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Social Commoning As A Way To Transition Towards Alternative Systems By Design

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Abstract: Many current social and environmental challenges have been described as an ultimate failure of design (Escobar, 2018), calling for designers to reconsider the way they operate, collaborate, and navigate internal ways of working (Akama et al. 2020; Irwin, 2019). The paper revisits the theories of the commons and their applicability to systemic design to transition existing systems from being dysfunctional to being regenerative. By examining a case study of a marine protected area in the South African ocean, the study explores how a commoning practice could be applied more intentionally in system design to increase cooperation amongst system actors and apply a multispecies - as opposed to human-centred - perspective to the management of natural, social, and immaterial resources. Thus, the paper draws on a working hypothesis of how a commons approach could open up novel opportunities for creating the conditions of increased stakeholder cooperation and alternative systems by design.

Keywords: Commons, Systemic Design, Beyond-human-centred design, Complex Systems

1. Introduction

As David Bollier poignantly stated:

> "In facing up to the many profound crises of our time, we face a conundrum that has no easy resolution: how are we to imagine and build a radically different system while living within the constraints of an incumbent system that aggressively resists transformational change?' (Bollier, 2015, p 1).

To preserve a liveable planet for future generations, we need to successfully navigate the transformation to a sustainable and climate-neutral world. This ambitious goal requires new approaches for transitioning existing systems from being dysfunctional to being regenerative (Raworth, 2019; Hutchins & Storm, 2019). Organisations will need to change the products and services they create, and rethink the ways they operate, collaborate, and navigate internal ways of working (Irwin, 2019). Design practice plays an important role in this context, providing participatory processes to empower citizens and giving them agency to effectuate

change (Design Council, 2021). At the same time, however, many of the challenges we are facing, have been described as an ultimate failure of design (Escobar, 2018), including a failure to design for regeneration (Acaroglu, 2018), a failure to design for multispecies (Metcalfe, 2015) and a failure to design well for 'endings' (Macleod, 2021). With a recognition of the complex and multispecies interdependence in our surrounding systems, (Escobar, 2018), interdisciplinary approaches are increasingly being applied to incorporate the broader nature of systems in design, particularly in the areas of transition (Irwin, 2015) and systemic design (Design Council 2021). And yet, there is considerable untapped potential for design practice to integrate and build upon multiple types of knowledge ranging from evolutionary (Schaeper & Robert 2020), indigenous (Akama et al., 2019) and economic theory (Poggenpohl, 2017) to avoid accidentally preserving the status quo when developing new design solutions.

Underlying these practice gaps lies the question of how to model design's contribution to economic value, when by default, it operates within the remits of a neoliberal system that needs a major evolution itself (Raworth, 2017). Today's neoliberal paradigm is built on the theories of neoclassical economics that, while promoting human welfare through maximising economic wealth, have led to socio-ecological problems that incumbent systems cannot resolve (Goodland and Ledec, 1987, Dolderer, Felber and Teitscheid, 2021). Instead, economic values are shifting towards ecological and planetary economic theories that conceptualise humanity as being embedded within environmental and social systems and understand human welfare as being conditional on the health of these systems (Gowdy, 2005, Grubb, 2014, O'Neill *et al.*, 2018).

In this paper, we explore how an understanding of the economic theory of the commons as a means of resource allocation and a social process of reproduction can open up novel opportunities for system change by design. We highlight the potential for design practice to increasingly support an alternative, more equitable economy that contrasts prevailing models and practices (Ostrom, 1990; Bollier & Helfrich, 2019; Raworth, 2019). Seen as an enduring and living form of organisation, we argue that the commons could inform a deeper understanding of how to design for participation, including how communities of users, human and non/human, can successfully organise *in common*, while employing efficient and sustainable ways of managing their resources. The aim of this paper is therefore to bring the commons, or *commoning,* to the fore as a form of designing for systems more broadly that up until now is underrepresented in design studies. We assess the applicability of a social commoning approach to systemic design by retrospectively applying Ostrom's 'core design principles' to an example case of a common pool resource that is managed through polycentric systems, i.e., multiple centres of semi-autonomous decision-making. The discussion that follows facilitates consideration of whether Ostrom's commoning principles could benefit systemic design practice as a heuristic. Social commoning by design, we conclude, could make a much-needed contribution to achieving a more sustainable and fair way of organising economies.

