

OPERATIONALISING TELECOUPLINGS FOR SOLVING
SUSTAINABILITY CHALLENGES FOR LAND USE

Deliverable D4.3

Fit for purpose? Scale-sensitive sustainability
governance in telecoupled systems

*(Synthesis paper on different concepts of
distance and mismatches)*



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About COUPLED

Human consumption of food and agricultural products has a significant impact on the environment and the societies in the regions where they are produced. Different sectors, consumers, businesses and politicians are increasingly demanding more environmental and social sustainable land use both inside and outside Europe. Yet, there is increasing recognition of the limitations of current research approaches to adequately understand and address the increasing complexity of land system dynamics, which are often characterized by strong non-linearity, feedback mechanisms, and local contexts, and where places of production, trade, and consumption of land-based products are increasingly separated.

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COUPLED trains Early Stage Researchers capable of:

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Executive summary

Distally connected socio-ecological systems – or ‘telecoupled’ systems – pose important challenges for sustainability governance at different scales. To a great extent this is due to difficulties in designing and implementing governance institutions at appropriate scales, which fit the scale of the environmental and social problems generated in telecoupled systems. We examine the issue of governance fit in relation to global commodity flows and telecoupled systems, focusing specifically on the spatial scalar dimension of this, and propose solutions to address governance mismatches. We draw on examples from land and global agricultural commodity governance to identify two types of governance mismatches – boundary mismatches and resolution mismatches. We argue that these can be addressed through governance rescaling processes, and elucidate this with reference to examples of four broad types of governance approaches, namely trade agreements, due diligence laws, landscape approaches to supply chain governance, and multi-stakeholder commodity platforms.

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Introduction

Sustainability problems are increasingly shaped by distal actors and processes through global flows of information, people, goods and services. For example, the production of palm oil, soy, cocoa and rubber is often far removed from sites of consumption and associated with negative social and environmental impacts, including deforestation, biodiversity loss, landholding concentration, rural displacement, food insecurity and agri-chemical pollution (Bager et al., 2021a; Cotta et al., n.d.; Laroche et al., 2021; Mempel and Corbera, 2021; Parra Paitan et al., n.d.; Russo Lopes et al., 2021). This means that sustainability problems rarely conform to political boundaries, which makes it challenging to design governance institutions at the scale of the problems. When governance responses do not match the scale of the environmental problems to which they are directed, scholars have diagnosed ‘problems of fit’ or ‘mismatches’ (Cumming et al., 2006; Ekstrom and Young, 2009; Epstein et al., 2015; Folke et al., 2007; Galaz et al., 2008; Young, 2005; Young and Underdal, 1996). Problems of governance fit are well researched with regards to particular socio-ecological systems (Bergsten et al., 2014; Moss, 2012), but research has so far not systematically explored solutions to spatial mismatches in distantly connected socio-ecological systems, so-called telecoupled systems (Munroe et al., 2019; Newig et al., 2020; Sikor et al., 2013). The problem of fit becomes considerably more complicated in telecoupled systems due to the involvement of multiple jurisdictions, actors and institutions.

Telecoupling denotes long-distance connections between two or more socio-ecological systems that are linked through material and non-material flows (Eakin et al., 2014; Friis et al., 2016; Liu et al., 2013). The telecoupling concept allows us to analyse how socio-ecological changes observed in one place are related to socio-ecological processes elsewhere. Rather than confronting globalisation as a diffuse, complex and all-pervasive phenomenon, the telecoupling concept thus helps to delineate and analyse particular place-specific social and environmental impacts and their (often remote) drivers in a globalising world (Challies et al., 2014; Friis and Nielsen, 2019; Sonderegger et al., 2020).

Governing ‘telecoupled’ systems towards greater sustainability is challenging (Eakin et al., 2017; Munroe et al., 2019; Newig et al., 2020). Addressing the social and environmental impacts of global flows is a daunting task because the underlying drivers and effects of these flows often exceed the reach and governance capacity of national governments, individual companies or citizens. In the case of global commodity trade, for example, governments in importing regions generally have no direct authority over land use, tenure rights, production methods, or labour laws in producing regions. Similarly, producing regions cannot regulate demand and consumption that drive international trade of unsustainably produced commodities. Furthermore, institutional capacity and political will to address social-ecological problems may vary between sites of production and consumption. Even new sustainability governance initiatives to govern global flows, such as corporate pledges, voluntary sustainability standards, public-private partnerships and multi-stakeholder initiatives (Cotta et al., n.d.; Grabs et al., 2021; Leijten et al., 2020; Meemken et al., 2021) are not necessarily effective (Dauvergne and Lister, 2010; Garrett et al., 2019; Greenpeace, 2021). Research has attributed the ineffectiveness of governance institutions in part to the mismatch between the scale of the governance institution and the scale of the underlying problem (Young, 2005), but this topic has not yet been explored in the context of telecoupling.

In this article, we discuss the problem of governance fit in relation to global commodity flows and telecoupled systems, and propose solutions to address this problem. While the degree of fit may pertain to the alignment between governance response and a given social-ecological problem in spatial, temporal or functional terms (Cumming et al., 2006; Folke et al., 2007), we focus in this paper specifically on the question of spatial fit in telecoupled systems, as the large geographical distance between two or more connected socio-ecological systems is a defining characteristic of telecoupling. We examine two general types of spatial mismatches: ‘boundary mismatches’, in which sustainability issues transcend relevant jurisdictional boundaries; and ‘resolution mismatches’, where governance responses are set at too coarse or too fine a scale to effectively address the issue at hand. We draw on illustrative empirical examples from the area of land and global agricultural commodity governance in order to support our conceptual arguments and elucidate how the governance of land and land-based resources is often confronted with problems of fit in telecoupled systems. We contend that a better understanding of the types of mismatches that arise when governing environmental problems associated with global flows will contribute towards identifying institutional design features for more

effective sustainability governance of telecoupled systems.

The article proceeds as follows. We first review the literature on governance mismatches in socio-ecological systems and explain why governance of telecoupling is prone to mismatches. Subsequently we outline different mismatches in telecoupled systems and discuss potential solutions.

The problem of fit

Problems of fit fundamentally exist because socio-political and ecological boundaries rarely coincide (Dallimer and Strange, 2015). That is, since environmental problems seldom conform to politico-administrative borders, the authorities and institutions tasked with governing a particular environmental problem may have little or no jurisdiction over its drivers or detrimental effects.

The problem of fit has been widely researched in the political science and social-ecological systems literature. Scholars have examined mismatches between the spatial, temporal, and/or functional scales of governance institutions and the scales of ecological processes (Brown, 2003; Cumming et al., 2006; Ekstrom and Young, 2009; Epstein et al., 2015; Galaz et al., 2008). Scale is here understood as “the various levels at which a phenomenon occurs in the dimensions of space and time” (Young, 2002, p. 26). Ekstrom and Crona (2017), for example, observe that governance responses to environmental threats are often unable to address the full extent of the problem, which has led to significant environmental degradation worldwide. They refer to the mismatch between ecosystems and governing institutions as “institutional gaps” (Ekstrom and Crona, 2017, p. 600). Dauvergne and Clapp (2016, p. 3), likewise, observe “a mismatch between political borders and problems without jurisdictional boundaries”. For example, human-induced drivers of land-use change operate at multiple levels and spatial scales. International trade, regional development policies, national property rights regimes and local people’s values and behaviours are among the many factors which may affect land conversion, including tropical deforestation (Geist and Lambin, 2002). However, most governance mechanisms are designed at a single level (e.g., national forestry law), and thus do not provide complete solutions for the challenge of forest governance (Nagendra and Ostrom, 2012).

Research has mostly adopted a spatial perspective on the problem of fit, pointing to various possible configurations of mismatches (Figure 1). As noted by Folke et al. (2007, p. 15), “spatial mismatches occur where the boundaries of management do not coincide with the boundaries of the ecological entity.” On the one hand, the governance scale may be smaller than the ecological scale (Figure 1 - A), cover only parts of the ecological scale (Figure 1 - B), or not have any jurisdiction over the ecological scale at all (Figure 1 - C). For example, a national government’s effort to regulate fishing in international waters is unlikely to prevent the depletion of fish stocks as long as fishing fleets from other countries continue to overfish (Moss, 2012). On the other hand, the governance scale may be greater than the ecological scale (Figure 1 - D), such as in the case of the EU’s Water Framework Directive that needs to be translated into River Basin Management Plans in order to adapt to local circumstances and avoid scalar mismatches.

