Global Environmental Change 53 (2018) 114–126

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

Social movements as key actors in *governing the commons*: Evidence from community-based resource management cases across the world

Sergio Villamayor-Tomas[a,c,*], Gustavo García-López[b,c]

[a] Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autonoma de Barcelona, Building Z Campus UAB 08193, Bellaterra (Cerdanyola), Barcelona, Spain
[b] Escuela Graduada de Planificación, Universidad de Puerto Rico, San Juan, 00925, Puerto Rico
[c] Ostrom Workshop in Political Theory and Policy Analysis, Indiana University, 513 N. Park Ave., 47408, Bloomington, IN, United States

ARTICLE INFO

Keywords:
Community based natural resource management
Political economy threats
Environmental justice movements
Meta-analysis
Institutional design principles

ABSTRACT

The international research on the benefits of community-based natural resource management (CBNRM) regimes for sustainable development has raised concerns about the vulnerability of said regimes to globalization, shortsighted government regulations, marginalization, and other global political economy threats. This paper addresses the question of whether and how social movements contribute to the organization and robustness of CBNRM in the advent of those threats. To accomplish this, we carry out a qualitative meta-analysis of 81 cases worldwide. Our evidence shows that one of the most important effects of movements on CBNRM is the promotion and defense of community use and management rights against certain government decisions or actions by global corporations. We also find that movements can generate positive effects beyond the reaction to specific threats. Those effects include the democratization of communities' collective choice processes, the reinvigoration of identity ties and local ecological knowledge, the promotion of economic development and autonomy, and the creation of nested user organizations. Exploring such potentially longer-term effects is a promising next step towards further connecting the social movement and CBNRM scholarships and better understanding the robustness of local management regimes in the context of global change.

1. Introduction

The international research on the benefits of community-based natural resource management (CBNRM) regimes to achieve sustainable development has come along with concerns about the vulnerability of said regimes to globalization, shortsighted government regulations, marginalization, intensified land competition from commercial interests for resource extraction, and other global political economy threats (Baynes et al., 2015; Blaikie, 2006; Notess et al., 2018; Salvanes and Squires, 1995). Increasing attention has been paid to the participation of local communities in social movements against those threats (Anguelovski and Martínez Alier, 2014). Communities' capacity to manage natural resources via CBRNM regimes and mobilize for the promotion or defense of said regimes are two sides of the same collective action phenomenon (Scholtens, 2016); however, they have so far been studied rather separately by scholars. Little is known, therefore, about whether and how mobilization contributes to better CBNRM. In this paper, we address that question via a meta-analysis of 81 cases around the world. The research questions of the study are: How do social movements affect CBNRM? What insights can we gain about the emergence and robustness of CBRNM regimes by looking at social movements?

Social movements have an important role as watchdogs and promoters of transformative sustainable development agendas, e.g., UN's 2030 Agenda. Many of these movements are global in their discourses, strategies, and networks (Martinez-Alier et al., 2016; Sikor and Newell, 2014); however, they also have strong roots in local environmental conflicts and resource-management practices. Local environmental justice conflicts are indeed an endemic phenomenon of our societies, with more than 2000 instances registered (Temper et al., 2015), and potentially thousands more unregistered all over the world. Many of those conflicts involve communities that have self-organized to manage local resources via customary or formal common property regimes. Although initially disrupting, such conflicts and movements have great potential to strengthen community-based management regimes, creating new such regimes, and generating more supportive policies (Cronkleton et al., 2008; Diegues, 1998; Verzijl et al., 2017).

In a review of the state of CBNRM studies and the theory of the

* Corresponding author at: Institut de Ciència i Tecnologia Ambientals (ICTA), Universitat Autonoma de Barcelona, Building Z Campus UAB 08193, Bellaterra (Cerdanyola), Barcelona, Spain.
E-mail address: villamayortomas@gmail.com (S. Villamayor-Tomas).

https://doi.org/10.1016/j.gloenvcha.2018.09.005
Received 10 March 2018; Received in revised form 7 September 2018; Accepted 15 September 2018
Available online 02 October 2018
0959-3780/

commons, Dietz and Stern (2002) argued that one of the understudied themes in this literature was the role of social movement organizations in influencing commons governance. They concluded that "[t]hese organizations have asserted the right to participate in institutional design; their assent may be necessary for institutions to function…they are linked across scale and place in ways which may help to spread design innovations." (p. 476). Social movements have also been analyzed by political ecologists concerned about the vulnerability of commons to neoliberal policies (Goldman, 1997; Peet and Watts, 1996). Unfortunately, efforts to integrate empirical insights about movements into the theory of the commons have been rather marginal (see Cronkleton et al., 2008; García-López and Antinori, 2018; Kashwan, 2017; Scholtens, 2016 for inspiring exceptions). This, among other factors, has reinforced the dominance of a narrative of commons initiatives and their robustness that emphasizes self-organized cooperation and institutional design from a rather static perspective, and downplays the historical, political and dynamic aspects of said initiatives (Agrawal, 2001; Johnson, 2004; Leach et al., 1999). This paper is inspired by the aim to integrate the critique with the valuable insights from the theory of the commons. Far from denying the explanatory capacity of the theory, our ultimate goal is to further test it by bringing in the marginalized topic of contentious politics to its core.

To accomplish the above, we focus on community institutions for governing the commons, as measured through Ostrom's design principles (Ostrom, 1990); and explore whether and how they are strengthened (or weakened) by social movements. The Design Principles theory explains the institutional robustness of CBNRM regimes and is one of the cornerstones of current CBNRM knowledge (Cox et al., 2010; Ostrom, 1990). We broadly define social movements as "processes of collective action that are sustained across space and time, that reflect grievances around perceived injustices, and that constitute a pursuit of alternative agendas" (Bebbington et al., 2008, pp. 2892). In this paper, most of the movements studied correspond to environmental justice movements. We diverge, however, from the traditional definition of environmental justice movements (EJMs) and its dominant focus on the health-related grievances of poor citizens and communities of colour in Western urban contexts. Instead we focus on the rural, Global South version of such kind of movements, which centres around the resistance of local resource users and indigenous populations to bear the resource scarcity and degradation costs created by actors large extractive activities, the government or other actors (Anguelovski and Martínez Alier, 2014; Goldman, 1997; Peet and Watts, 1996; Scheidel et al., 2018).

To address our research question, we carry out a systematic review (meta-analysis) of 78 case study publications referring to 81 cases that directly or indirectly address the topic. After an introduction to CBNRM and EJMs scholarship and the methods, the paper proceeds with a presentation and extended discussion of the results.

2. Literature background

2.1. CBNRM theory and political ecology critiques

Traditional economic analyses of common-pool resources (CPR) such as forests, irrigation systems, and fisheries prescribed the collapse of those resources unless they are managed through private or government-controlled property right systems (Hardin, 1968). Those diagnoses were based on the assumption that resource users were unable to cooperate and use their shared resources sustainably. As evidence began to question that assumption, attention turned to exploring the resource, social and institutional conditions under which groups of users can manage shared resources collectively through common property and other collective governance regimes (i.e., community-based management). One of the most robust pieces of the resulting scholarship (CBNRM scholarship) is Ostrom's Institutional Design Principles theory (see Table 1 and also Appendix A). According to Ostrom's theory, cooperation in CBNRM regimes has higher odds of emerging and being sustained over time when a number if not all of those principles are present (Ostrom, 1990). As illustrated by several reviews, a good number of single, comparative and large-n studies support the theory (Agrawal, 2001; Baggio et al., 2016; Cox et al., 2010; Ostrom, 2009; Poteete et al., 2010).

The consolidation of the design principles as a theoretical cornerstone of CBNRM studies has raised new questions and revamped old ones. There is still rudimentary understanding about the relative relevance of the principles, whether different sub-sets of principles may be sufficient to guarantee sustainable management depending on the context (Baggio et al., 2016), or whether they apply to larger-scale political/governance settings (Fleischman et al., 2014). Additionally, there is still the question of how the principles (and CBNRM regimes more generally) emerge and become robust to changing social and ecological conditions (Agrawal, 2001).