2. From participatory design practices to commoning for systems change

Much of design has focused on participation methods through a variety of design practices, including Service Design (SD), Participatory Design (PD) or Human-Centred-Design (HCD), bringing people together to co-create systemic solutions informed by shared human experiences (Irwin, 2019). However, there is an ongoing debate on how this focus has failed to combine knowledge from evolutionary, social, and economic sciences (Akama, 2019; Heskett, 2015; Atkins et al, 2019) and how one could design for improved cooperation and decision-making (Schaeper & Robert 2020). PD has been found to hinder rather than facilitate regenerative outcomes (Wamsler et al. 2020), as participation often refers to the context of the human voice, revolving around human needs and decision-making structures, ignoring non-human representations (Akama, Light, Kamihira, 2020). Celebrated for its human-centred problem-solving methodology, Human-Centred-Design (HCD) is increasingly criticised as a problem-generating approach (Norman, 2005) unable to sufficiently account for non-human needs (Escobar, 2018; Fry, 2009) and ignoring the issues of sustainability, inequity, and the need for long-term positive impact (Norman, 2022). Consequently, scholars have been calling for a 'redesign of design' where design welcomes more plural ways of knowing and 'designing-with-many' (Akama, Light, Kamihira, 2020). As such, it has been highlighted that a much deeper understanding of relationality and interdependence of all life is needed for design practices to be able to inform a more collective and regenerative future (Akama, Light, Kamihira, 2020; Escobar, 2018).

In responding to these challenges, scholars have turned towards the social practice of the commons in recent years (i.e., Akomolafe, 2016; Bollier, 2019; Botero et al. 2020). Commons can be understood as deeply collaborative arrangements for value production based on participatory principles (Bauwens & Niaros, 2017) that resonate well with the idea of co-design aspirations. The economic theory of the commons is mostly attributed to the economist Elinor Ostrom, who was able to prove that the collaborative management of common resources is possible for economic and environmental sustainability. With examples including the communal tenures that have lasted over centuries such as the high mountain meadows in Switzerland or horticultural garden irrigation systems in southern Spain (Ostrom, 1990), Ostrom demonstrated that users of common pool resources (CPRs) tend to create a shared set of rules for regulating access and use. Through extensive empirical research, she found that the commons involve relationships and community as a form of living organisation, which emerges based on cooperative behaviours and the sharing of resources enacted through a set of core design principles (CDPs), see Figure 1 (Ostrom, 1990).

1. Clearly defined boundaries
   Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
2. Congruence between appropriation and provision rules and local conditions
   Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
3. Collective-choice arrangements
   Most individuals affected by the operational rules can participate in modifying the operational rules.
4. Monitoring
   Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.
5. Graduated sanctions
   Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
6. Conflict-resolution mechanisms
   Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7. Minimal recognition of rights to organize
   The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

For CPRs that are parts of larger systems:

8. Nested enterprises
   Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Figure 1. Ostrom's Design principles exhibited by long enduring Common-Pool-Resource (CPR) institutions (Ostrom, 1990, p.90)

It is the activity of *commoning* - the very processes that make visible the social practices that enable people to discover, innovate and negotiate new ways of doing things for themselves (Bollier and Helfrich, 2012) - that is crucial for the existence of the commons. Through this perspective, attention shifted away from the so-called 'natural' commons and instead focused on the emergent possibilities of the 'social' or 'immaterial' commons (Bollier, 2020), which include knowledge and cultural commons (Hyde, 2010, Hess & Ostrom, 2007), digital commons and peer-to-peer production (Bauwens, 2005) and biopolitical commons (Hardt and Negri, 2009). Existing commons do not appear to be closely linked with contemporary design activity yet as they often emerge out of an evolved organisational paradigm (Laloux, 2012), not involving 'expert design' (Manzini, 2015). That said, the concept of the commons is not only a timely but appealing endeavour for systemic design because it offers an alternative, more equitable economic model for design practice to frame its activities around, contrasting the neoliberal paradigm. Another reason why the commons are pertinent to design is that *commoning* is always understood as a more-than-human achievement, as commons are always co-produced with nature including humans and nonhumans (Akomolafe, 2016). By decentering the human perspective, commoning can therefore allow us to recognize the importance of our entanglement with nature; taking a multi-species approach and collectively negotiating boundaries and resource-based decisions.

Ostrom's CDPs provides a crucial economic perspective for evolving systemic and participatory design to create more regenerative and transformational change. As a framework, Ostrom's CDPs could serve designers to better understand the underlying conditions and dynamics of systemic cooperation and more intentionally design for them. To test this hypothesis, we explore an existing case study of a common-pool-resource and its established management and governance practices. This offers an opportunity, firstly, to investigate the overall applicability of the CDPs in the context of improving governance and management practices, and secondly, to discuss the potential of adopting the CDPs as a heuristic within systemic design.