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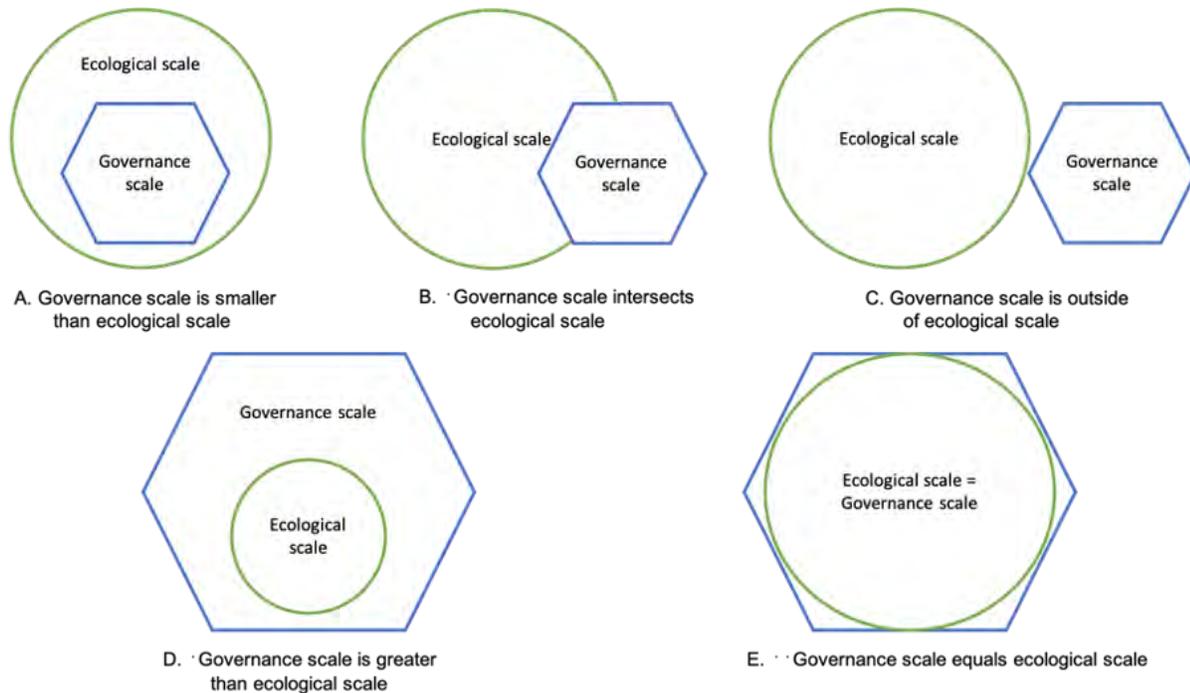


Figure 1. Scale (mis-)matches between the ecological and governance scale. Adapted from Newig et al. (2013, p. 13).

Fundamentally, the problem of fit concerns the question of how to scale and rescale governance arrangements so that they align with socio-ecological dynamics. Governance arrangements for the protection of a given resource or ecosystem that do not cover the full extent of the ecosystem dynamics have built-in weaknesses that impede their ability to fulfil their goals (Young, 2005). From this perspective, governance may be ineffective if (1) actors in one jurisdiction do not have full control over the problem they seeks to address because (a) the problem is influenced by higher-level systemic processes and depends on the quality of global public goods, thus requiring global solutions (e.g., global ozone layer), or (b) the problem is influenced by extra-jurisdictional processes so that jurisdictional governance responses can only partly address its causes and/or effects (e.g., cross-border water pollution) (Oates, 2001); or if (2) the governance intervention has collateral extra-jurisdictional effects, which reduce the overall effectiveness of the intervention (e.g., polluting activities are banned in one jurisdiction, but shift to another jurisdiction) (Lewison et al., 2019).

The overall question then becomes how to design the best institutional fit. That is, the concept of governance fit allows researchers to examine whether governance should be scaled up or down to match the perceived scale of the problem. However, since there is no objective way of defining the level of a problem or the perfect fit, what becomes important is to consider how a given problem is defined, perceived and framed, and by whom. As emphasised by Hospes and Kentin (2014, p. 216):

“The challenge is not to identify the one and only scale of the problem and construct the ideal scale of governance to tackle this problem; instead, the challenge is to explore how differently scaled forms of governance can be linked, renewed, and used to solve different scales of the problem.”

The scale at which the problem is perceived and framed will vary among actors and influence their preferences for scaling governance either up or down. For example, political and societal actors may strategically frame certain problems at the global scale if they perceive national governments as a possible hindrance to solving the problem, or if they try to avoid assuming responsibility and implementing domestic measures. Publicising

and promoting a problem at the global scale may lead to the implementation of governance instruments and approaches that can bypass national governments, such as certification (Gupta, 2014). How one frames the scale of the problem can give power to some actors and ideas for problem solutions and take it away from others (Mohan, 2014).

Questions about fit have predominantly been applied to problems associated with the governance of natural resources in particular social-ecological systems (SES), such as forest governance in Belarus (Shkaruba and Kireyeu, 2013), river basin governance in Europe (Lebel et al., 2013; Moss, 2012) and the Mekong Basin (Lebel et al., 2005), coastal fisheries systems in Kenya and forest patches in Madagascar (Bodin et al., 2014), wetland management in Sweden (Bergsten et al., 2014), moose management in Sweden (Dressel et al., 2018), forest governance in Ukraine (Melnykovich et al., 2018), and urban lakes in India (Enqvist et al., 2020). The main focus in much of the existing research has been on how and why local, regional and national governance institutions do not fit the characteristics of the social-ecological systems under investigation, leaving questions about the influence of international actors or flows on the analysed SES largely unaddressed. Challies et al. (2014) note that SES research has mostly dealt with the investigation of small, tightly-coupled systems, disregarding linkages and interdependencies that exist between multiple SES due to global production networks and telecouplings.

The problem of fit in telecoupled systems

The literature on telecoupling has repeatedly referred to the concepts of mismatches, but the definition and application of the concept in the context of telecoupling remains cursory. Munroe et al. (2019, p. 54) point towards “mismatches in scale between institutional extent and ecological process” with regards to governing flows in telecoupled systems, and Newig et al. (2020, p. 8) highlight that “telecoupled systems often present a misfit between governance institutions and the social-ecological problems that they are supposed to address”. Likewise, Zaehring et al. observe (2019, p. 371) “major mismatches between social-ecological system boundaries and existing governance territories” in the case of vanilla production in Madagascar. Additionally, Oberlack et al. (2018, p. 3) suggest that telecoupled systems may require “governance solutions that are neither local nor global: local institutions with clear boundaries may be overwhelmed by interactions with systems to which they are distantly connected”. Clearly the important question of how to align the scale of governance with the scale of the socio-ecological problem at hand remains unresolved in research on telecoupled socio-ecological systems.

Telecoupling is one among distinct typical configurations of socio-ecological systems and their interdependencies (Figure 2). Telecoupled systems arise when the activities of actors in one system affect a socio-ecological system elsewhere, either directly (e.g., actors shift their activities from one place to another like EU fishing fleets operating in waters of third countries) or indirectly (e.g., through international trade), thereby creating socio-ecological interdependencies.

