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Understanding the dynamics of fish politics: The role of diverse actor interactions in transformations towards co-management

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ABSTRACT

Co-management is often put forward as a way to foster sustainability and improve the adaptive capacity of small-scale fisheries. Transformations towards co-management are enabled by processes that support social change, such as nurturing leadership, collective action and learning, as well as political processes that change legislative frameworks from centralized to decentralized decision-making. However, major policy changes can be difficult and change-actors often fail to overcome barriers created by institutional friction, dominant policy discourses or powerful interests supporting the status quo. In the literature, special attention has been paid to social processes that foster cooperation, the role of bridging-actors on the path towards co-management, or conditions that influence its effective implementation. In this paper we shift the attention to political decision-making and changes in policy discourse as an integral part of fisheries' transformations. We use the well-studied cases of co-management transformations in small-scale fisheries to identify how interactions among political actors and stakeholders, as well as social-ecological interactions, shaped the policy discourse and influenced policy change during the transformation process. By comparing how policy change emerged across four fishery transformation cases, we illustrate the importance of (cross-scale and cross-type) coordination and collaboration among diverse political actors in creating conditions for adoption of legislation, as well as its timing during the policy process. The paper contributes to the literature on sustainability transformations by explaining how policy changes supporting such transformations may emerge, in addition to providing insight on political conditions and processes that could be fostered in order to support policy change towards decentralization in fisheries.

1. Introduction

Transformations towards sustainability in social-ecological systems (SES) are urgently needed in many natural resource use contexts in order to deal with challenges of overexploitation and increased global connectivity (Österblom et al., 2017). Changes in policy or governance institutions are often an important part of SES transformations, however, knowledge about the processes through which such policy change may take place is limited. SES transformations are inherently political in nature (Patterson et al., 2017), as the aim to change existing institutions and power relationships involves processes through which interests struggle to reinforce their authority, influence ideas and knowledge (Méndez et al., 2019). Insights into policymaking – the process through which laws, regulations or even government's intent to address societal problems are formed – are thus essential in order to understand how a governance system transforms. There is a growing understanding of the

social and political conditions under which governance transformations emerge and the forces that shape them; including agency, contested values, power and politics (Moore et al., 2014; Nayak et al., 2016; Avelino and Wittmayer, 2016; Avelino, 2017; Andrachuk et al., 2018; Pereira et al., 2018; Méndez et al., 2019 and others). There is, however, much less clarity and theoretical knowledge about the policy processes that are at the heart of such transformations.

In the SES transformations research domain, the phenomenon of policy change and the political domain in general have received increased attention in recent years (e.g. Manuel-Navarrete and Pelling, 2015; Patterson et al., 2017; Herrfahrtdt-Pähle et al., 2020). To an extent this can be attributed to earlier critique. Multiple authors in sustainability science have raised concerns about the “broad strokes” used in depicting complex and intricate political processes (Meadowcroft, 2009, 2011; Scrase and Smith, 2009) or lack of attention to its specific elements such as power and authority (Manuel-Navarrete and Pelling,

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2015), contested meanings (Kofinas, 2009), conflicts of interest (Pereira et al., 2015) or the relationship between political dynamics and transformations (Smith and Stirling, 2010). It is important to note that in efforts to identify pre-conditions of successful SES transformations, sustainability scholars have often drawn from existing research from the fields of political science and public policy. These include conceptualization of policy process as multiple streams of ideas, problems and politics (Perry and Kingdon, 1985) or focusing attention on the emergence of a “window of opportunity” or a favorable political context as a necessary condition for major transformations (e.g. Olsson et al., 2004; Folke et al., 2009; Chapin et al., 2010; Gelcich et al., 2010; Westley et al., 2013; Blythe et al., 2018; Salomon et al., 2019). However, this literature often does not go beyond analyzing politics as “pre-conditions” or catalysts of transformation (Salomon et al., 2019).

Our conceptualization of the policy process focuses on the dynamic processes through which diverse state and non-state actors interact to pursue their political goals (Orach and Schlüter, 2016). These processes need to be understood in light of the political, social and ecological conditions that shape them. These include, for instance: political structures, dominant ideas, paradigms and historical context – past policies, events or experiences (van Gestel et al., 2018) as well as the state of e.g. fish populations. During a transformation, a change in policy is often an important step that establishes the grounds for a new governance system. However, policies rarely respond to social-ecological change in a direct manner. A problem perceived by resource users (e.g. declining fish stocks) first needs to get on the political agenda in order to become a policy issue (recognized and addressed in the policy process), meaning that it would need to be perceived as a problem by political actors. During the policy process, actors attach meanings to problems and problems to solutions through interactions, exchanging information and exerting influence on each other. For example, an NGO can attempt to lobby the Ministry of Fisheries to address the problem of overfishing, highlighting lack of compliance and proposing a sharing of power to fishing communities as a solution. While their proposal might not necessarily change the policy agenda, they can influence policy change through processes such as supplying information to policy actors, forming coalitions and coordinating activities with other NGOs, competing for influence with opposing groups and engaging in experiments with scientist actors and fishers.

In this paper, our aim is to advance the understanding of SES transformations and their political context by studying the causal mechanisms through which political change, as an inseparable part of such transformations, can occur. To that end, we go beyond addressing politics as “pre-conditions” or drivers of transformative change and seek to study it as an endogenous, complex and dynamic part of such transformations (Biesbroek et al., 2015). To make sense of complex policy processes and their embeddedness within the broader social-ecological system, we adopt a mechanism-based approach. Through this approach, such complex processes can be understood by “distilling the key explanatory causal mechanisms” (Sieber et al., 2018, p. 2380). Adopting the definitions of causal mechanisms of Hedström and Ylikoski (2010) to the policy process context, we argue that causal mechanisms are actors with certain properties; engaging in activities and interactions, shaping a causal process that ultimately produces policy change. Multiple mechanisms can determine the outcomes of the policy process, however which causal mechanisms are activated and which have the most significant impact on policy change is influenced by their contextual conditions (Sieber et al., 2018). The value of using the mechanism-based approach lies in its ability to address complex processes and provide generalizable (within particular empirical contexts), causal explanations of macro-level phenomena. It can also allow us to provide a theoretical contribution to understanding SES transformations and unpacking the “black box” of policy processes within them by explicitly focusing on causal linkages through which social-ecological change interacts with policy change.