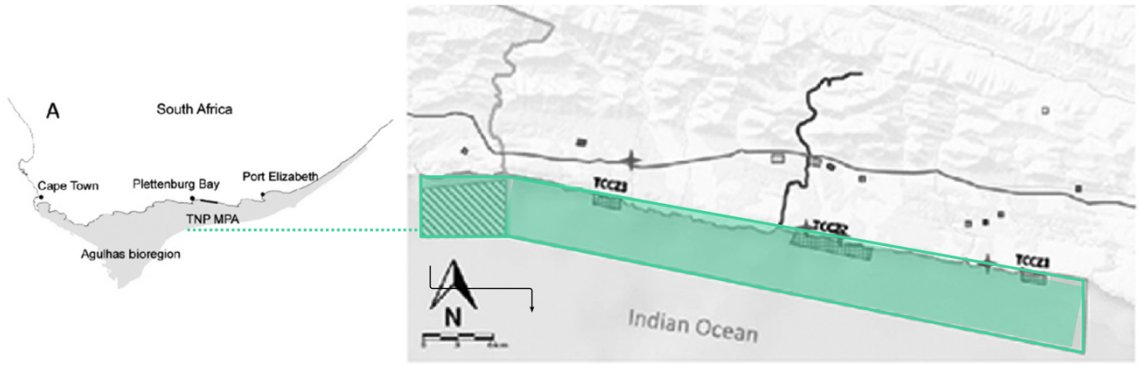
3. A case study analysis of marine protected area governance in South Africa

3.1. The Tsitsikamma National Park marine protected area (MPA)

The oceans around South Africa are enormously diverse. This diversity means that the marine and coastal zones have extensive economic and developmental opportunities (WWF-SA, 2016; DEFF, 2013; Jarre, et al., 2018). However, the oceans are presently a contested resource as contradictory state policies advocate the production of offshore oil and gas, directly in opposition to marine protection, fishing, and tourism (DEFF, 2019; Oceans Economy Masterplan, 2022; Chadema & Joseph, 2017). MPAs are a policy and management instrument to address the pressures on marine and coastal ecosystems such as overfishing, exploitation, habitat destruction and pollution (Western Cape Government, 2018). Set up to protect parts of the ocean, several challenges have been identified from current governance practices that persist within South African MPAs. These include: a lack of clarity about the boundary setting of MPAs and overall marine protection objectives; low levels of stakeholder participation and compliance to the protected area; negative impact on livelihoods; and the lack of perceived benefits (including ecological benefits) (Muhl et al., 2020; Thornton, 2021).

The Tsitsikamma National Park MPA is the oldest in South Africa and is managed by the South African National Parks (Figure 2). Created in 1964 under the Apartheid regime, it disregarded local communities' rights to the coast, in some cases even removing or restricting access with no consultation, leading to a public dispute since its creation. The Tsitsikamma MPA was proclaimed a strict "no-take" zone from 2000 following the collapse of some South African fishing stocks (Chadwick et al., 2014). In December 2016 the Tsitsikamma MPA changed from a "no-take" MPA to a partially open protected area with the aim of finally addressing historical exclusion and to provide managed access and benefits to adjacent communities. The rezoning allowed managed access to the MPA for recreational fishing by registered local community members in controlled areas and for predetermined quantities of fish (DFFE, 2016). From a governance perspective, the 2016 MPA zoning process has been challenging because of the speed in which it took place (five days) and the lack of stakeholder

consultation, which has consequently led to a range of issues and ongoing conflicts (Lombard et al., 2019).



Size of area & location	Socio-economic features	Responsible authority & governance context	Information on zoning / zoning types
Situated on the border of the Western and Easters Cape Provinces in southern South Africa, with a total area of 186 km^2	Koukamma municipality: 40,663 inhabitants. Average household income is between USD 1384 to USD 2697 per month. Unemployment in the area is at 50%. Reliance on natural resources	South African National Parks under the Department of Environment, Forestry & Fisheries (DEFF)	No-take (80%) with three coastal control zones (20%) restricted to registered community members only

Figure 2. Overview of Tsitsikamma National Park MPA and the zoning area in the Indian Ocean (adapted from Muhl et al., 2020)

Literature suggests that the long-term effectiveness of MPA practices could benefit from applying more inclusive and participatory management (Lombard et al., 2019). We therefore examine the case of Tsitsikamma National Park MPA using Ostrom's CDP and propose an alternative systemic design approach based on social commoning principles.

3.2. Methodology

The activity of designing is fundamental to being human, as 'everybody designs' (Manzini, 2017). As humans, we use our ability to see a situation and envision how it could be improved to meet a set of needs through diffuse (performed by everybody) or expert (performed by trained designers) design (Manzini, 2015).