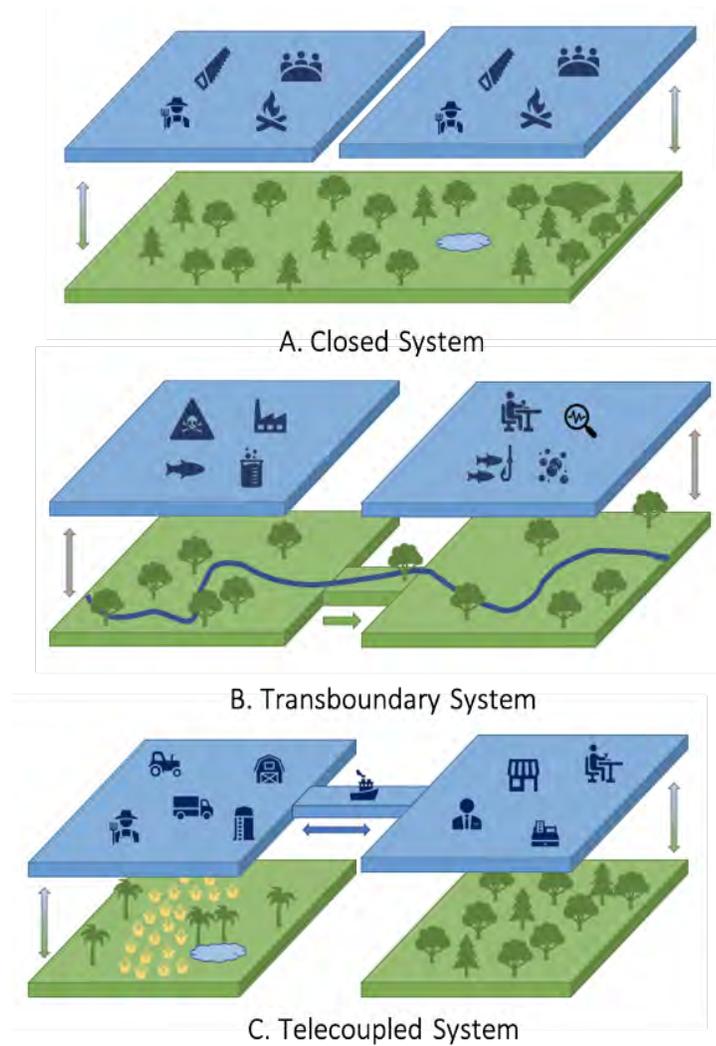


Figure 2. Typical socio-ecological systems and their interdependencies. This figure consists of two types of building blocks, in particular socio-economic building blocks (blue) and ecological building blocks (green), and their interdependencies (arrows). In a closed system (A), two socio-economic systems share the same ecological resources; e.g., two clans harvest wood from the same forest patches. In a transboundary environmental system (B), two socio-economic systems rely on ecosystems that are ecologically connected; e.g., pollution of a river by an upstream riparian country may affect fish populations in downstream riparian countries. In telecoupled systems (C), the ecological systems are geographically further apart, but connected through socio-ecological processes like trade or species migration; e.g., agricultural commodities are produced in a socio-ecological system and traded with another socio-economic system, where the commodities are further processed or consumed.

Telecoupled systems are characterized by a spatial distance between the system where the social or environmental impacts occur and the system to which the underlying causes can be traced. The geographical distance is often accompanied by a social and institutional distance between the socio-economic systems (Eakin et al., 2014; Friis and Nielsen, 2017; Mempel et al., 2019; Niewöhner et al., 2016). The telecoupled systems usually lack social and institutional ties and are governed by different actors and arrangements (Eakin et al., 2017). Even when actors are willing to cooperate, such disconnections raise the transaction costs for cooperating over sustainability issues (Newig et al., 2020). These geographical, social and institutional distances hinder the creation of governance institutions that match the scale of the socio-ecological dynamics of telecoupled systems for several reasons.

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First, governance actors can be blind to or ignorant about the distant negative environmental and social causes or effects of certain decisions or actions, due to the lack of manifest ecological feedbacks between telecoupled systems. In many local or closely related SES, the resource-intensive activities of one actor group will have directly tangible effects for other users (Bergsten et al., 2014; Kininmonth et al., 2015; Lebel et al., 2005). In transboundary water systems, for example, water withdrawals in one place affect downstream water levels in the same river basin. In contrast, in telecoupled systems, there is usually no such manifest direct ecological feedback between the places of extraction and end use of a given resource, even though indirect feedbacks may emerge with temporal delays, such as climate-related extreme weather events due to past greenhouse gas emissions from, for instance, tropical deforestation driven by international demand for forest-risk commodities. Furthermore, governance actors may find it difficult to attribute specific socio-environmental effects to specific activities in telecoupled systems (Busck-Lumholt et al., 2020). Processes of industrialization, globalization, corporatization and financialization have led to growing distances in the global food systems, which make it nearly impossible to unambiguously link the decisions of specific actors to particular ecological or social outcomes in specific agricultural landscapes (Clapp, 2015). Consequently, the actors responsible for driving the telecoupled interactions do not experience the negative effects of their actions or might not realize the link between past actions and the negative impacts, and might thus have few incentives to change their scope of governance.

Second, this means that an ecological or social problem may only become a concern in telecoupled systems among geographically and institutionally distal actors if transnational social and political pressures emerge that highlight the causal linkages between certain actions and distant outcomes. Only when ecological or social conditions cross a threshold of concern and are recognized in public discourse, or if new information emerges or new actors acquire agency and are able to bring attention to previously neglected system dynamics, a window of opportunity can open to establish governance interventions to address the cross-scale dimensions of telecoupled systems (Eakin et al., 2017; Kingdon, 1984). Improved transparency about the causes and impacts of telecoupled sustainability issues, through collection and dissemination of information on flows, impacts, and governance interventions can thus play a key role in triggering governance responses to telecoupled issues (Gardner et al., 2019). For instance, over time, EU media has become more concerned with environmental impacts such as deforestation related to soybean expansion in the Amazon biome. The growing public awareness has put pressure on the EU to address the issue (Mempel and Corbera, 2021). In recent years, a number of interventions have emerged to tackle deforestation embedded in international trade, and the European Commission is developing a policy package to reduce imported deforestation resulting from EU consumption (Bager et al., 2021b; Henn, 2021). However, other areas like the global water crisis have yielded far less attention, and interventions addressing embedded water use (i.e., virtual water) are not widely discussed in international or national politics (Graham et al., 2020).

Third, even though governance actors might become aware of and concerned about a telecoupled environmental problem, such as in the soybean-deforestation example above, a governance mismatch can arise from targeting interventions at the scale of the biophysical system where the impact occurs without considering the underlying problem structure, including the spatially distant socio-economic drivers. That is, governance interventions that target only the direct ecological impacts are often unlikely to resolve the issue without displacing it to other SES. While traditionally, the problem of fit relates to “how well the attributes of institutions and wider governance systems [...] match the dynamics of biophysical systems” (Galaz et al., 2008, p. 147, see also Figure 1), governing globalized issues requires governance systems to match the dynamics of the *socio-ecological* systems rather than just biophysical systems. For example, Europe’s demand for agricultural commodities such as soy is associated with negative socio-ecological impacts, such as deforestation in producer countries (Pendrill et al., 2019). Addressing tropical deforestation at the scale of a single ecosystem or biome, such as the Amazon, is unlikely to be effective because the demand for forest-risk commodities will persist. Governance interventions at the scale of a single ecosystem, like the Brazilian Soy Moratorium targeting the Amazon, may simply displace deforestation to another area, such as the Cerrado region (Dou et al., 2018).

Finally, mismatches are likely to arise in telecoupled systems because they may share few governance institutions and have little or no history of prior collaboration (Newig et al., 2020). The social and institutional

distance between telecoupled systems may lead to a situation in which separate policies, actors and networks govern telecoupling largely independently. Eakin et al. (2014, p. 143) point to the risk of a “governance vacuum” if governance arrangements do not address the full scope of newly emerging telecoupling. In the absence of joint institutional structures between telecoupled systems, governing global flows and processes is challenging because governance actors need to deal with issues whose causes or effects lie beyond their jurisdiction. For example, there is strong evidence that consumption in the EU has socio-ecological impacts beyond its own borders (Dorninger et al., 2021; Laroche et al., 2021; Roux et al., 2021). However, governing environmental issues beyond borders has clear limitations because the EU has to avoid infringing on the national sovereignty of other countries, and observe World Trade Organisation (WTO) rules.

