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## Beyond Integration: Exploring the Interdisciplinary Potential of Telecoupling Research

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### 1 Introduction

The telecoupling framework represents a clear and concrete response to the scientific and political need for interdisciplinary thought and practice to address the environmental and developmental challenges of the twenty-first century (e.g. Brondizio et al. 2016; Verburg et al. 2015; Moran and Lopez 2016). Within the contemporary global research agenda, it has been increasingly emphasised that these challenges require thinking that links the social and ecological spheres (Turner et al. 2007, [www.futureearth.org](http://www.futureearth.org), [www.glp.earth](http://www.glp.earth)). A growing number of recent

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papers (e.g. Fischer et al. 2015; Kramer et al. 2017; Lövbrand et al. 2015; Brondizio et al. 2016) advocate for a more organised and programmatic interdisciplinary approach to social-ecological research that systematically incorporates the physical, biological and social sciences (Moran and Lopez 2016). Such an approach should focus on priority areas (Fischer et al. 2015), the most pressing problems (Kramer et al. 2017) and new directions in social-ecological research as well as how to extend the conversation to policy makers and other stakeholders (Lövbrand et al. 2015). Some of the priority areas and pressing problems identified specifically relate to how to understand and govern interactions between regions and across large distances, how to understand causation in complex coupled socio-ecological systems and how to deal with diverging understandings of human-environment interactions in inter- and trans-disciplinary research groups. As discussed throughout this book, the telecoupling framework and the emerging field of telecoupling research steps into these discussions. It explicitly sets out to explore complex, distal and cross-scalar causal relations (see Chaps. 2 and 3), and the intertwining of nature and society in a systemic, yet open way, which makes engagement with a multiplicity of scientific disciplines and methods possible and, indeed, necessary (see also Chaps. 2, 3, 7, 10, 13 and 16).

The telecoupling framework is thus inherently interdisciplinary in its ambitions. In the initial publication on the framework, Liu et al. (2013, 8) heralded the “uniquely integrative” nature of the framework that “provides a common language, logical consistency, systematic approach, and holistic guidance for researchers” to analyse both socioeconomic and environmental interactions, flows and feedbacks between multiple systems. Eakin et al. (2014) also stressed “a need for integrating diverse epistemological perspectives, methodolog[ies], and analytical approaches” for researching telecoupling in order to “complement the long-standing focus of land science on place-based research with a new focus on the networks and system interactions involved in land change” (p. 142). This push for integration of perspectives finds resonance in the wider literature on land system science and human-environment change (e.g. Brondizio et al. 2016; Abson et al. 2017). In this literature, substantial efforts are currently being made to integrate methods and synthesise knowledge produced through various methods, from situated case studies to spatial

and economic modelling (Magliocca et al. 2018; Verburg et al. 2016), as well as to develop the techniques of meta-study analysis (Magliocca et al. 2015; van Vliet et al. 2016).

Yet, two issues challenge these efforts towards interdisciplinarity. First, while there is clearly a need and willingness amongst human-environment researchers to be open to accepting new approaches and to be epistemologically flexible in adapting multiple methods in their own research; in practice, it is difficult to achieve interdisciplinarity. The capacity to speak across disciplinary boundaries and to understand the assumptions of other research domains, the ability to use multiple conceptual frameworks and methods, and a shift away from studying different resources and sectors separately towards “a more holistic focus on multifunctional systems” (Fischer et al. 2015, 146) are difficult and require both modesty regarding one’s own position and openness to others (Roy et al. 2013). Second—and perhaps even more crucial—achieving interdisciplinary collaboration through integration may not always be what is needed or indeed what is feasible. On an epistemological level, different ways of knowing the world may not add up to a more comprehensive understanding of the world. Instead, frictions between thought styles may arise that are productive or otherwise (Tsing 2005). On an ontological level, current social science thinking suggests that people often inhabit vastly different worlds that are not readily commensurable (e.g. de Castro 2015). Hence, data, analysis, methods and approaches might not be integrable at all, but rather stand in contrast to each other: contrasts that need to be explored to turn them productive (see Chap. 3).

