

Environmental governance beyond borders:  
Governing telecoupled systems towards sustainability

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## Table of contents

|  |      |
|--|------|
| Acknowledgements .....   | iii  |
| Abstract .....   | v    |
| Framework Paper .....  | 1    |
| 1. Introduction .....  | 1    |
| 2. Conceptual background .....   | 4    |
| 2.1. Telecoupling .....  | 4    |
| 2.2. Environmental governance .....  | 6    |
| 2.3. Environmental governance & telecoupling .....   | 7    |
| 3. Research design & methodology .....   | 10   |
| 4. Results .....   | 13   |
| 4.1. Governance structures and spatiality .....  | 14   |
| 4.2. Governance actors and mechanisms of external environmental governance .....   | 18   |
| 4.3. Governance responses to domestic and foreign effects of telecoupled flows .....   | 23   |
| 5. Conclusion & future research agenda .....   | 28   |
| Annex .....  | vii  |
| Article 1: Toward spatial fit in the governance of global commodity flows .....  | ix   |
| Article 2: Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda ..... | x    |
| Article 3: Environmental Governance of China's Belt and Road Initiative .....  | xi   |
| Article 4: Environmental governance of a Belt and Road project in Montenegro – National agency and external influences .....         | xiii |
| Supplementary 1: Telecoupling as a framework to support a more nuanced understanding of causality in land system science .....       | xv   |
| Overview of articles included in this cumulative dissertation .....  | xvii |





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## **Abstract**

Globalization has increased the speed, volume and spatial scale of global flows of people, information, finance, goods and services. Economic globalization is closely linked to the globalization of environmental problems, with the underlying causes and directly visible effects of environmental problems becoming increasingly geographically dispersed. For example, the products consumed in one place can have negative environmental effects in distal places of production. This poses challenges to territorially-based governance systems. Governments do not have legal authority to regulate environmental problems in other jurisdictions, even if their own policies or actions of domestic companies contribute to these problems. Likewise, companies face challenges with overseeing and governing the environmental effects that occur along their supply chains. Nevertheless, state and non-state actors increasingly aim to govern environmental problems outside their jurisdictional and organizational boundaries that arise from long-distance interactions between social-ecological systems – so-called telecoupled systems.

This doctoral dissertation analyses the environmental governance of long-distance social-ecological interactions in telecoupled systems in two issue domains: global commodity chains and infrastructure projects as part of China's Belt and Road Initiative (BRI). Although both domains involve different governance actors, institutions and processes, they both concern the question of how the involved actors develop governance structures and institutional responses to telecoupling. This dissertation aims to contribute to a deeper understanding of how to govern environmental problems that are associated with global flows. Since many multilateral environmental governance initiatives have not yet produced the desired solutions to global problems, particular attention is directed at unilateral state-led governance approaches. This dissertation addresses the questions of (1) how to achieve a spatial fit between the scale of telecoupled systems and the scale of governance institutions, (2) how governance actors exercise agency in governing telecoupled systems, and (3) how state actors can govern the domestic and foreign environmental effects of telecoupled flows. This dissertation draws upon, and contributes to, two fields of research: research on telecoupling and research on global environmental governance.

The results show that creating a spatial fit in the governance of global commodity flows is challenging because boundary and resolution mismatches can emerge. Boundary mismatches denote situations where social-ecological problems transcend established jurisdictional boundaries, whereas resolution mismatches refer to governance institutions that have too coarse a spatial resolution to allow them to address the specific aspects of social-ecological problems effectively. No single governance institution is likely to avoid all mismatches, which highlights the need to align multiple governance approaches to effectively govern telecoupled systems.

Telecoupled flows are often governed at places where they originate and places where they arrive for processing, final consumption, or investment. If governance in the jurisdiction experiencing the environmental issue is weak, external governance actors can aim to fill this governance gap by introducing due diligence legislation and by promoting sustainability standards in international (trade) relations. State actors often rely on the actions of non-state

actors to govern beyond jurisdictional borders. Despite efforts to govern environmental outcomes in distant jurisdictions, it is important to recognize the agency of governments that experience the direct environmental effects of telecoupling. They have great leverage to steer telecoupled systems towards sustainability through the formulation, implementation, monitoring and enforcement of stringent regulatory frameworks, in the context of both commodity supply chains and BRI projects.

The findings of this dissertation are relevant for scholars and policy makers interested in what can be termed *external environmental governance*, which refers to the governance structures and institutions to shape environmental outcomes outside the borders of a given jurisdiction. This dissertation sets out a future research agenda for studying environmental governance beyond borders.

# Framework Paper

## Environmental governance beyond borders: Governing telecoupled systems towards sustainability

### 1. Introduction

We live in the Anthropocene, the new geological period of planetary history that is characterized by an unprecedented human impact on the functioning of the Earth's ecosystems (Steffen et al., 2011). Globalization has increased the speed, volume and spatial scale of flows of people, information, finance, goods and services across the globe, leading to a growing interdependence between geographically distal places and related complex environmental challenges (Young et al., 2006). For example, many affluent countries meet their rising levels of consumption with imports from distal places, which can result in the displacement of environmental and social pressures to far-off areas (Dorninger et al., 2021; Pendrill et al., 2019). In particular the expansion of transport infrastructure enables people and material flows to reach around the world farther, faster and cheaper than ever before. Economic globalization is thus closely linked to the globalization of environmental problems, as their underlying causes and effects also increasingly stretch over space and time (Christoff & Eckersley, 2013).

International efforts to govern global environmental problems have increased significantly over the last fifty years. Ever since the first United Nations (UN) Conference on the Human Environment and the creation of the UN Environmental Programme in 1972, and the publication of the Brundtland Report in 1987, environmental problems have become increasingly prominent on the international agenda. Despite these efforts, the degradation of ecosystems continues, biodiversity loss persists, and greenhouse gas emissions continue to rise on a global scale (ICPP, 2023; IPBES, 2019). Although states have negotiated more than 3,000 international environmental agreements (Mitchell et al., 2020), and a plethora of international environmental regimes have been created, many of these collective responses have not been effective in achieving the intended outcomes (Christoff & Eckersley, 2013; Park et al., 2008; Young & Stokke, 2020). This has led policy-makers and scholars to explore alternatives to both multilateralism and territorially based governance (Partzsch, 2020; Sikor et al., 2013).

This cumulative dissertation examines approaches for governing environmental problems whose causes are linked to global flows. The most prominent example is global commodity flows that have adverse effects in places of production, including land use changes, biodiversity loss or water pollution and scarcity (Dolan et al., 2021; Lenzen et al., 2012; Pendrill et al., 2019). In other instances, the influence of global flows is less obvious, but still important to scrutinize in order to develop a comprehensive understanding of the causes and potential solutions to these environmental problems. For example, China's Belt and Road Initiative (BRI) creates flows of construction materials, finance, workers, technology and knowledge that interact with local processes in BRI host countries. Long-distance socioeconomic interactions emerge that pose environmental risks. By investigating how local environmental changes are linked to actors and decisions in distal locations, this dissertation contributes to a better understanding of how to govern environmental problems that are neither purely local nor fully

global in scale, so-called telecoupled problems (Liu et al., 2013; Newig et al., 2020; Oberlack et al., 2018).

Telecoupling denotes long-distance interactions between two or more social-ecological systems that are connected through global flows and feedbacks (Eakin et al., 2014; Friis et al., 2016; Liu et al., 2013). The study of telecoupling highlights that human-induced processes in one part of the world affect environmental outcomes at a distance. The telecoupling framework has been applied to a variety of empirical phenomena, ranging from international trade in agricultural and forestry commodities (Gasparri et al., 2016; Lenschow et al., 2016; Schierhorn et al., 2016) to animal migration (López-Hoffman et al., 2017; Schröter et al., 2018), and food systems (Barbieri et al., 2021; Eakin et al., 2017; Garrett & Rueda, 2019). However, since “the original framing of telecoupling [...] does not encompass institutions and governance processes” (Boillat et al., 2018, p. 5), further research is needed to investigate how, why and by whom collective decisions and actions are and could be taken to steer telecoupled systems towards sustainability. In this context, Newig et al. (2020, p. 6) call for “a more nuanced treatment of governance” with regards to telecoupling.

To date, much research on telecoupling has treated governance as a secondary research aim as the primary goal has been to find evidence for the coupling between distal social-ecological systems (Fuller et al., 2019; Gasparri & de Waroux, 2015; Laroche et al., 2022; Parish et al., 2018). Nevertheless, research focusing specifically on the governance of telecoupling has been emerging, which can broadly be divided into two fields. First, scholars have investigated the performance of specific governance interventions in particular telecoupled contexts, such as corporate zero deforestation commitments, conservation policies or multi-stakeholder governance initiatives such as roundtables (Bastos Lima & Persson, 2020; Garrett et al., 2021; Leijten et al., 2022; Persson et al., 2021). Secondly, researchers have taken a more macro-level and theoretical perspective on governance arrangements in telecoupled systems and identified various general governance challenges and approaches to telecoupling (Bastos Lima et al., 2019; Eakin et al., 2017; Lenschow et al., 2016; Munroe et al., 2019; Newig et al., 2019, 2020; Oberlack et al., 2018). However, this literature has only marginally addressed how states govern the negative environmental effects of telecoupling that occur outside their jurisdictional boundaries. This dissertation focuses on the following questions: 1) How can we achieve a spatial fit between the scale of telecoupled systems and scale of governance institutions? 2) How can state actors govern environmental issues beyond jurisdictional boundaries, also in conjunction with non-state actors? 3) How can states govern the domestic and foreign effects of telecoupled flows? This dissertation aims to contribute towards addressing these gaps. The aims of this dissertation are to better understand:

**Aim #1 Governance structures and spatiality:** Examine the overarching structures that define how decisions are taken and how rules are developed to govern telecoupling, focusing specifically on the spatial fit between the scale of governance institutions and the scale of telecoupled systems.

**Aim #2 Governance actors and mechanism of external environmental governance:** Investigate how state actors prevent and mitigate the negative environmental effects of

telecoupling, focusing specifically on how they govern beyond jurisdictional boundaries, also in conjunction with non-state actors.

**Aim #3 Governance responses to domestic and foreign effects of telecoupled flows:** Outline the governance approaches that are developed to prevent and mitigate environmental problems of telecoupling, focusing specifically on how states govern the domestic and foreign effects of telecoupled flows.

The empirical focus of this dissertation lies on two issue areas of global-local connectedness that require environmental governance. Firstly, the environmental governance of global commodity flows is examined. Secondly, the environmental governance of China's Belt and Road Initiative is investigated. While these two issue areas involve different actor networks and governance institutions, they share the fundamental question of how to govern environmental problems whose causes and effects span across the globe. The empirical cases investigated in this dissertation are part of a larger set of the environmental problems that manifest in specific geographic locations, but are connected to distal human drivers.

This cumulative dissertation includes four peer-reviewed articles:

- Article 1: Coenen, J., Sonderegger, G., Newig, J., Meyfroidt, P., Challies, E., Bager, S., Busck-Lumholt, L. M., Corbera, E., Friis, C., Frohn Pedersen, A., Laroche, P. C. S. J., Parra Paitan, C., Qin, S., Roux, N., & Zaehring, J. G. (in press). Towards spatial fit in the governance of global commodity flows. *Ecology and Society*.
- Article 2: Cotta, B., Coenen, J., Challies, E., Newig, J., Lenschow, A., & Schilling-Vacaflor, A. (2022). Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda. *Earth System Governance*, 13, 100142.  
<https://doi.org/10.1016/j.esg.2022.100142>
- Article 3: Coenen, J., Bager, S., Meyfroidt, P., Newig, J., & Challies, E. (2021). Environmental Governance of China's Belt and Road Initiative. *Environmental Policy and Governance*, 31(1), 3–17.  
<https://doi.org/10.1002/eet.1901>
- Article 4: Coenen, J., Newig, J., & Meyfroidt, P. (2022). Environmental governance of a Belt and Road project in Montenegro – National agency and external influences. *Land Use Policy*, 119, 106136.  
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An additional publication provides supplementary insights on the use of the telecoupling framework for research in land system science, but does not address environmental governance:



Supplementary 1: Busck-Lumholt, L. M., Coenen, J., Persson, J., Frohn Pedersen, A., Mertz, O., & Corbera, E. (2022). Telecoupling as a framework to support a more nuanced understanding of causality in land system science. *Journal of Land Use Science*, 17(1), 386–406.  
<https://doi.org/10.1080/1747423X.2022.2086640>

This framework paper provides an overview of the conceptual background and outline the research design and methodology. Subsequently, it presents the results according to the three aims of this dissertation. The conclusion synthesizes the key insights obtained, reflect on the theoretical and policy implications of this research, and suggest avenues for future research. The articles are cited as *A1*, *A2*, *A3*, *A4* and *S1* in the text.

## **2. Conceptual background**

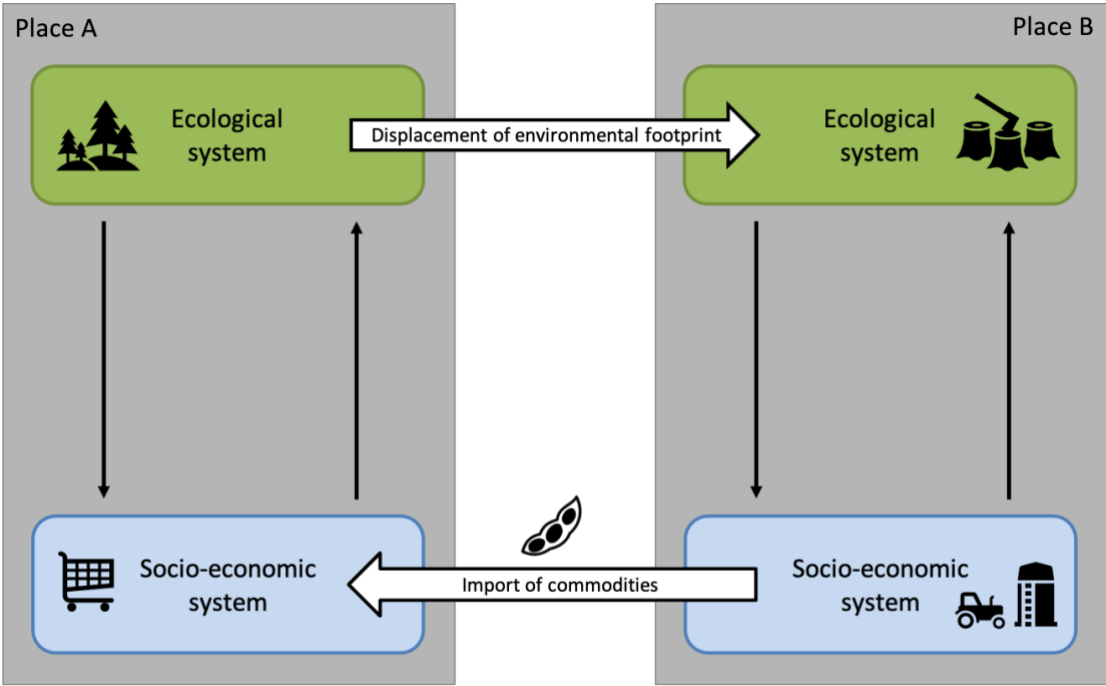
This dissertation draws upon, and contributes to, two fields of research: research on telecoupling and research on global environmental governance. Bringing these two streams of research together is constructive because the research stream on telecoupling directs attention to a particular set of environmental problems, namely place-specific environmental problems that are linked to decisions and actions in distant places through flows of materials, finance, humans, and/or information (Friis & Nielsen, 2019; Liu et al., 2013; Newig et al., 2020), while the research stream on global environmental governance offers concepts and theories (Biermann et al., 2010; Biermann & Pattberg, 2008, 2012; Dauvergne, 2005; O’Neill et al., 2013; Speth & Haas, 2006) that can be used fruitfully to analyse governance structures, actors and institutions in the context of telecoupling.

### **2.1. Telecoupling**

The telecoupling framework has been developed to capture long-distance interactions between two or more distal social-ecological systems that are connected through material and immaterial flows and feedbacks (Friis & Nielsen, 2017b, 2019; Liu et al., 2013). It offers an analytical lens to study complex environmental problems whose causal dynamics span the globe and for which it is difficult to draw analytical boundaries. According to Newig et al. (2020, pp. 3–4), telecoupling directs our attention to issues related to “(sub)nationally owned and managed resources, which are used, exploited, or impacted on by actors from other parts of the world” (Figure 1). Research on telecoupling is part of the wider field of research on social-ecological systems, which has become a recognized interdisciplinary area of sustainability science (Biggs et al., 2021). The telecoupling framework makes it possible to break the global connectedness into manageable units of analysis, thereby avoiding a holistic trap where everything is connected to everything (Friis & Nielsen, 2017a). Sustainability problems that fall under the umbrella of telecoupling can be described as “wicked problems” because they have neither easily identifiable causes and effects, nor definite solutions, and tend to be connected to, or are symptoms of, other problems (Rittel & Webber, 1973).

The telecoupling framework, as originally developed by Liu et al. (2013), enables a comprehensive examination of the five main components of telecoupling, namely systems (i.e., sending, receiving or spillover systems), flows, agents, causes and effects. However, this

dissertation does not follow this structured approach because focusing the analysis solely on the five analytical categories would not allow for a comprehensive analysis of the governance structures and institutions that influence telecoupled interactions. Instead, the telecoupling concept is used as a heuristic device that directs attention to how place-based environmental changes are linked to global flows and distal drivers, without favouring any specific scale or unit of analysis (Eakin et al., 2014; Friis & Nielsen, 2017b). This approach is useful for research on environmental governance in telecoupled systems because multiple points of entry for analysis are possible (Eakin et al., 2014), and the scale of analysis can be set according to the scales of governance that are deemed relevant. For example, *A4* presents a case study of a BRI project in Montenegro and uses a particular local environmental problem as the entry point for analysis. Rather than analysing only the focal telecoupled system, *A4* set the system boundaries at a larger scale to capture the influence of foreign and international governance actors. If the structured approach to the telecoupled analysis was used, it would not have been possible to capture the influence of important governance actors, who are not part of the focal telecoupled system, such as the European Union (EU) and United Nations Educational, Scientific and Cultural Organization (UNESCO).



Credits: “Deforestation” icon by Laymik & “soybean” icon by AFY Studio from Noun Project.

**Figure 1. Exemplary simplified schematic representation of telecoupling.**

*Source: author’s elaboration.*

In the context of telecoupling, ‘global’ is mostly seen as a causal category rather than a spatial one. ‘Global’ is *not* used synonymously with ‘universal’, ‘everywhere’ or ‘deterritorialized’, which are common interpretations of the term (Paterson et al., 2003). Instead, in the context of telecoupling, the term ‘global’ is used to describe environmental problems that are global in their cause-effect-relationship, but not in their physical occurrence. Many global environmental problems like biodiversity loss, deforestation, desertification, or acid precipitation do not occur everywhere on the globe. Nevertheless, they are of a global scale in at least three respects: (1)

the causal dynamics underlying these problems span the globe; (2) they affect or are affected by other global processes like international trade or international (food) security; and (3) they are of international concern because they go beyond the capacity of individual actors to effectively address them unilaterally. This conceptualization underlines why telecoupled problems are seen as a distinct set of global environmental problems (Newig et al., 2020), as opposed to globally occurring environmental problems like global warming. In short, the environmental problems associated with telecoupling are global in their cause-effect relationships, but not in their spatial (universal) occurrence.

This dissertation embraces a dual ontology with regards to telecoupling, seeing it as an empirical phenomenon and a heuristic device, which is used to make visible linkages between distally connected places and actors that otherwise tend to remain unnoticed. Thus, this dissertation refers to both “telecoupled problems” and to the “telecoupling perspective” that guides the analysis.

## **2.2. Environmental governance**

Governance refers to “the processes and institutions, both formal and informal, that guide and restrain the collective activities of a group” (Keohane & Nye, 2000, p. 12). While some theorists invoke the notion of governance as ‘governance without government’, implying that hierarchical governance by state actors has given way to self-organising networks (Rhodes, 1996), others have associated the concept with the different ways in which public and private actors “guide, steer, control, or manage sectors or facets of society” (Kooiman, 1993, p. 2).

This dissertation follows the latter perspective on governance as it does not associate governance with a weakening role of the nation state, but considers the state as a central actor in global governance. However, some rule-making authority of states has been relocated in three directions: *downwards* to provincial and municipal governments, *upwards* to supranational and international organizations, and *outwards* to non-state actors (Andonova & Mitchell, 2010; Bulkeley, 2005). The notion of governance enlarges the perspective on polity (i.e., the system), politics (i.e., the process) and policies (i.e., the output) by recognising that governments are not the only actors steering societal developments (Renn et al., 2011). Complex interactions between public authorities, private business and civil society occur across and within multiple levels (i.e., local, national, regional, global). Governance includes not only the traditional ‘command and control’ approach to policy-making, but also voluntary, non-hierarchical, informal and soft forms of coordinating, regulating and steering human actions through, for example, international standards, certification schemes, information campaigns and multi-stakeholder fora (Biermann & Pattberg, 2008, 2012).

Based on this perspective on governance, environmental governance is here defined as the deliberate actions taken by state and non-state actors to find collective solutions to environmental problems. Governance involves the creation and maintenance of *institutions* (e.g., laws, policies, rules and norms), governance *structures* (e.g., overlapping, interlinked and/or interacting set of institutions active in a given issue area), and *processes* (e.g., the classical policy-making process incl. agenda setting, policy formulation, implementation, etc.,

and other processes such as participation, policy integration, policy transfer, and self-regulation) to prevent, reduce and mitigate harmful human effects on the environment (Bennett & Satterfield, 2018; Biermann et al., 2009; Lemos & Agrawal, 2006). This dissertation is primarily concerned with collectively binding institutions, such as written rules and agreements, but also takes note of non-binding governance arrangements like voluntary corporate self-regulation. The three dimensions of environmental governance (i.e., institutions, systems and processes) are inherently linked and mutually constitutive, but research in the field of environmental governance may place the analytical focus on any of the three dimensions to different degrees. This also applies to this dissertation because the extent to which the various articles analyse the institutional, procedural or structural elements of environmental governance varies. *A1* and *A3* largely examine governance institutions and systems, investigating the spatial scalar dimensions of telecoupling governance (*A1*) and the governance initiatives that are established in the context of the “green BRI” (*A3*). The case study on a BRI project in Montenegro directs attention to the governance processes and politics, albeit recognizing their embeddedness in a larger governance framework (*A4*). This study highlights that national political processes are often influenced by international and foreign actors through, for example, international agreements or international norms (*A4*). Additionally, *A1* and *A2* draw attention to the institutions being established in response to telecoupling. They discuss various governance approaches used for the governance of commodity supply chains.

While this dissertation focuses on environmental governance, I acknowledge that environmental problems have social and economic implications, which means that environmental governance is part of sustainability governance, aiming to establish human-nature interactions within planetary boundaries (Rockström et al., 2009) and in accordance with the principle of intra- and intergenerational justice (Tremmel, 2006). Sustainability and sustainable development are understood as evolving normative concepts which have nearly universal appeal but no universally agreed definitions. I understand sustainability as a principle that guides decision-making and actions in order to, at a minimum, not damage or degrade ecosystems, the atmosphere or outer space and not harm present and future generations. At best, this principle can guide us to enhance social, economic and environmental well-being. This understanding of sustainability reflects that the concept can be assessed on a continuous scale, aiming at continuous improvements, rather than be judged against an ideal state of affairs. Additionally, I understand sustainability as a global concept, implying that improving the sustainability in one place is meaningless if it undermines the sustainability elsewhere. Tensions and trade-offs between the economic, social and environmental pillars of sustainability are inevitable, which highlights the need to govern how they are balanced against one another (Lange, 2017).

### **2.3. Environmental governance & telecoupling**

The telecoupling framework (Liu et al., 2013) does not encompass any reference to governance, other than recognizing that governments and corporations are important agents of change in telecoupled systems and that telecoupling may have political causes and effects. Liu et al. (2013) recognize the need for additional research to advance our understanding of sustainability governance at different levels, ranging from local to global. They highlight the importance of

addressing the questions of what policies are needed to regulate telecoupling effectively. Challies et al. (2014, p. 34) remark, “Thus far, global teleconnections and their implications for policy and governance have remained under-theorised”. Subsequently, research has emerged at the intersection between telecoupling and environmental governance (Eakin et al., 2017; Lenschow et al., 2016; Munroe et al., 2019; Newig et al., 2019, 2020; Oberlack et al., 2018).

Governing telecoupling is challenging because telecoupled systems are not only spatially distant, but usually also socially distant due to “a separation of social networks, institutions, and governance” (Eakin et al., 2014, p. 142). Separate policies, actors and networks govern human-nature interactions in both the receiving and sending systems. These actors may have diverging interests and face high transaction costs when seeking to develop joint solutions in the absence of institutionalized channels for bi- or multilateral cooperation. Knowledge deficits, policy incongruences and a weak legitimacy base pose further governance challenges (Newig et al., 2020). For example, many supply chains have become geographically dispersed, logistically complex, and are characterized by a lack of transparency regarding many dimensions of commodity production, trade and consumption (Gardner et al., 2019). Munroe et al. (2019) underline that actors traditionally considered outside the formal policy arena such as financial actors, land users, corporate actors and consumers influence decision-making in telecoupled systems. The relationships between actors are often characterized by asymmetries in financial value capture, information and power, which can constrain cooperation, coordination and collaboration.

Research has investigated the potential policy responses to telecoupling (Lenschow et al., 2016; Persson et al., 2022). Governance interventions like certification schemes, voluntary corporate commitments, commodity roundtables and due diligence provisions for imports are frequently investigated in the context of telecoupling, albeit not all of this research refers explicitly to the concept of telecoupling (Bastos Lima & Persson, 2020; Garrett et al., 2021; Leijten et al., 2022; Meemken et al., 2021; Schilling-Vacaflor & Lenschow, 2021). Scholars have highlighted that governance does not only respond to telecoupling by aiming to mitigate and prevent associated negative social and ecological effects, but can also drive the emergence of telecoupling (Newig et al., 2019; Oberlack et al., 2018). This dissertation adopts this dual perspective on governance, conceptualizing governance as a driving force of telecoupling and as a response to telecoupling. *A3* and *A4* indicate that the BRI incentivizes long-distance interactions between various social-ecological systems because Chinese firms and banks build infrastructure projects abroad, creating long-distance flows of workers, materials, finance and knowledge. Moreover, we outline the governance institutions that are established in response to (potential) negative social and ecological effects of telecoupling – in the context of the “green BRI” (*A3*, *A4*), and in the context of global commodity governance (*A1*, *A2*).

Bringing the telecoupling perspective into the research field of global environmental governance yields novel insights because it highlights the need to govern place-based environmental outcomes in light of their global connectedness. To date, no theoretical framework or theory exists that guides the empirical analysis of governance of telecoupling. Early research on global environmental governance has predominantly studied the creation and performance of issue-specific international regimes like the climate change regime (Dimitrov,

2006; Keohane & Victor, 2011; Young, 1999), while giving less attention to local circumstances and place-specific actions and outcomes (Newig et al., 2020). Researchers have examined how to govern areas of the planet that are beyond the jurisdiction and effective control of governments (Biermann & Kim, 2020; Biermann & Pattberg, 2012), such as the climate, the high seas, Antarctica or outer space (Young, 2020). Most of this research has focused on multilateral approaches to global environmental governance, focusing on international organizations, international bureaucracies (Bauer et al., 2012), and international regimes (Keohane & Victor, 2011). Moreover, research on transnational environmental governance has focused extensively on how to govern global flows towards sustainability through, for example, the use of certification schemes, voluntary sustainability standards, and corporate commitments (Folke et al., 2019; Lambin & Thorlakson, 2018; Partzsch, 2020). Research on global value chains has analyzed how private actors coordinate and try to upgrade value chains<sup>1</sup> (Gereffi et al., 2005; Ponte, 2022). However, this literature pays little attention to the institutional frameworks in which this within-chain-governance is embedded (Newig et al., 2020). Scholars have also applied the concepts of environmental justice to telecoupling (Boillat et al., 2018, 2020; Corbera et al., 2019).

Furthermore, the research stream on environmental policy has produced knowledge that is relevant for the governance of telecoupling. Public policy tools like technology transfer, international and bilateral financial support, environmental taxes, compensation payments and sustainable trade agreements can be used to mitigate the effects of telecoupling (Lenschow et al., 2016). There is growing recognition in the field of external environmental policy that states and supranational organizations like the EU try to influence environmental outcomes beyond their own borders through the use of multilateral environmental agreements (MEAs), trade agreements, green diplomacy and development cooperation (Adelle et al., 2018; Biedenkopf & Groen, 2021). Scholars have studied how state actors use due diligence laws and policies to hold corporate actors accountable for sustainability in global supply chains (Gustafsson et al., 2022; Moser & Leipold, 2021; Schilling-Vacaflor & Lenschow, 2021). Additionally, research has analyzed the extraterritorial dimensions of policies like the EU biofuel policies or the European Green Deal (Bastos Lima & Gupta, 2014; Fuchs et al., 2020). Extraterritoriality refers to processes or events that take place beyond the boundaries of a particular jurisdiction. Extraterritorial jurisdiction denotes attempts of a government to exercise jurisdiction over conduct occurring outside its own borders (Bernaz, 2013, p. 496).

In sum, the scholarly community agrees that telecoupled systems are complex and their governance is challenging (Eakin et al., 2017; Munroe et al., 2019; Newig et al., 2020; Oberlack et al., 2018). Despite the growing body of research on the governance of telecoupling, there exists no analytical framework that incorporates the key concepts and analytical elements required for studying the governance of telecoupling. It goes beyond the scope of this framework paper to present such an analytical framework, but I will highlight key concepts and outline a future research agenda that supports efforts towards developing one.

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<sup>1</sup> The concept of value chain upgrading describes the process whereby economic actors try to move to higher-value activities in the global economy (e.g., making better products, making them more efficient, or moving into more skilled activities) (Humphrey & Schmitz, 2002).

### **3. Research design & methodology**

This dissertation consists of four papers (Table 1). All articles are co-authored papers that were written in the context of the Innovative Training Network (ITN) *COUPLED – Operationalising Telecoupling for Solving Sustainability Challenges for Land Use*, which received funding from the European Union’s Horizon research and innovation programme. *A3* further contributes to the research project *GOVERNECT - Governance of Environmental Sustainability in Telecoupled Systems of Global Inter-Regional Connectedness*, which was funded by the German Research Foundation (DFG). *A1* has been accepted for publication in *Ecology & Society*. *A2*, *A3* and *A4* are published open access in *Environmental Policy and Governance*, *Land Use Policy* and *Earth System Governance*, respectively.

**Table 1. Overview of the research articles included in this dissertation.**

|                            | <b>Article 1</b>   | <b>Article 2</b>   | <b>Article 3</b>  | <b>Article 4</b>   |
|----------------------------|--|--|---|--|
| Title                      | Towards institutional fit in the sustainability governance of global commodity flows                 | Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda                    | Environmental Governance of China's Belt and Road Initiative  | Environmental governance of a Belt and Road project in Montenegro – National agency and external influences  |
| Empirical focus            | Governance of global commodity flows   |  | Governance of infrastructure projects within China's BRI  |  |
| Research approach/ methods | Conceptual work based on literature review   | Systematic literature review using descriptive statistics and bibliometric analyses  | Literature review, descriptive statistics and geographical mapping  | Qualitative case study based on online and in-person interviews, site visits and document analyses           |
| Overarching aim            | Conceptual advancements that support theory development  | Knowledge synthesis to consolidate the knowledge base  | Formation of a research agenda in anticipation of emerging social-ecological challenges   | Gathering of empirical evidence  |
| Type of research           | Conceptual, in support of explanatory research   | Exploratory  | Exploratory   | Exploratory & explanatory  |
| Research question          | How can the concept of institutional mismatches be applied to the governance of telecoupled systems? | How have various streams of literature that relate to environmental governance of telecoupled flows evolved over time and interlinked? | How do Chinese, BRI host countries, and international and transnational institutions contribute to the environmental governance of the BRI? | How are the environmental implications of the Bar-Boljare Highway governed, as one example of a BRI project? |



None of the four articles seeks to test a theory or specific causality. Rather, this dissertation aims to better understand a puzzling “class of phenomena that interests us [...], but for which we lack applicable theories” (Friedrichs & Kratochwil, 2009, p. 709). *A2* and *A3* are exploratory as they take stock of relevant topics, new trends, and research gaps. *A1* presents two conceptual building blocks, namely boundary and resolution mismatches, to explain the (in-)effectiveness of governance interventions in telecoupled systems. The case study presented in *A4* pursues an exploratory research question, but provides explanatory findings. First this study explored the governance structures and developed a general understanding of the problem. Subsequently, factors were identified that contributed to the environmental outcomes (*A4*).

*A1* is a conceptual paper that synthesizes the key findings of the COUPLED project. The aim of conceptual articles is to “bridge existing theories in interesting ways, link work across disciplines, provide multi-level insights, and broaden the scope of our thinking” (Gilson & Goldberg, 2015, p. 128). The paper was developed taking an iterative approach which involved the following steps: (1) identify the core concept should be explored through the research project (i.e., institutional mismatches), (2) review existing literature in order to recognize different uses and understandings of the core concept, (3) apply the concept in the context of telecoupling by drawing on the empirical findings of the COUPLED project. The article identifies two types of institutional mismatches in the governance of global commodity chains and the governance approaches to address them.

*A2* presents the results of a systematic literature review on the environmental governance of telecoupled systems. The rationale for this study originated in the observation that research on telecoupling draws on different streams of literature on governance, hindering the integration and synthesis of findings. At the same time, numerous studies on governance and policy refer to the phenomenon of telecoupling without explicitly making use of the concept of telecoupling. It is important to distil key insights from existing studies because the field of environmental governance, policy, and planning has been criticized for the widespread failure to produce robust and cumulative knowledge (Newig & Rose, 2020). Our article synthesizes the findings of different research areas, integrates existing knowledge, assesses the diversity and degree of fragmentation of the body of literature, and identifies relevant topics in need of further research. The article follows the PRISMA guidelines for systematic reviews in order to ensure transparency, reliability and replicability of the findings (Moher et al., 2009).

*A3* describes the environmental governance of China’s Belt and Road Initiative (BRI). The article uses the concept of governance architecture (Biermann et al., 2009) and applies it to the case of China’s BRI. The article starts by mapping the geographic and financial scale of the BRI and the distribution of its various types of infrastructure projects. It then outlines the environmental governance architecture that is emerging. A non-systematic literature review is employed because no established body of literature existed at the time of the analysis that could have been systematically analysed to identify the many newly established BRI governance initiatives. *A3* includes grey literature and applies a snowball technique to identify relevant academic publications and non-academic reports. The aim of *A3* is to set a research agenda and stimulate an interdisciplinary, scientifically-grounded and multi-faceted debate among researchers, practitioners, students and policy makers. The strength of this paper lies in its

originality, while the weakness lies in its limited empirical evidence. For example, *A3* synthesizes existing theoretical perspectives on the effects of trade and investments on public and private environmental standards (see Table 2 in *A3*), but this study does not empirically assess whether the BRI leads to a ‘race to the top’ or ‘race to the bottom’ on a global scale.

*A4* presents an empirical case study of a BRI infrastructure project in Montenegro, using primary data gathered through in-person and online interviews, site visits and document analyses. This study responds to scientific calls for “more grounded political understandings of the BRI, as well as attentiveness to its environmental consequences” (Lindberg & Biddulph, 2021, p. 138) and more “critical and fieldwork-based research [...] to understand the multi-faceted politics of the green BRI” (Harlan, 2021, p. 218). *A4* outlines conditions and factors that contribute to the emergence of environmental problems in the given case. The case selection of the Bar-Boljare Highway in Montenegro was based on both scientific and pragmatic criteria. The scientific criteria included: (1) a BRI project that is not just planned, but already implemented, (2) a BRI project that is implemented in Europe as it illustrates the governance challenges when the BRI faces EU legislation (as Montenegro is an EU candidate country), (3) a BRI project with actual and potential environmental impacts. The case was also chosen for pragmatic reasons, because (4) information was readily accessible through, for example, a website about the highway project with relevant documents, and (5) the European location facilitated establishing contacts and organizing the research stay more easily compared to a non-European context, thereby making the research project feasible within a limited time frame. The in-depth case study provides rich detail on the specific case, but this richness simultaneously reduces generalizability (i.e., external validity). However, by comparing our findings to the results of other case studies, we argue that our case shows some typical features that have also been observed in other contexts, such as a lack of transparency and an influential role of national elites in shaping the performance of BRI projects.

#### **4. Results**

This section briefly outlines the contributions of the individual articles to the three research aims of this dissertation. The articles contribute to addressing the three aims to different degrees (Table 2). While this dissertation focuses on public governance and the role of state actors in environmental governance, this state-centric perspective does not imply that other actors like companies and nongovernmental organizations are irrelevant with regards to governing telecoupled systems. Indeed, state actors rely on the governance actions of non-state actors to govern telecoupled systems, as highlighted in section 4.2. By using state-led governance as the main analytical vantage point, this dissertation examines how state actors create governance systems, exercise agency, mobilize non-state actors and design governance responses to telecoupling.

**Table 2.** Strength of contribution of the individual articles to the research aims of this dissertation.

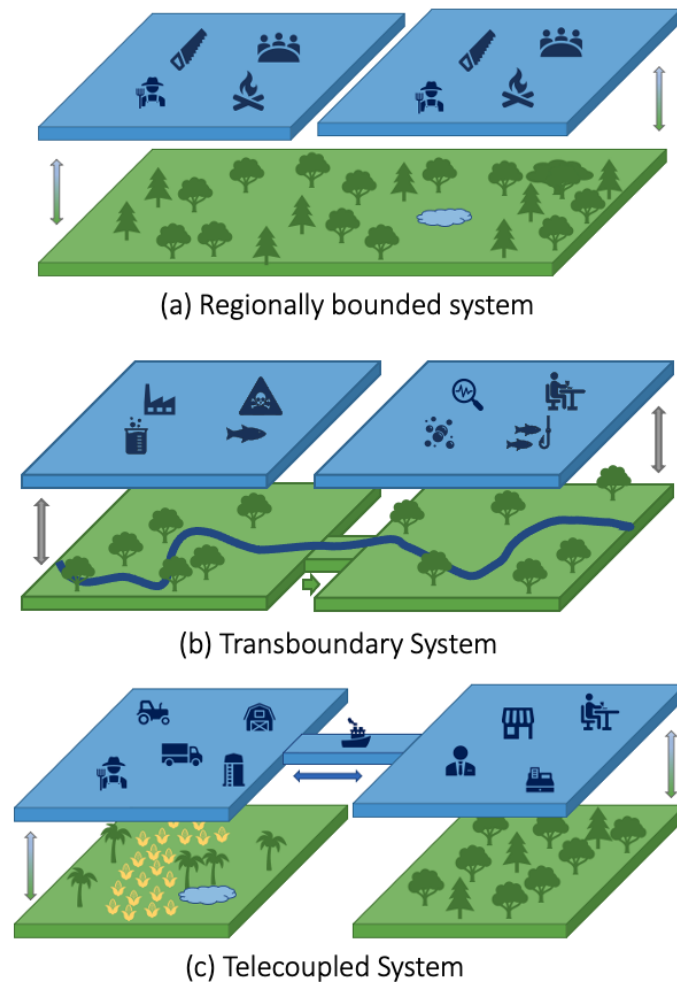
|                                  | <b>Article 1</b><br>Governance mismatches | <b>Article 2</b><br>Telecoupling literature review | <b>Article 3</b><br>BRI governance architecture | <b>Article 4</b><br>BRI Montenegro case study |
|----------------------------------|---|--|---|---|
| Aim #1:<br>Governance structures | XXX                                       | XX   | XXX   | XX  |
| Aim #2:<br>Governance actors     | X   | XX   | XXX   | XXX   |
| Aim #3:<br>Governance responses  | XX  | XX   | XX  | XX  |

Degree of contribution: (X) weak; (XX) moderate; (XXX) strong

**4.1. Governance structures and spatiality**

The spatial scale of political, economic and social interactions is expanding in a globalizing world, yet the legal authority of the most powerful governance entities, namely nation states, remains limited to the national scale. This poses questions about how to govern social-ecological processes that exceed the spatial scale of national jurisdictions. This section first elucidates the spatiality of telecoupling and second, its implications for governance. The main argument is that there is a lack of alignment between the spatial scale of individual governance institutions and the spatial scale of telecoupling, highlighting the need for further scholarly attention to institutional interplay in telecoupled systems. This section takes a broad perspective on governance structures, looking at the overarching structures and institutional arrangements in telecoupled systems, rather than the specific decision-making and implementation structures of individual institutions.

Telecoupled systems are characterized by geographical distance between the place where the social or environmental impacts occur and the place where underlying drivers are found. Newig et al. (2020) argue that telecoupled environmental problems represent a distinct class of environmental problems that differ in their spatiality from problems related to the global commons or (sub-)national, regional, transboundary environmental issues. Figure 2 illustrates that telecoupled environmental problems are different from regionally bounded or transboundary environmental issues because they lack manifest ecological feedbacks between the coupled social-ecological systems (see *A1* for more detailed discussion). The literature review presented in *A2* finds that environmental problems with a spatial configuration as depicted in Figure 2c are being studied increasingly, but few research articles explicitly refer to the concept of telecoupling to demarcate this class of environmental problems. Multiple research streams with different theoretical lenses have investigated the governance of telecoupling, but the body of literature remains diverse and fragmented (*A2*).



**Figure 2. Three types of interconnected social-ecological systems and their interdependencies.** Systems comprise socioeconomic building blocks (blue), ecological building blocks (green), and their interdependencies (arrows). *Source: A2.*

The spatial configuration of telecoupled systems has implications for the governance structures. Telecoupled systems tend to be governed by different, functionally independent institutional arrangements, actors and networks (Eakin et al., 2014, 2017; Friis & Nielsen, 2017b). Governance institutions at different scales and levels influence environmental outcomes in telecoupled systems. For example, the environmental governance of China’s BRI not only relies on governance policies and initiatives of the Chinese government, but also on the stringency and enforcement of environmental laws and regulations in BRI countries (A3, A4). Likewise, global commodity chains are governed at several places along the chain, which implies that no single actor or institution has the ability to foster a sustainability transition within a telecoupled system unilaterally (A1, A2). These examples illustrate that the underlying governance systems are polycentric, because multiple, formally independent institutions and actors interact and affect each other (A1, A2) (Oberlack et al., 2018; E. Ostrom, 2005; V. Ostrom et al., 1961). Not only national and sub-national environmental institutions in places experiencing the environmental impacts of telecoupling influence the emergence and severity of environmental outcomes, but also external actors from other jurisdictions may seek to mitigate and prevent environmental problems (further discussed in section 4.2 below). Additionally, sub-national and national governance institutions are embedded in transnational and international

institutions. For instance, *A4* underlines that the focal telecoupled system is subject to normative pressures from international organisations such as the EU and UNESCO. Likewise, *A3* shows that the Chinese government is actively developing the “green BRI” in partnership with UN agencies, as well as other international organizations and cooperation platforms.

The spatial configuration of telecoupled systems makes it challenging to establish institutional structures that align with the complete spatial scale of the causal relationships underlying the problem (Challies et al., 2019). *A1* examines the alignment between the spatial scale of the problem and spatial scale of governance in telecoupled systems. Questions of scale and institutional fit have long been discussed in the political science and social-ecological systems literature, referring to the ‘problem of fit’ or ‘mismatches’ (Epstein et al., 2015; Folke et al., 2007; Galaz et al., 2008; Young, 2005). *A1* is based on the underlying assumption that matching the spatial, temporal and/or functional scale of governance institutions with the scale of the problem contributes to institutional effectiveness (Young, 2005). The congruence between the underlying problem structure and the regulatory structures is expected to increase the governance capacity of both public and private governance actors (Knill & Lehmkuhl, 2002). Since environmental problems seldom conform to jurisdictional borders, governance authorities and institutions may have little or no authority to govern the full extent of the problem (*A2*). Governance mismatches are already challenging in local and regional contexts (Bergsten et al., 2014; Moss, 2012), but addressing such mismatches in telecoupled systems is even more difficult due to the involvement of multiple remote jurisdictions, actors, and institutions, which often lack a history of joint collaboration and problem-solving (Newig et al. 2020).

The governance of telecoupled systems may encounter spatial mismatches, in particular boundary and resolution mismatches, which unfold through different mechanisms and manifest differently in private and public governance (Table 3; explained in more depth in *A1*). The concept of boundary mismatches highlights that there is no single governance actor that has jurisdiction over the full scale of telecoupling, and thus, governance institutions may neglect social-ecological problems that transcend established administrative or jurisdictional boundaries. Many governance interventions aimed at mitigating environmental problems associated with global commodity flows are implemented at a scale that encompasses only certain parts of the telecoupled system, such as either the sending or the receiving system, but less frequently extend to the entire spatial scale (*A2*). The inadequate extent of governance can create spillover and leakage effects as parts of the problem remain outside the targeted spatial scale of the intervention (*A1*). Global governance institutions like MEAs usually have too coarse a spatial resolution to be able to address both place- and flow-specific characteristics of a given telecoupled system, which presents a resolution mismatch (*A1*).

**Table 3.** Spatial mismatches in the governance of telecoupled social-ecological systems  
Source: *AI*

|  | <b>Boundary mismatch</b>  |   | <b>Resolution mismatch</b>   |
|--|---|---|--|
| <b>Definition</b> <sup>†</sup>                               | Governance institutions neglect social-ecological problems that transcend established administrative/jurisdictional boundaries.   |   | Governance institutions have too coarse a spatial resolution than is suitable to address the social-ecological problems at hand.   |
| <b>Underlying problem</b>                                    | Lack of governance extent   |   | Lack of governance precision   |
| <b>Mechanism</b>   | Spillover   | Leakage   | Panacea trap   |
| <b>Description</b>   | Governance institutions do not govern a social-ecological problem that expands beyond their administrative/jurisdictional boundaries.   | Governance institutions address a social-ecological problem, but create leakage(s) – i.e., counterproductive effects outside the targeted area or domain of the intervention. | Governance institutions are not specific enough to be effectively implemented and enforced.  |
| <b>Example from a public policy perspective</b> <sup>‡</sup> | European countries have not (yet) implemented specific public policies to mitigate the deforestation effects of their demand for soy in remote jurisdictions. <sup>§</sup>                            | A forest moratorium shifts deforestation to neighbouring areas or other countries, thus producing negative externalities in distant jurisdictions.                            | A multilateral environmental agreement that is too broad in scope to govern particular telecoupled flows.  |
| <b>Example from a private governance perspective</b>         | A voluntary sustainability standard focuses on reducing harmful on-farm impacts at sites of production, but neglects sustainability issues outside the farm such as air pollution from pesticide use. | Supply chain actors implement zero-deforestation policies that target only one region, allowing actors in other regions or neighbouring countries to deforest.                | Supply chain actors set broad sustainability goals, which are insufficiently operationalized in terms of specific and measurable targets, unambiguous definitions, and exact coverage. |

<sup>†</sup> Adapted from Bergsten et al. (2014).

<sup>‡</sup> We present the different types of mismatches from both public policy and private governance perspectives, because their analytical focus differs. From a public policy perspective, the focus is on the jurisdictional scale, defined as clearly bounded political units (e.g., towns, provinces, states or countries) (Cash et al. 2006), whereas the private governance perspective puts more emphasis on the scale of the supply chain or associated flows.

<sup>§</sup>The newly-adopted EU Regulation on deforestation-free supply chains addresses this mismatch (European Commission, 2022). It is expected to enter into force in summer 2023. Once it is in force, operators and traders will have 18 months to implement the new rules.

Addressing governance mismatches requires (re-)scaling governance interventions to the scale of telecoupling. *A1* presents several illustrative examples in the context of land and global agricultural commodity governance. Governance approaches like due diligence policies and laws, sustainability chapters in trade agreements and landscape approaches are used to govern telecoupled systems. The study concludes that the risk of mismatches persists, not least because telecoupled systems are dynamic and constantly changing (*A1*). Thus, attention needs to be directed to how to create an effective institutional interplay between multiple adaptive governance institutions that jointly match the scale of the problem at hand (further discussed in section 4.3 below). In particular flow-based governance initiatives<sup>2</sup> like zero-deforestation commitments, certification schemes or due diligence laws are likely to benefit from robust place-based (national) governance structures (*A1*) (see also Schilling-Vacaflor et al., 2022), which, for example, support access to key data to help reveal sourcing patterns (zu Ermgassen et al., 2022). *A2* finds that many of the reviewed research articles mention the importance of the interactions between place-based and flow-based governance without discussing specific patterns and conditions of interactions, which thus, merits further research and theoretical developments.

Scaling governance at the scale of telecoupling has implications for the way agency is exercised in telecoupled systems, as demonstrated in the next section.

#### **4.2. Governance actors and mechanisms of external environmental governance**

Developing a better understanding of the governance of telecoupled systems not only requires studying the underlying governance structures, but also the governance actors that create these structures. Actors can enable, facilitate or constrain change in telecoupled systems (Parish et al., 2018). They can address the environmental effects of telecoupling in their own jurisdiction or in another jurisdiction. The ability of public authorities to govern environmental effects in other jurisdictions is often mediated by the actions of non-state actors, as explained further below.

Before institutional responses to telecoupling can be developed, societal actors need to recognize and problematize the effects of telecoupling. The absence of an imminently visible ecological connection between telecoupled systems obscures actors' recognition of and concern about issues of telecoupling (*A1*). In the case of international supply chains, a surge in commodity prices or a disastrous event, such as the significant spike in fires in the Amazon rainforest in Brazil in 2019, can raise societal and political awareness of the interconnectedness between distal markets and can trigger a change in consumer demand, political agendas and institutions (de Area Leão Pereira et al., 2020; Eakin et al., 2017). So-called 'problem brokers' and 'political entrepreneurs' can play important roles in highlighting causal linkages between certain actions and distant outcomes in telecoupled systems (*A1*) (see also Bastos Lima et al., 2019; Eakin et al., 2017; Meyfroidt et al., 2022). International non-governmental organisations and social movements are important agents in framing problems and bringing issues of

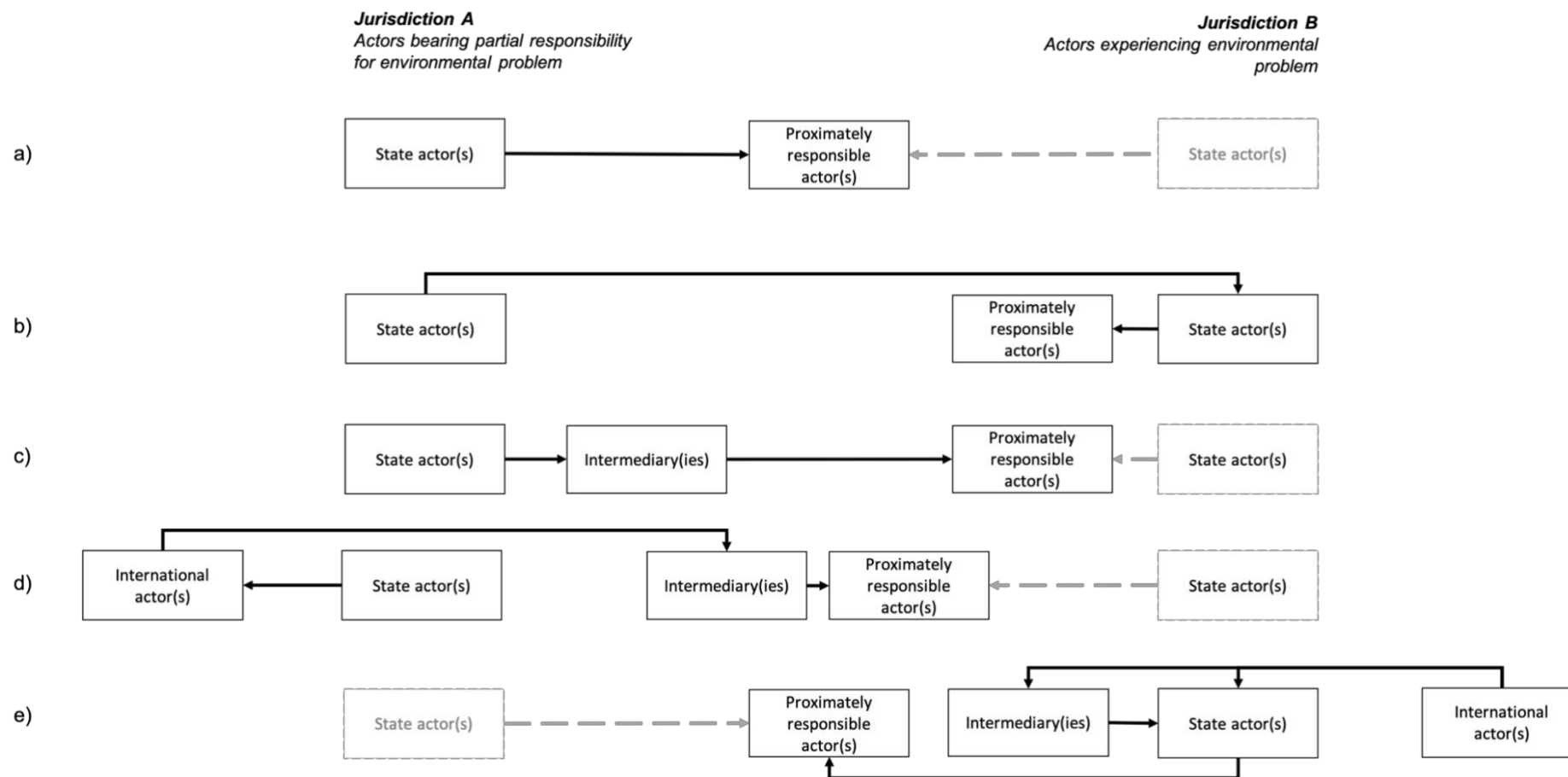
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<sup>2</sup> Flow-based governance "considers a place in light of its relationships with other places, by tracking and managing where key flows start, progress, and end" (Liu et al., 2018, p. 65).

telecoupling to the political agenda. Additionally, media outlets play a crucial role in defining and giving meaning to issues of telecoupling, and thus, influence the formulation and legitimization of governance interventions (Mempel & Bidone, 2023).

National governments have considerable leverage on the sustainability of telecoupled systems if the environmental effects of telecoupling occur in their jurisdiction. For example, BRI host countries possess considerable agency with regards to environmental outcomes by setting terms and environmental standards and bargaining with Chinese actors (*A3, A4*) (see also Rodenbiker, 2022; Rogelja & Tsimonis, 2020; Tritto, 2021). The case study from Montenegro (*A4*) supports this argument empirically because it shows that the Montenegrin government had substantial leverage over the environmental outcomes by setting environmental standards, approving the route of the highway, conducting an Environmental Impact Assessment (EIA) and monitoring the construction works, albeit it did not make full use of its agency. Host countries need to have the political willingness and capacity to enforce their environmental regulations (*A3, A4*). This argument also holds for the governance of commodity chains. *A2* underlines that public legislation and regulation is decisive for addressing the negative impacts of telecoupled flows. However, the governance in jurisdictions facing the sustainability problems may be weak or perceived as insufficient (Reis et al., 2021; Villiers, 2019). This ‘governance gap’ may prompt governance actors external to the jurisdiction where the environmental effects are observed to take actions. Several such mechanisms of external environmental governance are presented in the articles of this dissertation (*A1-A4*). Five such mechanisms are identified and discussed below (see Figure 3 for an overview).





**Figure 3. Potential mechanisms of external environmental governance.**

*The arrows indicate the direction of influence between different actors – either based on hierarchical governance like mandatory due diligence laws and international agreements or softer forms of governance like dialogue and capacity building. “Proximately responsible actors” refers to actors whose actions cause environmental changes at the local level, but these actions may be driven by underlying distal drivers. The dotted elements indicate the presence of potentially important governance actors, whose influence may, however, be weak or insufficient. The international actors are not part of any jurisdiction. Several of the displayed mechanisms can occur in parallel. This figure illustrates some underlying theoretical implications of this dissertation in a preliminary manner, which is intended for future theory development, but the figure has not been peer-reviewed yet. The presented governance relations are non-exhaustive.*

*Source: author’s elaboration.*

First, if the operations of a transnational company cause environmental effects outside its home jurisdiction, public authorities in the home jurisdiction typically lack the ability to hold the company accountable. Due to the principle of national sovereignty, states do not have the authority to regulate activities that take place within the territory of another state. This creates an accountability gap (Bernaz, 2016). For example, the Chinese government has limited direct governance capacity to address environmental challenges arising in BRI projects abroad (A3, A4). The Chinese government has no legal mechanisms in place to hold transnationally operating Chinese companies accountable for their potential non-compliance with environmental and social laws in BRI host countries. This lack of corporate liability for extraterritorial environmental and human rights violations is not unique to China. Around the world, states face difficulties with holding companies domiciled within their territories accountable for their extraterritorial impacts (Bertram, 2022; Scott, 2020; Villiers, 2019). However, the Chinese government uses soft governance mechanisms of external environmental governance. It has issued non-binding guidelines and policies that encourage Chinese companies to implement sustainability safeguards in BRI projects (A3). BRI host countries may exert only weak influence on the proximately responsible actors, i.e., transnationally operating Chinese companies, due to limited monitoring and enforcement of environmental regulations by the host countries, and concerns about increasing costs and time needed for construction (A4). This configuration is represented in Figure 3a.

Second, external governance actors may also seek to influence and support state actors in the jurisdiction where the environmental problems are observed through dialogue and negotiations, capacity building, and bilateral trade and investment agreements (Figure 3b). For example, social and environmental provisions are increasingly included in trade agreements to govern trade-related environmental impacts (A1). States can also promote bilateral dialogues to influence other states' sustainability policies. For example, the EU and Brazil engaged in several bilateral dialogues to strengthen their co-operation on issues related to environmental protection and climate change, including an energy dialogue to promote sustainable biofuels (A2) (Renckens et al., 2017). The ability to use such bilateral mechanisms of external environmental governance depends on the normative and market power of the governance actor, who tries to influence environmental governance in another jurisdiction (Adelle et al., 2018; Damro, 2015; Manners, 2002).