More generally, CBNRM theory has been criticized for its relative inattention to how historically-shaped patterns of power, conflict, the 'state' and the broader political-economic context shape the access to and uses of common resources, and CBNRM regimes (Johnson, 2004; Ribot and Peluso, 2003; Saunders, 2014). Political ecology scholars have shown the constraints imposed onto local common-pool resource governance systems by states' recentralization policies (Ribot et al., 2006), 'fortress' conservation policies (Brockington, 2002), or elite capture and inequalities (Blaikie, 2006; Persha and Andersson, 2014). Thus, the tragedy of the commons that Hardin had so popularized is not just the result of commoners' individualistic behavior but may well also stem from the acts of more powerful, profit-seeking actors (Scholtens, 2016). It is more adequately labeled as a "tragedy of the land-grabbed commons" (Dell'Angelo et al., 2017), a "tragedy of enclosures" (Beitl, 2012), or a "tragedy of the commoners", i.e. resource-dependent communities which are expelled continuously by state or private interests from their lands for speculation, large infrastructural projects or 'development' schemes (Diegues, 1998; McCay and Acheson, 1990). This critical scholarship emphasizes that benefits and costs of resource management are unequally distributed and shaped by power relations and political-economic structures, and that these conditions may lead to social movements and conflicts (Veuthey and Gerber, 2012). Indeed, it has been argued that the history of commons has always been one of struggles between the dynamic of enclosures (i.e., dismantling of CBNRM institutions), driven by the systemic need for capital accumulation, and that of movements to defend and reconstitute commons (De Angelis, 2012).

2.2. Social movements and CBNRM

Political ecology and environmental justice scholars have paid increasing attention to how social movements may shape the trajectories of resource access and use. Peet and Watts, 1996"liberation ecologies" proposal invited scholars to analyze socio-ecological movements as the basis for the protection of the commons from the forces of capitalist accumulation and the associated processes of enclosure and commodification. Since then, some works have highlighted the intricate connections between social movements (such as those against extractive industries or large conservation areas) and the formalization of customary community-based management regimes (Alcorn et al., 2003; Gerber, 2011; Kashwan, 2017; Perreault, 2001; Veuthey and Gerber, 2012); the recognition of collective territorial rights (Conde and Kallis, 2012; Kurien, 2013); and the reinvigoration of local indigenous practices and knowledge (Armitage, 2005; Poole, 2005). Underlying these works is the understanding that local resource-dependent communities may "organize and fight for preserving their means of livelihood in the name of social justice, defence of customary territorial rights, health, or sacredness", a process which could "eventually allow them to renegotiate power distribution" (Veuthey and Gerber, 2012, p. 612). These grassroots movements have been termed as "environmentalism of

Table 1
Institutional Design principles.
Source: Ostrom (1990) as adapted by Cox et al. (2010).

Principle	Description
1A	User boundaries: Clear boundaries between legitimate users and nonusers must be clearly defined.
1B	Resource boundaries: Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
2A	Congruence with local conditions: Appropriation and provision rules are congruent with local social and environmental conditions.
2B	Appropriation and provision: The benefits obtained by users from the resource, as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.
3	Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the rules.
4A	Monitoring users: There are mechanisms to supervise the appropriation and provision levels of the users.
4B	Monitoring the resource: There are mechanisms to supervise the conditions of the resource.
5	Graduated sanctions: Appropriators who violate operational rules are likely to sanctioned in proportion to the severity of the violation
6	Conflict-solving mechanisms: Appropriatior and have access to low-cost conflict resolution mechanisms
7	Minimal recognition of rights to organize: The rights of appropriators to self-organize are not challenged by external governmental authorities.
8	Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are organized in multiple layers of decision making.

the poor," to distinguish from conservationist movements concerned with nature protection for purely non-use values, as well as from northern environmental justice movements, mostly focused on urban pollution affecting marginalized groups (Anguelovski and Martínez Alier, 2014).

Apart from defending existing CBNRM initiatives, the struggles can also lead to the creation and or formalization of new initiatives. That is precisely the case of landless peasant movements and the creation of self-organized communities for the management of newly-acquired lands (Diegues, 1998; Lynn, 1998), or the activities carried by irrigation, fishery and forest movements to create extractive reserves and co-management agreements (Kurien, 1991; Paudel et al., 2010; Verzijl et al., 2017). As Cronkleton et al. (2008) conclude, “Forest-based social movements in Latin America today are helping to introduce a new conservation actor in the governance of protected areas: the forest steward community” (pp. 1). Movements can also create new polycentric (multi-level, cross-scale) commons governance arrangements connecting local to global institutions (Tormos-Aponte and García-López, 2018). These movements and their “governance from below” strategies may be indeed the only recognizable challenge to the control of environmental governance by corporate entities and multilateral organizations and their questionable approach to sustainability (Lemos and Agrawal, 2006). In other words, the literature suggests that movements can be expressions (or more accurately, means for) creating or defending key institutional characteristics (e.g., design principles) of CBNRM. A theory of the commons that aims to transition from analyzing local cooperation to a more comprehensive explanation of CBNRM, therefore, needs to recognize more systematically the role of movements.

3. Methods

This study consists of a meta-analysis of case studies following protocols used in similar research projects (Cox et al., 2010; Hartberg et al., 2014). Case studies were first searched, then screened, and finally content-analyzed to explore how social mobilization can affect community institutions, as measured via Ostrom’s Institutional Design Principles (see Table 1).

An initial list of potential case studies was first identified via a keyword search in Google Scholar and then completed via the snowball method. We chose Google Scholar over other bibliographic databases (ISI Web of Science and Scopus) for its more diverse coverage of sources and types of documents. We combined pairs of words from two groups, one related to CBNRM management (common pool resources, commons, commoning, collective management, common property regime), and the other related to social movements (social movement, environmental justice movement, resistance movement, social mobilization). The search was not temporally constrained. Each key-word search resulted in a large (thousands) of hits. Each of those lists was filtered down to case studies in the form of reports, working papers, published manuscripts or book chapters, containing the keywords in the main text (not in the references) and related to natural resource management in rural areas. We did not examine all hits in each list. Google scholar orders the hits by relevance, so as a rule of thumb, we stopped screening within a list after finding 20 consecutive irrelevant hits within that list. The resulting list was then explored for potential coding through a second screening. A case study qualified for coding if: it reported information about a specific rural community (or communities) that manages shared resources collectively (i.e., via a formal or customary common property regime), and got involved in social movements to defend its rights, interests or values concerning those resources. In some cases, authors focused on the mobilizing role of second-order organizations (i.e., federations of local user group organizations) or specific mobilization actions without referring to a specific social movement (e.g., Paudel et al., 2010; Tyagi et al., 2007). Given our interest in social movements, we decided to include those studies too. Importantly, we did not introduce any constraint on the role of external actors or whether the actions were led exclusively by the communities.

As a result of the second screening, the list was filtered down to 150 studies. The coding process revealed the unsuitability of a number of studies, mostly due to the lack of information about community institutions. Thus, out of the 150 studies, 32 were finally coded. The coded studies also referred to other potentially relevant studies, a good number of which were also coded. The final list of studies coded was 78. The studies’ dates ranged from 1989 to 2017. The 78 studies resulted in 81 cases, as a few of them contained information about different cases (see also Appendix B for more details on the number of studies and cases included in the database).

The coding involved a collaborative-coding stage and an independent-coding stage. In the collaborative-coding stage, both co-authors explored and coded 10 publications (11 cases) and then discussed their coding. The goal of this stage was to agree on a common understanding of the applicability of the coding book (see Supplementary materials). The coding book included a set of variables capturing descriptive features of the case studies (such as country, environmental sector or threats to the communities) and variables capturing whether the study reported information on the impact of collective protests on the Institutional Design Principles (see Table 2a for values).

In the independent-coding stage, each co-author was assigned a set of the remaining case-studies for individual coding. Both co-authors used a content analysis software (NVivo) to select and extract quotes from the case studies. These quotes were then used as evidence of the values assigned to each principle as well as a source for further qualitative assessment. After the independent-coding stage, we run a Krippendorff’s alpha and a Fleiss’ kappa test (Krippendorff, 2004) to check for inter-coder reliability with satisfactory results (see Appendix

Table 2a
Coded values for Institutional Design Principle variables.