The traditional perspective towards natural resources has been to govern them through top-down or bottom-up approaches largely mandated by state institutions with the focus on designing the hierarchical governance organisation (Holling and Meffe, 1996, Lockwood *et al.*, 2010). Increasingly, there is a recognition that better socio-ecological outcomes are attained through the involvement of the local community that is embedded within the ecological environment (Bandyopadhyay *et al.*, 2009, Berkes, 2004, McDermott and Schreckenberg, 2009). This involvement may take a participatory approach, co-management or community

stewardship of the resource in a multi-stake holder setting where the agency of different actors in designing the governance mechanism depends on the model chosen (Bennett *et al.*, 2018). Social commoning proposes a mechanism of natural governance that is inclusive of the needs of different stakeholders and driven by consensus, thereby including all human and non-human actors in a collaborative design process. Experts may be engaged by any of the actors involved to improve their capacity to design governance systems or articulate the interests of non-human actors (Puskás, Abunnasr and Naalbandian, 2021).

The analysis of the case of Tsitsikamma MPA is an exercise in collaborative design to define the characteristics of the governance system that may emerge using the principles of social commoning. We approach the analysis with an enumeration of all ocean system stakeholders impacted by MPAs based on an extensive literature review (Tranfield, Denyer, & Smart, 2003). Using a hybrid mapping approach consisting of a design-led empathy mapping exercise (Ferreira, 2015), informed by the Prosocial collective matrix method (Atkins et al., 2020) and a systematic stakeholder mapping process (Zingraff-Hamed et al., 2020) as key frameworks for resolving arising conflicts, we examined the interests, goals, and institutional expectations of all MPA system actors (see Figure 3). We then compared Ostrom's design principles with current management practices in the Tsitsikamma MPA. Having assessed the governance structures of the Tsitsikamma MPA, we explore an alternative vision for designing them based on a commoning approach led by Ostrom's CDP. Reconceptualizing governance practices of the Tsitsikamma MPA through a commoning lens, highlighted the potential of using the Ostrom framework as part of early design interventions that aim at improving stakeholder cooperation despite stark differences in interests. Mapping stakeholder interests allowed us to identify a set of common interests that may translate into shared understanding and the formation of a group purpose. Permitted behaviours and negotiated goals may then emerge from this shared vision and common objectives.

Conceptually applying Ostrom's CDP to the case of the Tsitsikamma MPA inspired a first attempt of translating them to the context of systemic design through a set of questions that could eventually support designers in driving environmental stewardship and collectively-governed system solutions (Bennett et al., 2018). While Ostrom's principles don't prescribe just how to go about the *commoning* process, they can offer a strategic lens for designers to orchestrate their activities around, and design the conditions that underline more sustainable governance practices. In a multi-stakeholder collaborative setting based on commoning principles, the eventual governance design emerges as a result of collective decision-making and self-organisation (Cundill and Fabricius, 2010). We conceptually apply each CDP to the Tsitsikamma MPA below to demonstrate their use as strategic heuristics for design practice moving forward.

4. Applying Ostrom's Core Design principles to shared governance and management practices

4.1 Assessing the current state of the Tsitsikamma MPA

Retrospectively tracing Ostrom's principles in Tsitsikamma's MPA reveals little evidence of their presence in current management operations. We find that the ways the MPA has been set up, run, managed - or as one might argue *designed* - caused many of the prevailing governance challenges. These include failures to translate regulatory policies into tangible action, or even make policy decisions widely understood. Consequently, and unsurprisingly, the policies set out have not been successful. In addition, best practices and legal requirements on consultation and cooperation have not been respected (Lombard et al., 2019). The overall lack of participation and cooperation amongst the important system actors, including the disregard for the ocean or marine life as key ocean stakeholders, has led to a range of issues and ongoing conflicts affecting both conservation goals and community wellbeing (Muhl et al., 2020). Overall, we found that the Tsitsikamma MPA used few, if any, of Ostrom's CDP, leading to a series of governance failures and pitfalls across MPA actors (see Table 1).

Table 1. Mapping the application of Ostrom's design principles in current MPAs

Core Design Principle	Tsitsikamma (TNP) MPA
1. Clearly defined boundaries	Unclear boundaries & purpose A critical challenge confronting marine conservation involves the effort to balance multiple objectives – social, economic, and ecological – and yet there is significant uncertainty amongst adjacent communities as to why certain objectives are prioritised. MPA objectives and boundaries have long been a source of confusion, resulting in local people perceiving the managing authority as failing to account for their own needs (Thornton, 2021; Evans, 2021; DFFE; SANBI; NDP2030, No date; Jarre et al., 2018)
2. Proportional equivalence between benefits and costs	Uneven distributions The implications of losing direct access to the coast for adjacent communities has been profound (Faasen and Watts, 2007). Many community members report a significant loss of livelihoods and an impact on food security (Muhl, 2016), calling into question the perceived legitimacy of zoning efforts all together (Thornton, 2021; Global Initiative Against Transnational Organized Crime, 2021; Jarre et al., 2018).
3. Collective-choice arrangements	Lack of involvement The way in which MPA actors participate in zoning processes has a significant influence on zoning impact and effectiveness. Stakeholder engagement has consistently been found to be