Third, although public authorities lack the authority to apply hierarchical command-and-control regulations in other jurisdictions, they can govern environmental issues beyond their own borders by steering the activities of *intermediaries*. The term intermediaries, borrowed from orchestration theory, refers to actors like non-governmental organizations, businesses or transnational networks who work towards achieving targets set by a 'governor', who is usually a state actor or an international organization (Abbott et al., 2012, 2016, 2017). Intermediaries can possess local information, monitoring capacity, legitimacy and technical expertise (Abbott et al., 2012). Figure 3c illustrates that intermediaries do not bear proximate responsibility for the observed environmental changes, but they have the capacity to influence the actions of the proximately responsible actor(s). For example, due diligence laws and policies that impose due diligence requirements rely on transnationally operating companies as intermediaries. The companies are domiciled in jurisdiction A and are partly responsible for the environmental

effects of the proximately responsible actor, i.e., supplier or subsidiary (Figure 3c). Due diligence laws and policies require companies to identify, assess and prevent or mitigate that the actions of their subsidiaries or suppliers cause human rights violations and/or environmental impacts (*A1, A2*).

Fourth, the BRI provides another illustrative example of the role of intermediaries in governing telecoupled systems (Figure 3d). The Chinese government relies on third parties that can act as intermediaries to achieve its foreign environmental policy goal of developing a ‘green BRI’. It established the BRI International Green Development Coalition (BRIGC), an international organization, which, as suggested in *A3*, could assume the role of an orchestrator, who governs actors on the ground indirectly through the mobilization of intermediaries (*A3*). Recent research has built upon that proposition, and finds that the BRIGC has limited success in performing its role as an orchestrator and currently serves a mostly symbolic function (Geng & Lo, 2022).

Fifth, *A4* shows that international organizations like the EU also use mechanisms of external environmental governance in the context of the BRI (Figure 3e). The case study of a BRI project in Montenegro shows that the EU encourages intermediaries like Montenegrin NGOs to perform governance functions like monitoring the development of large-scale infrastructure projects; and the EU finances their activities. Local NGOs exerted pressure on the Montenegrin government to hold Chinese companies accountable for the environmental impacts that resulted from the construction of the BRI project (*A4*). Additionally, international organizations like the UNESCO and the EU can exert normative pressure for good environmental governance on states hosting BRI projects through their advisory role (i.e., UNESCO) or political relations (i.e., EU) (see also Figure 6 in *A4*).

The described mechanisms highlight that intermediaries play influential roles in increasing the extent of governance by state actors in pursuit of avoiding boundary mismatches. Additionally, intermediaries can improve the precision of governance, thereby preventing resolution mismatches. If intermediaries possess knowledge of the local context and have the ability to translate macro-level policies and global goals into actionable measures on the ground, they can contribute to improving the fit between the scale of governance and telecoupled systems (*A1*). Research on social-ecological systems has referred to these types of intermediaries as ‘bridging organizations’ or ‘knowledge brokers’ (Crona & Parker, 2012; Galaz et al., 2008). They can provide an arena for learning and knowledge exchange about phenomena at various locations or on different scales. In the context of the BRI, China set up the so-called China-CEEC [Central and Eastern European Countries] Environmental Cooperation Mechanism, with an office being established in Montenegro’s capital, which could theoretically assume the function of a bridging organization (*A4*). In the context of global commodity governance, multi-stakeholder platforms and commodity roundtables can alleviate resolution mismatches by bringing together actors that operate at different scales and have different knowledge and interests. Moreover, other research has underlined the important role of traders in sustainability governance as they possess specialized context-specific knowledge and can “bridge gaps in terms of values, understanding, and awareness between countries in the Global North and producers in the Global South” (Grabs & Carodenuto, 2021, p. 1322). When companies act as intermediaries, as in the case of due diligence laws, they are not only knowledge brokers, but

they also contribute to causing the problems, which puts them in a key position to drive telecoupled systems towards sustainability.

Overall, the findings show that the agency of state actors in governing distal environmental effects is often mediated by the actions of non-state actors. Research has theorized that the actions of non-state actors are complementary, competitive or coexistent with public governance (Cashore et al., 2021; Lambin et al., 2014). My findings support this argument, but direct attention to a particular public-private interaction, namely intermediation (Abbott et al., 2017). By supporting, mobilizing, financing or regulating the actions of intermediaries, state actors can govern environmental issues beyond their jurisdictional boundaries, thereby potentially increasing the extent of governance and its precision. However, it is questionable whether external environmental governance can be effective in the absence of a favourable political environment and legal framework on the ground and compensate for weak national policymaking (Reis et al., 2021; Schilling-Vacaflor et al., 2022). In the context of the BRI, the case study from Montenegro suggests that good environmental governance by host countries is indispensable for sound environmental outcomes, which external actors can complement, but cannot substitute for (A4).

Several questions with regards to intermediaries remain unexplored. Future research could examine how state actors mobilize intermediaries, which governance functions are assigned to intermediaries, what mechanisms of accountability relations between actors are used (e.g., hierarchical, supervisory, fiscal, legal, market, peer, public reputational (Grant & Keohane, 2005)). Furthermore, to what extent is extraterritorial environmental governance effective in the absence of strong governance in the jurisdiction where the environmental effects are observed, and does it fit with the local people's needs and values? Moreover, intermediaries may operate "in series" or "in parallel" (Abbott et al., 2017), which is not displayed in Figure 3 to reduce complexity. For example, supply chains often consist of many suppliers, which means that authority, knowledge and standards are transferred between several intermediaries, creating long chains of accountability.

### **4.3. Governance responses to domestic and foreign effects of telecoupled flows**

There are two different, but complementary overarching governance responses to telecoupling. A first potential response to telecoupling is to decrease global flows that have negative environmental effects by, for example, reducing livestock production that is linked to trade of feed with environmentally harmful effects (Roux et al., 2022), while also incentivising an increase in the volume of flows with expected positive environmental effects, like green technologies, goods, services and investments (Brandi et al., 2020). Additionally, states can reduce their dependency on telecoupled flows by implementing policies fostering a transition towards a circular economy and reducing consumption. By localizing production, closing material cycles and becoming more resource efficient, states can aim to reduce the volume of telecoupled flows.

A second potential response to telecoupling is to prevent and mitigate the negative environmental and social effects of telecoupled flows. In addition to aiming to change the

volume of certain global flows, governance actors can try to avoid and alleviate the effects of telecoupling. Although some scholars might argue that this strategy cures the symptoms of telecoupling without addressing the underlying causes (e.g., over-consumption, linear economy, global inequalities), it is a relevant research area because, based on current trajectories, many global flows of trade and investments will likely increase in the future (Steffen et al., 2015). This dissertation focuses on this second response to telecoupling.

Bringing together the findings of the four articles reveals that governments respond to the effects of telecoupling in four respects (Table 4). Governments can govern either the domestic or foreign effects of either incoming or outgoing flows of a country. I will briefly outline all four responses to telecoupling, drawing on my own empirical examples from research on the BRI (A3, A4) and examples from the literature that we present in articles (A1) and (A2).

**Table 4.** Typology of public governance in response to the effects of telecoupling.

|                         | <b>Incoming flows</b>  | <b>Outgoing flows</b>  |
|-------------------------|--|--|
| <b>Domestic effects</b> | 1. <i>Governance of domestic effects of global flows</i> , e.g., by changing the stringency and enforcement of domestic policies.  |  |
|                         | 1a. <i>Governance of domestic effects of incoming flows</i><br><br>Example of the BRI (A3, A4): Governments in BRI host countries can monitor and enforce that incoming investment flows and activities of foreign companies are compliant with local laws and regulations.  | 1b. <i>Governance of domestic effects of outgoing flows</i><br><br>Example of commodity flows (A2): Governments in producer countries can influence the sustainability of exported commodity flows by adapting the stringency and enforcement of their (environmental, agricultural, trade) policies and create governance initiatives to promote sustainability standards (e.g., national certification schemes). |
| <b>Foreign effects</b>  | 2. <i>Governance of foreign effect of global flows</i> , e.g., by introducing due diligence legislation and by promoting sustainability standards in their international (trade) relations.  |  |
|                         | 2a. <i>Governance of foreign effect of incoming flows</i><br><br>Example of commodity flows (A1, A2): Governments in consumer countries try to mitigate potential negative extraterritorial effects of imported commodities by, for example, introducing due diligence policies or advocating sustainability chapters in trade agreements. | 2b. <i>Governance of foreign effect of outgoing flows</i><br><br>Example of the BRI (A3, A4): The Chinese government issued environmental policies and guidelines targeted at companies and financial institutions that finance and implement BRI projects.  |

First, governments can govern the domestic effects of incoming flows by implementing stringent domestic policies. *A3* and *A4* show that governments can monitor that incoming investment flows and activities of foreign companies are compliant with local laws and regulations and sanction non-compliance. *A3* highlights that building a genuinely ‘green BRI’ requires effective environmental governance in BRI partner countries, which need to ensure that incoming investment flows do not cause negative environmental impacts. The political willingness and institutional capacity of BRI partner countries to implement and enforce strict environmental rules determines the sustainability of the BRI to a large extent because Chinese companies are encouraged to adhere to the local and national laws and regulations in BRI partner countries (*A3*). The case study presented in *A4* underlines that the legal frameworks and policies of BRI host countries are crucial in determining environmental outcomes, as well as their ability to monitor and enforce the relevant laws and regulations identified in the Environmental Impact Assessment.

Second, governments can prevent and mitigate the domestic effects of outgoing flows by designing, implementing and enforcing stringent domestic policies. *A2* finds that a substantial share of the analysed literature considers place-based responses to telecoupling, in particular in systems that send telecoupled flows abroad (see Figure 15 in *A2*). For example, the Argentinian government issued a national law for environmental protection of native forests in the context of deforestation driven by agricultural expansion for commodities exported to and commercialized on global markets (*A2*) (Krapovickas et al., 2016). Other governance schemes to promote the sustainability of outgoing flows include the Malaysian and Indonesian sustainable palm oil schemes (Higgins & Richards, 2019; Schouten & Bitzer, 2015) and Iceland’s responsible fisheries certification program (Foley, 2017), which present alternatives to the well-established Roundtable on Sustainable Palm Oil and the Marine Stewardship Council. These examples indicate that researchers have mostly used case studies to study public governance in sending systems, while a systematic exploration of public governance of the effects of outgoing flows is lacking (*A2*). Notably, studying domestic responses to telecoupling not only requires researchers to examine the effectiveness of environmental policies, but also to consider policies in the macroeconomic domain, including, for example, market deregulation, credit and investment security, funding for research and technology, and infrastructure development, which create the conditions for the growth of telecoupled flows.

Third, governments can govern the foreign effects of incoming flows by introducing due diligence legislation and by promoting sustainability standards in their international (trade) relations. Governments and companies increasingly recognize their responsibility for preventing and mitigating any negative environmental and social effects of the resource flows they import, process and/or consume (European Commission, 2021; Partzsch & Vlaskamp, 2016; Scott, 2020). Even though governments or supranational organizations like the EU do not have jurisdictional power over other sovereign states, they design and implement policies and laws aimed at influencing environmental outcomes outside their jurisdictional boundaries. A prominent example is due diligence obligations and laws, which can be applied to specific commodities, a particular sector, or to the entire economy (*A1*, *A2*) (see also Moser & Leipold, 2021; Schilling-Vacaflor & Lenschow, 2021). Mandatory due diligence laws aim to hold

companies accountable for their socially and environmentally harmful behaviour committed by other actors at an earlier stage of the supply chain (Partzsch & Vlaskamp, 2016). Rather than asserting direct extraterritorial jurisdiction, due diligence laws and policies are an example of how states use domestic measures with extraterritorial implications to govern beyond their borders (*A1, A2*) (Zerk, 2010). Moreover, sustainability chapters in trade agreements are increasingly used to govern trade-related environmental impacts between specific countries or regions (*A1*) (see also TREND analytics database by Berger et al., 2017), as well as bilateral dialogues on environmental protection (*A2*) (Renckens et al., 2017). The EU has developed flow-specific governance instruments to ensure the legality of imported commodities, such as the European Union Timber Regulation (EUTR) and the EU Regulation to prevent, deter and eliminate illegal, unreported and unregulated fishing (*A2*) (see also Bellmann et al., 2016; Sotirov et al., 2017). In addition to public governance, private governance initiatives like zero-deforestation commitments and certification schemes aim at preventing and mitigating the foreign effects of incoming flows (Garrett et al., 2019; Meemken et al., 2021).

Fourth, governments can govern the foreign effects of outgoing flows by demanding due diligence from nationally registered companies which operate or send flows abroad. The “green BRI” is a case in point. The Chinese government issued a number of voluntary environmental guidelines for companies and financial institutions that operate and invest in BRI projects. Most of these guidelines encourage companies to adhere to the applicable laws and regulations in BRI partner countries (*A3*). This highlights the interplay between governance efforts in type 1a and type 2b in table 4. Chinese governance initiatives of the ‘green BRI’ explicitly make reference to the environmental regulations in BRI partner countries. The provision to adhere to applicable laws and regulations transfers responsibility for sustainable outcomes to companies and BRI partner countries. However, the Chinese government does not demand proof of due diligence, as compared to recently developed European due diligence laws and policies (Schilling-Vacaflor & Lenschow, 2021; Villiers, 2019; Weihrauch et al., 2022), which indicates a soft governance approach. Additionally, institutions financing BRI projects implement safeguards to prevent and mitigate negative environmental effects of their financial flows. For example, the environmental policy of the Export-Import Bank of China requires that an Environmental Impact Assessment must be approved before the loan agreement is signed, which was however not the case for the BRI project in Montenegro (*A4*). These examples underline that state and non-state actors are increasingly aware of the potential negative effects of their policies outside their jurisdictional boundaries and recognize the need to hold transnational companies accountable for the effects of their oversea activities.

The typology presented here not only helps to synthesize the findings of this dissertation, but this matrix could also inform the analysis of governance of telecoupling in the context of other empirical cases. Its analytical value lies in recognizing the co-existence of various governance interventions at different ends of the telecoupled flow, which may reinforce or undermine each other. The matrix could also help to analyse the governance of co-existing reverse flows, such as financial flows that are associated with commodity flows. The analysis of reverse flows could reveal important leverage points in the governance of telecoupled systems because governing transnational investments in resource frontiers in the case of supply chains or investments in BRI infrastructure projects, could steer financial flows and actors towards sustainability during

the emergence of telecoupled systems. An analytical limitation of the matrix in Table 4 is that it does not account for spillover systems or complex causal relations such as cascading effects, cumulative effects, threshold effects, time lags and feedbacks (*SI*).

Table 4 offers two important insights for research on the governance of telecoupling. First, it highlights that telecoupled systems can be governed at places where global flows originate and where they arrive for processing, final consumption, or investment. If governance in the jurisdiction experiencing the sustainability issues (i.e., types 1a and 1b) is weak, external governance actors can aim to fill this governance gap by introducing due diligence legislation and by promoting sustainability standards (i.e., types 2a and 2b). Additionally, governance actors can seek to create synergies between governance initiatives of types 1a and 2b, and between initiatives of types 1b and 2a. Theoretically, a strengthening of the legal and regulatory frameworks and enforcement capacities in producer countries benefits efforts to establish due diligence systems for internationally traded flows because effective domestic governance in producer countries decreases the risks of environmental problems or human rights violations caused by transnational companies and their subsidiaries and suppliers. This argument resonates with scholarly claims that demand-side measures like certification, commodity roundtables or moratoria should be combined with supply-side measures like forest conservation (Henders et al., 2015; Sporchia et al., 2021).

The second insight is very closely connected to the first one and concerns the need to recognize (inter-) dependencies between governance institutions in telecoupled systems. *AI* highlights that a key task is to design governance systems in which effective institutional interplay offsets institutional mismatches of single institutions. The article points to the need to study potential synergies between different governance interventions in telecoupled systems. The cumulative evidence of this dissertation goes beyond this finding and highlights that researchers should not only examine the well-established types of institutional interactions like synergies, antagonisms and substitution effects (Lambin et al., 2014), also conceptualized as coexistence, complementarities and competition (Cashore et al., 2021). It is also important to assess *institutional dependencies* in telecoupled systems. Institutional dependency signifies a relation between institutions where the outcome from one institution is required for the performance of another institution (Mesdaghi et al., 2022, p. 121). In contrast to synergies, which occur when the outcomes or successes of one institution contribute towards the performance of another institution, the concept of dependency underlines the fact that the performance of one institution is a requirement for the performance of another institution, and not simply an additionality. Institutional dependencies can be anchored in the design of governance institutions. For example, Chinese policies specify that the overseas operations of Chinese companies and banks shall be in line with the laws and regulations of host countries (*A3*, *A4*). Likewise, governance interventions like the European Union Timber Regulation (EUTR) require the legality of timber or timber products placed on the EU market. Thus, the effectiveness of these institutions depends on the effective implementation and enforcement of laws and regulations in BRI host countries and timber producing countries. If a country's legal framework is dismantled, such as in the case of Brazil, which legalized agricultural production in illegally deforested areas (Reis et al., 2021), this may reduce the effectiveness of transnational public policies introduced by consumer countries (Schilling-Vacaflor et al., 2022). Institutional dependencies also commonly



exist between public and private governance institutions. For instance, private certification schemes are used to demonstrate compliance with the sustainability criteria for biofuel under the EU's Renewable Energy Directive (Burrell et al., 2012; Moser & Leipold, 2021). In short, this dissertation points to the need to consider not only institutional synergies and trade-offs, but also to examine institutional dependencies between governance institutions at different scales in telecoupled systems.

## **5. Conclusion & future research agenda**

This dissertation has analysed the environmental governance of long-distance social-ecological interactions in telecoupled systems in two domains: global commodity chains and China's Belt and Road Initiative (BRI). Although both research domains involve different governance actors, institutions and processes, there is an overarching conclusion that applies to all empirical cases that have been investigated. Globalization poses challenges to territorially-based governance systems. Governments cannot directly regulate environmental problems in other jurisdictions, even if their own policies or actions of domestic companies have contributed to those problems. Likewise, companies face challenges with overseeing and governing the environmental effects that occur along their supply chains. Since multilateral environmental governance has not yet produced the desired solutions to global problems, states and non-state actors have developed numerous unilateral, bilateral and plurilateral approaches to govern actors and processes beyond jurisdictional or organizational borders (see also Partzsch, 2020). States either engage with foreign states that are facing the observable environmental problem (by e.g., including sustainability chapters in trade agreements), or they govern external environmental effects by regulating or influencing the actions of intermediaries such as international organizations, non-governmental organizations and transnational companies (e.g., through due diligence laws). Additionally, private actors have adopted a range of voluntary approaches, including corporate commitments, labelling and certification to govern corporate conduct beyond national borders. Governance institutions which operate from a distance aim to overcome boundary mismatches by targeting social-ecological problems that transcend established jurisdictional boundaries. However, the risk of resolution mismatches persists because institutions may have too coarse a spatial resolution to be able to address the social-ecological problems at hand.

In addition to these attempts to govern environmental problems from a distance, effective public governance in jurisdictions that experience the direct effects of telecoupling remains crucial for preventing and mitigating the negative environmental effects of telecoupling. Since the agency of state and non-actors who govern environmental outcomes from the distance is limited due to their reliance on soft and indirect governance approaches, as well as a weak legitimacy base, high transaction costs and knowledge deficits (Newig et al., 2020), the agency of governments that experience the direct effects of telecoupling ought not to be overlooked or underestimated. These have great leverage to steer telecoupled systems towards sustainability through the formulation, implementation, monitoring and enforcement of stringent regulatory frameworks. However, it is important to recognize that these governments face significant challenges in using their agency effectively because they have limited institutional capacities and resources that they must allocate among various competing and conflicting development goals. Environmental goals may rank low on the political agenda, in particular in countries where

economic growth is based on natural resource extraction. Some producer countries or BRI host countries may have a limited political willingness or institutional capacity to prevent and mitigate the negative environmental effects of telecoupling. Their need and sovereign right for economic development and the difficulty in competing in the global economy may constrain efforts to integrate their environmental and economic policies at national level (Christoff & Eckersley, 2013). State and non-state actors that outsource environmental impacts to other countries have a responsibility to prevent and mitigate the extraterritorial effects of their actions and to support states that experience the effects of telecoupling in addressing those problems.

Even though the concept of telecoupling has been the main reference point to synthesize the findings of this dissertation, these findings are also relevant for a larger audience in the field of environmental policy and governance beyond the scholarship that explicitly draws on the concept of telecoupling. This dissertation contributes to developing a research niche in the field of global environmental governance, which I term *external environmental governance*. This refers to governance efforts to shape environmental outcomes outside the borders of a given jurisdiction. The notion of external governance underlines that governance is enacted in one jurisdiction, but ultimately targets a behaviour change in another jurisdiction (see Figure 3 in section 3.3; and A2). While there exists a considerable body of literature on EU external environmental policy (Adelle et al., 2018; Biedenkopf & Groen, 2021; Delreux & van den Brande, 2013; Lavenex & Schimmelfennig, 2009), extraterritorial governance in the field of international and corporate law (Scott, 2020; Zerk, 2010; Zhao, 2019), and transnational private governance (Folke et al., 2019; Grabs, 2020; Pattberg, 2005; van der Ven et al., 2018), the scholarly dialogue between these fields of study is limited as they draw on different theories and concepts – despite a common interest in how to govern beyond jurisdictional boundaries (A2). The notion of external environmental governance could offer a common theoretical reference point for diverse strands of literature that relate to the governance of telecoupling. Such a common theoretical reference point does not exist to date, as revealed by our literature review presented in A2.

Research on external environmental governance has started to flourish. A growing strand of fairly recent literature has adopted a governance perspective to study how state and non-state actors govern beyond national borders, examining, for example, foreign corporate accountability (Gustafsson et al., 2022; Schilling-Vacaflor & Lenschow, 2021), proxy-led accountability (Kramarz et al., 2022) and alternatives to multilateralism to govern supply chains (Partzsch, 2020) such as unilateral measures with extraterritorial implications (Henn, 2021) and the EU's external governance in the case of the EU biofuel policies in Mozambique (Di Lucia, 2017). The modes of external governance can rely on hierarchy, markets or networks (Di Lucia, 2017; Knill & Tosun, 2009; Lavenex & Schimmelfennig, 2009). The exercise of external governance encourages considerations of how state sovereignty is reconstituted in a globalizing world (Bulkeley, 2005). For instance, Pauly and Grande (2005) observe a shift towards transnational sovereignty, which at times suspends the immunity of states from external influence. The notion of external environmental governance could also be applied to transnational private governance because corporate actors have developed policies to direct behavioural changes among external actors, namely suppliers and business partners (Grabs & Garrett, 2023; Zhao, 2019). The case of the BRI shows that the EU is not the only actor that

seeks to govern environmental issues beyond borders, which highlights the need to look beyond the EU to study external environmental governance.

The notion of external environmental governance could be further developed by utilizing the theoretical insights presented in this dissertation. First, this dissertation has pointed to the dual challenge of addressing *regulatory gaps* in host or producer countries where the manifest environmental effects of telecoupling occur, and addressing *accountability gaps*, meaning that actors can be held accountable for causing environmental harm beyond jurisdictional boundaries. Second, the concepts of *boundary and resolution mismatches* provide relevant conceptual building blocks to study the spatial scalar challenge of external environmental governance (section 3.1. and *A1*). Third, future research could build on the findings of this dissertation to investigate the role of *intermediaries* in external environmental governance (section 4.2) and *institutional dependencies* between various governance initiatives (section 4.3) to identify patterns and conditions that explain the effectiveness of external environmental governance. The literature on EU external environmental policy focuses on the available public policy tools for external environmental governance (Adelle et al., 2018; Biedenkopf & Groen, 2021). New insights could be generated by focusing on actors, institutional dependencies and public-private interactions. Research on external environmental governance could direct more attention to unilateral and bilateral approaches to global problems, complementing the study of multilateral approaches. The notion of external environmental governance could also be linked to the literature on external corporate governance, engaging with how corporate actors govern environmental impacts associated with the actions of suppliers, sub-contractors and subsidiaries (Aguilera et al., 2015; Zhao, 2019). It is also relevant to study the extent to which regulatory competition and learning can be employed as mechanisms of external environmental governance, leading to a “race to the top” or “race to the bottom” (see Table 2 in *A3*).

This dissertation has several limitations. One limitation is that it draws on a very heterogenous set of empirical cases from two different research domains: global commodity flows and the BRI. A narrower empirical focus could have facilitated greater analytical depth. However, this limitation can also be seen as an asset. In fact, the broad scope of this dissertation has inspired theoretical reflections on the usefulness of the telecoupling framework for research on global environmental governance, and produced new conceptual insights. Such reflections may not have arisen if the dissertation had focused solely on addressing a particular environmental problem in the context of a specific supply chain or BRI country. Another limitation is that the research conducted on global supply chains has largely taken a Eurocentric perspective because the European Union offers many examples of policy tools and mechanisms of external environmental governance. Additionally, from a telecoupling perspective, one could claim that this dissertation has paid insufficient attention on spillover systems and feedbacks. However, the lack of explicit reference to these aspects does not mean that these dynamics have been ignored. For example, the governance responses to telecoupling, described in section 4.3, can be considered feedbacks to the telecoupled social-ecological problems, triggered by information flows between distally connected social-ecological systems. Another limitation is that this dissertation does not make a strong methodological contribution to the literature. However, its strength lies in its conceptual contribution and its originality with regards to research on the environmental governance of the BRI. Lastly, this dissertation has not addressed

the politics of governing telecoupled systems. Questions on the nexus of private power and public authority, the legitimacy of external environmental governance, and issues related to political contestation and interests of a given government, political party or political class have not been covered.

Future research could adopt critical perspectives to scrutinise the notion of external environmental governance in order to examine issues related to power, justice and legitimacy. For instance, EU external environmental governance may be seen as “eco-imperialism” (Gonzalez, 2001) through which countries of the Global North impose their environmental priorities and preferences on countries of the Global South. Environmental issues that are salient in discourses in the Global North (e.g., greenhouse gas emissions) may not correspond to the most pressing environmental concerns in countries of the Global South (e.g., air pollution or water scarcity). Additionally, the power of transnational corporations needs to be recognized and critically assessed. A handful of transnational corporations have become dominant in industries shaping the biosphere (Folke et al., 2019). An important question to ask is whether and how various forms of external public governance challenge or reinforce corporate power. While this dissertation has focused on environmental impacts largely in isolation from their social implications – while the strong link between both domains must be acknowledged – critical perspectives could highlight the need to prevent external environmental governance from increasing global inequalities. For example, this happens when the costs of compliance with externally determined sustainability standards are imposed on less powerful actors in supply chains (Ponte, 2022), resulting in supply chain exclusions (Grabs & Garrett, 2023).

This dissertation has several policy implications. First, policy makers that encounter the direct environmental effects of telecoupling in their jurisdiction can facilitate effective domestic and environmental governance by providing transparent, accessible and reliable information with regards to data on financial transactions and environmental monitoring in commodity producer countries (Gardner et al., 2019) and in BRI host countries. Both state and non-state actors rely on this information to mitigate environmental impacts and exercise due diligence. In the case of the BRI, the lack of transparency in the planning and implementation process of the BRI projects shields financiers, firms and public authorities from civil society scrutiny (A3; A4). In the case of supply chains, research has highlighted that the availability of publicly accessible environmental monitoring data supports private governance initiatives (Garrett et al., 2019). Second, policy makers need to recognize the interests and needs of actors who become subject to external governance. It is important to address governance weaknesses or gaps in jurisdictions, where the environmental effects are observed. Both state and non-state actors are encouraged to provide technical and financial support to the jurisdictions targeted by external governance in order to build governance capacities (e.g., effective monitoring or enforcement), which in turn supports the effectiveness of external environmental governance interventions. Third, governing telecoupled systems towards sustainability requires not only the implementation and enforcement of environmental laws and policies, but also the review and adjustment of trade, agricultural, industry, fiscal and infrastructure policies. Environmental policies alone cannot achieve the fundamental changes needed to ensure that investments, production, trade and consumption occur within planetary boundaries. With regards to trade, for example, states can take a first step towards greening their trade relations by including

sustainability chapters in their trade agreements. This, however, should not preclude considerations of how to reduce the physical volume of commodities being produced and consumed. It is necessary to avoid trade liberalizations from leading to increased production and consumption of commodities with high environmental impacts.

Despite the growing influence of non-state actors like multinational corporations, civil society organizations and financial institutions in global environmental governance, state-led governance remains central in a globalizing world. In light of rising geopolitical tensions, multilateral approaches to global environmental problems may not always be feasible or effective in solving complex environmental challenges. States can also address the environmental impacts of global flows unilaterally or bilaterally. Recognizing institutional dependencies and creating synergies between multiple governance initiatives is a formidable task for future governance seeking to steer telecoupled systems towards sustainability.

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# **Annex**





## **Article 1:**

### **Toward spatial fit in the governance of global commodity flows**

#### **Abstract**

Global commodity flows between distally connected social-ecological systems pose important challenges to sustainability governance. These challenges are partly due to difficulties in designing and implementing governance institutions that fit or match the scale of the environmental and social problems generated in such telecoupled systems. We focus on the spatial dimension of governance fit in relation to global commodity flows and telecoupled systems. Specifically, we draw on examples from land use and global agricultural commodity governance to examine two overarching types of governance mismatches: boundary mismatches and resolution mismatches. We argue that one way to address mismatches is through governance rescaling and illustrate this approach with reference to examples of three broad types of governance approaches: trade agreements, due diligence laws, and landscape approaches to supply chain governance. No single governance approach is likely to address all mismatches, highlighting the need to align multiple governance approaches to govern telecoupled systems effectively.

# Toward spatial fit in the governance of global commodity flows

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## ABSTRACT

Global commodity flows between distally connected social-ecological systems pose important challenges to sustainability governance. These challenges are partly due to difficulties in designing and implementing governance institutions that fit or match the scale of the environmental and social problems generated in such telecoupled systems. We focus on the spatial dimension of governance fit in relation to global commodity flows and telecoupled systems. Specifically, we draw on examples from land use and global agricultural commodity governance to examine two overarching types of governance mismatches: boundary mismatches and resolution mismatches. We argue that one way to address mismatches is through governance rescaling and illustrate this approach with reference to examples of three broad types of governance approaches: trade agreements, due diligence laws, and landscape approaches to supply chain governance. No single governance approach is likely to address all mismatches, highlighting the need to align multiple governance approaches to govern telecoupled systems effectively.

*Keywords: environmental governance; human-environment interactions; scale; spatial mismatch; supply chain; telecoupling*

## INTRODUCTION

Local sustainability problems are increasingly shaped by distal actors and processes through global flows of information, people, goods, and services. Demand for commodities such as palm oil, soy, meat, cocoa, and rubber produces negative social and environmental impacts, including deforestation, biodiversity loss, food insecurity, agri-chemical pollution, and consolidation of landholdings, in production regions that are often far removed from sites of consumption (Laroche et al. 2021, Cotta et al. 2022, Roux et al. 2022). Such sustainability problems often transcend traditional political boundaries, which makes it challenging to design governance institutions to fit the scale of the problems. Where governance institutions do not match the scale of the problems they are expected to address, scholars have diagnosed “problems of fit”, “mismatches”, or “misfits” (Young 2005, Folke et al. 2007, Galaz et al. 2008). The degree of fit may pertain to alignment between a given social-ecological problem and a governance response in spatial, temporal, or functional terms (Cumming et al. 2006, Folke et al. 2007). Issues of governance fit are well researched with regard to regionally bounded or transboundary social-ecological systems such as aquatic or riverine ecosystems (Moss 2012, Bergsten et al. 2014). However, research has not yet systematically explored solutions to spatial mismatches in social-ecological systems connected across long distances, so-called telecoupled systems (Sikor et al. 2013, Munroe et al. 2019, Newig et al. 2020).

Telecoupling denotes long-distance connections between two or more social-ecological systems that are linked through material and non-material flows (Liu et al. 2013, Eakin et al. 2014, Friis et al. 2016). The telecoupling concept supports analysis of how social-ecological changes in one place are related to social-ecological processes elsewhere. Rather than confronting globalization as a diffuse, complex, and all-pervasive phenomenon, a focus on telecoupling helps to delineate and analyze particular connections, place-specific social and environmental impacts, and their (often remote) drivers in a globalizing world (Challies et al. 2014, Friis and Nielsen 2019, Sonderegger et al. 2020).

Governance in telecoupled systems is challenging because the drivers and effects of global flows often lie beyond the reach of national governments, companies, or citizens. Existing sustainability governance initiatives that govern global flows of agricultural and forestry commodities, such as corporate pledges, voluntary sustainability standards, public-private partnerships, and multistakeholder initiatives, are not necessarily effective in driving sustainable supply chains (Garrett et al. 2019, 2021, Grabs et al. 2021, Meemken et al. 2021). Research has attributed the ineffectiveness of governance interventions in part to mismatches between the scale of the governance institution and the scale of the underlying problem (Young 2005).

Here, we explore the problem of spatial fit between governance arrangements and the social-ecological problems they address in relation to land use, as well as global agricultural commodity governance and telecoupled systems more broadly. We focus specifically on the question of spatial fit because telecoupled sustainability problems are inherently related to issues of spatial scale. We distinguish two overarching types of spatial mismatches: boundary mismatches and resolution mismatches, building on previous work by Cumming et al. (2006) and Bergsten et al. (2014). Whereas boundary mismatches denote situations in which social-ecological processes transcend governance boundaries, resolution mismatches refer to governance schemes designed at too coarse a spatial scale to effectively address the issue at hand (Bergsten et al. 2014).<sup>[1]</sup> We present illustrative empirical examples from land and global agricultural commodity governance to elucidate how problems of spatial fit impede the effective governance of land and land-based resources in telecoupled systems. We also examine

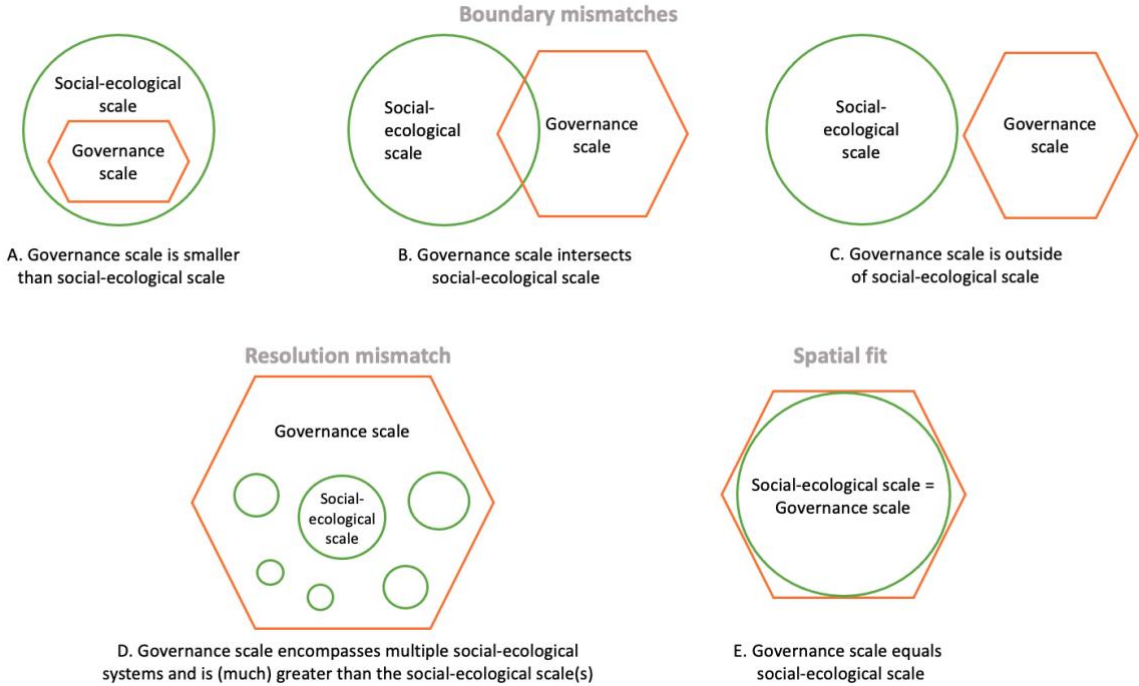
governance approaches to address this problem. We contend that a better understanding of the types of mismatches that arise in efforts to govern global commodity flows will contribute to identification of leverage points for effective governance interventions in telecoupled systems (Carrasco et al. 2017, Munroe et al. 2019, Newig et al. 2020).

## THE PROBLEM OF FIT

The problem of fit has been widely researched in political science and social-ecological systems literature. Scholars have examined mismatches between the spatial, temporal, and functional scales of governance institutions and the scales of social-ecological processes (Cumming et al. 2006, Folke et al. 2007, Galaz et al. 2008, Ekstrom and Young 2009, Epstein et al. 2015). Here, scale is understood as “the various levels at which a phenomenon occurs in the dimensions of space and time” (Young 2002a:26). Because of institutional mismatches, governance responses to environmental threats often struggle to address the full extent of the problem (Ekstrom and Crona 2017). For example, 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 agricultural practices are among the many factors that may lead to land conversion (Geist and Lambin 2002). However, governance mechanisms typically target a single level (e.g., national forestry laws), and thus do not provide adequate solutions to the challenge of governing wider resource systems (Nagendra and Ostrom 2012). Governance arrangements that only partially cover the resource or ecosystem in question have built-in limitations that impede their ability to fulfill their goals (Young 2005).

Various possible configurations of spatial mismatches exist (Fig. 1). The governance scale may be smaller than the social-ecological system scale (Fig. 1A). For example, a municipality may not be able to effectively address air pollution, which is caused by local factories but dispersed beyond municipal boundaries. Governance at larger scales, such as national regulations, may solve the problem (upscaling of governance). Similarly, the governance scale may only partially cover the social-ecological scale (Fig. 1B), as is often the case, for example, with governance of transboundary rivers. In such situations, upscaling may be more difficult in the absence of an authority at a higher governing level. Moreover, governance institutions and actors may have no jurisdiction at all over the social-ecological scale of an identified problem (Fig. 1C), such as in the case of a country lacking the authority to regulate illegal logging by a company domiciled in the country but operating in a neighboring country. Lastly, the governance scale may be greater than the social-ecological scale (Fig. 1D). In such cases, regulation at a (much) larger scale than that of the ecological problem may lack the regulatory specificity to “come to terms with local variations in biogeophysical conditions and [lack] sensitivity to both the knowledge and the rights and interests of local stakeholders” (Young 2002b:283; see also Ostrom 1990). For example, much of European Union legislation has been criticized for being too insensitive to local contexts, despite the EU’s principle of subsidiarity (Article 5 Treaty on European Union), which demands that decisions should be taken at the most appropriate level of governance, and that the EU should only take action when national, regional, or local governments are unable to achieve a particular objective. The EU Water Framework Directive provides an example of governance that seeks to avoid resolution mismatches. It requires member states to develop River Basin Management Plans to guide local and context-specific implementation (Jager et al. 2016). An institutional fit emerges if the governance scale equals the social-ecological scale (Fig. 1E), as in the case of the global agreements reached in the Montreal Protocol on Substances that Deplete the Ozone Layer to address a global problem (Epstein et al. 2014).

**Fig. 1.** Scale (mis-)matches between social-ecological (green) and governance (orange) scales. (A–C) Boundary mismatches. The institutional boundaries do not match with the spatial boundaries of the social-ecological problem, creating spatial spillover effects. (D) Resolution mismatch. The governance institution does not fit the specifics of the (local) social-ecological context that is to be addressed by governance and hence lacks sufficient spatial specificity. A single governance institution typically addresses a class of social-ecological problems that occurs in multiple distinct localities that have specific contextual features, to which a single governance institution cannot necessarily be adjusted. (E) Spatial fit. Illustration inspired by Newig et al. (2013:13).



Fundamentally, the problem of fit concerns the question of how to scale or rescale governance arrangements so that they have the best possible institutional fit with the targeted social-ecological dynamics. Establishing the most appropriate fit requires a trade-off between the advantages of better coordination at higher scales, which may reduce the risk of overlooking spatial externalities, and the risk of lacking context sensitivity and legitimacy among local actors, impeding effective implementation (Newig and Moss 2017). Importantly, problems do not occur at a single scale that is objectively given, but different actors perceive and frame problems at different scales and levels (Padt et al. 2014). For example, if state actors aim to meet forest restoration commitments made under international agreements and frame the problem solely at an ecological scale, a national afforestation program fits with the objective of forest restoration for carbon storage. However, if the problem is framed at a social-ecological scale, a single homogeneous afforestation program may suffer from a resolution mismatch and fail to address context-specific challenges related to rural livelihoods (Wiegant et al. 2020, Coleman et al. 2021). Thus, evaluations of fit depend upon how a problem is framed and by whom (Epstein et al. 2015). What is perceived as the “optimal scale” may vary among actors, and the scale at which they define a problem will influence their preferences for governance rescaling. 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 want to avoid assuming responsibility and implementing domestic measures (Gupta 2014).

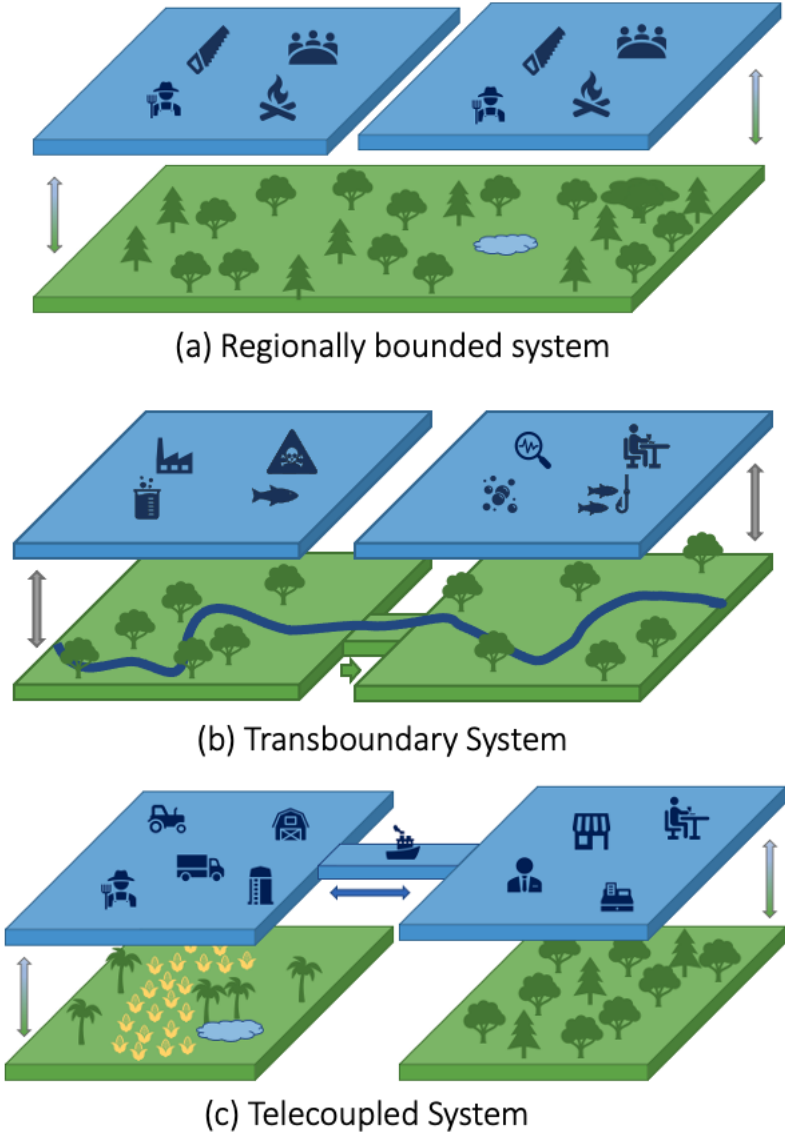
Here, we build on the concept of institutional fit, which is based on the underlying normative assumption that institutional scale can be optimized to avoid spatial externalities (Moss and Newig 2010). Thus, we focus on how individual institutions face this problem of fit. Nevertheless, we recognize that governance always involves the interplay of different institutions. Analysis of institutional fit is closely linked to the analysis of institutional interplay because social-ecological problems are typically governed by various institutions at different spatial scales (Young 2002*a*). Although no institution operates in a vacuum, it can be useful to assess the spatial fit of a specific institution in isolation from the broader institutional landscape. This approach simplifies the analysis and does not consider all interdependencies, but it enhances analytical tractability and makes it easier to identify governance weaknesses and gaps (Young 2005). The analysis of institutional mismatches can be complemented with considerations of how to create linkages and facilitate interactions among various institutions. We return to considerations of the relation between institutional fit and interplay below.

## **THE PROBLEM OF SPATIAL FIT IN TELECOUPLED SYSTEMS**

Research on institutional fit has primarily focused on cases of natural resources in specific social-ecological systems. Studies have been conducted on forest governance (Shkaruba and Kireyeu 2013, Bodin et al. 2014, Melnykovych et al. 2018), water governance (Lebel et al. 2005, 2013, Moss 2012, Enqvist et al. 2020), and land and wildlife management (Bergsten et al. 2014, Dressel et al. 2018). Most research has focused on mismatches between local, regional, and national governance institutions and the social-ecological systems they target, but a small and growing pool of literature investigates transboundary and larger scale social-ecological problems such as depletion of the ozone layer or pollution of international watersheds (Cox et al. 2014). Challies et al. (2014) observe that social-ecological systems research itself has mostly examined small, tightly coupled systems, rather than connections and interdependencies that exist between multiple social-ecological systems linked through global production networks and supply chains (Nyström et al. 2019). Research on telecoupling is increasingly addressing this research gap by investigating the causes, drivers, and implications of globally linked social-ecological systems. Telecoupling research has referred to the problem of mismatches, but the definition and application of the concept in the context of telecoupling remains limited (Oberlack et al. 2018, Munroe et al. 2019, Zaehring et al. 2019, Newig et al. 2020). The important question of how to align the scale of governance with the scale of the social-ecological problem at hand remains largely unaddressed in research on governing telecoupled social-ecological systems.

Telecoupling is one distinct ideal-typical configuration of interdependent social-ecological systems (Fig. 2). Telecoupled systems arise when the activities of actors in one system affect a social-ecological system elsewhere (e.g., through international trade or the displacement of extractive activities from one place to another), thereby creating social-ecological interdependencies. Consequently, feedbacks can develop, for example, when actors in one location become aware of the displaced effects of their actions and seek to mitigate them through measures such as increased conservation funding.

**Fig. 2.** Ideal types of interconnected social-ecological systems and their interdependencies. Systems comprise socioeconomic building blocks (blue), ecological building blocks (green), and their interdependencies (arrows). (A) In a regionally bounded system, two socioeconomic systems share the same ecological resource base; e.g., two communities harvest wood from the same forest. (B) In a transboundary system, two socioeconomic systems rely on resources or ecosystems that are ecologically connected; e.g., pollution of a river by an upstream riparian country may affect fish populations in a downstream riparian country. (C) In telecoupled systems, the ecological systems are geographically separate but are connected through social-ecological processes such as trade in agricultural commodities.



Telecoupled systems are characterized by geographical distance between the place where the social or environmental impacts occur and the places where underlying causes are found. The geographical distance is often associated with social and institutional distances between the socioeconomic systems (Eakin et al. 2014, Niewöhner et al. 2016, Friis and Nielsen 2017) because they tend to be governed by different, functionally independent institutional arrangements, social networks, and actors (Eakin et al. 2017). Even when distant actors are



willing to work together, transaction costs of cooperating on sustainability issues are often much higher than in local or transboundary settings (Newig et al. 2020). Geographical, social, and institutional distances thus hinder the creation of appropriately scaled governance institutions in telecoupled systems in at least four ways.

First, the absence of manifest ecological feedbacks between telecoupled systems obscures the remote causes and effects of certain decisions and actions. In many locally bounded or closely neighboring social-ecological systems, the activities of one group of resource users will have direct effects on other users (Lebel et al. 2005, Bergsten et al. 2014, Kininmonth et al. 2015). With transboundary water resources, for example, withdrawals in one place affect downstream availability. In telecoupled systems, however, there is usually no such direct ecological feedback. For example, tropical ecosystem degradation driven by commodity production for export to European markets causes biodiversity loss in producing regions or carbon emissions, but does not directly affect European consumers in the short term. Where feedbacks are delayed or indirect, it is also difficult to attribute specific social-ecological effects to particular activities (Carlson et al. 2018). Consequently, the actors driving telecoupled interactions do not necessarily experience the negative effects of their actions or recognize the connections between past actions and subsequent negative effects (Newig et al. 2020). They may therefore have very little incentive to formulate or adapt governance responses.

Second, as a result of the above situation, recognition of and concern about specific problems may depend on social or political actors highlighting causal linkages between certain actions and distant outcomes. “Problem-brokers” or “political entrepreneurs” can play important roles in framing and problematizing unsustainable connections between telecoupled systems (Bastos Lima et al. 2019, Meyfroidt et al. 2022). Once distant ecological or social conditions attract sufficient public attention and concern, a policy window opens wherein various governance interventions may become possible (Kingdon 1984, Eakin et al. 2017). Improved transparency, through the collection and dissemination of information on flows and impacts, can enable or instigate governance responses to telecoupled issues (Gardner et al. 2019). For instance, increasing media attention on environmental issues such as deforestation has put pressure on the EU to address soybean production in the Amazon region (Mempel and Corbera 2021). Several interventions have emerged to tackle deforestation embedded in international trade and to reduce “imported deforestation” from EU consumption (Bager et al. 2021).

Third, governance mismatches arise when governance responses misdiagnose a problem or neglect its wider drivers. Interventions that target only the direct ecological effects of an activity risk merely displacing it to other social-ecological systems. For example, European demand for soy is associated with negative ecological impacts such as deforestation in producer countries (Pendrill et al. 2019, Schilling-Vacaflor et al. 2021). Addressing tropical deforestation at the scale of a single region such as the Amazon is unlikely to be effective because demand for forest-risk commodities will persist. Therefore, governance interventions such as the Brazilian Soy Moratorium, which targets the Amazon specifically, have displaced deforestation to other areas such as the Cerrado region (Dou et al. 2018).

Fourth, the places and governance institutions implicated in telecoupled systems may have very little history of prior collaboration (Newig et al. 2020). The social and institutional distance between telecoupled systems may mean that separate policies, actors, and networks govern largely independently. In the absence of joint institutional structures, governing telecoupled systems is challenging because governance actors face issues that extend beyond their jurisdiction. For example, consumption in the EU has social-ecological effects beyond EU borders (Kastner et al. 2015, Dorninger et al. 2021, Roux et al. 2021). However, the EU’s ability

to govern these issues has clear limitations given the national sovereignty of external countries and World Trade Organization rules.

## **DIFFERENT TYPES OF MISMATCHES IN TELECOUPLED SYSTEMS**

We apply the concepts of boundary and resolution mismatches to telecoupled systems. We identify the underlying governance problem associated with each type of mismatch, outline two particular mechanisms of boundary mismatches and illustrate with examples from both public and private governance perspectives (Table 1). Our distinction between ideal-typical configurations of mismatches helps in elaborating how the scale of governance institutions often does not align with the scale of social-ecological problems.<sup>[2]</sup>

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

|   | Boundary mismatch   |  | Resolution mismatch  |
|---|---|--|--|
| Definition <sup>†</sup>                               | Governance institutions neglect social-ecological problems that transcend established administrative or jurisdictional boundaries   |  | Governance institutions have too coarse a spatial resolution than is suitable to address the social-ecological problems at hand  |
| Underlying problem                                    | Lack of governance extent   |  | Lack of governance precision   |
| Mechanism   | Spillover   | Leakage  | Panacea trap   |
| Description   | Governance institutions do not govern a social-ecological problem that expands beyond their administrative or jurisdictional boundaries   | Governance institutions address a social-ecological problem but create leakage(s), i.e., counterproductive effects outside the targeted area or domain of the intervention | Governance institutions are not specific enough to be effectively implemented and enforced   |
| Example from a public policy perspective <sup>‡</sup> | European countries have not (yet) implemented specific public policies to mitigate the deforestation effects of their demand for soy in remote jurisdictions <sup>§</sup>                           | A forest moratorium shifts deforestation to neighboring areas or other countries, producing negative externalities in distant jurisdictions                                | A Multilateral Environmental Agreement that is too broad in scope to govern particular telecoupled flows   |
| Example from a private governance perspective         | A Voluntary Sustainability Standard focuses on reducing harmful on-farm impacts at sites of production but neglects sustainability issues outside the farm such as air pollution from pesticide use | Supply chain actors implement zero-deforestation policies that target only one region, allowing actors in other regions or neighboring countries to deforest               | Supply chain actors set broad sustainability goals that are insufficiently operationalized and lack specific and measurable targets, unambiguous definitions, and exact coverage |

<sup>†</sup>Adapted from Bergsten et al. (2014).

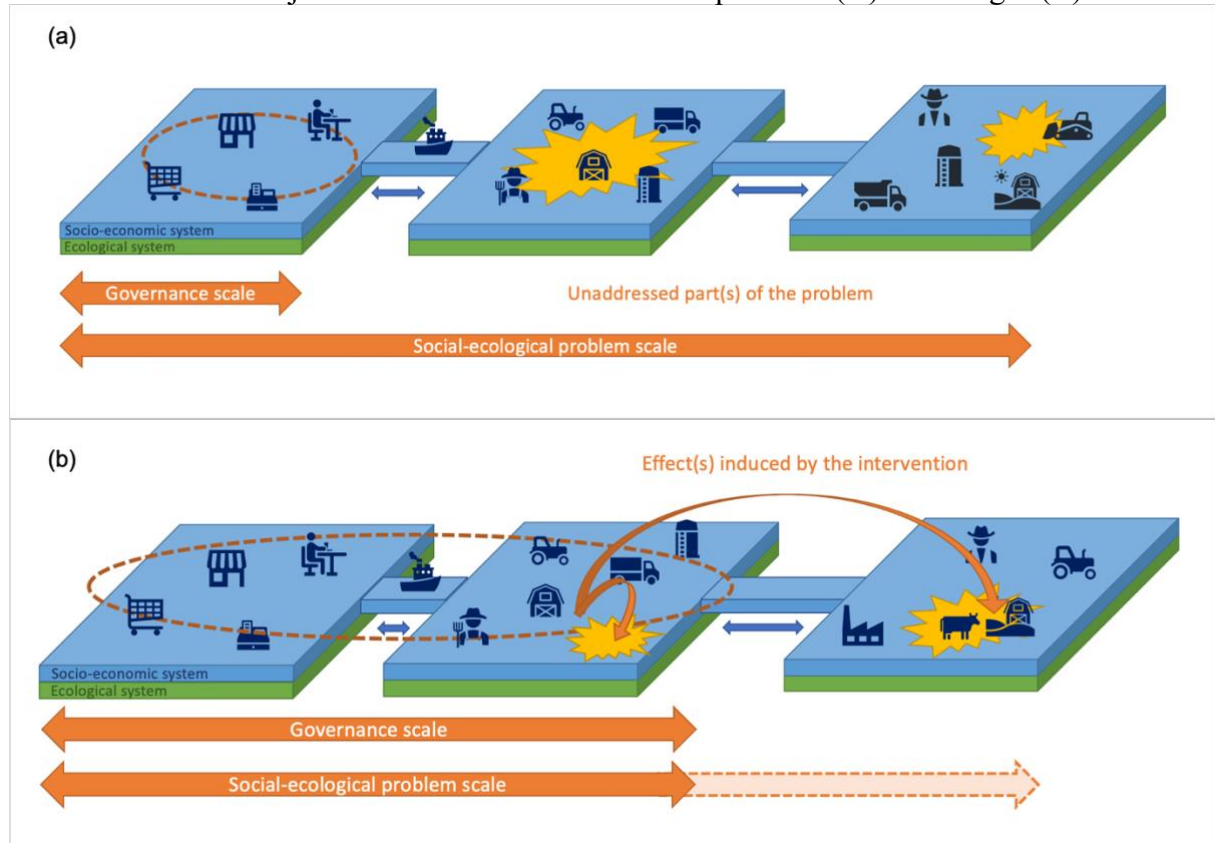
<sup>‡</sup>We present the different types of mismatches from both public policy and private governance perspectives because their analytical focus differs. From a public policy perspective, the focus is on the jurisdictional scale, defined as clearly bounded political units (e.g., towns, provinces, states, or countries; Cash et al. 2006). In contrast, the private governance perspective puts more emphasis on the scale of the supply chain or associated flows.

<sup>§</sup>The newly adopted EU Regulation on deforestation-free supply chains addresses this mismatch (European Commission 2022). It is expected to enter into force in summer 2023. Once it is in force, operators and traders will have 18 months to implement the new rules.

### Boundary mismatches in telecoupled systems

Boundary mismatches arise in telecoupled systems when the spatial reach of governance structures is such that these structures do not internalize existing social-ecological externalities of activities (i.e., spillovers; Fig. 3A) or when public policies or transnational economic activities produce new externalities (i.e., leakages; Fig. 3B). Spillovers describe events or developments that are not targeted by a given governance intervention, whereas leakages are a form of spillover caused by a governance intervention (Meyfroidt et al. 2020).

**Fig. 3.** Boundary mismatches. Governance institutions neglect social-ecological problems that transcend established jurisdictional boundaries due to spillovers (A) or leakages (B).



