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# Evolutionary Perspectives on the Commons: A Model of Commonisation and Decommonisation

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**Abstract:** Commons (or common-pool resources) are inherently dynamic. Factors that appear to contribute to the evolution of a stable commons regime at one time and place may undergo change that results in the collapse of the commons at another. The factors involved can be very diverse. Economic, social, environmental and political conditions and various drivers may lead to commonisation, a process through which a resource is converted into a joint-use regime under commons institutions and collective action. Conversely, they may lead to decommonisation, a process through which a commons loses these essential characteristics. Evolution through commonisation may be manifested as adaptation or fine-tuning over time. They may instead result in the replacement of one kind of property rights regime by another, as in the enclosure movement in English history that resulted in the conversion of sheep grazing commons into privatized agricultural land. These processes of change can be viewed from an evolutionary perspective using the concepts of commonisation and decommonisation, and theorized as a two-way process over time, with implications for the sustainability of joint resources from local to global.

**Keywords:** commons; commonisation; decommonisation; evolutionary perspective; excludability; subtractability



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## 1. Introduction

Policy and governance regarding environment and resources are never static, but are subject to various kinds of changes over time. The governance of shared resources (commons or common-pool resources) offers some particularly interesting insights regarding the use of evolutionary perspectives to understand how processes of change occur. This article follows on our original paper on commonisation and decommonisation [1], and a new book of detailed cases and analysis, Making Commons Dynamic [2]. Commonisation is understood as a process through which a resource is converted into a joint-use regime under commons institutions and collective action. Conversely, decommonisation is a process through which a commons loses these essential characteristics. Here our objective is to analyse commonisation/decommonisation processes from an evolutionary perspective, to develop a model, and explore interdisciplinary aspects of commons dynamics for sustainability. In this section, we first establish commons terminology and in the next section, provide examples of commons dynamics from various parts of the world that lead to the development of our model. Next, we explore evolutionary perspectives on the commons from Hardin to Ostrom, the interdisciplinary evolution of commons scholarship, and the prospects ahead.

Common pool resources have traditionally included ecosystems that are seen as depletable and renewable. A defining characteristic of many of these resources is that they are shared or jointly used. Therefore, it is difficult to limit potential users, and at the same time, use by one reduces the quantity or quality available to others. Commons include

forests, fisheries, wildlife, grazing areas; earth-system components, such as groundwater basins, the atmosphere and the oceans; and products of civilization, such as irrigation systems, urban greenspaces, and shared information and knowledge systems.

Commons are formally defined as those resources in which the exclusion of beneficiaries through physical and institutional means is especially costly, and exploitation by one user reduces resource availability for others, known as principles of excludability and subtractability [3]. These two principles are of key importance because property rights to commons hinge on them. Commons are resource systems regardless of the property rights in effect. Commons scholars have defined four kinds of ideal, analytic types of property-rights regimes: open access, private property, common property, and state property. Changes in these property-rights regimes are crucially linked to commonisation and decommonisation processes. Sustainability is possible under three of the four regimes, although in practice, many resources are held in overlapping combinations of these regimes [4,5]. The one regime that does not work is open access, the absence of property rights, which leads to the well-known tragedy of the commons (Box 1).

**Box 1.** Glossary of the key terms used in the commons literature. Source: Adapted from [4,6,7].

**Adaptive management (or governance):** An approach to management, under conditions of high uncertainty and low controllability, that relies on experimentation and learning over multiple cycles. Learning-by-doing.

**Collective action:** Any action taken together by a group of people whose goal to enhance their situation and achieve a common objective.

**Co-management:** Sharing management power and responsibility between the government and resource users. Adaptive co-management is co-management that has had the benefit of learning-by-doing

**Common-property regimes** are those in which resource rights are held by an identifiable community of interdependent users who can exclude others.

**Commons (common-pool resources)** are those resources in which exclusion of beneficiaries through physical and institutional means is especially costly, and exploitation by one user reduces resource availability for others

**Complex adaptive systems:** A network of components and interrelationships that cannot be described by a few rules. Their structure, order and function emerge from the interactions among diverse components.