	key for the success of an MPA (Bennett and Dearden, 2014). However, participation and consultation did not occur at the MPA, despite the importance of zoning and access regulations for adjacent communities. Collective choice mechanisms could not be established as a result and to date, no explanation has been given as to how the stakeholder comments were addressed during the MPA decision-making processes (Lombard et al., 2020; Gwebani, 2021.).
4. Monitoring	Top down Monitoring regulations have been set top down by the state ministry of environmental affairs with no involvement of the communities impacted (Naidoo, 2020).
5. Graduated sanctions	Top down Suspensions, cancellations of permits and penalties have been defined by the state ministry of environmental affairs, including heavy fines and imprisonment. South African National Parks is the official management authority actioning potential sanctions (Thornton, 2021; WWF; DFFE, 2021; Jarre et al, 2018).
6. Conflict resolution mechanisms	Lack of mechanisms MPA practices failed to implement any conflict resolution mechanisms. Zoning process failed to incorporate the knowledge of local fishers about the status of stocks or levels of fishing effort, undermining the opportunity to clarify the conservation benefits behind the original zoning initiative and exacerbating feelings of mistrust WWF; DFFE, 2021.
7. Minimal recognition of rights to organise	No agency Many community members directly impacted by the MPA have been excluded all together, losing any sense of agency over their own livelihoods. As a result, many people voiced a sense of loss of identity and culture (Global Initiative Against Transnational Organized Crime, 2021) .
8. Nested enterprises	Siloed We found no evidence of polycentric systems or an attempt to understand the MPA as an interdependent system connected to many other systems (Oceans Economy Masterplan, 2022; DFFE, 2019; Chadema & Joseph, 2017)

4.2 Re-conceptualizing governance practices of the Tsitsikamma MPA based on social commoning

Having assessed the current governance structure of the Tsitsikamma MPA using Ostrom's CDP, we subsequently explore an alternative vision for ongoing management practices of the MPA based on social commoning. This begins with the identification of stakeholders in the MPA and their goals, interests, and expectations, described in Figure 3.