### Spillover

In case of spillovers (Fig. 3A), part of the problem remains unaddressed because it lies outside the domain of the governance institution. The omitted part of the problem is referred to as a spillover, which is broadly understood as an indirect effect of an activity or intervention (e.g., policy, program, or new technology) that occurs outside the targeted area (Meyfroidt et al. 2020). Spillovers emerge because governance actors may not be aware of the full scale of the social-ecological problem, may be uninterested in or unable to govern what happens beyond their jurisdictional boundaries, or may intentionally neglect parts of the problem (Bastos Lima et al. 2019). For example, voluntary sustainability standards often focus on reducing harmful on-farm effects at sites of production but tend to neglect off-farm effects such as reduced downstream water availability or air pollution from pesticide use (Zaehringer et al. 2018, Parra-Paitan and Verburg 2022, Sonderegger et al. 2022). Spillovers can also cascade to further

social-ecological systems (as indicated in Fig. 3A) and have cumulative effects, which makes it difficult to identify causal connections (Busck-Lumholt et al 2022a).

The transnational operations of companies make it challenging to achieve institutional fit and to internalize the extra-jurisdictional social and environmental effects of global supply chains. Because multinational enterprises operate beyond the jurisdictional reach of individual states, the externalities of their activities are often not addressed by existing governance institutions. These actors are not accountable to any single authority that matches their scope of operation (Kobrin 2009).

Private actors may encounter boundary mismatches in their efforts to govern supply chains for two reasons. First, individual companies may lack oversight and influence over some or all of their suppliers and therefore lack the ability to control the environmental and socioeconomic effects of production. For example, approximately one-quarter of the solid wood furniture that IKEA sells is manufactured in Chinese factories that source their timber from other countries, in particular Russia (Newell and Simeone 2014). IKEA attempted to control the timber sourcing of its Chinese subcontractors to “green” its supply chain but was unsuccessful because of the geographical distance to upstream activities, the large number of intermediaries between timber extraction and retail, and an inability to trace timber to a specific logging permit (Goldstein and Newell 2020). Additionally, supply chain configurations change over time (dos Reis et al. 2020). China has long depended on Russian wood for the manufacture of finished wood products for export to the United States, but the specific companies within these supply chains change regularly (Goldstein and Newell 2020). Even where large, powerful retailers dictate prices and quality standards to their suppliers, their ability to control sustainability along the value chain is often limited because of the mismatch between their governance reach and the scale of the social-ecological problem. Companies are often not able to monitor their indirect suppliers, which makes it difficult to implement chain-wide sustainability policies (zu Ermgassen et al. 2022).

Second, companies may govern particular segments of their supply chain but neglect others, which constitutes a boundary mismatch if the goal is to create sustainable supply chains that encompass the full value chain. For example, textile certifications generally focus on either the upstream end of the supply chain (i.e., organic and fair cotton production) or the midstream section (i.e., working conditions of garment workers; Partzsch 2020), but seldom cover all segments of the supply chain.

### *Leakage*

A leakage may emerge when a governance intervention induces externalities (Fig. 3B). The governance intervention produces effects that contradict its objectives and reduce the overall benefit of the interventions, which constitutes a leakage effect (Meyfroidt et al. 2018, Bastos Lima et al. 2019). For example, the EU’s Renewable Energy Directive created additional demand for biofuel crops produced outside of the EU and thereby fuelled land-use change and deforestation in tropical countries, counteracting the goal of reducing greenhouse gas emissions (Bastos Lima 2021). This process has also been described as “governance inducing telecoupling” (Newig et al. 2019), i.e., situations in which governance initiatives themselves create new distal interactions with positive or negative outcomes. Recognition of the negative distal effects led to revision of the Renewable Energy Directive to mitigate indirect land-use change (Bastos Lima 2021). In other instances, the leakage effect does not occur across a great distance but can be in proximity to the target area. For instance, if a forest moratorium prohibits

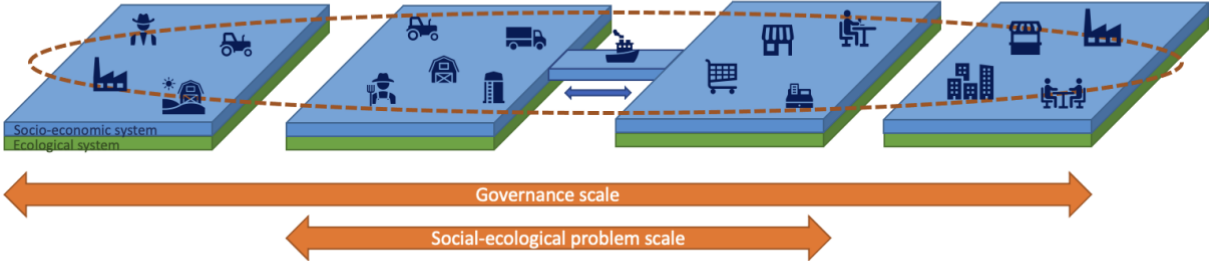
deforestation within designated areas, the activity may simply shift to nearby areas not covered by the moratorium (Meyfroidt et al. 2010, Leijten et al. 2021).

Just like public governance, private governance can have spillover effects and leakages. For instance, if private conservation actors focus their efforts on specific regions such as the Brazilian Amazon, that leaves other regions such as the Cerrado and Gran Chaco comparatively less well protected, and land conversion may be displaced to those regions (Soterroni et al. 2019, Qin et al. 2022). In short, leakage occurs when the side effects of an intervention escape the scope of governance.

**Resolution mismatches in telecoupled systems**

Resolution mismatches represent a second problem of governance fit in telecoupled systems (Fig. 4). Because international or transnational governance institutions usually aim to address a social-ecological problem that occurs in more than one place, they are not specific to the social and ecological attributes of a particular social-ecological system or a particular telecoupling. If governance occurs at too coarse a scale, meaning that governance instruments are not context sensitive or flow specific, they are unlikely to be successful because “one-size-fits-all” panaceas do not exist (Ostrom et al. 2007, Meyfroidt et al. 2022).

**Fig. 4.** Resolution mismatches. Governance institutions have a coarser scale than is suitable to address the social-ecological problems they target.



For example, international governance schemes such as Multilateral Environmental Agreements tend to be too general to govern specific telecoupled systems because international conventions, agreements, and commitments typically involve a large number of signatories, have a general thematic scope, and are not specific to any particular flow.<sup>[3]</sup> Of approximately 250 Multilateral Environmental Agreements worldwide, only 15 explicitly include trade-related provisions for environmental protection (World Trade Organization 2021). International governance schemes cover a large spatial scale and require a broad institutional outlook that can be implemented in heterogeneous national and local contexts. Because most international institutions are not supranational, meaning that they do not have authority beyond that of their respective members, they rely on lower-level institutions for implementation, which, however, have limited abilities to govern the causes or effects of cross-border flows beyond their jurisdictional boundaries. If the implementation pathway is not defined and lower-level institutions have neither the capacity nor the experience to implement higher-level governance objectives, a spatial scale challenge emerges (Wiegant et al. 2020). Global environmental

governance is often directed toward reaching global targets (e.g., Paris Agreement, Aichi Biodiversity Targets, Bonn Challenge). However, target-based governance has been criticized for the gap between international policy and national implementation, the missing linkages between national governments and on-the-ground actions, and the unclear definitions of some wording of the targets (Hagerman et al. 2021, Perino et al. 2022).

In the context of private governance, supply chain actors may set broad, blanket-coverage sustainability goals that are meant to apply across entire supply chains but are, for that reason, ambiguously defined, limited in scope, and poorly operationalized in terms of concrete and measurable targets. For example, in a sample of 513 companies in the coffee sector, only one-third reported tangible commitments to sustainability, whereas the remaining companies reported no or vague commitments (Bager and Lambin 2020). Similarly, companies may adopt zero-deforestation commitments without setting clear implementation goals, mechanisms, or deadlines, which impedes effective implementation across the contexts in which they operate (Garrett et al. 2019).

As a result of resolution mismatches, new kinds of mismatches may emerge when governing institutions do not reflect the values, interests, and beliefs of different social groups. What Epstein et al. (2015) have termed “social mismatches” points to the spatial scalar challenge of matching governance objectives and rules with social customs and patterns of resource use, stakeholder expectations and needs, and social organization scales (Epstein et al. 2015). In telecoupled systems, international governance based on global goals carries a clear risk of diverging from issues that are seen as most important by local stakeholders. Global initiatives such as the Kimberley Process, for example, promote transparency in supply chains, but in so doing, they risk favoring global ideals (e.g., of traceability and accountability) over the day-to-day needs and concerns of local communities (Pedersen et al. 2021a). Research on gold mining in Tanzania, for instance, found that a centrally imposed transparency initiative had not addressed inequalities, informal structures, and power asymmetries in the mining sector (Pedersen et al. 2021b). Likewise, conservation projects that are governed by external actors (such as states, international nongovernmental organizations, or private firms) tend to subordinate local institutions, customary practices, and traditional ecological knowledge, resulting in relatively ineffective conservation management (Dawson et al. 2021). International conservation initiatives may overlook social and political complexities in local systems and create unintended and undesirable effects, including restricted access to land and natural resources and the erosion of customary natural resource governance institutions (Persson and Mertz 2019, Persson et al. 2021). If local people are merely seen as recipients of services and are not involved in the design of sustainability interventions, a mismatch between local goals and strategies and those of the wider project can emerge. In the case of a World Bank conservation project in Argentina, project concepts and ideas were decided by external actors, rather than in partnership with local beneficiaries (Busck-Lumholt et al. 2022b). Sustainability issues prioritized at the global scale may not match with local people’s understanding of and aspirations for sustainability.

Self-governance and local rule development have been found to be highly important for effective natural resource management (Ostrom 1990). Otherwise, there is a high risk that international or transnational governance schemes are insufficiently adapted to local contexts. If governance actors perceive that transnational institutions do not fit the local contexts (i.e., social mismatch as result of a resolution mismatch), they may create their own institutions. This situation occurred with the establishment of the Icelandic Responsible Fisheries certification program as an alternative to the transnational Marine Stewardship Council certification scheme (Foley 2017), and with the introduction of Indonesian and Malaysian Sustainable Palm Oil

schemes as alternatives to the Roundtable on Sustainable Palm Oil (Higgins and Richards 2019).

## **ADDRESSING MISMATCHES IN TELECOUPLED SYSTEMS**

These examples suggest that global commodity flows, through boundary and resolution mismatches, pose multiple environmental governance challenges that are difficult to address through territorial or global governance approaches. Against this background, both public and private actors have attempted to rescale governance to account for social-ecological interactions across long distances and between jurisdictions. With respect to global governance, governance rescaling has been defined as “a shift in the locus, agency, and scope of global [...] politics and governance across scales” (Andonova and Mitchell 2010:257). Scaling up governance to make it more comprehensive in terms of target area, actors, or supply chain segments can limit the risk of boundary mismatches. In contrast, scaling down governance might enhance the context sensitivity of interventions and the participation of local stakeholders, thus correcting resolution mismatches. Additionally, creating new governance scales can be another strategy to avoid mismatches. In telecoupled systems, such governance institutions comprise due diligence laws, as elucidated below. We next present three illustrative examples of public, private, and hybrid governance forms to illustrate the opportunities and challenges involved in addressing both boundary and resolution mismatches.

### **Social and environmental provisions in trade agreements**

The inclusion of binding, measurable, carefully monitored, and sanctionable social and environmental provisions in preferential or regional trade agreements presents a potential instrument to govern trade-related environmental impacts between specific countries or regions (Kehoe et al. 2020). Recently, researchers have advocated shifting focus on the relation between trade and the environment away from merely mitigating the negative impacts of trade, and toward focusing on how to harness the positive environmental effects of trade through, for example, the use of so-called “trade-and-environment agreements” (Roux et al. 2021; <https://ieep.eu/news/a-cup-of-trade-and-environment-agreement-tea/>). In theory, environmental provisions in trade agreements can oblige parties to uphold environmental law and implement “Multilateral Environmental Agreements”; increase cooperation, transparency, and participation in environmental matters; and trigger the uptake of voluntary sustainability standards and public regulations targeted at sustainability issues of a specific sector or product. However, empirical evidence of the actual environmental effects of environmental provisions in trade agreements is scarce and inconclusive (Berger et al. 2020).

Although trade agreements do address specific flows at the scale of telecoupled relations, they pose a risk of leakage because trade flows may shift geographically (i.e., trade diversion), and regulated commodities may be replaced by less regulated or unregulated commodities within supply chains (i.e., substitution effect). For example, the U.S.-Peru trade agreement includes a binding Forest Annex, which details measures to strengthen forest governance in Peru, including the establishment of chain-of-custody systems to verify the legality of timber exports. However, because the Forest Annex is strongly focused on protecting CITES-listed timber species, one risk is that it increases exports of species not listed in CITES. It could also prompt U.S. importers to switch to other, less regulated markets (Del Gatto et al. 2009). Governance institutions that target specific geographic areas or commodities risk creating boundary mismatches. This situation suggests that trade agreements may be more effective at reducing leakage effects at regional scales when they contain binding, measurable, and enforceable sustainability chapters, and they involve regional blocs rather than individual countries, and



commodity groups rather than single commodities. However, the risk of resolution mismatches increases when the spatial scale of trade agreements increases.

Trade agreements can suffer from resolution mismatches. For example, Berger et al. (2020) reviewed 48 preferential trade agreements of five emerging economies and found that three-quarters of the agreements make reference to general environmental goals in their preamble or other chapters. However, these provisions are not of substantive nature, meaning that they do not imply any substantive rights or obligations in environmental matters to the parties. Additionally, some countries restate their commitment to ratify or implement Multilateral Environmental Agreements in their trade agreements, thus, only restating the pledges already made elsewhere. If countries only make commitments to general environmental goals and international conventions without defining concrete actions in their trade agreements, they are unlikely to address the specific social and ecological problems of telecoupling in particular social-ecological systems.

Moreover, if the needs and priorities of local communities are overlooked or deprioritized, social mismatches may arise. Failure to recognize the economic, social, and environmental concerns of affected communities can also induce a boundary mismatch. For example, a trade ban may prove ineffective if it does not recognize the economic concerns of local communities, who may derive little economic benefit from the ban, and hence have little incentive for conservation or sustainable resource use (Abensperg-Traun 2009). Consequently, the resource may be sold illegally or into alternative markets, creating leakage effects that limit the effectiveness of the trade ban. For instance, Busch et al. (2022) estimated that a European ban on importing high-deforestation palm oil from Indonesia would have only minor effects on deforestation because, among other reasons, non-participating countries would absorb the high-deforestation palm oil. More research is needed on how to avoid mismatches when designing trade agreements and trade bans.

### **Due diligence obligations and laws**

The proliferation of due diligence policies shows that public sector actors increasingly govern social and environmental conduct beyond their own borders. Due diligence policies are a clear example of “rescaling” or “territorial extension”, whereby states or groups of states extend their regulatory influence to actions abroad (Scott 2020). Although due diligence laws are implemented within formal administrative boundaries on a jurisdictional scale, they govern extra-jurisdictional processes by obliging transnational companies to monitor their supply chains and to rectify unsustainable impacts. Due diligence policies tend to be applied at scales applicable to telecoupled systems because they address flows that extend beyond jurisdictional boundaries.

Due diligence requirements often apply to specific commodities, as in the case of the EU Timber Regulation, which prohibits the sale of illegally harvested wood on the EU market, and the EU Renewable Energy Directive, under which member states can count biofuels toward the attainment of their renewable energy targets only if the biofuel production complies with certain sustainability criteria (European Union 2018), irrespective of whether the biofuel crops are produced inside or outside the EU (Scott 2020). Additionally, the EU adopted a Regulation on deforestation-free supply chains in December 2022, which prohibits the placing of palm oil, soy, wood, cattle, cocoa, coffee, rubber, and some derived products on the EU market if these commodities are linked to deforestation and forest degradation or if they are non-compliant with all relevant applicable laws in force in the country of production (European Commission 2022). These sector-specific due diligence policies use conditional market access as a

mechanism to secure foreign producers' compliance with EU rules. More recently developed, economy-wide, mandatory due diligence laws, at the national and European levels, rely on another governance mechanism, namely self-reporting and public scrutiny. The French Duty of Vigilance Law, for example, requires companies to assess and report the risks of infringing environmental and human rights in their supply chains, as well as measures to mitigate such risks. If preventable human rights violations or environmental damages occur, the company can be held liable and can be required to remedy the harm (Schilling-Vacaflor 2021). Additionally, the European Commission proposed a Directive on sustainable corporate governance that covers human rights and environmental due diligence (Schilling-Vacaflor and Lenschow 2023). In sum, due diligence laws 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 because they do not target any particular locality, but rather general social-environmental problems, irrespective of their local manifestation. This situation can lead to social mismatches. The EU Timber Regulation, for example, demands that timber is sourced legally according to the laws of the producer country. However, such policies that are reliant on local laws risk endorsing certification systems that neglect the rights of certain local communities (Bartley 2014) and work against sustainability by incentivizing a regulatory “race to the bottom” among exporting countries (dos Reis et al. 2021). Furthermore, if mandatory due diligence laws require companies to report on risk mitigation in their supply chains, companies may focus their reporting on issues that are not key priorities for local stakeholders. For example, under the French Duty of Vigilance Law, companies have focused on environmental issues such as deforestation in the soy and beef supply chains while neglecting other issues such as biodiversity loss, pesticide use, water scarcity, and water pollution. The companies prioritize labor rights, whereas the rights to health, land, water, and food may be more important for local stakeholders (Schilling-Vacaflor 2021).

### **Landscape or jurisdictional approaches to supply chain governance**

Landscape approaches aim to reconcile competing social, economic, and environmental interests and objectives at the landscape scale. Landscape approaches have been widely employed in international conservation projects and are now also increasingly taken up in sustainable supply chain management (Sayer et al. 2013, Boshoven et al. 2021). They are based on multistakeholder collaboration (e.g., public authorities, producers, companies, civil society organizations), which sets them apart from purely public jurisdictional governance approaches that do not seek to involve all affected stakeholders. These relatively recent governance approaches rest on the premise that the involvement of public actors allows for the implementation and enforcement of mandatory requirements for production practices, provided that enforcement capacities exist (Bager 2021). Public actors 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 2021:6–7). A jurisdictional approach is a type of landscape approach that uses formal administrative boundaries to define the scope of action and involvement of stakeholders (Denier et al. 2015).

Landscape and jurisdictional approaches aim to avoid the boundary mismatches that commonly affect public and private governance initiatives that focus exclusively at farm or supply-chain scales. This narrow focus can create “islands of good practice” while surrounding areas continue with business as usual (UNDP 2019:12). Many of the social-ecological problems that sustainability initiatives such as voluntary sustainability standards target manifest in the wider

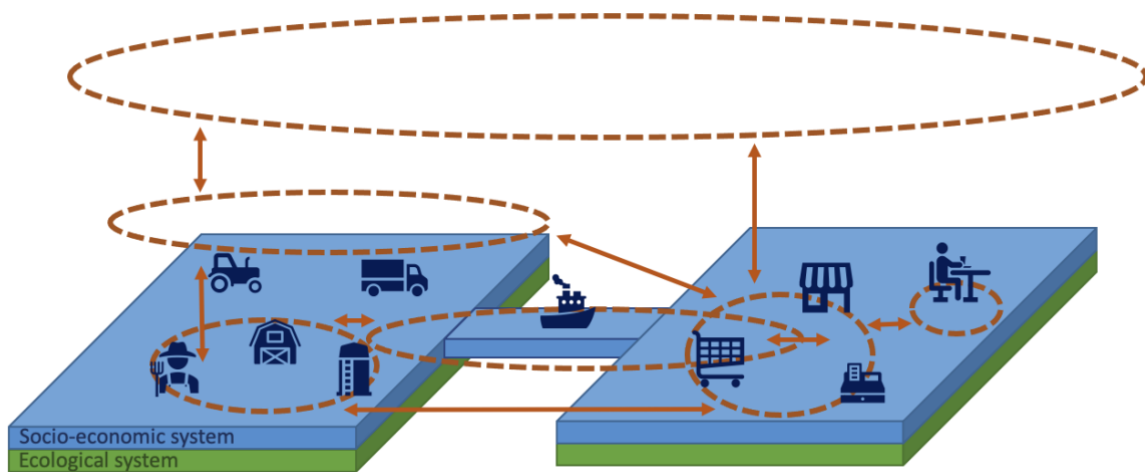
landscape, leading to mismatches between the scale of the intervention and the scale of the sustainability challenges being addressed (Sonderegger et al. 2022). For example, where companies seek to reduce commodity-driven deforestation by certifying some of their own or their suppliers' farms or plantations, deforestation may shift to non-certified areas (Heilmayr et al. 2020). Jurisdictional and landscape approaches are assumed to reduce the risk of leakages (and thus boundary mismatches) because they target entire jurisdictions or landscapes rather than a selected smaller area. In terms of certification and standard-setting, landscape and jurisdictional approaches have been introduced to upscale governance to reduce the risk that commodity sourcing produces ungoverned impacts beyond the production area or unit (e.g., farms). Sustainable cocoa initiatives, for example, are evolving in their focus from the farm level to sector, landscape, and jurisdictional levels (Carodenuto 2019, Parra Paitan et al. 2022, 2023). Empirical evidence on the effectiveness of landscape and jurisdictional approaches is scant, however, given their recent emergence (Bager 2021, von Essen and Lambin 2021).

Jurisdictional and landscape-based certification and sourcing also have limitations. Governance at the landscape level remains limited to a certain regionally confined scale and may not address all potentially relevant telecoupled dynamics such as migrant worker flows or illicit financial flows (Sonderegger et al. 2022). Additionally, the risk of leakage persists because neighboring jurisdictions may have weaker environmental protections (von Essen and Lambin 2021). Non-compliant production may shift to neighboring places with fewer restrictions (Meyfroidt et al. 2018), and commodities from non-compliant neighbors might be laundered into the more tightly regulated jurisdiction (Gibbs et al. 2016, Boshoven et al. 2021).

### **Institutional interplay**

Although we focus on how specific institutions can define and address what they conceive as mismatches, in practice, telecoupled systems are typically governed by several institutions, which interact horizontally at the same level of social organization or vertically across levels (Fig. 5). Institutions influence the decision-making, commitments, behavior, and effects of one another (Oberthür and Gehring 2006). Institutional interplay is based either on functional linkages that occur when developments in one issue area unavoidably affect another issue area, such as between institutions on agricultural production and land use, or it is based on political linkages that arise when actors recognize interdependencies and deliberately forge institutional interactions (Young 2005). For example, the EU's Forest Law Enforcement Governance and Trade (FLEGT) initiative interacts with private certification schemes and public legal timber regulations in partner countries (Overdevest and Zeitlin 2014). FLEGT promotes better enforcement of forest law and the establishment of export licencing systems in partner countries to identify, monitor, and export legally harvested timber products destined for EU markets. Additionally, the FLEGT initiative, adopted in 2003, encouraged U.S. environmental activists to advocate for an extension of the U.S. *Lacey Act* from fish and wildlife to plants, leading to amendment of the *Lacey Act* in 2008. This example highlights how institutional interactions can lead to the convergence of separate national or regional governance regimes. The convergence between FLEGT and the U.S. *Lacey Act* ensured that illegally harvested timber is not simply diverted from one market to another (Overdevest and Zeitlin 2014).

**Fig. 5.** Schematic illustration of institutional interactions in a telecoupled system. The circles denote the governance scales of different institutions.



Creating effective collaborative ties between institutions has been repeatedly proposed as a solution to rectify mismatches (Galaz et al. 2008, Bodin et al. 2017, Enqvist et al 2020). Bergsten et al. (2014:1) argue that “boundary mismatches are impossible to resolve if the focal ecological processes are not contained within the spatial jurisdiction of either a single high-level actor responsible for the whole area or by several lower level actors who collaborate” and thus jointly build a comprehensive governance system at a larger scale. This idea suggests that studying telecoupled systems from the perspective of polycentric governance, defined as systems of overlapping jurisdictions with formally independent but interlinked centers of decision-making, could yield valuable insights into how to resolve mismatches in global land and agricultural commodity governance. Beyond examining the effectiveness of single governance institutions in isolation, a more systematic evaluation of the interplay and potential synergies between different governance interventions can advance the understanding of how to design governance solutions that match the scale of the problem at hand.

A social-ecological network approach can be used to study collaborative natural resource governance across jurisdictional boundaries (Janssen et al. 2006, Bodin and Tengö 2012, Barnes et al. 2019). Studies could adopt such an approach to represent telecoupled systems as networks of social actors and ecological resources connected through commodity flows and institutional or social linkages. Although it is difficult to account for different kinds of social actors and the processing of commodities (e.g., from cocoa bean to chocolate bar) with this approach, it can help to capture how material, information, and communication flows connect different ecosystems, actors, and institutions (Janssen et al. 2006, Bodin and Tengö 2012). This approach is particularly suited to the analysis of landscape-scale responses to boundary mismatches because it highlights horizontal institutional interplay, as demonstrated, for example, in research on an agricultural landscape in Madagascar (Bodin and Tengö 2012) and wetlands in Sweden (Bergsten et al. 2014).

Research on telecoupling highlights the need to combine traditional place-based governance approaches with flow-based governance, which “considers a place in light of its relationships with other places, by tracking and managing where key flows start, progress, and end” (Liu et al. 2018:65). Flows are dynamic, and their origin and destination may change over time as a result of, for example, changing infrastructure, market demand, or biophysical conditions (dos Reis et al. 2023). Flow-based governance arrangements such as certification schemes, zero-

deforestation commitments, and due diligence laws are designed to govern commodity flows, irrespective of changing trading relationships between supply chain actors. However, flow-based governance may generate new forms of social exclusion, inequality, and ecological simplification in places of production if transnational notions of sustainability do not match with local needs and realities (Newig et al. 2020). This idea highlights that flow-based governance can cover the full spatial scale of telecoupled systems, but their flow specificity comes at the cost of place specificity. Evidence suggests that the effectiveness of flow-based governance benefits from synergistic place-based governance (zu Ermgassen et al. 2022). For example, governments can support the implementation of zero-deforestation commitments by providing additional disincentives for deforestation through, for example, credit restrictions for non-compliant individuals and companies, and through anti-corruption measures that improve the reliability of geospatial forest information on which private governance schemes depend (Garrett et al. 2019). More research is needed to investigate the interplay between institutions that focus on the full spatial extent of the problem and institutions that are adapted to the local context.

## CONCLUSION

The governance of telecoupled systems is beset with problems of fit. Because 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. Here, we applied the established concepts of institutional fit and governance mismatches to complex sustainability issues arising due to telecoupling. We identified two types of mismatches that are pertinent in the governance of telecoupled systems. First, boundary mismatches occur when governance institutions neglect social-ecological problems that transcend established jurisdictional boundaries, either because the institutional design fails to cover the full scale of the problem or because the intervention induces leakages. Second, resolution mismatches arise when governance institutions have a coarser resolution than is suitable to address the social-ecological problem they aim to address. Because of a lack of governance precision, governance instruments are too general to be effectively implemented and enforced. In the context of land and global agricultural commodity governance, approaches such as due diligence laws and policies, landscape and jurisdictional approaches to supply chain governance, and environmental provisions in trade agreements present important steps toward creating institutional fit in the governance of telecoupled systems.

Scaling or rescaling 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 addressed (Newig and Moss 2017). Rescaling governance can entrench, rather than restructure, existing power relations and global inequalities. For instance, companies may stop sourcing from places with weak public governance, where the risk of infringing environmental or human rights is high, and shift to places with stricter governance to meet consumer demands for more transparency and due diligence (Gardner et al. 2019). This effect increases the risk of unintentionally marginalizing small-scale producers in these regions by excluding them from international value chains and the economic benefits of the global economy (Zhunusova et al. 2022). The most vulnerable people and countries may become subject to 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.

We do not claim that rescaling governance institutions to perfectly match telecoupled social-ecological systems will necessarily solve telecoupled sustainability issues, or even that it is

attainable in all circumstances. Rather, we acknowledge that the risk of mismatches persists and identifying an “optimal spatial scale” may not be possible. Any attempt to resolve boundary or resolution mismatches comes with the risk of creating new mismatches, and because material flows, immaterial connections, and spillover relations are dynamic (dos Reis et al. 2020), governing telecoupled systems requires recognizing constantly evolving problem structures and continuously evaluating and adapting governance initiatives. However, even if it were possible to create institutional fit, there would be no guarantee of effective governance, due to implementation or enforcement problems. Nonetheless, we see substantial value in distinguishing different types of mismatches in telecoupled settings to be more productive in devising multiple, well-aligned, and adaptive governance arrangements that are better equipped to bring about the required change toward social and environmental sustainability. Looking at land-based commodity flows through the lens of boundary and resolution mismatches helps us to better anticipate potential governance weaknesses arising from a lack of governance precision or extent, and hence, enables better policy debates. Our analysis indicates that complementary interventions at various spatial scales, rather than single interventions, are needed to govern telecoupled systems effectively.

The most pressing and challenging future research question is how to align multiple governance institutions to govern telecoupled systems. Advancing understanding of institutional mismatches in telecoupled systems requires interdisciplinary research, which itself needs to grapple with the challenge of bridging scales embedded in different research approaches, problem definitions, and perspectives (Friis et al. 2023). While we have focused on spatial mismatches in the governance of telecoupled systems, future investigations could analyze the occurrence and implications of temporal mismatches. Telecoupled systems are dynamic, and the spatiotemporal connections between regions and actors can change over time (dos Reis et al. 2020, 2023, Leijten et al. 2022), requiring adaptive governance responses. Additionally, investigating to what extent governance institutions fit with the complete life cycle of products merits further research because the spatial scale of governance expands when the temporal scale of governance is upscaled to the product life cycle. The task, albeit formidable, is to design governance systems in which effective institutional interplay offsets institutional mismatches of single institutions.

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[1] Bergsten et al. (2014) note that the two types of mismatches may overlap, for example, when jurisdictional boundaries compel actors to govern ecological processes at too fine a scale.

[2] However, we acknowledge that the different types may overlap or be nested in reality, depending on which governance institution is taken as the analytical vantage point. For example, what appears as a spillover of one governance institution may be an induced leakage of another governance intervention.

[3] For example, the Convention on Biological Diversity, United Nations Convention to Combat Desertification, United Nations Framework Convention on Climate Change, and New York Declaration on Forests are not flow specific.

## **AUTHOR CONTRIBUTIONS**

J. C. coordinated the development and conceptualization of the study and wrote the original draft of the manuscript, as well as the revisions. G. S., J. N., P. M., and E. Challies contributed to conceptualizing the study and drafting, revising, and editing, the manuscript; authors' names are listed according to the degree of contribution. S. B., L. B. L., E. Corbara, C. F., A. F. P., P. L., C. P. P., S. Q., N. R., and J. Z. contributed to discussing the concepts at two workshops and revising and editing the manuscript; authors' names are listed alphabetically to indicate equal contributions. All authors approved the final manuscript.

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## **DATA AVAILABILITY**

*Data/code sharing is not applicable to this article because no new data/code were created or analyzed in this study.*

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## **Article 2:**

### **Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda**

#### **Abstract**

Environmental governance is increasingly challenged by global flows, which connect distant places through trade, investment and movement of people. To date, research on this topic has been dispersed across multiple fields and diverse theoretical perspectives. We present the results of a systematic literature review of 120 journal articles on the environmental governance of global flows and their environmental impacts, employing the notion of telecoupling as a common analytical lens. Six themes emerged, which can guide a comparative and policy-relevant research agenda on governing global telecoupling: (1) advancement of problem-centered research (as opposed to studying existing governance arrangements), (2) displacement of environmental burdens from Global North to South from a telecoupling perspective, (3) environmental governance of telecoupling between Global South countries, (4) policy coherence in governing global flows, (5) cross-scalar interactions between private and public governance and (6) combinations of governance arrangements to effectively address environmental problems in telecoupled settings.



## Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda

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### ABSTRACT

Environmental governance is increasingly challenged by global flows, which connect distant places through trade, investment and movement of people. To date, research on this topic has been dispersed across multiple fields and diverse theoretical perspectives. We present the results of a systematic literature review of 120 journal articles on the environmental governance of global flows and their environmental impacts, employing the notion of telecoupling as a common analytical lens.

Six themes emerged, which can guide a comparative and policy-relevant research agenda on governing global telecoupling: (1) advancement of problem-centered research (as opposed to studying existing governance arrangements), (2) displacement of environmental burdens from Global North to South from a telecoupling perspective, (3) environmental governance of telecoupling between Global South countries, (4) policy coherence in governing global flows, (5) cross-scalar interactions between private and public governance and (6) combinations of governance arrangements to effectively address environmental problems in telecoupled settings.

### 1. Introduction

Global flows of goods, services, information, people, and capital increasingly cross national and continental borders, connecting distant places and actors in complex ways. However, the proliferation and intensification of global flows has not been a uniform or homogenizing process. Rather, it has been highly uneven, generating different sustainability outcomes in different places. As global interlinkages and interdependencies increase, 'local' changes often need to be understood as being shaped by multiple distant drivers. For example, consumption of palm oil-based cosmetics, foods and detergents in Europe drives deforestation and transboundary pollution in several Southeast Asian countries where palm oil is produced (Saswattecha et al., 2015; Pacheco et al., 2017). Such processes have long been studied from diverse disciplinary perspectives by scholars who have sought to trace global flows and interconnections, and understand how their impacts have been governed. For example, global commodity chain research has drawn attention to actors and conventions that constitute economic chains and networks linking distant places, while research in the field of

global environmental governance has focused on governance mechanisms, such as environmental regimes, that have emerged to tackle a range of transboundary and global environmental impacts.

In recent years, the world of cross-scalar flows, and associated social and ecological impacts has been described and explored by a growing interdisciplinary sustainability science community via the concept of 'telecoupling' (Friis and Nielsen, 2019; Liu et al., 2013). Increasingly invoked as an analytical concept or heuristic, telecoupling offers a view on globalization that foregrounds particular connections, flows and actors, as well as specific place-based outcomes and impacts (Eakin et al., 2014; Newig et al., 2019), while recognizing that these are embedded in dynamic global networks.

The concept of telecoupling offers a useful analytical reference point for this systematic review because it "provides a common language, logical consistency, systematic approach, and holistic guidance for researchers and others who work on different types of distant interactions" (Liu et al., 2013, p. 8). Its ability to work across disciplinary boundaries and break up the complexity of global connectivity into identifiable units of analysis, while explicitly acknowledging the relational and

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networked character of human-environmental change, makes this concept a very suitable tool for synthesizing research on environmental impacts and their cross-scalar drivers and feedbacks (Friis and Nielsen 2017a). Indeed, the telecoupling concept, given its “uniquely integrative” character (Liu et al., 2013, p. 8), has emerged in response to a need for more integrative interdisciplinary research to address wicked problems of sustainability (Nielsen et al., 2019). The goal of an integrated research agenda is to connect different analytical perspectives and enable interdisciplinary analysis, rather than to merge or ‘solve’ diverging perspectives (Friis 2019). The concept of telecoupling is one among several concepts that have been deployed to study linkages among distant places in a globalized economic system. Other concepts like translocality (see, e.g., Radel et al., 2019), leakage (see, e.g., Meyfroidt et al., 2018) and unequal ecological exchange (see, e.g., Jorgenson 2016; Frey et al., 2018) are also used to investigate the social and environmental implications of global interdependencies. The telecoupling concept has often been used in combination with these related concepts (e.g., Dorminger et al., 2021). In this study, we consider telecoupling a point of departure for fostering an interdisciplinary dialogue between researchers using different but compatible concepts and terminologies for studying similar empirical phenomena. Originally developed in land systems science, telecoupling appears particularly applicable to focusing attention on environmental effects of distant human-nature interactions, which is increasingly the concern of interdisciplinary sustainability research.

We maintain that research examining governance in relation to telecoupled systems needs to recognize and build on prior and ongoing work in multiple neighboring fields. The general phenomenon of telecoupling, and aspects thereof, have been studied from a range of disciplinary perspectives employing different theoretical framings and terminologies. Much of this work has also engaged with governance in, of, and for telecoupling (Newig et al., 2019). Taking stock of this work is challenging, as it does not comprise an easily delineated body of literature, and is in fact rather diverse and fragmented. This review seeks to ‘map’ the terrain of this literature in an integrated manner, by bringing together different streams of research, and by highlighting commonalities and gaps in order to stimulate research across these divisions. Indeed, we sought to capture a wide variety of literature by searching across diverse research fields and disciplines, but we do not claim to have comprehensively taken stock of all relevant literature.

This article thus analyzes a wide range of work across disciplines dealing with the governance of environmental impacts of globally telecoupled flows. We conducted a systematic review to identify literatures addressing environmental governance in relation to the phenomenon of telecoupling, while assuming that this literature would use diverse terminology to describe the phenomenon (possibly, but not necessarily including the term ‘telecoupling’). With this study, we offer a first systematic empirical mapping of the literature addressing environmental governance in global flows, as well as the geographical areas, actors and governance instruments implicated in the studied flows. We also delineate the environmental impacts of global flows, and consider potential governance challenges in addressing them. In order to chart the breadth of approaches in the literature, we map the scholarly field of environmental governance in global telecoupling and identify key theoretical lenses employed in the literature.

The article is structured as follows: Section 2 presents our analytical framework and defines key concepts used in this study. Having explained our methodology in Section 3, Section 4 presents the results of our systematic review on the scholarly field, global flows, environmental impacts and governance. Section 5 discusses the key findings from our analysis while also outlining an agenda for future research.

## 2. Analytical framework

In this study, we examine governance in relation to telecoupled flows and their environmental impacts. Our analytical framework, depicted in

Fig. 1, follows two main logics: First, it integrates the three key dimensions of our analysis: (1) global flows connecting distant places, (2) environmental impacts of global flows, and (3) governance responses in place to tackle the environmental impacts of global flows. Second, our framework reflects three distinct governance perspectives identified in relation to global telecoupling: governance (a) inducing telecoupling, (b) coordinating telecoupling, and (c) responding to telecoupling.

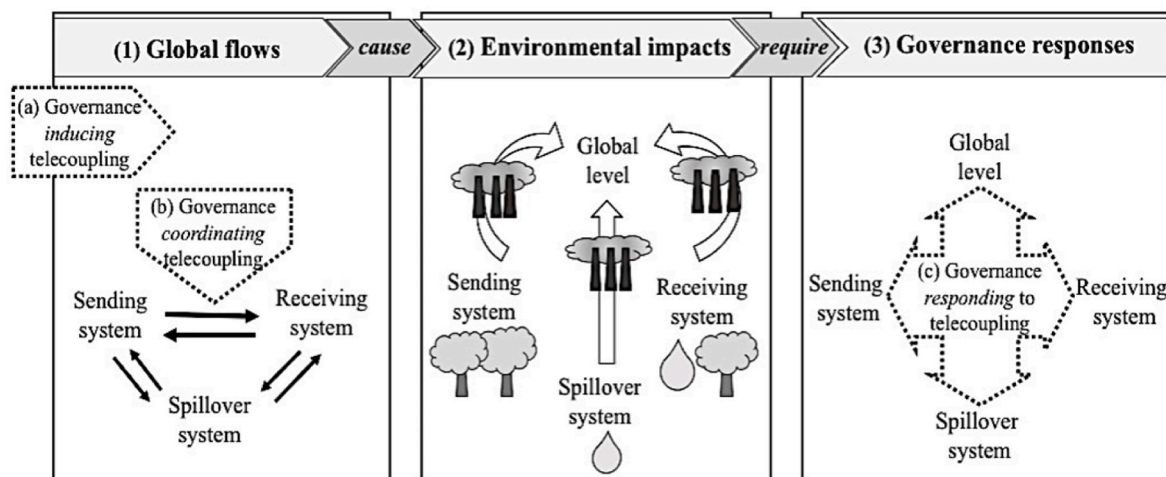
We are interested in global flows linking distant places, which we describe as instances of ‘telecoupling’ (Liu et al. 2013, 2019; Friis 2019). Telecoupling means that human-induced socio-ecological changes in one place produce socio-ecological effects in geographically distant places due to their interconnectedness through global flows. These global flows can be commodity- or product-based such as agricultural and forestry products, but they can also involve movements of people or financial flows. We identify “sending systems” as those from which flows emanate, such as sites of production of goods and services or extraction of resources, and “receiving systems” as those to which flows are directed, such as sites of consumption or disposal (Liu et al. 2013, 2019; Friis and Nielsen 2017b). In addition, we consider “spillover systems” as those systems that are incidentally connected through flows between other systems (Liu et al., 2018), for instance, due to trade diversion or transit. Although we conceptually isolate flows and telecoupled systems, we acknowledge that in reality flows are dynamic with no clear start or end point, as are the wider global networks of which they are a part.<sup>1</sup> Telecoupled interactions typically involve a multitude of spatially dispersed actors such as investors, producers, suppliers, traders, consumers and regulators, all of whom are implicated in multiple other networks, which makes it difficult to assign responsibilities for remedying environmental harm associated with unsustainable patterns of production and consumption (Burch et al., 2019).

Globally telecoupled flows often give rise to negative social impacts such as changes in livelihood opportunities and food security (Eakin et al., 2017) and environmental impacts that manifest either at a local scale in sending, receiving and/or spillover systems (e.g., deforestation and water pollution), or at a global scale (e.g., greenhouse gas (GHG) emissions to the atmosphere).

We focus on governance responses to negative environmental impacts of globally telecoupled flows. We define governance as encompassing “the totality of interactions among societal actors aimed at coordinating, steering and regulating human access to, use of, and impacts on the environment, through collectively binding decisions” (Challies and Newig, 2019; Newig et al., 2020). We are concerned with the instruments through which governance is conducted, its geographical scale, and whether it intervenes in specific places or rather targets flows. ‘Place-based’ governance arrangements consist of more territorial forms of governance, in particular, national or sub-national environmental governance, including, for example, land-use planning, impact assessment procedures and emission standards (see e.g. Sikor et al., 2013). In contrast, ‘flow-centered’ governance targets key flows, for example by addressing particular value chains through certification schemes, tax incentives, tariffs or import bans, and the like (see e.g. Liu et al., 2018, p. 65).

Building on Newig et al. (2019), our analytical framework integrates three different perspectives on how governance relates to telecoupling (marked with dotted arrows in Fig. 1). In the first instance, governance induces telecoupling by creating political, institutional and economic conditions that enable and promote the development of global flows and interconnections. For instance, the favorable mining regulations adopted by Argentinian governments in the 1990s and the early 2000s led to increased investments by North American companies in the

<sup>1</sup> We acknowledge that telecoupling research necessarily simplifies reality, as all research on global networks and systems does – facing the trade-off between being comprehensive and taking in a larger system, or narrowing the scope of analysis to focus on a sub-set or part of the system.



**Fig. 1.** Analytical framework: (1) Global flows (2) cause environmental impacts, which are addressed by (3) governance responses. The dotted arrows indicate three perspectives on governance in relation to global telecoupling: Governance (a) inducing telecoupling, (b) coordinating telecoupling, and (c) responding to telecoupling.

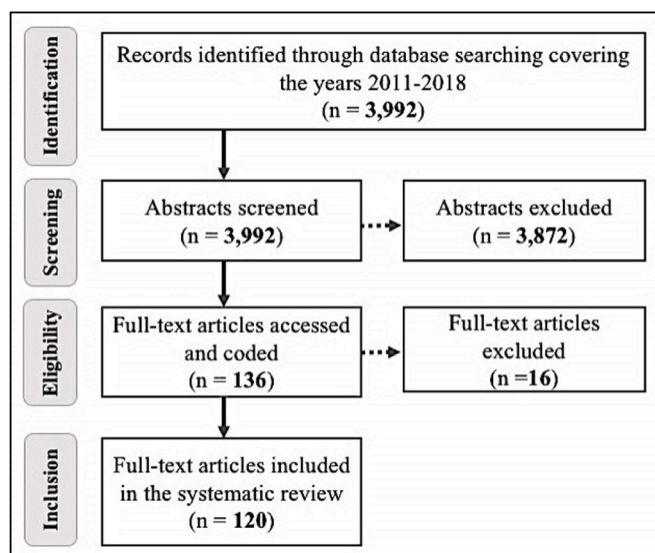
Argentinian mining sector, which resulted also in an expansion in the number and size of mining projects for the extraction of gold, silver, copper and lithium for export (Forget 2015). Second, governance may also relate to within-chain management to coordinate and organize commodity and value chains (Newig et al., 2019). Research on global value chains has mainly dealt with the structures and functions of chains and technical managerial activities, such as the improvement of intra-firm and inter-firm collaboration with the aim of improving operational efficiency (Richey et al., 2010; Bush et al., 2015). Third, governance may respond to the negative environmental impacts of telecoupling. This aligns with what is commonly referred to as environmental and sustainability governance (Newig et al., 2019). One example of such a perspective on governance is the EU Timber Regulation No. 995/2010 (EUTR), adopted to regulate timber on the EU market and to address deforestation, biodiversity loss and GHG emissions resulting from illegal timber trade (Sotirov et al., 2017). Although these three perspectives suggest distinct analytical categories, they can overlap empirically. For example, a trade agreement can reduce tariffs on certain commodities (i.e., inducing telecoupling), but also include a sustainability chapter to mitigate potential social and environmental impacts (i.e., responding to telecoupling).

In this systematic review, we focus on this third perspective on governance of telecoupling, honing in on the ways in which governance helps to counteract environmental issues that arise due to global flows. Building on our previous research (Newig et al., 2020), we identify several particular challenges that governance initiatives are likely to face: (1) Governance actors may face knowledge deficits in their efforts to govern long-range commodity flows because of a lack of transparency and accountability in global commodity chains. (2) Actors that are networked across distant territories may have divergent interests due to a lack of proximity and history of cooperation, which works against collaboration in governance initiatives. (3) The high number of actors and jurisdictions involved in telecoupled flows, and the complexity of relationships among them, gives rise to high transaction costs, which hamper not only cooperation but also the implementation of bilateral and multilateral agreements (Jager 2016; Schilling-Vacaflor et al., 2021; Newig et al., 2020). (4) Transnational private governance and multi-stakeholder initiatives addressing the impacts of telecoupling have been criticized for having a weak legitimacy base (Black 2008; Oosterveer 2018) in terms of the openness and inclusiveness of decision-making processes and a lack of transparency in the auditing of corporate initiatives. (5) Policy incoherence and fragmentation may also arise given likely differences between policies in sending and receiving

systems, as well as inconsistencies with higher-order policy such as World Trade Organization (WTO) rules. For instance, while the EU has adopted policies to address deforestation embodied in trade, sustainability clauses in trade agreements like the developing EU-MERCOSUR agreement have often been weak or unenforceable (Kehoe et al., 2020).

### 3. Methods

We followed the PRISMA guidelines for systematic reviews and meta-analyses (Moher et al., 2009)<sup>2</sup>, as illustrated in Fig. 2. A literature search was conducted in Scopus, using a search string specified in Appendix A (see Supplementary Material). This search string was designed to be encompassing, and included broad keywords in order to capture a wide array of publications that have approached the topic from different disciplines such as economics, environmental sciences



**Fig. 2.** Selection process of the systematic literature review.

<sup>2</sup> Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA). For details, see <http://prisma-statement.org/>.



and social sciences, thus allowing for different framings, concepts and terminology. We did not limit our search to articles that explicitly used the term ‘telecoupling’, but also included articles referring, for example, to ‘globalization’, ‘global flows’, ‘global commodity chains’ and ‘global production networks’. However, for inclusion in our sample we required every publication to address all three main aspects of our study: (1) global flows, (2) environmental impacts, and (3) governance responses. Our study covers academic peer-reviewed articles written in English and published in Scopus-listed academic journals in the years 2011–2018. We excluded grey literature due to methodological difficulties with its identification and systematic inclusion (Adams et al., 2017), and uncertainties with the quality assessment of grey literature (Lawrence et al., 2015).

Three researchers screened the abstracts, eliminating any that did not refer to: (1) a flow crossing international borders, (2) an environmental problem, and (3) environmental governance instruments. We excluded 3872 abstracts that did not meet our criteria. Ambiguous cases were discussed among the researchers until agreement on inclusion or exclusion was reached. During the coding process, we eliminated a further 16 articles, which, on closer reading of the full texts, did not meet our review criteria. The total number of articles included in the final review was 120.

We accessed and coded the 120 full-text articles using a coding scheme that operationalized our analytical framework (see an overview in Table 1 and an operationalization of the codebook in Appendix B in the Supplementary Material). The coding scheme was iteratively tested and revised with six research assistants, who conducted the coding. Coders were trained in five consecutive workshops, which involved a series of coding pilots in order to increase inter-coder reliability. Two coders read and coded each article independently, before meeting and discussing their coding, and potentially amending or revising their results. While we aimed for inter-coder agreement on the basic parameters of the study (e.g., identification of flows and geographical areas described), we allowed for deviations in coding regarding variables that required more subjective evaluation of the text (e.g., the three perspectives on governance of telecoupling). These variables were then consolidated by averaging the independent codings. While for many variables our original scale was limited to 0 (absence of a phenomenon) and 1 (presence of a phenomenon identified by two coders), our consolidated scale also includes the value of 0.5 (presence of a phenomenon identified by one coder). This approach acknowledges that coding is an interpretative endeavor in which we view other scholars’ work through our own analytical lens (See Table 1).

#### 4. Results

We analyze the scholarly field in terms of researchers involved in, and theoretical lenses applied. On this basis, we present a mapping of what has been studied in relation to telecoupling in terms of global flows, their environmental impacts and their governance. Although our literature search revealed a rich corpus of literature addressing these aspects, we identified relatively few studies that consider them together. Compared with the wealth of studies that describe global flows and connections, only 120 of the articles we identified met the inclusion criteria, in investigating governance of the environmental implications of telecoupled flows.

##### 4.1. Mapping the scholarly field on environmental governance in global telecoupling

A broad range of disciplines, including political science, human geography and economics, have similarly studied the phenomenon of telecoupling, examining global flows, their environmental impacts, and governance responses. In our sample of 120 articles, a majority (70 articles) analyses the effectiveness of environmental governance instruments in different global flows, often highlighting a variety of

**Table 1**

Variables and dimensions covered in the codebook.

| Category              | Variables and dimensions   |
|-----------------------|--|
| General information   | Authors, title, year of publication, journal<br>Theoretical lens (es)  |
| Global flows          | Flow(s)<br>Geographical scale of studied flow(s)<br>Geographical area(s) <sup>3</sup> and countries involved<br>Direction of telecoupling  |
| Environmental impacts | Nature of environmental impacts<br>Geographical scale of environmental impacts<br>Nature of environmental impacts per system   |
| Governance            | Perspectives on governance<br>Governance challenges<br>Governance instruments<br>Governance actors and addressees<br>Place and directionality of governance<br>Spatial scale of governance |

<sup>3</sup> In our analysis we applied eleven geographical areas based on the categorization by O.T. Ford (available at: <http://the-stewardship.org/research/referen ce/world-region.htm>): North America, Caribbean and Latin America, South America, Europe, Middle East and North Africa, Sub-Saharan Africa, Russian sphere, Central Asia, South Asia, East Asia, Southeast Asia, Australia and Pacific. We introduced an additional “global” category to capture those global flows where sending and/or receiving systems were unspecified.

governance barriers to improving environmental conditions (e.g., complexity and lack of traceability in global value chains, policy incoherence, weak legal frameworks in producer countries, lack of enforcement). Yet, scholarship on environmental governance in global telecoupled flows remains rather fragmented. To visualize the fields of scholarship we used the software package VOSviewer to derive and display bibliometric networks<sup>3</sup> and trace the relationships among authors and articles included in the review (see Figs. 3 and 4). Co-authorship and co-citation networks are used here as proxies for collaboration and exchange among research communities addressing environmental governance in global telecoupling.

Fig. 3 shows authors’ ‘relatedness’ based on the strength of co-authorship links between all authors of the 120 reviewed articles. A total of 339 nodes (authors) are displayed. Colored shading of nodes refers to the publication year of co-authored articles. While articles co-authored by several authors increase in number over the years, no overarching clusters emerge, reflecting a relatively low degree of collaboration across co-authors and suggesting a fragmented landscape of co-authorship among the authors of the articles included in our review.

Fig. 4 provides an analysis of citations among the 120 reviewed articles according to whether articles cite one another (visualized with the name of the first author and year of publication of the article). Here, we see that only very few articles (displayed as blue-colored clusters) cite each other, indicating little collaboration and exchange among the scholarly fields addressing environmental governance in global telecoupling.

To further delineate the field of scholarship engaging with environmental governance of telecoupling, we also reviewed the theoretical framing adopted in each study. In so doing, we coded for theoretical lenses, building on those identified in Newig et al. (2020), and also incorporated additional theoretical framings that emerged in the course of coding. Overall, we identified ten theoretical lenses framing the reviewed studies, which we acknowledge are not exhaustive, but which are helpful in assessing which scholarly communities have devoted attention to governance aspects of telecoupling phenomena.

<sup>3</sup> Available at <https://www.vosviewer.com/>.

<sup>4</sup> We acknowledge that Figs. 3 and 4 do not display all labels for the nodes shown. As VOSviewer aims to avoid overlapping labels, names are visible only for some of the nodes (Van Eck and Waltman, 2017).

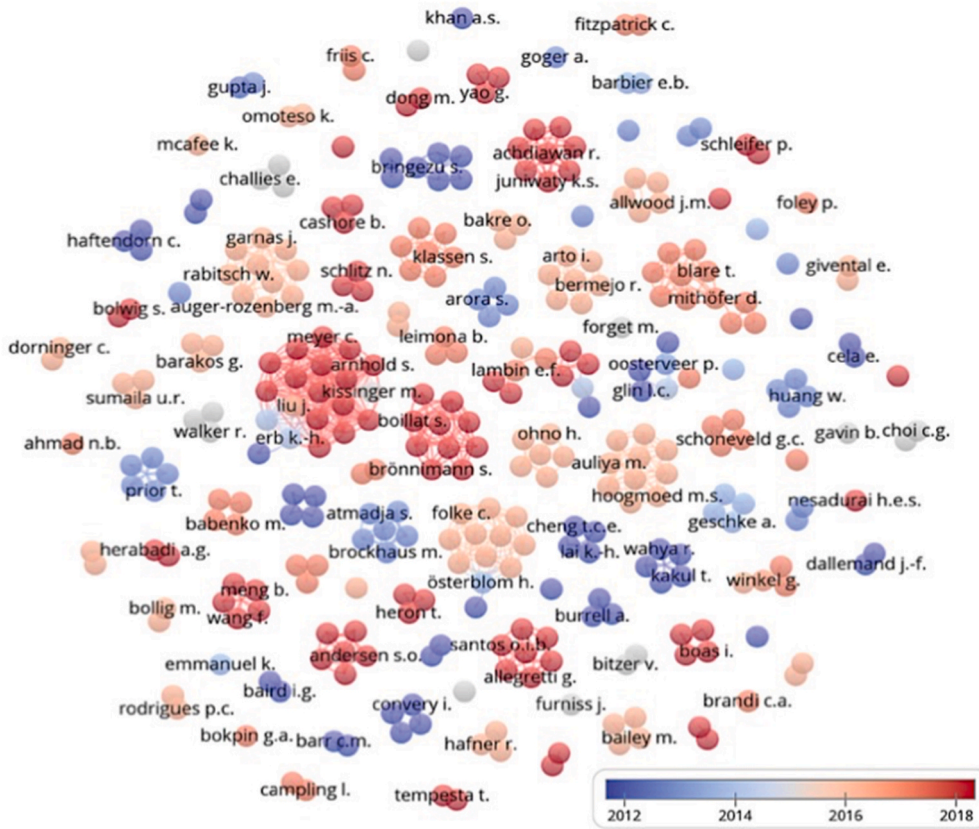


Fig. 3. Co-authorship network of reviewed articles. Authors (nodes) are connected if they have co-authored work.<sup>4</sup>

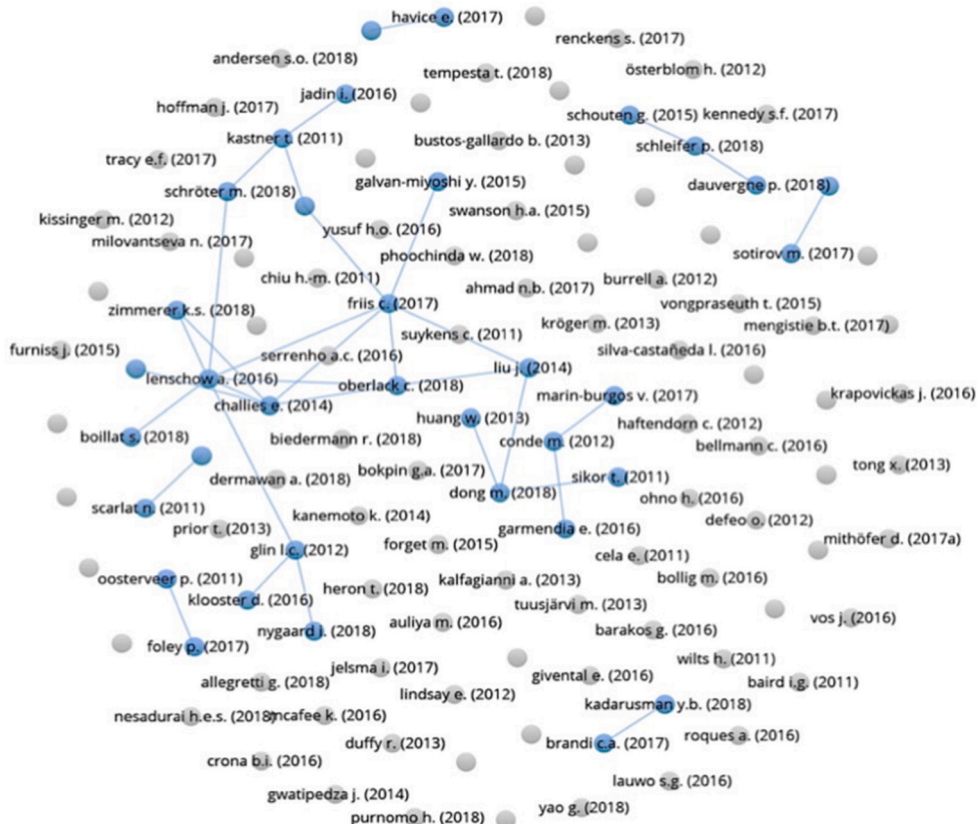
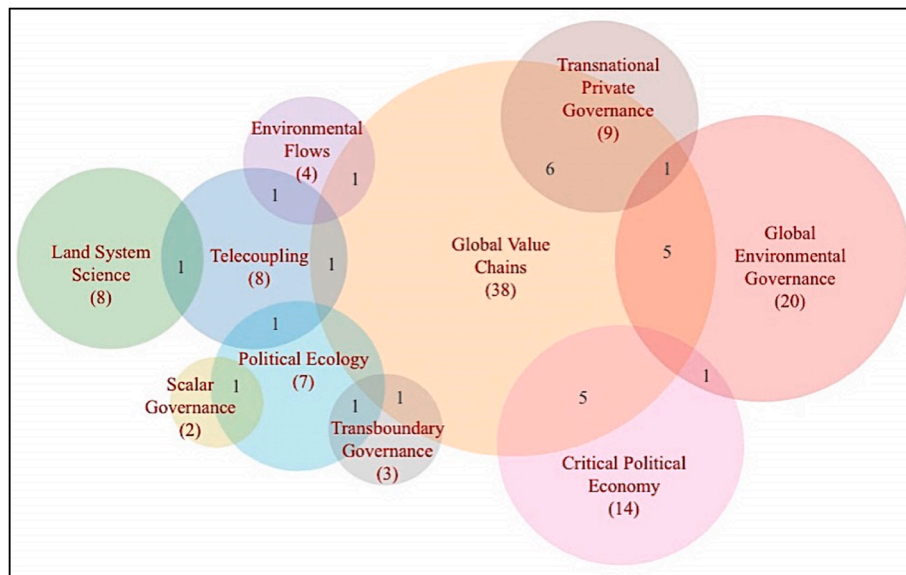


Fig. 4. Citation network of reviewed articles. Articles (nodes) are connected if they cite each other.