This represents a challenge for telecoupling research, as it requires a new mode of interdisciplinarity that moves beyond methodological and analytical integration. In this chapter, we begin the discussion on how to go about this by engaging with insights from the sociology of science. Specifically, we draw on Barry and Born (2013) and their discussion of an agonistic (combative)–antagonistic (hostile) mode of interdisciplinarity and the logic behind it. Based on this perspective, we argue that interdisciplinarity should not only be a matter of integration but also be a process that depends on scientific differences, so that the goal of interdisciplinary exchanges is to find ways of exploring productive tensions rather than smoothing them over (Barry and Born 2013; Niewöhner et al. 2016a).

Examples from telecoupling research will be used to illustrate how this mode of interdisciplinarity pushes knowledge production forward. This approach requires an understanding of theory as not simply an ever more encompassing body of general principles. Rather, this approach suggests that theoretical concepts deliver specific analytical sensitivities to the researcher; analytical sensitivities that have the potential to set telecoupling research off on the right interdisciplinary track. Our main aim in this chapter is therefore not to evaluate the state of interdisciplinarity in current telecoupling research, but rather, to provide suggestions for avenues that it needs to follow if it is to become a meaningful interdisciplinary research framework capable of addressing the manifold current and future challenges in social-ecological research.

## 2 New Directions for Interdisciplinary Research

### 2.1 Modes of Interdisciplinarity

Due to a “paucity of empirical studies of how interdisciplinarity unfolds in practice” little is actually known about how best to do interdisciplinary work (Barry and Born 2013, 2). However, it is increasingly acknowledged that interdisciplinary research can be more than simply the integration or synthesis of two or more disciplines in a relatively symmetrical form *or* a research process in which one or more disciplines make up for, or fill in for, “an absence or lack in the other, (master) discipline/s” (Barry and Born 2013, 11). Such *integrative-synthesis* and *subordination-service* modes of interdisciplinarity, as Barry and Born label them, are not outdated or useless, as bringing together disparate data and knowledge is needed for tackling today’s sustainability challenges around land use. Within land system science, for example, studies have shown how integrating geographical spatial models of land-cover change and economic models of land-use decision making in an interdisciplinary integration-synthesis mode provide useful knowledge on land-use and land-cover changes (e.g. Verburg et al. 2016). As for the subordination-service mode, a social science perspective is sometimes added to otherwise largely natural

science-based land-use change studies in order to discuss drivers of consumption changes, for example (Nelson et al. 2006). Yet, the limiting interdisciplinary exchanges often taking place in these two modes make it less likely that radically different understandings of a given research object are achieved since the basic assumptions of the participating scientists are left unchallenged (Barry and Born 2013). For social-ecological research, such as telecoupling research, a different mode of interdisciplinarity is needed in striving to achieve a “radical recasting” of the “dualistic ways that researchers, analysts, and commentators think about interactions between two historically distinct worlds: the world of social, economic and political systems and processes, and biophysical systems of the planet” (Brondizio et al. 2016, 319).

This mode should strive to contest and transcend the given epistemological and/or ontological assumptions of “specific historical disciplines” within interdisciplinary projects (Barry and Born 2013, 12)—that is, it should challenge their established methodological and theoretical positions. Driven by agonistic (combative) or even antagonistic (hostile) relations to existing forms of disciplinary knowledge and practice such an *agonistic-antagonistic* mode of interdisciplinarity should strive to create knowledge “irreducible to its antecedent disciplines” (Barry and Born 2013, 12). This mode is relevant when an interest in shared research objects or boundary objects (Star 2010) brings together diverse and contesting perspectives on knowledge production. Boundary objects are best described as objects with a large amount of interpretive flexibility that allows different disciplines to discuss the same object but from different positions (Star and Griesemer 1989). For example, a forest is a boundary object from the research field of land-use and land-cover change. A forest has multiple meanings at the same time and, depending on whether the forest is described by a biologist, an economist or an anthropologist, it can be said to be a biome, an economic resource or a site of recreation and/or cultural meaning. That is, each disciplinary perspective assigns different ontological status to the forest (see also Niewöhner et al. 2016a, 12–13). In an agonistic-antagonistic mode of interdisciplinarity, the aim is not to settle upon the right definition or understanding of what a forest is, as this carries the risk of a “spurious unity” or a false idea of agreement (Barry and Born 2013, 13). Rather, it is a process focused on changing