Values	Description
Yes impact, positive	Collective mobilization promoted, defended, partially improved, or strengthened the design principle against an external threat
Yes impact, negative	Collective mobilization undermined or prevented the implementation of the design principle
Yes intention, no impact	Collective mobilization aimed at promoting, defending or strengthening the design principle against an external threat but was not successful
Yes intention, no information	Collective mobilization aimed at promoting, defending or strengthening the design principle against an external threat; there is no sufficient information in the case study about whether it was successful or not
No information	The case study does not contain enough information about intention or impact

B).

In this study, we were interested in exploring whether and how social movements have an impact on the design principles, independently of whether the movements were successful in their claims. This distinction was not always straightforward. As pointed in the results section, many of the threats to CBNRM manifested in the form of violations of communities' use and management rights, and unequal distribution of costs and benefits of resource use and degradation, which can be related to the boundaries (DP1), external recognition (DP7), proportionality and fit principles (DP2), respectively. Thus, in many cases, the success of the movements in confronting the threats de facto meant the reinforcement of the principles. That said, our distinction, was still useful. As we found, even when the movements were not successful in obtaining their central demands, they did reinforce some of the principles.

One concern about Ostrom's design principles has to do with their interpretation as an institutional panacea for sustainable CBNRM (Cox et al., 2010). The principles are a synthesis of detailed evidence from a diversity of cases and, as such, they are relatively general (Ostrom, 1990). This, however, does not mean that they apply to different contexts in similar ways or that they are the result the of the same processes. In this study, keeping track of quotations in the coding process offered an opportunity to look into the pathways (i.e., processes) through which the movements? the principles? affect CBNRM. This, in turn, contributed to further validate findings about the influence of movements on CBNRM (Bennett and Elman, 2007; Collier, 2011; Oberlack et al., 2016).

4. Results

4.1. Countries, sectors, and threats

The diversity of countries uncovered is relatively wide (27 countries, see Fig. 1 and also map in Appendix A). India (14%), Mexico (10%) and the US (9%) were the most represented. Regarding sectors, the water sector was least represented (10%), as compared to the land, fisheries and forest sectors (40%, 25%, and 25% respectively). Regarding the scale of the movements, 44% of the cases corresponded to the local scale (i.e., one community); 46% to the regional scale (i.e., several communities, like in the "Pacific North Coast black communities", PCN, movement in Colombia); and 12% to the national or state scale (e.g., the movement led by the National Federation of Forest Communities, FECOFUN, in Nepal).

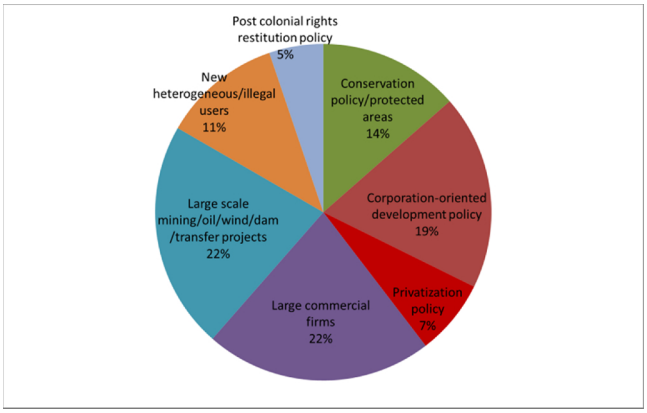

Fig. 2. Threats to community CBNRM (n = 94*).
*: Some cases illustrated the coexistence of multiple threats.

We also found a relatively wide diversity of political economy threats and associated impacts against which the studied movements emerged (see Fig. 2). There were three broad categories. First, restrictions in use and management rights and physical displacements by government conservation policies; capital investment and privatization policies; and by land concessions to large resource industries (e.g., forest companies, big fishing trawlers, agribusinesses). Second, resource degradation caused by the arrival of new, sometimes illegal, user groups (e.g., recreational, tourism, and commercial users). Finally, resource degradation from the implementation of large-scale extractive projects (e.g., mines, oil fields, windmills, dams, water transfers).

4.2. Impact of social movements on CBNRM

A first look at the overall data reveals several insights (see Fig. 3). First, there is some diversity in the information reported in the studies. Three design principles for which at least half of the studies contained

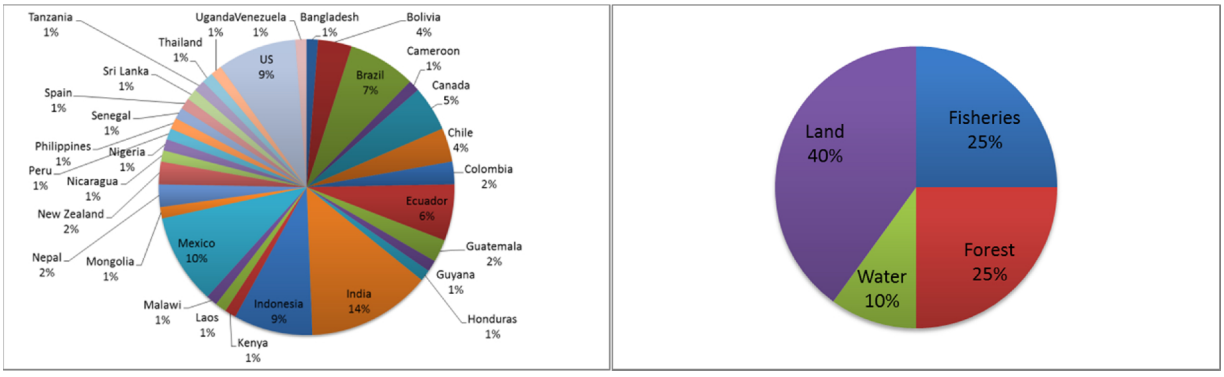

Fig. 1. Countries and sectors of analyzed cases (n = 81).

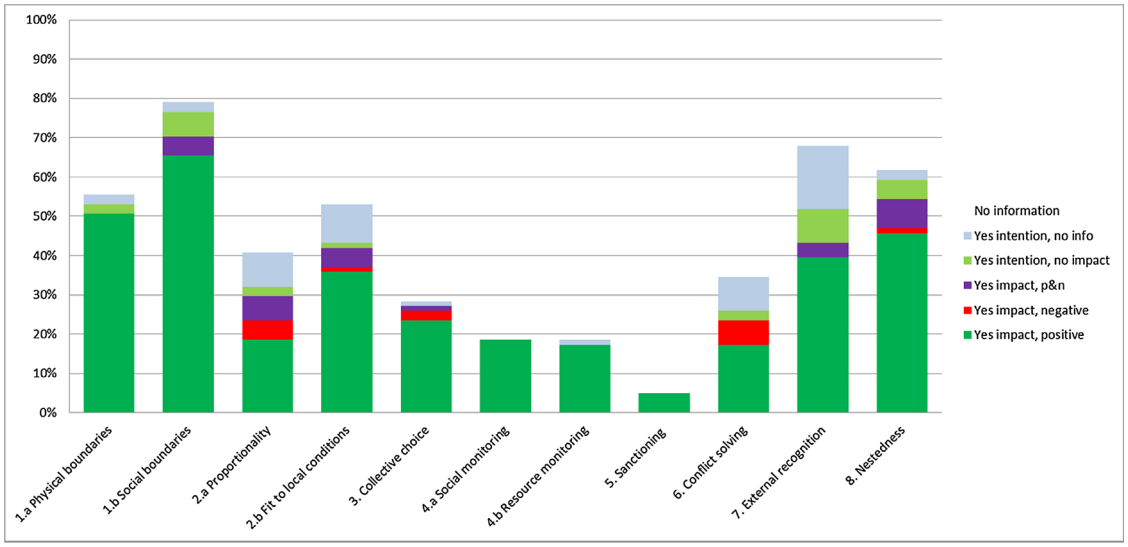

Fig. 3. Impact of social movements on Institutional Design Principles (n = 81).
Note: "No information" cases are represented by the gap from the bars to 100%.

information are the social boundaries (DP1b), recognition of self-organization (DP7) and nesting (DP8). The monitoring and sanctioning principles were the least reported in the studies.