**Fig. 5.** Incidence of theoretical lenses employed in the studied articles. Multiple lenses could be employed per article. Figures in brackets depict the total number of times a theoretical lens was identified across the 120 articles. Figures in overlapping areas indicate the number of times the respective lenses were identified together in one article.

The following theoretical strands are depicted in Fig. 5: Global environmental governance, focusing on governance arrangements beyond nation state boundaries, including international environmental governance institutions and regime formation; Transboundary governance, studying governance arrangements across neighboring nation states; Transnational private governance, examining governance of flows via private certification, standards, and voluntary commitments; Global value chain research, concerned with coordination (by primarily private actors) of production-consumption across distal regions; Environmental flows literature, taking a sociological perspective on places and flows, as well as governance challenges; Critical political economy literature, concerned with revealing (in)justice in global interconnections through detailed description of production chains and their environmental impacts; Scalar governance literature, addressing spatial fit/misfit between governing institutions and the spatial scale of problems to be governed; Land system science, integrating place-based and flow-based phenomena to understand multiscale governance approaches; Political ecology, focusing on power and (in)justice in the distribution of environmental impacts and their governance; and Telecoupling, conceptualizing global connections as flows among sending and receiving systems, which pose a number of environmental governance challenges.

As Fig. 5 shows, the main theoretical lenses identified in the reviewed articles are Global Value Chains (38 coded instances) and Global Environmental Governance (20), followed by Critical Political Economy (14). Fig. 5 also depicts many overlaps among theoretical lenses, where the theoretical framing of the reviewed articles combines more than one lens. This may be interpreted as further evidence of the heterogeneity of the literature, and reflects the multi-disciplinarity of the research area.

As another indication of the heterogeneity of the research area, we find that the 120 articles are spread across 77 different, mostly multi-disciplinary journals, the five most frequent outlets being Global Environmental Change (eight articles), Geoforum and Resources, Conservation and Recycling (five articles each), and Sustainability (four articles) (for details, see Appendix C in the Supplementary Material).

#### 4.2. Environmental governance challenges of telecoupling

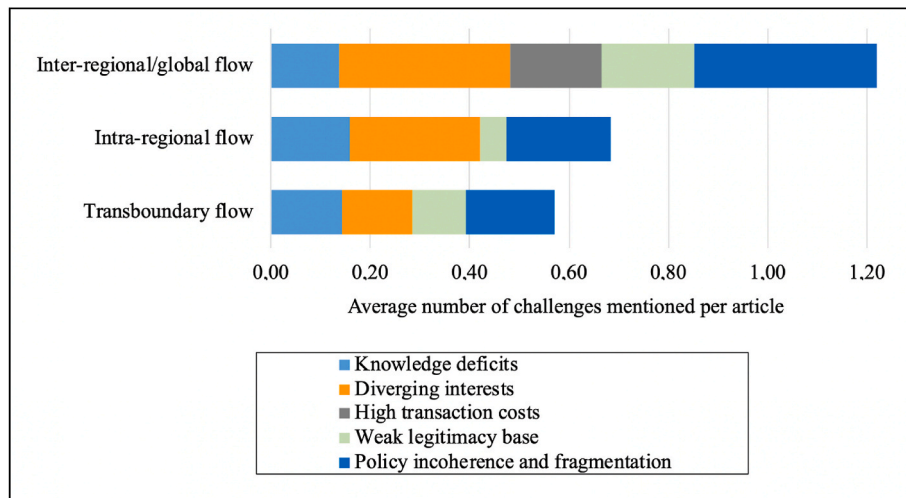
As outlined above, telecoupled flows likely pose considerable

challenges for environmental governance, which potentially affect the management of complex value chains, the multitude of governance actors and jurisdictions involved, and the policies promulgated by sending and receiving systems in telecoupled flows. We tested whether globally telecoupled flows, in our sample of studies, would be more prone to governance challenges than regional or transboundary flows, as posited in Newig et al. (2020). Indeed, we find that in studies on global (inter-regional) flows, roughly twice as many governance challenges (1.2 per paper) were described as in studies on transboundary<sup>5</sup> flows (0.7 challenges per paper) or on intra-regional flows (0.6), as detailed in Fig. 6. This is in line with our expectation that governance of inter-regional/global linkages is more challenging than governance in more local/regional settings. Looking in detail at the governance challenges identified, we find that policy incoherence and fragmentation, and diverging interests are the main governance challenges observed. With the exception of knowledge deficits, all governance challenges are far more prevalent in articles on inter-regional/global flows. This suggests that an absence of geographical proximity in inter-regional/global flows is associated with (1) diverging interests among the involved governing entities; (2) higher transaction costs for reaching joint governance agreements where there is no history of prior collaboration; (3) a weak legitimacy base of transnational governance arrangements; and (4) policy incoherence and fragmentation, given likely differences in policies between sending and receiving systems as well as with higher order policy.

<sup>5</sup> Transboundary flows between neighboring countries were included in our review insofar as they reached across a distance, i.e. a non-contiguous landscape and social-ecological system. Flows were characterized as 'intra-regional' if they occurred between non-neighboring countries with one of the following geographical areas: North America, Caribbean and Latin America, Europe, Middle East and North Africa, Sub Saharan Africa, Russian Sphere, Central Asia, South Asia, East Asia, Southeast Asia, Australia-Pacific. Flows that combine more than one of these regions were characterized as inter-regional/global.

<sup>6</sup> Articles may refer to flows on multiple geographical scales: 13 articles mention two geographical scales, and 7 articles mention three geographical scales.





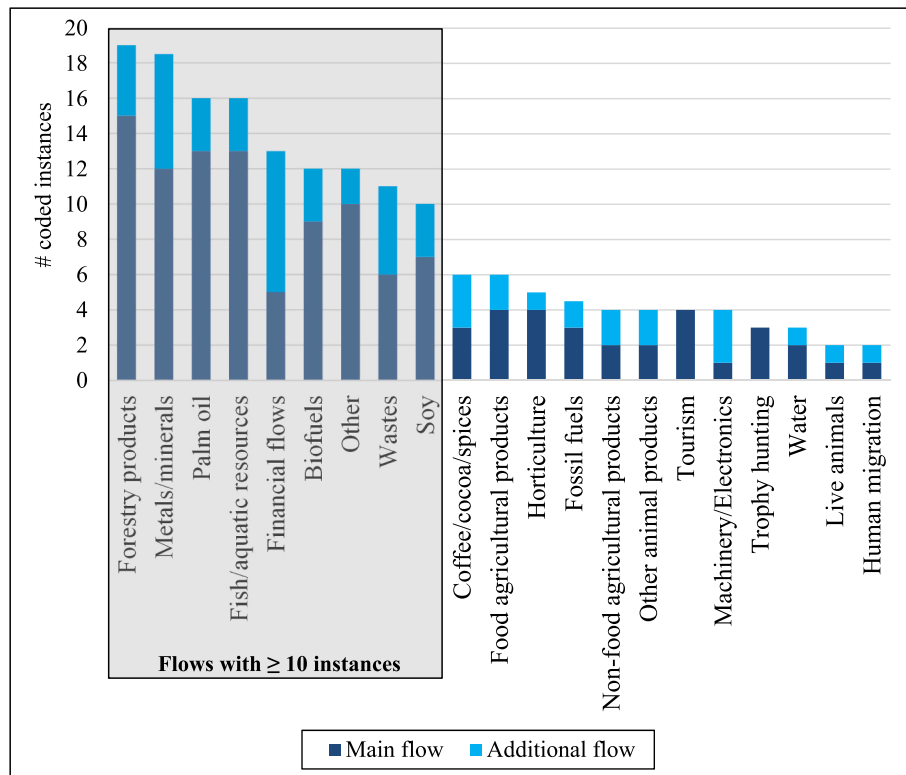
**Fig. 6.** Governance challenges arising with different geographical scales of flows. Note that all three scales count as ‘telecoupled’ flows according to our definition of flows crossing at least adjacent jurisdictions in different countries. While the majority of articles (112) examine inter-regional/global flows, 19 articles report on intra-regional flows, and 14 articles report on various forms of transboundary flows.<sup>9</sup>

4.3. Nature of telecoupled flows

The reviewed literature examines a multitude of global flows (see Fig. 7). The majority of these are flows associated with trade in, for example, forestry products, machinery and electronics, metals and minerals, and palm oil. Trade in animal products, horticulture products, fossil fuels and wastes is also often studied. This focus on traded products aligns with the predominance of global value chain conceptual framings in the literature (see section 4.1). Fewer articles investigate flows such as financial flows and movements of people as tourists or migrants. Commodity- and product-based flows are usually the primary focus (main flow in Fig. 7). Furthermore, flows that involve movements

of people or financial resources are often discussed only as secondary flows (additional flow).

The studied global flows can be further analyzed according to their directionality, in the sense of whether their origin (sending system) and destination (receiving system) are in the Global North or the Global South, as shown in Fig. 8. In our review of the literature, we find that flows largely originate in countries of the Global South and are directed to countries in both the Global North (66 instances for main flow, and 18.5 for additional flows) and the Global South (43.5 instances for main flow, and 18 for additional flows). Among the articles addressing South-South flows, several focused on the growing demand from emerging markets like China and India for palm oil produced in Indonesia and



**Fig. 7.** Frequency of telecoupled flows studied (as main flows and additional flows).

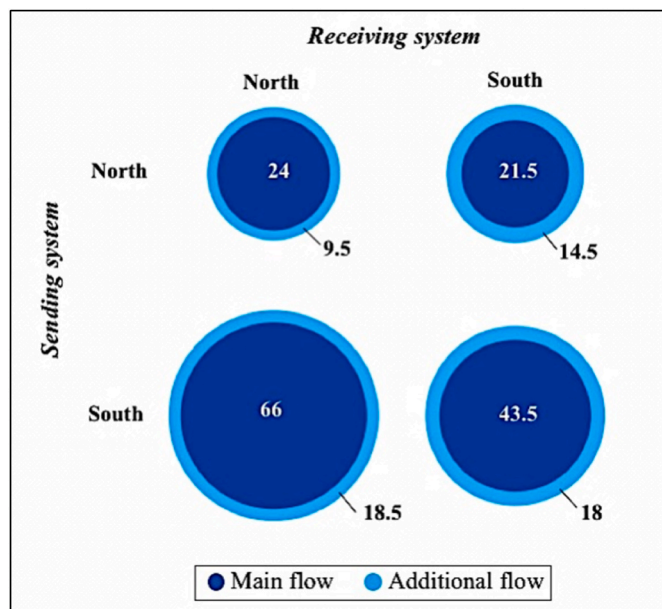


Fig. 8. Directionality of global flows from sending to receiving systems in the Global North or Global South. Multiple directions could be identified per flow category. Figures indicate the total number of times a particular directionality was identified across the 120 articles. Partial numbers (i.e., with 0.5) reflect instances identified by only one coder (for more detail, see section 3 on Methods).

Malaysia. While Dauvergne (2018) examines the politics of palm oil certification, Schleifer and Sun (2018) investigate conditions for certification uptake in emerging economies, and Brandi (2017) focuses on the effectiveness of smallholder certification for environmental outcomes. The literature thus presents complementary insights into similar phenomena related to telecoupled commodity flows. Flows originating from countries in the Global North are less prominent in the literature, but those that do feature are directed to countries of both the Global North and the Global South, as in the case of the global trade in metals from Japan to China, Europe and North America (Ohno et al., 2016).

Some of the below analyses focus on the eight most frequently studied flows, highlighted in grey in Fig. 7 as flows with 10 or more

reported instances. Data for these flows was analyzed using descriptive statistics, whereas incidences of the remaining flows are too small for systematic comparison.

#### 4.4. Environmental implications of telecoupling

Global flows often produce negative environmental impacts. Building on definitions provided in European policy documents (European Union, 2017) and in the literature (Lowe et al., 2005), we identify eight broad types of environmental impacts mentioned in the reviewed articles. These relate to land use, biodiversity, water quantity and quality, soil condition, air quality, GHG emissions, habitat integrity and species dynamics (for an operationalization of these impacts see Appendix B).

Fig. 9 shows that the large majority of the reviewed articles focus on impacts occurring in the sending systems of the selected flows (with a total of 283.5 coded instances), while less attention is paid to impacts in receiving systems (56.5 instances). This may be because impacts in receiving systems are either not occurring, less severe, unspecified, or even positive. With regard to the latter, for instance, Swanson (2015) illustrates how the import of Chilean salmon to Japan has enabled increased conservation of Japanese salmon, demonstrating how, in turn, conservation in one place may rely on displacing environmental burdens to distant places. Among the environmental impacts studied in receiving systems, land use appears to be a prominent issue in relation to most flows. Flows of fish and aquatic resources affect species dynamics and habitat integrity, while biofuels trade particularly affects GHG emissions in receiving systems.

#### 4.5. Governing telecoupling

Previous literature has discussed a wide variety of governance instruments across globally telecoupled flows. By governance instruments we refer to “a set of mechanisms that are used to achieve a particular policy goal” (Biggs et al., 2021, p. 485). These ‘tools of governance’ may take a variety of forms such as legally binding public policies, economic and fiscal instruments, information- and communication-based instruments and voluntary instruments (Steuer 2011; Challies et al., 2019). Legislation and regulation, which originate at different levels of governance and include EU legislation (e.g., the EU’s Renewable Energy Directive) and national legislation (e.g., the US Lacey Act on fish, wildlife and plants), are by far the most studied governance instruments, as shown in Fig. 10. Other relevant public instruments are economic and

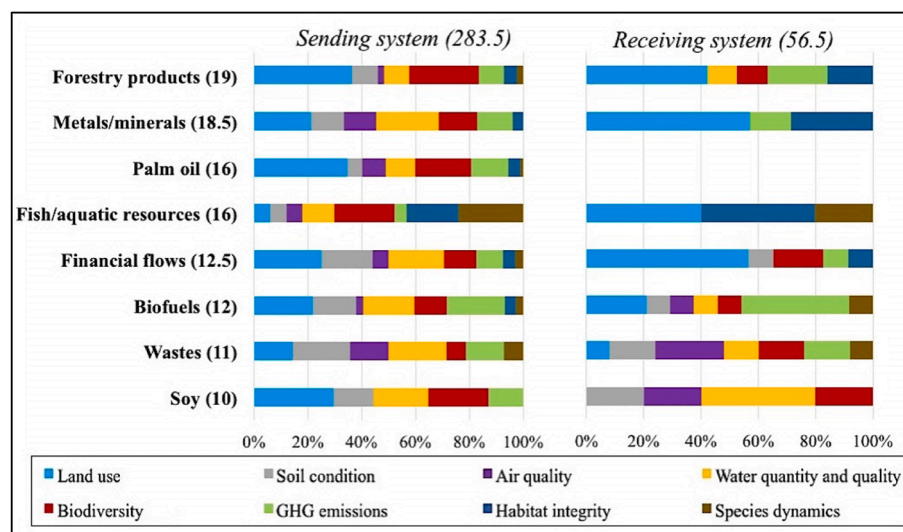


Fig. 9. Studied environmental impacts in sending (left) and receiving (right) systems for selected flow categories. Numbers in brackets on the y-axis indicate the total coded instances per flow, while numbers in brackets next to ‘sending’ and ‘receiving’ systems indicate the coded instances per system type in the selected flow category. Coding allowed for selection of multiple environmental impacts per flow category and system.

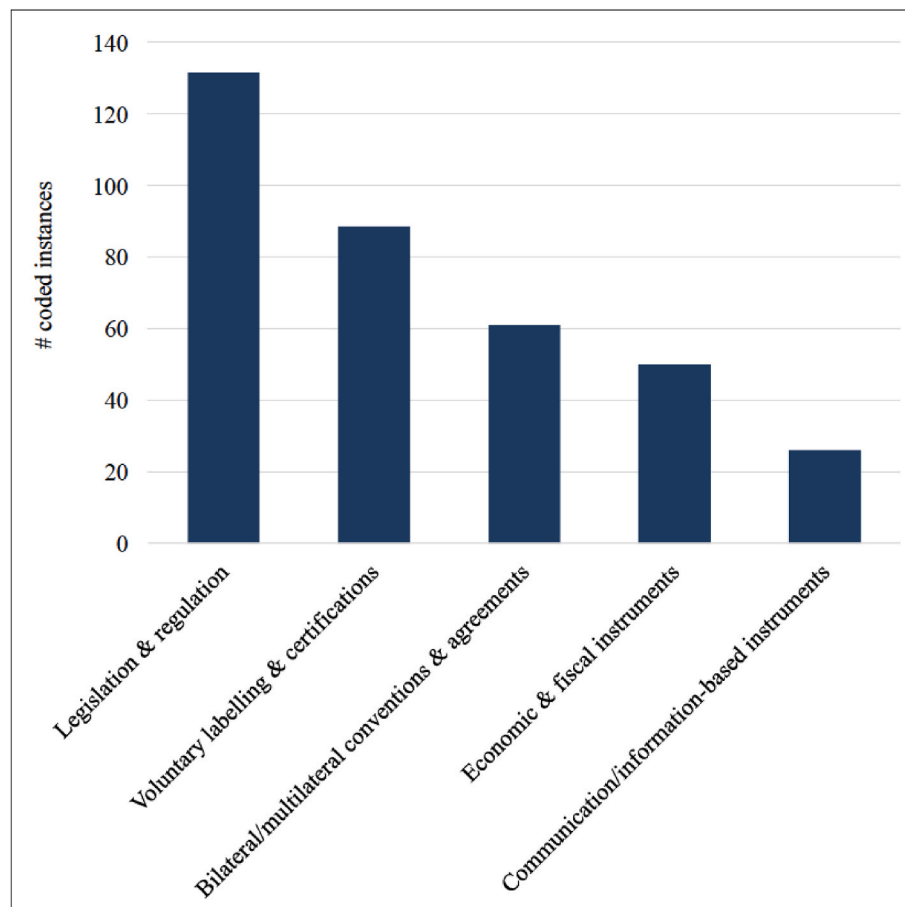


Fig. 10. Governance instruments studied in the 120 reviewed articles. Multiple instruments possible per article.

fiscal instruments (e.g., the Reduced Emissions from Deforestation and Degradation (REDD+) mechanism addressing forest carbon and conservation), and bilateral and multilateral conventions and agreements (e.g., the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, aimed at regulating trade in hazardous wastes). Communication and information-based instruments, like the Soja Plus program,<sup>7</sup> which provides training and capacity building on environmental regulation and impacts to Brazilian soy producers, are less widely studied.

Furthermore, Fig. 10 shows that voluntary labelling and certification instruments are also prominently studied in the reviewed literature. These instruments include, for example, standards and certification schemes and multi-stakeholder initiatives initiated by businesses and civil society organizations like the Forest Stewardship Council (FSC)<sup>8</sup> and the Roundtable on Sustainable Palm Oil (RSPO)<sup>9</sup>.

In assessing how categories of governance instruments map onto individual flows, we observe several patterns, as shown in Fig. 11. Although it is unclear whether such patterns reflect an uneven choice of instruments across flows or researchers' preferences, we find that articles addressing wastes, biofuels and forestry products tend to examine legislation and regulation, such as the German ElektroG (Elektro-und Elektronikgeräte-Gesetz) law on waste from electronic and electric equipment, the EU Renewable Energy Directive, and the Lacey Act. Labelling and certification appears to be virtually absent in articles studying waste flows. Moreover, articles on soy and palm oil flows tend

to focus on voluntary labelling and certification initiatives such as the Round Table on Responsible Soy (RTRS) and the RSPO.

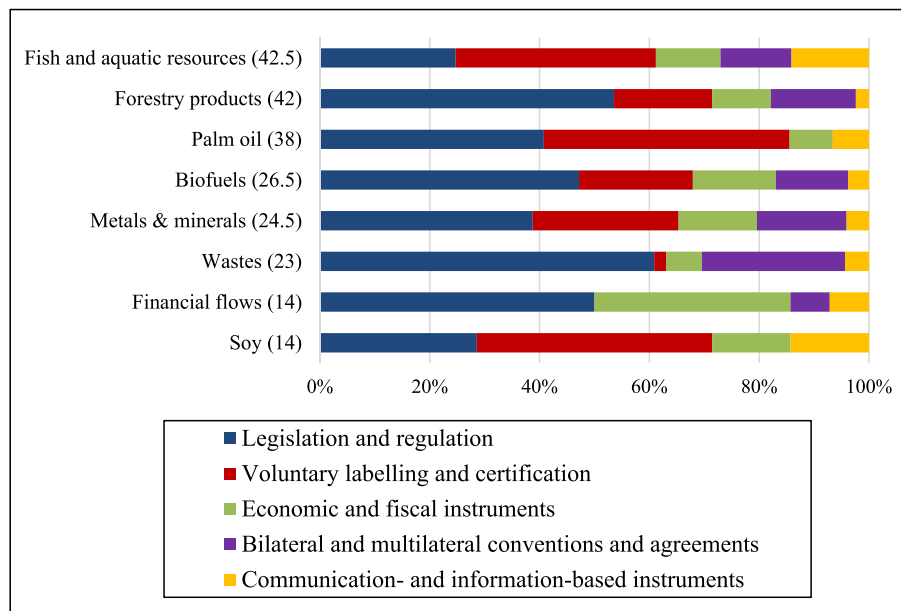
Several of the reviewed articles on palm oil have highlighted how voluntary labelling and certification initiatives for palm oil, such as the RSPO, are often designed to govern South-North trade in accordance with consumer demands in developed countries, and may thus be limited in their ability to address palm oil markets in developing countries (Dauvergne 2018; Schleifer and Sun 2018). Likewise, existing forestry sustainability certification initiatives, driven by consumer demands and Northern firms primarily in the US and the EU, may not secure environmental protection of forestry trade between African timber suppliers and Chinese manufacturers (Huang et al., 2013). Given the increasing importance of Chinese firms in the African timber trade, Huang et al. (2013) argue that these firms will be mostly concerned with their domestic market rather than applying consumer driven/Northern standards to the value chain.

Despite a perceived roll-back of the state, and a stronger role played by corporations and civil society groups in the social and environmental governance of flows (Lenschow et al., 2016), our results highlight that public instruments still play an important role in the environmental governance of telecoupled systems. For instance, in response to deforestation driven by agricultural expansion, the Argentinian government issued the national Law on Minimum Standards for Environmental Protection of Native Forests in 2007, which promotes forest conservation through territorial zoning and regulation of agricultural expansion (Krapovickas et al., 2016). Similarly, the EU Forest Law Enforcement Governance and Trade (FLEGT) action plan aims to reduce illegal logging in exporting countries by strengthening sustainable and legal forest management and trade in producing countries (Huang et al., 2013; Maryudi and Myers 2018; Sotirov et al., 2017). Research has also begun

<sup>7</sup> For details, see [www.sojaplus.com.br/en/sobre](http://www.sojaplus.com.br/en/sobre).

<sup>8</sup> For details, see <https://fsc.org/en/about-us/25-years-of-fsc>.

<sup>9</sup> For details, see <https://www.rspo.org/about>.

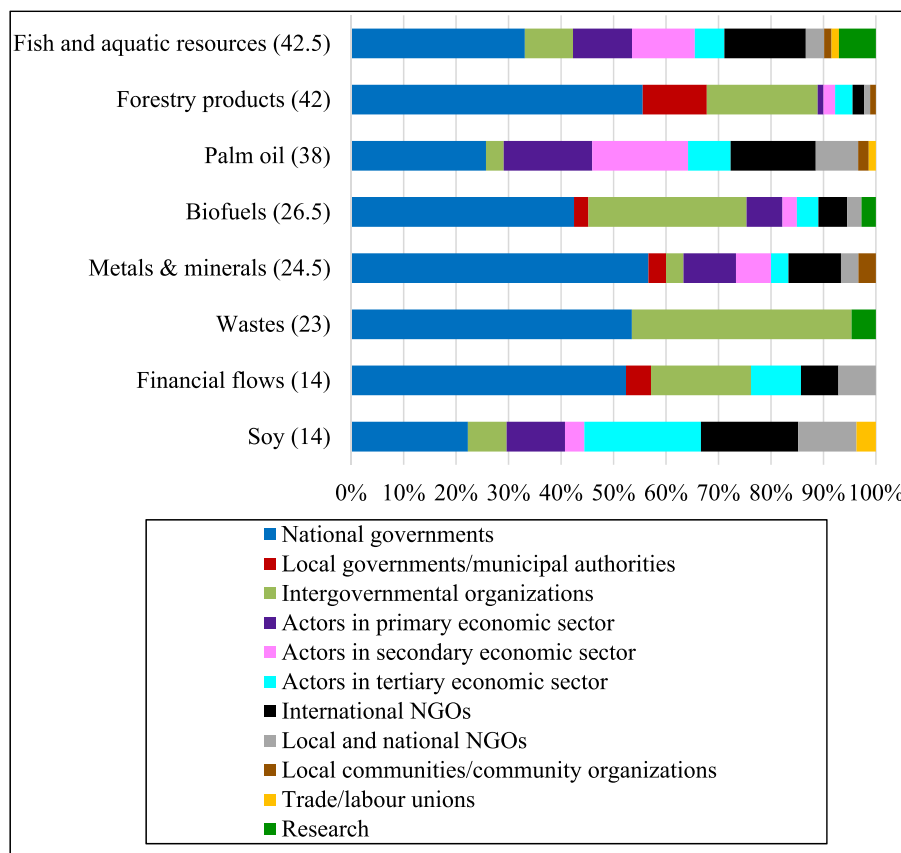


**Fig. 11.** Governance profile of selected flows. Numbers in brackets denote the total number of coded instances for all governance instruments identified in each selected flow category. Multiple instruments could be selected in one article per flow. This stacked bar chart illustrates the relative distribution of governance instruments per flow, meaning that the bars allow us to compare how prominently a certain governance instrument features in the governance profile of a given flow.

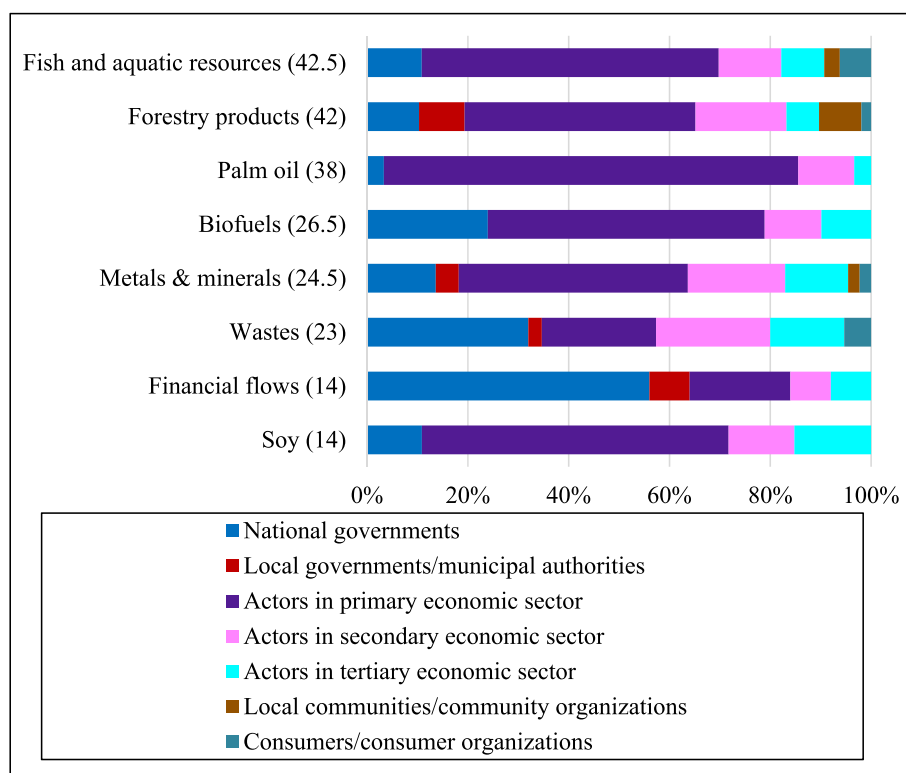
to examine emergent ‘Southern’ public standards like the Indonesian and Malaysian Sustainable Palm Oil standards (ISPO and MSPO), which may have the potential to become important governance responses to South-South telecoupling. *Schouten and Bitzer (2015, p. 176)* argue that “Southern actors are beginning to take up a new governance role by

developing their own standards in issue areas where Northern standards have tended to dominate”. This sees public sector actors in the Global South integrating more locally relevant interpretations of sustainability into flow-based governance instruments.

The role that public actors play in governing global flows is further



**Fig. 12.** Key actors in the governance of selected flows. The numbers in brackets denote the total number of governance instruments identified in relation to the respective flow category.



**Fig. 13.** Key addressees in the governance of selected flows. The numbers in brackets denote the total number of governance instruments identified in relation to the respective flow category.

shown in Fig. 12, which displays the main actors involved in the governance of selected flows. National governments are important actors in governing global flows where public governance instruments such as legislation and regulation have been prominently studied (e.g., wastes, biofuels, forestry products), but also in those flows where labelling and certification are particularly important (e.g., palm oil, soy). Actors in the primary economic sector, such as producers, are particularly relevant for governing flows of fish and aquatic resources, where labelling and certification instruments are prominent. In relation to palm oil flows, international non-governmental organizations (NGOs) such as the World Wide Fund for Nature (WWF) have played important roles, with WWF being one of the initiators of the RSPO (see also footnote 9), for example.

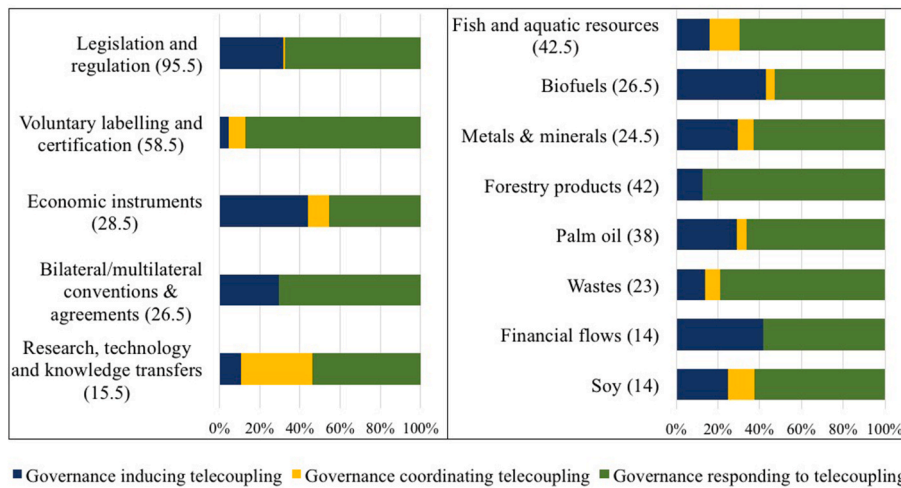
When focusing on the main addressees of governance instruments identified for the selected flows, public actors were less prominently studied than private businesses, as reflected in Fig. 13. Here, actors in the primary economic sector are particularly connected with those flows where labelling and certification are prominent governance instruments (e.g., fish and aquatic resources and palm oil), but also where public instruments are equally relevant (e.g., biofuels, forestry products, soy and metals and minerals). Actors in the secondary economic sector, such as manufacturers, are also relevant addressees in relation to flows of forestry products, fish and aquatic resources, metals and minerals, palm oil and wastes. National governments are relevant addressees in relation to the governance of financial flows and waste flows, while local governments and municipal authorities are particularly relevant addressees in relation to flows of forestry products.

As mentioned above, we conceptualize three different perspectives on how governance relates to telecoupling. By far most often, perspective 3 (governance responding to telecoupling) was studied with a total of 173.5 instances in the reviewed articles addressing the eight selected flows. Perspective 1 (governance inducing telecoupling) was examined in 61 instances, and perspective 2 (governance coordinating telecoupling) was found only in 16.5 instances. Fig. 14 focuses on these

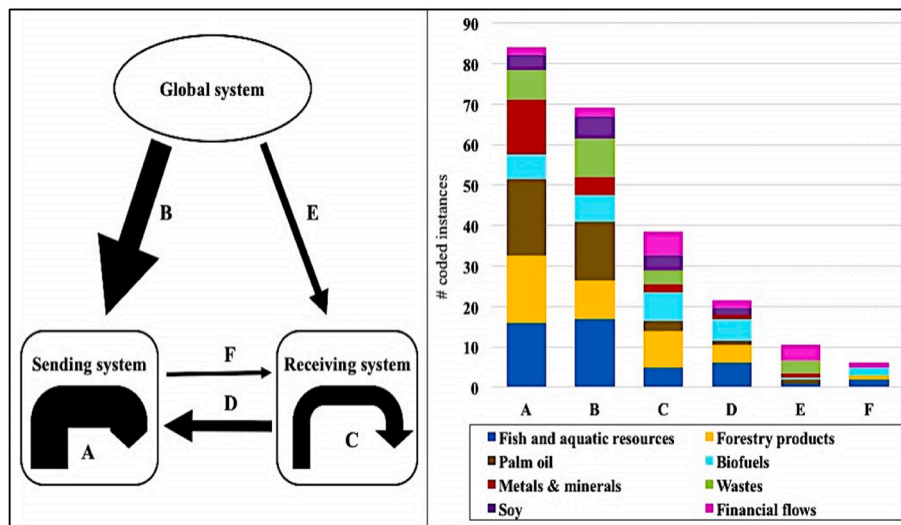
three perspectives as they relate to governance instruments (left) and selected flows (right) studied in the literature. Here we can observe that some public governance instruments, especially economic and fiscal instruments, are inducing telecoupling. An example of how governmental actors can actively promote development of telecoupled agricultural supply chains can be seen in South American soybean-producing countries that are promoting soy production in Southern Africa through free trade agreements and development cooperation, and most notably technology transfer projects (Gasparrini et al., 2016). Likewise, policy changes in a particular country can trigger the emergence of telecoupled systems. For instance, Liu (2014) states that China's entry into the WTO and associated liberalization of tariffs in the forest products sector, as well as the implementation of major national conservation programs in China, has increased China's imports of forestry products, driving both negative environmental impacts in exporting countries, and conservation of forests in China. Moreover, governance as communication and information-based instruments occurs relatively often to coordinate telecoupling. For example, tuna processors and the WWF established the International Sustainable Seafood Foundation in 2009 to coordinate and extend environmental governance practices throughout the tuna value chain (Havice and Campling 2017).

The governance of telecoupling is particularly complex, as different jurisdictions are involved and diverse flow-based and place-based forms of governance interact. Given the global nature of telecoupled flows, we might expect that governance occurs primarily at the global level, addressing both sending and receiving systems. However, this is not necessarily the case, as shown in Fig. 15. We do find that global governance interventions can target particular systems, such as the sending system (see arrow B on the left side of Fig. 15). For instance, waste flows (bar B, right side) are often governed from global to sending systems such as in the case of the 1989 Basel Convention on Transboundary Movement of Hazardous Wastes and their Disposal. Governance from global to receiving systems (arrow E) is less prominent and often occurs in combination with governance from global to sending





**Fig. 14.** Governance instruments by type i.e., inducing, coordinating or responding to telecoupling (left), and in relation to selected flows (right). Numbers in brackets indicate the number of coded instances per governance instrument in the selected flows (left) and the number of governance instruments in relation to the respective flow (right).



**Fig. 15.** Place and directionality of governance in selected flows. Left: Arrows depict whether governance interventions in a given system aim to create an impact cross-system (arrows D & F and B & E), or within a system (arrows A & C). Right: bars depict the variety of flows to which governance intervention types A-F apply.

systems. An example is the Extractive Industries Transparency Initiative,<sup>10</sup> a global standard that governs flows of metals and minerals, specifically of lithium, in both sending (i.e., South America and Australia) and receiving (i.e., Europe) systems (Prior et al., 2013).

Most of the reported governance interventions occur as place-based responses to global governance initiatives within the sending system (arrow A), and to a lesser extent within the receiving systems (arrow C). As an example of the latter, Foley (2017) investigates the case of the Iceland Responsible Fisheries certification program, and illustrates how Iceland established an alternative to global multi-stakeholder initiatives, such as the Marine Stewardship Council (MSC), within its jurisdictions. Other examples of place-based governance are the Chilean Salmon Task Force established in 2008 to coordinate and monitor the salmon industry (Bustos-Gallardo 2013), the Natural Forest Conservation Programme established in China in the late 1990s to restore and conserve natural forests (Liu 2014), and the ISPO and MSPO public standards on the

production of sustainable palm oil (Dauvergne 2018).

A governance intervention enacted in one place can directly target distant places that are outside the formal jurisdiction of the governance actor introducing the intervention (arrows D and F). A notable example of governance intervention from receiving to sending systems (arrow D) can be found in the EU Regulation to prevent, deter and eliminate illegal, unreported and unregulated fishing (Bellmann et al., 2016), which targets fish and aquatic resources trade (see bar D). Interestingly, governance interventions from sending to receiving systems (arrow F) often co-occur with interventions from receiving to sending systems (arrow D), such as the bilateral dialogues established between the EU and Brazil on environmental protection in biofuels trade (Renckens et al., 2017).

A key challenge for research on governance of telecoupling lies in the need to be attentive to global, macro-level drivers of local environmental change, while also identifying and assessing governance approaches and their consequences on the ground. In this sense, several of the articles reviewed here highlight the often complementary, reinforcing or conflicting interactions between public and private, as well as

<sup>10</sup> For more information, see <https://eiti.org/who-we-are>.

place-based and flow-based governance approaches. For instance, Schleifer and Sun (2018) emphasized that the Chinese government played an important role in promoting private sustainability standards for palm oil by adopting a policy on green consumption, which led some government agencies to partner with private standard-setting organizations, paving the way for eco-certification in the Chinese palm oil market. Lauwo et al. (2016) examined corporate social responsibility in the mining sector in Tanzania, and found that the government had established legal and regulatory frameworks on enhanced public accountability, ethical business practices and corporate disclosure. Yet, since the Tanzanian government lacked the necessary financial, legal and administrative resources to enforce these, NGOs have sought to fill the remaining regulatory gap. In contrast to this complementary role of state and non-state actions, public and private actors' interests can also conflict, leading to the undermining of governance institutions as in the example of the Indonesian Palm Oil Pledge (IPOP) (Dermawan and Hospes 2018). In 2014, several large palm oil producing companies made zero-deforestation commitments by signing the IPOP, but Indonesian politicians and government agencies openly criticized the IPOP for posing a danger to smallholders, not acknowledging government rules and priorities and functioning as an illegal cartel, which ultimately led to the dissolution of the IPOP in 2016 (ibid.).

## 5. Discussion and conclusions

In recent years, research addressing a variety of global flows connecting geographically distant places, examining their environmental impacts, and discussing their implications for environmental governance, has expanded. Based on the 120 articles reviewed here, we observe that the number of articles published per year has almost doubled between 2011 (12 articles) and 2018 (22 articles). Despite the fact that the majority of the reviewed articles study similar problems related to the lack of effectiveness of existing governance instruments in different global flows, scholarship in this broad field seems to be only tenuously connected, given the low number of mutual citations and co-authored articles, and the wide variety of theoretical lenses adopted. This poses obstacles to the cumulation of knowledge in this field. The heterogeneous nature of research on this topic may of course be valuable in advancing understanding, starting from diverse, but complementary theoretical and disciplinary perspectives to investigate economic, political, social and ecological drivers and responses to telecoupled flows. On the other hand, it may be timely to identify opportunities to more strongly integrate the various strands of research exploring the governance of telecoupling, to develop a common language for shared concerns, and to establish wider collaborations to study how telecoupling can be governed towards sustainability. Rather than merging or bridging the diverging theoretical perspectives, research might usefully harness the productive tensions between various approaches (Nielsen et al., 2019). In this sense, other conceptual frameworks that consider the linkages between multiple places, such as translocality or land use leakage, provide opportunities for cross-fertilization between different theoretical frameworks and could be employed to investigate the economic, environmental, social and cultural dynamics underpinning global commodity flows (Güneralp et al., 2013; Meyfroidt et al., 2018). The concept of translocality, for example, highlights the changeable character of (social) networks, which need to be actively created and maintained (Schapendonk 2015). This also points to the role of traders in global supply chains and the persistence of trade relationships (Grabs and Carodenuto 2021; Reis et al., 2020; Leijten et al., 2022). Although the telecoupling framework suggests that commodity flows have a clearly identifiable start and end, this may be hard to observe in reality, due to a lack of transparency and traceability in global commodity supply chains (Gardner et al., 2019). Teasing out the specific strengths of different conceptual frameworks will help the research community progress towards a more realistic and nuanced understanding of (governing) distant human-nature relationships. We hope that this study

helps pave the way towards a more integrated research agenda on the governance of telecoupled phenomena and more intensive collaboration and scholarly exchange as this research field continues to consolidate.

Our review identifies six cross-cutting themes and governance challenges emerging from our literature review, which, in our view, have not been investigated in detail but constitute promising avenues for advancing research on the topic. First, we found that previous research has largely evolved around the analysis of certain flows and prominent governance initiatives such as soy and palm oil and the two roundtables on Responsible Soy (RTRS) and Sustainable Palm Oil (RSPO). In contrast, flows not yet targeted by such initiatives have remained under-researched – even though they have significant environmental impacts. In general, the global trade in non-consumer-facing commodities, such as sand, phosphorus and uranium, has received little attention with regard to governance, even though these commodities often have harmful local environmental impacts (Torres et al., 2017; Nesme et al., 2018; Larsen and Mamosso 2014). We contend that to understand the governance implications of telecoupling, it is necessary to pursue a problem-centered approach, starting from the environmental impacts of telecoupled flows, rather than examining existing governance instruments and institutions in the first instance. On this basis, research would be well positioned to investigate which governance arrangements are in place to tackle these environmental problems and how they function and perform in practice.

Second, efforts to decouple economic growth and environmental degradation may drive telecoupling. The literature reviewed in this study recognizes that global flows reach around the world ever more rapidly, making it increasingly possible to shift environmental burdens from one place to another – usually from countries of the Global North to countries of the Global South. The majority of the studied flows originate in countries of the Global South, as shown in Fig. 8, where negative socio-ecological impacts predominate (Fig. 9), and are directed towards places of consumption in the Global North. Previous research has recognized the risk that decoupling of economic growth from resource use and/or emissions in the Global North may lead to the displacement of environmental impacts to distant places in the Global South (e.g., Dauvergne 2010; Wiedmann and Lenzen 2018; Jiborn et al., 2018; Sanyé-Mengual et al., 2019). This dynamic lends itself to analysis from a telecoupling perspective, yet studies on telecoupling have often only implicitly acknowledged how processes of decoupling in one jurisdiction may result in the creation or intensification of telecoupling between that jurisdiction and distant places. Given the urgent need to better understand and address diverse sustainability impacts that manifest in sending and receiving systems as well as globally, future research that studies interrelated impacts at opposite 'ends' of telecoupled flows and in spillover systems is needed.

A third aspect to emerge from our review is that effective environmental governance of telecoupling between countries of the Global South will likely become more important for global environmental sustainability, given the rapidly growing demands for natural resources and raw materials from emerging markets in the Global South. Most of the global flows reported in the reviewed articles originate in countries of the Global South and, although the majority of them are directed towards the Global North, South-South trade is becoming ever more important (Fig. 8). For instance, China is nowadays the main importer of beef and soy from Brazil, while India and China are the main importers of palm oil from Indonesia.<sup>11</sup> Since South-South telecouplings are a growing phenomenon, with China and Brazil leading the way (Gasparri et al., 2016), governance responses need to be adapted or developed to effectively address these new developments. As outlined in section 4, existing Northern consumer-driven governance initiatives like labelling and certification may be less relevant and effective in countries of the Global South, where consumer demand for social and environmental

<sup>11</sup> See TRASE database at: <https://trase.earth>.

standards is (at least currently) comparatively lower than in markets of the Global North. These trends highlight the need for further research into emergent environmental governance arrangements in the Global South, which could provide more tailored and appropriate solutions to sustainability problems in the Global South and present alternatives to governance initiatives developed in the Global North.

Fourth, while previous research has described the growing role of private initiatives in the governance of global flows, this review shows that national governments and public policies such as legislation and regulation continue to play a crucial role as illustrated in Figs. 11 and 12. On the one hand, state actors from sending and receiving systems assume important roles in addressing the negative environmental impacts of global flows in telecoupled systems. With reference to the emergence of supply chain regulations from receiving systems, including new mandatory due diligence policies, scholars have even declared a 'return of the state' in the governance of global commodity chains (see Partzsch 2020; Schilling-Va-caflor and Lenschow 2021). On the other hand, our study has highlighted the importance of examining the state not only in its role in addressing sustainability problems, but also in its role in inducing and exacerbating telecoupled phenomena and their negative externalities. To enhance the effectiveness of environmental governance in global telecoupling, it will be crucial to ensure better policy coherence between different policy fields such as investment, trade and environmental policies. For example, in the case of the European Green Deal, improved effectiveness will mean inclusion of stringent measures to avoid displacement of the impacts of largely unsustainable European consumption to distant places, and the associated social and ecological costs (Fuchs et al., 2020).

Fifth, the emergence of transnational forms of governance reflects how regulatory scales increasingly transcend national territories and borders. While this is of course not an entirely recent development, attempts to govern globally telecoupled flows have exacerbated this situation. In telecoupled systems, authorities tasked with addressing a particular environmental problem may have no jurisdiction over the underlying cause of the problem (Ingold et al., 2019). This gives rise to a situation in which telecoupled systems are often governed by institutions and actors at multiple levels. In other words, governance of telecoupling tends to be polycentric (Oberlack et al., 2018), which gives rise to problems of policy coherence. Our study shows that diverse governance instruments often co-exist in relation to particular flows (Fig. 11), and interact across different levels of governance (Fig. 15). This highlights the need to pay close attention to the potentially reinforcing or counteracting interactions between different public and private governance instruments and across levels of governance. Moreover, many articles from our review mention the importance of the interactions between place-based and flow-based governance, without discussing specific patterns of interaction in detail. Thus, the multiple ways in which place-based and flow-based governance interventions – with their potentially territorially distant causes and effects – can interact, makes the governance of telecoupled systems a highly challenging and complex task that merits further in-depth and comparative research as well as the development of new concepts and theories.

Sixth, and finally, our review identifies rather different governance patterns across flows. For instance, recalling Fig. 11, state regulation and bi- and multi-lateral agreements dominate the governance of waste flows, whereas voluntary agreements and certification stand out in the governance of fish and soy flows. Future research should seek to confirm whether these observations reflect the empirical reality of governance across flows, or merely point to the uneven nature of research clusters. Given that different governance patterns are likely required to address different flows, we suggest that there is a need for comparative research in telecoupling governance. On the one hand, such research might test for flow-specific functional needs, for example, whether the toxicity of waste influences governance choices. On the other hand, inquiry might usefully be directed towards the social, political, cultural or economic foundations influencing the demand and supply of governance, such as the role of consumers, market structure, or the framing of problems as regionally specific or shared. At present, we know relatively little about what explains patterns of

hard versus soft governance, publicly- or privately-led governance, or the dominance of the local, national or international level in governance across different flows. Ultimately, such inquiries will inform decision-making on (combinations of) governance arrangements that may best address environmental problems in complex telecoupled settings.

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## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.esg.2022.100142>.

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**Online supplementary material for:** Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda

**Appendix A**

We searched the Scopus bibliographic database on 9 April 2019, applying the following search string:

(TITLE-ABS-KEY (telecoupl\* OR tele-coupl\* OR teleconnect\* OR tele-connect\* OR globali\* OR "commodity chain\*" OR (global\* w/2 chain\*) OR (global\* w/2 govern\*) OR "global production network\*" OR (global\* AND flow\* )) AND TITLE-ABS-KEY (govern\* OR policy OR policies OR polit\* OR planning) AND TITLE-ABS-KEY (sustainab\* OR environment\* OR ecolog\* OR pollut\* OR water OR waste\* OR deforest\* OR forest\* OR biodivers\* OR emission\* OR soil\* OR air OR landscape\* OR "natural resource\*" OR ocean\* OR "coastal zone\*" OR "climate change" OR wildlife OR ecosystem\* OR toxic)) AND (LIMIT-TO (SRCTYPE,"j" ) ) AND ( LIMIT-TO ( DOCTYPE,"ar" ) OR LIMIT-TO ( DOCTYPE,"re" ) ) AND (EXCLUDE (SUBJAREA,"ARTS" ) OR EXCLUDE ( SUBJAREA,"ENGI" ) OR EXCLUDE ( SUBJAREA,"MEDI" ) OR EXCLUDE ( SUBJAREA,"COMP" ) OR EXCLUDE ( SUBJAREA,"PSYC" ) OR EXCLUDE ( SUBJAREA,"BIOC" ) OR EXCLUDE ( SUBJAREA,"PHAR" ) OR EXCLUDE ( SUBJAREA,"CENG" ) OR EXCLUDE ( SUBJAREA,"MATH" ) OR EXCLUDE ( SUBJAREA,"NURS" ) OR EXCLUDE ( SUBJAREA,"MATE" ) OR EXCLUDE ( SUBJAREA,"PHYS" ) OR EXCLUDE ( SUBJAREA,"DENT" ) OR EXCLUDE ( SUBJAREA,"HEAL" ) OR EXCLUDE ( SUBJAREA,"VETE" ) ) AND (EXCLUDE (PUBYEAR,2019) ) AND (LIMIT-TO ( LANGUAGE, "English" ) ) AND ( LIMIT-TO ( SUBJAREA,"SOCI" ) OR LIMIT-TO ( SUBJAREA,"ENVI" ) OR LIMIT-TO ( SUBJAREA,"ECON" ) )

**Appendix B**

| Category            | Variables and dimensions  | Operationalization  |
|---------------------|---|---|
| General information | Author(s), title, year of publication, journal name                                       |   |
|                     | Theoretical framework(s)<br><i>[Coders could identify up to 4 frameworks per article]</i> | Land System science, Telecoupling, Environmental Flows, Scalar Governance, Political Ecology, Transboundary Governance, Global Value Chains, Transnational Private Governance, Global Environmental Governance, Critical Political Economy. |
| Global flows        | Flow(s)<br><i>[Coders could identify up to 5 flows per article]</i>                       | Main and additional flows. Coders selected one main flow per article, and could add up to three additional flows if mentioned in the text.  |
|                     | Geographical scale of studied flow(s)<br><i>[Coded per identified flow]</i>               | Transboundary, intra-regional, inter-regional/global flows. With “regional” scale of flows we refer to world regions, which we described as “geographical areas” and that   |

|                       |  |  |
|-----------------------|--|--|
|                       |  | could be selected by coders to identify the sending, receiving and spillover systems of the flows studied in each article.   |
|                       | Geographical area(s) and counties involved<br><i>[Coded per identified flow]</i>   | The geographical areas specified in the codebook were: North America; Caribbean and Latin America; Europe; Middle East and North Africa; Sub-Saharan Africa; Russian Sphere; Central Asia; South Asia, East Asia; Southeast Asia; Australia and Pacific; unspecified/global.   |
|                       | Direction of telecoupling<br><i>[Coded per identified flow]</i>  | In assessing the direction of global flows, coders selected from four options indicating sending and receiving systems, namely Global North-Global South; Global North-Global North; Global South-Global South; Global South-Global North. To assess the distribution of countries in one group or the other, we took as a threshold the preliminary conditions for OECD membership: open and transparent market-based economy, pluralist democracy, rule of law and protection of human rights (OECD 2019). Hence, “Global North” encompasses all OECD countries while “Global South” all non-OECD countries.   |
| Environmental impacts | Environmental impacts<br><i>[Coded per identified flow and connected geographical areas]</i>                             | Positive or negative.  |
|                       | Geographical scale of environmental impacts<br><i>[Coded per identified flow and connected geographical areas]</i>       | Sub-national, national, regional, global.  |
|                       | Specification of environmental impacts per system<br><i>[Coded per identified flow and connected geographical areas]</i> | To assess land use impacts we particularly looked at permanent or temporary change in land use, landscape, land cover or topography including increases in intensity of land use; for soil condition at quantities, depths, humidity, stability or erosion of soils; for biodiversity at loss of biodiversity or loss of biodiversity-rich areas; for air pollution at dust from the handling of materials including construction materials, sewage, and waste or emission of air pollutants; for water quality and quantity at abstraction or transfer of water from ground or surface waters, changes in quantities, flows or levels of rivers, lakes, groundwater, estuaries, coastal waters or the sea, at more general water pollution as well as |

|            |   |  |
|------------|---|--|
|            |   | eutrophication or acidification of waters; for GHG emissions at CO2 emissions from combustion of fossil fuels or land use change such as deforestation as well as methane emissions from agriculture; for habitat integrity at fragmentation or disturbance of habitats; and finally, for species dynamics at the introduction of alien species.   |
| Governance | Governance instruments<br><i>[Coders could identify up to 5 instruments per article linked to the identified flows]</i> | The codebook specified categories of governance instruments: legal proceedings; public-private partnerships; legislation and regulation; research, technology and knowledge transfers; voluntary certification, labelling, commitment and reporting; bilateral and multilateral conventions and agreements.  |
|            | Perspectives on governance<br><i>[Coded per instrument]</i>   | 1) Governance that induces telecoupling, 2) Governance that coordinates and organizes telecoupling, 3) Governance that responds to telecoupling.   |
|            | Governance actors and addressees<br><i>[Coded per instrument]</i>   | National governments, international organizations, actors in primary sector, actors in secondary sector, actors in tertiary sector, international nongovernmental organizations (NGOs), local and national NGOs, local communities and community organizations, local governments and municipal authorities, consumers and consumer organizations. |
|            | Place of governance<br><i>[Coded per instrument]</i>  | By “place of governance” we refer to the systems where governance takes place, including a specification of directionality from one system to the other. The codebook specified multiple combinations between sending, receiving, overarching (global) and spillover systems.  |
|            | Governance challenges<br><i>[Coded per article]</i>   | Knowledge deficits, diverging interests, high transaction costs, policy incoherence and fragmentation, weak legitimacy base.   |

**Table B.1:** Overview of the coding scheme

## Appendix C

List of the 120 reviewed articles:

- Ahmad, N. B. (2017). Blood biofuels. *Duke Environmental Law and Policy Forum*, 27(2), 265-315.
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### **Article 3:** Environmental Governance of China's Belt and Road Initiative

#### **Abstract**

China's Belt and Road Initiative (BRI), launched in 2013, is rapidly subsuming much of China's political and economic involvement abroad. As a far-reaching infrastructure development and investment strategy, officially involving more than 130 countries, the expansion of the BRI raises important questions about its environmental impacts and its implications for environmental governance. This article examines how China is actively and rapidly developing an institutional architecture for its envisioned “green BRI,” considering the key actors, policies, and initiatives involved in the environmental governance of the BRI. We find that the current institutional architecture of the “green BRI” relies on voluntary corporate self-governance and a multitude of international and transnational sustainability initiatives. The effectiveness of the environmental governance of the BRI not only hinges on China's priorities and commitments, but also on the political willingness and capacity of BRI partner countries to maintain, implement, and enforce stringent environmental laws and regulations. We conclude by outlining several environmental governance challenges and an agenda for future research.

## RESEARCH ARTICLE

## Environmental Governance of China's Belt and Road Initiative

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## Abstract

China's Belt and Road Initiative (BRI), launched in 2013, is rapidly subsuming much of China's political and economic involvement abroad. As a far-reaching infrastructure development and investment strategy, officially involving more than 130 countries, the expansion of the BRI raises important questions about its environmental impacts and its implications for environmental governance. This article examines how China is actively and rapidly developing an institutional architecture for its envisioned "green BRI," considering the key actors, policies, and initiatives involved in the environmental governance of the BRI. We find that the current institutional architecture of the "green BRI" relies on voluntary corporate self-governance and a multitude of international and transnational sustainability initiatives. The effectiveness of the environmental governance of the BRI not only hinges on China's priorities and commitments, but also on the political willingness and capacity of BRI partner countries to maintain, implement, and enforce stringent environmental laws and regulations. We conclude by outlining several environmental governance challenges and an agenda for future research.