We investigate policy processes within SES transformations through

a comparative analyses of governance transformations towards co-management in small-scale fisheries (SSF). Transformations of SSF towards co-management are among the most well-researched cases, where multiple place-based studies have been explored extensively; providing qualitative insights about the context of transformations, events in the policy process and interactions between political and other actors. In efforts to explain transformations in SSF, the majority of studies focus on qualitative, place-based research, considering a broad diversity of drivers and interactions. These include, for example, the role of the global market, ecological crises and change of political regime (Gelcich et al., 2010), interactions between non-governmental (e.g. NGOs, donor agencies) and governmental actors (Chuenpagdee and Jentoft, 2007), among fishers (Crona and Bodin, 2010; Finkbeiner and Basurto, 2015) and between fishers and enforcers (Alexander et al., 2015). Many of the published cases pay attention to the political context of co-management transformations. They emphasize, for example, the importance of combining scientific and local knowledge when making policy decisions supporting transformations (Linke and Bruckmeier, 2015; Nayak et al., 2016), the role of multi-level, polycentric governance structures for learning and adaptation (Finkbeiner and Basurto, 2015; Gelcich, 2014), and the importance of political leadership and entrepreneurship (Cinner and McClanahan, 2015). While few case studies of co-management transformations explore the interactions within the policy process in detail, some do shed light on key interactions influencing policy change. The availability of in-depth descriptions of such interactions in the papers analyzed in this manuscript allows us to investigate causal mechanisms that drive process of policy change rigorously and with sufficient detail. With our comparison we address the following research question:

How do interactions between policy actors, influenced by interactions outside of the policy process, as well as change in the social, ecological and political contexts, result in policy change that lays the institutional groundwork for transformations towards SSF co-management?

We do so through an in-depth analysis and comparison of four well established and researched cases of SSF co-management transformations (Kenya, Hawai'i, Chile and Vietnam). The in-depth analysis included identification of social, ecological and social-ecological interactions, their combinations and their role in adoption of key legislation for co-management transformations.

It is important to highlight that we do not seek to explain transformations in their entirety, but instead focus on the policy process that accompanies and supports them. We thus do not aim to explain the success of transformations or show whether transformations to co-management have actually occurred to completion. Instead our goal is to understand specific policy changes that lay groundwork for transformations towards co-management and can be viewed as part of a routinization or stabilization sub-processes (Moore et al., 2014). In the context of SSF co-management, such policies would typically redistribute management costs (from government to fishing industry/resource users/communities) and ensure a greater fisher involvement in designing rules in use/policy instruments (e.g. gear limits, area closures, other types of input control; limiting catch and bycatch, etc.). Thus, in each case analyzed in this study we seek to explain changes to a fundamental piece of legislation that routinizes and stabilizes the new co-management arrangements (changes in the state Fisheries Law that e.g. establish territorial use rights for fisheries or decentralize power to fishing communities or fishing associations).

The article will proceed as follows: first we describe our approach and method used in the study; next – we present results from the exploratory stage, followed by insights from comparison across cases. We will finally conclude with discussion, linking to the literature on SSF transformations specifically and theorization on sustainability transformations in general.

2. Approach and method

We selected four case studies of SSF co-management transformations from a review of the scientific literature on governance transformations in SSF (see Table 1 for the selection and the literature sources for each case). For each of the case studies we could draw on several published papers. For the initial broad search of papers we searched the Scopus database using the following search term:

((TITLE-ABS-KEY (fishery AND co-management) AND (TITLE-ABS-KEY (policy) OR TITLE-ABS-KEY (governance))))

For our following selection we considered that the studies should:

- Involve a change in major legislation that institutionalized SSF co-management or was fundamental to the process of transformation;
- Be well-studied, with several publications providing broad insights into the processes that occurred throughout the transformation;
- Address interactions between diverse actors in the policy process in sufficient detail to allow for the formulation of hypotheses about causal mechanisms;

These criteria significantly reduced the number of studies we could use for our analysis. There are many studies of fisheries’ transformations that pay great attention to bottom-up processes and interactions between resource-users and other non-state actors. These studies emphasize the role of policy or institutional change, but they do not specify the interactions and processes that lead to this change. Their focus is rather on the effect of the policy change on the fishery. The lack of detailed information on the link between the fishery and the policy process made

these studies unsuitable for our purpose.

We developed a 2-step procedure for identifying and comparing potential mechanisms of policy change across case studies (see Fig. 1). The first stage of the analysis is exploratory and inductive, focusing on each individual case (Fig. 1, left panel). The second stage is a qualitative comparison between case studies with the aim to develop comparable and generalizable (within our set of case studies) empirical mechanisms (Fig. 1, right panel). In the process of case comparison, we followed the method of structured focused comparison (George and Bennett, 2005). In the first stage, we built representations of each case using the framework of linked social-ecological action situations (SE-AS) (see Schlüter et al., 2019 for a detailed description of the tool) with the aim to identify key social and social-ecological action situations and participating actors, such as participants of the policy process, social actors (e. g. resource users and communities) in addition to social and social-ecological interactions that influenced the policy dynamics (Table 1). The SE-AS framework was suitable for our approach because it accounts for intertwined ecological, social and policy processes, focusing on interactions, generating a phenomenon of interest. We also established the emergent outcome of interest in each case, i.e. the change in legislation or policy change we want to explain. Finally, we included the social, ecological and political conditions that were identified as important for the outcomes of interactions by the authors of the original publications. We did not approach the first stage with a theoretical mechanism or a set of mechanisms in mind that we aimed to test in each of the cases. Instead, we used available knowledge about each case as empirical data to generate assumptions about the broad, general pathway through which policy change took place.

Table 1
Identification of outcome of interest, key action situations, participating actors and social-ecological conditions.