(or at least challenging) the respective researcher's stance as this might lead to "novel research questions, objects and practices" around the shared research object (Niewöhner et al. 2016a, 12). The irreducibility of new knowledge to the participating disciplinary perspectives also implies that researchers engaging in this mode of interdisciplinarity must be ready to accept that the knowledge generated by their own discipline may be revealed to be inadequate, faulty or even unreliable (Penny 2006, as cited in Barry and Born 2013, 12). In this sense, agonistic-antagonistic interdisciplinarity depends on a "self-conscious dialogue with, criticism of or opposition to" established disciplines (Barry and Born 2013, 12). The drive within an agonistic-antagonistic mode is hence a wish to supersede prior knowledge commitments in a dialogical way. As such, this mode should be understood diachronically, or as in constant formation, defined and facilitated by the multiplicity of researchers engaging in it.

Within telecoupling research, this is exemplified by the discussions around the concept of scale. While it is beyond the scope of this chapter to provide a thorough review of the papers discussing scale within telecoupling research (e.g. Friis and Nielsen 2017a, b; Friis et al. 2016; Liu et al. 2013; Niewöhner et al. 2016a; Eakin et al. 2014), it is fair to say that something resembling an agonistic-antagonistic discussion about this concept has taken place as researchers, with very different perspectives compared to the one traditionally held in land system science, have started engaging in telecoupling research. Conventionally, land system science has approached scale from a Euclidian perspective, where scale is determined by spatial extent relative to the planet as a whole, and scales, such as local, regional, national or global, are understood as existing independently of the object of research and of the observer. In contrast, human geography and anthropology have largely developed a relational perspective on space and scale (Friis and Nielsen 2017a, b; see Chap. 3). Insisting on an analytical engagement with how different phenomena, objects, events, places or processes are constituted in space in relation to each other, a relational perspective does not necessarily limit scale to a specific spatial extent. Rather, the scale of a particular object of study is determined by the perspective from which it is studied, the methodology used, who is using it and for what purpose. Whereas the Euclidian perspective on scale adopted in land system science often leads to a

scale-dependent view of different phenomena and drivers, which are understood to be tied to and represented as operating at specific scales, a relational perspective argues that these different phenomena have to be related to each other and to the methods by which they are represented, since these shape the nature of the particular phenomena.

In an example from recent telecoupling research, Friis and Nielsen (2017a, b) illustrate this move between different understandings of scale. Exploring the conversion of land from rice to banana in northern Laos, they show how the spatial boundaries of the telecoupled banana system were determined by the methodological scale choices, analytical interests and empirical observations, rather than by a priori scalar definitions such as fields, village, region or nation. At the same time, such scalar units of analysis remained important too since, for example, government policies targeting a regional scale played a role in the land-use conversion. The implications of this are manifold, as becomes evident throughout the chapters in this book, but one clear outcome is that scales simultaneously exist (in the case of the region) and do not exist (in the case of the banana system) independently of the observing scientists (Friis and Nielsen 2017a, b; Niewöhner et al. 2016a). As such, telecoupling research can embrace both a positivist and a social constructivist understanding of scale that cannot be reduced to either the natural or the social sciences collaborating within the framework. Adopting an agonistic-antagonistic mode of interdisciplinarity implies that discussions on scale, as exemplified here, should lead to new questions, discussions and eventually understandings concerning system boundaries and spatiotemporal scale (mis) matches between social and ecological processes without necessarily reaching consensus on a new “scale definition.”