## KEYWORDS

environmental policy, global environmental governance, new silk road, sustainable development, telecoupling

## 1 | INTRODUCTION

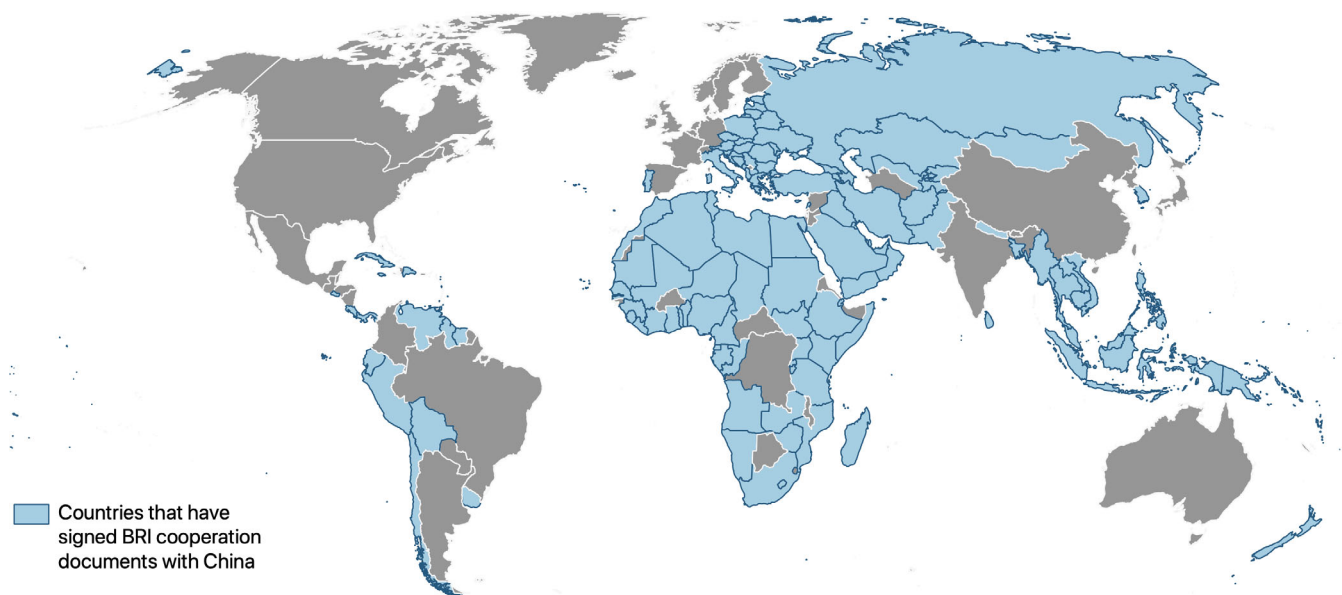
In 2013, the Chinese President Xi Jinping launched the Belt and Road Initiative (BRI) to improve regional and trans-continental cooperation and connectivity through investments, trade, and infrastructure projects. Under the umbrella of the BRI, China invests in transport and energy infrastructure, such as railways, roads, ports, airports and pipelines across the Eurasian, Asian, and African continents via the land-based "Silk Road Economic Belt" and the "twenty-first century Maritime Silk Road." The BRI is intended to extend beyond infrastructure construction to encompass policy coordination, trade facilitation, financial integration, and cultural and scientific exchange

(NDRC, 2015). Chinese policy banks and state-owned commercial banks provide the largest sources of funding for the BRI, totaling at least USD 500 billion by 2019, while additional investments are made by Chinese companies, non-Chinese companies and banks, international organizations, and governments of partner countries (European Union Chamber of Commerce in China, 2020).

Today, most social or economic cooperation agreements, plans, or projects between China and foreign countries are framed as BRI-related activities (Zhang, 2018). As of January 2020, the Chinese government had signed 200 cooperation documents with 138 countries and 30 international organizations (Figure 1). Since the BRI is still expanding, and an official registry of all BRI projects does not exist, it

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**FIGURE 1** Countries that have signed cooperation documents with China to jointly build the Belt and Road. Data retrieved from Belt and Road Portal (2019) [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

remains challenging to pinpoint the geographical scope and full number of BRI projects. Even countries that have not signed bilateral cooperation documents on jointly building the BRI with China (Figure 1) may be considered part of the BRI, such as Turkmenistan (Xinhua, 2017c).

Given the unprecedented dimension of this initiative, scholars and civil society organizations have voiced concerns about its actual and potential negative environmental impacts (Ascensão et al., 2018; Teo et al., 2019; Tracy, Shvarts, Simonov, & Babenko, 2017; WWF, 2017). Protecting the environment while fostering economic development under the BRI will be challenging, as the initiative traverses a diverse range of fragile environments. Biophysical conditions range from forests and steppes in Russia, to ice, snow, and permafrost across the Tibetan Plateau, and tropical rainforests in Malaysia. Partly in response to growing international criticism, several Chinese ministries collectively issued policies on the “green Belt and Road” or “green Silk Road”<sup>1</sup> (Belt and Road Portal, 2017a, 2017b) to respond “to the international trend of seeking green, low-carbon and circular development” (Belt and Road Portal, 2017a, section 1.2). After launching high-level domestic policy commitments to achieving an “ecological civilization,”<sup>2</sup> China is now increasingly making efforts to mainstream this policy paradigm in its international activities (Belt and Road Portal, 2017a).

To date, most research on the BRI has focused on geopolitical and geo-economic impacts, centering on the question of international order. The BRI is seen as part of a new phase of globalization in which China plays a more active role (Gao, 2018; Kolosov et al., 2017; Liu & Dunford, 2016). Scholars widely agree that the BRI, if implemented as planned, will rewrite the current geopolitical landscape (Beeson, 2018; Du, 2016; Fallon, 2015; Minghao, 2016). In contrast, environmental issues have attracted less attention, and

research on the environmental governance challenges and institutional structures arising as part of the “green BRI” remains sparse (Hughes et al., 2020).

This article provides an initial assessment of the emerging environmental governance architecture of the BRI, which comprises organizations, regimes, and other forms or norms, principles, regulations and decision-making procedures (Biermann, Pattberg, van Asselt, & Zelli, 2009). We address the question of how Chinese, BRI-host country, and international and transnational institutions contribute to the environmental governance of the BRI. Since the BRI is governed by multiple independent but interacting governance arrangements, it is crucial to examine the governance architecture of the BRI rather than the design and effectiveness of individual institutions. In this we follow Dauvergne and Clapp (2016), who argue that global environmental governance scholarship focuses too narrowly on specific existing international governance schemes and may therefore miss important developments concerning new environmental issues that are not yet the subject of sophisticated governance frameworks. We restrict this analysis to formal institutions; thus, we do not consider the role of social norms or implicit rules. Our insights are drawn from official government documents, published peer-reviewed literature, media articles, reports, and working papers published in English. Even though the use of Chinese sources could have improved this work, all of the cited BRI-specific policy documents are available in English. The BRI is a young, fast-developing initiative that requires more empirical and joint research effort by both Chinese and non-Chinese scholars.

After outlining the major environmental risks and opportunities of the BRI, we present the emerging environmental governance architecture of the BRI. Then, we discuss three key governance challenges, and the role of the BRI in global environmental governance. Finally,



we outline a future research agenda for analyzing environmental governance of the BRI.

## 2 | ENVIRONMENTAL CHALLENGES AND OPPORTUNITIES OF THE BRI

There are two overarching perspectives on the prospects of the BRI to contribute to sustainable development. From one point of view, scholars, policy analysts, and politicians see the BRI as an opportunity for sustainable development (Dong, Yang, & Li, 2018; Jin, 2018; UNDP & CCIEE, 2017). At the first BRI Forum in 2017, the Chinese President Xi Jinping emphasized “efforts should be made to strengthen cooperation in ecological and environmental protection and build a sound ecosystem so as to realize the goals set by the 2030 Agenda for Sustainable Development” (Xinhua, 2017a). Green trade (i.e., cap and trade mechanisms), finance and investment, as well as green technology and innovation, are seen as the key mechanisms through which the BRI can accelerate progress in achieving the Sustainable Development Goals (SDGs) (UNDP & CCIEE, 2017). Chinese financial institutions could provide financial resources to BRI countries to implement their Nationally Determined Contributions under the Paris Agreement (Zhou, Gilbert, Wang, Muñoz Cabré, & Gallagher, 2018). As the world's largest supplier of renewable energy equipment, China could help to unlock the huge renewable energy potential of BRI countries (Andrews-Speed & Zhang, 2018; Chen et al., 2019), and share its knowledge and expertise on how to adjust policy targets, change subsidy structures, and reduce power wastage (Eyler, 2019). The Digital Silk Road,<sup>3</sup> which aims, for example, to build a network for collecting and sharing Earth observation data, could improve environmental monitoring and support sound policy-making in BRI countries (Guo et al., 2018). From this perspective, the BRI could thus contribute to the Paris Agreement and the SDGs, but concrete empirical demonstrations have not yet been explored.

From another point of view, observers are concerned about the environmental risks that the BRI poses. Infrastructure development, trade, and investments under the BRI could bring unprecedented negative environmental impacts that may outweigh its economic benefits (Li, Qian, & Zhou, 2017). The potential impacts of the BRI are manifold. Infrastructure projects have direct effects on ecosystems and wildlife, but also indirect effects such as attracting logging, poaching, and settlement (Teo et al., 2019), contributing to deforestation and other land use changes (Losos, Pfaff, Olander, Mason, & Morgan, 2019). The BRI may drive biodiversity loss due to fragmentation and degradation of habitats (Ascensão et al., 2018; Lechner, Chan, & Campos-Arceiz, 2018; WWF, 2017), and increase greenhouse gas emissions due to the construction and maintenance of transportation infrastructure and further Chinese investment in coal-fired power plants (Zhang, Liu, Zheng, & Xue, 2017; Zhou et al., 2018). It could also accelerate extraction of natural resources, such as water, sand, and ferrous metal ores in countries along the BRI (Howard & Howard, 2016; Hughes, 2019; Suocheng et al., 2017). These

environmental problems are neither exhaustive nor exclusive to the BRI, but without effective environmental governance, infrastructure investments and other development projects can cause direct and indirect environmental impacts.

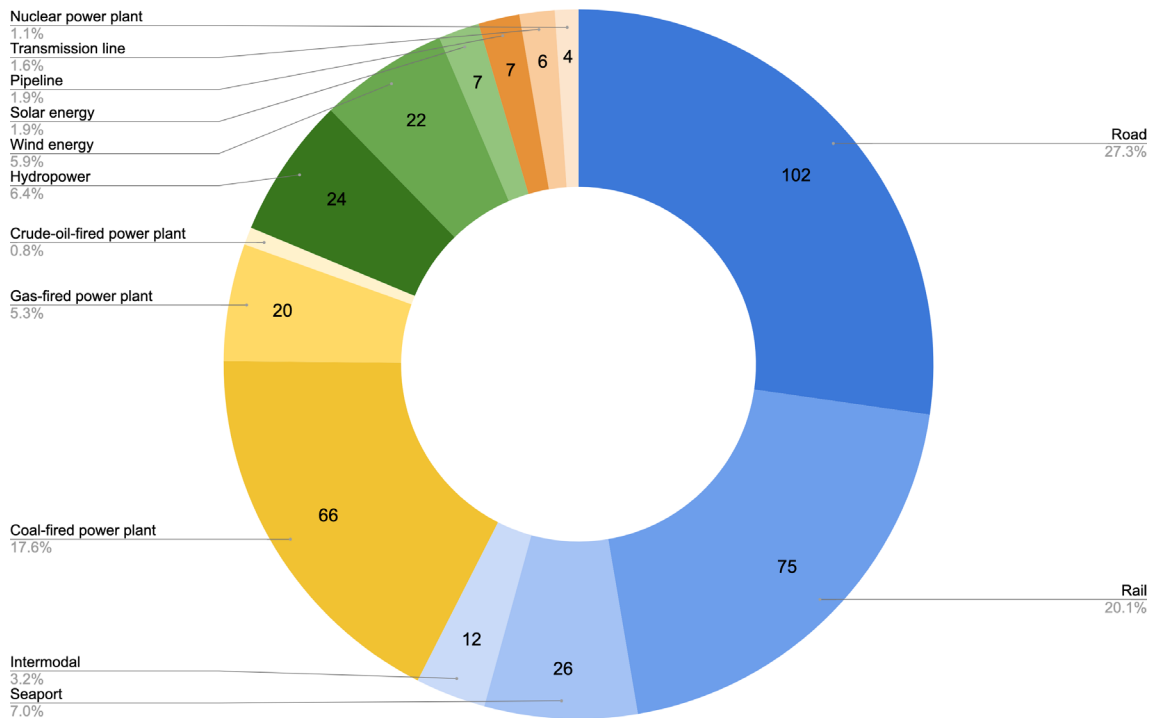
The difficulty of defining the scope and size of the BRI and its related activities makes it challenging to draw clear, evidence-based conclusions about the environmental effects of the BRI on a global scale. According to research by the Mercator Institute for China Studies (MERICS), about two-thirds of Chinese spending on completed BRI projects was directed at the energy sector (more than USD 50 billion), of which more than USD 20 billion were invested in renewable energy projects, followed by fossil-fuel energy generation projects (about USD 15 billion) and grid investments (about USD 12 billion). Several large hydropower projects contribute to higher overall investments in renewables. Additionally, USD 15 billion were spent on transport projects and USD 10 billion on the Digital Silk Road (Eder & Mardell, 2019).

In Figures 2 and 3, we analyze 374 BRI projects across 51 countries, which have been identified by the Reconnecting Asia Database (CSIS, 2020). We find that most BRI projects concern the transport sector (215 projects), followed by the energy sector (159 projects). Despite China's leadership in renewable energy manufacturing and deployment (Andrews-Speed & Zhang, 2018), the majority of energy projects are still related to fossil-fuels. Although the two figures provide only a snapshot of all BRI projects and deviate from the research results by MERICS, they contribute towards clarifying the scope of the BRI, given the paucity of official information. The funding for the 300 projects for which data is available amounts to about USD 500 billion (Figure 3). Pakistan, Bangladesh, China, Indonesia, and Cambodia are the top five recipients of BRI project funding. The overall highest costs are reported for BRI projects in Pakistan, China, Russia, Bangladesh, and Belarus.

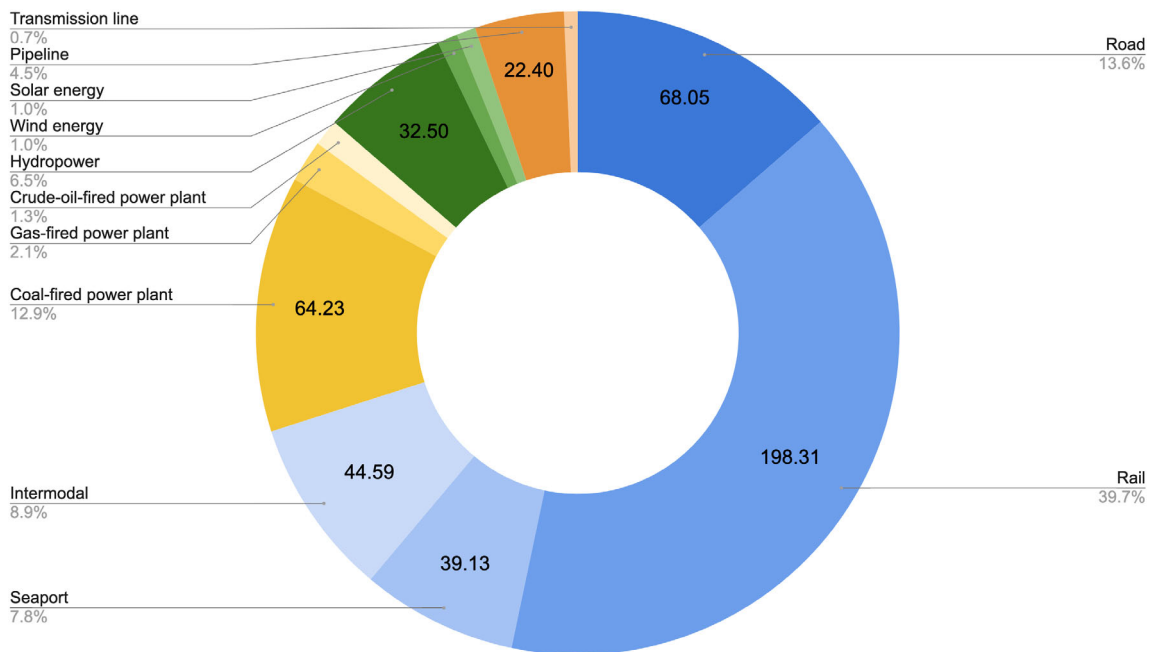
## 3 | ENVIRONMENTAL GOVERNANCE ARCHITECTURE OF THE BRI

China's endeavor to build hard infrastructure across the world is accompanied by efforts to develop the necessary soft infrastructure such as the “green BRI,” to provide governance structures to coordinate and implement BRI activities. Governance implies finding collective solutions to problems that involve multiple actors and are too complex to be addressed by individuals, groups of individuals, or non-state actors (Young et al., 2015). Kooiman (1993) defines governance as the patterns that emerge from all those activities of social, political, and administrative actors to guide, steer, control, and manage societies. Research on environmental governance is concerned with “the set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes” (Lemos & Agrawal, 2006, p. 298).

In our analysis of the environmental governance architecture of the BRI, we focus on institutions, defined as “persistent and connected sets of rules and practices that prescribe behavioral roles, constrain activity, and shape expectations” (Keohane, 1989, p. 3). The



**FIGURE 2** Type of Belt and Road Initiative projects in 51 countries (n = 374). Transport (blue), fossil-fuel energy (yellow), renewable energy (green), other energy (orange) [Colour figure can be viewed at wileyonlinelibrary.com]



**FIGURE 3** Reported costs (in USD billion) of Belt and Road Initiative projects (n = 300). Transport (blue), fossil-fuel energy (yellow), renewable energy (green), other energy (orange) [Colour figure can be viewed at wileyonlinelibrary.com]

concept of governance architecture allows us to analyze an issue area, which is regulated by more than one institution. All governance architectures are fragmented to some degree because they consist of different parts that are rarely ever fully interlinked or integrated (Biermann et al., 2009). This is clearly applicable to the “green BRI”, as

it is governed by multiple independent public and private governance institutions from China, BRI host countries, and the international realm. While some scholars rely on the notion of fragmentation to analyze these complex governance systems (Biermann et al., 2009), others adopt the perspective of polycentricity, emphasizing the

system's ability to self-organize (Ostrom, 2005). Focusing on the wider governance architecture helps keep us alert to overarching trends in environmental governance, such as the emergence of new multi-stakeholder modes of governance, and their more or less integrated coexistence with traditional forms of state-based governance (Cashore, 2002; Folke et al., 2019; Newell, Pattberg, & Schroeder, 2012), as well as interactions of multiple institutions across horizontal and vertical governance levels (Gehring & Oberthür, 2009; Schreurs, 2017). Increasing long-distance flows of traded goods, capital, and foreign direct investment (FDI) pose governance challenges that are difficult for national public authorities to address alone, but require interstate collaboration and actions by civil society and market actors (Challies, Newig, & Lenschow, 2019). In our analysis, we draw on these theoretical perspectives in assessing the environmental governance of the BRI by considering the role of non-environmental institutions such as banks, the interactions between the BRI institutions and established international governance institutions, and the use of non-mandatory policy instruments.

### 3.1 | Chinese institutions governing the “Green BRI”

The formulation and implementation of BRI activities take place across multiple actors and multiple levels, including various Chinese

government ministries and organizations under the State Council (Figure 4), banking institutions, as well as state-owned and private corporate actors.

China has developed a complex institutional framework for environmental protection in the context of the BRI, which is composed of BRI-specific and BRI-related policies. In addition to the official guidelines of government authorities, industrial associations and business networks have issued environmental guidelines, many of which are based on international guidelines developed by the Organisation for Economic Co-operation and Development (OECD) or United Nations (UN) (Table 1). Unlike enforceable laws and regulations, these policies and guidelines are voluntary, primarily outlining aspirational goals and visions. China proactively engages with stakeholders from BRI host countries using soft law, that is, nearly all the sources of BRI-specific rules are legally non-binding informal documents rather than formal treaties (Wang, 2019). The two core policy documents on the BRI are the “Visions and Actions on Jointly Building Silk Road Economic Belt and 21st Century Maritime Silk Road” and the “Vision for Maritime Cooperation under the Belt and Road Initiative,” published in 2015 and 2017, respectively (NDRC, 2015; Xinhua, 2017b). Both vision documents state that the BRI should increase exchange and cooperation on ecological protection, but provide no regulatory provisions for achieving these aspirations.

The most relevant policies on environmental governance of the BRI are the “Guidance on promoting a green Belt and Road” and the



**FIGURE 4** Key Chinese governance entities involved in the environmental governance of the Belt and Road Initiative (non-exhaustive). Sources: Ministry of Foreign Affairs (2019); National People's Congress Observer (2018), Ren, Zhang, Zhu, and Zhang (2017), Rolland (2018), Yu (2018)



**TABLE 1** Key policies and guidelines governing the environmental aspects of the Belt and Road Initiative (BRI). A short description of all documents can be found in the Appendix S1. The table includes policies and guidelines that do not refer explicitly to the BRI, but are related to the BRI by governing environmental dimensions of Chinese trade and investment. A full overview of regulations governing Chinese outward foreign direct investment (FDI) can be found in Gallagher and Qi (2018)

| Scope   | Title   | Year  |      |
|---|---|---|------|
| Policies and guidelines issued by government authorities  |   |   |      |
| BRI-specific  | Visions and actions on jointly building Silk Road Economic Belt and 21st century Maritime Silk Road   | 2015  |      |
|   | Building the belt and road: Concepts, practices and China's contributions   | 2017  |      |
|   | Guidance on promoting a green belt and road   | 2017  |      |
|   | Vision for maritime cooperation under the belt and road initiative  | 2017  |      |
|   | The belt and road ecological and environmental cooperation plan   | 2017  |      |
|   | Vision and actions on agriculture cooperation in jointly building silk road Economic Belt and 21st century maritime silk road   | 2017  |      |
|   | Vision and actions on energy cooperation in jointly building silk road Economic Belt and 21st century Maritime Silk Road  | 2017  |      |
|   | BRI-related   | A guide on sustainable overseas Silviculture by Chinese enterprises                       | 2007 |
|   |   | A guide on sustainable overseas forests management and utilization by Chinese enterprises | 2009 |
|   |   | Green credit guidelines   | 2012 |
| Guidelines on environmental protection for overseas investment and cooperation  |   | 2013  |      |
| Guidelines for establishing the green financial system  |   | 2016  |      |
| Regulations on outbound investment and business activities of private enterprises   |   | 2017  |      |
| China banking regulatory commission on the standardization of banking service enterprises going abroad: Guide to strengthen risk prevention and control |   | 2017  |      |
| Measures for the management outbound investment regulations   |   | 2017  |      |
| A guide on sustainable overseas trade and Investment of Forest Products by Chinese enterprises  | In progress   |   |      |
| Guidelines issued by industry associations  |   |   |      |
| BRI-related   | Guide on Social Responsibility for Chinese International Contractors (2012), Operational Manual for the Guide on Social Responsibility for Chinese International Contractors (2018) | 2012, 2018  |      |
|   | Guidelines for social responsibility in outbound mining investments   | 2015  |      |
|   | Chinese due diligence guidelines for responsible mineral supply chains  | 2016  |      |
|   | Environmental risk management for China's overseas investment guidelines  | 2017  |      |
|   | Guidelines of sustainable infrastructure for Chinese international contractors  | 2017  |      |
|   | The guidelines on China's sustainable agricultural overseas investment  | 2018  |      |
|   | Guide for overseas investment and production of sustainable palm oil by Chinese enterprises   | In progress   |      |

“The Belt and Road Ecological and Environmental Cooperation Plan”. They promote a very strong pro-environmental narrative on the BRI, underscoring that projects should support green and low-carbon development, protect biodiversity, and address climate change. China thus projects itself through these policies as a key supporter of global environmental governance. The policies explicitly state that “promoting the green Belt and Road is an essential effort to participate in global environmental governance” (Belt and Road Portal, 2017a, section 1.2), and repeatedly emphasize the goal of aligning the “green BRI” with the most prominent global sustainability agenda—the 2030 Agenda for Sustainable Development. The Cooperation Plan lists 25 specific projects, without providing additional detail beyond project names (Belt and Road Portal, 2017b). While several projects have already been launched (see Appendix S1), others do not seem to have

started yet, like the “Eco-Label Mutual Recognition” or the “Biodiversity Conservation Corridor Demonstration” projects. The scheduled targets are to integrate the concept of “ecological civilization” into the BRI by 2025, and to promote cooperation on environmental protection “with higher standards and at deeper levels” to accomplish the SDGs by 2030 (Belt and Road Portal, 2017b, section 2.3).

A key feature of these two policies is that they demonstrate China's push for corporate environmental governance under the BRI. Both indicate the roles and responsibilities of different governance actors: The role of the state is to provide guidance and to establish cooperation platforms for communication, information support, technology transfer, and big data. Corporations are expected to be the main players in the environmental governance of the BRI and to voluntarily bear environmental and social responsibilities. They are urged

to observe both international regulations, policies, and standards and those of the host countries (Belt and Road Portal, 2017a). Corporations should adhere to guidelines on “green corporate behavior” issued by various ministries, strengthen environmental management, and disclose environmental information (Belt and Road Portal, 2017b). The main mechanism to achieve the sustainability objectives of the BRI is cooperation, “characterized by governance guidance, business commitment, and social participation” (Belt and Road Portal, 2017b, section 2.2).

In addition to the BRI-specific policy documents, China has established a wider governance structure to guide and supervise Chinese overseas investments. Many policies governing the conduct of and reporting by state-owned and private Chinese corporations operating overseas predate the BRI. Growing concerns about the environmental practices of Chinese companies operating abroad have led the Chinese government to issue a number of policies and initiatives, calling for compliance with host countries' laws and regulations. To date, no formal law regulating environmental matters in Chinese overseas investments exists (Gallagher & Qi, 2018). Several government agencies have issued policy guidelines that set out voluntary measures for environmental protection (Table 1). For instance, the “Guidelines on Environmental Protection in Overseas Investment and Cooperation” encourage—but do not require—Chinese companies operating overseas to conduct environmental impact assessments (EIA) (MOFCOM & MEP, 2013). In contrast, within China, EIAs have been legally required since 2003 for all construction projects or plans with potential environmental impacts (National People's Congress, 2003). Thus, while companies can be held accountable for their potential impacts within China, they will not be legally sanctioned by the Chinese government for operations abroad.

Furthermore, financial institutions have substantial leverage with companies and governance actors by defining socioeconomic conditions for project approval and financing (Brombal, 2018). China has made efforts to establish a green banking system. The “Green Credit Guidelines”, issued in 2012, are the most important Chinese regulations regarding sustainable banking practices. The guidelines encourage banking institutions to promote green credit and to effectively identify, measure, monitor, and control environmental and social risks associated with their credit activities. Overseas projects to which credit is granted should abide by applicable laws and regulations on environmental protection in the country where the project is located, and follow relevant international practices or standards (CBRC, 2012). The 2016 “Guidelines for Establishing the Green Financial System” signal China's commitment to green finance. For example, the largest lenders for BRI projects, the Chinese policy banks, have developed environmental and social safeguards (Figure 4). Other important financiers of the BRI are multilateral development banks such as the Asian Investment and Infrastructure Bank and the New Development Bank, which adopted Environmental and Social Frameworks in 2016 (Losos et al., 2019).

Overall, all identified BRI-specific and BRI-related environmental rules are legally non-binding. Gallagher and Qi (2018) conclude that even though the governance system for overseas investments has

matured, the policies governing the environmental impacts of Chinese overseas investments remain relatively weak, mostly voluntary in nature, and inconsistent with the policies that govern domestic investments. The Chinese government has incorporated green strategies into the BRI, but so far only in aspirational terms. China has a growing collection of BRI guidelines, but they lack essential details regarding implementation, monitoring, and enforcement (Losos et al., 2019). A report by the Asia Society Policy Institute highlights a disconnect between China's proclamations on implementing a “green BRI,” and actual environmental practices on the ground (Russel & Berger, 2019). In the absence of financial or legal sanctions for non-compliance, both public authorities and civil society actors can potentially engage in “naming and shaming” to hold companies accountable to their voluntary commitments (van Erp, 2008). Domestically, this mechanism is increasingly being employed in China as polluting industries are publicized in an effort to shame companies into action, and citizens are expected to assist by reporting violations (Schreurs, 2017). Yet, citizens' awareness of and interest in environmentally or socially harmful behavior of companies in distant countries is arguably lower compared with their interest in domestic misbehavior. Therefore, transnational advocacy networks and strong civil society organizations in BRI host countries are important actors, which could employ this extralegal social mechanism to hold foreign companies accountable.

### 3.2 | International and transnational environmental institutions governing the BRI

Apart from formal policies and guidelines, China is also actively developing an international and transnational governance structure for the “green BRI.” The Chinese government pursues a dual-track approach in this regard. On the one hand, China aims to build new environmental protection cooperation networks, and on the other hand, it also plans to make use of existing bilateral and multilateral international cooperation mechanisms, such as China-ASEAN, the Euro-Asia Economic Forum, the Shanghai Cooperation Organisation, the Lancang-Mekong Cooperation (Belt and Road Portal, 2017a), as well as the 17 + 1 (formerly 16 + 1) cooperation framework between China and 17 Central and Eastern European Countries.

First, China seeks recognition for the BRI from international organizations, particularly the UN, in order to gain some external legitimacy for its mega-project. More than 25 UN agencies have signed cooperation agreements with the Chinese government on the BRI (UN Environment Programme [UNEP], n.d.), and around 20 high-level UN officials, including the UN Secretary-General, attended the second Belt and Road Forum in 2019 (Rosellini, 2019). According to the Chinese Minister of Ecology and Environment, China has strengthened several bilateral and multilateral environmental cooperation mechanisms under the umbrella of the BRI. The Lancang-Mekong Environmental Cooperation Center, the China-Cambodia Environmental Cooperation Center, and the China-Laos Environmental Cooperation Office have been opened in recent years, while the China-Africa Environmental Cooperation Center is in planning





(Li, 2019). The Green Silk Road Envoys Program, a training program for environmental officials, is a prime example of how the Chinese government builds the “green BRI” upon existing environmental governance institutions. This flagship project, launched in 2011 and carried out by the Ministry of Ecology and Environment (MEE), trained more than 1,000 environmental officials, technical personnel, and scholars from more than 20 countries on topics such as green economic policies and environmental law enforcement (Kou, 2019). China continues to implement the program as part of the “green BRI” and aims to train another 1,500 environmental officials over the next 3 years (Benson Wahlén, 2019). Additionally, the Chinese Academy of Sciences has developed research institutes to facilitate research and collaboration and initiated other BRI-related training and research projects, most notably the Alliance of International Science Organizations of the BRI region.

Second, the government of China initiates new cooperation platforms for the “green BRI,” often in collaboration with international governmental or non-governmental organizations (NGOs) (see Appendix S1). A paramount example is the “International Coalition for Green Development on the Belt and Road” (BRIGC), which was jointly initiated by the MEE and international partners, first and foremost the UNEP (Nakano, 2019). President Xi proposed the Coalition himself during the opening of the first Belt and Road Forum in 2017, showing that the Coalition receives support from the highest political levels (Xinhua, 2017a). As of August 26, 2019 national environmental ministries, eight intergovernmental organizations, 68 NGOs, and 30 corporations had joined the Coalition, comprising a total of 132 members (BRIGC, 2019). The BRIGC aims to provide guidance, advice, and financial support to its partners to make progress toward achieving the SDGs and the Paris Agreement (BRIGC, 2019). The Coalition has established 10 thematic issue areas covering a wide range of issues, such as renewable energy, sustainable transportation, and biodiversity. The emerging institutional structure of the BRIGC suggests that it will potentially serve as an “orchestrator” of various public and private governance activities, thus enacting a form of meta-governance (Abbott, 2017).

Numerous international and transnational initiatives have been established to govern environmental aspects of the BRI. Year 2019 alone saw the launch the Coalition of Sustainable Cities on the Belt and Road, the Belt and Road South–South Cooperation Initiative on Climate Change, the BRI Green Cooling Initiative, BRI Environmental Big Data Platform, the BRI Green Lighting Initiative, and the BRI Green Going-Out Initiative (see Appendix S1). Aside from launching transnational initiatives, the Chinese government has also engaged in bilateral environmental governance by signing Memoranda of Understanding (MoU) with international partners (see Appendix S1). These actions underscore that China employs both classical environmental governance instruments, such as intergovernmental MoUs, and new governance arrangements, such as transnational cooperation initiatives. The Chinese government utilizes the “green BRI” as a platform to actively raise its profile as a participant in global environmental governance. The question arises whether the “green BRI” will integrate with the existing global environmental governance landscape or

create entirely new governance structures. To date, there are strong indicators that China has no intention of replacing the existing institutions of global environmental governance through the “green BRI.” Instead, China makes use of regional and multilateral cooperation mechanisms and creates new environmental governance initiatives under Chinese leadership, such as the BRIGC, in close collaboration with international partners, including UN agencies. China’s current approach to the “green BRI” is characterized by a combination of rule-taking and rule-making (Hamel, 1996). Since it remains unclear precisely what mandates and organizational structures the newly established initiatives will assume, it is too early to assess whether they will complement or undermine existing international environmental governance institutions, or shift leadership in environmental governance eastwards.

### 3.3 | Environmental governance in BRI partner countries

Even though China has made efforts to strengthen and expand the institutional architecture of the “green BRI,” a genuinely “green BRI” will require effective environmental governance in BRI partner countries. Since numerous Chinese policies strongly urge Chinese companies to adhere to host countries’ environmental laws and regulations, the political willingness and institutional capacity of BRI partner countries to formulate, implement, and enforce strict environmental rules will significantly influence the environmental sustainability of the BRI. Yet, low-income countries may prioritize national economic development over environmental protection and set weak environmental standards in order to attract FDI (Gray, 2002). Especially countries with poor environmental governance records face high environmental risks under the BRI (Tracy et al., 2017). Even if environmental regulations are present, they may not be enforced. Brombal (2018) warns that many BRI projects will be realized in countries where public participation and environmental rights remain curtailed. For example, the use of robust and effective EIAs and Strategic Environmental Assessments (SEAs) is essential for identifying the direct and indirect effects of infrastructure projects, and can potentially alter infrastructure designs to avoid or mitigate impacts (Hughes et al., 2020; Lee & George, 2013). BRI projects often involve complex contractual arrangements with numerous parties including investors, financiers, consultants, construction contractors, operators, and government authorities. Contracts can require that the countries hosting BRI infrastructure projects undertake EIAs (Masood, 2019). Some host countries, however, have little capacity to monitor and evaluate such assessments. Comprehensive EIAs and SEAs take time to develop and can result in changes to the original plan—all of which can lead to project delays. China and BRI partner countries are often reluctant to do anything that could slow projects’ progress (Masood, 2019).

Increasing trade and investment flows between BRI countries may affect public and private environmental standards in multiple

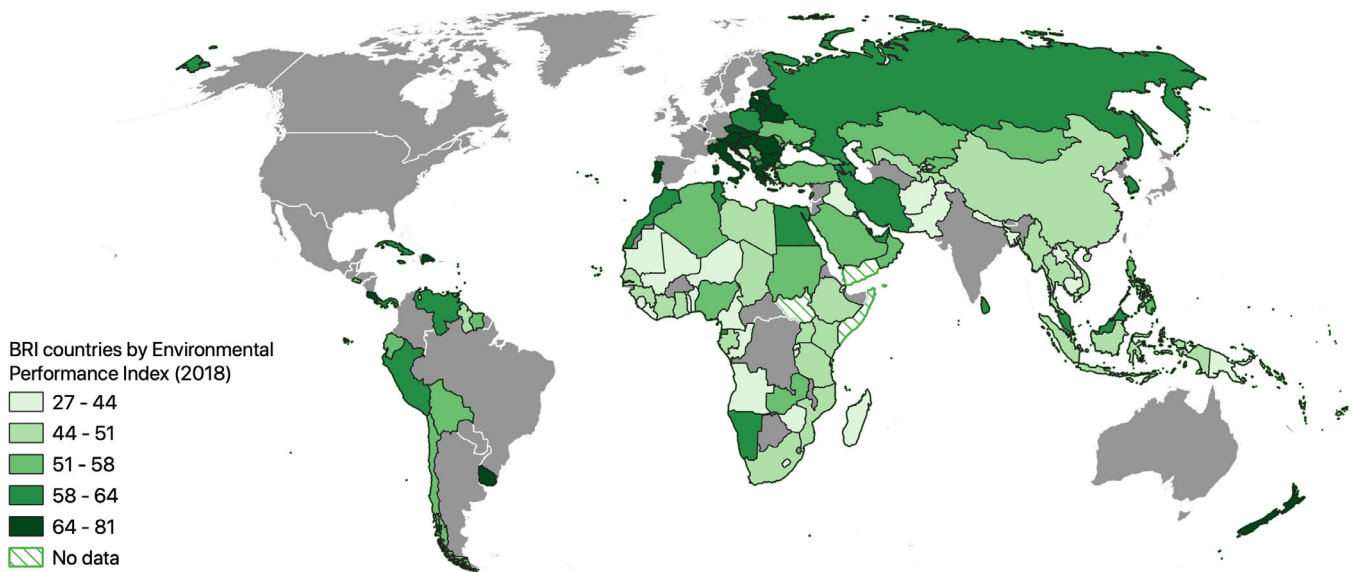
**TABLE 2** Potential effects of trade and investment on public and private environmental standards

|             | Adverse effects  | Beneficial effects   |
|-------------|--|--|
| Investments | <p><b>Pollution haven effect:</b> Pollution-intensive industries migrate from countries with strict environmental standards to countries with lax environmental regulations (Zarsky, 1999).</p> <p>This can lead to a <b>race to the bottom</b> (or Delaware effect, see Vogel, 2009), whereby governments actively lower environmental standards to attract foreign direct investment (FDI), or a <b>regulatory chill</b>, when countries refrain from enacting stricter regulations to not lose FDI (Gray, 2002).</p> <p>For example, as environmental regulations are becoming stricter in China, heavy-polluting Chinese cement plants relocate to Tajikistan (Teo et al., 2019). More than 100 new cement plants are planned along the Belt and Road Initiative (Hughes, 2019).</p> | <p><b>Pollution halo effect:</b> Foreign companies use cleaner environmental technology and improved environmental management practices, which they spread to their counterparts in the host country (Zarsky, 1999).</p> <p>This can lead to <b>environmental leapfrogging</b> as developing countries need not pass through the dirty stages of industrial growth experienced by developed countries.</p> <p>For example, coal advocates argue that Chinese backed coal power plants will bring environmental benefits to host countries because they provide more efficient technologies than these countries could otherwise afford (Walker, 2016).</p>   |
| Trade       | <p><b>Shanghai effect:</b> Exporters apply lower environmental and social standards if they shift from markets with requirements for high standards to markets with lower standard requirements or demands. A shift to new export markets can undermine social and environmental conditions in producer countries (adapted from Adolph, Quince, &amp; Prakash, 2017).</p> <p>For example, a change in final market from the European Union to China led to lower requirements for standards being applied to the value chains of timber from Gabon and cassava from Thailand (Kaplinsky, Terheggen, &amp; Tijaja, 2011).</p>   | <p><b>California effect (or race to the top):</b> Governments enact higher environmental standards to facilitate exports to jurisdictions with higher regulatory standards (Vogel, 2009). By adopting higher standards, producers are able to continue selling to higher regulated markets, which outweigh the investment costs necessary for compliance. Arguably, this effect also applies to companies selling their products to environmentally conscious consumer markets (see example below).</p> <p>For example, multinational firms that produce in China and export a large proportion of their output to developed countries are more likely to adopt ISO 14000 environmental management standards than non-export-oriented firms (Christmann &amp; Taylor, 2001).</p> |

ways (Table 2). The BRI may accelerate the “pollution haven effect” by shifting polluting industries to less-regulated jurisdictions within the BRI (Kolosov et al., 2017; Suocheng et al., 2017; Teo et al., 2019). Since China is increasingly strengthening environmental protection (Schreurs, 2017), it is becoming attractive for Chinese companies to migrate inefficient or resource-intensive industries and technologies to BRI countries that do not follow suit (Tracy et al., 2017). The “pollution haven effect” can lead to a “race to the bottom” if governments lower environmental standards to attract FDI (Table 2). Gamso (2018) shows that trade with China generates a race to the bottom in the environmental policies in countries of Latin America and Sub-Saharan Africa. This effect is moderated by the strength of governance institutions, in particular bureaucratic capacity. Analyzing manufacturing industries exclusively, Tian, Hu, Yin, Geng, and Bleischwitz (2019) find no evidence so far that the BRI shifts pollution and resource exploitation from China to other BRI countries. Morris (2018, p. 54) concludes that effective coordination between BRI countries on legal and regulatory matters is needed to ensure that enterprises do not engage in “jurisdiction shopping” and migrate their unsustainable activities from one country to another. Many BRI partner countries rank low on environmental performance, including top BRI investment

recipients like Pakistan, Bangladesh, and Cambodia, highlighting the risk that these countries become pollution havens (Figure 5).

On the contrary, the BRI may improve environmental standards and regulation in BRI countries. If the BRI advances trade relations with environmentally conscious consumer markets, it may stimulate a “race to the top,” whereby exporter countries adopt higher environmental standards to gain or maintain market access (Table 2). According to Liu (2018), the Chinese government intends to use the BRI to export China's environmental standards to countries with lower development levels. For instance, the guidance document on the “green BRI” outlines that China commits to include environmental protection requirements in free trade agreements (Belt and Road Portal, 2017a). In addition, China will recommend that BRI partner countries include more eco-labeled products in public procurement (Belt and Road Portal, 2017b). This indicates that China is no longer ostensibly refraining from intervening in host countries' internal affairs, at least when it comes to environmental issues. Mol (2011) argues that China is slowly replacing its strict principle of “non-interference” by securing popular support through foreign assistance in non-economic sectors such as the environment. In addition to public governmental actors, corporate actors can encourage environmental sustainability in host countries



**FIGURE 5** Environmental performance of China and countries that have signed cooperation documents with China to jointly build the Belt and Road. The Environmental Performance Index (EPI) ranks countries on 24 performance indicators, which indicate how close countries are to established environmental policy goals (Wendling et al., 2018). While 83 BRI countries have a higher EPI than China (EPI 50.74), 50 BRI countries rank lower than China. Data is not available for five BRI countries. The average EPI for BRI countries is 54.47 [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

through the so-called “pollution halo effect” (Table 2). However, to our knowledge, there are to date no empirical studies of how the BRI affects the environmental governance of host countries and vice versa.

As the BRI covers ever more European countries, it increasingly intersects with environmental governance institutions of the European Union (EU). A prime example is the Peljesac Bridge project in Croatia, the first BRI project that is financed by the EU and built by a Chinese consortium. In order to meet the strict environmental regulations of the EU, the Chinese consortium set up a Safety and Environmental Protection Department, introduced noise-canceling technology to protect the marine environment, and collaborates with local companies to meet EU environmental rules and regulations (Xinhua, 2019). This example suggests that EU member countries engaging in BRI projects are less likely to engage a race to the bottom than non-EU countries, as they are bound to comply with supra-national EU environmental law. Even if BRI projects are implemented outside the EU and funded by other financiers, international organizations like the EU or the World Bank may exert some limited, but not negligible influence on environmental governance by requiring adherence to existing environmental standards as part of their lending criteria (Lee & George, 2013) or by drawing on their normative power towards BRI host countries. For instance, European and international actors have voiced concerns about the environmental effects of a BRI highway project in Montenegro (European Parliament, 2018; Word Heritage Committee, 2019). The engagement of third parties can help scrutinize contracts and encourage host countries to negotiate better deals, as in the case of a special economic zone in Myanmar, where a U.S. task force

facilitated renegotiations with China in an effort to protect the human rights of local people (Hughes et al., 2020).

#### 4 | GOVERNANCE CHALLENGES OF THE “GREEN BRI”

In the few years since the inception of the BRI, the environmental governance architecture of the “green BRI” has developed into a fragmented patchwork of national, regional, transnational, and international institutions of various forms—initiatives, guidelines, agreements, and programs. The Chinese government plays a key role in initiating voluntary and cooperative programs and networks of public, private, and civil society actors and institutions for the environmental governance of the BRI. Formally, the government of China does not take a “command-and-control” approach, but rather provides incentives for enterprises and banks to self-regulate. Responsibility for environmental governance is widely dispersed across multiple state agencies, which explicitly request that corporations assume a key role. Overall, the development of the institutional landscape for the “green BRI” mirrors major trends in global environmental governance toward increasing reliance on transnational multi-actor governance and the use of soft law (Folke et al., 2019).

Despite the rapid proliferation of initiatives under the umbrella of the “green BRI,” major challenges for environmental governance remain. First, BRI-specific and -related policies are not stringent, but based on voluntary and corporate self-regulatory instruments. China’s vision of a “green BRI” is unlikely to be realized in the absence of stricter policies that set out concrete sets of actions. China has



outlined a detailed set of principles to govern the “green BRI,” but unless these are further operationalized, they will likely be criticized as mere window dressing, designed to improve China's international image, rather than ensure environmental protection.

Second, another challenge for the environmental governance of the BRI is to address telecouplings. Telecouplings arise when various geographically distant human–environmental systems become increasingly interconnected and interdependent due to accelerated flows of capital, labor, energy, materials, and economic activities across distances (Eakin, Rueda, & Mahanti, 2017; Friis et al., 2016; Liu et al., 2013). There is growing recognition that activities in any world region can have environmental impacts in other regions and even the wider Earth system (Dietz, 2003; Kissinger, Rees, & Timmer, 2011). Analyzing the BRI from a telecoupling perspective helps in understanding and governing the interconnected socioeconomic and environmental issues within and among BRI countries (Yang et al., 2016).

Telecoupling shows that distant, seemingly unconnected, human–environmental systems can become closely interdependent, highlighting that (un)sustainability in one place is closely linked to (un)sustainability other places. Policy leakage is a clear example. Leakage occurs if environmental policies (e.g., in China) create indirect impacts (e.g., in BRI-affected countries) that go against the objectives of the policy, reducing the overall benefit of the intervention (Bastos Lima, Persson, & Meyfroidt, 2019). Environmental governance of the BRI needs to mitigate the risk that increasingly stringent environmental policies in China create leakages to BRI countries. If China wants to achieve its dual goal of sustaining economic growth, while at the same time preserving its natural environment, the country will likely need to import more energy and natural resources.<sup>4</sup> Land-use leakage serves as an illustrative example. As China has strengthened its afforestation and conservation policies through a moratorium on commercial logging in domestic natural forests, the BRI could help meet China's growing demand for timber through additional imports from participating countries (Kolosoov et al., 2017). Since 1998, logging bans in China have led to increasing timber imports from abroad, especially from Russia and Southeast Asia (Laurance, 2008; Mayer, 2005). Simonov (2018) argues that the China-Mongolia-Russia-Economic Corridor of the BRI could lead to the reopening of a Sino-Russian border crossing, which would allow for export of roundwood to China, likely contributing to deforestation in Russian border provinces in the future. Between 2013 and 2018, exports of forestry products from Russia to China grew by 11% (Chatham House, 2018).

The BRI will increase interdependencies between regions of different countries involved in the BRI through material and immaterial flows. This highlights that there are limits to the ability of territorially bounded national governance to address environmental impacts resulting from changing policies, consumption patterns, or sourcing practices in distant locations. In contrast to strictly global-scale problems, such as climate change, for which mitigation actions can take place anywhere because the concentration of pollutants is evenly spread, the environmental governance of telecouplings needs to be

targeted at specific flows and places (Newig, Lenschow, Challies, Cotta, & Schilling-Vacaflor, 2018).

Third, we find a strong discourse on a “green BRI” at national level. However, this does not necessarily mean that local governmental institutions, local state-owned, or private companies will adapt their actions accordingly. China's local governments tend to lack motivation and capacity for effective enforcement of national environmental regulations (Qi & Zhang, 2014). BRI projects involve many different private and public actors, including contractors, developers, consultants, financiers, and regulators, not only from China, but also from host countries and international organizations. Therefore, the Chinese government needs to link its pro-environmental narrative and various recently established high-level initiatives across spatial and jurisdictional scales to projects at the local level. As the BRI is governed by multiple interacting governance arrangements, it needs to bridge the social and institutional distance between actors and institutions from China and BRI partner countries. Although countries may be geographically close, they can be institutionally distant if they share few governance arrangements, or socially distant if there are few linkages of social networks, values, and knowledge between them (Eakin et al., 2017). In terms of social distance, high communication barriers and long-standing trust deficits between China and some BRI countries create high transaction costs for environmental governance. The legal and regulatory systems of countries along the BRI vary widely, ranging from those which rest on religious teachings to those with common law or civil law traditions. Chinese companies should show awareness and concern for the sociopolitical climate and local environmental laws and regulations of host countries where they invest.

## 5 | CONCLUSION

The Chinese government is taking an active, yet soft approach to the environmental governance of the BRI. China is actively and rapidly developing an institutional architecture for the “green BRI” based on aspirational vision statements and voluntary instruments at the national, international, and transnational level. This underlines China's ambitions to seek a more influential role in global environmental governance. The Chinese government has increasingly sought to strengthen multi-actor governance by involving a number of private and international actors in the strongly state-driven institution-building process of the “green BRI.” Companies are explicitly expected to play a leading role in realizing the government's vision of a “green BRI.” China seeks to integrate its “ecological civilization” policy paradigm into the BRI, but it remains to be seen whether the country manages to further move its ambitions from words to actions.

China uses the BRI as a platform to present itself as a rule-taker and rule-maker in global environmental governance as it mobilizes existing environmental governance institutions and builds new ones. However, the environmental sustainability of the BRI does not only hinge on the environmental governance efforts of Chinese actors, but notably on the effective implementation, monitoring, and



enforcement of environmental laws and regulations in BRI host countries. Since China strongly encourages its enterprises and financial institutions to comply with the laws in the countries where BRI projects are implemented, BRI host countries have substantial leverage on how the sustainability of the BRI unfolds. The governance capacity and political willingness of BRI host countries to safeguard the natural environment will strongly influence the environmental performance of the BRI. Countries with low environmental performance, such as Pakistan, Bangladesh, or Cambodia, are arguably at greater risk to become pollution havens.

Several key research questions regarding the environmental governance of the BRI remain. Due to the vague and expanding size of the BRI and associated enormous data requirements, the scientific community will face considerable methodological challenges in moving from outlining potential environmental effects of the BRI toward developing comprehensive studies of its actual global environmental impacts in the coming years. Another important task for future research is to empirically investigate whether and how China's "green BRI" influences environmental governance in BRI countries. Will the BRI drive a race to the bottom among partner countries in search of investment or will China actually become an exporter of stricter environmental regulations and norms? Does the BRI lead to environmental policy convergence? Will environmental standards be subject to Shanghai or California effects?

Moreover, it is necessary to better understand how countries or groups of countries that do not formally take part in the BRI, such as the EU or the United States, can affect the sustainability of the BRI. Consumption in the United States and the EU is responsible for 30% of the carbon emissions in 65 BRI countries through embodied carbon flows (Han, Yao, Liu, & Dunford, 2018). Thus, researchers should investigate how the newly established BRI institutions can govern the environmental effects of telecoupled commodity and resource flows and their interplay with existing global governance arrangements. Applying the telecoupling framework to trade or investment flows associated with the BRI may be a fruitful approach to examining sustainability challenges and opportunities that transcend national borders. Additionally, our work on the environmental governance architecture of the BRI provides a basis from which to explore the roles of particular actors and the effectiveness of specific governance arrangements. Finally, a core question for political scientists will be how the emerging environmental governance architecture intersects with inter- and intra-state power relations and national interests. Since China is not a unitary actor, but a collection of provinces, autonomous regions and municipalities, future studies could explore the role of subnational governance institutions in the context of the "green BRI." The formidable challenge regarding the sustainability of the BRI is to govern a wide variety of environmental issues that transcend spatial and jurisdictional scales, and involve multiple institutions, actors, and sectors. Orchestrating the various environmental governance efforts outlined in this article and ensuring their effectiveness will be a core task on the long road ahead.

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## ENDNOTES

<sup>1</sup>Subsequently referred to as "green BRI".

<sup>2</sup>The aim of developing an "ecological civilization" is to promote greater conservation of natural resources, low carbon development, greater recycling of resources, and cultivation of an ecological culture. This policy paradigm calls for reductions in carbon intensity and water consumption, improved water quality and biodiversity protection, sound land use and development, and greening of the industrial structure and urban areas (Schreurs, 2017).

<sup>3</sup>The Digital Silk Road (also referred to as "online Silk Road" or "information Silk Road") refers to the goal of improving digital connections along the BRI by building bilateral cable networks, transcontinental submarine cable projects, and improving satellite passageways (Shen, 2018).

<sup>4</sup>This process is of course not unique to China's development path. Western countries also achieved their ecological modernization partly through displacement of extractive and polluting industries and the outsourcing of production to less industrialized countries.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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## Supplementary material

The supplementary material provides an overview of important Chinese policies and guidelines governing the 'green BRI', as well as international and transnational initiatives that are part of the emerging environmental governance architecture of the BRI.

References are provided in the footnotes. A list of acronyms can be found below. All websites were last accessed on November 13, 2019.