Case study	Kenya	Vietnam	Hawai’i	Chile
Studied period and the outcome of transformation	2000–2007 Beach Management Units as new Fisheries Regulations Policymaking (national level)	1990s–2006 Directive 03 on Promotion of Allocation of Management Rights to Fishers’ Organizations Policymaking (national level)	1990–1994 Adoption of Community-based Subsistence Fishing Areas Policymaking (state level)	Late 1980s–1997 Adoption of Management and Exploitation Areas for Benthic Resources under Fishery and Aquaculture Law Policymaking (national level)
Key social and social-ecological action situations	Policymaking, information-sharing (international level – LVFO) Knowledge-generation, capacity-building (local level – Fisheries Forum) Fishing (local and regional level)	Implementation (district and commune level) Community mobilization (formation of Fisher Associations) Knowledge-generation, capacity-building (local level – Lagoon projects) Fishing and farming (local level)	Community mobilization (formation of local lobby groups) Knowledge-generation (local level - Moloka’i Task Force) Fishing (local level)	Community mobilization (formation of Fisher Associations) Knowledge-generation, capacity-building (fishery-scientist collaborations) Fishing (regional and local level)
Actors identified as key in the original case studies	Lake Victoria freshwater SSF communities; Coastal reef SSF communities; FAO; EU; WCS; Kenya Fisheries Ministry	Capture fishermen; Aquaculture farmers; Fishery Associations; Researchers; Donor Organizations; District & Provincial public officials	Subsistence fishers ‘Migrant’ fishers State officials – Governor Local officials Researchers	Loco Fishers Fisher Associations Scientists State officials
Social and ecological conditions	Overexploitation of freshwater fishery (Lake Victoria) Increasing poverty Opening up to international trade (export of Nile Perch) Donor ideology (FAO, EU)	Overexploitation of coastal fisheries, disease outbreaks Conflict between fishermen and aquaculture farmers, non-compliance Donor ideology (development organizations) Decentralization reforms	Overexploitation of coastal fisheries Conflict between subsistence fishermen and industry, local communities and outsiders	Overexploitation of loco fishery Increased demand for loco in global market Transition to a democratic regime
Literature	Etiegni et al. (2017), McClanahan et al. (2016), Cinner and McClanahan (2015), Cinner et al. (2009, 2012) and Cinner and McClanahan (2015)	Armitage et al. (2011), Van Tuyen et al. (2010), Ho et al. (2015, 2016) and Carbonetti et al. (2014)	Kittinger et al. (2015), Tissot et al. (2009), Ayers and Kittinger (2014), Ayers et al. (2017), Ayers et al. (2018), Richmond (2013) and Levine and Richmond (2014)	Gelcich et al. (2010), Gelcich et al. (2019), Marín and Berkes (2010) and Herrfahrdt-Pähle et al. (2020)

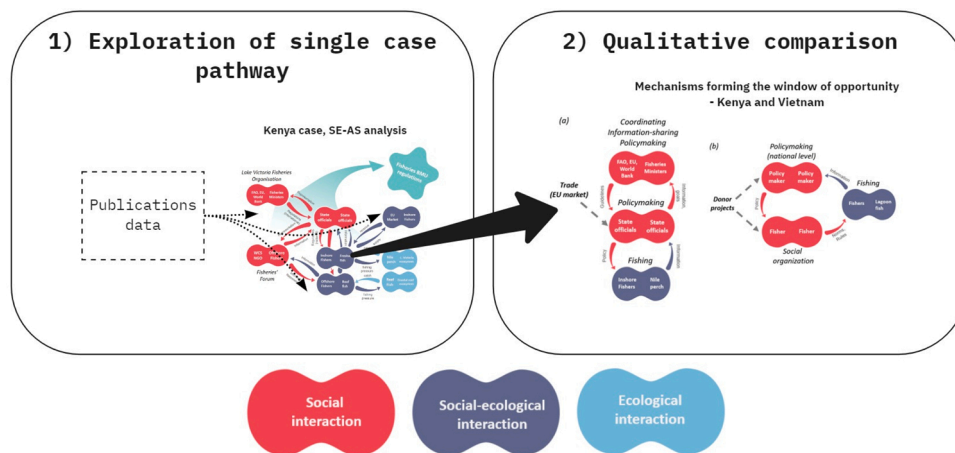


Fig. 1. An approach to exploring (1) and comparing (2) mechanisms of policy change in the context of co-management transformations in selected case studies using the SE-AS framework (Schlüter et al., 2019). Light-blue bubbles represent ecological, purple bubbles – social-ecological and red – social action situations.

In the second step, we identified configurations of action situations that together created a pathway towards policy change in each case. Each configuration of action situations constituted a mechanism. We then clustered the mechanisms across cases according to their function and the aspect of policy change a mechanism most contributed to (e.g. formulating the policy problem, shaping the window of opportunity or supporting the adoption of policy change). With this we uncovered empirical manifestations of not so much the broad causal mechanisms, but rather mechanisms schemes (Ylikoski, 2018) – abstract or stylized (with the help of theory) representations of mechanisms resulting in change. In this stage we focused on comparing mechanisms of the same type across the cases, identifying and exploring the specific differences within mechanisms (e.g. types of actors participating in key interactions, direction of mechanisms – top-down versus bottom-up), while also considering contextual conditions identified in the previous stage. As a result, we identified a preliminary set of generalizable empirical mechanisms that could be used in explaining policy change in the SSF context. It is important to note however, that the design of our study and focus on few select cases means that the set of mechanisms needs to be explored further and enriched with insights from other contexts in order to make our findings more generalizable.

2.1. Identifying key mechanisms through frameworks & theories of policy process

Research within political science and public policy fields provides a multitude of conceptualizations of the policy process (Orach and Schlüter, 2016). There are also multiple competing explanations for policy change, although very few theories or frameworks go as far as specifying causal mechanisms (van der Heijden et al., 2019). Theoretical frameworks of the policy process highlight different elements or dimensions that contribute to policy change. Among those are the formation of policy windows (Perry and Kingdon, 1985), shocks or exogenous events (Weible et al., 2009; Baumgartner and Jones, 1991) or policy actor learning (Sabatier, 1988). Most of the time, however, theoretical explanations of policy change provide a conceptualization of a “trigger” for change and specify key variables or processes that are triggered, resulting in major policy change. The causal relationships between the trigger and resulting processes is often obscured in theoretical frameworks, however made more explicit in empirical case studies applying them (van der Heijden et al., 2019).

The Advocacy Coalitions (ACF) (Sabatier, 1988) and Multiple Streams (MS) (Perry and Kingdon, 1985) frameworks provide the most detail regarding causal mechanisms of policy change (van der Heijden et al., 2019). The key triggers for change according to the frameworks

are, respectively, exogenous events or perturbations (e.g. shifts in public opinion, changes in governing coalitions, crises or even new information) or events that lead to the formation of a window of opportunity for change (e.g. focusing events, increased awareness of policy issue, changes in policy issue, changes in government or interest group pressure). The “exogenous” trigger can lead to change in beliefs or resources of political actors or change in power balance between coalitions (Sabatier, 1988). Alternatively, with the opening of a policy window, the key role is attributed to “agents of change” – policy entrepreneurs that connect problems to solutions and solutions to key actors, resulting in a high likelihood of major policy change (Perry and Kingdon, 1985).