Different types of mismatches in telecoupled systems

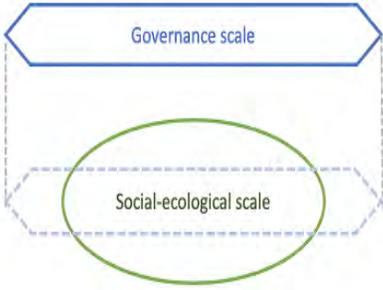
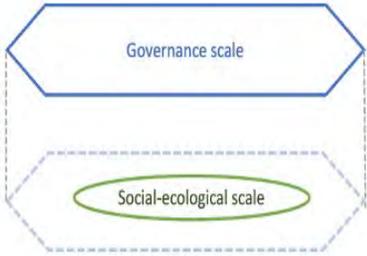
That governance mismatches are common characteristics of sustainability problems in telecoupled systems is evident from the examples presented above. It furthermore becomes clear that due to the geographical distances, it is particularly relevant to investigate how mismatches arise along the spatial scale. The spatial scale can be analysed along two dimensions: extent (i.e., size of the spatial scale) and resolution (i.e., precision used in measurement) (Gibson et al., 2000). Based on this analytical distinction, Bergsten et al. (2014), building on Cummings et al. (2006), identify two types of mismatches, namely boundary mismatches and resolution mismatches. While the former describes instances where ecological processes transcend governance boundaries, the latter refers to situations where governance is applied at a coarser or finer scale than it is relevant to solve the ecological problem (Bergsten et al., 2014). A refined version of these definitions serves as a starting point for our analysis of mismatches in governance of telecoupled systems (Table 1).

We contend that one critical difference between the two types of mismatches are the problems they constitute for governance. While boundary mismatches create problems of externality, meaning that governance does not account for effects outside the target area, resolution mismatches pose problems for the principle of subsidiarity, which denotes that issues ought to be handled by the smallest, lowest, or least centralized competent authority, while the central authority deals with only those tasks that cannot be addressed effectively at lower levels.

Table 1. *Boundary and resolution mismatches in the governance of telecoupled socio-ecological systems.*

	Boundary mismatch	Resolution mismatch
Definition	Governance does not account for social-ecological processes that transcend established jurisdictional/administrative boundaries.	Governance institutions have a coarser scale than it is suitable/adequate to address the social-ecological processes and solve the social-ecological problems.

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<p>Graphical representation</p>		
<p>Why is this mismatch problematic?</p>	<p>Problem of externality</p>	<p>Problem of subsidiarity</p>
<p>Viewing this mismatch from a jurisdictional perspective</p>	<p>Governance institutions such as public policies have negative externalities in distant places, which are not internalized by existing governance institutions (e.g., A forest moratorium shifts deforestation to neighbouring areas, or other countries).</p>	<p>Higher level governance institutions prescribe boundaries, objectives and measures that do not match with those of lower-level institutions (e.g., the spatial boundaries and objectives of international conservation initiatives do not match with customary boundaries and the needs of local people).</p>
<p>Viewing this mismatch from a supply chain perspective</p>	<p>Actions of downstream actors have negative externalities in distant places, which are not internalized by existing governance institutions (e.g., consumer goods companies source from areas with a high risk of deforestation).</p>	<p>More powerful actors in the supply chain define goals, priorities and actions at a spatial scale that does not match those of less powerful actors (e.g., the certification schemes/codes of conducts defined by multi-stakeholder initiatives, industry associations or upstream companies not corresponding with the needs of local producers).</p>

Boundary mismatches in telecoupled systems

Boundary mismatches arise in telecoupled systems when governance institutions do not internalize spatial externalities resulting from public policies or transnational economic activities. In short, boundary mismatches lead to ungoverned spatial externalities. For example, if a forest moratorium prohibits deforestation within designated areas, the activity may shift from areas targeted by the moratorium to neighbouring areas (Leijten et al., 2021; Meyfroidt et al., 2010). More broadly, conservation initiatives can protect ecosystems from unsustainable resource extraction in spatially delimited areas (Qin et al., 2021), but the demand for resources will persist and may shift to other areas. These externalities have also been referred to as spillovers, and more specifically as leakages (Meyfroidt et al., 2018). Spillovers are broadly understood as collateral effects of

governance outside the targeted geographical, jurisdictional, political, temporal or sectoral domains of an intervention (e.g., policy, program or new technology). Leakages constitute a particular type of spillover in which an environmental policy has indirect effects that go against its objective and reduce the overall benefit of the intervention (Bastos Lima et al., 2019; Meyfroidt et al., 2020). Spillovers and leakages indicate boundary mismatches, meaning that governance interventions do not account for the side effects of interventions that manifest in other places (Figure 3).

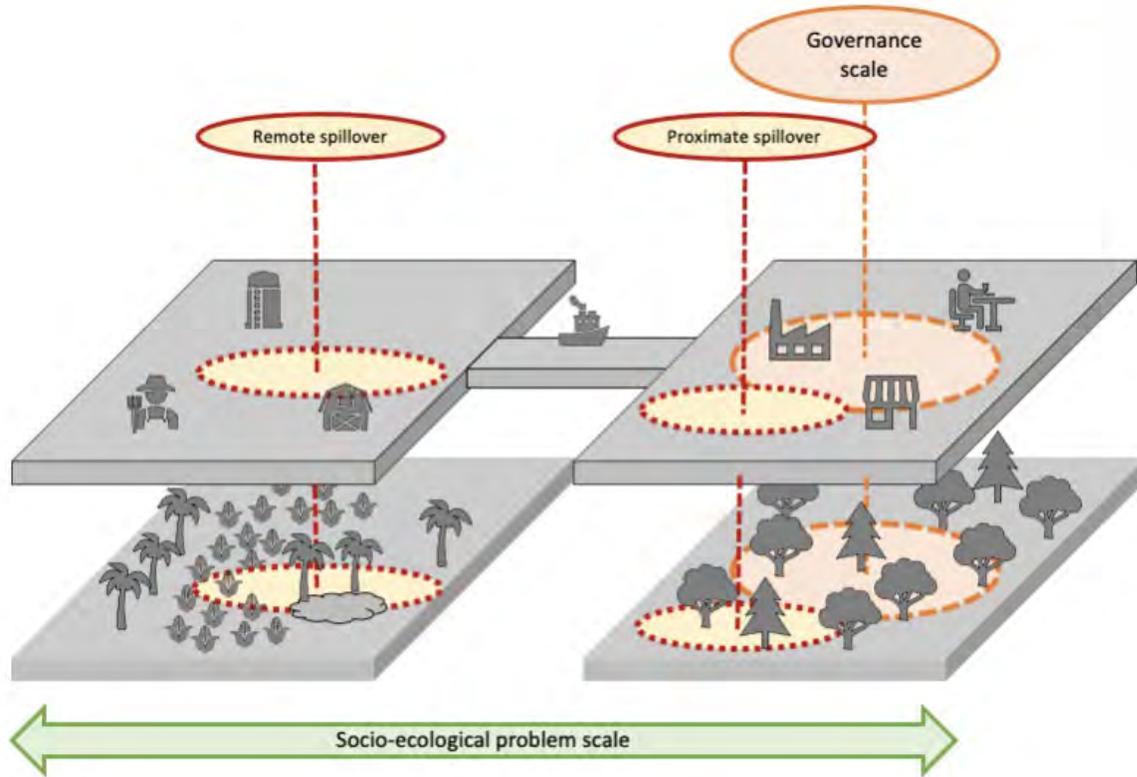


Figure 3. Boundary mismatch. Governance does not account for social-ecological processes that transcend established jurisdictional boundaries. Externalities (e.g., spillovers) are not internalized by existing governance institutions.

From a jurisdictional perspective, a boundary mismatch becomes visible when a policy shows effects outside the targeted jurisdiction. The EU’s Renewable Energy Directive (RED), for example, created additional demand for biofuel crops from overseas, and thereby fuelled land-use change and deforestation in tropical countries (Bastos Lima, 2021). The RED caused socio-ecological interactions with unsustainable place-specific impacts that transcended the EU’s jurisdictional reach. This process has also been referred to as ‘governance inducing telecoupling’ (Newig et al., 2019). The realisation that RED caused land-use changes in distant countries led to a recast of the policy, introducing several sustainability criteria that biofuel production must meet as to avoid indirect land-use changes (Bastos Lima, 2021). This example shows that public policies can create social-ecological interactions across long distances that have unsustainable place-specific impacts, and for which governance institutions often do not (yet) exist at the scale of the telecoupled interaction.