**Excludability:** The difficulty of excluding potential users through physical and institutional means. It pertains to the question of who is and who is not a legitimate user of a resource.

**Institutions:** The rules, norms, rights, culture and beliefs that shape the behaviour of actors in their relationships with one another and with nature. Rules-in-use.

**Open access** is the absence of well-defined property rights. Access to the resource is unregulated, and the resource is a free-for-all.

**Private-property regimes** are those in which property rights are held by an individual or corporation who can exclude others. Applicable to those resources in which the costs of exclusion are relatively low.

**Property-rights regimes:** Commons can be held under four property-rights regimes: open-access, private-property, common-property, and state-property regimes. These are ideal, analytic types. In practice, many resources are held in overlapping combinations of these regimes

**Social-ecological systems:** Integrated complex adaptive systems that include social (human) and ecological (biophysical) subsystems in a two-way feedback relationship.

**State-property (government property) regimes** are those in which resource rights are vested exclusively in a government that can regulate their use and make decisions regarding access and allocation.

**Subtractability:** Refers to the idea that exploitation by one user reduces resource availability for others, and deals with the rules of resource distribution and allocation among users.

**Tragedy of the commons:** A paradigm formulated by Garrett Hardin (1968) to the effect that the users of commons are caught in an inevitable process that leads to the destruction of the resources on which they depend. See Open access.

## 2. Commonisation and Decommonisation Dynamics

Governance of shared resources is inherently dynamic, with changing property-rights regimes on a time scale of months to decades. Factors that appear to contribute to the formation of a commons regime at one time and place may result in change at another. There are diverse possibilities for change, responding to economic, social, environmental and political conditions, and various drivers. These changes may be manifested as adaptation or fine-tuning over time, as in Japanese village commons [8]. Alternatively, they may result in the replacement of one kind of property rights regime by another, as in the enclosure movement in historical England that resulted in the conversion of animal grazing commons into privatized agricultural land [9]. These processes of change are important to understand how commons can be governed as common property in the long run.

Commons literature is interdisciplinary [5,10] by necessity, as the study of commons involves the consideration of social systems as well as ecological systems. Thus, the study of commons deals with social-ecological systems that include social (human) and ecological (biophysical) subsystems in a two-way feedback relationship. This means that human actions affect biophysical systems, biophysical factors affect human well-being, humans in turn respond to these factors and so on. Social-ecological systems function as coupled, integrated, interdependent, and co-evolutionary systems [11,12].

Social-ecological systems are complex adaptive systems. The study of commons is anything but Newtonian in worldview, in which the universe is considered orderly, mechanical and predictable by mathematical rules. By necessity of their complexity, social-ecological systems are seen as being made up of interconnected dynamic relations, with interactions that are adaptive, unpredictable and full of surprises. This marks a paradigm shift in the way social-ecological systems, and nature in general, are conceived —away from a Newtonian worldview and toward a complex adaptive systems worldview [13], which is an extension of von Betalanffy's general systems theory [14].

Complexities may also be seen in the changes and evolution of property-rights regimes in commons. Historically, the destruction of local commons was often associated with colonial policies. The creation of open access regimes has been a favoured colonial policy to turn resources into commodities by removing local controls on exploitation. This has been seen in Oceania [15], Canada's Pacific salmon fisheries [16], and many chapters of Nayak [2]. For example, the decommonisation process and the uncontrolled hunting of vicuña (Vicugna vicugna), a species related to llama, that resulted in the near-extinction of the species followed the Spanish conquest of the Andean Region [17]. Such colonial policies do not apply only to living resources. In Yucatan, Mexico, cenotes (sinkholes) were important for water management in an area that lacks surface water; they were considered sacred in Mayan cosmology. With colonization, they became sources of water-as-commodity for agricultural and similar uses, and later waste disposal sites, losing all but a shadow of their sacredness [18].