Second, the percentage of cases showing positive impact varies across principles (see Fig. 4). The percentage is over 70% for the boundaries (DP1a and DP1b), and multi-level (DP8) principles (see Fig. 2); between 50% and 70% for the fit to local conditions (DP2b), conflict solving (DP6), and recognition to self-organization (DP7) principles; and less than 50% for the proportionality (DP4b) principle.

Third, it is important to note the existence also of negative impacts of movements (see Fig. 3). These are relatively infrequent as compared to the positive impacts, and include issues of leader accountability and formalization of use rights that undermine solidarity ties (Byambajav, 2012; De Alessi, 2012) and create conflicts within the communities (Wouters, 2001), respectively (social boundaries principle); problems of fit (fit to local conditions principle) associated with the standardization of local organizational rules and types of knowledge by the movement (Diniz and Gilbert, 2013; Kearney, 1989; Kurien, 1991); or loss of autonomy (external recognition principle) associated with the capture of movement elites by political parties or international donors (Hafild, 2005; Scholtens, 2016).

4.3. Pathways to the strengthening of CBNRM

The results above show that movements can have a positive impact on community-based natural resource management, i.e., as measured through the institutional design principles. The pathways through which such positive impact can happen vary both within and across the principles (Table 2b). In the following paragraphs, we review the most frequent of those pathways.

4.3.1. Principle 1.a: physical boundaries

According to our analysis, the most frequent pathway to the strengthening of physical boundaries in CBNRM regimes is the creation and defense of *exclusive-use zones*, such as the "extractive forest reserves" promoted by the rubber tappers movement in Brazilian Amazon, and local forest communities in Petén, Guatemala (Cronkleton et al., 2008; Paudel et al., 2010); or the "trawler-free coastal fishing zones" reserved for artisanal fishing communities in Kerala and Goa, India (Kurien, 1991; Sinha, 2012).

A related pathway is the *formalization of boundaries*, which takes place via the elaboration of maps (Alcorn et al., 2003; Diegues, 1998; Roberts, 2016), and the legal registration of the boundaries (Neumann,

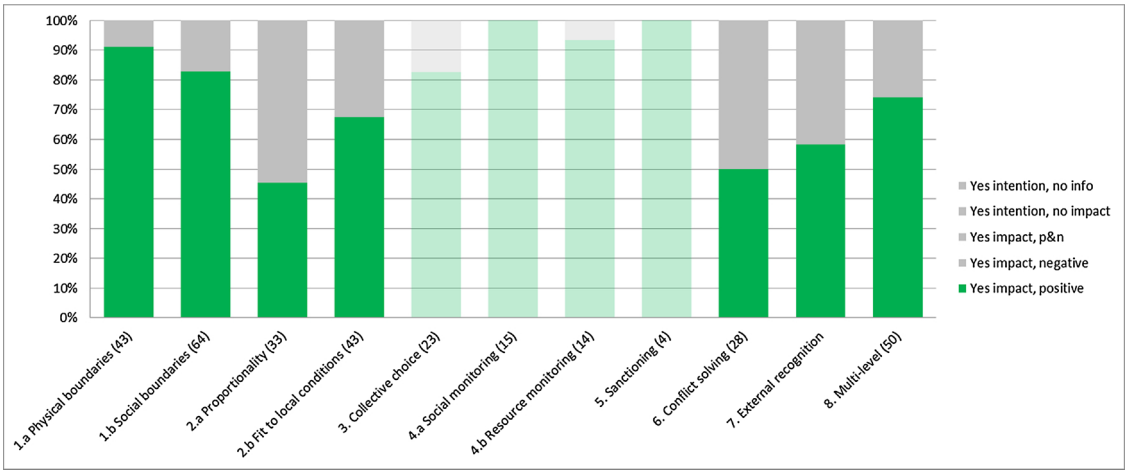

Fig. 4. Weight of positive impact of collective resistance actions/movements across Institutional Design Principles (% of case studies with information).
Note: Design principles for which less than 30% of the cases reported information are in lighter color (3, 4a, 4b and 5). In parenthesis: number of studies that reported information on the design principle.

Table 2b
Pathways to the strengthening of CBNRM by institutional design principles.

Design principles	Pathways
1.a Physical Boundaries (41/43)[a]	Creation of extractive reserves/exclusive zones for community (37%)[b]
	Formalizing boundaries of communal territory (21%)
	Physical in-situ defense/occupation of territory by community (26%)
	Delimiting extractive projects that neighbor community (15%)
1.b Social Boundaries (43/64)	Defense of communal use rights (80%)
	Strengthening of communal identity (27%)
	Reinforcement of social capital among community members (19%)
2.a Proportionality (15/33)	Promoting change in distribution of benefits from resource use (47%)
	Adding value to community-based management (47%)
	Framing resource access as a matter of justice (35%)
2.b Fit Local conditions (27/43)	Raising environmental awareness/discourse within community (50%)
	Reinvigoration of local ecological knowledge in community (46%)
	Promoting adoption of local management plans by government (39%)
3. Collective choice (19/23)	Empowering role of women within the community (48%)
	Promoting deliberation within the community (29%)
	Formalization of community collective choice rules (24%)
	Promoting inclusiveness and democratic communal decisions (19%)
4.a Social Monitoring (15/15)	Promoting community-based monitoring (47%)
	Formalizing monitoring (33%)
4.b Resource Monitoring (14/14)	Promoting community-based data collection and analysis (64%)
	Elaborating environmental impact assessments (36%)
5. Sanctioning (4/4)	Strengthening community-based enforcement (50%)
6. Conflict solving (14/28)	Providing resources and upscaling use of courts by community (80%)
	Legitimizing use of courts among community members (27%)
7. External recognition (32/54)	Promoting community-based development (56%)
	Defending community control/management rights (47%)
	Formalizing community control/management rights (44%)
	Promoting community self-organization & management capacity (22%)
8. Nesting (37/50)	Promoting community representation in government (68%)
	Creating community-based second order user organizations (58%)

Note: the pathways are not exclusive; a number of cases illustrated more than one pathway to the strengthening of a design principle.

[a] # cases with positive impact evidence/# cases with information.

[b] Percentage of cases where the pathway is present (out of cases showing positive impact of movements on the design principle.

1995).

Another straightforward pathway is the *physical in situ defense/or occupation of territories*. Two well-known examples are the *"empates"* (land occupations), carried by families belonging to the rubber tapper's movement in the Brazilian Amazon (Cronkleton et al., 2008), and the land occupations and tree planting activities inspired by the women-led Green Belt and Mau Mau movements in Kenya to recover communal lands that had been taken from them through enclosure processes (Brownhill, 2007; Turner and Brownhill, 2004).

A final pathway is *delimiting the range of action of extractive projects* (e.g., mining, oil extraction, water transfers) and external user groups (e.g., large timber firms) that encroach the commons. Irrigators from Mankhambira community, Malawi, for example, have clarified the borders of their customary land by fiercely resisting the installation of a large sugar state within the boundaries of their irrigation scheme (Chinsinga et al., 2013). Similarly, fishing communities from the San Ignacio Lagoon, Mexico, joined forces with environmental groups to halt the expansion of salt works in the lagoon by appealing to the borders of the lagoon as a World Heritage Site and the negative impacts that the expanded works would have on the lagoon's status (Young, 2001).

4.3.2. Principle 1.b: social boundaries

By far, the most frequent pathway through which movements contribute to the clarification of social boundaries is *defending community use rights*. A good example is the Maori movement's actions to promote the Waitangi (Fisheries Claims) Settlement Act and the allocation of one-third of New Zealand's total commercial fishing quota to Maori fisherfolk (Sherman, 2006). By claiming their rights, the movements defend also the collective nature of such rights. In the Yaqui Valley, Mexico, the opposition to the *Independencia* water transfer has been a defense of the access to a resource on which people's livelihoods depend as much as "a fight over historical recognition of collective indigenous water rights" (Radonic, 2015, pp. 37). And in Cochabamba, Bolivia, irrigators movements "have been at the forefront of efforts to secure communal rights to water, a direct response to attempts by the Bolivian government to implement water privatization and marketing policies." (Perreault, 2008, pp. 836).