From a supply chain perspective, the negative externalities from boundary mismatches are not attributed primarily to a particular change in public policy, but to the transnational operations of multinational enterprises (MNEs). Since the operations of MNEs go beyond the jurisdictional reach of individual states, the displaced

externalities of their activities are often not internalized by existing governance institutions. MNEs are not accountable to any single authority that matches their scope of operations. Kobrin (2009, pp. 187–188) summarizes:

“While MNEs are, in theory, responsive to all of the national jurisdictions in which they operate, in practice, none has complete control, either individually or collectively. No single territorial state has sufficient information to fully understand the operations of an MNE. Furthermore, authority cannot be summed across jurisdictions; each nation attempting to regulate the MNE through the portion ‘residing’ within its borders may not provide sufficient leverage over the firm as a whole to achieve policy objectives.”

This quote highlights that the spatial scale of the operations of MNEs transcend the jurisdictional boundaries of states, which makes it difficult to hold MNEs accountable for the negative externalities of their actions in other jurisdictions. The collapse of the Rana Plaza building in Bangladesh in 2013 made many consumers aware of the severe social and environmental problems in textile supply chains and highlighted the need to improve private and public governance of transnational supply chains. More than one thousand garment workers, who produced clothes for international brands, were killed in this accident (Partzsch, 2020). The public authorities in Dhaka could not even determine how many factories fell under their jurisdiction (Kim and Davis, 2016). In response to this accident, the garment industry increasingly adopted voluntary certification. However, the certification of textiles often affects only the very first stage of the supply chain, namely cotton production, without setting standards for other segments of the supply chain (Partzsch, 2020), which presents a boundary mismatch.

Furthermore, MNEs themselves can encounter boundary mismatches in the governance of their supply chains as they may not hold sufficient power over all upstream suppliers to fully control the environmental and socioeconomic effects of their production. For example, approximately one-quarter of the solid wood furniture that IKEA sells is manufactured in Chinese factories. The Chinese manufacturers predominantly source their timber from other countries, in particular Russia (Newell and Simeone, 2014). IKEA tried to ‘green’ its supply chain by controlling the timber sourcing of its Chinese subcontractors, but was unsuccessful due to the geographical distance to upstream activities, the high number of intermediaries between retailers and logger, and the absence of a tracking system that links wood to a specific logging permit. Wood from multiple sources is often mixed in Russia prior to export and at Chinese factories, which makes it highly difficult to validate linkages between loggers and retailers (Goldstein and Newell, 2020). Additionally, supply chain configurations may change over time, even to the extent that they remain stable at one scale, but are fluid at another. For years, China has remained dependent on Russian wood imports to manufacture finished wood products for export to the United States of America, but the specific companies within these supply chains can change between years and even months (Goldstein and Newell, 2020). The example shows that despite the power positions of large retailers to dictate prices and quality standards of their suppliers, the effectiveness of their attempts to control sustainability along the value chain can be limited by the mismatch between their governance reach and the scale of the social-ecological problem. Kim and Davis (2016, p. 1912) find that “deep pockets and motivation to be sustainable [are] not sufficient to achieve accountability” because companies are often not able to identify their indirect suppliers, which makes it difficult to implement chain-wide sustainability policies.

Resolution mismatches in telecoupled systems

While jurisdictional approaches to govern telecoupling are likely to suffer from boundary mismatches, international governance is likely to encounter resolution mismatches. This means that governance is applied at a coarser scale than it is relevant to address the social-ecological processes and solve the social-ecological problems (Figure 4). For instance, Multilateral Environmental Agreements (MEAs) tend to be too general and

D 4.3. Fit for purpose? Scale-sensitive sustainability governance in telecoupled systems

unspecific to govern telecouplings. The scale of international governance is usually larger than the scale of telecoupling because international conventions, agreements or commitments typically involve a large number of signatory countries and have a general thematic scope, which goes well beyond specific telecoupling flows (e.g., Convention on Biological Diversity, United Nations Convention to Combat Desertification, United Nations Framework Convention on Climate Change; New York Declaration on Forests, Amsterdam Declaration). Notable exceptions are the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and the Minamata Convention on Mercury, which regulate the flows of specific materials to protect social welfare and natural environments. However, the mere existence of flow-specific international agreements does not guarantee their effectiveness, and many other flows, including agricultural and forestry commodities, are not governed internationally for a wide range of reasons. Low environmental issue visibility, the large number of actors involved, the distribution of power across negotiating coalitions, concerns with relative gains, opposition by single actors, vested material interests, poor interest alignment, growing regulatory fragmentation and uncertainty, and contested or incomplete scientific knowledge can impede the formation and functioning of institutions in a given issue area (Dimitrov et al., 2007; Lister et al., 2015). Even though MEAs may contain trade-related environmental measures, they do not regulate environmental pressures that are embodied in trade (Scott, 2020). The CITES Convention, for instance, regulates the direct trade of endangered animal and plant species, but it does not regulate the trade of commodities that pose threats to endangered species (Wiedmann and Lenzen, 2018).

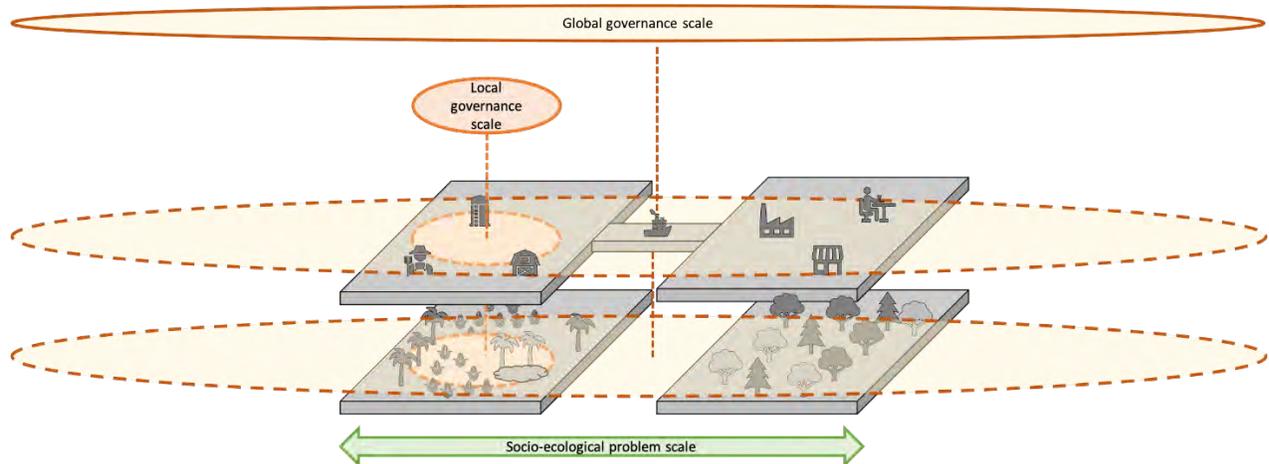


Figure 4. Resolution mismatch. Governance institutions have a coarser or finer scale than it is relevant to address the social-ecological processes and solve the social-ecological problems. Higher level governance institutions prescribe boundaries, objectives and measures that do not match with those of lower-level institutions.

Resolution mismatches pose problems for the principle of subsidiarity. If telecoupled systems are governed at the global level, there is a clear risk that local stakeholders lose power and control over local issues. Top-down interventions by international organizations or central states have been documented to disrupt local institutions by changing customary rules, norms, and conventions for ecosystem service governance (Gómez-Baggethun et al., 2013; Scott, 1999). Top-down or internationally-driven conservation initiatives may overlook the political complexity in the local system and create unintended and undesirable impacts, including restricted access to land and natural resources, enhanced dependence of markets for subsistence, the erosion of customary institutions for natural resource governance, and the relocation and migration to other socio-ecological systems (Persson et al., 2021; Persson and Mertz, 2019). In the case of protected area governance, dominant global discourses about wilderness and negative narratives about local land uses have led to the exclusion of local communities and the dismissal of local land uses in national parks (Boillat et al., 2018). Conservation projects