As each framework focuses on particular, distinctive elements of the policy process or a specific set of causal mechanisms (ACF and MS), we do not find it useful to select a particular framework for approaching policy change in SSF case studies. The goal of our paper is not to test a particular causal mechanism observed in theory, but rather to build a causal mechanism based on empirical information provided in the case studies. However, we employ elements of the above-mentioned frameworks to structure our analysis in search for empirical mechanisms. In particular, we focus on three key elements of policy change that are common across frameworks – external triggers, change in policy issue and formation of favorable conditions for policy change.

3. Results

In this section we first present key features of the case studies (Section 3.1), summarizing results of our exploratory analysis of key interactions that shaped pathways of policy change in each case (case by case analysis can be found in detail in the Supplementary material) and the comparative analysis of mechanisms of policy change (Section 3.2).

3.1. Key features of the case studies

Table 1 provides an overview of the policy changes that are the foci of our analysis, the social and social-ecological action situations that were identified as most important in shaping the process of policy change, the key actors involved and the social-ecological context. We also list the literature sources on which the analysis is based. A detailed analysis of the interactions and representations of the configurations of action situations that brought about policy change using the SE-AS framework can be found in the Supplementary material 1.

Through applying the SE-AS framework we identified the main “pathways” of change that eventually resulted in the outcome of interest (Table 1). The pathways are represented by multiple combinations of causally linked action situations. For instance, in the case of Kenya, the

pathway involved policymaking on both the national and international levels, influenced by donor organizations, as well as capacity-building on the local level. In Vietnam, over-exploitation of fisheries and conflict between fishers and aquaculture farmers, in combination with donor-funded projects and information exchange between fisher and NGO networks, both played an important role in the process of policy change. The pathway of change in Hawai'i involved both mobilization of local actors from the bottom up and projects aimed at generating knowledge about the problem that were launched in the top-down manner. Finally, in the case of Chile the pathway was shaped by capacity building and knowledge generation among fishers and scientists followed by mobilization and lobbying at the time when conditions for change were most favorable. In the next section we will take a closer look at the specific mechanisms that comprised the pathway to change in each of the respective cases.

3.2. Key causal mechanisms shaping pathways across cases

3.2.1. Emergence of a SE problem (through competition)

In some cases, competition between fishermen for the fish or for the use of coastal marine ecosystems (between fishers and aquaculture farmers) has led to conflict and over-harvesting of the resource. Although the resources decline may have multiple contributing causes, competition and conflict between resource users can exacerbate it further. In two of the cases analyzed in this study (Vietnam and Hawai'i), competition between resource users for declining fish stocks was an important mechanism through which the policy issue took shape. In Vietnam (Fig. 2, a) the policy problem emerged through the process of competition between fishers for the lagoon reef fish and between fishers and fish farmers for the use of the lagoon ecosystem for fishing versus aquaculture. In the case of Hawai'i (Fig. 2, b) the policy problem context was shaped by conflict between local fishermen and "roving bandit" fishermen which, with the use of new technology, were able to target distant fishing areas and poach reef fisheries.

The key difference between the mechanism in the two cases was that in the case of Vietnam both the fishers and fish farmers were members of local communities (although fish farmers also arrived from other regions and often were more well-off than fishers). In Hawai'i the competing fishermen were "outsiders" that migrated to the island more recently. Other sources of competition came from "roving bandits" who were not based on the islands, but used boats with advanced engine and storage technology to fish in remote areas. In both cases the competition between resource users has led to some degree of social conflict (even violent conflict in case of Vietnam) and resulted in increased fishing pressure.

Although not directly emphasized in the analyzed literature, it is possible to argue that in the other two cases (Chile and Kenya), competition for resources has also been important for decline of the fishery and subsequently resulted in emergence of the policy issue.

However, Vietnam and Hawai'i case directly point to competition between diverse types of resource users, and in both of these cases the existence of competition has strongly influenced motivations and aims of policymakers. In Hawai'i this occurred through mobilization and lobbying of the local fishing communities. In Vietnam authorities were interested in mitigating conflict and maintaining both fishing and aquaculture, whose expansion in the early 1990s, provided high returns in comparison to small-scale fishing.

3.2.2. Recognition of policy problem, opening of policy window

In each of the four cases an opportunity to change policy materialized through different mechanisms. We can, however, compare across cases which interactions played a role in drawing attention to the problem and putting it on the policy agenda. In Kenya and Vietnam (Fig. 3, a and b) donor organizations played the key part in this mechanism. In Kenya the shift towards co-management started through the process of international negotiations in the Lake Victoria Fisheries Organization (LVFO). The positions of Kenyan state officials, participating in international negotiations in LVFO were influenced by earlier EU trade bans on Lake Victoria fish, instituted due to allegations of the use of pesticides and salmonella outbreaks in Nile Perch. Within LVFO co-management was put forward as a potential solution to the problem by the donor organizations. The main donors (European Commission, World Bank, NORAD, SIDA, USAID, FAO and others) expected co-management reforms to be adopted under the framework of the new regional management plan. At the same time, they also provided the funding for the implementation of reforms and coordination of activities among the state actors in the region. Thus, Kenyan policy officials had the incentive to change policy, but the change occurred in the context of international negotiations where donor organizations proposed solutions and secured funding for their implementation. The negotiations in LVFO resulted in an Integrated Fishery Management Plan that further led to the adoption of co-management policy on the national level and establishment of Beach Management Units, changing the rules for the harvesting social-ecological action situation.