Two less frequent but still remarkable pathways have to do with the influence of movements on *social capital* and *community identity*. As reported in a fair number of cases. The participation of community members in movements' actions can reinforce solidarity ties and trust. For example, the rubber taper's movement in Brazil "managed, through social mobilization, to raise the levels of consciousness and education of their members, creating and re-creating values of group solidarity" (pp. 75). In the case of the anti-privatization mobilizations and the referendum promoted by community aqueduct activists in Colombia, Perera (2015) concludes that the referendum failed, but the "community water activists learned about each other, inspired each other, and developed trust" (pp. 205), creating capital for further collaboration in mobilizations and in commons management. As pointed by a number of commons scholars, social capital not only reinforces social boundaries and facilitates cooperation in CBNRM regimes, but contributes to resilience in the advent of disturbances (Adger et al., 2003; Brondizio et al., 2009).

The reinforcement of community identity owes to an intrinsic linkage between resource use rights and political-cultural rights in many of the studied cases, especially in cases of indigenous communities. In the case of the "Pacific North Coast black communities" (PCN), much of the movement's success and impact on self-organization had to do with the elaboration of a discourse that mobilized critical issues of identity, territory, autonomy, and development based on the

livelihood practices, lifeworld (ontologies), and cultural desires of the region's communities (Escobar, 1998).

4.3.3. Principle 2a: Proportionality of costs and benefits

A straightforward pathway through which movements contribute to the proportionality principle is the promotion of *changes in the distribution of the benefits of resource use*. Those changes can be advocated to favour a more equal distribution of wealth within the communities (Kearney, 1989; Paudel et al., 2010); however, we found most evidence pointing to tensions between the communities and external user groups. Proportionality of costs and benefits among groups was frequently advocated when there were significant differences in the extraction intensity between the groups, like in the case of artisanal fisherfolk vs. the mechanized fishing industry in Sri Lanka and India (Scholtens, 2016; Sinha, 2012; Somayaji and Coelho, 2017). In other cases, movements demanded compensation for externalities of different kinds, like in the movement against water transfers in the Huancavelica region of the Peruvian Andes (Hoogesteger and Verzijl, 2015). They also challenged the exclusion of communities from the benefits from local resources, for instance from wildlife tourism in Tanzania's pastoralist movement (Neumann, 1995), or from timber in Eastern Senegal's forest community protests (Ribot, 2000).

Movements also *add value to the participation of community members in CBNRM* regimes. This is accomplished by lobbying for tax benefits (Paudel et al., 2010) and attracting subsidies and development funds (Diegues, 1998; García-López and Antinori, 2018; Perreault, 2001), as well as by exploring new production strategies (Cronkleton et al., 2008), and facilitating access to markets and credit via information, diversification strategies and collective bargaining (García-López and Antinori, 2018; Lynn, 1998). These means can be understood as cooperation "selective incentives" (Olson, 1965) and contribute to balance the risk of participating in the CBNRM regimes in uncertain contexts like those featuring environmental justice conflicts (Paudel et al., 2010).

Last, movements also reinforce proportionality through *discourses that portray resource use as a matter of social justice*. These discourses, which often act as a bridge between the communities and supporting NGOs, take the form of claims recognizing a "basic human right to food" (Brondo and Bown, 2011), an "ethic of access" (Klooster, 2000), a "basic wellbeing", or "shared injustices" (Alcorn et al., 2003). Discourses like those around social justice can give visibility to ignored interests and strengthen common understanding and acceptance of proportionality standards, all of which contribute to sustainable management (Trawick, 2001).

4.3.4. Principle 2b: Fit to local conditions

Two similarly relevant pathways through which movements promote the fit between management rules and local conditions are the *reinvigoration of local traditional knowledge* and the *promotion of the environmental conservation discourse*. The promotion of *traditional ecological knowledge* is based on the understanding that local communities, especially indigenous people, know best how to adjust resource use to local conditions, as proven by their longstanding relationship with their environments (Alcorn et al., 2003; Armitage, 2003; Escobar, 1998; Perreault, 2008; Randeria, 2003). Indeed, in a number of cases like the Kamalise movement in Indonesia, the mobilization efforts are less oriented to replace formal government apparatus as to "provide the broader institutional and organizational framework in which traditional norms, practices, and systems are sufficiently free to provide locally relevant solutions and insights into conservation challenges" (Armitage, 2003, pp. 81). Traditional knowledge is reproduced through at least three processes: (1) actual practices, like in the case of women´s Green Belt Movement in Kenya (Brownhill, 2007; Turner and Brownhill, 2004); (2) educational and research campaigns, like in the case of the Dayak of Indonesia (Alcorn et al., 2003) and the *acequias* of the Rio Culebra in the US (Peña, 2003); and (3) frames or narratives that legitimize said knowledge, like in the case of the PCN movement in Colombia (Escobar, 1998).

In a good number of cases, the *environmental conservation discourse* reflects communities' efforts to emphasize the negative environmental impacts of large-scale fishing and logging (Kurien, 1991; Laumann et al., 1989; Nguiffo, 1998; Rangan, 1996), and mining and oil activities (Stoltenborg and Boelens, 2016; Turner and Brownhill, 2004; Urkidi, 2010). In a few other cases, the promotion of conservation is used as part of a community-based management agenda (Escobar, 1998; Tyagi et al., 2007). For example, part of the aim of the Maasai's rights movement in Tanzania is to promote among the pastoralists "a transition from a subsistence economy to a long-term sustainable economic system, accomplished by integrating community development with nature conservation" (Neumann, 1995, pp. 371). In this and other instances, communities emphasize how their livelihoods are compatible with sustainable use and conservation, contrasting with the 'peopleless' emphasis that has dominated global conservationism, as in the recent proposal to turn half the world into protected areas (Büscher et al., 2017).

A less frequent but also relevant pathway is the *elaboration of local management plans*. In some cases, this is a natural step in the process of self-organization, i.e., after the recovery of resource use and management rights (Cohen, 1989; Cronkleton et al., 2008; Peña, 2003). In some other cases, the plans are used as alternatives to government policies that fail to recognize local idiosyncrasies (Kearney, 1989; Pinkerton, 1993; Schwartzman et al., 2010; Stoltenborg and Boelens, 2016).

4.3.5. Principle 3: collective choice

Social movements can contribute to the implementation and quality of collective decision making in the communities by at least four different means. First and foremost, they can *empower women*. In Bolivia, land reform movements' incorporated the recognition of women's land rights as one of their central demands, which led to legal prohibition of discrimination against women in access, tenancy, and inheritance of land and guarantee of women's access to land in the titling and redistribution process, irrespective of their marital status (Deere, 2017). It also led to women achieving key leading political and elected positions and the creation of a legislative commission on women's. In Nepal, the National Federation of Community Forestry (FECOFUN) promoted 50 percent women's representation in local forest committees, an idea institutionalized by the government's 2009 Community Forestry Guidelines. In other cases, movements have directed efforts at capacity-building for women's involvement in natural resource management or other livelihood activities (Topatimasang, 2005); or directly empowered women to challenge gender relations inside the household (Veuthey and Gerber, 2012).

Second, movements can lead or *promote deliberation* and self-reflective discussions (i.e., beyond just voting) about everyday issues as well as legal aspects, issues of community production practices and organizational capacity, as it happened with the Dayak movement in Indonesia (Alcorn et al., 2003) or the Afro-Colombian communities of the Pacific Coast (Escobar, 1998). Third, and closely related to the above, movements can enhance the *inclusiveness of decision-making* by opening spaces that give voice to the different social groups within the communities (Diniz and Gilbert, 2013; Kenney-Lazar, 2012; Martiniello, 2015; Ojha, 2011).