## 2.2 Logics of Interdisciplinarity

Engaging in an agonistic-antagonistic of interdisciplinarity, or any other mode, does not in and of itself ensure new knowledge or new understandings of a boundary object. To reach new knowledge positions that allow researchers to both transcend and confirm traditional understandings of a forest or scale, for example, Barry and Born (2013) argue that

reflexivity is required regarding more than the mode, or the how to, of interdisciplinarity. It is equally important to understand the *logic* behind it, or which (social-economic-political-scientific) agendas drive the current push for interdisciplinarity as these might delimit the scope and freedom of the research.

Barry and Born (2013) describe three such logics: a *logic of accountability*, a *logic of innovation* and an *ontological logic*. In the two first logics, interdisciplinarity is understood as fostering a culture of accountability for science with respect to society because science can deliver innovative solutions needed by society to tackle the multidimensional problem of environmental change. These logics of interdisciplinary collaboration are thus justified on the basis that they “encourage publics and governments to ‘buy into’ the results of the research, and [because] they can make scientific institutions more responsive to the demands and concerns of non-scientists” (Barry and Born 2013, 15). Telecoupling research aligns well with these two logics as it strives to achieve a high level of accountability towards and relevance for society by arriving at innovations that push land use onto a more sustainable path both locally and globally (see also Chaps. 1, 9, 11 and 19). The recently funded European Union project *COUPLED—Operationalising Telecouplings for Solving Sustainability Challenges Related to Land Use* is a clear example of this, connecting stakeholders from large multinational companies, NGOs, international organisations and policymakers with academic partners around the issue of sustainable land use ([www.coupled-itn.eu](http://www.coupled-itn.eu)). While there is nothing wrong with this, Barry and Born (2013, see also the authors they cite in support of this argument) caution that an exclusive focus on these two logics invariably results in a situation where science loses some of its autonomy, and potentially has to adjust its aims according to funding bodies that are increasingly oriented towards innovative research that is applicable to the public and private sectors. The risk is that interdisciplinary collaboration arises “primarily in response to wider social and economic demands” rather than as a result of a need to actually develop new knowledge about a research object (Barry and Born 2013, 17). This is something we should be aware of as we push telecoupling research forward.

Interestingly, Barry and Born (2013) note that “what is striking across a range of interdisciplinary fields today is how they are understood to be



governed not only by a logic of accountability and innovation but [also by] an ontological logic” (p. 17). Socio-political and economic demands are not the major drive behind this third logic. Nor is being “of service,” but rather, it is driven by a desire and a need to engage with the world in radically new ways. In human-environment research, this is of immediate relevance as any efforts to foster sustainability needs to address environmental, social and economic dimensions of human-environment systems symmetrically. Telecoupled dynamics, in addition, foreground the increasingly diverse and multi-scalar sets of drivers that underpin plural engagements with particular sites. Four major scientific positions of relevance for telecoupling research characterise this logic. First, research driven by an ontological logic takes as a given that knowledge practices intervene in the world and thereby bring research subjects and objects into relational existence. This means, for example, that the manner in which a research object, for example a specific land-use change, is framed, problematised and analysed contributes to the production of the research object. Second, the logic of ontology is found in the interdisciplinary practices that are concerned with the creation of hybrid or relational objects that “cannot be broken down into distinct natural, technical and social components” (Barry and Born 2013, 19). Land use represents such a relational research object. It cannot be distilled into distinct natural or social components and, as emphasised by Barry and Born (2013), it is exactly this hybridity that spurs interdisciplinary interest in the first place. Third, it addresses the division between reality as conceived by science and reality as experienced by humans—meaning that we need to attend to the “aesthetics, affective or social qualities of events as well as their physical or biological dynamics” (Barry and Born 2013, 20) in order, for example, to grasp what “land” is. Fourth, and lastly, this logic emphasises how the involvement of non-scientists, citizens or lay publics may not only revolve around fostering accountability but also help “enlarge and enrich what must be taken into account” (Barry and Born 2013, 20) and thus what constitutes the problem of a given land-use change that is influenced by distal processes and telecoupling.