that are not governed by local communities and indigenous communities, but controlled by external actors like states, non-governmental organizations or private firms tend to supersede local institutions, customary practices, and traditional ecological knowledge, resulting in relatively ineffective conservation (Dawson et al., 2021). A recent study from Tanzania shows that a centrally imposed transparency initiative in the mining sector has not addressed inequalities, informal structures and power asymmetries in the sector, which limited its potential to truly empower the majority of artisanal and small-scale miners. Global governance initiatives like the Kimberley Process promote more transparency in global supply chains, but risk favouring global ideals of traceability and accountability rather than everyday needs (Frohn Pedersen et al., 2021). If local people are merely seen as service receivers without being included in the early design phase of sustainability interventions, a mismatch between the local people's goals and strategies and those of the project designers can emerge, as shown in case of a World Bank's conservation project in Argentina (Busck-Lumholt et al., n.d.). Resolution mismatches exist if more powerful actors in the supply chain define goals, priorities and actions at a spatial scale that does not match those of less powerful actors. Transnational concerns about forest conservation may not match with local concerns about economic development and poverty alleviation (Brandão et al., 2021). For instance, downstream actors in the cocoa sector try to address deforestation and child-labour in cocoa supply chains in response to consumer demands, while West African producing countries are concerned about poverty among cocoa farmers. The Cocoa and Forest Initiative (CFI), the largest sector-wide multi-stakeholder initiative, focuses on deforestation, whereas the governments of Cote d'Ivoire and Ghana focus more on poverty by issuing regulations to increase farm-gate prices and balance market competition between affluent transnational corporations and small domestic companies (Carodenuto, 2019; Parra Paitan et al., n.d.). Ponte (2020, p. 1) argues that "private, value chain-oriented forms of sustainability governance are not addressing the environmental problems they are putatively designed to solve", as lead firms may move the costs of compliance with sustainability initiatives upstream towards producers and not solve environmental issues. What is perceived as a problem at lower levels may not match problem perceptions and framings at higher governance levels, leading to resolution mismatches.

Finally, efforts to govern telecoupled systems might encounter both resolution and boundary mismatches. Veldman et al. (2015), for example, argue that the misinterpretation of grassy biomes as 'degraded' by global governance actors like the World Resources Institute (WRI) and the International Union for Conservation of Nature (IUCN) can translate into tree-promoting conservation initiatives that have leakage effects. If international organisations hold misperceptions about grassy biomes and misclassify this vegetation type in maps used for policy making, a resolution mismatch occurs that could lead to ill-placed afforestation projects, or leakage from forest-oriented conservation interventions, potentially leading to a boundary mismatch.

Attempts to resolve mismatches in telecoupled systems

The growth of global trade of agricultural and forest commodities poses multiple environmental challenges that are difficult to address through jurisdictional governance, due to the risk of boundary mismatches, or through global governance, due to the risk of resolution mismatches. However, both public and private actors have attempted to rescale governance to account for socio-ecological interactions across long distances. Rescaling is defined as "a shift in the locus, agency, and scope of global [...] politics and governance across scales" (Andonova and Mitchell, 2010, p. 257). Scaling up jurisdictional governance to make it more comprehensive in terms of targeted area, actors or supply chain segments can limit the risk of boundary mismatches. In contrast, scaling down governance might improve the contextualization of interventions and participation of local stakeholders, correcting resolution mismatches.

We elucidate these two rescaling processes with several examples, demonstrating the inherent difficulty to strike a balance between avoiding boundary mismatches without creating resolution mismatches and vice versa. Scaling governance for suitable and sustainable solutions in telecoupled systems entails re-arranging and re-designing institutional features to match the cross-scalar dimensions of distal interactions, resulting in institutional designs that are neither fully global nor local in scale (Oberlack et al., 2018). We focus on four illustrative examples of public, private and hybrid governance forms that do this, namely (1) regional and preferential trade agreements, (2) multi-stakeholder commodity platforms and roundtables, (3) public due

diligence obligations and laws, and (4) landscape and jurisdictional approaches to supply chain governance. We elucidate how these governance approaches help redressing mismatches of existing governance institutions, and highlighting how mismatches in their design can be avoided.

1. Regional and preferential trade agreements

First, regional trade agreements (RTAs) and preferential trade agreements (PTAs) can potentially resolve boundary mismatches left by the WTO trade regime if social and environmental provisions are carefully integrated, monitored and enforced, and avoid resolution mismatches if local communities are systematically consulted early on. International trade is regulated through the rules of the World Trade Organization, whose main objective is to ensure international trade liberalization through the gradual removal of tariff and non-tariff barriers. However, the governance scale of the WTO appears to be too coarse to address particular social and environmental issues of telecoupling. The WTO is designed to regulate trade relations at a global scale, but it is not equipped to govern socio-ecological interactions between particular producing and consuming regions, allowing for contextual adaptations.

Regional and preferential trade agreements have proliferated in recent years and present a potential instrument to govern trade-related environmental impacts between specific countries or regions if they include side-agreements or environmental chapters that are carefully designed, monitored and enforced (Berger et al., 2017). Even though it remains questionable whether trade agreements can make agricultural and forestry trade truly sustainable, as they do not challenge the underlying dependencies, inequalities and power asymmetries between the Global North and Global South, or the large-scale nature of agricultural production that is commonly associated with issues like biodiversity loss, land concentration and soil degradation, RTAs and PTAs can contain obligations on actions to be taken by the parties to uphold specific social or environmental standards. For example, the US-Peru trade agreement includes a detailed binding Forest Annex, which sets out measures to strengthen Peru's forest governance. This trade agreement is arguably better designed to govern specific trade-related environmental effects like illegal logging than the WTO, but it is not without limitations. Since the Forest Annex strongly focuses on the protection of CITES-listed timber species, an unintentional outcome could be an increase of exports of timber species not listed in CITES, as well as a potential shift to other markets that do not demand any particular verification measures for timber products (i.e., leakage effect) (Del Gatto et al., 2009). This shows that the risk of boundary mismatches is pervasive in a globalizing world because the origin or destination of trade flows may shift geographically (i.e., shift in sourcing region or final market) or because the commodity that becomes subject to regulation is replaced by another less regulated commodity without solving the environmental problem (i.e., intercommodity transition). Governance institutions that target single geographies or single commodities risk causing boundary mismatches, which suggests that negotiating trade agreements with regional blocs rather than individual countries, and for commodity groups rather than single commodities may be more effective as they could reduce the risk of leakage effects.

Additionally, RTAs and PTAs can have spillover effects on third countries that are not partners to the trade agreement, indicating a boundary mismatch. For example, the EU trade agreement with Japan foresees that 85% of EU agri-food products exported to Japan will be liberalized over time. Tariffs will be removed for pork meat, which is the EU's main agricultural export to Japan, and tariffs on beef will be cut from about 38% to 9% over 15 years (European Commission, 2018). Since the EU's livestock sector relies on imported soybeans that is associated with deforestation (Karlsson et al., 2021), the increasing trade of meat products between Japan and the EU can have negative externalities in other parts of the world, including South American countries, where large portions of the EU's animal feeds are grown (Figure 5).

2002-2013 - eHANPP Meat, pig

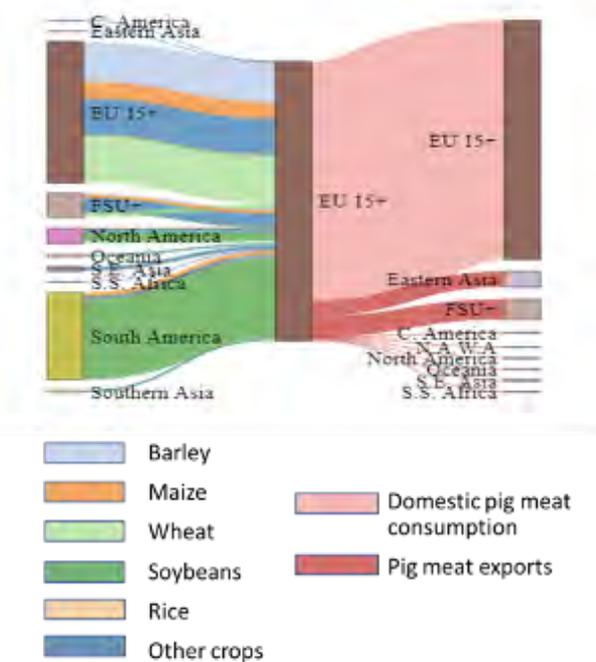


Figure 5. Human appropriation of net primary production embodied in bilateral trade flows of pork meat between Western Europe (EU15+) and other world regions (eHANPP) from 2002-2013. The eHANPP indicator measures pressure on land ecosystems embodied in international trade flows. For methodological details see Roux et al. (2020). Data for this figure are based on commodity balance sheets and bilateral trade matrices of crop and animal products (FAOSTAT) corrected for reexports (Kastner et al., 2011), animal feed requirements from the literature (Krausmann et al., 2008) and HANPP factors calculated by the authors.