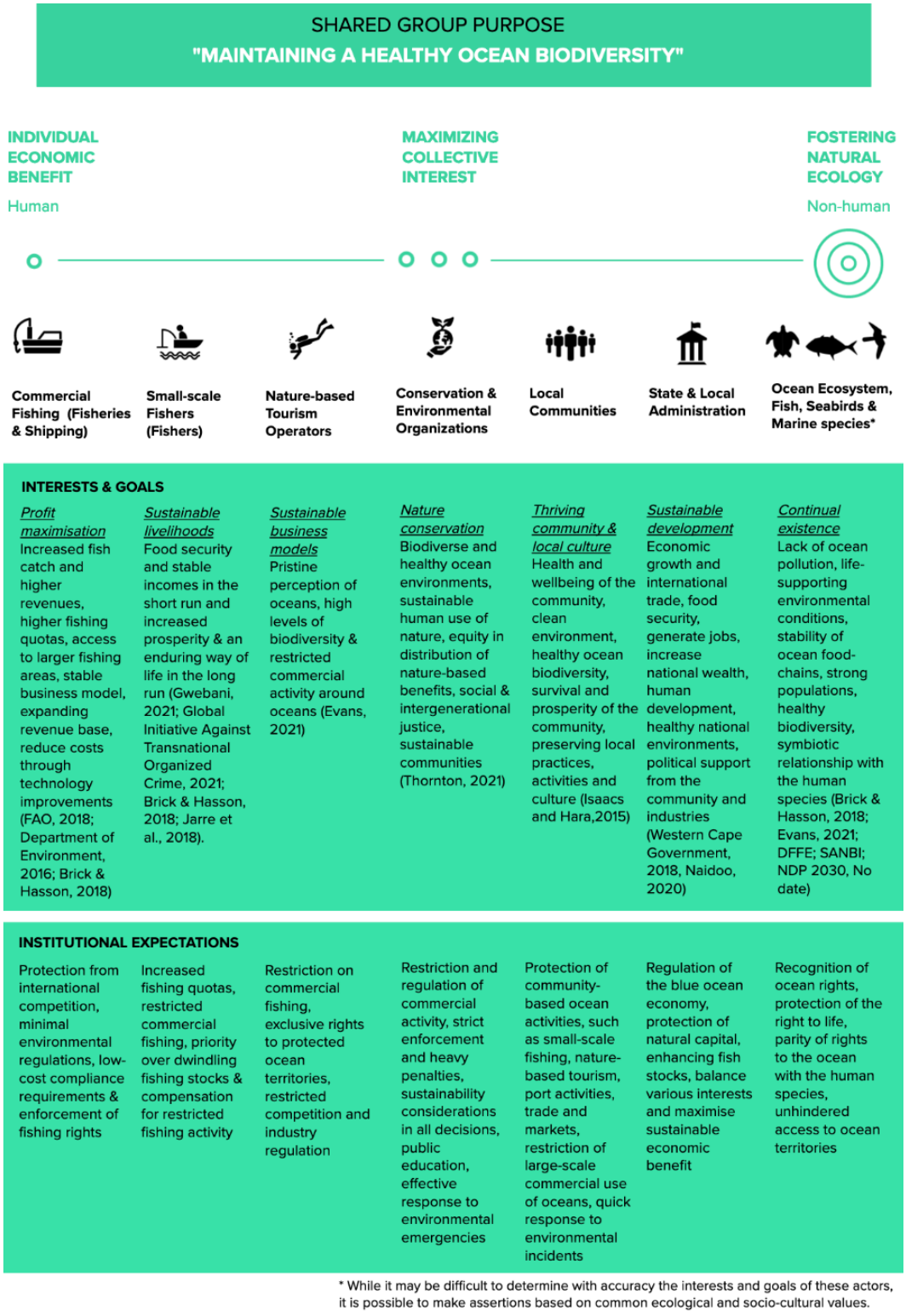


Figure 3. Mapping MPA system actors, interests & goals, Authors' own illustration, 2021

We proceed to describe the features of the governance system by applying the CDPs to the Tsitsikamma MPA, detailed in Table 2 below.

Table 2. Application of Ostrom's design principles to create an alternative governance system using the social commoning approach in a co-design context

Core Design Principle	Alternative governance system for Tsitsikamma (TNP) MPA
1. Clearly defined boundaries	Common identity & clear purpose Understanding actor relationships, goals, interests, and motivations is key to the process of identity formation and conflict resolution. In the case of MPA, individual objectives, such as having healthy seas, creating viable and growing fish stocks and supporting the diversity of human activity, may form the basis for creating a shared understanding of needs followed by a vision such as 'Maintaining a healthy ocean biodiversity'. Permitted behaviours, boundaries and a set of recognisable objectives can further be derived from this vision.
2. Proportional equivalence between benefits and costs	A sense of fairness Stakeholders need a sense of equity in distribution of rights and responsibilities. For the MPA, existing fishing quotas need reform with recognition of diverse interests to ensure for example that small-scale fishers and local communities obtain sustained livelihoods or nature-based tourism operators have exclusive access to certain ocean territories. A platform to openly disclose individual interests and discuss grievances, could increase transparency, recognise multiple perspectives, and achieve a compromise for a more even distribution of benefits and costs.
3. Collective-choice arrangements	Inclusive decision-making Consensus-based and inclusive processes can lead to perceptions of increased fairness and enhance acceptability of decisions. MPA long-term goals could form the foundation for a set of key criteria that can guide collective decision-making. Through an iterative process conflicting objectives can be considered and build on equity and inclusiveness. MPA may establish emergency procedures and empower groups of actors, ex-ante to deal with time-critical events such as dealing with local pollution incidents
4. Monitoring	Monitoring agreed behaviours Ostrom's work suggests that monitoring is often better performed by peers and integrated into routine group interactions (Atkins et al., 2015). Consequently, MPA actors, such as environmental organisations, local communities, and fishers, could be given agency to monitor fishing stocks, ocean pollution and adherence to fishing quotas. This principle will facilitate the design of structures for all MPA actors to be able to monitor the state of the common and adherence to agreed behaviours.
5. Graduated sanctions	Fulfilling responsibilities and sanctioning