Finally, movements can support and promote the *formalization of previously informal decision-making processes* into collective-choice rules, through for instance the creation of community councils, community assemblies and other decision-making bodies, which are sometimes required by law but not implemented (De Alessi, 2012; Oslender, 2004) or not operationalized into local rules (du Monceau, 2006; Sampat, 2015; Tyagi et al., 2007).

4.3.6. Principle 4.a: social monitoring

Our findings show that social movements strengthen social

monitoring by supporting the *formalization and involvement of the communities in collective monitoring actions*. In Cameroon, forest commoners have mobilized to take enforcement into their own hands, by arresting outsider poachers in their forests and cooperating with the government (Nguiffo, 1998). Also, movements can indirectly contribute to the *formalization of monitoring*. In the case of the forest communities in Mexico and Guatemala, the movements for community forestry concessions were followed by the establishment of local governance systems, which included organizing patrols to monitor the forest's uses and physical boundaries at local level (Klooster, 2000; Paudel et al., 2010) and regional level (García-López and Antinori, 2018). In Madhya Pradesh, India, tribal forest people displaced by a dam mobilized and formed a federation of fishery workers' cooperatives (Tawa Matsya Sangh, TMS) to obtain fishing and management rights in the new reservoir. After succeeding in this, TMS staff directly supported monitoring of the fishing through patrols (Tyagi et al., 2007).

4.3.7. Principle 4.b: resource monitoring

Social movements can also contribute to resource monitoring through the *involvement of communities and other actors in data collection and analysis*, and the elaboration *of environmental impact assessments*. Some movements collect data through community-based mapping and research programs, often based on local ecological knowledge, and in collaboration with scientists and researchers. In the case of Indonesia, the Dayak indigenous movement for forest management rights developed a community-based mapping unit which documents Dayak land-use and traditional ecological information (e.g., flora and fauna, water-bodies, sacred areas, topography) to ensure conservation and prosperity (Alcorn et al., 2003). The mapping has helped renew Dayak institutions, identify the agricultural productivity of community lands and necessary management improvements to them, and compare the benefits of indigenous farming against those promised by development projects. Moreover, after a crisis of forest fires in 1997, the mapping put the movement in a privileged position for negotiating their demands with the government, by offering accurate ground information to solve the crisis (Alcorn et al., 2003).

Research carried by movements also helps to document social and environmental impacts from proposed development projects. For instance, in New Mexico, eco-activists fighting against large-scale logging worked with other organizations and irrigation (*acequia*) communities to conduct research on biodiversity in the affected area and to prepare scientific reports for legal actions to protect endangered species (Peña, 2003). Similarly, in Mexico, a fishermen movement opposed a wind park expressing concerns about the adverse effects on the local environment, as well as on their livelihood. Their protests led to an independent environmental study conducted by researchers from different universities which supported the communities' concerns and found many inconsistencies in the environmental impact study conducted by the wind energy company (Altamirano-Jiménez, 2017).

4.3.8. Principle 5: sanctioning

We did not find information about "graduated" sanctions in any of the cases, which is how the original principle 5 was formulated. Similarly, we found a few cases informing about sanctions in general. The main pathway through which movements contribute to sanctioning is by *strengthening community involvement*. This is often achieved through movement-sponsored changes in national laws in ways that give local authorities the right to design and enforce rules. For instance, the successful movement for community forest management in Mexico created a new legal framework which allowed communal authorities to enforce restrictions and issue permits through, e.g., community patrols, roadblocks, and confiscations of equipment (Klooster, 2000).

4.3.9. Principle 6: conflict solving

We did not find much evidence about the impact of movements on local, community-based conflict solving mechanisms; however, we found evidence regarding the use of supra-community (i.e., national and international) courts. Movements contribute to that via two pathways. First, movements frequently *sponsor the usage and credibility of the courts* as an effective conflict resolution mechanism. In the case of the movement against the commercial exploitation of lake Chilika in India, for example, the efforts made by the intellectuals and environmental activists was crucial to make "the local fisherfolk conscious about the courts and different laws regulating the coastal ecology (…*and take*…) the case of lake Chilika to supreme court" (pp. 60). This pathway is particularly evident when the courts resolve in favour of the communities (Pattanaik, 2003), or when the courts are specifically created to resolve the conflict generated by the movement (Rixecker and Tipene-Matua, 2003).

More secondarily, movements assist the communities with *litigation resources*. These resources, which include expertise and legal training, as well as economic resources and coordination, allow the communities to address courts at governance levels otherwise inaccessible to them.

4.3.10. Principle 7: external recognition

According to our data, social movements can strengthen external recognition through three similarly relevant ways, including the *defense of existing control and management rights*, the *formalization of said rights*, and the *promotion of economic autonomy*. More secondary, movements can also contribute to create or *strengthen community organizations and capacities*.

As with the defense of community-*use* rights (social boundaries), the defense of *control and management* rights was one of the foundational motivations of many of the movements studied, and a frequent pathway through which they positively contributed to CBNRM regimes. Many of the cases related to the defense of control and management rights were featured by indigenous communities, often under discourses of "self-determination" and autonomy (Escobar, 1998; Hoogesteger and Verzijl, 2015).

The above pathway is closely aligned with efforts to *formalize management rights in laws or constitutions*. For instance, in Mexico the struggles of forest communities against state and private timber concessions on their lands led to the passage of the 1986 Forest Law, which recognizes communities' forest management rights (García-López and Antinori, 2018; Klooster, 2000); similar struggles led to the creation of the extractive reserves under the control of rubber-tapper communities in Brazil (Diegues, 1998), the legal registration of "black communities" territorial rights in Colombia's Pacific coast (Escobar, 1998; Oslender, 2004; Wouters, 2001), and the passage of a law recognizing irrigator´s traditional water management rights also in Colombia (Perera, 2015).

Enjoying the governmental recognition of management rights may not be enough for the CBNRM regimes to sustain if communities do not enjoy a capacity to put that autonomy into motion, which requires a minimum of economic autonomy (Basurto, 2013). Thus, movements promote and support *community-based/grassroots development ventures*. This was indeed the most frequent pathway among all contributing to the external recognition principle. Development ventures include community forestry enterprises for timber and non-timber products and ecotourism (Cronkleton et al., 2008; Diegues, 1998; García-López and Antinori, 2018; Klooster, 2000); agricultural cooperatives (Diniz and Gilbert, 2013); seed exchange networks and peasant-to-peasant market exchanges (Alonso-Fradejas, 2015; Turner and Brownhill, 2004); production plans (Diniz and Gilbert, 2013); credit unions (Hafild, 2005); or certification labels (Paudel et al., 2010). Although not exactly the same, the promotion of development ventures is closely associated with the generation of value from participating in CBRNM regimes (DP 2.a). This was quickly understood by the landless peasants' movement (MST) in Brazil. The strict organizational rules initially imposed by the movement to the new communal settlements hindered economic development and value generation. This, in turn, undermined the willingness of settlers to participate in the communal regime due to the unbalance between the costs and benefits of doing so. The decline ended once the

movement relaxed said organizational rules and started promoting self-organization around economic development ventures (Diniz and Gilbert, 2013). Overall, this pathway reveals an insufficiently highlighted role that movements fulfill by linking CBNRM to sustainable grassroots development. As pointed by Sampat (2015), "a distinction needs to be made between issue-based campaigns and programmatic social movements with explicit agendas for democratically determined egalitarian and ecologically appropriate development" (pp. 786).

Finally, putting political and economic autonomy into practice also demands strong organizational structures. Thus, grassroots development initiatives are often developed by movements in conjunction with the *promotion of community organizations and capacities*. For instance, the creation of extractive rubber-tapping reserves in Brazil is also based on the local organization of rubber tappers and on education, health, cooperativism, and resource management research programs (Diegues, 1998). Often these community-organization actions are part of the movement's strategy to gain legitimacy and materialize claims to rights. The Afro-Colombian movement supported the creation of community councils needed to make claims of territorial autonomy to the state (Escobar, 1998; Wouters, 2001); while FECOFUN in Nepal has continually promoted the establishment of Community Forestry User Groups (CFUGs) needed to obtain formal rights to forest management. Movements such as this can also strengthen local organization through pedagogical strategies to educate about the meaning of new laws, founding concepts such as territory, development, traditional production, and use of natural resources (Alcorn et al., 2003; Escobar, 1998; Wouters, 2001); and promoting collaborations and exchanges of experiences among communities (Alcorn et al., 2003; Ojha, 2011).