### A. Key Chinese policies and guidelines governing the 'green BRI'.

| Title  | Year | Issued by                               | Description   |
|--|------|---|---|
| <b>BRI-specific</b>  |      |   |   |
| Visions and Actions on Jointly Building Silk Road Economic Belt and 21st Century Maritime Silk Road <sup>1</sup> | 2015 | NDRC, MOFA, MOFCOM                      | This document presents China's vision and mission of the BRI. It mentions that the BRI should promote ecological progress in conducting investment and trade, and increase cooperation in conserving the environment, protecting biodiversity, and addressing climate change. It states that the BRI should be environmentally friendly for the benefit of the general public.  |
| Building the Belt and Road: Concepts, Practices and China's Contributions <sup>2</sup>                           | 2017 | Office of the Leading Group for the BRI | This document elaborates on China's plans and visions for the BRI. It states that China is committed to building a green Silk Road and apply a "green development philosophy" to BRI cooperation activities. China aims to promote cooperation on water conservation, the protection of wildlife and forests, actions against climate change, and green investments and financing. "China is committed to working together with other countries to foster the environment-friendly and sound development of the Belt and Road [...] and to build a global economy that is more vibrant, open, inclusive, stable, and sustainable".  |
| Guidance on promoting a green Belt and Road <sup>3</sup>   | 2017 | MEP, MOFA, NDRC, MOFCOM                 | The document describes the key objectives and rationales for promoting a green BRI. The purpose of the green BRI is to (1) share the 'ecological civilization' philosophy with the countries along the BRI and (2) to participate in global environmental governance and to (3) to forge communities of shared interests, common responsibilities and common destiny. A strong emphasis is put on resource efficiency, as well as the compatibility of economic growth and environmental protection. The role of the state is to provide guidance and to establish cooperation platforms for communication, information support, technology transfer, and big data. Enterprises are supposed to be the main players, which are expected to voluntarily bear environmental and social responsibilities. They are urged to observe international regulations, as well as regulations, policies and standards of the host countries. The aim is to create not only new |

<sup>1</sup> [http://en.ndrc.gov.cn/newsrelease/201503/t20150330\\_669367.html](http://en.ndrc.gov.cn/newsrelease/201503/t20150330_669367.html)

<sup>2</sup> <https://eng.yidaiyilu.gov.cn/wcm.files/upload/CMSydylyw/201705/201705110537027.pdf>

<sup>3</sup> <https://eng.yidaiyilu.gov.cn/zchj/qwfb/12479.htm>

|   |      |           |  |
|---|------|-----------|--|
|   |      |           | <p>policies and projects, but to also work through existing “international multilateral and bilateral cooperation institutions and funds”. Key issue areas are “green investment, green trade and green financial systems”. The time span for developing the institutional framework for the green BRI is 3 to 5 years. Favorable results are expected within 5 to 10 years.</p>   |
| Vision for Maritime Cooperation under the Belt and Road Initiative <sup>4</sup> | 2017 | NDCR, SOA | <p>The document outlines that the joint actions under the Maritime Silk Road should be made to jointly protect and sustainably utilize marine resources. It acknowledges that the oceans comprise the largest ecosystem on earth and provide a common arena for sustainable development. China is willing to establish a “Blue Partnership” to forge a “blue engine” for sustainable development. Section 4.1. focuses specifically on green development. China proposes that countries along the BRI jointly undertake marine ecological conservation and safeguard global marine ecological security. Additionally, the objectives are to safeguard marine ecosystem health and biodiversity (including the conservation of rare and endangered species and the creation of marine ecological corridors); to promote the protection of regional marine environment; to strengthen cooperation in addressing climate change (mitigation and adaptation); and lastly, to strengthen “international blue carbon cooperation”. The document also describes China's plan to participate in Arctic affairs: "Chinese enterprises are encouraged to join in sustainable exploration of Arctic resources in a responsible way". This document underscores again that enterprises play a primary role in the BRI and they should abide market rules and international norms. It explicitly mentions the concept of collaborative governance in section 4.5. China's vision is to build bilateral and multilateral cooperation mechanisms to jointly participate in ocean governance and to provide the institutional framework for ocean cooperation.</p> |
| The Belt and Road Ecological and Environmental Cooperation Plan <sup>5</sup>    | 2017 | MEP       | <p>The environmental cooperation plan repeats the message of the Vision and Action document that China aims to increase cooperation in conserving the environment, to protect biodiversity and to tackle climate change. The plan stresses that the BRI will be an important measure to implement the 2030 Agenda for Sustainable Development. The goal is "to 2025, we will integrate the concepts of ecological civilization and green development into Belt and Road Initiative and create a favourable pattern of well-grounded cooperation on eco-environmental protection." and "to 2030, we will promote cooperation on eco-environmental protection with higher standards and at deeper levels to accomplish the Sustainable Development Goals.". In order to achieve these goals, the plan sets out the following measures: share the concept and practice of ecological civilization and green development, build platforms for eco-environmental protection cooperation, and fuel exchange and cooperation of social organizations and think tanks. Additionally, enterprises are encouraged to play the major role in environmental governance. They should adhere to various guidelines on green corporate behaviour issued by several</p>  |

<sup>4</sup> [http://www.xinhuanet.com/english/2017-06/20/c\\_136380414.htm](http://www.xinhuanet.com/english/2017-06/20/c_136380414.htm)

<sup>5</sup> <https://eng.yidaiyilu.gov.cn/zchj/qwfb/13392.htm>

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|--|------|-------------|--|
|  |      |             | ministries, and abide to local environmental regulations and standards. Enterprises should strengthen their environmental management and disclose their corporate environmental information. By clarifying environmental protection requirements in infrastructure construction and enforcing environmental standards, the issuing ministry plans to promote green low-carbon construction, operation and management of infrastructure. Furthermore, promoting sustainable production and consumption is another field of action. The plan is to facilitate trade of environmental products and services (e.g. include eco-labelled products in government procurement; include environmental considerations in free trade agreements) and to enhance green supply chain management. Attention is also given to the area of green financing. Notably, China aims to promote cooperation for compliance with environmental conventions. "We will help relevant countries along the Belt and Road to fulfil commitments under multilateral environmental agreements (MEAs), such as Convention on Biological Diversity and Stockholm Convention on Persistent Organic Pollutants". |
| Vision and Actions on Agriculture Cooperation in Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road <sup>6</sup> | 2017 | NDRC, MOA   | This document describes China's vision for agricultural cooperation under the BRI. China recognizes that climate change has negative impacts on major grain producing regions. Agricultural cooperation among BRI countries is supposed to support developing countries to implement the 2030 Agenda for Sustainable Development and to promote "agricultural sustainability". Yet, the concept of "agricultural sustainability" is not defined in the document.   |
| Vision and Actions on Energy Cooperation in Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road <sup>7</sup>      | 2017 | NDRC; NEA   | The document lays out China's vision for energy cooperation under the BRI. It highlights that the cooperation will be green and efficient. China encourages the efficient development and utilization of clean energy and "strictly control the emissions of pollutants and greenhouse-gases, raise energy efficiency and contribute to green and efficient development in all countries". In addition, the document explicitly describes that China will actively implement the 2030 Sustainable Development Agenda and Paris Agreement. "We will build on the Belt and Road energy cooperation system, synchronize countries' effort to jointly build a green and low-carbon global energy governance structure and push forward global green development together."   |
| <b>BRI-related</b>   |      |             |  |
| A Guide on Sustainable Overseas Silviculture by Chinese Enterprises <sup>8</sup>   | 2007 | SFA, MOFCOM | The guide describes concrete goals and measures that companies engaged in silviculture overseas should implement, such as formulating an afforestation scheme, training forestry employees, communicating with local communities and departments and establishing an appropriate forest monitoring system.   |

<sup>6</sup> [https://www.followingthemoney.org/wp-content/uploads/2017/06/2017\\_NDRC-MOA\\_Vision-and-Actions-on-Agriculture-Cooperation-in-BRI\\_E.pdf](https://www.followingthemoney.org/wp-content/uploads/2017/06/2017_NDRC-MOA_Vision-and-Actions-on-Agriculture-Cooperation-in-BRI_E.pdf)

<sup>7</sup> [http://www.nea.gov.cn/2017-05/12/c\\_136277478.htm](http://www.nea.gov.cn/2017-05/12/c_136277478.htm)

<sup>8</sup> <http://www.chinafile.com/library/reports/guide-sustainable-overseas-silviculture-chinese-enterprises>



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|--|------|--|---|
|  |      |  | Additionally, the companies shall abide to the laws and regulations of the host countries, as well as relevant international conventions.   |
| A Guide on Sustainable Overseas Forests Management and Utilization by Chinese Enterprises <sup>9</sup> | 2009 | SFA, MOFCOM                            | The guide outlines that companies should manage the forest resources legally, meaning that they meet the requirements of the relevant laws and regulations of the host country. Additionally, the companies shall comply with relevant international agreements. Apart from sections on the management of forest resources and community development, one section is dedicated to ecological protection, outlining that companies should take measures to minimize the impact of harvesting to the natural environment and protect biodiversity.  |
| Green Credit Guidelines <sup>10</sup>  | 2012 | CBRC                                   | The guidelines encourage banking institutions to promote green credit and the effectively identify, measure, monitor and control environmental and social risks associated with their credit activities. The banking institutions shall set up an environmental and social risk management system, including internal controls, information disclosure, and monitoring and evaluation mechanisms. Overseas projects to which credit is granted should abide by applicable laws and regulations on environmental protection of the country of jurisdiction where the project is located. |
| Guidelines on Environmental Protection for Overseas Investment and Cooperation <sup>11</sup>           | 2013 | MOFCOM & MEP                           | The guidelines encourage Chinese companies operating overseas to conduct environmental impact assessments, abide to host countries' laws, regulation and standards concerning environmental protection, and include environmental protection into their enterprise development strategies, as well as production and operation plans.   |
| Guidelines for Establishing the Green Financial System <sup>12</sup>                                   | 2016 | PBOC, MOF, NDRC, MEP, CBRC, CSRC, CIRC | The guidelines propose to support and encourage domestic financial institutions, non-financial enterprises and multilateral development banks to strengthen environmental risk management, improve environmental information disclosure, and adopt green financing instruments such as green bonds, develop green supply chain management and explore the use of instruments such as environmental pollution liability insurance. The aim is to enhance the "greenness" of Chinese outward investment.  |
| Regulations on Outbound Investment and Business Activities of Private Enterprises <sup>13</sup>        | 2017 | NDRC, MOFCOM, PBOC, MFA, ACFIC         | "Private firms are requested to undertake environmental impact assessments for their overseas construction and business operation, to apply for environment related permits from the host country, or refer to standards of international or multilateral organization conducive to the ecological development of host countries, to develop contingency plans for environmental emergencies, to reduce the emission of pollutants through clean production, and also to actively engage in ecological restoration"   |

<sup>9</sup> [https://surumer.uni-hohenheim.de/fileadmin/einrichtungen/surumer/A\\_Guide\\_on\\_Sustainable\\_Overseas\\_Forests.pdf](https://surumer.uni-hohenheim.de/fileadmin/einrichtungen/surumer/A_Guide_on_Sustainable_Overseas_Forests.pdf)

<sup>10</sup> <http://www.cbrc.gov.cn/EngdocView.do?docID=3CE646AB629B46B9B533B1D8D9FF8C4A>

<sup>11</sup> <http://english.mofcom.gov.cn/article/policyrelease/bbb/201303/20130300043226.shtml>

<sup>12</sup> [http://www.chinadaily.com.cn/business/2016hangzhou20/2016-09/04/content\\_26692931.htm](http://www.chinadaily.com.cn/business/2016hangzhou20/2016-09/04/content_26692931.htm)

<sup>13</sup> No English translation available, data retrieved from Gallagher & Qi (2018, 13)

|  |             |           |  |
|--|-------------|-----------|--|
| Guide to Strengthen Risk Prevention and Control <sup>14</sup>  | 2017        | CBRC      | The Guide “encourages financial institutions engaged in infrastructure projects to learn from the Equator Principles and other international best practices, establish environmental and social risk control systems, conduct environmental and social assessments in evaluating the projects feasibility, and strengthen monitoring of social and environmental risks”.   |
| Measures for the Management Outbound Investment Regulations <sup>15</sup>                                    | 2017        | MOFCOM    | “The Measures require overseas enterprises to strengthen the consciousness of risk and responsibility, observe the laws and regulations of the investment destination, respect local customs, perform social responsibility, and take responsibility for environment protection, labor protection, and cultural protection so as to better integrate with the local society. The Measures instruct MOFCOM to promulgate environmental protection guidelines for enterprises operating overseas”.   |
| A Guide on Sustainable Overseas Trade and Investment of Forest Products by Chinese Enterprises <sup>16</sup> | in progress | SFA & CAF | The Guidelines encourage Chinese companies that engage in forest product trade and investment in foreign countries to comply with the laws, regulations, department rules and related documents of both China and the host country, as well as with international conventions and agreements ratified by China or the host country (e.g. the Convention on International Trade in Endangered Species of Wild Fauna and Flora; CITES). Chinese companies are requested to not buy products of illegal origin and prioritize the procurement of sustainable forest products. |

<sup>14</sup> No English translation available, data retrieved from Russel & Berger (2019, 24)

<sup>15</sup> No English translation available, data retrieved from Gallagher & Qi (2018, 14)

<sup>16</sup> Consultation draft available at: <https://eia-international.org/wp-content/uploads/Chinese-guidelines-2014.pdf>

**B. BRI-related guidelines issued by industry associations.**

| Title   | Year       | Issuing authority | Description  |
|---|------------|-------------------|--|
| <b>BRI-related</b>  |            |                   |  |
| Guide on Social Responsibility for Chinese International Contractors (2012), Operational Manual for the Guide on Social Responsibility for Chinese International Contractors (2018) <sup>17</sup> | 2012, 2018 | CHINCA            | The Guidelines aim to assist Chinese international contractors in building infrastructure that meet leading sustainability standards. “The Guide reflects international consensus on social responsibility as embedded in the United Nations Global Compact and the ISO 26000 Guidance on Social Responsibility”.  |
| Guidelines for Social Responsibility in Outbound Mining Investments <sup>18</sup>   | 2015       | CCCCMC            | The Guidelines call for Chinese mining companies undertaking outbound mining investment, cooperation and trade to strictly “observe the UN Guiding Principles on Business and Human Rights during the entire life-cycle of the mining project” and to “conduct thorough environmental impact assessments, reduce pollution and waste emissions, conserve and recycle resources, conserve biodiversity, and minimize environmental impact and ecological footprint in the life cycle of mining activities”. |
| Chinese Due Diligence Guidelines for Responsible Mineral Supply Chains <sup>19</sup>  | 2015       | CCCCMC            | The Guidelines were jointly developed with the OECD and are based on the OECD Due Diligence Guidance for Responsible Mineral Supply Chains from Conflict-affected and High-risk Areas and the Chinese Responsible Mining Guidelines. The Guidelines establish a 5-step due diligence framework that both meets international standards while also incorporating Chinese characteristics.   |
| Environmental Risk Management for China's Overseas Investment guidelines <sup>20</sup>  | 2017       | GFC, IAC, CBA,    | Among others, the Guidelines state that “financial institutions and enterprises engaged in overseas investment should fully understand the environmental laws, regulations and standards of the host countries, as well as the key environmental risks for their projects” and “should understand the environmental laws, regulations and standards for the specific   |

<sup>17</sup> <http://csr2.mofcom.gov.cn/article/policies/ind/201812/20181202821055.shtml> and (Losos et al. 2019)

<sup>18</sup> <http://csr2.mofcom.gov.cn/article/policies/ind/201812/20181202819524.shtml>

<sup>19</sup> [https://www.globalwitness.org/documents/18138/201512\\_Chinese\\_Due\\_Diligence\\_Guidelines\\_for\\_Responsible\\_Mineral\\_Supply\\_Chains\\_-\\_En\\_K83fxzt.pdf](https://www.globalwitness.org/documents/18138/201512_Chinese_Due_Diligence_Guidelines_for_Responsible_Mineral_Supply_Chains_-_En_K83fxzt.pdf) and [https://www.asienhaus.de/uploads/tx\\_news/Blickwechsel\\_Human\\_Rights\\_Due\\_Diligence\\_in\\_Mineral\\_Supply\\_Chains\\_International\\_Developments\\_and\\_Chinese\\_Efforts\\_02.pdf](https://www.asienhaus.de/uploads/tx_news/Blickwechsel_Human_Rights_Due_Diligence_in_Mineral_Supply_Chains_International_Developments_and_Chinese_Efforts_02.pdf)

<sup>20</sup> <http://unepinquiry.org/wp-content/uploads/2017/09/Environmental-Risk-Management-Initiative-for-China---s-Overseas-Investment.pdf>

|   |             |  |   |
|---|-------------|--|---|
|   |             | AMAC, IAMAC, CTA, FECO                       | sectors of their projects, as well as the sector-specific environmental risks and mitigation approaches”, as well as “in making overseas investments, banks should refer to relevant international sustainability standards, and institutional investors should refer to the UN Principles for Responsible Investment”.   |
| Guidelines of Sustainable Infrastructure for Chinese International Contractors <sup>21</sup>              | 2017        | CHINCA                                       | The Guidelines encourage Chinese companies engaged in overseas infrastructure projects to boost their investment and construction of sustainable infrastructure projects. The Guidelines have taken up certain concepts and views from internationally recognized standards and guidelines, such as Envision of Harvard University, SuRe of Global Infrastructure Basel (GIB), and Performance Standards on Environmental and Social Sustainability of International Finance Corporation (IFC). The Guidelines cover the entire process from funding, planning, design, building, operation and maintenance to closure. The guidelines are divided into different sections: economic sustainability, social sustainability, environmental sustainability and sustainability governance rules. |
| The Guidelines on China's Sustainable Agricultural Overseas Investment <sup>22</sup>                      | 2018        | CAPIC; Rural Economy Research Center of MARA | Overseas agricultural investments are encouraged to abide by international general principles, such as the principle of free, prior and informed consent (FPIC). In addition, companies are encouraged to implement investment due diligence policies. All investment project should conduct environmental and social impact assessments. The document explicitly refers to the BRI: “Under the framework of the ‘Belt & Road’ Initiative, China will further enhance its agricultural cooperation with relevant countries to the benefit of [forming] a new pattern on global agricultural international cooperation and making the countries along the ‘Belt & Road’ give full play to their comparative advantages [...]”.   |
| Guide for Overseas Investment and Production of Sustainable Palm Oil by Chinese Enterprises <sup>23</sup> | in progress | CFNA   | The voluntary Guide aim to provide guidance to Chinese enterprises which are planning or are engaged in overseas investments and production of sustainable palm. The Guide is designed to be consistent with global standards and guides on sustainable production, especially the RSPO Principles and Criteria. The aim is that the implementation of this Guide by Chinese enterprises will prepare the enterprises for international certification as well as to meet the requirements of host countries.  |

<sup>21</sup> <http://csr2.mofcom.gov.cn/article/policies/ind/201707/20170702608844.shtml>

<sup>22</sup> [https://www.followingthemoney.org/wp-content/uploads/2019/02/2018\\_CAPIC\\_Guidelines-on-Sustainable-Agricultural-Overseas-Investment\\_E.pdf](https://www.followingthemoney.org/wp-content/uploads/2019/02/2018_CAPIC_Guidelines-on-Sustainable-Agricultural-Overseas-Investment_E.pdf)  
(unofficial translation)

<sup>23</sup> [http://www.rt13.rsपो.ग/ckfinder/userfiles/files/China%20SPO%20Guide-PRODUCTION-Version%203\\_0-RT13\\_ENG.pdf](http://www.rt13.rsपो.ग/ckfinder/userfiles/files/China%20SPO%20Guide-PRODUCTION-Version%203_0-RT13_ENG.pdf)

**C. International and transnational environmental governance institutions for the BRI**

| Category  | Title  | Year | Actors involved   | Description (mainly self-reported information)   |
|---|--|------|---|--|
| <b>BRI-specific</b>                             |  |      |   |  |
| Cooperation platform / initiative / partnership | Belt and Road Green Development Partnership (CGGL) <sup>24</sup>                       | 2016 | Joined by 24 civil society organizations including Greenpeace, WWF, the Global Environmental Institute  | The objective of the partnership is to carry out research under the BRI; to provide policy recommendations for sustainable development under the BRI by bringing together Chinese and international think tanks, environmental NGOs, and foundations; and to promote the implementation of the Paris Agreement and the achievement of the United Nations 2030 Sustainable Development Goals. |
|   | The Green Supply Chain Cooperation Platform for Belt and Road Initiative <sup>25</sup> | 2017 | Launched by 9 organizations, including China-ASEAN (Shanghai Cooperation Organization) Environmental Cooperation Center, Environmental Defense, Environmental Development Centre of MEP, Policy Research Center for Environment and Economy of MEP, Environmental Protection Bureau of Shanghai, China Association of Environmental Protection Industry, Green Supply Chain Association of Guangdong, Dongguan Demonstration Center for Green Supply Chain Management, Tianjin Demonstration Center for Cooperation Network of APEC Green Supply Chain. | The aim of the platform is to promote green supply chain management. It is a sub-platform of the BRI big data platform.  |

<sup>24</sup> <http://www.chinagoinggreen.org/en/?p=6886>

<sup>25</sup> [http://www.chinaenvironment.info/Policy/201706/t20170615\\_93999.html](http://www.chinaenvironment.info/Policy/201706/t20170615_93999.html)

|  |            |   |  |
|--|------------|---|--|
| Silk Road NGO Cooperation Network <sup>26</sup>  | 2017, 2019 | More than 170 delegates of NGOs from 22 countries attended the second forum in 2019.  | The first Forum was held in November 2017 and the second in 2019. Members of the cooperation network aim to strengthen exchanges and cooperation in the fields of health care, public charity, emergency rescue and relief, volunteer service and environmental protection. They have carried out more than 200 exchange activities and livelihood projects in countries along the Belt and Road so far.                                 |
| BRI Environmental Big Data Platform <sup>27</sup>  | 2019       | n/a   | With five subplatforms, including the Shanghai Cooperation Organization Environmental Information Sharing Platform and the Green Supply Chain Platform, the new platform will provide environmental data support for countries involved in the BRI, including ecological environmental protection concepts, laws, regulations, standards, environmental policies, management measures, technical exchanges and industry cooperation.     |
| International Coalition for Green Development on the Belt and Road (BRIGC) <sup>28</sup> | 2019       | As of August 2019, 26 national environmental ministries, eight intergovernmental organizations, 68 NGOs and 30 enterprises had joined the Coalition, making up a total of 132 members | BRIGC is a platform for policy dialogue and communication, environmental knowledge and information, and green technology exchange and transfer. According to the Coalition's website, its main goal is to promote international consensus, understanding, cooperation and concerted actions to achieve green development of the BRI; to help BRI countries to implement the SDGs; and to integrate sustainable development into the BRI. |
| Coalition of Sustainable Cities on the Belt and Road <sup>29</sup>                       | 2019       | NDRC, UN-Habitat, WHO, UCLA-ASPAC, Eurocities, Energy Foundation  | The alliance is to support exchange among cities of BRI countries on low carbon, sustainable, livable, and healthy urban development   |

<sup>26</sup> [http://www.china.org.cn/china/2019-05/01/content\\_74742210.htm](http://www.china.org.cn/china/2019-05/01/content_74742210.htm)

<sup>27</sup> <http://www.chinadaily.com.cn/a/201904/25/WS5cc181c5a3104842260b8626.html> and <https://www.unenvironment.org/regions/asia-and-pacific/regional-initiatives/belt-and-road-initiative-international-green>

<sup>28</sup> <https://www.unenvironment.org/regions/asia-and-pacific/regional-initiatives/belt-and-road-initiative-international-green> and <http://eng.greenbr.org.cn/icfgd/>

<sup>29</sup> [https://www.fmprc.gov.cn/mfa\\_eng/zxxx\\_662805/t1658767.shtml](https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1658767.shtml) and <http://www.efchina.org/News-en/EF-China-News-en/news-efchina-20190508-en>

|  |             |  |  |
|--|-------------|--|--|
| Belt and Road South-South Cooperation Initiative on Climate Change <sup>30</sup> | 2019        | n/a  | The Belt and Road South-South Cooperation Initiative on Climate Change was launched during the 2nd Belt and Road Forum in 2019.  |
| BRI Green Cooling Initiative <sup>31</sup>                                       | 2019        | Launched by the NDRC, UNIDO, UNESCAP, and Energy Foundation China; Cooling industry associations from China, the United States, Japan, Brazil, Europe, and other countries and regions, as well as the China National Institute of Standardization and China's leading air conditioning manufacturers have joined the initiative | The initiative aims to promote sustained energy efficiency improvement and green development in the cooling and air conditioning industry and contribute to the international and national energy efficiency goals of fighting climate change through various efforts. |
| BRI Green Lighting Initiative <sup>32</sup>                                      | 2019        | Launched by the NDRC, UNIDO and UNESCAP  | The initiative aims to deepen the collaboration of countries in the Asia Pacific Region and globally on policy, technology and market transformation for lighting.   |
| BRI Green Going-Out Initiative <sup>33</sup>                                     | 2019        | n/a  | The BRI Green Going-Out Initiative on investments by Chinese companies abroad was launched during the 2nd Belt and Road Forum in 2019.   |
| Group of international green industrial cooperation platforms <sup>34</sup>      | in planning | n/a  | According to the 2019 BRI progress report on the BRI, "China will build a group of international green industrial cooperation platforms, including model bases for green industrial cooperation, bases for green technology transfer and exchanges,                    |

<sup>30</sup> <http://en.people.cn/n3/2019/0423/c90000-9571019.html>

<sup>31</sup> <http://www.efchina.org/News-en/EF-China-News-en/news-efchina-20190428-en>

<sup>32</sup> <https://www.unescap.org/speeches/statement-thematic-forum-green-silk-road-2nd-belt-and-road-forum-international-cooperation> and [http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7\\_5.html](http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7_5.html)

<sup>33</sup> <https://sdg.iisd.org/commentary/policy-briefs/sdg-knowledge-weekly-update-and-perspectives-on-belt-and-road-initiative/>

<sup>34</sup> <https://www.beltandroad.news/wp-content/uploads/2019/04/TheBeltandRoadInitiativeProgressContributionsandProspects.pdf>

|                   |   |      |   |   |
|-------------------|---|------|---|---|
|                   |   |      |   | technology demonstration and popularization bases, and science and technology parks"  |
| Project / Program | Green Silk Road Envoys Program <sup>35</sup>  | 2011 | MEE   | The purpose is to train 1500 environmental officials, technical personnel and scholars from countries along the BRI over the next three years (from 2019).                                  |
|                   | BRI Sustainable Investment Promotion (SIP) Facilities Project (with pilot project in Ethiopia) <sup>36</sup>  | 2019 | Implemented by UNDP in China; Program partners are the Ethiopian Investment Commission, China's Ministry of Foreign Affairs, the Chinese embassy in Ethiopia, Ethiopia-China Chamber of Commerce, and enterprises | The pilot project in Ethiopia aims to provide a scalable blueprint on how investments can be more sustainable responding to partner countries national development and economic priorities. |
| MoU               | MoU on water resources <sup>37</sup>  | 2017 | Signed by Chinese government and the Malaysian government   | n/a   |
|                   | MoU on water resources <sup>38</sup>  | 2017 | Signed by Ministry of Water Resources of China and the Ministry of Environment of Poland  | n/a   |
|                   | MoU for the promotion of the 2030 Agenda for Sustainable Development through the Belt and Road Initiative for bridging the digital divide <sup>39</sup> | 2019 | Signed by Export-Import Bank of China and the International Telecommunication Union   | n/a   |

<sup>35</sup> <https://sdg.iisd.org/news/second-belt-and-road-forum-results-in-over-283-deliverables/> and <http://en.people.cn/n3/2019/0423/c90000-9571019.html>

<sup>36</sup> <http://www.cn.undp.org/content/china/en/home/projects/promoting-sustainable-investments-along-the-belt-and-road-by-str.html> and <https://open.undp.org/projects/00116121>

<sup>37</sup> [http://www.xinhuanet.com/english/2017-05/15/c\\_136286376.htm](http://www.xinhuanet.com/english/2017-05/15/c_136286376.htm)

<sup>38</sup> Ibid.

<sup>39</sup> [http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7\\_5.html](http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7_5.html)



|            |   |      |   |   |
|------------|---|------|---|---|
|            | MoU on the Belt and Road Initiative for the 2030 Agenda for Sustainable Development <sup>40</sup> | 2019 | Signed by MOFA and UNESCAP  | n/a   |
| Guidelines | Guiding Principles on Financing the Belt and Road <sup>41</sup>                                   | 2019 | Signed by MOF and its counterparts in 27 countries  | The signatories commit to follow the principles of equal-footed participation, mutual benefits and risk sharing as they work together to build a long-term, stable, sustainable financing system that is well-placed to manage risks. |
|            | Green Investment Principles (GIP) <sup>42</sup>   | 2019 | Jointly developed by the Green Finance Committee of China Society for Finance and Banking and the City of London Corporation's Green Finance Initiative; the World Economic Forum, UNPRI, Belt & Road Bankers Roundtable, the Green Belt and Road Investor Alliance and the Paulson Institute were also part of the drafting group; 27 financial institutions signed the GIP at the second Belt and Road High-level Forum in 2019. Signatories include all major Chinese banks and China's investors in the Belt and Road region, as well as some of the world's largest financial institutions | The GIP aims to incorporate low-carbon and sustainable development practices into investment projects in Belt and Road countries.   |
| Other      | Platform for Belt and Road Environmental  | 2016 | Jointly developed by China-ASEAN Cooperation Center and China Center for SCO Environment Cooperation  | This platform deploys the technologies of "Internet +", big data and satellite remote sensing, collects the information related to environment quality, environmental protection policies, laws,                                      |

<sup>40</sup> [http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7\\_5.html](http://global.chinadaily.com.cn/a/201904/28/WS5cc4fa20a3104842260b8cf7_5.html)

<sup>41</sup> <https://eng.vidaiyilu.gov.cn/zchj/qwfb/13757.htm>

<sup>42</sup> <http://gflp.org.cn/index/index/newsdetail/id/42.html>

|   |      |   |  |
|---|------|---|--|
| Big Data Services (website) <sup>43</sup>   |      |   | regulations, standards, technologies and industrial development of China and those countries along the One Belt and Road, shares concepts and practice in ecological civilization and green development, establishes a channel to promote policy dialogue and communication, decision-making, scientific research and capacity building, provides information support to countries along the One Belt and Road and serves the development of a green One Belt and Road.                              |
| Green Silk Road Network / Green Silk Road Initiative Declaration <sup>44</sup>  | 2016 | Launched by 20 NGOs   | The Green Silk Road Initiative Declaration was adopted at the Civil Society Workshop "The New Silk Belt and Road Initiative (BRI): Towards Responsible Social and Environmental Policies and Practices" held on November 18, 2016 in Moscow, Russia, and attended by 20 NGOs from 11 countries. The Declaration outlines that the BRI presents tremendous opportunities as well as environmental challenges for the countries involved. It calls for unified efforts of civil society organizations. |
| Statement of Intent for Cooperation on Promoting Specification-setting for Pesticide Quality under the Belt and Road Initiative <sup>45</sup> | 2019 | Announced by MOA and agricultural ministries of 9 South and Southeast Asian countries | MOA and agricultural ministries of 9 South and Southeast Asian countries jointly announced this Joint Statement during the second Belt and Road Forum in 2019.   |
| Trilateral Cooperation Agreement on Renewable Energy in   | 2019 | Signed by MOFCOM and UNDP   | The Ministry of Commerce of China signed this Trilateral Cooperation Agreement with the UNDP during the second Belt and Road Forum in 2019.  |

<sup>43</sup> [http://english.mee.gov.cn/News\\_service/media\\_news/201609/t20160930\\_364965.shtml](http://english.mee.gov.cn/News_service/media_news/201609/t20160930_364965.shtml)

<sup>44</sup> <http://greensilkroad.net/declaration/>

<sup>45</sup> <https://eng.yidaiyilu.gov.cn/qwyw/rdxw/88228.htm>

|                              |   |      |   |  |
|------------------------------|---|------|---|--|
|                              | Ethiopia and Sri Lanka <sup>46</sup>  |      |   |  |
|                              | BRI Environment Technology Exchange and Transfer Center <sup>47</sup>         | 2016 | Established by MEP  | The center was established in Shenzhen City, Guangdong Province, in April 2016 in order to promote cooperation in technology used to combat atmospheric pollution and improve the treatment of wastewater and solid wastes.  |
|                              | Green BRI Platform <sup>48</sup>  | 2017 | Developed by Oxford Sustainable Finance Programme (University of Oxford)  | The objective of this data and analysis platform is to measure, manage, and mitigate the environmental risks and impacts of investments along the Belt and Road. The platform can help financial institutions, companies and policymakers to integrate climate change and sustainability assessment in their decision-making.      |
|                              | Green Belt and Road Investor Alliance (GBRIA) <sup>49</sup>                   | 2018 | n/a   | GBRIA invests in sustainable projects along the Belt and Road. The Alliance specializes in financing projects from private and public actors. GBRIA works on 3 work streams: harmonising standards for green finance; how to drive capital markets' efficiency for this finance to give long-term benefits; and capacity building. |
| <b>BRI-related</b>           |   |      |   |  |
| Regional cooperation centers | China-ASEAN Environmental Cooperation Center (including the One Belt one Road | 2010 | Founded by China and ASEAN members; partner organizations include, among others, the WWF, SCO, the Stockholm Environment Institute, the | The cooperation center aims to facilitate high-level dialogues on environmental policy, technical exchanges and training, personnel exchanges and capacity building. The One Belt one Road Environmentally Sound Technology Transfer Hub   |

<sup>46</sup> Ibid.

<sup>47</sup> [http://www.chinatoday.com.cn/english/economy/2017-03/01/content\\_736359.htm](http://www.chinatoday.com.cn/english/economy/2017-03/01/content_736359.htm)

<sup>48</sup> <http://bri.ouce.ox.ac.uk/> (official website) and <https://www.chinadialogue.net/blog/10299-A-green-BRI-is-a-global-imperative/en>

<sup>49</sup> <https://www.chinadialogue.net/article/show/single/en/10622-Interview-Sherry-Madera-on-greening-the-Belt-and-Road> and [http://www.gib-foundation.org/content/uploads/2018/12/Developing\\_a\\_Carbon\\_Neutral\\_Infrastructure\\_Framework\\_and\\_Implementation\\_Guidelines\\_along\\_the\\_Belt\\_and\\_Road\\_2018\\_07.pdf](http://www.gib-foundation.org/content/uploads/2018/12/Developing_a_Carbon_Neutral_Infrastructure_Framework_and_Implementation_Guidelines_along_the_Belt_and_Road_2018_07.pdf)

|   |      |  |  |
|---|------|--|--|
| Environmentally Sound Technology Transfer Hub) <sup>50</sup>  |      | World Resource Institute China and UNDP  | conducts research on environmental policies and strategies for the BRI and putting forward policy recommendations.   |
| Lancang-Mekong Environment Cooperation Center <sup>51</sup>   | 2016 | Proposed by China; joined by the Laos, Myanmar, Thailand, Cambodia and Vietnam | The mission is to promote sustainable development in the six countries of the sub-region, promote cooperation in the Lancang-Mekong ecological Environmental protection; provide a dialogue platform for regional environment and development policy; promote regional environmental management capacity; and promote regional environmental-friendly industries cooperation. "The Lancang-Mekong Environmental Cooperation Center aims to disseminate China's theory of environmental governance, boost the capacity of environmental governance of each country and achieve regional sustainable development through the promotion of environmental cooperation among Lancang-Mekong countries". |
| China-Cambodia Environmental Cooperation Center <sup>52</sup> | 2018 | Jointly established by China and Cambodia                                      | The center should facilitate environmental cooperation between both countries  |
| China-Laos Environmental Cooperation Office <sup>53</sup>     | n.d. | Jointly established by China and Laos  | n/a  |

<sup>50</sup> <http://www.chinaaseanenv.org/about/functions/201612/W020170224594566989375.pdf> and <http://english.mee.gov.cn/Resources/Plans/Plans/201707/P020170714352675668098.pdf>

<sup>51</sup> [http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369\\_2.html](http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369_2.html) and [http://www.chinaaseanenv.org/lmecc/about\\_us/our\\_history/](http://www.chinaaseanenv.org/lmecc/about_us/our_history/)

<sup>52</sup> <https://www.phnompenhpost.com/national/cambodia-china-environmental-cooperation-center-inaugurated> and [http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369\\_2.html](http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369_2.html)

<sup>53</sup> [http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369\\_2.html](http://www.chinadaily.com.cn/a/201904/25/WS5cc108efa3104842260b8369_2.html)

|       |  |             |   |  |
|-------|--|-------------|---|--|
|       | China-Africa Environmental Cooperation Center <sup>54</sup>                                | in planning | n/a   | President Xi Jinping formally announced the establishment of the Center in 2018. The Centre should become a platform for broad environmental policy dialogue, information exchange, capacity building and co-operation on green development, directed and steered by both African countries and China.   |
| Other | China-ASEAN Partnership for Eco-friendly Cities <sup>55</sup>                              | 2015        | Joined by more than 20 Chinese and ASEAN cities   | The partnership provides a platform for China and ASEAN countries to cooperate in urban green and sustainable development. Over the past three years, the two sides have held many cooperation activities centered on the experience of eco-friendly city construction. Currently, more than 20 China and ASEAN cities have established such partnerships. Many environmental protection enterprises have also actively joined in China-ASEAN cooperation for eco-friendly cities, involving urban planning, air pollution control, water environment control, solid waste treatment, green building and other fields. |
|       | Shanghai Cooperation Organization Environmental Information Sharing Platform <sup>56</sup> | 2019        | Launched by China and is funded by the Chinese government, SCO member countries, the SCO Development Fund, Funds of the SCO Development Bank, funds from relevant financial institutions, foreign governments and international partners, as well as donations from enterprises and civil society organizations | China has established an online platform for the sharing of environmental information among member states of the Shanghai Cooperation Organization. It will facilitate environmental exchanges, and more seminars and training will be organized. It will serve as a platform for environmental cooperation for SCO members, observers and partners and promote sustainable development and better environment quality of the region.  |

<sup>54</sup> Ibid; and <https://www.unenvironment.org/regions/africa/regional-initiatives/china-africa-environmental-cooperation-centre>

<sup>55</sup> <http://www.caeisp.org.cn/activities/seminar-asean-china-cooperation-eco-friendly-cities-2019-held-beijing>

<sup>56</sup> <http://www.chinadaily.com.cn/a/201906/15/WS5d0435f0a3103dbf143285c8.html> and <http://www.scoei.org.cn:184/> (official website)

**D. List of Acronyms**

|                   |  |
|-------------------|--|
| <b>ACFIC</b>      | All-China Federation of Industry and Commerce  |
| <b>AMAC</b>       | Asset Management Association of China  |
| <b>ASEAN</b>      | Association of Southeast Asian Nations   |
| <b>CAF</b>        | Chinese Academy of Forestry  |
| <b>CAPIAC</b>     | China Association for the Promotion of International Agricultural Cooperation  |
| <b>CBA</b>        | China Banking Association  |
| <b>CBRC</b>       | China Banking Regulatory Commission (now CBIRC, which is a merger of CBRC and CIRC as part of the 2018 State Council institutional reform) |
| <b>CCCMC</b>      | China Chamber of Commerce of Metals and Chemicals  |
| <b>CFNA</b>       | China Chamber of Commerce of Foodstuffs and Native Produce   |
| <b>CHINCA</b>     | China International Contractors Association  |
| <b>CIRC</b>       | China Insurance Regulatory Commission (now CBIRC)  |
| <b>CSRC</b>       | China Securities Regulatory Commission   |
| <b>CTA</b>        | China Trustee Association  |
| <b>FECO</b>       | Foreign Economic Cooperation Office of the Ministry of Environmental Protection  |
| <b>GFC</b>        | Green Finance Committee (GFC) of China Society for Finance and Banking   |
| <b>IAC</b>        | Investment Association of China  |
| <b>IAMAC</b>      | Insurance Asset Management Association of China  |
| <b>MARA</b>       | Ministry of Agriculture and Rural Affairs  |
| <b>MEE</b>        | Ministry of Ecology and Environment  |
| <b>MEP</b>        | Ministry of Environmental Protection (now MEE)   |
| <b>MFA</b>        | Ministry of Foreign Affairs  |
| <b>MNR</b>        | Ministry of Natural Resources (externally aka State Oceanic Administration)  |
| <b>MOA</b>        | Ministry of Agriculture (now MARA)   |
| <b>MOF</b>        | Ministry of Finance  |
| <b>MOFA</b>       | Ministry of Foreign Affairs  |
| <b>MOFCOM</b>     | Ministry of Commerce   |
| <b>MWR</b>        | Ministry of Water Resources  |
| <b>NDRC</b>       | National Development and Reform Commission   |
| <b>NEA</b>        | National Energy Administration   |
| <b>PBOC</b>       | People's Bank of China   |
| <b>SASAC</b>      | State-owned Assets Supervision and Administration Commission   |
| <b>SCO</b>        | Shanghai Cooperation Organisation  |
| <b>SFA</b>        | State Forestry Administration (now National Forestry and Grassland Administration; under Ministry of Natural Resources)                    |
| <b>SOA</b>        | State Oceanic Administration   |
| <b>UCLA-ASPAC</b> | United Cities and Local Governments Asia Pacific   |
| <b>UNESCAP</b>    | United Nations Economic and Social Commission for Asia and the Pacific   |
| <b>UNIDO</b>      | United Nations Industrial Development Organization   |
| <b>WWF</b>        | World Wide Fund for Nature   |



## **Article 4:**

### **Environmental governance of a Belt and Road project in Montenegro – National agency and external influences**

#### **Abstract**

China's Belt and Road Initiative (BRI) is an ambitious effort to increase trans-continental connectivity and cooperation mainly through infrastructure investments and trade. On the one hand, this globally unparalleled initiative is expected to foster economic growth, but on the other hand, it can have substantial environmental implications. The BRI creates new challenges and opportunities for environmental governance as new actor constellations emerge in BRI host countries to plan and construct large infrastructure projects. Although China has outlined its vision of building a "green Belt and Road", it remains unknown how it unfolds on the ground.

As an example of a BRI project with clear environmental implications, we present a case study of the Bar-Boljare highway in Montenegro. Based on expert interviews, we elucidate the complex web of actors and contractual arrangements involved, and demonstrate how internal and external actors exert influence on domestic environmental governance in this EU candidate country in the Western Balkans. We find that Montenegro has substantial agency over the environmental governance of this BRI project, but shows little concern over the environmental impacts of the project. Environmental issues could have been prevented during the spatial planning phase, but important governance instruments such as the Environmental Impact Assessment (EIA) were of limited effectiveness due to its fast and late completion, lack of assessment of alternative routes, and the limited enforcement of the provisions therein. International institutions like the EU or UNESCO have drawn on their normative power in environmental governance to demand greater environmental safeguards from Montenegrin authorities. This case is illustrative of a larger set of BRI projects which run the risk of falling short on sustainability due to a lack of environmentally sound and transparent planning and implementation.





# Environmental governance of a Belt and Road project in Montenegro – National agency and external influences

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## ABSTRACT

China's Belt and Road Initiative (BRI) is an ambitious effort to increase trans-continental connectivity and cooperation mainly through infrastructure investments and trade. On the one hand, this globally unparalleled initiative is expected to foster economic growth, but on the other hand, it can have substantial environmental implications. The BRI creates new challenges and opportunities for environmental governance as new actor constellations emerge in BRI host countries to plan and construct large infrastructure projects. Although China has outlined its vision of building a “green Belt and Road”, it remains unknown how it unfolds on the ground.

As an example of a BRI project with clear environmental implications, we present a case study of the Bar-Boljare highway in Montenegro. Based on expert interviews, we elucidate the complex web of actors and contractual arrangements involved, and demonstrate how internal and external actors exert influence on domestic environmental governance in this EU candidate country in the Western Balkans. We find that Montenegro has substantial agency over the environmental governance of this BRI project, but shows little concern over the environmental impacts of the project. Environmental issues could have been prevented during the spatial planning phase, but important governance instruments such as the Environmental Impact Assessment (EIA) were of limited effectiveness due to its fast and late completion, lack of assessment of alternative routes, and the limited enforcement of the provisions therein. International institutions like the EU or UNESCO have drawn on their normative power in environmental governance to demand greater environmental safeguards from Montenegrin authorities. This case is illustrative of a larger set of BRI projects which run the risk of falling short on sustainability due to a lack of environmentally sound and transparent planning and implementation.

## 1. Introduction

In 2013, China launched the Belt and Road Initiative (BRI, also referred to as “One Belt One Road Initiative” or “New Silk Road”), which is an infrastructure-led development plan aimed at increased regional and trans-continental economic and political cooperation (Flint and Zhu, 2019). The BRI has become an umbrella term for a number of different Chinese overseas activities, yet, its current main focus lies on the development of road, rail, energy, industrial, maritime and multimodal transport infrastructure worldwide (Casarini, 2016; Holzer, 2020). Apart from advancing its geopolitical influence and economic

objectives, China aims to develop its soft power through tourism and cultural and scientific exchanges across BRI countries (Flint and Zhu, 2019). Initially, the first BRI projects were launched across the Eurasian continent, but today, more than 130 countries across the entire world have signed cooperation agreements with China to jointly build the BRI, including many countries in Africa, South America and Europe (Belt and Road Portal, 2019).

The BRI is gaining momentum in the Western Balkans. Political and economic relations between China and Central and Eastern European Countries (CEEC) have been deepening in recent years, not least since the establishment of the 16 + 1 framework<sup>1</sup> in 2012, which grew into

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<sup>1</sup> In 2012, China established the 16 + 1 platform with 16 central and eastern European countries (CEECs), including 11 EU Member States and five Western Balkan countries to expand cooperation in the fields of investments, transport, finance, science, education, and culture

the 17 + 1 framework with Greece joining in 2019 (Holzer, 2020). In addition to the regular political exchanges of the 17 + 1 grouping, China is expanding its economic ties with CEEC by financing and constructing large infrastructure projects, which improve better access of Chinese manufacturers to European markets (Bieber and Tzifakis, 2019; Casarini, 2016). Prominent examples include the port of Piraeus in Greece, the Kostolac power plant in Serbia and the Kičevo-Ohrid highway in North Macedonia (Tsimonis et al., 2020).

The Balkans has been a zone of power rivalry among global and regional actors, including Russia, China, the United States (US), the European Union (EU), Turkey and the United Arab Emirates (Bieber and Tzifakis, 2019). Even though the Western Balkan countries are largely Europe-oriented and aspire to join the EU, the EU's 'enlargement fatigue' and diminishing US involvement have created a space for non-Western players like China to step in (Chrzová, 2019). The Bar-Boljare Highway (BBH) in Montenegro is a prime example of China's growing presence in the region. The small Balkan country, which has an area of about 13,000 square kilometers and a population of about 622,000 people, is one of the few European countries without a highway. The middle section of the BBH is currently being built by a Chinese company and financed through a loan from the Export-Import Bank of China (Fig. 1). Both domestic and international actors have criticized not only the high public debts this project caused (Grgić, 2017; IMF, 2018; Marović, 2019), but also its negative environmental effects (European Commission, 2019b; MANS, 2019c; UNESCO, 2019).

In recent years, China has outlined its vision of building a "green Belt and Road" (Coenen et al., 2021), in which context "critical and field-work-based research is essential to understand the multi-faceted politics of the green BRI" (Harlan, 2020, p. 17). The primary pathways through which BRI infrastructure affects the natural environment are land-use changes, impacts on landscape connectivity and greenhouse gases emissions (Teo et al., 2019). The expansion of transport networks poses the risk of habitat loss, the overexploitation of resources and the degradation of surrounding landscapes (Ascensão et al., 2018). For example, the BRI-related Kičevo-Ohrid Highway in North Macedonia cuts through the natural habitat of the Balkan lynx, a critically endangered species, whose population has been declining due to pressures from infrastructure projects (Tsimonis et al., 2020). Despite increasing investments in renewable energy infrastructure, the majority of BRI energy projects are in fossil fuels (Jackson et al., 2021), such as lignite coal power plants in the Balkans (Rogelja, 2020).

In this study, we address the question how the environmental implications of the Bar-Boljare Highway are governed. The main objectives of our study are to elucidate (1) the roles and responsibilities of different actors for addressing environmental implications during the planning and construction process, (2) the influence of foreign actors on the environmental governance of the BBH, and (3) the challenges and opportunities faced to safeguard the environment in current, but also future work on the highway.

The case study contributes to the existing literature in two respects. First, we contribute to an academic discussion which considers infrastructure development not merely in economic terms, but increasingly in relation to land use and environmental protection (Busscher et al., 2015; Oldekop et al., 2020). Infrastructure development is a proximate driver of landscape change in Europe (Plieninger et al., 2016), and it potentially influences the attainment of all Sustainable Development Goals (Thacker et al., 2019). Our study illustrates that infrastructure projects should not only be studied in the realm of environmental management alone, i.e., procedures and techniques to prevent, mitigate and monitor human impacts on the natural environment. Additionally, there is the need to also consider the environmental governance of such projects, i.e., interactions between societal actors aimed at preventing, mitigating and monitoring human impacts on the natural environment. Doing so will put a stronger focus on the interactions between public, private and civil society actors, and their interplay with international organizations.

Second, this study contributes to the emerging literature analyzing environmental issues and governance structures of BRI projects (e.g., Anthony, 2020; Hale et al., 2020; Jahns et al., 2020; Tritto, 2021; Tsimonis et al., 2020). Our findings can be compared and contrasted with other BRI cases to build a cumulative knowledge base on environmental governance of BRI projects in order to identify unifying characteristics of BRI projects worldwide. While existing studies have mostly focused on the role of Chinese actors and BRI host countries in negotiating and implementing BRI projects (e.g., Anthony, 2020; Calabrese and Cao, 2021; Tritto, 2021), we also take note of the influences exerted by international organizations like the United Nations Educational, Scientific and Cultural Organization (UNESCO) and EU, showing how European BRI countries are faced with the challenge to balance national priorities and international interests.

The remainder of this article is structured as follows. We first introduce our theoretical departures and relevant literature. After describing our methods and data sources, we present the results in three steps. First, we elucidate the historical development of the BBH and contextualize it in the realm of the BRI. Second, we outline the environmental effects. Third, we examine the domestic environmental governance structures of this project and analyze how foreign and international actors exert influence on Montenegro's environmental governance in the context of the BBH.

## 2. Conceptual departures

Our theoretical perspective is inspired by the telecoupling framework, which directs attention to how socio-economic decisions and activities in one place affect socio-ecological systems at a distance (Fris and Nielsen, 2019; Liu et al., 2013). Local environmental change is no longer conceived as resulting from local activities only, but as influenced by changing political, social or economic decisions elsewhere, which poses new challenges for environmental governance (Newig et al., 2020). The telecoupling framework lends itself to the analysis of newly emerging economic and political linkages under the BRI (Coenen et al., 2021; Yang et al., 2016). It explicitly recognizes the relevance of long-distance flows of materials, people, energy, finance and information that link the focal system, here Montenegro, and the telecoupled system of interest, here China, for investigating local environmental changes (centre of Fig. 2).

From a governance perspective, the question arises regarding the locus and origin of governance in telecoupled systems, and hence, regarding the agency of the involved political actors in the overall telecoupled system. Recent research has highlighted the important role of both China and host countries in governing BRI projects towards greater sustainability in order to realize China's vision of a "green BRI" (e.g., Coenen et al., 2021; Tritto, 2021). At the level of global representation, China's role in the BRI is central, but as the scale shifts towards the implementation of actual projects, the role of local states and local communities becomes far more prominent than the role of China (Anthony, 2020). Notably, BRI projects are often national development projects that have been envisioned by national elites prior to the BRI, who play a crucial role in facilitating entry for Chinese financiers and companies (Anthony, 2020; Rogelja, 2020). Host countries' governments can shape the outcomes of BRI projects and leverage the BRI to achieve their own objectives by, for example, diversifying development partners, or by establishing procedures of screening, appraisal, selection, and prioritization of infrastructure projects (Calabrese and Cao, 2021). Consequently, national agency ought not be underestimated, including when it comes to environmental governance. A good deal of responsibility for poor environmental outcomes of BRI projects in Southeast Europe and elsewhere has been attributed to host countries' governments (Anthony, 2020; Tritto, 2021; Tsimonis et al., 2020).

As part of the larger telecoupled system, Montenegro, like other BRI host countries, is also embedded in regional and international institutional structures, which may directly or indirectly influence national

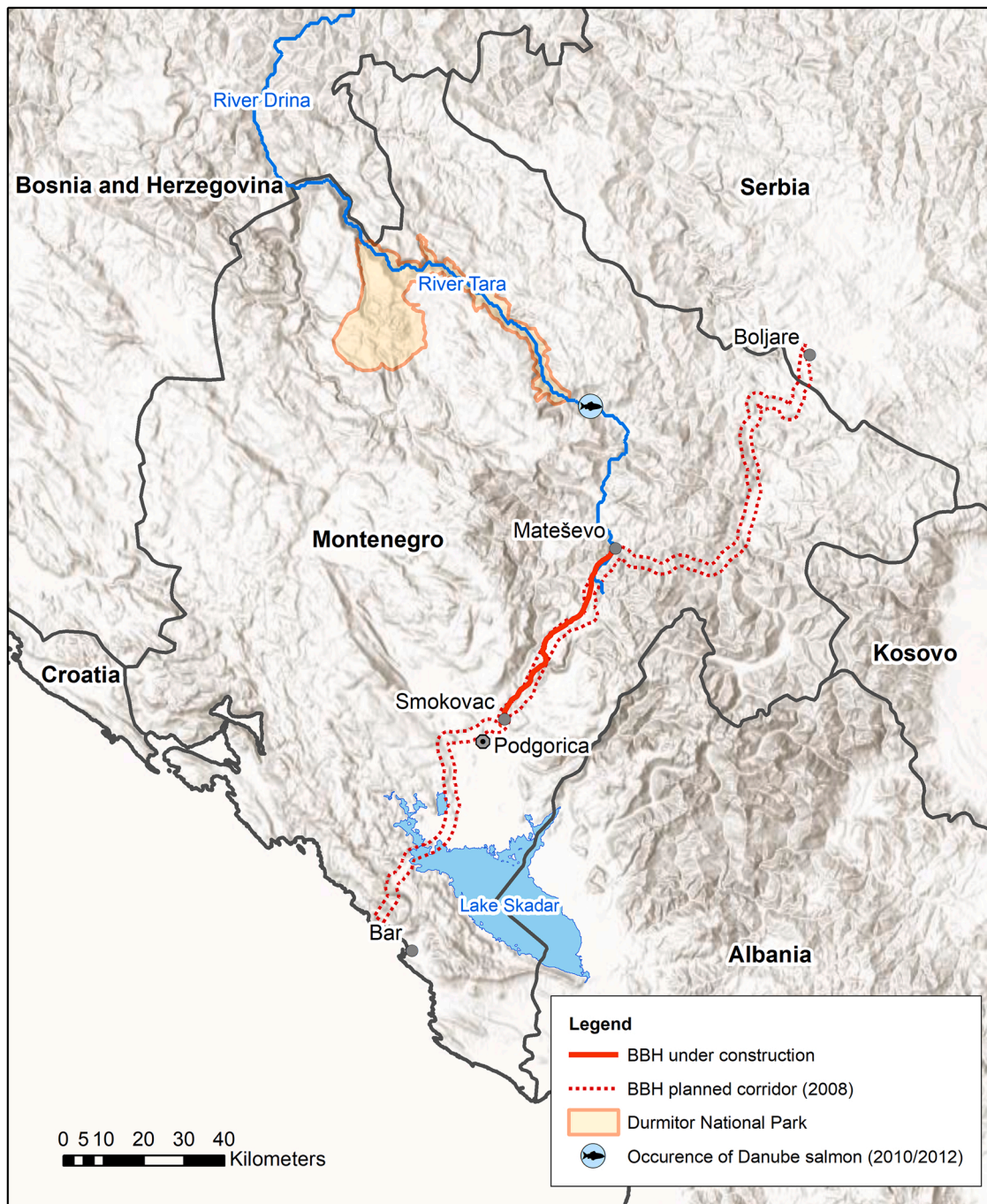


Fig. 1. Map of Montenegro and the planned Bar-Boljare highway.

Sources of map features: GBIF.org (2020), UNEP-WCMC (2020), Ministry of Economic Development, 2008a. Sources of service layer: Esri, U SGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geo datastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community. The precise localization of the S-M section was identified in Google Earth, using also ancillary documents and field visits.

decision-making. International organizations, which shape and maintain institutional structures, can mobilize their authority and exert influence on national authorities by, for example, disseminating information, framing issues, shaping procedures and law making, providing technical advice, and assisting countries to comply with international rules (Jinnah, 2014). State actors remain key players in environmental governance of national development projects, but they are neither unitary actors, nor do they operate in a void. The traditional telecoupling framework highlights the linkages and interdependencies

between actors and processes in two or more distant places (Friis and Nielsen, 2019; Liu et al., 2013), but it does not capture the overlapping and interrelated layers of governance in which these actors are embedded, which we added to our theoretical framework in Fig. 2 in order to illustrate that Montenegro is facing various external influences.

Apart from being part of the BRI and interacting with Chinese actors, Montenegro faces two particularly important external influences. First, Montenegro is embedded in the international governance system of the United Nations (UN), which includes specialized agencies like the



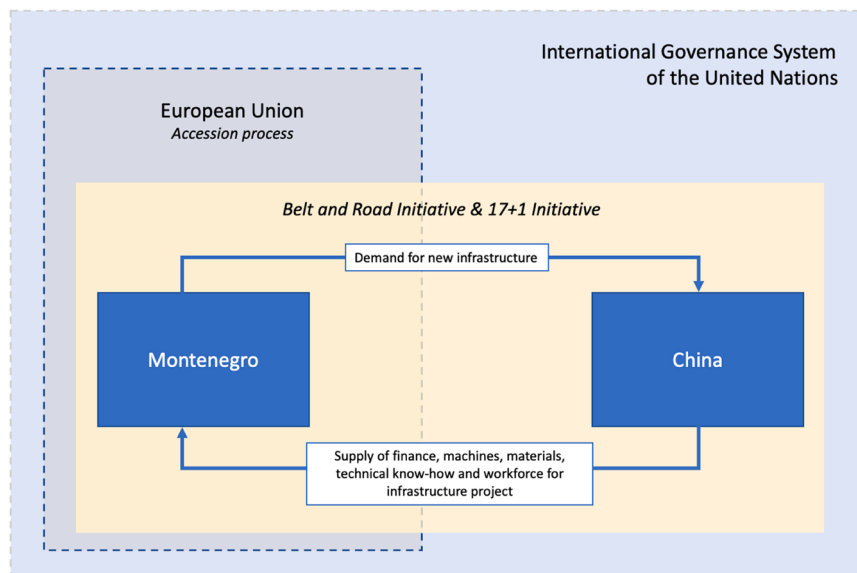


Fig. 2. Montenegro's BRI project as part of a telecoupled relationship with China, embedded in a larger institutional context involving international and EU (environmental) governance.

UNESCO. Second, as an EU candidate country, Montenegro is subject to multiple influences on the part of the European Union, which have broadly been described as Europeanization and diffusion of ideas, normative standards, policies and institutions (Börzel and Risse, 2012). In concrete terms, Montenegro is aligning its domestic legislation with EU legislation and has a strong incentive to demonstrate its capacity to follow EU standards (Schimmelfennig and Sedelmeier, 2008). Given the EU's normative and regulatory influence in the region, we follow the call by Tsimonis et al. (2020) to consider both national-level actors and EU frameworks when studying the challenges posed by Chinese capital for environmental sustainability in Southeast Europe.

The various external actors can draw on different sources of authority to exert influence. The EU and UNESCO have first and foremost moral authority in this context, as they can "draw from shared normative belief systems to advocate for or defend particular activities or ideas" (Jinnah, 2014, p. 49). In addition, the UNESCO possesses expert-based authority, as it can mobilize technical knowledge in order to, for example, evaluate ecological impacts and make concrete recommendations how to address those impacts (Jinnah, 2014). This contrasts with the role of Chinese actors who have limited authority, but potentially more direct influence on the operational management of the project. Existing empirical studies found that Chinese contractors take a passive role regarding the environmental requirements in BRI projects in the Western Balkans. According to Jahns et al. (2020), Chinese contractors declared to meet the standards required by the host countries' legislation and regulation, but neither took a pro-active approach towards going beyond the minimum requirements, nor made any explicit references to the "green BRI". Typically, Chinese investments do not come with the usual strings attached like with EU financial assistance (Bieber and Tzifakis, 2019), and BRI projects are often characterized by a lack of transparency during the negotiation and subsequent implementation process, which shields financiers, firms and local authorities from civil society scrutiny (Gonzalez-Vicente, 2019; Jahns et al., 2020; Tsimonis et al., 2020).

### 3. Methods and materials

We selected the Bar-Boljare highway for an in-depth case study for several reasons. First, the first section of this highway (42,5 of a planned total of 170 km) has already been under construction since 2015, which

allows us to study a BRI project at an advanced stage (Fig. 1). Second, compared to many other BRI projects, documentation on the highway is available (e.g., an official website<sup>2</sup> with relevant documents including the Environmental Impact Assessment). Third, several environmental problems have been reported, including the disposal of construction wastes at the river Tara and alterations of the river course (European Commission, 2019b; MANS, 2019c; UNESCO, 2019). Fourth, other sections of the highway are currently planned, which makes it highly relevant to learn some lessons from the construction of the first section.