	Using a facilitated discussion mechanism (for instance by a systemic design practitioner), actors could determine a system of graduated sanctions and rewards for positive behaviour. Collectively and inclusively agreed upon by MPA actors, damages and benefits to both human and non-human actors can be weighed up in equal terms. As such, the group may decide a preferred use of damage redressal measures for instance (clean-up after a pollution event), or voluntary measures to avoid future digressions (proactive technological changes and improving fishing methods) ahead of hefty monetary fines.
6. Conflict resolution mechanisms	Fast and fair conflict resolutions Conflict resolutions represent an endogenous and positive process leading to ongoing identification of ways to achieve a desirable human/non-human ecosystem balance. This principle allows the group to design mechanisms and procedures for quick and fair conflict resolution within the MPA. Conflicts can be turned into a positive operational function, involving the participation of other commons, technical experts, external arbitrators, or judicial institutions in this process.
7. Minimal recognition of rights to organize	Agency & self-organisation If existing rules lead to ocean deterioration or decline in fish stocks, violating interests of these non-human actors, then the MPA commons could assess and redesign stakeholder rights to achieve its long-term goals. Having agency to self-organise can allow the MPA commons to review its overall purpose, rights, rules, and procedures and change these at any point through the process of collective decision-making. The right to self-organise and govern recognized within the legal structures for oceans protection
8. Nested enterprises	Network of commons Ocean commons across SA may benefit from a facilitated design of a polycentric governance structure of individual ocean commons, allowing them to govern themselves and working collectively to tackle bigger, cross-related challenges. The state may function as a coordinating entity, being part of multiple commons, and adopt the polycentric governance structure of the commons as the national governance mechanism for oceans

5. Discussion

Based on the case study analysis above, we reflect broadly on how a social commons approach could conceptually inform a systemic design practice moving forward:

5.1 Commoning to identify leverage points for multi-stakeholder systems change

Commoning represents an alternative method for designers to organise and negotiate access to systemic resources beyond public and private models using collaborative arrangements amongst system actors. It captures the entirety of stakeholder population associated with a resource in an inclusive fashion that includes the participation of both human and non-human actors. In designing intentional processes of mutual understanding and cooperation, commoning can help in identifying leverage points for multi-stakeholder systems change. Firstly, since the governance system emerges because of ongoing interactions between system actors, it is able to capture the complex interlinkages in the biophysical, social and economic spheres using a relational system mapping approach. Secondly, it goes beyond a narrow economic assessment of costs and benefits and can capture unquantifiable value of ecosystem services. For instance, in the case of the Tsitsikamma MPA, applying the CDPs shows that the system has the potential to move away from competitive and selfish behaviours towards a shared purpose and decision-making rules, and conflicts can be accommodated through an inclusive process of self-organisation. The process of self-organisation, if designed well, can identify leverage points for stakeholder engagement, commitment, and participation as places for system intervention (Meadows, 1999).

5.2 Commoning to nurture systemic cooperation beyond co-design

Ostrom recognized that when it comes to achieving successful cooperation, top-down control mechanisms have a limited effect. In contrast, Ostrom demonstrated that when certain design principles are implemented within a system, cooperation tends to thrive without the need of external regulation, and that this systemic cooperation leads to the emergence of successful commons. Human cooperation is not only central to successful group outcomes but can be understood as a complex adaptive system that is constantly evolving (Ostrom, 1990; Atkins et al. 2015; Luhmann, 1995). As such, cooperation requires more careful consideration and designing as part of the very design process. Adapting the CPDs for establishing successful collaboration could evolve existing co-design and PD frameworks towards establishing more cooperative relationships, both as an end objective and as a means of achieving system objectives. By designing for commoning, designers could shift their focus away from problem-based thinking towards identifying systemic interventions that strengthen human/non-human relationships and influence mental models towards increased collaboration.

5.3 Commoning to design system conditions ahead of outcomes

Design practice can help to develop interventions at multiple levels of a system, oscillating between the whole and the element in the design process (Schön, 1983). As such, system design approaches bifurcate between approaches that aim to design entire systems and those that aim to strengthen relationships while intervening in systems (Checkland, 1999). In highly complex societal systems, however, there are limits to predictability and control.

Therefore, instead of designing systemic solutions with specific outcomes in mind, approaches that acknowledge limits to predictability and instead aim to cultivate systems change, have come into focus (Birney, 2014). Built on living systems theory, they provide an understanding of how human interactions impact the emergent behaviour of the social system as a whole (Sevaldson and Jones, 2019, Luhmann, 1995). Social commoning is one of these approaches. It influences the broader system by creating the conditions for emerging, cooperative behaviours to unfold in the form of broadly defined communication structures and governance processes. All commons self-organise, eventually discovering their own structures, operating procedures, and outcomes, and consequently, it might not even be the designer's task to be designing any of these outputs in the first place (Smith and Stevens, 1996). Instead of focusing on designing system outcomes, then, designers might be able to use Ostrom's CDPs to enable systemic conditions in the form of relationships, interactions, and cooperation, and, ultimately, design for them.