4.3.11. Principle 8: nesting

Movements increasingly organize in, and promote the creation of, nested governance arrangements (Tormos-Aponte and García-López, 2018). One pathway through which movements enhance nesting of community governance activities is through the promotion of collaborative management and the *institutionalization of mechanisms of representation within governmental jurisdictions*. This may involve the use of existing local and regional councils (Byambajav, 2012) and international organizations (Turner and Brownhill, 2004); participation in governmental agencies (Cohen, 1989; Perreault, 2008); promotion of technical committees (Langdon, 1989), legislative committees (Pattanaik, 2003) management groups (Jordan, 1989), and co-management agreements (Freeman, 1989; Morrell, 1989; Randeria, 2003); collaboration with political parties, and direct participation in elections to public office (Correia, 2010; du Monceau, 2006; Escobar, 1998; Schwartzman et al., 2010).

A similarly relevant way of supporting nesting is through the *creation of second-order community-organizations* that fulfill governance functions beyond contestation. For instance, the Colorado Acequia Association (CAA) in the Culebra watershed, U.S., was created to contest the enclosure of the commons as well as to find ways to guarantee the long-range viability of *acequia* farming. Accordingly, "the CAA defined its mission as to organize and conduct scientific and legal research to empower the *acequias* to manage and protect" said commons (Peña, 2003, pp. 163). Good examples from the forest sector are the Federation of Indigenous Organizations of Napo (FOIN), in the Ecuadorian Amazon, the Community Forest Association of Peten (ACOFOP), in Guatemala´s Peten region, and the abovementioned FECOFUN in Nepal. FOIN combines its role as a legal and political advocate of the indigenous community in the region, with a diversity of activities oriented to improve rural livelihoods of the communities. Similarly, ACOFOP emerged as an effort by the movement to consolidate community rights and then evolved to integrate also forest management services for the communities (Cronkleton et al., 2008; Paudel et al., 2010; García-López and Antinori, 2018). In the case of fisheries, the Goenchea Ramponkarsancho Ekvott organization (GRE) was formed to protect the interests of traditional fishing communities in Goa, India, which had been threatened by commercial trawlers; afterwards, aware of the powerful opponents they faced, and the similar threats faced by the millions of traditional fishermen in other parts of coastal India, the GRE promoted the creation of the National Forum for Catamaran and Country Boat Fishermen Rights and Marine Life (Somayaji and Coelho, 2017).

5. Discussion: A dynamic, political-economic reading of the design principles

The above discussion contributes to contextualize some of Ostrom's design principles in situations of socio-environmental conflicts. Such contextualization does not question Ostrom's theory, but rather enriches it. It shows that the robustness of CBNRM is dependent on the active defense and (re)resign of community institutions by social movements. We found this to be particularly evident for the proportionality (DP2), collective choice (DP3) external recognition (DP7), and nesting (DP8) principles, and to some extent also for the boundaries (DP1) principle.

First, the proportionality design principle (DP2) makes emphasis on the need that costs and benefits of cooperation are balanced. According to Ostrom (1990), in the absence of such balance, there is not much sense for individuals to contribute to rulemaking and comply with community-rules. What our data shows is that proportionality in the distribution of cost and benefits between user groups is also important for community members, at least when such distribution is considered as unfair by the communities. Within and between user group fairness considerations may indeed be interrelated.

Second, the collective choice design principle (DP3) recognizes the importance that "most individuals affected by the operational rules can participate in modifying the operational rules" (Ostrom, 1990, pp. 90). As explained in Ostrom (1990), the principle is justified for information and legitimacy reasons (e.g., those with the most information and most affected by decisions are in charge of institutional design). The fulfillment of such collective choice, however, implies certain qualities of the collective decision-making process (Cox et al., 2010). Our data do not allow us to systematically assess the relevance of those qualities, but illustrate the importance given by communities and movements to some of them, such as women empowerment, inclusiveness, deliberation, and formalization. This is important given that one of the critiques of CBNRM has been the persistence of internal decision-making inequalities (Saunders, 2014).

Third, the external recognition (DP7) and nesting principles (DP8), are the principles that most benefits from our political contextualization. Movements are to a great extent an expression of these principles, that is, of the willingness of communities to fulfill them. Critiques of the external recognition principle have argued that power relations and political contestation influence how and when the state would recognize local governance autonomy or provide support for CBNRM (García-López and Antinori, 2018; Kashwan, 2017). As illustrated in the results section, our analysis suggests that social movements can positively influence state recognition and autonomy of CBNMR regimes via at least four different pathways. Notable in this regard is our finding about the relevance of measures put into practice by the movements to guarantee the organizational capacity and economic viability of the communities in parallel to –or as a basis for– their political/managerial autonomy. This important finding connects with similar findings on the role of civil society actors, such as non-governmental organizations (Barnes et al., 2016; Barnes and van Laerhoven, 2014).

Similarly, the participation of local communities in movements materializes in the formation of second-order organizations and the institutionalization of venues to participate in government decisions (DP8, nesting principle). Additionally, communities may build alliances with a variety of organizations; in our data, 35% of the communities did so. These alliances may or may not affect resource governance functions, which is why we did not include this pathway in the previous

section. That said, if one understands DP8 as involving both the influence of government decisions through institutionalized venues, as well as informal actions such as awareness-raising campaigns, then *alliance-building* becomes a crucial pathway. The Dayak in Indonesia, for example, "have used communication links with national NGOs to build their political strength and draw public attention to their problems shared with other indigenous people across Indonesia" (Alcorn et al., 2003, pp. 319); and many of the activities carried by the above-mentioned Colorado Acequia Association (CAA) "are carried out through the collaborative research and advocacy of a loosely affiliated network of lawyers, natural and social scientists, sustainable agriculture advocates and local *acequia* farmers" (Peña, 2003, pp. 161).

Fourth, a common denominator to many of the cases reviewed is the revitalization of community identity. Community identity can serve as a social boundary for resource management (DP1b) but can also be used as the basis to claim political rights. Such connotation is particularly evident in cases of indigenous rights and other political movements, where socio-political and resource management boundaries are somewhat indistinguishable. This suggests that perhaps indigenous community regimes and movements deserve separate attention from other, "management-only" CBNRM regimes.

A critique of Ostrom´s design principles has to do with its exclusive focus on institutional robustness and failure to explain other desirable properties of CBNRM (Agrawal and Benson, 2011). Some authors have pointed that "because the design principles focus on the robustness of resource systems, they are not sufficiently tailored to explain the distributional patterns of resource benefits" (Tiwari et al., 2016, pp. 589). This, however, does not mean that the principles do not or cannot inform about distributional or justice issues. On the one hand, our study shows that the efforts by communities to keep boundaries clear (DP1), guarantee a fair distribution of costs and benefits of resource use (DP2), or gain the recognition of the government (DP7) can be responses to situations that are perceived to be unjust by communities. On the other hand, the data also shows that such responses can also result in power distribution improvements within the communities, as seen here for the collective choice principle (DP3).

A more methodological critique to Ostrom's design principles has to do with the "principles" approach and its supposed incompatibility with a more historically contextualized perspective (Leach et al., 1999; Mosse, 1997). Related to this is the general concern that the principles might be seen as something of an institutional panacea and thus be misapplied as a blueprint for improving the governance of CPRs in particular settings (Cox et al., 2010). This concern is over the possible overgeneralization of the principles to a large diversity of cases, the individuality of which they do not sufficiently reflect. The apparent inappropriateness of the "principles" approach can be minimized if one understands analysis as an exercise of diagnosis that mobilizes theory at multiple levels of detail (Ostrom et al., 2007). Our analysis shows the potential of such an approach. The focus on pathways and a political-economic reading of the design principles illustrates one way to contextualize the principles in a relatively detailed fashion. As shown in Table 2b, social movements can have an impact on community institutions via a significant number of pathways. By the same token, this study illustrates that those pathways can also be meaningfully organized across the design principles.