This paper draws on fieldwork comprising 18 semi-structured expert interviews (Table 1). Thirteen interviews were held in person in Montenegro in February 2020, while five interviews were conducted via phone. All interviews were conducted in English by the first author, except for three interviews which were translated by a local researcher from the Euraxess Service Centre of the University of Montenegro. The interviews lasted between 40 and 90 min. The interview questions were developed based on our theoretical framework and available literature (e.g., Environmental Protection Agency, 2015; Grgić, 2017; IMF, 2018), following the approach by Arthur and Nazroo (2003) on how to design fieldwork strategies and prepare topic guides. The questions revolved around the interviewee's role with regards to the highway project, the perception of the project's environmental impacts, existing procedures to address potential environmental effects, the interaction with other stakeholders, and lessons learnt from this project for the future development of the BBH. Detailed conversation protocols were written for all interviews and coded according to themes that were defined before the fieldwork (i.e., governance institutions, governance processes, governance challenges, influence of domestic actors, influence of external actors, environmental outcomes) using the MAXQDA software. During the coding process, sub-codes were added that emerged from the analysis (e.g., planning and design, river Tara, UNESCO mission). Moreover, a representative from the Ministry of Sustainable Development and Tourism (henceforth Ministry of Sustainable Development), and a representative from the Ministry of Transport and Maritime Affairs (henceforth Ministry of Transport) provided written responses to our

<sup>2</sup> The website <http://barboljare.me/en/> was accessed between November 2019 and April 2021. The weblink is no longer valid. The original page can be accessed through an Internet archive

**Table 1**  
Expert interviews.

| Affiliation                                       | Acronyms used in text | Number of Interviews |
|---|-----------------------|----------------------|
| Governmental authorities                          | GOV                   | 3                    |
| Operational project management units <sup>a</sup> | OPMU                  | 2                    |
| International organizations                       | IO                    | 3                    |
| International consultants/experts                 | EXP                   | 2                    |
| Local researchers                                 | RES                   | 4                    |
| Local nongovernmental organizations               | NGO                   | 4                    |

<sup>a</sup> See Fig. 5.

questions. Additionally, document analysis, online research and three site visits<sup>3</sup> enabled us to triangulate and corroborate the information gathered during the interviews. The different sources of knowledge were combined and cross-checked through a triangulation research strategy to increase the reliability and credibility of the findings. The first part of our results (i.e., tracing the historical development of the BBH) largely relies on literature because interviewees sometimes contradicted each other regarding some key events. For example, interviewees disagreed about the timing of the Strategic Environmental Assessment (SEA) (interviews GOV3 and RES3), which we subsequently cross-checked with available literature in order to provide reproducible and accurate information. The second and third part of our results (i.e., environmental impacts and governance) are derived from our interview data and supplementary literature. Due to the political sensitivity, several interviewees seemingly felt uncomfortable with talking about environmental issues. The government has designated some key project documents about, for example, finance and control of the implementation works, as state secret (MANS, 2018). The Chinese contractor declined our request to answer our questions. Due to the sensitivity of the topic, we ensure full anonymity of all interviewees.

## 4. Results

### 4.1. The development of the Bar-Boljare highway in the context of the Belt and Road Initiative

The construction of a highway between the Adriatic Sea and the Serbian border has been a long-standing vision of the Montenegrin government, as outlined in the 2008 Spatial Plan of Montenegro by 2020 and the 2008 Detailed Spatial Plan for the Bar-Boljare highway (Ministry of Economic Development, 2008a; 2008b). State officials often refer to it as the “project of the century” (Dnevne novine, 2016). The BBH, approximately 170 km long, would link the port of Bar on the Adriatic coast to Serbia, through the Montenegrin capital Podgorica (Fig. 1).

The government of Montenegro decided to build the BBH section by section, starting with the middle section from Smokovac to Mateševo (hereafter referred to as S-M section). The S-M section is about 42.5 km long. It includes 21 bridges and 16 tunnels (Ministry of Transport, personal communication, June 1, 2020), which together cover about 58% of the route (Dnevne novine, 2016). Additionally, supporting infrastructure, including about 40 km of access roads, five main camps with offices and accommodation for the Chinese staff, laboratories, crushers, workshops, cement plants and warehouses, have been constructed (Dnevne novine, 2016). The S-M section poses the highest technical and financial requirements among all sections, given the mountainous

terrain and high altitude difference. At a cost of nearly one billion Euro, the S-M section is the most expensive section of the BBH, as the remaining 136 km of the highway together will likely cost somewhat more than the S-M section (IMF, 2018). The construction officially started in May 2015 and was planned to be completed in 2019. Yet, the opening of the S-M section has been postponed several times due to the global COVID-19 pandemic and other reasons (Table 2).

The S-M section is financed by a Chinese bank and constructed by a state-owned Chinese company. After Western financial institutions deemed the project as unfeasible and two construction companies failed to deliver the required completion guarantees (Grgić, 2017), the government of Montenegro secured Chinese support for the project (Table 2). It signed a contract worth €809 million with the Chinese construction company China Road and Bridge Corporation (CRBC), a subsidiary of the China Communications Construction Company (CCCC), for designing and building this S-M section. The Chinese Exim Bank (CHEXIM) provided a 20-year loan, with a 2% interest rate, a six-year grace period and a 20-year repayment period, for 85% of the total value of the contract (Government of Montenegro, 2014c). The remaining 15% of the costs are financed by the Montenegrin government. In Article 8.1 of the loan agreement,<sup>4</sup> the government of Montenegro waives its sovereign rights on its property, apart for military and diplomatic assets, in case of loan default, and Article 8.5 stipulates arbitration in Beijing. Under the Law on the Highway, the project is exempt from taxes and custom fees, while at least 30 per cent of the work should be assigned to local companies (Government of Montenegro, 2014a). At peak times, more than 2,000 Chinese workers were employed on the construction site (interview OPMU1). A public controversy erupted in 2017 when the government announced its plans to build an additional 1.5 km long interchange near Podgorica (Smokovac interchange), as well as the water supply and electricity network on the highway. Critics argued that these works have been forgotten in the construction contract with CRBC, whereas governmental authorities refuted these claims, arguing that the Montenegrin government will cover these costs as part of “subsequent and unforeseeable works” (Ministry of Transport and Maritime Affairs, 2018, para. 11).

The Chinese government has not yet published any official list of all BRI projects, but the project has repeatedly been mentioned in the context of the BRI (see e.g., interview with CRBC project manager in Dnevne novine, 2016, pp. 3–5), and Montenegro has signed cooperation documents with China on jointly building the BRI (Belt and Road Portal, 2019). BRI projects are often initiated by the host countries’ governments, just like the BBH for which spatial plans have been developed long before the official inception of the BRI in 2013 (Table 2). According to Rogelja (2020, p. 7), “The ‘pull’ coming from the region is complemented by a ‘push’ emanating from China”. The Montenegrin government repeatedly emphasizes its national ownership of the project. The former Prime Minister Duško Marković underlined, “So we cannot speak of Chinese investment, but of our investment being implemented by a Chinese company” (as cited in Prager, 2019, para. 46).

Boosting economic development through large infrastructure is a shared priority of both China and Montenegro. China’s primary interest has been assumed to be the improvement of the region’s infrastructure, which lays at the intersection of the maritime and land-based BRI corridors, in order to facilitate the transport of Chinese manufactured products to Europe (Bieber and Tzifakis, 2019). In addition to geopolitical considerations, commercial interests may have been an equally important motivation for the Chinese company and bank as they could negotiate a favourable business deal, given the tax exemptions and

<sup>3</sup> The on-site visits included: (1) site visit with an NGO representative to a citizen living close to the construction site near Podgorica, (2) site visit with the Project Management Unit to the Southern part of the highway section, and (3) private site visit to the Northern construction site (i.e., on a public road which crosses the river Tara at the construction site).

<sup>4</sup> Article 8.1: “The Borrower hereby irrevocably waives any immunity on the grounds of sovereign or otherwise for itself or its property, except for those assets dedicated to military or diplomatic purpose, in connection with any arbitration proceeding pursuant to Article 8.5 [...]” (Government of Montenegro, 2014c).

**Table 2**  
Timeline of the development of the Bar-Boljare Highway.

| Date        | Event  | Source   |
|-------------|--|--|
| 2006 & 2007 | Development of the <b>Strategic Environmental Assessment (SEA)</b> on the Spatial Plan of Montenegro until 2020 <sup>a</sup>   | Markovic et al. (2009)                             |
| 03/2008     | <b>Spatial Plan of Montenegro</b> until 2020   | Ministry of Economic Development (2008b)           |
| 10/2008     | <b>Detailed Spatial Plan for the BBH</b>   | Ministry of Economic Development (2008a)           |
| 2008        | <b>Feasibility Study</b> for the BBH; designed by <i>Louis Berger SAS</i> <sup>a</sup>   | Ministry of Transport and Maritime Affairs (2017a) |
| 2009        | <b>Feasibility Study</b> for the BBH, designed by <i>Scott Wilson</i> in collaboration with the International Finance Corporation (IFC) <sup>a</sup>   | Ministry of Transport and Maritime Affairs (2017a) |
| 2009/2010   | The <b>government announces the construction of the BBH</b> . However, the first and second-placed companies in the tender (a Croatian company and a Greek-Israeli consortium) withdraw after failing to deliver the required completion guarantees.   | Grgić (2017)                                       |
| 2012        | <b>Feasibility Study</b> for the SEETO Road Route 4 Investment Plan, designed by a consortium led by <i>URS Infrastructure &amp; Environment UK Limited</i> <sup>a</sup>   | Government of Montenegro (2013; 2014b)             |
| 06/2011     | <b>Intergovernmental agreement</b> between the Government of Montenegro and the Government of the People's Republic of China on Enhancing Cooperation in Infrastructure Construction   | Government of Montenegro (2013)                    |
| 02/2014     | <b>Amendment to the intergovernmental agreement</b> between the Government of Montenegro and the Government of the People's Republic of China on Enhancing Cooperation in Infrastructure Construction (explicitly mentioning the BBH now)              | Government of Montenegro (2014b)                   |
| 02/2014     | <b>Design and Build Contract</b> (based on the FIDIC Yellow Book) between the Government of Montenegro and CRBC  | Government of Montenegro (2014c)                   |
| 10/2014     | <b>Preferential Loan Agreement</b> between the Ministry of Finance and the Exim Bank of China  | Government of Montenegro (2014c)                   |
| 12/2014     | The Parliament passes the <b>Law on the BBH</b>  | Government of Montenegro (2014a)                   |
| 05/2015     | <b>Official start of construction</b>  | Dnevne novine (2016)                               |
| 12/2015     | Environmental Protection Agency (EPA) <sup>b</sup> issues consent for the <b>Environmental Impact Assessment (EIA)</b>   | Environmental Protection Agency (2015)             |
| 06/2018     | Environmental Protection Agency (EPA) <sup>b</sup> issues consent for the <b>Environmental Impact Assessment</b> of the Smokovac interchange (EIA)   | CRBC (2017)  |
| 04/2019     | Start of the construction of the <b>Smokovac interchange</b>   | BEMAX (n.d.)                                       |
| 2021        | According to media reports, Montenegro sues CRBC for the environmental damages caused to the river Tara (Note: there was a change of government in 2020)   | RTCG (2021)  |
| 05/2022     | Latest announced <b>opening date</b> of the S-M section (after several delays)   | CdM (2022)   |
| Ongoing     | Preparation of a <b>new feasibility study</b> for the entire BBH, and the Preliminary Design and Environmental and Social Impact Assessments for two future sections of the BBH, financed through the EU's Western Balkans Investment Framework (WBIF) | WBIF (2019)  |

<sup>a</sup> Document is not publicly available.

<sup>b</sup> Now Nature and Environmental Protection Agency (NEPA).

sovereign guarantee. So far, China has mainly focused on pursuing economic interests and creating business connections with Montenegro, but cultural and academic exchanges are also increasingly promoted through, for example, the opening of the Confucius Institute in Podgorica, the celebration of Chinese New Year and Spring Festival in larger Montenegrin cities, and visa facilitations for Chinese tourists (Semanić, 2019).

From the perspective of the Montenegrin government, the highway contributes towards integrating the country into the Trans-European Transport Network (TEN-T) and promoting economic growth through, for example, the development of tourism in Northern parts of the country (Ministry of Transport and Maritime Affairs, 2017b). The government expects the highway to increase traffic safety, improve the integration of the southern, northern and central regions of Montenegro, support the competitiveness of the Montenegrin economy, attract foreign direct investments and transit traffic flows, and contribute to GDP growth. The integration of local experts and companies in the realization of the project is expected to lead to the transfer of knowledge, skills and technology (Ministry of Transport, personal communication, June 1, 2020).

#### 4.2. Environmental effects of the Bar-Boljare Highway

The primary environmental effects of the highway construction are already visible today (Figs. 3 and 4). The highway crosses the river Tara in the northern part of the S-M section, which has raised environmental concerns among domestic and international actors (European Commission, 2019b; MANS, 2019c; UNESCO, 2019). The 78km long Tara river canyon is the deepest canyon in Europe (Pešić et al., 2020). Located downstream the construction site, it is protected as part of the UNESCO World Heritage Site Durmitor National Park. The Tara river basin is recognized as a World Biosphere Reserve and part of the UNESCO Man and Biosphere Programme.<sup>5</sup> The canyon is also protected under national legislation as it was declared a Nature Reserve and Nature Monument in 1977 (IUCN, 2020). In addition, the Parliament adopted the "Declaration on the protection of the river Tara" in 2004.

The highway construction led to changes in the river course from a braided river, stretching across the floodplain, to an artificially straightened river (Fig. 3). Since the bridge piers, pay toll stations and entry and exit ramps of the highway are located in the heart of the floodplain (Fig. 4), core biodiversity values and characteristic habitat features for floodplains will likely be lost (UNESCO, 2019). Water turbidity and sediment accumulation threaten the fauna at both the construction site and in downstream river sections. In this context, the joint UNESCO and IUCN Advisory mission recommends that Montenegro confirms the status of the endangered Danube salmon (UNESCO, 2019), which is part of the IUCN Red List of threatened species and protected by the Bern Convention that has been ratified by Montenegro. The occurrence of this species is one reason why the Durmitor National Park is inscribed on the list of UNESCO World Heritage Sites.<sup>6</sup> Yet, the actual impacts on the fish population remain unclear due

<sup>5</sup> The Man and Biosphere Programme (MAB) is an intergovernmental scientific programme that aims to establish a scientific basis for the sustainable use and conservation of natural resources and for enhancing the relationship between people and their environment. According to the official website (<https://en.unesco.org/mab>; accessed July 07, 2020), 701 biosphere reserves in 124 countries have been included in the World Network of Biosphere Reserves to date.

<sup>6</sup> To be included on the World Heritage List, sites must be of Outstanding Universal Value and meet at least one out of ten selection criteria. Durmitor National Park meets three criteria, including the criterion to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation (see <https://whc.unesco.org/en/list/100/>, accessed July 07, 2020)





Fig. 3. River Tara before and after the highway construction started near Mateševo. Bottom left: materials disposed close to the river. Bottom right: modifications of the river course.

to lack of monitoring data. The project foresees that the floodplain terrain will be transformed into an artificially planted forest, which will further alter the ecological character of this river section (UNESCO, 2019).

Several illegal landfills pose another visible threat to the river Tara and its tributaries. In 2019, the nongovernmental organisation *Network for Affirmation of the NGO Sector* (MANS) reported that construction waste, mainly excavated rock and gravel from the tunnels and open route of the highway, has been disposed close to the rivers Tara and Drcka (MANS, 2019c). Although the Environmental Impact Assessment (EIA) prohibits the disposal of surplus material from the excavation into the river, river banks or agricultural lands (Environmental Protection Agency, 2015, p. 356), civil society organizations and local residents complained about the occurrence of this practice (Ždero, 2019). MANS (2019c) argues that CRBC, instead of opening two planned landfills at a significantly greater distance from the construction site, disposed the construction waste on the river banks.

Even though dust and vibrations are only temporary disturbances for wildlife and people living close to the construction site, local inhabitants complain about these negative impacts and the lack of information (interview NGO2). Additionally, the highway construction could have several environmental knock-on effects associated with increasing development pressures and resource extraction in the long-term. Already today, tourism development, uncontrolled urban development, poaching and logging pose threats to the natural environment, in particular the Durmitor National Park (IUCN, 2020). The highway could have negative impacts on flora and fauna as it may lead to habitat degradation or fragmentation, and interrupt natural corridors used for animal migration (Environmental Protection Agency, 2015). Once a highway is open for traffic, noise, light and air pollution, the spread of alien species, wildfires, and vehicle-related road killing of wildlife pose additional potential threats to biodiversity (Koemle et al., 2018; Laurance et al., 2014). Several of these impacts could have been alleviated if an alternative route had been selected, as discussed in the next section.



Fig. 4. Construction site at the river Tara. Photo taken by the first author on road R-13 near Mateševo on February 22, 2020.

#### 4.3. Environmental governance of the Bar-Boljare Highway

Large infrastructure projects are never without environmental effects. Yet, the extent of the environmental disturbances largely depends on the political decisions how to reconcile the trade-offs between environmental and economic losses and gains, and the effectiveness of institutional structures and environmental governance instruments. Below, we first outline the domestic environmental governance structures and procedures, and subsequently examine the influence of international actors on the environmental governance of this project.

##### 4.3.1. Domestic environmental governance structures

Multiple different public and private actors are involved in the development of the S-M section (Fig. 5), having different levels of

importance for environmental governance in the different phases of the project development.

During the first phase – the initiation, conceptualization, and planning of the project – highly important decisions with regards to environmental protection were taken. In 2002, the Montenegrin government started developing a new national spatial plan, which is the country's most important strategic planning document (Ministry of Economic Development, 2008a). After the publication of the draft of the national spatial plan in 2006, the first pilot Strategic Environmental Assessment (SEA)<sup>7</sup> in Montenegro was developed as part of a regional Strategic Environmental Assessment training and capacity building programme. The national spatial plan shortly refers to plans to construct a motorway from Belgrade to Bar, but due to lack of time, it was not possible to conduct an in-depth assessment of alternatives during the Strategic Environmental Assessment process (Markovic et al., 2009). There exists no Strategic Environmental Assessment specifically for the BBH. Shortly after the publication of the national spatial plan in 2008, the Detailed Spatial Plan for the BBH was released, which specifies the highway corridor (Ministry of Economic Development, 2008a; Fig. 1). In 2014, the Montenegrin government authorized the Chinese company CRBC to develop the main design for the S-M section on the basis of the preliminary design. After the State Review Panel for Technical Documents, consisting of national experts, reviewed and approved the main design, the Ministry of Sustainable Development started issuing building permits for the construction (interview GOV3). Although several route variants have reportedly been discussed in the project design process, the exact route and its variants have never been made public (interviews NGO1 and NGO4).

In addition to the Strategic Environmental Assessment, the EIA can be an important instrument in the planning process to potentially avoid, minimize and compensate environmental impacts, especially if it is integrated early in the project development. However, in this case, the EIA was prepared too late for having a real impact. An EIA expert remarked, “The issue is that the EIA came out after they started construction. This is what we call ‘putting the tick mark in the right regulatory box’” (interview EXP1). The construction of the highway officially started in May 2015, seven months before the Environmental Protection Agency (EPA) issued its consent for the EIA (Environmental Protection Agency, 2015) (Table 2). CRBC commissioned local experts to develop the EIA, and submitted it to the EPA, which formed a commission composed of a multidisciplinary group of experts to review the EIA (interview GOV3). However, the EIA was developed at the same time as the final main design and did not assess alternative routes, thus having presumably no influence on the main design. The experts responsible for the EIA were hired by the project designer, CRBC, which presents a conflict of interest (interview IO3). The development of the EIA involved only “several realized field days”, and the available literature on flora and fauna was limited and partly very old, including some studies dating back to 1875, 1919 and 1942 (interview NGO2; see also Environmental Protection Agency, 2015, p. 217).

The joint advisory mission of the World Heritage Centre and IUCN concluded that a less impactful route could have been identified with regards to the section at the river Tara (UNESCO, 2019). Several interviewees shared this opinion by indicating that environmental impacts could have been avoided if the route was planned differently (interviews NGO2 and IO2). Since the highway does not only intersect the river Tara at one point, but passes through its riverbed (Fig. 4), it is difficult to minimize the ecological impacts. An NGO representative highlighted, “All these action plans trying to minimize – what can you minimize if

you made the big mistake in the first step?”, referring to the project planning and design (interview NGO2).

During the construction phase, the Sector for Environmental Inspection, which is part of the Administration for Inspection Affairs, is responsible for the enforcement of environmental legislation (Kujundzic, 2012). Between May 2015 and June 2019, the Environmental Inspection conducted 68 inspections on the construction of the highway and issued five fines, totaling about 20.000€ (MANS, 2019b). According to an interviewee (GOV2), the Environmental Inspection faces the challenge of being generally understaffed, lacks the capacity to perform regular inspections, and faces administrative burdens. For example, the existence of various EIAs for different parts and sections of the project complicates the situation (interview NGO2). In contrast to the Environmental Inspection, which mostly undertakes periodic and ad-hoc inspections, the French-Italian consortium Ingerop-Geodata is tasked by the Ministry of Transport with the day-to-day supervision of the project, including the environmental protection (interview OPMU2). They hold regular meetings with the contractor CRBC, develop monitoring plans and check the implementation of the measures prescribed in the EIA. In the event of noncompliance, Ingerop-Geodata issues a notice of non-conformity to CRBC, which functions as a temporary fine that is revoked if the problem is solved (interview OPMU2). Yet, the ability of Ingerop-Geodata to act as an independent supervisor is limited because the consortium is appointed and hired by the project's client (i.e., Ministry of Transport on behalf of the Government of Montenegro; also referred to as *Employer*) and thus, acts as the client's agent when carrying out his duties or exercising authority (interview IO1; see also Ndekugri et al., 2007).

Domestic civil society organizations started to become active in environmental governance only in October 2018, when they discovered the negative environmental effects of the construction activities on the river Tara (interviews NGO1 and NGO3). Even though the EPA organized two public hearings on the EIA in 2015, just one representative of an environmental NGO participated (interview GOV3). Only when the environmental effects became physically visible, the NGO MANS started raising awareness about these issues among the general public by publishing reports, drone footages and pictures. MANS also organized a conference with domestic and foreign experts and filed criminal complaints on behalf of six NGOs against several individuals for the environmental pollution along the river Tara and the construction of an illegal landfill on the bank of the river Drcka (interview NGO1; see also MANS, 2019c). Several NGOs sent an open letter to the European Commission, voicing their concerns regarding the environmental effects and lack of transparency on the project, and asking the Commission to raise these issues with the government of Montenegro (MANS, 2019a). In sum, civil society pressure to safeguard the environment were largely absent when important decisions on environmental matters were taken during the spatial planning and EIA process, but strongly emerged only when the negative environmental effects became visible.

#### 4.3.2. External influences on environmental governance

The BBH is a national development project, which involves external actors (Fig. 6), who are either directly engaged (e.g., Chinese actors), or act as observers and guardians of environmental governance (e.g., EU and UNESCO).

The main Chinese actors are CHEXIM and CRBC. Even though CHEXIM's environmental policy foresees that an EIA is implemented and verified by the host country's EPA or federal government prior to the project approval (Friends of the Earth US, 2016), the loan agreement between CHEXIM and the government of Montenegro was signed before the EPA of Montenegro approved the EIA for the highway section (Table 2). Additionally, the loan agreement does not contain any environmental provisions (Government of Montenegro, 2014c). It appears that CHEXIM has very limited influence on environmental safeguards of the highway project.

In contrast, CRBC has greater leverage on the environmental

<sup>7</sup> SEAs are typically conducted for policies, plans or programmes at early stages in the planning process, prior to the development of individual projects. SEAs usually have regional or sectoral scope. In contrast, Environmental Impact Assessments (EIAs) are typically conducted for particular development projects, aimed at assessing and preventing environmental (and social) harm.



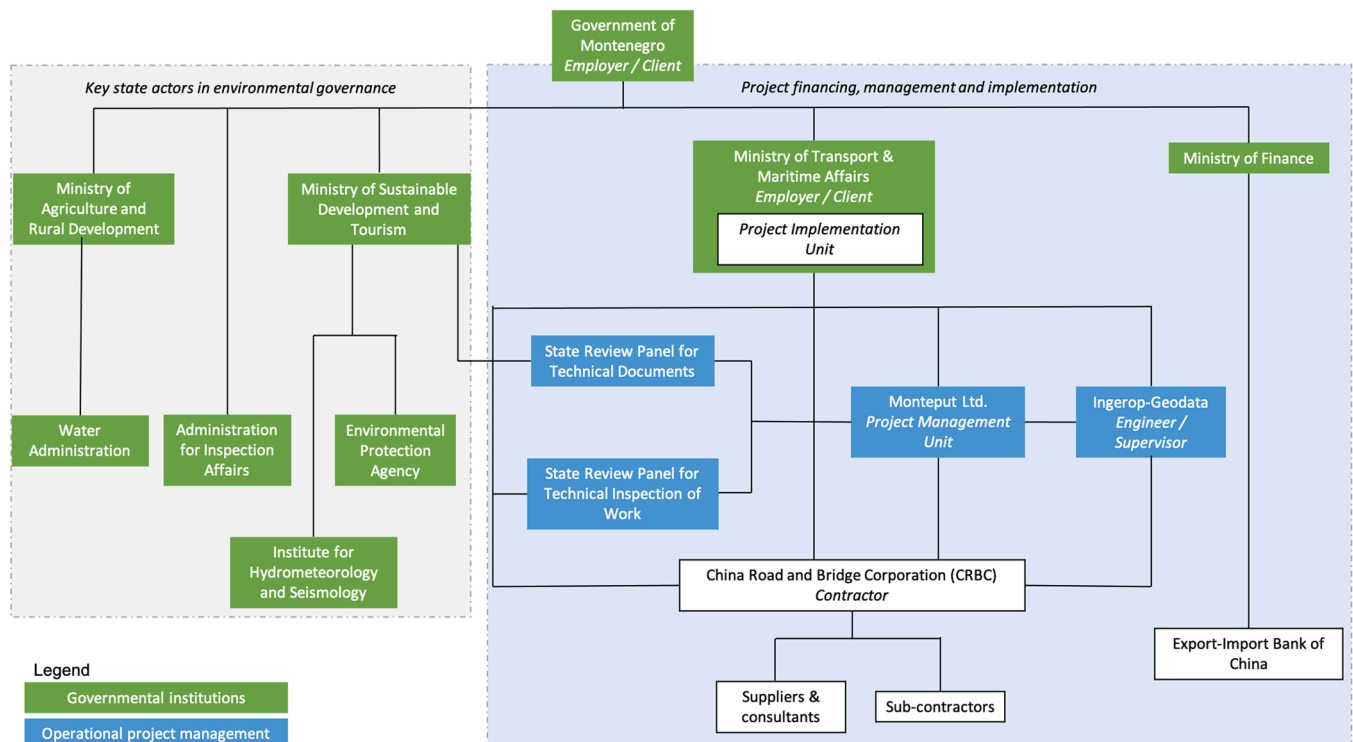


Fig. 5. Key stakeholders involved in the development of the Bar-Boljare highway section from Smokovac to Mateševo. The figure has been reviewed and approved by a representative of the Ministry of Transport. A description of the stakeholders’ roles and relations can be found in the [Supplementary materials](#).

outcomes of this BRI project. Sub-clause 4.18 of the Design and Build Contract places an obligation on the contractor to protect the environment by stating that “the Contractor shall take all reasonable steps to protect the environment [both on and off the site] and to limit damage and nuisance to all land, flora and fauna, animal life, people and property [...] restore any damage to the environment adjacent to the Site caused by his activities [...], fully comply with the regulation on environmental protection” (Government of Montenegro, 2014c). This contract is based on the FIDIC<sup>8</sup> Yellow Book, a standard form of contract used in construction projects worldwide. Yet, FIDIC contracts have been criticized for their limited commitment to environmental sustainability because they only regulate the main phase of the construction project but not the phase in which the EIA process takes place, do not deal with post-EIA monitoring, do not cover the long-term ecological impacts of the project, and externalize the responsibility for regulating the environmental implications of the construction to the host country through compliance provisions (Perez, 2002). An interviewee from an international organization (IO3) explained:

“It’s the responsibility of the national authorities then what standards they write into the contracts because (...) I would rate Chinese capacities in road building as pretty high, pretty good, so the contractors are capable to do what you ask them to do. But of course, it’s also a question of costs and time, and in the end, they will do what is written in the contract. And then it’s also the obligation of the national authorities to monitor that the conditions in the contracts are respected.”

The Chinese company is well regarded for its efficiency, can-do attitude and technical expertise in the construction business, but cultural differences in the project management approaches pose challenges

<sup>8</sup> The International Federation of Consulting Engineers (FIDIC) is an international standards organization for engineering and construction, best known for the FIDIC family of contract templates.

to the smooth implementation of this large project in a European context (interviews OPMU1 and OPMU2). The Balkans has become a training ground for Chinese companies where they can learn and gain experience with applying European standards without the hurdle of competitive public tenders (Rogelja, 2020). Since the BBH is the first highway constructed by a Chinese construction enterprise in Europe (CRBC, n.d.), the company had to learn how to build according to European standards, in particular safety and environmental standards, and implement the project according to Montenegrin law. For example, an employee of the Chinese company noted, “The difference of safety management between China and foreign countries put me through hell. After a period of exploration, we finally formulated the practical safety management system” (CCCC, 2019, p. 56). In order to seek advice on Montenegrin and European practices and standards, CRBC hired a Danish consultancy for reviewing some technical aspects of the design, and a Montenegrin consultancy specialized in environmental issues. These complex contractual arrangements involving both domestic and foreign companies hamper effective chains of accountability. During an interview, representatives of an operational project management unit (see Fig. 5) reported of an instance where they requested CRBC to remove some solid waste. The issue was caused by CRBC’s sub-contractor and appeared difficult to solve because CRBC had to grapple with the effective supervision of local sub-contractors (interview OPMU2).

While Western financiers would likely be concerned about the often-criticized Montenegrin government’s lack of transparency on financial and environmental aspects of the project (interview EXP1), China has had a long-standing foreign policy principle to not interfere in domestic affairs of partner countries. Even though the Chinese actors are not actively promoting any opacity in decision-making procedures, observers suggest that “China consolidates the traditional ways of doing business behind closed doors and undermines governance reforms” (Makocki and Nechev, 2017, p. 2). According to Rogelja (2020), this project – like other BRI projects in the region – was strongly facilitated by the host country’s elites, who tried to attain their political goals by mobilizing Chinese support.

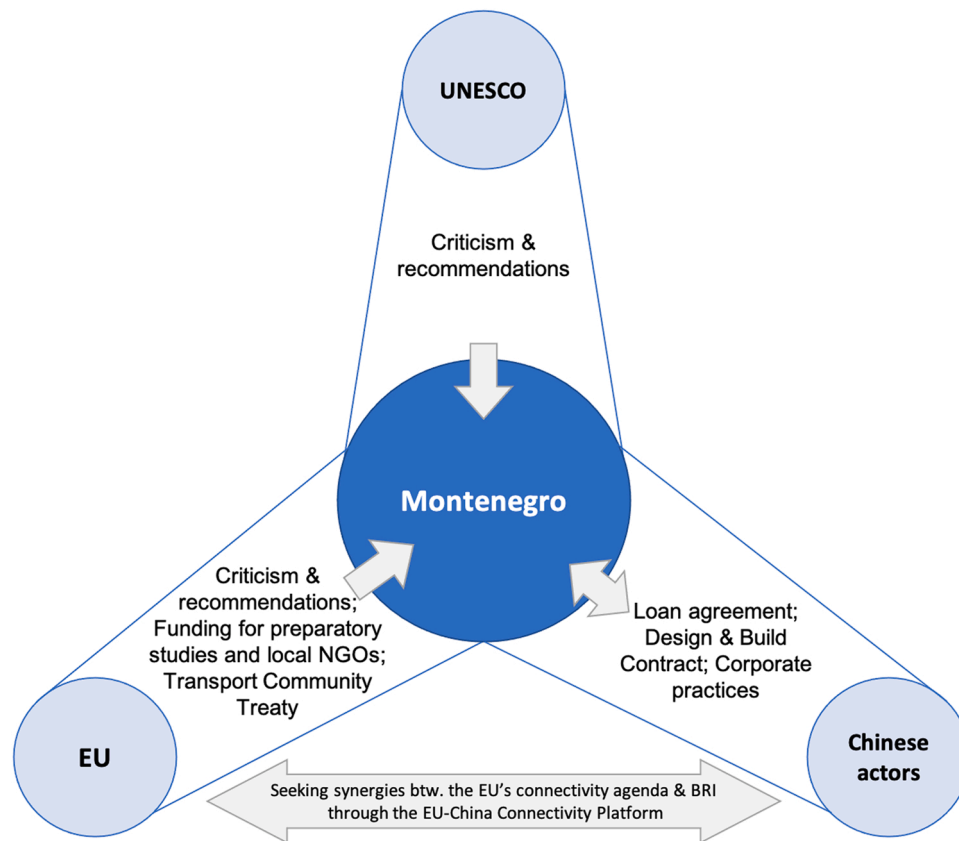


Fig. 6. External influences on domestic environmental governance of the BBH project in Montenegro.

The EU is an important and influential actor in the region, which remains highly skeptical and apprehensive about China's presence in the CEEC. Johannes Hahn, former European Commissioner for European Neighbourhood Policy and Enlargement Negotiations, warned that China could turn countries in the Western Balkans into Trojan horses as they will likely become EU members in the future, citing the example of the highway project in Montenegro (Heath, 2018). European Commission President von der Leyen noted in her State of the Union Address, "The Western Balkans are part of Europe - and not just a stopover on the Silk Road. We will soon present an economic recovery package for the Western Balkans focusing on a number of regional investment initiatives" (European Commission, 2020a). Following growing concerns about the increasing influence of China in CEEC and the Western Balkans, the EU stepped up its engagement in the region, and reinforced its support for sustainable infrastructure development through a plethora of policies and initiatives. Most of these initiatives are not framed explicitly as a response to the BRI or China's growing presence in the region, but concern policy areas perceived to be both channels and expression of China's influence in the CEEC, such as infrastructure and investments (Pavličević, 2019). For example, the European Commission has set aside up to €1 billion in grants for transport and energy projects until 2020 through its 2015 Connectivity Agenda for the Western Balkans (European Commission, 2019a). Additionally, the "Berlin Process", which is an EU-endorsed intergovernmental cooperation initiative between six Western Balkan countries and several EU members that started in 2014, serves as a framework through which the EU supplements the accession process of the Western Balkans and increases investments in the regional infrastructure (Pavličević, 2019).

In 2017, the EU established the Transport Community, an international organization comprising the EU and six Western Balkan countries, which legally requires the Western Balkan countries to adhere to EU legislation during the development of their transport networks (EU,

2017). One interviewee explained, "The Transport Community Treaty requires the country in a legally binding way to – at least for future projects – respect EU environment standards. And that can be enforced up to the level of the Court of Justice [of the European Union]" (interview IO3). In sum, China's involvement in the Western Balkans raised concerns in Brussels and triggered a series of multilateral initiatives that reaffirm the EU's regional influence and commitment to upholding and establishing European standards in the Western Balkans. In parallel to creating these various channels intended to influence regional transport development, the EU also started to directly engage with China's BRI. Rather than pursuing a zero-sum strategy, the EU seeks to enhance synergies between China's BRI and the EU's approach to connectivity – most notably through the 2015 EU-China Connectivity Platform (European Commission, 2020b).

The EU's reaction to the environmental governance of the BBH reflects the aforementioned EU's highly critical stance towards Chinese-led development projects in the Western Balkans, and commitment to maintain and deepen its close ties with the CEEC. The EU reaffirms its role as an influential regional player by not only drawing on its normative power to demand greater environmental safeguards from the Montenegrin government, but also by using its material sources of influence as it provides financial support for sound planning of future sections of the BBH. The European Parliament (2018) stressed in its report on Montenegro the need for timely and accurate publicly available information on the impact of the construction on the river Tara, and demanded the cessation of all activities of waste dumping and riverbed alterations. Half a year later, the European Commission (2019b) urged the country to strictly assess and prevent possible negative environmental impacts of construction activities of the BBH on the Lake Skadar National Park and the river Tara, which are both potential Natura 2000 sites. Although representatives of governmental authorities repeatedly emphasized during the interviews that the project is implemented

according to the EU's rules and regulations, the EU has criticized, for example, that the EIA is not compliant with EU standards (interview IO3; see also [European Commission, 2016](#)).

The EU provides three grants, totaling €6.8 million, through the Western Balkans Investment Framework (WBIF) for the preparations of the preliminary design and Environmental and Social Impact Assessments of two future sections of the highway, as well as a feasibility study with a cost-benefit analysis for the entire highway ([WBIF, 2019](#)). As the technical preparations of the BBH receive significant EU funding, the [European Commission \(2019b, p. 81\)](#) argues that Montenegro must ensure that future infrastructure investments are implemented in full compliance with applicable EU standards on public procurement, State aid and environmental impact assessment. The Commission reasons that “a comprehensive cost benefit analysis for the entire highway will set recommended standards and means of financing for the remaining sections”, noting that Montenegro signed a memorandum of understanding with a Chinese contractor to build further sections of the BBH on a public-private partnership basis in March 2018 ([European Commission, 2019b, p.81](#)).

In addition, the EU exerts some indirect influence on environmental governance by funding a project of several local NGOs aimed at providing more publicly available information on the planning and implementation of the country's largest development projects in infrastructure, energy and tourism. Initially, the project was intended to mainly investigate the financial aspects of the BBH, but an NGO representative explained that they included environmental aspects in their analysis when they discovered what this interviewee referred to as a “wall of silence” on behalf of governmental authorities with regards to environmental matters, and the visibly destructive environmental effects on the river Tara in 2018 (interview NGO1).

In brief, the EU cannot exert any direct influence on the construction operations because the project is neither financed by the EU, which would allow the EU to make their investment conditional on certain economic, social and environmental requirements, nor can the EU sanction the candidate country for violating EU's regulations and policies as it is not an EU member (yet). Nevertheless, by making unequivocally clear that future infrastructure development projects should be implemented in line with EU legislation, and by financing the preparatory phases of future sections of the BBH, including an Environmental and Social Impact Assessment, the EU aims to gain some leverage in shaping the overall trajectory of future sections of the highway.

Another important push for better environmental protection is coming from the UNESCO. When a joint advisory mission team of the UNESCO World Heritage Centre and the International Union for Conservation of Nature (IUCN) visited Montenegro in November 2018 after being invited by Montenegro to discuss a potential boundary modification of the Durmitor National Park and the overall state of conservation of the UNESCO World Heritage site, the visit coincided with the public controversy concerning the construction activities at the river Tara. Consequently, the mission included the highway issue into its analysis of the overall state of conservation of the site, for which it conducted field visits and meetings with governmental authorities and civil society organizations. The results were summarized in a mission report with recommendations to Montenegro (interview IO2; see also [UNESCO, 2019](#)). Montenegro has no formal obligation to implement the recommendations of the advisory mission, unless they are endorsed and specifically requested by the World Heritage Committee, which is the case here. Indeed, the [World Heritage Committee \(2019\)](#) expressed its concerns about potential downstream impacts of the construction of the motorway and requested Montenegro to carefully assess any impacts on the Outstanding Universal Value of the property, including on the endangered Danube salmon. Reacting to this, the Ministry of Sustainable Development started a biological monitoring programme of the river Tara on a monthly basis at three sites from 2019 (interview GOV3 and RES1; see also [National Commission of Montenegro for UNESCO, 2020](#)).

However, the monitoring is conducted on the benthic fauna (i.e.,

bottom fauna of the river), not on the ichthyofauna (i.e., fish of a specific region), and thus, does not directly assess the status of the Danube salmon. The monthly monitoring reports are not made publicly available. First monitoring results have shown that the density of the macroinvertebrate fauna (e.g., worms, snails and insects without a backbone) was much lower close to the construction site as a consequence of the negative ecological impacts associated with the highway construction ([Pešić et al., 2020](#)). As a last resort, the World Heritage Committee could threaten to put the site on the list of World Heritage sites in danger, or completely remove the site from the World Heritage list, which would be detrimental to Montenegro's international reputation and tourism development. Yet, there are currently no signs that this event may occur (interview IO2). It remains to be seen whether the monitoring results will have any significant impact on the construction activities, as they are already at an advanced stage, and whether the ecological impacts of the highway construction are indeed mostly temporary and reversible, as repeatedly emphasized by governmental authorities. What becomes clear, however, is that international organizations can exercise influence on BRI host countries' environmental governance, with the biological monitoring programme being a concrete result of this external influence. Our findings support the argument by [Tsimonis et al., \(2020, p. 191\)](#) that “the role of regional organisations and regimes is crucial in strengthening the host governments' often anaemic commitment to sustainability”. The BBH exemplifies that the BRI fosters a growing internationalization of national infrastructure project, which are judged against stringent international environmental governance standards by international organizations that closely follow the growing Chinese involvement in development projects worldwide.

## 5. Conclusion

This case study highlights that the host countries' political willingness and institutional capacities are key for safeguarding the environment in BRI projects. The Chinese government has launched several initiatives and guidelines aimed at building a “green BRI”, but apart from the recently published report on social responsibility within the BRI by [CCCC \(2019\)](#) – which demonstrates rising awareness of the social and environmental impacts of BRI projects among corporate actors – we find few signs that the “green BRI” has already had a clear impact on the practices on the ground (noting, however, that we could not interview the Chinese contractor). We neither observe a “race to the bottom”, whereby host governments weaken environmental regulations to attract investments, nor an active push towards stronger environmental governance on behalf of the Montenegrin government or Chinese actors in this BRI project. Yet, local NGOs, the EU and UNESCO strongly encourage more stringent environmental governance in Montenegro.

Particularly during the spatial planning phase of linear infrastructure routes, important decisions are taken that determine the overall trajectory of the environmental sustainability. Even though many studies on the BRI highlight the importance of governance instruments like the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) to anticipate, prevent and mitigate potential negative environmental effects of plans and projects (e.g., [Aungh et al., 2020](#); [Harlan, 2020](#); [Ng et al., 2020](#); [Turschwell et al., 2020](#); [Wang et al., 2020](#)), this case illustrates that the mere existence of EIAs or SEAs does not suffice for effective environmental protection. The EIA was conducted too late to have a real impact on the design of the highway, a comprehensive assessment of the highway's effects on flora and fauna was lacking, and limited institutional capacities inhibit effective monitoring and enforcement of the provisions outlined in the EIA.

Montenegro made seemingly large concessions when negotiating the project deal, given that it waived its sovereign property rights in case of loan default and granted high tax exemptions for both contractors and sub-contractors, thus appearing to be in a weak negotiation position vis-à-vis the Chinese side. Nevertheless, Montenegro has substantial agency

over the environmental governance of the project because the Design and Build Contracts stipulates that the construction activities need to be compliant with Montenegro's legislation, which would allow Montenegrin authorities to set the standards that the Chinese company should achieve and to hold the company accountable for their actions. Yet, the high time pressure to prevent anything that could slow down the construction and delay the opening of the highway may limit the scope and willingness for actions of the authorities. Due to the lack of transparency and public involvement in the planning phase, civil society actors started scrutinizing the construction process and its effects only after environmental damage has already been caused.

The future will show whether the Montenegrin government will integrate environmental considerations more carefully and seriously into the planning and management of the next sections of the highway, in particular with regards to the Lake Skadar National Park. The 2008 Spatial Plan of the BBH foresees that the highway corridor runs across this transboundary lake (Fig. 1), which is a wetland of international importance under the Ramsar Convention, a candidate Emerald site under the Bern Convention, and one of the most important habitats for birds in the Mediterranean, listed as an Important Bird and Biodiversity Area in danger by BirdLife International. Since the main challenge for the Montenegrin government is to find the financial means for completing this highway – considering the high debts it has already caused – there is a high risk that economic interests override environmental considerations.

The EU and UNESCO exert influence on the environmental governance of this project and future infrastructure projects. By drawing on their normative power both actors are strongly advocating for stronger environmental protection with regards to development of the BBH. In response to the UNESCO's recommendations and requests, the Ministry of Sustainable Development started a biological monitoring programme on the river Tara in 2019. However, it remains to be seen whether the monitoring results can and will have any tangible effects on public decision-making to either remediate current or prevent future environmental damages. In addition, the EU finances the preparation of a feasibility study and Environmental and Social Impact Assessment for future highway sections, thereby indirectly influencing planning and decision-making on the next sections of the BBH. The EU has consolidated and extended its influence over regional infrastructure planning through the newly established Berlin Process and Transport Community, under which it indirectly defines the conditions for potential future project with Chinese or other foreign actors' involvement.

We do not claim that our findings can be generalized across the wide range of BRI projects, instead, our case should be perceived as a typical case of a BRI projects that runs the risk of falling short on sustainability due to a lack of environmentally sound and transparent planning and implementation. Our findings confirm earlier observations reported for other BRI projects, while also adding additional nuances by explicitly considering international and European influences in this BRI project. Studies about BRI projects in Greece, Serbia and Kenya have also reported about the use of deficient or delayed SEAs or EIAs that proceeded without adequate or meaningful public consultation (Anthony, 2020; Tsimonis et al., 2020). Like in the case of Montenegro, civil society groups played a key role in raising awareness about the detrimental environmental effects of BRI projects in Indonesia and Kenya (Hale et al., 2020), and the UNESCO raised concerns about the environmental impacts of the Kičevo-Ohrid highway in Macedonia (Tsimonis et al., 2020). In Indonesia, the government's positive attitude towards using coal, the loose requirements and lax enforcement of technological standards, the lack of monitoring, and a tendering process that favored mostly speed and costs of construction undermined the BRI's sustainability (Tritto, 2021). These findings highlight that BRI countries are not passive recipients of BRI projects, but important agents who can foster the sustainability of BRI projects through transparent negotiations and tendering, the implementation of thorough a priori feasibility studies and impact assessments, and effective monitoring and enforcement of contractual obligations.

To date, there are no signs that China is proactively greening its infrastructure projects in the Western Balkans (Jahns et al., 2020), yet this may partly be explained with the fact that many existing BRI projects were launched before the "green BRI" has been promoted from 2017. In the future, stronger policy signals for environmental protection may come from China. The so-called China-CEEC Environmental Cooperation Mechanism, which has been initiated under the 17 + 1 initiative in 2017, and for which an office is currently established in Montenegro's capital could become a potentially relevant institution for environmental cooperation (personal communication with representative of governmental authority, February 28, 2020). Besides corporate commitments and political cooperation on environmental matters, the influential role of financiers should not be underestimated. According to Narain et al. (2020), CHEXIM could have substantial leverage on the overall environmental performance of the BRI because it is among the top contributors of the BRI. Lastly, since the BRI encompasses a variety of different projects in various sectors, other projects may be used to showcase the development of a "green BRI". For example, the recent inauguration of a wind park in southern Montenegro, which has been constructed by a Chinese-Maltese consortium and branded as a BRI project (Xinhua, 2019), illustrates that China's "green BRI" materializes on the ground. Additionally, a Chinese-Montenegrin consortium will implement an ecological reconstruction of the coal-fired power plant in Pljevlja (Jahns et al., 2020). However, investments in linear infrastructure and conventional energy sources remain an important part of the BRI, requiring academic and societal attention on how to govern its social and environmental implications in a proactive, effective and transparent way that is in line with international best practices.

#### Declarations of interest

None.

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#### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.landusepol.2022.106136](https://doi.org/10.1016/j.landusepol.2022.106136).

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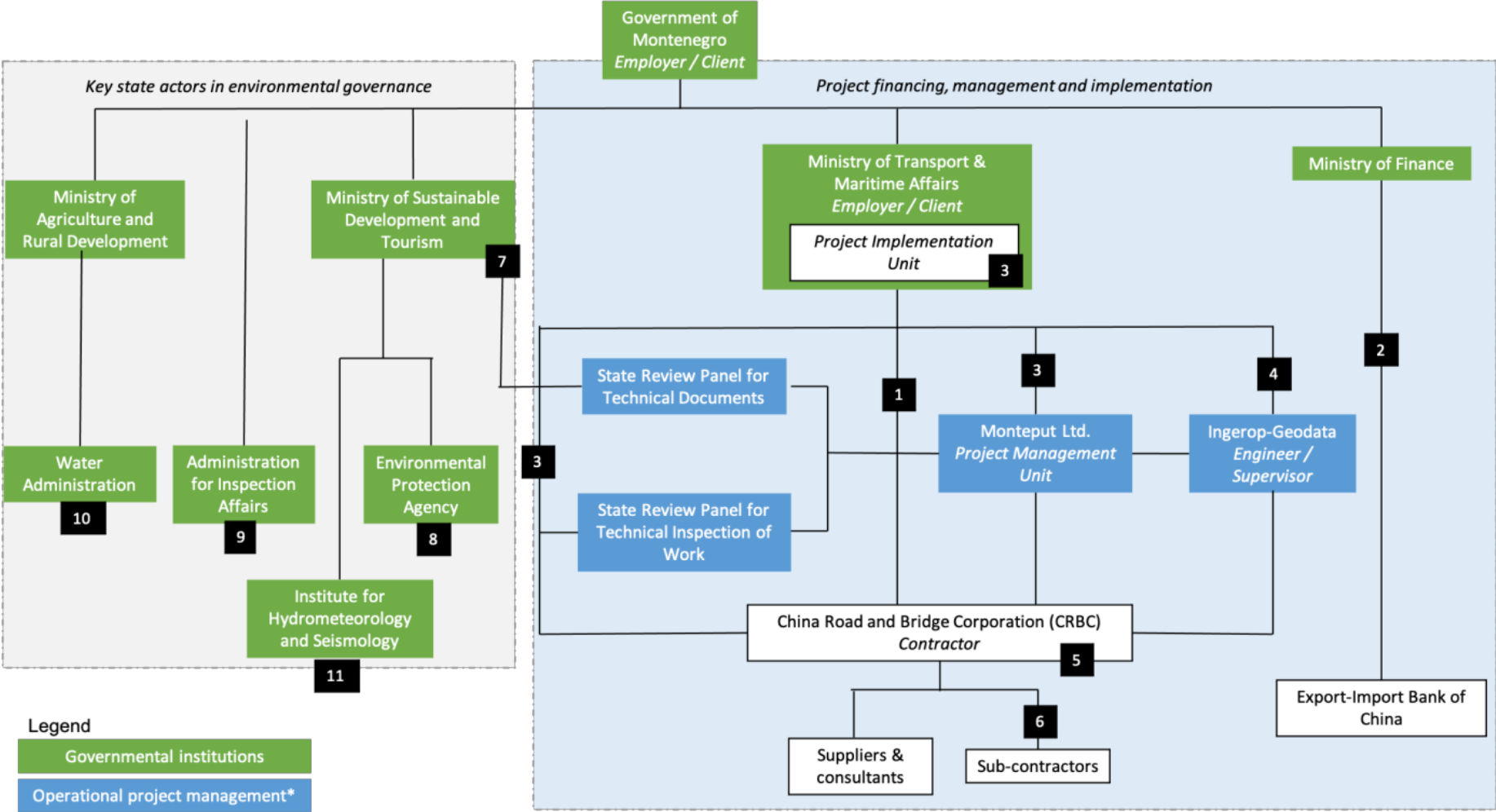


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**Online supplementary material for:** Environmental governance of a Belt and Road project in Montenegro – National agency and external influences

**Key stakeholders involved in the development of the Bar-Boljare highway section from Smokovac to Mateševo** (Figure 5, including a description of the stakeholders’ roles and relations).





## Organizational chart (Figure 5)

1. The **Ministry of Finance** (on behalf of the Government of Montenegro) signed the Preferential Buyer Credit Loan Agreement with the Export-Import Bank of China in October 2014. The Ministry of Finance is responsible for the payments to the Contractor.
2. The Ministry of Transport and Maritime Affairs, which is the Employer on behalf of the government, set up several units for the implementation of the project:
  - a. The **Project Implementation Unit** is responsible for the overall management of the project.
  - b. The **Project Management Unit**, which is a special unit of the state-owned company Monteput Ltd, is responsible for control and implementation of the Design and Build Contract.
  - c. The **State Review Panel for Technical Documents** is responsible for the review and approval of the Main Design.
  - d. The **State Review Panel for Technical Inspection of Work** is responsible for the technical acceptance of works on behalf of the Employer.
3. The **Ministry of Transport and Maritime Affairs** hired the French-Italian consortium Ingerop-Geodata, which deals with the day-to-day supervision of the construction. The consortium arranges and chairs monthly management meetings together with the Contractor and the Project Management Unit.
4. The **Contractor** constructs the highway according to the terms defined in the Design and Build Contract. The Contractor developed the Main Design of the highway on the basis of the Preliminary Design provided by the Employer.
5. The Contractor hires sub-contractors with the approval of the Employer. According to the Design and Build Contract, at least 30% of the works should be performed by local sub-contractors from Montenegro.
6. The **Ministry of Sustainable Development and Tourism** issues building permits for the construction. Building permits can only be issued if the State Review Panel for Technical Documents provides its prior approval.
7. The **Environmental Protection Agency**, which is supervised by the Ministry of Sustainable Development and Tourism, reviews and approves the Environmental Impact Assessments (EIAs).
8. The **Administration for Inspections**, in particular the Ecological Inspections, are responsible for the enforcement of environmental legislation, including the EIAs.
9. The **Water Administration**, which is supervised by the Ministry of Agriculture and Rural Development, is responsible for the implementation of water legislation.
10. The **Institute for Hydrometeorology and Seismology**, which is supervised by the Ministry of Sustainable Development and Tourism, performs tasks related to the observation and measurement of meteorological, hydrological, ecological and agrometeorological parameters. For example, the Institute provided data for the EIAs.

\* The operational project management units are responsible for overseeing, directing and controlling the work of the Contractor. By doing so, they support the Project Implementation Unit, which oversees the entire project, plans the projects stages, manages its execution, and allocates resources.

*The figure and elaborations have been approved by a representative of the Ministry of Transport.*



## **Supplementary 1:**

### **Telecoupling as a framework to support a more nuanced understanding of causality in land system science**

#### **Abstract**

This article illustrates the potential of the telecoupling framework to improve causal attribution in land system science (LSS). We shed light on the distinct analytical approaches that have characterized telecoupling research to date, how these can contribute to LSS with new insights, and whether such insights can improve causal attribution. By reviewing 45 empirical telecoupling studies, we firstly demonstrate how telecoupling is applied in a broad variety of ways within LSS and across different disciplines and research topics, albeit with qualitative data and assessments being underrepresented. Secondly, we show that telecoupling is clearer in its contribution to causal attribution when applied explicitly in framework integration or empirical application, rather than when it is included more indirectly as a narrative. Finally, we argue that telecoupling can complement existing LSS theory with a flexible and holistic approach to dealing with the uncertainties and complexities related to attributing causality in a globalized world.



## Telecoupling as a framework to support a more nuanced understanding of causality in land system science

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# Telecoupling as a framework to support a more nuanced understanding of causality in land system science

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## ABSTRACT

This article illustrates the potential of the telecoupling framework to improve causal attribution in land system science (LSS). We shed light on the distinct analytical approaches that have characterized telecoupling research to date, how these can contribute to LSS with new insights, and whether such insights can improve causal attribution. By reviewing 45 empirical telecoupling studies, we firstly demonstrate how telecoupling is applied in a broad variety of ways within LSS and across different disciplines and research topics, albeit with qualitative data and assessments being underrepresented. Secondly, we show that telecoupling is clearer in its contribution to causal attribution when applied explicitly in framework integration or empirical application, rather than when it is included more indirectly as a narrative. Finally, we argue that telecoupling can complement existing LSS theory with a flexible and holistic approach to dealing with the uncertainties and complexities related to attributing causality in a globalized world.

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## 1. Introduction

Understanding how relationships between people and their environment make up land systems is key to supporting more sustainable land use and reducing the negative environmental impacts of land-use change (Rounsevell et al., 2013). Today, there is broad scientific awareness about the interconnectedness of these relationships, and this is reflected in the land system science (LSS) literature, which seeks to understand and model land-use change through analytical approaches that emphasize relativity, complexity, and context-dependency of causes and effects. This includes frameworks such as coupled human-environment (Turner et al., 2003) and social-ecological systems (Schlüter et al., 2012), coupled human-natural systems (Liu et al., 2007), and most recently, the telecoupling framework (Liu et al., 2013).

Systems and actors influencing and/or being influenced by land-use change are increasingly both linked and globalized. This implies that processes influencing land-use change outcomes, including the actions by individual actors, can be physically distant while at the same time being causally connected. For example, deforestation can be caused by consumption in

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a distant country (Torres et al., 2017), and modifications in ecosystems in one place can be fuelled by trade relationships and multinational corporations in another place (Pace & Gephart, 2017). In LSS, it is key to disentangle this causal interconnectedness to understand the social-ecological drivers of land-use change and better target interventions for more sustainable land systems (Meyfroidt, 2016).

In this article, we undertake a literature review to understand how the telecoupling framework can address this challenge of causal attribution in LSS. Specifically, we ask: 1) Which analytical approaches characterize telecoupling research? 2) How can the different approaches to telecoupling contribute to LSS with new insights? and 3) Can these insights help clarify the influence of the telecoupling framework for causal attribution in LSS?

Telecoupling emerged as an analytical tool to help account for socio-economic and environmental interactions across large distances by examining the systems of interest, the flows that connect them, the causes and effects of those flows, and the actor-networks that mediate them (Eakin et al., 2014; Friis & Nielsen, 2017; Liu et al., 2013). Thus, telecoupling recognizes the complexity and interconnectedness of causes and effects in land-use systems. In this regard, existing research and reviews of the telecoupling literature have provided insights into how telecoupling can improve our understanding of human-environment interactions and contribute with applicable terminology and techniques for analyzing such interactions in a globalizing world (Corbera et al., 2019; Friis et al., 2016; Kapsar et al., 2019; Sonderegger et al., 2020). There have been a few flagship contributions highlighting techniques for explaining cause-effect relationships through a telecoupling lens (Carlson et al., 2018; Meyfroidt, 2019). However, we still know little about how existing research has benefitted from applying the telecoupling framework to understand causal relationships within LSS and how telecoupling is influencing research designs and the interpretation of research findings. This is critical to avoid the risk of pursuing a conceptual idea that is not any different from what is already available in the LSS literature on causality (Lambin et al., 2001; Meyfroidt, 2016; Meyfroidt et al., 2018).

While telecoupling research has gained momentum since 2013 (Eakin et al., 2017; Friis, Cecilie, & Nielsen, 2019; Liu et al., 2013), the interdisciplinary and empirical application of the framework is still novel. The attention to proximate and underlying causes is not new to the LSS community (Scheidel & Gingrich, 2020), but the telecoupling conceptualization introduced a terminology and framing for disentangling the complexity that arises when both proximate and underlying causes are coupled over social, institutional, and geographical distances.