In Vietnam, district and state officials were also aware of the declining ecological state of the lagoons, and concerned with the social conflict that resulted from competition for lagoon resources. Top-down solutions have failed in the past, and similar to the Kenyan case, proposals to adopt co-management reforms came from donor organizations (World Bank, NORAD, SIDA) that also encouraged and funded fiscal and administrative generalization reforms in the country in 1990s. Pressure from international donors, together with perception of policy failures led to the national government's support of self-organization of small-scale fishing communities on the local level and initiated the process of policy change towards co-management legislation – by promotion of rights to local Fishers' Associations. It is important to note that in case of Vietnam policymaking interaction was situated on the state level, while in case of Kenya – on the international level. This naturally occurred, as

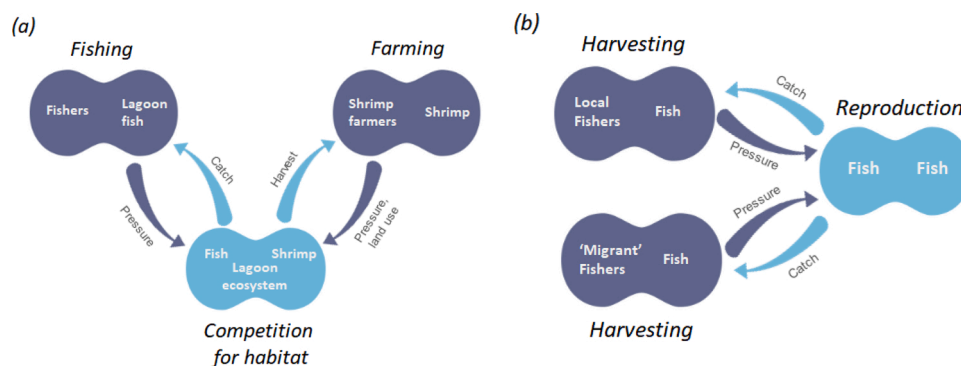


Fig. 2. Mechanism of competition between different types of resource users in Vietnam (a) and Hawai'i (b). Light-blue bubbles represent ecological and purple bubbles – social-ecological action situations.

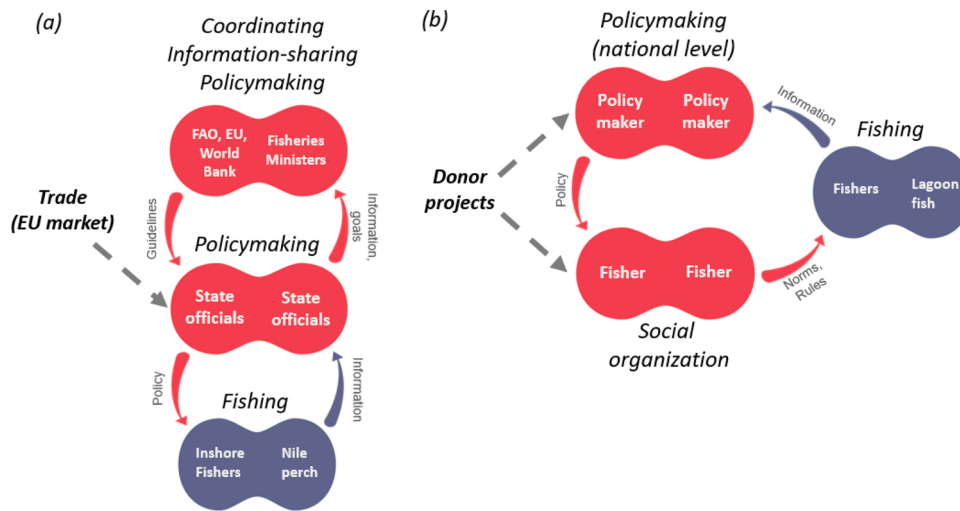


Fig. 3. Mechanisms forming the window of opportunity for policy change in Kenya (a) and Vietnam (b). Purple bubbles represent social-ecological and red – social action situations.

access to Lake Victoria is shared by Kenya, Tanzania and Uganda. International negotiations thus carried out information sharing and coordinating functions, apart from policy decisions, which was the key function of policymaking on the state level in the case of Vietnam.

In contrast to the above mechanisms, in Hawai'i and Chile (Fig. 4), solutions for policy problems came from the bottom-up, with resource users (as well as researchers) playing the key role in pushing for solutions and drawing attention to the problem. The key difference between Hawai'i and Chile was how the window of opportunity for policy change emerged. In Chile the opportunity was mainly shaped by a transition towards a democratic regime (state-level transformation of the political system). New policy actors entering the system had the incentive to significantly reform policy and implement co-management measures. The previous government recognized the problem of over-harvested resources and had an economic incentive to resolve the issue. However, it only attempted to implement top-down management tools such as fishery closures, with little incentive to reform fishery management system in general.

Unlike the abrupt political change in Chile, Hawai'i's window of opportunity was strongly influenced by the mobilization of local communities. The over-harvesting of fish threatened food security and livelihoods of the communities, which led to the self-organization of local fishermen, and community leaders raised awareness of the issue on the state level. This process greatly relied on the presence of long-existing ties within native Hawai'ian communities. The networks,

created by common dependence on subsistence fishing led to a strong collective interest in its sustainable management and restricting access of the “outsiders”. Hawai'ian fisheries also had a tradition of self-management and an intricate monitoring system in the past. The existence of traditional and customary practices strongly incentivized community advocates to lobby for sharing decision-making power. In contrast to Chile, the existing policymakers already had the incentive to reform policy significantly, particularly driven by concerns for Hawai'ian communities' subsistence. The Governor or Hawai'i at the time was also a native Hawai'ian, and the lobbying efforts of the native communities have also ensured support of a Hawai'ian House Representative.

3.2.3. Generating knowledge and building capacity in support of policy reform

Before and especially during the window of opportunity, policy change may rely on a supporting mechanism, through which actors pushing for change generate knowledge about potential solutions, exchange information and mobilize, building capacity for influence. We identified such supporting mechanisms in each of the analyzed cases and found them to be important for the reform's adoption (Fig. 5). We find that such mechanisms can become active in anticipation of policy change (e.g. Chile) and after the political window of opportunity has already been opened (e.g. Hawai'i). In Kenya, before the Lake Victoria management reforms, the environmental NGO Wildlife Conservation