As a final reflection, it is worth mentioning the relatively scant information found about social monitoring (DP4a), resource monitoring (DP4b), sanctioning (DP5), and collective choice (DP3). This shows the advantages and disadvantages of a more political-economic reading of commons governance vis a vis traditional commons theory. On the one hand, management aspects such as monitoring and sanctioning may be relatively irrelevant to the robustness of CBNRM in the advent of external political economy threats; in these situations, a look into the role of political processes, like the one displayed by many of the works included in this study, can be particularly illustrating. On the other hand, as clearly demonstrated by CPR theory, one should not ignore the importance of these managerial factors on CBNRM robustness (Chhatre and Agrawal, 2008; Coleman and Steed, 2009; Cox et al., 2010; Fleischman et al., 2014), especially when collective action problems and external threats interact (Villamayor-Tomas and García-López, 2017). We should therefore aim to integrate both managerial and political economy factors into an explanation of the social and ecological outcomes of CBNRM.

6. Conclusions

In this paper, we have addressed, via a meta-analysis of case studies, the question of whether and how social movements contribute to community-based natural resource management (CBRNM), as measured through Elinor Ostrom's institutional design principles. The evidence points to a notable positive impact of the movements and CBNRM, and further underscores that these effects can occur through various pathways, enriching our understanding of how the CBNRM shall emerge and sustain over time.

An important role fulfilled by movements has to do with the defense of community use and management rights (social boundaries and external recognition principles) against certain government decisions or actions by outside resource users. That said, movements can also generate positive effects beyond the reaction to specific threats. Those effects include the democratization of communities' collective choice processes, the reinvigoration of identity ties and local ecological knowledge, the promotion of economic development and autonomy, and the creation of nested (second order) organizations. Exploring such potentially longer-term effects is a promising next step towards further connecting the social movement and CBNRM scholarships. Additionally, movements can also entail unattended negative effects associated with the formalization of management, simplification of policies, leadership corruption, and elite co-optation. Although evidence about negative effects was relatively low in our study, these effects are important, as they reproduce well-known biases traditionally associated with top-down government policy making (Acheson, 2006; Dwyer, 2015)

Lastly, we argued that the analysis of movements in CBNRM facilitates a politically contextualized reading of the institutional design principles. Such reading not only illustrates the risks of using the principles as an institutional panacea for sustainable development but also paves the way for integrating the theory into more complex diagnoses. The continued erosion of democratic governance, rising inequalities, pro-corporate policies, and intensified extractivism across the world continues to present dramatic challenges to the global sustainable development agenda (Agenda 2030) and CBNRM. Attention to movements helps pinpoint these political-economic constraints on sustainable governance of commons – as well as various pathways through which local and supra-local collective actions can overcome them.

Funding

This project was supported by a grant from the European Commission funding under the Marie Curie Actions – Individual Fellowships –, contract Nr. 660089–COMOVE.

Acknowledgements

We thank Forrest Fleishmann, Graham Epstein, Laura Calvet and participants in the ICTA EEI Seminar, 2017 IASC conference, and 2017 European Ecological Economics conference for their valuable feedback on previous versions of this manuscript. We also want to thank the support of Marta Borras (ICTA) in the elaboration of the location map and the suggestions of the two anonymous reviewers.

Appendix A

See Fig. A1.

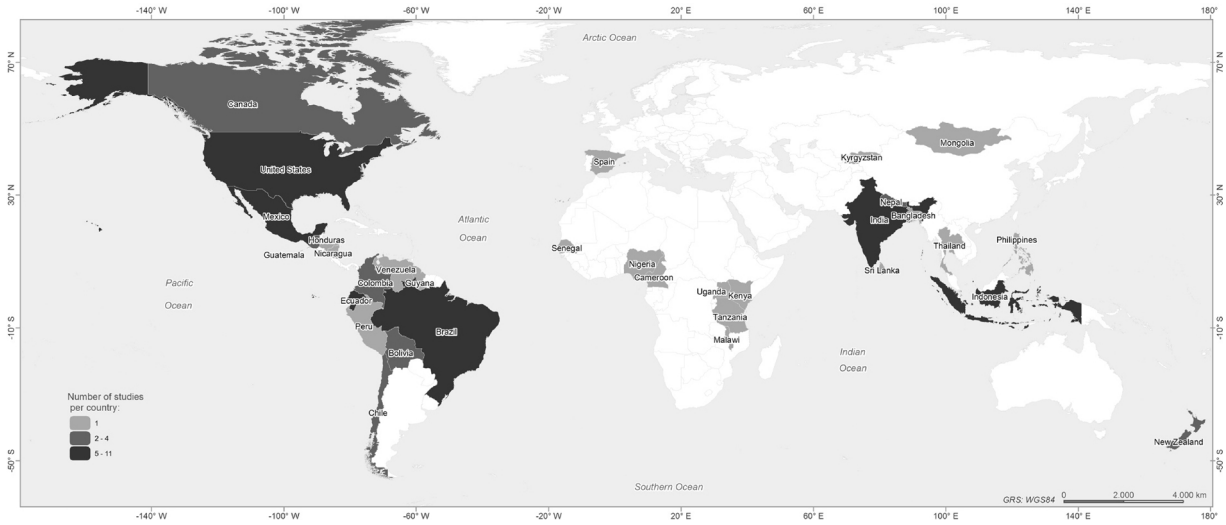

Fig. A1. Map of studies included in the meta-analysis by country.
Source: GADM database of Global Administrative Areas (http://www.gadm.org/), and own data.

Appendix B

Inter-coder reliability scores

	Kappa	Alpha	Agreement
1.a Physical Boundaries	0.6	0.6	77%
1.b Social Boundaries	0.51	0.51	77%
2.a Proportionality	0.84	0.85	88%
2.b Fit Local conditions	0.46	0.44	65%
3. Collective choice	0.88	0.88	94%
4.a Social Monitoring	1	1	100%
4.b Resource Monitoring	0.82	0.83	94%
5. Sanctioning	1	1	100%
6. Conflict resolution	0.62	0.62	77%
7. External recognition	0.44	0.46	65%
8. Nesting	0.76	0.76	88%

Explanation:

The collaborative coding stage comprised 10 publications (11 case studies, as one of the publications reported information on two cases). The independent coding comprised 69 publications (78 case studies, as 10 of the publications reported information about two cases). Different publications informed about the same case. This affected 8 cases for which we synthesized across the publications according to the table below ("Rules for synthesizing"). The final number of cases included in the database was 81. Coder 1 (lead author) coded 52 publications (62 cases); coder 2 coded 16 publications (17 cases). For the inter-reliability coding, the first coder re-coded all 17 cases coded independently by the second (20% of the total number of cases coded independently by both coders). Once the inter-reliability test was calculated, the disagreements for the 17 cases were discussed to settle on the final codes.

Landis and Koch (1977) outlined a set of values that mark different agreement levels based on the value of Fleiss' kappa: < 0.00 Poor; 0.00–0.20 slight; 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 substantial, and 0.81–1.00 almost perfect.

Rules for synthesizing when different publications inform about the same case

Value 1	Value 2	Final value	Total number of cases/studies/principles
Yes impact, positive	Yes intention, no impact Yes intention, no info	Yes impact, positive	3/7/2
Yes impact, positive	Yes impact, negative	Yes impact, positive and negative	1/2/1
Yes impact, negative	Yes intention, no impact Yes intention, no info	Yes impact, negative	0/0/0
Yes impact, positive and negative	Any other value	Yes impact, positive and negative	3/7/3

Note: these rules were designed to give priority to studies that provided the most information. Rules in the first and third rows introduce a bias in favour of finding a positive effect in two cases for one principle and a third case for another principle (see fourth column); that said, the underlying logic was not necessarily finding an effect but give priority to studies that provided the most information, as we understand that studies showing evidence about a positive effect contained more information than those showing evidence of no impact. This is the case because we understood any improvement over a status quo situation as a positive impact, even if the improvement was not sufficient in the eyes of communities.

Appendix C. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.gloenvcha.2018.09.005.

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