Finally, ensuring that trade agreements do not encounter resolution mismatches requires the inclusion of all affected stakeholders during the negotiation process. In case of the EU-Mercusor trade agreement, Kehoe et al. (2020) criticize that local communities were not systematically consulted – despite 20 years of negotiations. Trade agreements are a critical means of leveraging action towards sustainability, but without meaningful inclusion of local communities, traceability requirements for high-risk products and strict enforcement, their leverage potential is limited (Kehoe et al., 2020). Failure to recognize the economic, social and environmental concerns of affected communities may lead to ineffective governance interventions. For example, a trade ban may prove ineffective if it does not recognize the economic concerns of local communities, who may derive no or inadequate economic benefits from the trade-ban, and hence have no or little incentives for conservation and the sustainable use of the resource, which is subject of the trade ban (Abensperg-Traun, 2009). The resource may be sold illegally or to different markets, which then constitutes a boundary mismatch.

2. Multi-stakeholder commodity platforms and roundtables

Rescaling governance can involve the establishment of new networks and the participation of actors other than the state (Reed and Bruyneel, 2010). In recent years, multi-stakeholder commodity platforms and roundtables like the Forest Stewardship Council (FSC), the Roundtable on Responsible Soy (RTRS), the Roundtable on Sustainable Palm Oil (RSPO) or the Global Platform for Sustainable Natural Rubber (GPSNR) have been established to mitigate the negative social and environmental impacts of commodity production (van der Ven et al., 2018). Multi-stakeholder commodity platforms and roundtables appear promising in resolving boundary

mismatches because they work across corporation and national boundaries. These market-based governance schemes have a transnational scale, which allows them to govern sustainability issues along the supply chain. The RSPO's membership, for example, comprises oil palm growers, palm oil processors and traders, consumer goods manufacturers, retailers, banks and investors and non-governmental organizations (Okereke and Stacewicz, 2018). By acting together, the various stakeholders have greater leverage in driving behaviour change in the supply chain than individual actors. However, multi-stakeholder commodity platforms and roundtables are unlikely to be effective on a global level if they lack broad market uptake and the participation of actors from emerging economies.

The inclusion of traders in sustainability governance of global commodity chains is particularly important because they assume relevant intermediary roles; functioning like so-called 'boundary or bridging organizations', which are deemed relevant to address mismatches in socio-ecological systems (Cash et al., 2006). Traders can be powerful actors in the governance of sustainable commodity production because they can potentially share their best-practice insights across various commodity-specific sustainability working groups, distribute resources and expertise among producers, and bridge gaps in terms of values, understandings and awareness between upstream and downstream segments of the supply chain. They also possess specialized context-specific knowledge and may have an interest in driving sectoral innovation to safeguard their supply bases in the long term. In short, traders can fill implementation gaps between corporate sustainability commitments and on-the-ground impacts (Grabs and Carodenuto, 2021), and thus, help downstream actors to internalize the externalities of their transnational supply chains. In particular traders with more enduring commercial relationships with a producing region are well positioned to influence sustainability-oriented change in their suppliers (Reis et al., 2020).

The cross-sectoral membership in commodity platforms and roundtables suggests that these governance approaches can alleviate resolution mismatches by bringing together actors that operate at different scales and have different interests. However, power asymmetries can impede the resolution of conflicting interests and the equitable distribution of value capture. Research from Indonesia shows that the RSPO sustainability standards are perceived to prioritize the interests of powerful stakeholders like global buyers and global environmental non-governmental organizations (Kadariusman and Herabadi, 2018). The engagement of local governments and the meaningful participation of local producers, including smallholders, is important to avoid that upstream-initiated governance schemes conflict with downstream actors' needs for tangible improvements of their livelihoods and well-being (Millard, 2019). For example, food security at local level is hardly ever part of these schemes, even though global standards like the RSPO affect national and local food provision in countries of the global South (Oosterveer et al., 2014).

3. Due diligence obligations and laws

Various scholars have discussed the potential of demand-side and flow-based governance, like certification and labelling, corporate zero-deforestation commitments and due diligence laws, to govern place-specific socio-ecological changes in light of their relationships with other places, by tracking and managing where key flows start, progress and end (Munroe et al., 2019; Newig et al., 2020; Sikor et al., 2013). Flow-centred governance arrangements tend to match the spatial scale of telecoupling because they trace the movement of global flows beyond jurisdictional boundaries. The degree to which flow-based governance arrangements target specific flows and places varies strongly. For example, due diligence requirements are implemented for specific commodities, such as in the case of EU's Timber Regulation, which prohibits companies from placing illegally harvested wood on the EU market, and the EU's Conflict Minerals Regulation, which prohibits the import of tantalum, tin, tungsten, and gold from conflict-affected or high-risk areas. More recently, national due diligence policies are established that are not sector or flow-specific, such as the French Corporate Duty of Vigilance Law or the German Supply Chain Due Diligence Act. Additionally, the European Commission plans to adopt a directive on sustainable corporate governance that covers human rights and environmental due diligence (Schilling-Vacaflor and Lenschow, 2021). The proliferation of due diligence policies shows that public actors are increasingly governing social and environmental conduct beyond their own borders.

Due diligence policies are a clear example of 'rescaling', or what Scott (2020) refers to as 'territorial extension'

in EU law. The EU makes its market access conditional upon certain criteria and thereby gains regulatory leverage over conduct that takes place abroad. Under the Renewable Energy Directive (RED), for example, member states can count biofuels towards the attainment of their renewable energy targets only if the biofuel production complies with certain sustainability criteria, irrespective of whether the biofuel crops are produced inside or outside the EU (Scott, 2020). The RED, just like other sector-specific due diligence policies such as the EU Timber Regulation or the EU Conflict Minerals Regulation, relies on conditional market access as the underlying mechanism to demand foreign producers' compliance with EU rules. In contrast, the more recently adopted or developed economy-wide mandatory due diligence laws on national or European level rely on a different governance mechanism, namely self-reporting and public scrutiny. The French Duty of Vigilance Law, for example, requires companies to assess and report their risks of infringing environmental and human rights in their supply chains, as well as their measures to prevent and mitigate such risks. If severe human rights violations or environmental damages occur that could have been prevented, the company can be held liable and be obliged to remedy the harm (Schilling-Vacaflor, 2021). Rather than avoiding that commodities with high sustainability risks enter the market in the first place, economy-wide due diligence laws incentivize companies to scrutinize and potentially change their sourcing strategies, without denying them market access if their due diligence systems fail.

Due diligence laws present an attempt to alleviate the boundary mismatch that occurs because importing countries in principle have no jurisdiction over producing countries, where sustainability problems appear. However, due diligence policies may suffer from resolution mismatches. The European Timber Regulation, for example, demands that timber is sourced legally according to the laws of the producer country, but such legality-based sustainability policies may stipulate certification systems that fail to respect customary land use rights of local communities (Bartley, 2014) and may prove insufficient to protect forests and other ecosystems by incentivizing exporting countries to weaken their legal frameworks (Reis et al., 2021). Furthermore, if mandatory due diligence laws require companies to report any risks of human rights and environmental violations in their supply chains, and the measures taken to mitigate those risks, companies may prioritize issues in their vigilance reports that do not match with the most pressing issues of local stakeholders. An analysis of the corporate vigilance plans under the French Duty of Vigilance Laws has shown that companies predominantly focus on environmental issues like deforestation in the soy and beef supply chain, while neglecting other issues such as biodiversity loss, pesticide use, water scarcity and water pollution. With regards to human rights, the companies prioritize labour rights, while the rights to health, land, water, food and protection of violence of stakeholders, who are negatively affected by the production activities, have not been discussed (Schilling-Vacaflor, 2021). Companies may selectively address environmental and human rights issues that are salient in the Northern-dominated discourses on sustainable supply chains, instead of responding to the concerns of local communities. The inclusion of local stakeholders from the Global South in the drafting and implementation of due diligence regulations is critical to make them more legitimate, context-sensitive, and effective (Schilling-Vacaflor and Lenschow, 2021).

