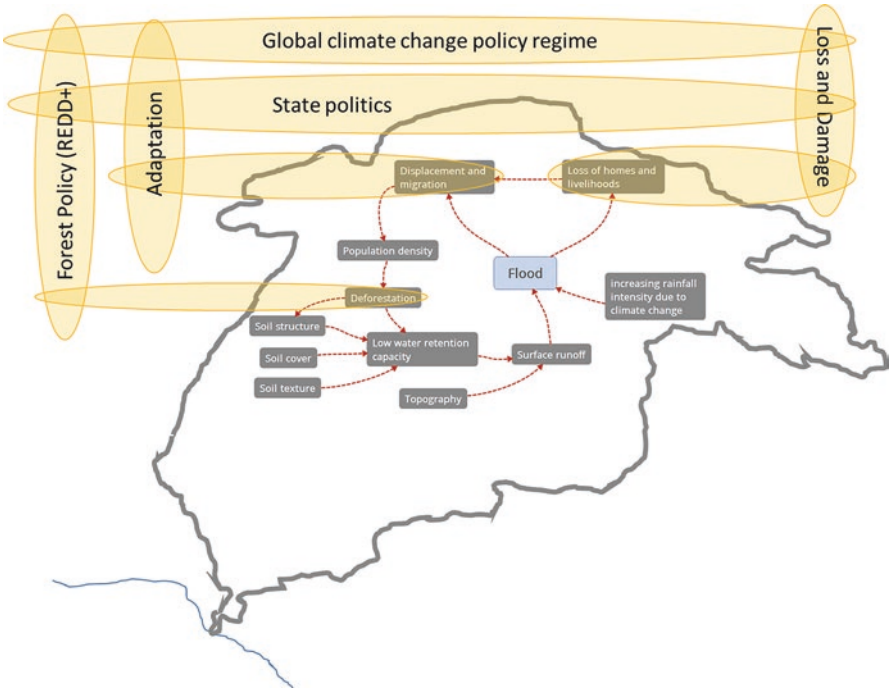

Fig. 2.1 Schematic illustration of how social fields (orange ovals) interact with natural systems (Indus river basin). (Modified from (Olsson and Jerneck 2018))

2.7 A Typology – Linking Science and Politics

Below we suggest a typology which links a scientific understanding of sustainability challenges with political and ideological beliefs. The typology is a device for reframing research problems. By shifting them between distinctly different visionary categories we make theoretical, methodological, and other features visible. This allows further scrutiny of complementarities and contradictions as well as an evaluation of the potential of these frames for tackling sustainability challenges. The typology should be seen as a source of inspiration and discussion rather than a fixed schema. Ultimately, the goal of such a typology is to increase the political awareness of scientific knowledge production as a basis for a more politically informed sustainability science which is a prerequisite for social change.

As a basis for the typology, we postulate that a spectrum of visions – one and each of which claims to promise sustainability – from continuing the ongoing modernisation to defying modernisation **exists**. Along this spectrum we define three more or less distinct views supported by their own frame of science and reality, theoretical and methodological approaches, and strategies for social change. In the typology we call them *ecological modernity, critical modernity* and *anti-modernity*. Inspired by York & Rosa's theoretical analysis of ecological modernisation theory (EMT) (York and Rosa 2003) we make a distinction between ecological modernity and critical modernity. In their analysis they distinguish between observed institutional changes and the efficacy and outcome of such changes. Proceeding from this distinction, endeavours for achieving sustainability have clearly generated a wide individual, institutional, and organisational response throughout society – at least since the time of Our Common Future. To exemplify, states participate in international negotiations resulting in national targets towards sustainability such as the Paris Agreement and the Sustainable Development Goals. Firms and corporations increasingly use sustainability claims in their communications such as Corporate Social Responsibility. Municipalities initiate and promote recycling and waste management as well as public transports. Civil society exert pressure on the private and public sectors and call for improved environmental performance while many individuals seek to adjust to these new norms. In all, these activities and processes are recognised as contributing to and providing the basis for ecological modernisation. In our view, these responses are necessary for achieving sustainability, but are they sufficient, or is there need for more?

While categories under ecological modernity focus on *promises* of social change rather than on outcomes, the categories under critical modernity are more concerned about the *outcomes*. Ecological modernisation is characterised by a set of piecemeal and incremental processes of change without any connection to a planetary whole. Critical modernisation, however, takes the global whole as its point of departure in sketching what is needed in terms of social change to achieve sustainability. Anti-

modernity as a worldview is less coherent than the other two worldviews in terms of the processes of social change that may be required for sustainability. Anti-modernity has a strong focus on the, often utopian, images of sustainability (Naess and Rothenberg 1990; Taylor 2011) rather than on the processes of social change leading to these outcomes.

The boundaries between the three visions and their associated categories are fuzzy but the scheme provides a useful heuristic for understanding the rich flora of sustainability approaches and claims (Table 2.1).

Table 2.1 Three visions of sustainability

Pathway	Weak sustainability	Critical sustainability	Unclear
Theory	Ecological modernisation	Radical reform = modernisation	Anti-modernisation, degrowth/postgrowth
Problem definition	Empirically observed and approached = inductive	Empirically grounded while theoretically informed = analytic induction	Theoretically generated and approached = deductive
Analytical approach	Specific = detailed but detached	Critical reframing via several frames = varied and complex	Holistic = encompassing but vague
Main benefit	Rapid progress in solving (narrowly) identified problems	Structural change towards sustainability based on broad understanding	Visionary, activism, social movement
Main drawback	Risk of lock-in	Slow progress	Utopian
Concepts	Green state (Eckersley 2004; Taylor 2011)	Political ecology	Deep ecology (Naess and Rothenberg 1990)
Discourses	Green economy (Stern 2009)	Envisioning real utopias (Wright 2010)	De-growth (Kallis 2011)
Theory	Resilience theory (SRC 2016)	Ecological unequal exchange (Rice 2007)	Biocentric egalitarianism (Taylor 2011)
	Environmental economics	Transition theory (Geels 2011)	
		Ecological economics	
Mechanisms	Corporate social responsibility, market based schemes such as PES. Conditional cash transfers	Creative destruction and disruptive innovations, radical tax reforms.	Basic salary for all
		Unconditional cash transfers.	

2.8 The Way Forward

At this point, we challenge the notion of coupled social-ecological systems. Ontologically, we therefore separate nature, often represented by systems or models based on a system representation, and society – here represented by strategic action fields – for the purpose of creating a methodological opportunity to unite (the best available) knowledge from each in a process of integrative research.

Sustainability science has a strong focus on action-oriented research; hence, politics is essential for sustainability science. Social fields theory is a way to make the politics of sustainability visible and actionable, and by linking strategic action fields to natural systems we are able to identify the leverage points of the natural system.

To make the political dimensions visible, and to facilitate framing and reframing, we suggested a typology whereby the sustainability challenge can be placed in a spectrum of sustainability visions, from ecological modernity, through critical modernity, to anti-modernity.

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