These conceptual debates on the utility of telecoupling for establishing causal relationships are presented in the following section. Then, we present our approach to data collection, data processing, and our literature review. We elaborate on the review findings in three separate but interlinked sections corresponding to the three research questions. We then discuss the findings through a critical lens and recommend future pathways for telecoupling application.

## 2. Telecoupling and the challenge of attributing causality

Telecoupling is the process that connects social-ecological systems across time and space. In its original framing, telecoupling is understood through the analysis of five major components: systems, agents, flows, causes, and effects (Liu et al., 2013). *Systems* are categorized as either sending-, receiving-, or spillover systems, meaning that they either 'send', 'receive', or are indirectly impacted by material and immaterial flows (of money, commodities, information, etc.) from other systems (Hull & Liu, 2018). *Agents* can be humans, organizations, animal species, or any actor at any scale whose actions are consequential to the studied phenomenon (Liu et al., 2014). Examining the *flows* between agents helps trace distal drivers of land-use change and the connections between causes and effects at different scales, between distant locations, and beyond the regulatory context of the studied

phenomenon. By analytically following material and immaterial flows, causes can be discovered that are not immediate, obvious, or place-bound (Friis & Nielsen). In this article, we define material flows as physical measurable units such as commodities, people, or biophysical elements, and immaterial flows as more intangible flows such as information, discourse, and social interactions (Friis & Nielsen). We understand information flows as including knowledge and money, but other literature such as Eakin et al. (2014) defines money as part of the physical material flows. Both material and immaterial flows are important for the identification of causes behind telecoupled land-use change processes. For example, soybean expansion is connected to the increase of a material flow (i.e. international trade of soybeans) and is driven by proximate causes such as agricultural technology. In turn, the adoption of new technologies is strongly linked to immaterial flows like information about technologies and production schemes, disseminated through personal experiences, social networks, workshops, meetings, and social media (Henderson et al., 2021). Thus, the flow-based analysis draws attention to the spatial and temporal complexity of causes and effects which characterize telecoupled systems (Eakin et al., 2014). We understand *causes* in relation to telecoupling as the factors that determine the emergence and strength of telecoupled relationships, and the *effects* as the environmental and socioeconomic consequences of such relationships (Liu et al., 2014). Furthermore, we refer to the analysis of causal mechanisms, which is what distinguishes causation from correlation (Meyfroidt, 2016).

To our knowledge, the initial conceptualization of the telecoupling framework did not claim an ability to identify causal mechanisms. Still, research grounded in the idea of telecoupling often assumes or analyzes a (telecoupled) relationship between a given land-use phenomenon occurring in a specific location and its distal drivers and feedback mechanisms. In so doing, telecoupling researchers apply a variety of approaches to establish causality between phenomena, by, for example, qualitatively exploring information and discursive flows across distance (Eakin et al., 2014) or quantitatively tracking and measuring the flows of commodities between regions (Yao et al., 2018). Liu et al. (2013) highlight how land-use telecouplings can have various economic, technological, political, environmental, or cultural causes, and how these causal mechanisms influence the emergence, dynamic, and strength of the relationship. Eakin et al. (2014) exemplify this process by showing how telecoupling entails effects on livelihoods or land systems that are caused (indirectly) by spatially distant (but connected) actors.

While telecoupling can provide new perspectives on the interconnectedness of the global economy and its social-ecological consequences, this interconnectedness implies some fundamental challenges for causal attribution. For example, a given specific land use, or land-use change process, cannot be explained by a single phenomenon (e.g. increased international demand for a certain crop) but by a combination of drivers (e.g. increased international demand, coupled with local economic incentives), which in turn may be products of different political, social and/or cultural forces. It becomes increasingly difficult to disentangle the causal relationships driving land-use change processes since causal factors can rarely be understood in isolation from each other, and they often transcend institutional, spatial, and temporal scales (Norder et al., 2017).

Causal effects in telecoupled systems will often be created by multiple and overlapping causal variables. Some causal processes work more gradually, and some work more rapidly, often depending on a number of factors connecting sending and receiving systems (Friis et al., 2016). For example, Nepstad et al. (2014) argue that several mutually reinforcing factors, including temporally and spatially overlapping policy and supply chain interventions, decreased demand for new deforestation in the Amazon. Leisz et al. (2016) analyze a case of telecoupled land use and land cover change in Vietnam and show how this is linked to a multitude of both distal causes in the form of historical political decisions, immediate causes, and causes at both higher and more local scales.

Even though the debate between quantitative and qualitative causal analysis has become more integrative in acknowledging that causes can be validated both quantitatively and qualitatively (Beach & Pedersen, 2016; Carlson et al.), researchers still tend to avoid making direct causal claims



**Table 1.** Terms related to the complexity of attributing causality in telecoupled land-use systems.

| Term                            | Definition   | Source   |
|---------------------------------|--|--|
| <b>Causes</b>                   |  |  |
| Multi-causality                 | Any given pattern may be caused by several different processes, and the action of each is dependent on context.  | Chapman et al., 2017; Lambin et al., 2001                  |
| Confounders                     | A variable that influences explanatory (independent) and response (dependent) variables. Confounding variables can be both observable and unobservable.  | Carlson et al. (2018)                                      |
| Proximate (or direct) causes    | Human activities or immediate actions at the local level that originate from the observed change and directly impact the observed change.  | Geist & Lambin, 2002; Meyfroidt, 2016                      |
| Underlying (or indirect) causes | Fundamental forces that underpin the more proximate causes.  | Geist & Lambin, 2002; Meyfroidt, 2016                      |
| <b>Effects</b>                  |  |  |
| Cascading effect                | The process by which a system affects other multiple systems in sequence as a result of telecoupling dynamics; occurs when a change of one element of a system drives a chain of events leading to many other changes in the system.   | Baird & Fox, 2015; Paitan & Verburg, 2019                  |
| Cumulative effect               | impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [...] or person undertakes such other actions.   | Clark, 1994  |
| Legacy effect                   | Effects that do not disappear until many years to decades after the emergence of a telecoupling.   | Liu, 2014; Norder et al., 2017; Paitan & Verburg, 2019     |
| Non-linearity                   | Social and ecological patterns do not gradually change as a linear function of relevant processes but rather display thresholds, time lags, and generally complex behavior (including regime shifts).  | Chapman et al., 2017; Paitan & Verburg, 2019               |
| Threshold effects               | Seemingly stable systems can suddenly undergo comprehensive transformations into something entirely new, with internal controls and characteristics that are profoundly different from those of the original. Small events might trigger changes that are difficult or even impossible to reverse. | Duit & Galaz, 2008   |
| Time lags (or inertia)          | Effects that do not emerge until years or even decades after the initiation of a telecoupling.   | Liu, 2014; Norder et al., 2017; Paitan & Verburg, 2019     |
| Multifinality                   | Similar combinations of causal factors result in substantially different outcomes, for example, due to small variations in contextual factors or contingent events.  | Bennet and Elman 2006; Meyfroidt, 2016                     |
| Equifinality                    | Different combinations of causes that end up in similar outcome.   | Bennet and Elman 2006; Meyfroidt, 2016                     |
| Temporal spillover              | Conducting behavior A in time 1 affects the probability of conducting behavior A in time 2.  | Nilsson et al., 2017                                       |
| <b>Cause and effect</b>         |  |  |
| Feedback                        | Feedbacks occur between systems when effects of the first system on a second system feed back to affect the first system. Feedbacks can be negative (damping) or positive (amplifying).  | Liu et al., 2013; Rotmans & Loorbach, 2009                 |
| Feedback loop                   | Feedback loops, or reverse causality, can be related to bidirectional causation and implies that events in a nonlinear causal chain can be both causes and effects,  | (Carlson et al., ; Meyfroidt, 2016; Sugihara et al., 2012) |
| Multi-scalarity                 | Relevant processes are simultaneously operating at a diversity of scales, manifesting in patterns at multiple scales (both temporal and spatial).  | Chapman et al., 2017                                       |
| Path dependence                 | Positive feedback loops or self-reinforcing sequences i.e. chains of chronologically ordered and causally connected events which are more tightly connected and less contingent than in typical causal chains.   | Mahoney, 2000; Pierson, 2000                               |
| Unobserved heterogeneity        | The unmeasured third factors that may affect the relation between the causal factor and the outcome.   | Meyfroidt, 2016  |
| Spatial decoupling              | The decoupling of drivers and outcomes which gives rise to telecouplings.  | Friis et al., 2016   |

unless quantitative analyses are included (Efroymsen et al., 2016; Rounsevell et al., 2013). Altogether, the literature highlights that attributing causality to telecoupled land-use systems is a complex endeavor. Such complexity stems from the fact that causes and effects in land-use systems can be

approached from different scalar, temporal, and spatial perspectives, which involve specific conceptual and methodological challenges. We highlight examples from the literature on terms related to this challenge in [Table 1](#).

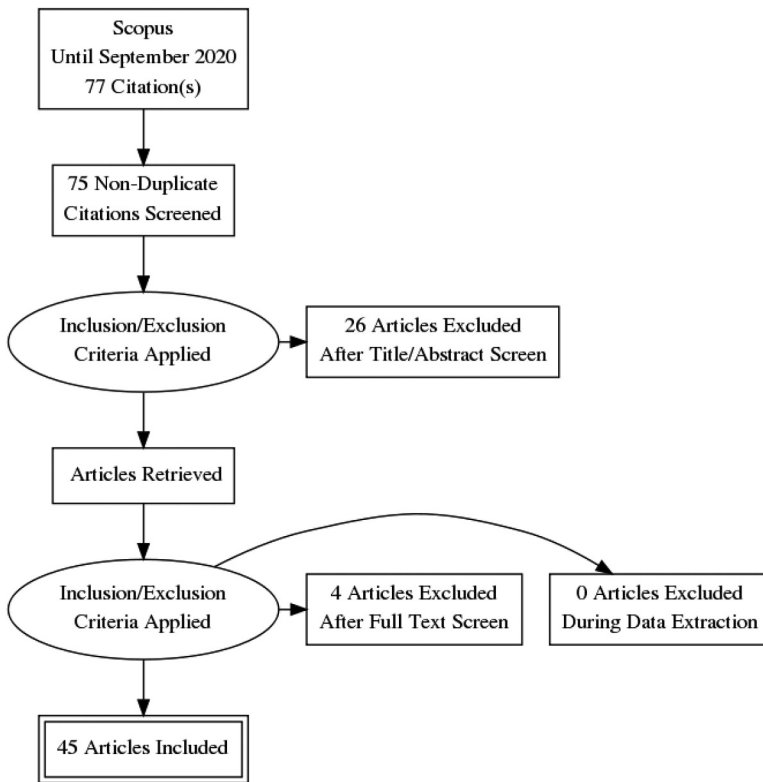
### 3. Methods

#### 3.1 Data collection

This paper builds on data from a review of 45 articles that draw on telecoupling to empirically study land systems. Conceptual and literature-based articles were thus excluded from the review. The sample articles were collected through Scopus, using the search string: telecoupl\* OR tele-coupl\* AND 'land use' OR 'land-use' OR 'deforestat\*' OR 'land system' OR 'land-system' in the title, abstract or keywords. The search yielded 77 results, containing articles published up until September 2020. Subsequently, we made sure that each article in the sample had a) been peer-reviewed; b) written in English; c) analysed an empirical case; d) mentioned telecoupling at least once, and e) made explicit reference to land use or land cover change in the title or abstract. This resulted in a sample of 45 articles which we acknowledge is substantially smaller than, for example, the sample in [Sonderegger et al. \(2020\)](#) who, due to a broader screening, identified 137 articles roughly within the same search period. It is beyond the scope of our review to address the entirety of research topics engaging with telecoupling, and our search string and inclusion criteria have left out some flagship contributions as a consequence (e.g. [Boillat et al., 2018](#); [Eakin et al., 2017](#); [Ringel, 2018](#)). The aim of our review is not to exhaustively document the breadth of the research field, but rather to pinpoint the variety of opportunities that the telecoupling framework offers for causal attribution in relation to different research agendas within LSS. The sampling process is visualized through the PRISMA flow chart below ([Figure 1](#)), which is an acknowledged method for reporting sampling strategies in systematic reviews ([Moher et al., 2010](#)).

When the final sample of the 45 articles was identified, we conducted a content analysis to analyze how the relationships between telecoupling approach, research design, data collection, and methods for data analysis are investigated. We employed a mixed approach, using elements from both the systematic review tradition ([Moher et al., 2010](#)) and qualitative content analysis ([Mayring, 2014](#)). We used a systematized coding scheme to review and critically appraise the selected research ([Moher et al., 2010](#)). We analyzed the articles by looking at relationships in coded content in NVivo rather than applying statistical methods (meta-analysis), inspired by a qualitative content analysis tradition and guided by the following review steps (cf. [Mayring, 2014](#)).

- (1) Identification of knowledge gaps in existing telecoupling reviews (exploring review strategies and supplementary materials) and LSS literature on causality.
- (2) Formulation of the research question to inform identified knowledge gap;
- (3) Linking research question to theory (state of the art, theoretical approach, preconceptions for interpretations);
- (4) Definition of the exploratory research design and development of the codebook;
- (5) Defining the literature sample supported by the PRISMA approach;
- (6) Codebook and methods of data collection pilot-tested and revised;
- (7) Inter-coder reliability established, processing of the study in NVivo and organization of node hierarchies;
- (8) Presentation of results in response to the research question; and
- (9) Discussion concerning quality criteria.



**Figure 1.** PRISMA of literature included for review. Source: Figure generated from own data in <http://prisma.thetacollaborative.ca/>.

The coding protocol combines deductive and more open-ended inductive categories, each assigned a code in the review (supplementary material\_1). Inductive category development consists of formulating broad categories such as ‘causal relations’ and working through the text line by line, formulating code categories directly from the text at the decided level of abstraction (i.e. how detailed or general categories are formulated). In the deductively formulated category system, categories are predefined (such as ‘material’ or ‘immaterial’ analytical focus), and text segments are coded to illustrate examples of the character of the category.

The predefined codes were developed based on first readings of the review sample, theoretical insights from the telecoupling literature, and existing reviews (Eakin et al., 2014; Friis et al., 2016; Kapsar et al., ; Liu et al., 2013; Liu et al., 2014; Meyfroidt, 2016). The inductive codes facilitated an exploratory inquiry of how telecoupling provides both opportunities and pitfalls in causal attribution. These codes refer primarily to the identification of authors’ statements on their application of telecoupling. The deductive codes contributed with information on research characteristics such as data collection and processing approaches and to what extent these strengthen causal statements. An example is our distinction between ‘material’ and ‘immaterial’ analytical focus, through which we try to identify which aspects of the study object are in primary focus. This is different from the distinction between material and immaterial flows. A study might analyze a material flow (such as commodities) but focus on the immaterial aspects of this commodity flow (such as local attitudes in the receiving system or political incentive structures in the sending system) (supplementary material\_1).

### 3.2 Data coding and analysis

The articles were not examined in terms of how well they attribute causality since causal analysis is not an explicit objective of all reviewed articles. Rather, we analyzed if and how telecoupling influences the way causal relationships are identified and we reviewed the methods and methodological approaches used to make causal attributions. The different research designs are discussed in their relation to one another and with regards to the causal statements made in the article and the telecoupling approach applied (i.e. discerning between heuristic and structured approaches and the application of telecoupling as either a narrative, empirical application, or operationalization through existing concepts and tools see also supplementary material\_1).

Since the analysis included some elements of latent content (the underlying meaning of the text), coding reliability became particularly important. Intercoder reliability was enhanced by conducting a series of pilot tests during the development of the codebook and conducting continuous and collective meetings to evaluate results. Moreover, each article was reviewed by a minimum of two authors with the use of the same coding scheme, and the first author was in charge of merging reviews, aggregating and analyzing the coded text segments.

With regards to causality, the coders were asked to code all statements made that captured cause-effect relationships were coded, including statements that were not explicitly claiming to attribute causality. Codes were then labeled with direct reference to authors' terminology to avoid unstructured and layered interpretation by individual coders. The analysis was conducted in NVivo, relying on the codebook to investigate the articles' causal statements, analyzing their relationship to other codes, and organizing node hierarchies.

## 4. Results and discussion

### 4.1 Analytical approaches in telecoupling research

The reviewed articles represent a broad variety of research topics and types of flows, albeit a majority focus on land use, land-use change, or international trade since we limit the sample to studies within LSS. In turn, the flows mostly analyzed are financial flows, commodities, and trade flows, but there are also several examples of more immaterial flows such as information, knowledge, and policy (supplementary material\_1). Generally, the contributions reviewed in this paper shows how a relatively simple idea like telecoupling can support a broad variety of research inquiries addressing a high level of complexity.

An overview of the causal statements and key research attributes is presented in the supplementary material. These statements vary in scale from specific country-level inquiries such as how Chinese imports from the Congo basin are driven by the US demand for Chinese furniture (Fuller et al., 2018), to broader discussions of the multiple drivers of global and regional land-use change (Creutzig et al., 2019). Nine articles justify causal statements by referring to findings from field observations, whereas the majority of the causal statements are justified by using evidence from existing literature, models, and quantitative measurements or estimations (Figure 2). The figure presents broader categories while a breakdown of specific tools applied is available in supplementary materials. Two articles are excluded from the figure as we did not identify any specific causal claims (Seaquist et al., 2014; Zimmerer et al., 2018).

In 30 of the 45 articles, data is included on the same topic over a given time period (years or decades, past or future) (supplementary material\_1.4). Twenty-three of these deal with spatial data (including forest cover data), while the others are spread across biophysical, economic, and trade data, among others. The use of longitudinal data is not equivalent to an explicit focus on causal temporal couplings (e.g. legacy effects and time lags), such as the historical interactions between deforestation and soil loss (Norder et al., 2017), as there is a much stronger focus on the spatial connections (supplementary material\_1).

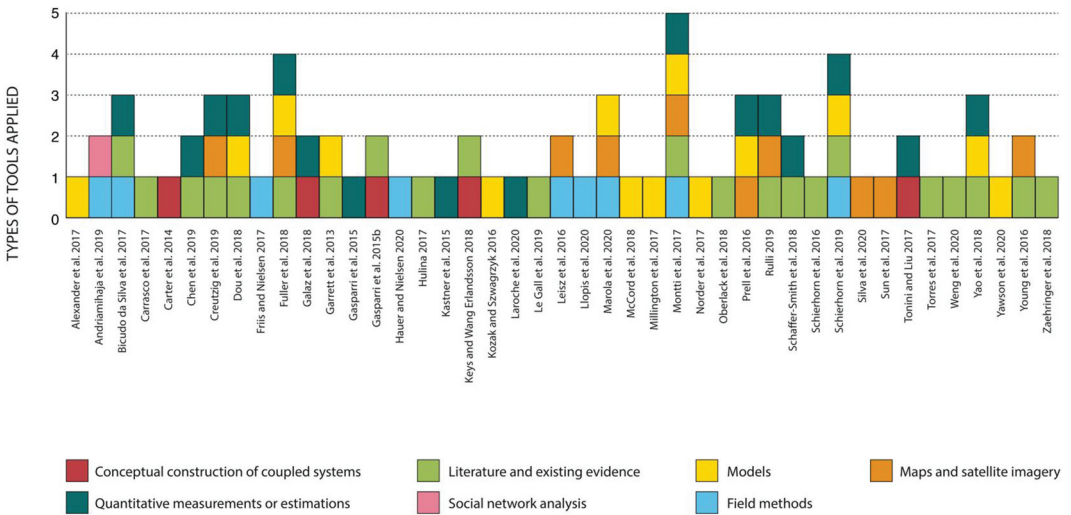
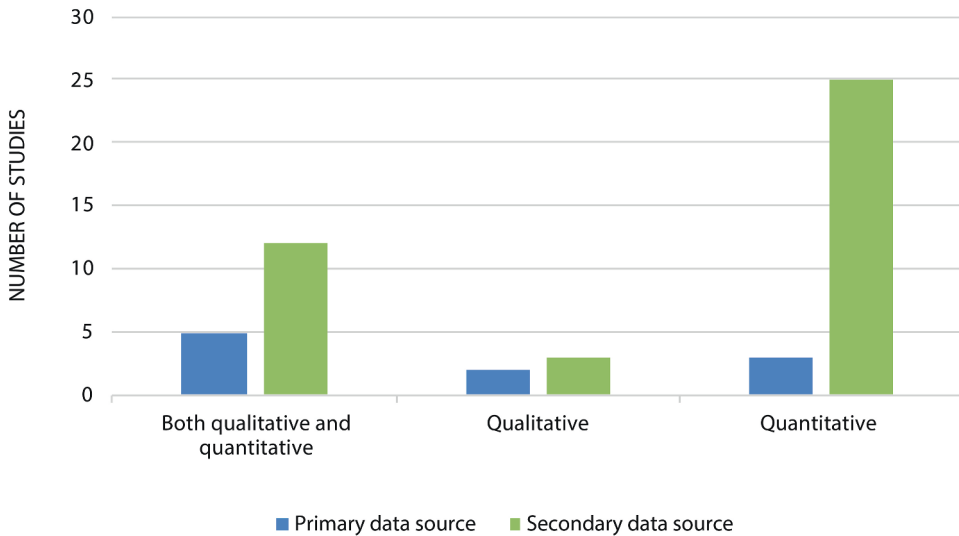


Figure 2. Type of tools applied to justify causal statements. Source: Figure generated from own data.

The articles that primarily use quantitative assessments tend to frequently approach their research from a deductive approach, testing a predefined explanatory theory or exploring the effects of a top-down rule or policy, whereas the mixed methods and qualitative approaches are more exploratory (see supplementary material\_1). Generally, qualitative and mixed methods approaches together with temporal perspectives seem to be an underrepresented combination in the sample. Qualitative approaches are important to pursue since some flows in telecoupled systems are difficult, if not impossible, to quantify. Discursive or knowledge flows cannot easily be measured in quantitative terms. Generally, due to the context-dependent, complex, and dynamic nature of land systems, and the (partial) lack of relevant knowledge and data (Newig et al., 2020), it is challenging to isolate causal factors and measure and quantify them. More interpretative analyses are required to explain the less tangible dimensions of causal relationships.

For example, REDD+ is an official framework for reducing emissions from deforestation and forest degradation, but in terms of understanding the drivers and effects of related interventions, it is important to examine the various incentives and values of the governing actors (Eakin et al., 2014), as they pursue different aims and strategies for implementation, which will affect the outcome of the interventions (Andriamihaja et al., 2019). Thus, in a REDD+ case, it is relevant to map and quantify the direction of material and financial flows. However, to understand the full nature of causal mechanisms, it is essential to investigate, through more qualitative inquiry, the more immaterial flows of ideas and values, and the actions and behaviors of actor-networks mediating these. A relevant and frequently referenced but rarely applied approach in telecoupling research is process-tracing. The process-tracing method breaks down flows and causal chains observed in case studies into analyzable units and validates each link in causal graphs as well as invalidates counter-hypotheses (Beach & Pedersen, 2016; Bennett & George, 2005).

In the review sample, the use of secondary data is more common in studies with primarily quantitative interpretation rather than qualitative interpretation (Figure 3). In two studies, qualitative secondary social data is used (Carter et al., 2014; Keys & Wang-Erlandsson, 2018). This finding is related to the tendency that most of the examples of temporal perspectives are conducted with quantitative (22 articles) rather than qualitative (two articles) assessment. The two examples that combine a qualitative assessment with some degree of quantitative and



**Figure 3.** Data source within qualitative and quantitative studies. Source: *Figure generated from own data.*

longitudinal analysis include Oberlack et al. (2018) who provide a stylized timeline from 2007 to 2016 of a bioenergy project case in Sierra Leone that led to significant land-use changes. The timeline provides an overview of major activities and events associated with the project in the set-up phase, the operational phase, and the scaling down and termination phase. While the authors do not claim to present more than a process overview, we argue it is a useful tool for a telecoupling analysis as it provides a context for knowledge and value generation and allows for the consideration of links between concrete events in time (temporal couplings) that might be decisive for the outcome of the intervention. Another example is Hauer and Nielsen (2020) who do not explicitly adopt a longitudinal design, but they provide an example of how questions in qualitative interviews can be tailored to focus on organizational evolution and changes over time.

There appears to be a reluctance to engage more explicitly with the implied temporal dimension of the telecoupling framework and to move beyond quantitative approaches more familiar in traditional LSS. Due to the few examples in our review that combine qualitative and mixed methods approaches with a temporal perspective, we present a few cases beyond our sample to illustrate the value of conducting comparative longitudinal studies on topics that are often subject to telecoupling research. Vicol et al. , for example, apply a temporal perspective on the implications of global value chain upgrading for coffee producers in Indonesia. They select secondary qualitative-quantitative survey data from case studies at three different geographical sites where village-level field visits and household surveys had been carried out at least annually between 2008 and 2016. This allows them to make a longitudinal assessment of local attitudes and analyze how coffee value chain relationships emerge, evolve, and break down. These are dynamics that would be difficult to capture using a single-sited snapshot of an isolated case. Petursson and Vedeld (2017) present an approach to analyzing the development and manifestation of conservation policy discourse over time by analyzing qualitative data from interviews in the same case-study region in Uganda for a period of eight years from 2003 to 2011. This enables them to generate new insight into how changing actor interests and power relations can contribute to explaining the gap between rhetoric and reality in protected area governance. Another approach

is presented by Liu et al. (2014), who suggest that information about transnational land deals could be documented in a relational database and categorized according to sending, receiving, and spillover systems, with each system including a list of agents, flows, causes, effects, and their linkages to other telecouplings such as species invasion. This would provide future telecoupling analyses with information on how land deals evolve and are connected in time. As pointed out by the authors, a promising database to enable such research inquiries is the LandMatrix, an independent land monitoring initiative to improve transparency in decisions over large-scale land acquisitions (Land matrix, n.d.).

We do not find any evidence that the interaction with telecoupling prescribes a specific type of analysis. Still, we do find that the application of the telecoupling influences the analytical perspective and contributes to generating new insights by specifying distal system dynamics, as we elaborate on in the following sections.

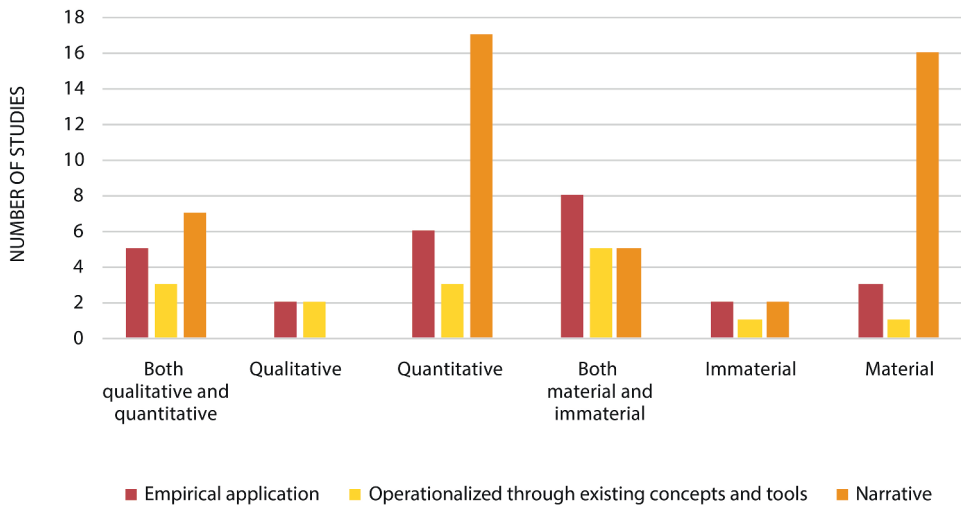
#### **4.2 Different approaches to telecoupling**

In the literature, the word ‘telecoupling’ is on the one hand used to describe the phenomena of globalization, and on the other hand, used as a conceptual framework to study these phenomena. We echo the argument that telecoupling research needs more consistent language, as proposed in (Meyfroidt, 2016) and, equally important, to be clear about how telecoupling is understood. We find that the potential of telecoupling to directly support more nuanced causal attribution in LSS depends on this variety in telecoupling application and operationalization.

A distinction between telecoupling as a phenomenon, a concept, and a framework has been identified in previous reviews (Kapsar et al.). However, our review reveals examples where all three types are applied simultaneously, which makes it difficult to clarify the difference it makes for causal attribution to adopt a telecoupling lens in the analysis. For the sake of consistent wording, from here onwards we refer to telecoupling as a framework in our conceptual discussions and recommendations for future research. To categorize and discuss the variety of approaches to telecoupling across the articles in our review sample, we offer a modification of the typology proposed in Kapsar et al. (2019) by discerning between 1) research that applies telecoupling implicitly as a phenomenon or research context (telecoupling as a narrative), and 2) research that directly applies the telecoupling framework on an empirical case in combination with another framework (telecoupling operationalized through existing concepts and tools), and 3) research that directly applies the telecoupling framework to an empirical case (empirical application of telecoupling). These three archetypes are not mutually exclusive but provide a constructive categorization for the discussion of the value added by the telecoupling framework.

Telecoupling as a *narrative* constitutes much of what we already know from research on multifaceted sustainability challenges about system interconnectedness but makes the interconnectedness more explicit by zooming in on the linkages involved in global processes. We identified 24 articles applying telecoupling as a narrative for research context rather than operationalized through existing concepts and tools or empirical application, and 16 of those articles focus primarily on material aspects (Figure 4). For instance, Rulli et al. (2019) apply telecoupling as a narrative in their analysis of potential environmental impacts of the expansion of oil palm production in Indonesia, where they focus primarily on observable, measurable, and material aspects such as quantifying forest loss, fragmentation, CO<sub>2</sub> emissions, and freshwater pollution. They refer to the interconnectedness of drivers (bioenergy and palm oil consumption) and the multitude of environmental impacts, as an argument that policymakers should develop strategies that consider the complexity of telecoupled systems and spillovers.





**Figure 4.** Telecoupling application and analytical focus. Source: *Figure generated from own data.*

Applying telecoupling as a narrative can help move beyond seeing globalization as a diffuse process and towards attending to specific global linkages and identifying the underlying distal drivers of environmental and social problems that manifest in a particular place. However, the analytical influence of telecoupling in studies that do not refer to any of the framework components, but only briefly mentions the term as an empirical phenomenon, is unclear (see for example, Creutzig et al., 2019; Fuller et al., ; Galaz et al., 2018; Kastner et al., 2015; Kozak & Szwagrzyk, ; Schierhorn et al., 2019).

In several research articles applying telecoupling as a narrative, telecoupling is understood broadly as a globalization process that has various impacts on land use and land cover, rather than operationalized as a tool to identify causal relationships. For example, Llopis et al. (2020) explore two telecoupling dynamics (protected areas and cash crop price boom) as drivers of the state of local well-being in a context of agricultural intensification in a biodiversity hotspot in Madagascar, or Bicudo da Silva et al. (2020) who consider telecoupling processes such as ecological tourism connecting urban and distant populations as the driver of direct and indirect land changes in Brazil. As such, telecoupling as a narrative can work as a way to describe the phenomenon of multiplex and intertwined causes rather than disentangling the complexity through the operationalization of the telecoupling framework components.

In contrast, the remaining 21 articles apply telecoupling more explicitly in either operationalization through existing concepts and tools or direct empirical application with reference to some or all of the telecoupling elements of the original framework: systems, causes, effects, actors, and flows (Liu et al., 2013). These more explicit telecoupling applications are frequently carried out with a combined material and immaterial analytical focus (13 articles out of 21). Telecoupling as operationalized through existing concepts and tools and empirical application is also associated with more examples of qualitative interpretation (four articles) and integrated qualitative/quantitative interpretation (eight articles) than the ‘telecoupling as a narrative’ application where 17 articles apply quantitative interpretation, 7 articles engage with both quantitative and qualitative interpretation, and zero articles appear purely qualitative (Figure 4). In turn, analyses of information-based flows such as discourse, knowledge, policy, and social dynamics are found primarily within empirical application or operationalization through existing concepts and tools (supplementary material\_1).

Telecoupling as *operationalized through existing concepts and tools* shows how telecoupling can support an extension or modification of existing conceptual frameworks from various disciplines to better capture the interlinkages and interdependencies in a globalizing world. Hauer and Nielsen (2020) combine telecoupling with geographies of marketization. The marketization perspective supports attention towards everyday practices and actor behavior in the study site while telecoupling provides a structured way of accounting for the systemic position of the studied phenomenon. Using this approach, they show how rice markets, rice cultivation and landscapes are intertwined and co-evolving in Burkina Faso rather than one causing the other. The iteration between a systemic and practice-oriented analysis enables a move beyond isolated descriptions of causes and effects and towards an understanding of the causal mechanism and broader causal relationships influencing the rice sector.

Another example is Andriamihaja et al. (2019) who combine the telecoupling framework with a social network analysis (SNA) approach to capture the drivers of more immaterial flows by showing how the interests of distant actors influence and accelerate local land competition in Madagascar. They inform this theoretical approach by qualitative field observations at a regional and national level and qualitative-quantitative survey information on, amongst other things, product prices, and less tangible and informal information flow. They visualize this variety of data in a network graph showing the intensity, scale, frequency, and complexity of flows and interactions that comprise the evidence for the variety of land-use change drivers. They note how the application of telecoupling enabled them to better understand the links between distant drivers and local effects. In this example, telecoupling provides a framework for the application of SNA by prescribing the domains for analytical inquiry (systems, actors, causes, effects, flows), and SNA offers a way of carrying out this inquiry in a structured and quantifiable way. The articles within this category engage directly with telecoupling and deal with an empirical case but the focus is on how empirical application is operationalized through either integration or combination with existing theory (Hauer & Nielsen, 2020), conceptual integration (Oberlack et al., 2018; Zimmerer et al., 2018), the extension of existing frameworks (Keys & Wang-Erlandsson, 2018), or models (Yao et al., 2018), or through specific methodological tools (Andriamihaja et al., ; McCord et al., 2018; Millington et al., 2017). We cluster these together in one archetype because they all primarily focus on developing the idea of telecoupling through explicit interaction with existing concepts and methods.

Finally, the application of telecoupling for direct *empirical application* reveals how the telecoupling framework can be used as an analytical tool to disentangle actors, systems, flows, causes, and effects in situations where the analytical boundaries are inherently challenging to draw due to the transcending nature of the research problems studied. Friis and Nielsen (2017), for example, break up the banana production network into separate units of analysis (sending and receiving systems, actors, feedback, flows, etc.) and show how qualitative data and an empirical application of telecoupling can help expand the understanding of agency and power between distant actors. They show how this analytical approach better captures the complexity of causal relations behind the banana boom rather than limiting the analytical focus to a particular production system or place. Hulina et al. (2017) also show how telecoupling supports their analysis of migratory species by accounting holistically and systematically for the multitude of interrelated components (systems, flows, agents, causes, effects), in a way that provides a full picture of issues related to species migration and conservation, without losing sight of important but more underlying factors such as public perceptions of land use and cultural acceptance of the need for species conservation. Gasparri et al. (2015) combine a focus on both material and immaterial aspects in their empirical application of telecoupling to show how knowledge transfer, direct investment, and cooperation with South America are crucial elements of the soybean expansion in Southern Africa, which can result in similar deforestation and biodiversity loss as in South America

We propose these three distinct ways of understanding and applying the telecoupling framework as a way to structure the discussion that follows, even if aware that there are examples of more ambiguous applications. For example, Marola et al. (2020) refer to telecoupling as a phenomenon and emphasize that their objective is ‘not so much to see what telecoupling can tell us about environmental certification as what we can learn from environmental certification about crafting information flows to govern telecoupled systems.’ (p. 2). Still, they apply the idea directly to an empirical case. As they refer to telecoupling as a phenomenon and a globalization effect rather than an analytical framework, we have categorized their application as a narrative. The article is atypical for the sample in that it shows that telecoupling as a narrative can also be applied more directly to explore an empirical case, and thus contribute to the theory development of the framework components even if they are not explicitly included in the analysis. They do so by providing a structured way to analyze and distinguish between information flows between distant places in terms of bandwidth, which can support empirical theorizing on telecoupling governance (Marola et al., 2020).

### 4.3 The analytical influence of telecoupling for causal attribution

Nineteen of the 45 articles in the reviewed sample report in different ways how the telecoupling framework contributes to their analysis. Articles belonging to the empirical application of the telecoupling framework more often report on such contributions, followed by studies that combine telecoupling with other theoretical frameworks. Studies that employ telecoupling as a narrative rarely do so (Figure 5).

The statements in Figure 5 suggest that the umbrella conceptual framing of telecoupling (*mapping distant connections* and *multiple systems interactions*) is the most broadly reported contribution of the framework across all three types of application. In a globalized and interconnected world, it

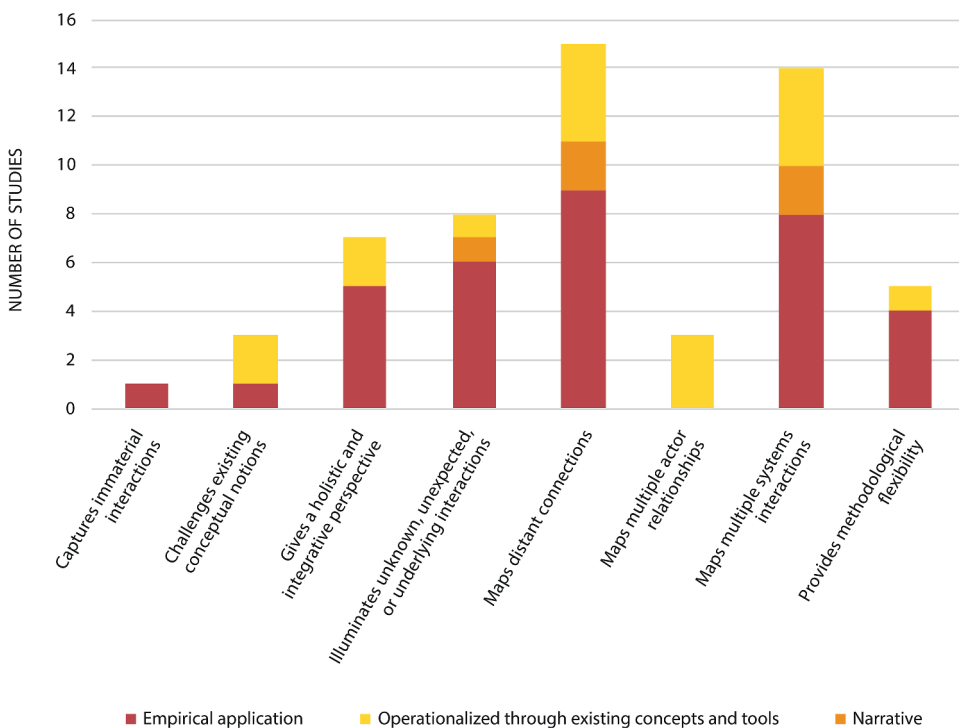


Figure 5. Reported contributions of the telecoupling framework. Source: Figure generated from own data.

can be difficult to determine which variables should be accounted for as a cause, and which should be accounted for as the effect (cf. the challenge positive feedback loops presented in Table 1). By mapping distant connections between multiple system components, the telecoupling framework disentangles this multitude of possible cause-effect relationships. It does so in a structured manner that makes it possible to focus on investigating specific linkages, causes, and effects, while acknowledging the wider system and other potential explanations. Thus, telecoupling does not ask what can be seen as a cause for the object of study, but what might have an interaction with the object of study. Hauer and Nielsen (2020) argue that the emphasis on systems connections through the analysis of flows results in less attention towards the question of how systems emerge, and how causal mechanisms play out. From another perspective, it could be argued that the telecoupling framework supports exactly such inquiry by showing *how* systems are created, maintained, or dissolved, by the direction and strength of flows between actors. In that sense, telecoupling maps the challenge of inferring causality, while at the same time providing a way to meet this challenge.

*Mapping multiple actor relationships* is also key in the original framing of telecoupling, but a less frequently reported contribution in the reviewed sample (3 articles; Figure 5). This speaks to the argument by Sonderegger et al. (2020), that the embedded network aspect of telecoupling deserves further testing and operationalization. Telecoupling research can contribute to shedding light on the interconnectedness between systems, actors, processes, and flows, but inevitably falls short in depicting all the dimensions of such complexity at once. Acknowledging the telecoupling framework as a type of network approach would also imply acknowledging this premise, and that the framework can map multiplex causal relationships that can then be subject to narrower inquiries in integration with other theoretical frameworks and/or by tapping into the telecoupling toolbox. This growing toolbox contains script tools for the assessment of potential causes and effects between social-ecological telecoupled systems through both statistical assessment and qualitative description (Nielsen et al., 2019; Tonini & Liu, 2017).

The objective of telecoupling research does not need to be to identify *all* causes and effects related to a given empirical case of land-use change but to identify which telecoupled relationships generate the largest socio-economic and environmental impacts (Liu et al., 2014) and to discover more unanticipated, intangible or underlying driving forces (Geist & Lambin, 2002). This is related to the reported strength that telecoupling contributes to *illuminating unknown, unexpected, or underlying interactions* (Figure 5). Telecoupling can help identify otherwise overlooked drivers by following flows between agents across systems with complex and fuzzy institutional boundaries. The inherent uncertainty related to causal attribution in LSS should be acknowledged as part of telecoupled systems rather than as a barrier to causal analysis. Uncertainty is not necessarily an analytical shortcoming but can be a valuable finding if it is explicitly discussed and integrated with the analysis. Some land-use changes require an acceptance that there will always be uncertainty because of the difficulty of attributing one factor as a cause and another one as an outcome (Rauschmayer et al., 2009).

In principle, causality can never be fully proven, only inferred. It has been a long while since science started to attribute causality beyond what can be directly observed, but there are not many holistic analytical frameworks within LSS that manage this accepted uncertainty about causal mechanisms. Whether applied directly and empirically, through existing concepts and tools, or as a narrative, the telecoupling framework does not prescribe any theory or methods to analyze causal mechanisms. Still, the framework's approach to relationships between causes and effects as complex linkages and pathways (cf., Eakin et al., 2017), provides a heuristic framing for the data collection on processes, actors and flows that can contribute to a more nuanced understanding of causality and causal mechanisms. As put by Eakin et al. (2017), the phenomenon of unexpected outcomes can in part be explained by the intangible nature of linkages such as values, political dynamics and information flows in telecoupled systems. For example, in the classic case of the causal relationship between increased meat demand in China (cause) and deforestation in Brazil (effect), analysis of the

direction and strength of trade flows provides information on the interdependency of distant actors and land use processes which contributes to revealing the mechanisms through which the cause produces the effect (Torres et al., 2017). As such, and especially when approached through integrated toolboxes, telecoupling facilitates consideration of the agency of causal linkages which is essential to guide the different types of land use policy interventions that different causal mechanisms call for (Meyfroidt, 2016).

Integrated approaches to telecoupling causality are enabled through the framework because it provides *methodological flexibility* (Figure 5). The telecoupling framework gives analytical direction for the identification of specific causal relationships between systems and actors through material and immaterial flows, while at the same time providing flexibility to discover alternative patterns (Figure 5). As noted in Friis and Nielsen (2017), it allows to flexibly set the institutional and analytical boundaries of the study, while always keeping a focus on the local issue at hand. For example, Eakin et al. (2017) use telecoupling as a heuristic and draw system boundaries based on the different values and interests of actors associated with a telecoupled food production system. Moreover, the telecoupling framework provides flexibility in the sense that what makes a cause and what makes an effect will change depending on the analytical entry point i.e. which flows and actors that are in focus and what is interpreted as sending, receiving, and spillover systems.

Telecoupling does not prescribe *where* to look for specific drivers and effects, but it provides a framework for *how* to look, and from where a decision on an analytical entry point can be made without losing sight of the bigger picture. This is associated with the reported strength that overall, telecoupling *supports a holistic and integrative perspective*. As put by Lambin et al. (2001), what drives land-use change are 'peoples' responses to economic opportunities, as mediated by institutional factors' (p. 261), opportunities that are created by local, national, and international markets. This underscores well why an integrative holistic perspective on concrete interactions across scales and geographic distance is paramount. Moreover, the argument supports the need to further tap into the reported contribution regarding *demonstrating immaterial flows and interactions* to illuminate the beforementioned more intangible factors (e.g. incentive structures and institutional logics), which is key to fully understanding the complexity of causes behind land-use change.

For example, underlying economic incentive structures among government actors or discursive flows between institutions in a given land-use setting can over time contribute to environmental degradation if local and positive attitudes towards conservation progressively weaken (Geist & Lambin, 2002). While challenging to go beyond the acknowledgement of their presence and towards structured causal analysis, these underlying and discursive structures make up enabling causal factors for the phenomenon in focus (e.g. environmental degradation) and should be explored in both their quantitative (e.g. volume or frequency) and qualitative (e.g. motivation or subjectivity) characteristics and the context of the telecoupled systems. Boillat et al. (2018) present a good example of telecoupling operationalization through existing concepts and tools in combination with more qualitative inquiries, in this case, a telecoupling analysis in an environmental justice framing to map power asymmetries in four different cases of protected area governance. Underlying causal mechanisms are also more far-reaching than the effects they from time to time generate. An example from the review is the observable trade of commodities (material flows), which can be linked to more underlying reciprocal flows, policy, and discourses (immaterial flows; Gasparri et al., 2015; Leisz et al., 2016). In addition, the biological state of a forest can be influenced by cultural values, institutions, and social capital even though a direct causal link to physical traits such as resource extraction cannot be easily attributed with concrete measures and numbers (see, Gibson et al., 1999 or Geist & Lambin, 2002).

We did not identify any direct reports on the potential and strength of the telecoupling framework in terms of supporting analysis of complexities related to the temporal dimension such as facilitating the identification of non-linearity, time-lags, or inertia (Table 1). As noted earlier, 30 of the

45 reviewed articles include some level of temporal perspective. However, the ability of the telecoupling framework to identify temporal couplings is not reported in the articles applying the framework more explicitly (Figure 5). The temporal dimension is addressed in the original conceptualization of the telecoupling framework (Liu et al., 2015). However, as our review indicates, not much telecoupling research aims at moving beyond the presentation of system interactions as temporal snapshots and towards addressing both temporal and underlying flows behind multiple interacting causal mechanisms. Such information is relevant for policy intervention as it informs about the permanency and institutionalization of the telecoupled system. Relevant tools for more integrated inquiries have already been discussed in relation to telecoupling research including socioeconomic metabolism (Friis et al., 2016), process-tracing (Carlson et al., ; Meyfroidt, 2016), hybrid telecoupling models (Millington et al., 2017), agent-based modeling (Dou et al., 2019) or system dynamics models (Paitan & Verburg, 2019), and networks of action situations (NAS) approach (Oberlack et al., 2018), amongst others. Moreover, there are visualization techniques to show temporal order and development within social-ecological systems (Banitz et al., 2022; Sonderegger et al., 2020). However, accounting for temporal dynamics such as latency effects or slow-moving variables remains a challenge.

A telecoupling framework that supports longitudinal and mixed methods assessments would strengthen its contribution to causal analysis, not least because underlying drivers that require qualitative inquiry tend to reveal themselves over time. For example, increased timber logging is a proximate cause of the decline in biodiversity. The direct effect of timber logging in terms of habitat destruction can be measured and mapped quantitatively. However, looking at the cause of increased timber logging in more detail would require attention to the underlying driving forces (Geist & Lambin, 2002) at broader governance scales, and a consideration of the cumulative causes and more slow-moving variables (Pierson & Brown University, Rhode Island, Dietrich Rueschemeyer, Brown University, 2003). Moreover, underlying driving forces such as individual incentives related to increasing incomes from logging, and slow-moving variables such as attitude change require more qualitative inquiries.

Addressing causal mechanisms in an exploratory and hypothetical manner does not necessarily mirror a lack of structural approach to causality (cf., (Carlson et al.). Rather, it can be seen as an acknowledgement of the challenges associated with causal attribution (Table 1). Tapping into the strengths reported in Figure 5, the telecoupling framework becomes particularly suited to meet some of these challenges as it disentangles the interconnectedness associated with environmental and social problems involving multiple actors, scales, and locations (multi-causality), the immaterial and indirect flows between actors (potential underlying causes or confounding variables), and the spillover systems of such problems (cumulative and cascading effects).

## 5. Conclusion

Attributing causality in LSS is a challenging endeavor in today's interconnected world. In this article, we have demonstrated how the empirical telecoupling literature has taken up the challenge. First, we have shown that such literature is characterized by a broad variety of disciplines and analytical approaches. While most studies applying telecoupling do so with the use of quantitative methods, as identified in earlier reviews, qualitative and mixed methods studies and perspectives on temporal couplings are underrepresented. Consequently, we have suggested that qualitative and mixed-method longitudinal approaches to telecoupling research can complement quantitative analyses and provide a promising pathway for strengthening causal assessments in complex system interactions.

Second, based on the review, we have argued that telecoupling applications are most explicit in their contribution to providing a more nuanced understanding of causality in LSS when approached through either empirical application or operationalization through existing concepts and tools, rather than as a narrative. The empirical application of telecoupling shows that using telecoupling directly as an analytical tool to map and visualize actors and flows

between distant systems can reveal unexpected impacts, spillovers, and significant causal relationships that are surrounded by complexity and uncertainty. Telecoupling operationalized through existing concepts and tools, in turn, demonstrates that conceptual frameworks from other disciplines can be enriched with a telecoupling lens and subsequently contribute to better capturing interconnectedness across distance. Altogether, the explicit interaction with the telecoupling framework seems to facilitate a more holistic focus on both material and immaterial aspects of causal relationships.

Third, the analysis of the review findings and the authors' reports on the benefits of engaging with the telecoupling framework, reveal that the analytical contribution of applying the framework is broad and ranges from its methodological flexibility to the holistic mapping of multiple systems and distant interactions. While it is rarely elaborated in detail how telecoupling contributes to causal attribution, there is evidence that telecoupling supports the identification of causal relationships that explicitly address, and thereby overcome, the analytical challenge related to the inherent complexity, unpredictability, and uncertainty of causes and effects which can complement existing LSS theory. Providing a flow-based and agency-focused perspective on causality can if operationalized through relevant qualitative and quantitative methods, guide the direction of interventions to target the processes and actors responsible for the most decisive causal mechanisms.

Overall, this article has demonstrated that telecoupling can push otherwise unobservable driving forces to the empirical domain through the conceptualization of multiple system components. In research advocating for better causal attribution in LSS, however, there is often a focus on the need to have causality proven with solid evidence from rigorous and triangulated methodological approaches. In this regard, we conclude that a telecoupling perspective does not necessarily make research better at proving causality, but it provides a structured framework for better understanding the complexity in the variety of ways causes and effects can be linked and unfold in a hyperconnected world. Finally, the telecoupling framework offers terminology and a toolbox for structuring and communicating such complexity in a way that shows applicable in various disciplines and methodological approaches, which makes it suitable for trans- and interdisciplinary research and collaboration. It is the analytical process that the telecoupling framework supports, which we argue can ensure a more nuanced understanding of causal attribution within LSS and beyond.

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## Disclosure statement

There are no financial or personal relationships with other people or organizations that could inappropriately influence this work.

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## Data availability statement

Raw data were generated in NVivo. Derived data supporting the findings of this study are available from the corresponding author upon request.

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## Overview of articles included in this cumulative dissertation

(in accordance with the guideline for cumulative dissertations in Sustainability Science [January 2012], in the following termed “the guideline”)

- [1] Coenen, J., Sonderegger, G., Newig, J., Meyfroidt, P., Challies, E., Bager, S., Busck-Lumholt, L. M., Corbera, E., Friis, C., Frohn Pedersen, A., Laroche, P. C. S. J., Parra Paitan, C., Qin, S., Roux, N., & Zaehringer, J. G. (in press). Towards spatial fit in the governance of global commodity flows. *Ecology and Society*.
- [2] Cotta, B., Coenen, J., Challies, E., Newig, J., Lenschow, A., & Schilling-Vacaflor, A. (2022). Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda. *Earth System Governance*, 13, 100142. <https://doi.org/10.1016/j.esg.2022.100142>
- [3] Coenen, J., Bager, S., Meyfroidt, P., Newig, J., & Challies, E. (2021). Environmental Governance of China’s Belt and Road Initiative. *Environmental Policy and Governance*, 31(1), 3–17. <https://doi.org/10.1002/eet.1901>
- [4] Coenen, J., Newig, J., & Meyfroidt, P. (2022). Environmental governance of a Belt and Road project in Montenegro – National agency and external influences. *Land Use Policy*, 119, 106136. <https://doi.org/10.1016/j.landusepol.2022.106136>

**Authors' contributions to the articles and articles publication status (according to §16 of the guideline):**

| Article # | Title  | Specific contribution of all authors   | Author status                           | Weighting factor | Publication status   | Conference Contributions               |
|-----------|--|--|---|------------------|--|--|
| 1         | Towards spatial fit in the governance of global commodity flows.   | JC: Coordination of the development of the study; Writing of the original draft<br>JC, GS, JN, PM,<br>ECh: Conceptualization of the study<br>JC, GS, JN, PM, ECh: Review & editing of the manuscript<br>SB, LBL, ECo, CF, AFP, PL, CPP, SQ, NR, JZ: Discussing the concepts at two workshops, Review & editing of the manuscript | Co-author with predominant contribution | 1.0              | Accepted for publication in <i>Ecology and Society</i> (JIF: 4.653)  |  |
| 2         | Environmental governance in globally telecoupled systems: Mapping the terrain towards an integrated research agenda. | BC, JN, ECh, AL, ASV: Conceptualization of the study<br>BC, JC, JN: Data collection; Data analysis<br>BC: Data curation<br>BC & JC: Writing of the original draft<br>BC, JC, ECh, JN, AL, ASV: Review & editing of the manuscript  | Co-author with equal contribution       | 1.0              | Published in <i>Earth System Governance</i> (JIF: N/A)               | ISA 2019*,<br>ICPP 2019*,<br>ESG 2021* |
| 3         | Environmental Governance of China's Belt and Road Initiative.  | JC, SB, PM, JN, ECh: Conceptualization of the study<br>JC, SB: Data collection and data analysis for descriptive statistics<br>JC: Writing of the original draft<br>JC, SB, PM, JN, ECh: Review & Editing of the manuscript  | Co-author with predominant contribution | 1.0              | Published in <i>Environmental Policy and Governance</i> (JIF: 3.136) | ECPR 2019                              |



|   |  |  |   |     |  |                     |
|---|--|--|---|-----|--|---------------------|
| 4 | Environmental governance of a Belt and Road project in Montenegro – National agency and external influences. | JC, JN, PM: Conceptualization of the study<br>JC: Conduction of interviews & fieldwork; Data Analysis; Writing of the original draft<br>JC, JN, PM: Review & Editing of the manuscript | Co-author with predominant contribution | 1.0 | Published in <i>Land Use Policy</i> (JIF: 6.189) | ECPR 2020, ESG 2021 |
|---|--|--|---|-----|--|---------------------|

## Explanations

### *Specific contributions of all authors*

AFP: Anna Frohn Pedersen, AL: Andrea Lenschow, ASV: Almut Schilling-Vacaflor, BC: Bendetta Cotta, CF: Cecilie Friis, CPP: Claudia Parra Paitan, ECh: Edward Challies, ECo: Esteve Corbera, GS: Gabi Sonderegger, JC: Johanna Coenen, JN: Jens Newig, JZ: Julie Zaehringer, LBL: Louise Busck-Lumholt, NR: Nicolas Roux, PL: Perrine Laroche, PM: Patrick Meyfroidt, SB: Simon Bager, SQ: Siyu Qin

### *Author status*

according to §12b of the guideline:

Single author [Allein-Autorenschaft] = Own contribution amounts to 100%.

Co-author with predominant contribution [Überwiegender Anteil] = Own contribution is greater than the individual share of all other co-authors and is at least 35%.

Co-author with equal contribution [Gleicher Anteil] = (1) own contribution is as high as the share of other co-authors, (2) no other co-author has a contribution higher than the own contribution, and (3) the own contribution is at least 25%.

Co-author with important contribution [Wichtiger Anteil] = own contribution is at least 25%, but is insufficient to qualify as single authorship, predominant or equal contribution.

Co-author with small contribution [Geringer Anteil] = own contribution is less than 20%.

### *Weighting factor*

according to §14 of the guideline:

|  |     |
|--|-----|
| Single author [Allein-Autorenschaft]                           | 1.0 |
| Co-author with predominant contribution [Überwiegender Anteil] | 1.0 |
| Co-author with equal contribution [Gleicher Anteil]            | 1.0 |
| Co-author with important contribution [Wichtiger Anteil]       | 0.5 |
| Co-author with small contribution [Geringer Anteil]            | 0   |

*Publication status*

JIF: 2021 Web of Science Journal Impact Factor

*Conference contributions (acronym, society, date, venue, website)*

ISA 2019, International Studies Association Annual Convention, March 27-20, 2019, Toronto, Canada,

<https://www.isanet.org/Conferences/Toronto-2019>

ICPP 2019, International Conference on Public Policy, June 26-28, 2019, Montreal, Canada, <https://www.ippapublicpolicy.org/conference/icpp4-montreal-2019/10>

ECPR 2019, European Consortium for Political Research (ECPR) General Conference, 04-07.09.2019, Wrocław, Poland,

<https://ecpr.eu/Events/123#:~:text=The%202019%20General%20Conference%20will,12%20islands%20and%20130%20bridges.>

ECPR 2020, European Consortium for Political Research (ECPR) General Conference Virtual Event, 24-28.08.2020, online,

<https://ecpr.eu/Events/156#:~:text=ECPR%20General%20Conference%20Virtual%20Event%2C%2024%20%2D%2028%20August%202020>

ESG 2021, Bratislava Conference on Earth System Governance, September 7-9, 2021, online, <https://www.earthsystemgovernance.org/event/2021-bratislava-conference-on-earth-system-governance/>

\* Paper presented by first author

**Declaration (according to §16 of the guideline)**

I avouch that all information given in this appendix is true in each instance and overall.