4. Landscape or jurisdictional approaches to supply chain governance

Current initiatives for sustainable agricultural commodities such as sustainability standards or certification systems often focus at farm or supply-chain level. This practice creates 'islands of good practice', while surrounding areas continue with 'business as usual' (UNDP, 2019, p. 12). However, many of the challenges that these initiatives target (e.g., deforestation) are rooted and/or manifest themselves within the wider landscape. For example, if companies seek to reduce commodity-driven deforestation by certifying some of their farms or plantations, deforestation may shift to non-certified areas (Heilmayr et al., 2020). This can lead to mismatches between the scale of the intervention and the scale of the sustainability challenges they aim to address (Sonderegger et al., n.d.; Tscharnke et al., 2015). In efforts to address such boundary mismatches, policy-makers and businesses increasingly engage with landscape and jurisdictional approaches (Boshoven et al., 2021; von Essen and Lambin, 2021).

Jurisdictional and landscape approaches aim to reconcile competing social, economic and environmental interests and objectives of different stakeholders in a landscape. Both terms are often used synonymously;

however, the jurisdictional approach is a type of landscape approach that uses formal administrative boundaries to define the scope of action and involvement of stakeholders (Deneir et al., 2015). Landscape approaches are already widely used in international conservation projects and are now also taken up in sustainable supply chain management (Boshoven et al., 2021; Sayer et al., 2013). Landscape and jurisdictional approaches present an effort to upscale the spatial scale of governance to reduce the risk that commodity sourcing strategies have ungoverned impacts beyond the strict boundaries of the production unit (e.g., farms). Sustainable cocoa initiatives, for example, have evolved from targeting the farm level towards being more sector and landscape oriented (Carodenuto, 2019; Nelson and Phillips, 2018; Parra Paitan et al., n.d.). Likewise, some standard-setting organizations aim to upscale their activities beyond the individual production site and adopt broader collaborative landscape approaches to achieve impacts at a larger scale (ISEAL Alliance, 2017; Komives et al., 2018; Mallet et al., 2016). Landscape and jurisdictional approaches facilitate collaboration between multiple stakeholders (e.g., public authorities, producers, companies, civil society organizations), and ideally resolve conflicting interests between stakeholders and foster cross-sectoral coordination between isolated sustainability initiatives. Jurisdictional approaches involve public actors, who have regulatory authority over the area covered, “allowing for better monitoring and enforcement as well as addressing the problem of institutional mismatch” (von Essen and Lambin, 2021, pp. 6–7).

However, jurisdictional and landscape-based certification and sourcing have limitations. Governance at the landscape level remains limited to a certain scale and may not address all potentially relevant telecoupled dynamics, such as migrant worker flows coming from distant countries (Sonderegger et al., n.d.). Additionally, the risk of leakages still exists because neighbouring jurisdictions may have lower levels of environmental protection (von Essen and Lambin, 2021). Non-conforming production may shift to neighbouring places with fewer restrictions (Meyfroidt et al., 2018), and commodities from non-conforming neighbours might be laundered into the tighter regulated jurisdiction (Boshoven et al., 2021).

Even though landscape-approaches are context-specific, resolution mismatches can arise because more powerful supply chain actors define goals, priorities and actions that do not match those of less powerful actors. In theory, all actors benefit from engaging in jurisdictional approaches (von Essen and Lambin, 2021), and all major stakeholders support the approach (Boshoven et al., 2021). However, the interactions between different stakeholders within a jurisdictional or landscape approach are power-laden (Delabre et al., 2021). Jurisdictional approaches carry the risk that external stakeholders or local elites impose their values and idealized visions of certain management systems on local stakeholders in a top-down manner without recognizing the needs of smallholders and their importance for sustainable commodity production and biodiversity conservation (von Essen and Lambin, 2021).

Conclusion

The governance of telecoupled systems is beset with problems of fit. Since most social and environmental problems in a globalizing world are neither purely local nor global in scale, addressing these problems requires governance responses that transcend political borders to match the spatial scale of the problem, while also being sensitive to local context. Governing the social and environmental impacts of global processes like cross-border agricultural commodity trade without neglecting place-specific environmental, social and political needs is highly challenging.

Governance of telecoupled systems often proves ineffective where the spatial extent of governance does not account for the social-ecological processes that transcend jurisdictional boundaries (i.e., boundary mismatch), or where the governance scale is too coarse to deal with socio-ecological particularities and context-specific conditions (i.e., resolution mismatch). Ideally, telecoupled systems are governed by institutions and actors who have the mandate, resources, knowledge and power to act at the same spatial scale as the socio-ecological process in question. Both public and private actors are seeking ways to account for the geographically displaced social and environmental impacts of their policies and transnational operations. In the area of land and global agricultural commodity governance, governance approaches like due diligence laws and policies, landscape and jurisdictional governance, multi-stakeholder initiatives, and environmental provisions in preferential and regional trade agreements have emerged to address the place-specific social and

environmental impacts of cross-border flows.

(Re-)scaling governance to match the scale of telecoupled systems is an inherently political process. The scale at which a given problem is perceived and framed influences the scale at which it is dealt with. Rescaling governance can entrench, rather than restructure, existing power relations and global inequalities. For instance, companies may stop sourcing from places with very low levels of development and weak public governance, where the risk of infringing environmental or human rights is high, and shift towards places with stricter governance to meet consumer demands for more transparency and due diligence (Gardner et al., 2019). This means, however, that places and people who are already marginalized are further excluded from the benefits of a global economy. The most vulnerable people and countries may become subject of extraterritorial control and externally imposed notions of sustainability if actors of the Global North seek to govern environmental and social issues beyond their own borders.

Even though it is assumed that governance institutions that align with the spatial scale of the problem tend to be more effective than those that do not match the perceived problem structure, designing governance institutions that match the scale of telecoupling without encountering boundary or resolution mismatches may be an insoluble task. Examining governance mismatches in telecoupled systems can help us understand how to make governance more effective, but our analysis of various governance approaches has shown that any attempt to resolve boundary or resolution mismatches comes at the risk of creating new mismatches. Even if there was a governance institution with a 'perfect fit', this would not guarantee the effective governance of telecoupled systems because governance institutions that are well aligned with the spatial scale of the problem are not necessarily stringently implemented or enforced.

Future research could explore to what extent governance mismatches can be addressed through collaborative or polycentric governance. Important knowledge gaps remain regarding how to achieve successful collaboration when confronted with complex socio-ecological problems that transcend jurisdictional and geographical boundaries (Bodin, 2017). Additionally, studying telecoupled systems from the perspective of polycentric governance, defined as systems of overlapping jurisdictions with formally independent but interlinked centres of decision making, could yield valuable insights into how to resolve mismatches in global land and agricultural commodity governance. Rather than examining the effectiveness of various governance approaches in isolation from one another, more systematic evaluations of the interplay and potential synergies between different governance interventions can advance our knowledge about how different governance arrangements can jointly form a governance system that matches the scale of the problem. For example, demand-side governance interventions like corporate zero-deforestation commitments are unlikely to be effective if public land use planning and law enforcement in producer countries is weak (Carodenuto, 2019). Furthermore, while we have focused on spatial mismatches in the governance of telecoupled systems, future research could investigate the occurrence and implications of temporal governance mismatches in telecoupled systems. Telecoupled systems are not static, but subject to changes and shocks. The spatial-temporal connections between sourcing regions and commodity buyers may not be stable (Reis et al., 2020), but change over time, which requires adapting governance responses to changing supply chain configurations.

Finally, we briefly reflect on our normative implicit assumptions and messages embedded in our research (Nielsen et al., 2019). Although this article is centered around the question how to steer telecoupling towards greater sustainability, we remain sceptical whether telecoupling can be truly sustainable (Challies et al., 2019). Since human pressures on the Earth System exceed planetary boundaries (Rockström et al., 2009), it is impossible to create sustainable global commodity flows at current levels without reaching ecological limits and inflicting social harm. Our discussion about how governments and companies can green their trade relations and supply chains should not overshadow the simple fact that current levels of consumption are unsustainable. Attempts to establish more socially responsible and environmentally friendly resource production and trade relations provide only short-term benefits if the actual problem is imminent resource depletion (Pedersen et al., 2021). Research on telecoupling has an important role to play in investigating how public and private actors can assume responsibility for the overseas impacts of their actions, but greening production and consumption patterns will not suffice for achieving 'The Future We Want' without being complemented with measures to reduce overall levels of consumption and production.

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