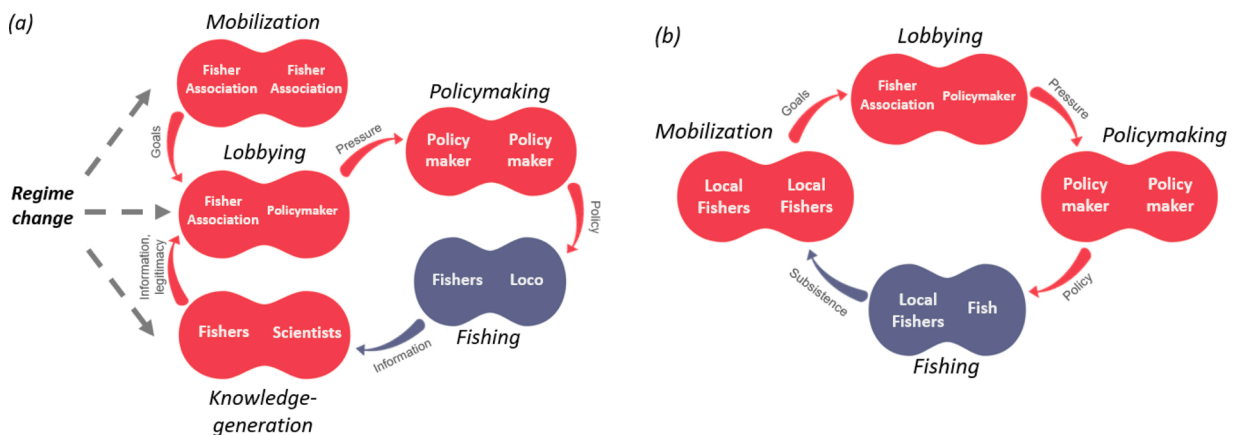


Fig. 4. Mechanisms forming the window of opportunity for policy change in Chile (a) and Hawai'i (b). Purple bubbles represent social-ecological and red – social action situations.

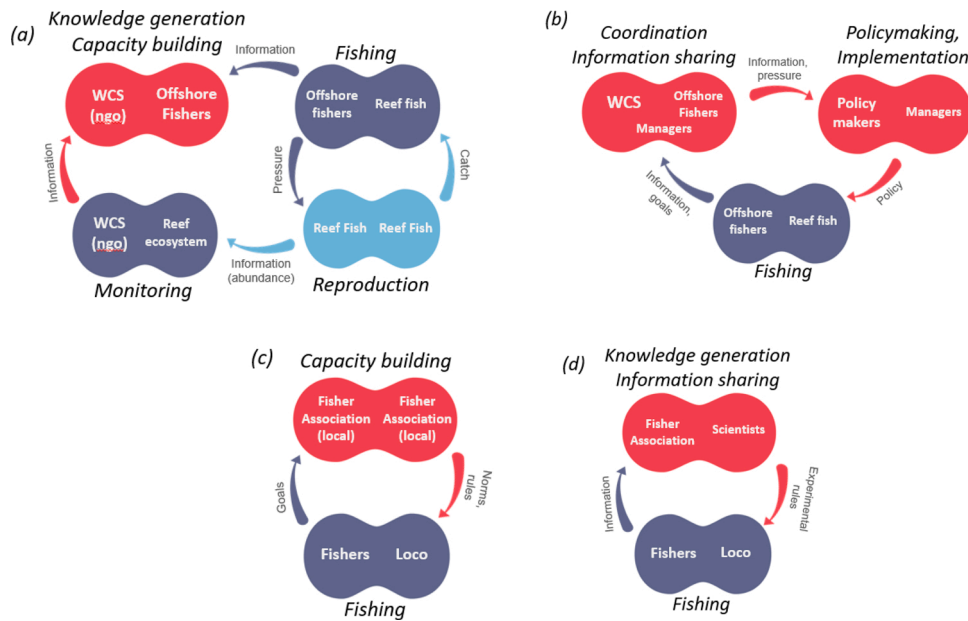


Fig. 5. Supporting mechanisms, building capacity and generating knowledge in anticipation of policy change in Kenya (a,b) and Chile (c,d). Light-blue bubbles represent ecological, purple bubbles – social-ecological and red – social action situations.

Society (WCS) played an important role as both policy entrepreneur and a bridging actor. It engaged in monitoring the state of ecosystems and exchanging information with local fishing communities. This knowledge generation and exchange did not result in policy change by itself, but

provided both NGOs and fishermen with a better understanding of the state of the problem and potential solutions that could be implemented. Then, once the change to Lake Victoria fisheries management created a political opportunity for a marine fisheries reform, WCS assisted in

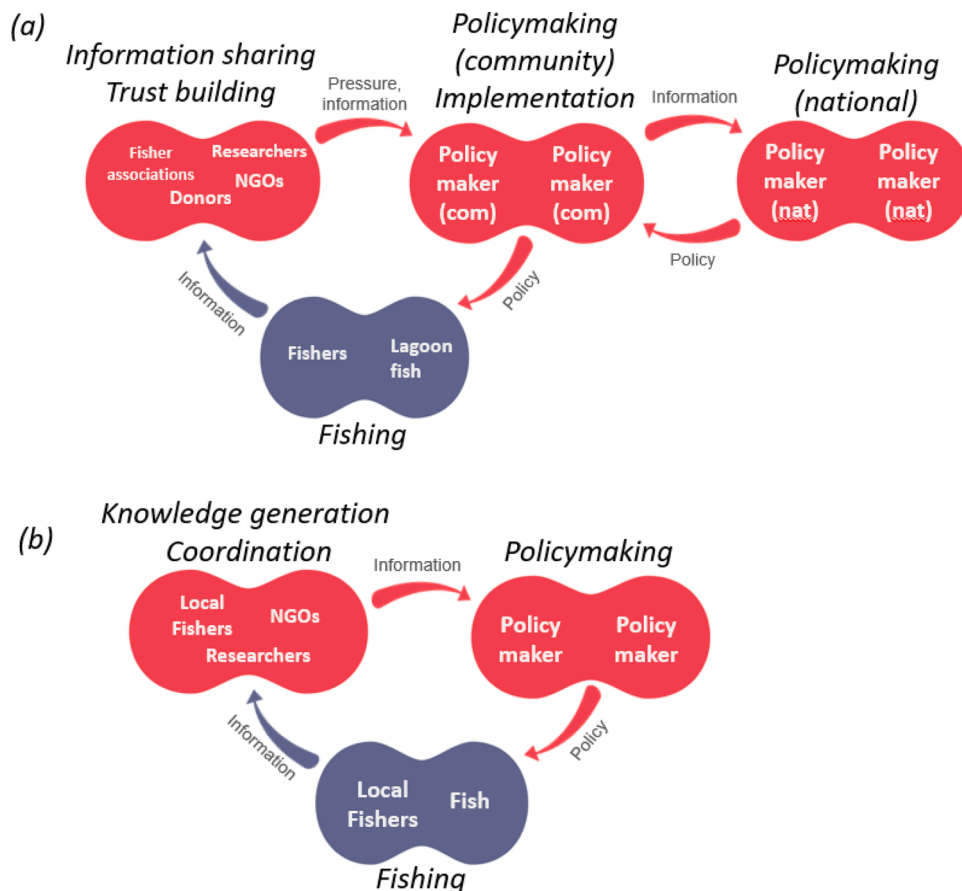


Fig. 6. Supporting mechanisms, set off after the formation of window of opportunity for policy change in Vietnam (a) and Hawai'i (b). Purple bubbles represent social-ecological and red – social action situations.

sharing of information between fishing community leaders as well as Fisheries Department officials. Having built trust and common understanding of policy problem, the NGO has pushed for first experimental adoption of Beach Management Units in the context of coastal fisheries.