Barry and Born (2013) note that, for research facilitated by an agonistic-antagonistic mode of interdisciplinarity, there is almost invariably a privileged relation to the logic of ontology because the contestations and

arguments around a common research object aim to change respective knowledge positions and facilitate new understandings of the object. As the telecoupling framework might already be fostering such agonistic-antagonistic interdisciplinary exchanges, it is worth reflecting upon the particular logics driving different parts of telecoupling research, as well as their potential consequences for how and what we study and the results we produce. In interdisciplinary projects that focus on addressing complex issues such as social-ecological interactions, we need to be aware of these modes and logics and how they shape ways of working as well as knowledge outcomes (Fischer et al. 2015; Moran and Lopez 2016).

### 3 Discussion: Telecoupling as a Mode and Logic of Interdisciplinarity

Telecoupling is only just emerging as a framework for analysing globalised land-use change. As such, it is too early to fully evaluate whether telecoupling research as an interdisciplinary practice will manage to set up and develop new ways of systematically exploring cross-scale relations, complex causation, bridge place-based research with network and flow perspectives, as well as capture how the intertwinement of nature and society manifests in land-use changes. Indeed, fundamental questions about what telecoupling research is and how it will develop as an interdisciplinary endeavour are currently being asked, as illustrated in the present work and recent papers (e.g. Eakin et al. 2014; Friis and Nielsen 2017a, b; Niewöhner et al. 2016b). In this sense, telecoupling is very much a “framework in the making,” in which several interdisciplinary tracks are being pursued. It defines a space and terms of engagement rather than attempting to characterise a particular stance.

The distinction between different modes and logics of interdisciplinarity as presented by Barry and Born (2013) is helpful for disentangling *how* as well as *why* different approaches to interdisciplinarity arise and (co-)exist. Substantial focus has so far been given to the telecoupling framework’s potential for the scientific integration of processes, perspectives and methods (Liu et al. 2013). As such, much effort has gone into developing its potential for facilitating an *integration-synthesis* mode of

interdisciplinarity and for “operationalising” it through mixed-method approaches including both qualitative and quantitative approaches (see Chaps. 7, 10, 13 and 16).

In this chapter, we have explored how telecoupling might productively (remain) open up for an additional interdisciplinary path. That is, if it is committed to and engages in critical reflection on the core components and assumptions of the framework, telecoupling research also invites an agonistic-antagonistic mode of interdisciplinarity. More concretely, early conceptual, methodological and empirical work around the framework has initiated discussions of key elements of telecoupling that have led to insights not reducible to either the social or natural sciences engaged within it (e.g. Friis and Nielsen 2017a, b; Friis et al. 2016; Niewöhner et al. 2016a; Eakin et al. 2014). The example of scale discussed above highlights this and shows how telecoupling research accommodates a position where scale is understood as both geographically real and socially constructed. Similarly, recent work has explored how to approach systems as both epistemological constructs and empirically founded (e.g. Friis and Nielsen 2017b). This discussion allows critical reflection on how we delimit, define, describe and use sending, receiving and spillover systems in telecoupling analysis (see Chap. 3). Another related discussion enabled by the agonistic-antagonistic mode of exchange concerns distance. While the prefix “tele” in telecoupling implicitly invokes a sense of geographical and spatial distance between the systems that are interacting to produce a connection, telecoupling research also incorporates an understanding of space whereby distance is also measured in institutional, cultural and political terms (Eakin et al. 2014). Various actors creating a telecoupling might, for example, be distant in terms of institutional settings yet physically close, or vice versa (Niewöhner et al. 2016b). In telecoupling research, distance is, like scale and systems, neither reducible to a social or natural science definition, nor is a “spurious unity” or consensus sought. By focusing on identifying and discussing key shared boundary objects with interpretive flexibility in terms of scale, system and distance, research around telecoupling can allow for *agonistic-antagonistic* contestations that might lead to new research questions and research objects and ultimately result in a better understanding of global land use.