5.4 Systemic design starter questions

Beyond highlighting areas of contribution for systemic design, the case study analysis also highlights potential challenges in applying Ostrom's CDP to natural resource governance in practice. For instance, contextual factors might require for the design principles to be adapted to suit individual situations better (Cox et al., 2010). This aligns with Ostrom's original interpretation of the CDPs which argued the need for auxiliary principles that better reflect and directly respond to specific contexts (Wilson, Ostrom, Cox, 2013). With this in mind, we extract a set of accompanying questions for each principle to guide more intentional design activities based on a social commoning approach (Figure 4).

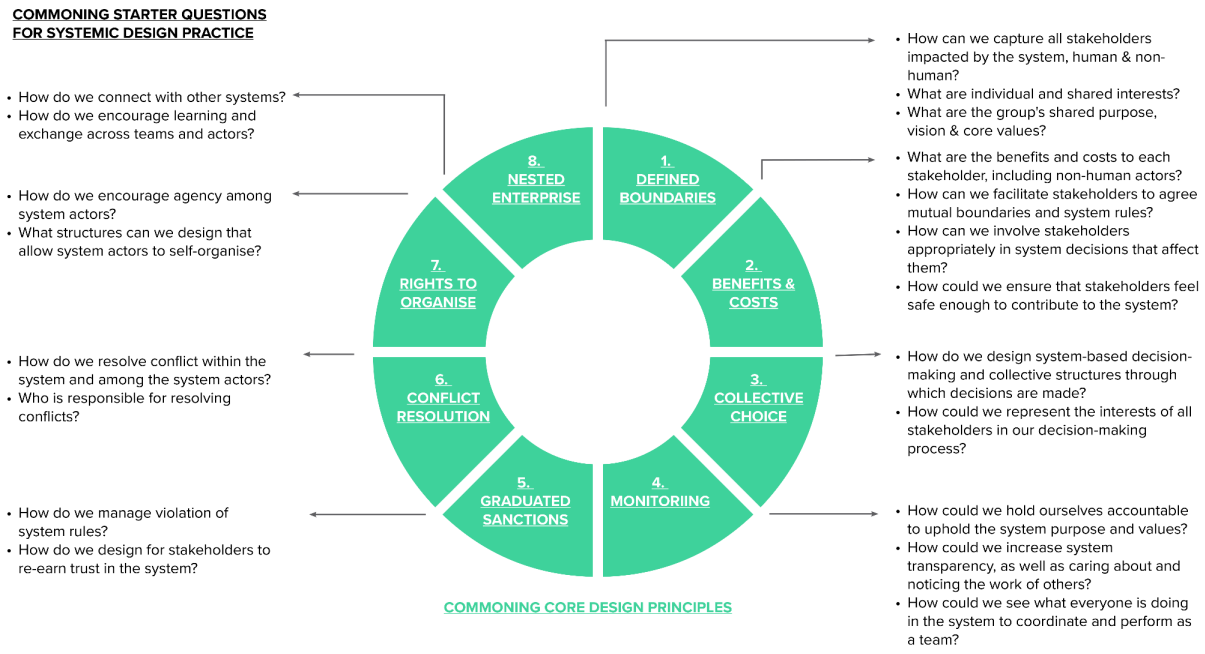


Figure 4. Starter questions for using commoning in the context of systemic design, Authors' own illustration, 2022

6. Conclusion

Design has a crucial role to play in finding and utilising new approaches to our current economic models of value production in society. One approach is social commoning which can offer a valuable transitional perspective for design to adopt as it tries to adapt to the creation of a new sustainable order. Our discussion shows that designing based on commoning has the potential to shift the designer's focus from a problem and solution-led approach towards an infrastructure-based practice that embraces systemic conditions ahead of fixed outcomes. We demonstrate this issue by expanding the boundaries of current co-design practices into key learnings from the commons and using Ostrom's design principles to guide the design of long-term cooperation among diverse actors with fundamentally different interests, to enable a more equitable, inclusive, and effective way of working across stakeholder groups. Using the principles as a design heuristic in an emerging systemic design practice can help to create and sustain governance approaches, that designers might be able to facilitate. This can change the starting point for design as key questions on how processes of identity formation and self-governance are designed come into focus, including how the rules and practices for cooperation and shared use of resources can be designed in fair, inclusive and sustainable ways.

A commons perspective highlights the aliveness of systems, how systems are realised through everyday interactions between people, institutions, and resources and how they ought to be designed as such. Commoning thus underlines important questions around designers' contribution to systems level change, and to which extent it is the designer's role to create system solutions, versus systemic conditions for system actors who, themselves, define and create their own future solutions. The commons are already here, and so are early versions of a changing value system. Now time has come for designers to embrace design for commoning as a means to achieve alternative systems by design.

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