Likewise in Chile, generating knowledge through experimenting with novel solutions and capacity building occurred before the political opportunity was ripe for a reform. The role of policy entrepreneurs in this case was played by scientists, not NGOs. Engaging in experimentation has resulted in new knowledge about potential solutions to the over-harvesting problem, while on the other hand it built trust between fishermen and scientists, developing a common understanding of the problem. At the same time interactions among Fisher Associations have been crucial for capacity building in anticipation for change. Fisher Associations formed a “shadow network” that essentially mobilized fishers and allowed them to have a stronger lobbying presence that could potentially better connect to the policymakers and lobby for legislative support.

In Vietnam and Hawai'i (Fig. 6) processes generating information and knowledge supporting policy change were initiated after the window opportunity had already opened, and there was no notable “preparatory” stage. In the case of Vietnam it is possible again to highlight donor organizations in the role of a policy entrepreneur and a bridging actor. However, in Hawai'i the key entrepreneur was the Governor, initiating the Task force for monitoring the state of the issue. In Vietnam the donor-funded projects led to formation of strong networks between NGOs, fishers and researchers and built trust through the continuous exchange of information and knowledge. Stakeholder interactions within the projects created the informational basis for a reform proposal to the district and provincial authorities. With the support of donor organizations, and with Fisher Associations acting as the central actor, the information and knowledge created in the donor projects' action situation has supported adoption of changes to existing Fishery Law.

In Hawai'i, capacity building has not been identified as prominent function of the supporting mechanism (possibly due to already present ties within native communities and initial strong mobilization). The lobbying efforts of Hawai'iian communities have resulted in the formation of a “Task Force” that, similar to donor projects in Vietnam, engaged in monitoring and generating knowledge about the policy issue. The Task force included local managers, NGOs and researchers, who worked together with local fishermen and communities in order to assess the dependence of communities on fishing for subsistence and cultural values, customs and practices. Its main purpose was not to exchange knowledge or build trust, like in other case examples, but rather generate knowledge for policymakers to form a policy position. The assessment of the Task Force allowed proponents of policy change towards co-management on the state level to advocate the importance and urgency of legislative support of co-management. Independent information lobbying by various NGOs in support of sustainable management of local reef ecosystems have also substantiated support for potential policy changes.

4. Discussion

Social-ecological transformations are complex phenomena, and the political processes that accompany them are driven by a multitude of interacting causal mechanisms. In part because of this, it is difficult or even not very helpful to determine the initial cause or “trigger” of policy change during transformations. Or, stated differently: a trigger alone may not be sufficient but there needs to be capacities to sustain the process (Herrfahrdt-Pähle et al., 2020). When analyzing the case of Kenya for instance, we observed that information about ecological change was important for recognition of the problem by key policy actors. However, this was not sufficient for initiating a process of policy change, which only set off through the mediating role of donor organizations and increase in international trade. Similarly, a major change in political conditions (regime change in Chile) or involvement of

powerful actors (development organizations in Vietnam or the Governor in Hawai'i) were important to push policy towards change or create an opportunity during which policy change is more likely but the processes that followed after this push were equally important. It is thus impossible to single out particular events as sole triggers of policy change.

While over-exploitation of the resource and related social and ecological issues (conflict between user groups, local users and outsiders, spread of disease, etc.) have manifested across all cases, these have been generally very long-lasting and had little effect on policy change initially. The social-ecological issues were mostly recognized, but their severity was underemphasized. There was a lack of political will to adopt new solutions or solutions were not yet available at the time. Such differences constitute part of the context in each of the analyzed cases. The presence of multiple causal mechanisms and the difference in conditions between each case of transformation means that policy change has manifested in a unique way in each of the case studies. Arguments about the multi-causal and context-specific nature of social change in transformations have also been made in sustainability science literature, however without distinguishing the political process specifically (Olsson et al., 2014; Westley et al., 2013).

4.1. Top-down versus bottom-up direction of policy change mechanisms

Despite different political and social contexts across the cases, there are similarities in the ways that a policy problem and an opportunity for its solution manifest themselves. In some cases, mechanisms that lead to problem recognition and formation of an opportunity for policy change materialized in a top-down manner (Vietnam and Kenya). Top-down processes are present in cases where initiatives of international donors played a strong role (e.g. Kenya, Vietnam), where adoption of co-management in fisheries has been part of a nation-wide shift towards decentralization (Vietnam) or where state authorities involved non-state actors to collect information about the state of the fishery (Hawai'i). Top-down processes often have a strong effect on policy change. While not necessarily fitting to local context (e.g. similar to co-management being proposed as a suitable framework for fisheries management by the FAO or donor organizations), they can open up opportunities for change, innovation and new knowledge to be fostered and included in the process from the local level.

In other cases, recognition of the problem and search for solutions was a bottom-up process involving scientists and fishers (e.g. Chile). As political conditions became favorable (after the transition to a democratic regime), the process of change was also driven from the bottom up, as Fisher Associations had sufficient political influence to lobby the government. In Hawai'i resource over-exploitation and conflicts between local subsistence fishermen and industry mobilized communities who lobbied state officials. This created political will in a bottom-up manner. The task force that was then established by the governor, however, was an assessment instrument that policymakers established in order to support their policy position. It was not a community-based initiative, yet it relied on existing networks that emerged during community mobilization response to over-exploitation of reef fisheries. We find that it is often the combination of top-down and bottom-up processes that leads to a successful policy change (see also Patterson et al., 2017; Herrfahrdt-Pähle et al., 2020). Problems and need for change can arise from the local level, as well as knowledge identifying which solutions would work in the local context. Top-down processes can open windows of opportunity for addressing the problems and allow the inclusion of such knowledge in decision-making process.