Moreover, the explicit focus within telecoupling research and land system science on developing interventions towards more sustainable land use have led to an acute awareness of the fact that decisions concerning land use are embedded in political, financial, scientific and discursive (global) power relations and flows that need to be understood. This has fostered calls (Eakin et al. 2014; Friis et al. 2016) and research designs (e.g. [www.coupled-itn.eu](http://www.coupled-itn.eu)) that are attentive to critical social science including critical and economic geography and political ecology insights on justice, power and social complexity. By being open to and inviting such perspectives however, the current embedding of the telecoupling framework in land system science and coupled human-environment systems literature with its general post-positivist position on knowledge production is challenged by the more constructivist approaches found in the critical social sciences (see also Chap. 3). This is likely to result in further *agonistic-antagonistic* interdisciplinary exchanges around the direction and position of telecoupling research. The work of Friis and Nielsen (2017a, b) and Niewöhner et al. (2016a, b), as well as this book, illustrate how these debates are already unfolding.

The productive interdisciplinary momentum that we believe characterises telecoupling research is supported by loud calls by scientists and from politicians and institutions concerned with global social and environmental problems for inclusive and innovative interdisciplinary frameworks (e.g. Fischer et al. 2015; Kramer et al. 2017; Moran and Lopez 2016; [www.glp.earth](http://www.glp.earth)). Responding to a global research agenda obviously supports the framework, yet also positions and potentially drives the research in specific directions. As we advance telecoupling research, we need to be aware of this and critically discuss not only *how to* do interdisciplinary research but also *why* and *for* whom we do it. We believe that Barry and Born's (2013) description of different logics of interdisciplinarity can help researchers who are engaged with understanding telecoupled land-use change critically reflect upon their research practices and its consequences. In particular, we need to make sure that, in the race for funding and political, economic and social legitimacy, we are not caught up in an interdisciplinary endeavour that strives towards the delivery of innovations and solutions that are only useful to economic and political interests. Clearly this is important, but if telecoupling research aims to

push for more sustainable land use (see Chaps. 9, 11, 17 and 19), we should seriously consider how we not only deliver solutions to policy-makers and industry, but also how we provide challenging suggestions that question the institutional, political and economic status quo. While the chapters in this book to a large extent demonstrate that telecoupling can encompass all three logics described by Barry and Born (2013), the large challenge of how to balance the three logics remains. Interdisciplinary telecoupling research is currently located at the border between applied and pure research domains, dependent upon third-party funding, driven by a problem-solving agenda and concerned with sustainability and the trade-offs between various demands, agendas and actors claiming interest in land use. Thus, this research is likely to be advanced predominantly by a logic of accountability and of innovation. Yet, pursuing research through an agonistic-antagonistic mode of interdisciplinarity driven by a *logic of ontology*, as we have tried to illustrate in this chapter, has perhaps the larger potential to foster truly novel understandings of key research objects vital for tackling today's problems around land use and (un)sustainability.

## 4 Conclusion

Telecouplings represent a fundamental challenge to explanations of land-use change that requires an interdisciplinary practice or mode that can accommodate and facilitate new ways of thinking and conducting research. For telecoupling research to succeed in its interdisciplinary ambition, there is a need for a more systematic and conscious recognition of the limits of specific research approaches and disciplines, be it network-science, flow-analysis or ethnographic modes of fieldwork. As well as knowledge of how to go about working together across such divides, in this chapter we have argued that an *agonistic-antagonistic* mode of interdisciplinarity driven by a *logic of ontology* is rewarding. We have highlighted that discussions around scale, distance and systems indicate that the framework is already to some extent engaging in this type of interdisciplinary work. However, advancement in this respect also depends on the adoption of a critically reflexive approach to science production that

acknowledges the manner in which scientific knowledge and practices intervene in the world. This research foregrounds the need to engage more consequentially in a combination of different modes and logics of interdisciplinarity and emphasises joint problematisation, understanding and problem solving. Telecoupling research should not only be regarded as a response to those who call for a more integrated scientific agenda to meet the challenges of the Anthropocene, but should also be seen as a research domain that holds the potential to actively shape this agenda and develop formats that can appropriately address it.

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