4.2. Timing of key interactions in the policy process

Our analysis confirms the importance of the timing of key interactions within the policy process as also found for governance transformations (e.g. Herrfahrdt-Pähle et al., 2020). Collaboration between non-state actors before the opening of an opportunity for change

was critical in Kenya and Chile as it provided new knowledge that changed the discourse about the problem and possible solutions and assisted implementation of adopted policy changes further on. Collaboration after a policy change process had already begun was critical for providing knowledge that was used in negotiations to support a strong reform towards adoption of community-based subsistence fishing areas (Hawai'i). In these cases, collaboration did not come about as strongly through self-organization among local actors and bottom-up processes, but was either supported or established as an initiative by policymakers (Vietnam, Hawai'i).

Another important aspect was the timing during which supporting mechanisms were “turned on” in the process. This question is inherently linked to the top-down/bottom-up discussion. For instance, in Hawai'i the request for information supporting policy change came from the policymakers, who launched a Task Force in order to support a potential reform. In Chile and Kenya similar knowledge generating mechanisms occurred from the bottom up, before the problem reached the policymaker's agenda. Both types of knowledge generation supporting mechanisms were important for the subsequent reforms, and it is crucial to consider how the “top-down” process of knowledge generation and capacity building can best use information that was created during the “bottom-up” processes, before the issue reached spotlight. Particularly, how can this information be identified and reach the policy process in a timely manner (e.g. in order to avoid shifts that are difficult to reverse)? In future studies it would also be interesting to closely examine under which conditions such supporting mechanisms can successfully influence the reform once the issue enters the agenda. In the two cases we considered this has been possible due to presence of influential actors (e.g. researchers or an international NGO), however it is important to examine this issue across other political contexts.

4.3. Diversity of actors involved in key mechanisms across cases

When considering policy change within social-ecological transformations, other studies have highlighted the role of agency – particularly in connecting innovation to the opportunity for a major institutional change (Moore et al., 2014; Westley et al., 2011, 2013). Westley et al. (2013) refers to key skills such as incentivizing, coalition-forming, mobilizing, identifying windows of opportunity, connecting ideas and resources, that are employed by agents of change and enable linking innovation and opportunity. We find that in the case of policy change, such skills can be found in a broad diversity of actors. Policy change in each investigated case has been greatly influenced by processes that involve a diversity of actors, such as fishers, fisher associations, environmental or donor NGOs, or scientists. NGOs, for instance, were instrumental for raising awareness and enabling information flows from the problem to the political process, drawing attention to them and supporting the process of reform. Even if the policy system was aware of a problem, participation of other types of actors in knowledge generation and information transmission was critical for policy change (Vietnam). Just like broader social-ecological transformations, benefits stemming from the inclusion and engagement of a diversity of actors, which brings about a change in policy could be dependent on different actors at different stages.

At the same time, non-state actors have played a diversity of roles such as providers or brokers of knowledge (Hawai'i) or information lobbyists – that sought to exchange information for policy goals (Hawai'i and Chile). Flows of information are crucial during both agenda setting and before adoption of policy change. The information and knowledge generated may range from stakeholder knowledge elicited when NGOs work with fishers and other stakeholders, to results from scientific assessments (e.g. Kenya, Chile, Hawai'i). NGOs may act as information lobbyists, pressuring policymakers to either place the issue on the agenda (Kenya) or connect existing solutions to problems that the policymakers were already aware of (Vietnam). As also seen in other studies the role of “information broker” (Westley et al., 2013) or rather

information lobbyist can be played by a diversity of actors – NGOs, researchers, or even fishers/resource users themselves. Finally, environmental NGOs and development donor organizations engaged in bridging - coordinating activities and enabling collaboration and trust building between actors at and across different levels that have been previously disconnected (e.g. Kenya, Lake Victoria Fisheries Organization; Kenya, reef fisheries' management). A bridging role or coalition-building skills can be filled by a policymaker (e.g. the Governor in the case of Hawai'i) as well as by a non-state actor (e.g. Wildlife Conservation Society NGO in Kenya case).

The empirical insights described above point to elements of social-ecological transformations that require further research. Advances in theoretical frameworks of social-ecological transformations should pay attention to how favorable political conditions for transformations are shaped both through top-down and bottom-up processes. Additionally, while such frameworks typically pay significant attention to knowledge creation and management before the opportunity to transform, it is also important to consider how political process can be supported with information and knowledge once the problem is on the agenda and the reform processes have been launched.

4.4. From in-depth case analysis to comparing cross-case patterns

Reflecting on the approach used in the paper, we would optimistically state that a combined approach, through which a researcher is able to first examine the case in all of its complexity to then zoom in on specific mechanisms or interactions, has potential for developing empirical explanations of complex, multi-causal processes in SES. Single case studies have great value and depth, however make it difficult to compare their results to similar highly complex studies in different contexts. Our analysis started out with comparison in mind, and the SE-AS framework greatly helped to focus our initial assessment of cases on interactions between key actors and their combinations. Following this, our focus on causal mechanisms in the second stage allowed us to identify similar patterns which would have been difficult to spot without considering how interactions have been causally linked over time, during which stage of the policy process (e.g. contributing to agenda setting or formation of window of opportunity). It is important to note however that our approach was limited by its dependence on already published material. As a result, we had to rely on framing used by respective authors and could have missed some contributing mechanisms – as the publications we used did not look closely at the processes of policy change when analyzing co-management transformations. Although this could potentially be a challenge, any case study runs a risk of missing important processes and realities by applying a particular framing. Additionally, our analysis included several published papers by multiple authors for each case which provided a broader overview of processes and diversity of framings. We consider our analysis as a first step towards generalizable mechanisms of policy change in transformations and such gaps could be filled with analysis of cases across other contexts (e.g. not limited to co-management transformations or even the fishery SES context).

5. Conclusions

This paper contributes to advancing our understanding of the political processes embedded in transformations. It does so through identifying empirically based, but to an extent generalizable combinations of mechanisms that have led to policy change in selected cases. We hope that this work stimulates the development of future research that engages with such empirical insights and further refines our understanding of policy change mechanisms. Further comparative analysis, particularly a study which expanded the selection of cases beyond policy issues related to co-management of SSF, and included a broader range of contextual conditions would be the logical next step towards generalization of our empirical mechanisms. For the purpose of further

theorizing about political processes embedded in transformations, such mechanisms could be explored e.g. in combination with agent-based modelling, through which they could be formalized and tested.

Author statement

Kirill Orach: Conceptualization, Methodology, Investigation, Writing – Original Draft, Writing – Review and Editing, Visualization. **Maja Schlüter:** Conceptualization, Methodology, Writing – Review and Editing, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A. Supplementary data

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