However, other cases of historical commons management have different and more positive outcomes. Galappaththi and Galappaththi [19] have shown how coastal commons use has been transformed into shrimp aquaculture based on cooperatives. In northern Pakistan, the traditional local institutions for land and forest management have been reinvented and transformed into a formal institution, Shimshal Nature Trust [20]. A common feature of these examples of commonisation is that they do not involve colonial powers. In some cases, decolonisation may be a factor, as in the apparent fragile success of vicuña management for their valuable fiber, under a cooperative controlled by the local Indigenous people [17].

A common but not universal feature of recent decommonisation cases is that many of them involve privatisation and other impacts of neo-liberal policies and practice. While framed in terms of sustainable development, the recent Blue Economy initiatives to privatise ocean resources to increase harvesting of seafood and other products for profit run the risk of undermining the food security and livelihoods of small-scale producers, along with their common-property systems. Blue Economy initiatives of governments and large

corporations, likely driven by profit and not by sustainability, are being countered by Blue Justice initiatives [21].

A good example of privatisation's impact is the fishery in Chilika Lagoon on the Bay of Bengal. This large lagoon once supported nearly half a million people whose livelihoods depended on small-scale fisheries. Much of the lagoon is shallow and has protected waters, ideal conditions for aquaculture. Starting in the 1970s, international markets developed for large shrimp (prawns), which previously had little value in India. Profit motives drove politically powerful aquaculture investors into the lagoon to grow highly profitable tiger prawn (Panaeus monodon). This started the displacement of small-scale fishers and the destruction of their commons arrangements [1,22].

Other recent cases signal the existence of a diversity of drivers for decommonisation. In the Gulf of California, Mexico, the profit motive was the driver in Comcaac (Seri) fisheries, with outside buyers turning fish into a cash crop and playing Indigenous family groups against one another, generating tension between private (family) benefits vs. community benefits [23]. Some cases show multiple drivers at play. In northern Pakistan, the establishment of protected areas was a major driver of decommonisation. In addition, the central government asserting itself and establishing a state-property regime also had significant impact [20]. Decommonisation processes have a way of cascading through resource systems. In the Eastern Caribbean, coastal resources, including beaches and sand, have been decommonised in building for and allocating space to tourism [24].

In the complicated story of Comcaac use of coastal resources in the Gulf of California, decolonisation and self-determination were the major drivers for commons institutions and collective action. The case is complicated because there were factors that drive commonisation in play simultaneously with those that drive decommonisation processes. One important source of tension was that family cooperatives (driven by profits) were competing with the tribal Seri Cooperative in a context in which commons were more than resources and involved other values and considerations [23]. The case is significant because it so clearly shows the two processes occurring simultaneously, but it is not unusual. The case is only one of the six chapters in a section on commonisation/decommonisation as parallel processes [2].

## 3. The Commonisation–Decommonisation Perspective and Model

The dynamics associated with the commons lead to a search for a theory that is helpful to understand commons as an evolutionary process, albeit one that responds with skips and jumps to a myriad of drivers, and one characterized by interactions that are adaptive, unpredictable, and full of surprises. Case studies in Nayak [2] and elsewhere inform the development of such a model, starting with the ways in which the principles of excludability and subtractability are successfully operationalised (commonisation). This refers to a process in which a resource comes to be governed under a common-property regime, involving commons institutions and collective action. This facilitates the creation and maintenance, and sometimes the revival, of the commons as jointly used resources.

The opposite process refers to the weakening or collapse of commonisation processes (decommonisation). This may involve varying levels of loss of excludability and subtractability as in colonisation, along with the institutional arrangements and collective action previously in place. For example, the creation of open-access conditions leads to the challenges associated with exclusion of potential users. Loss or weakening of collective action and commons rules-in-use creates a challenge for resource distribution and allocation to avoid exploitation by one user reducing resource availability for others [6].

One thread of the evolutionary perspective on commons pertains to the questions about who is included and who is excluded from the commons, and who gets what, how much and when. Given the multidimensional complexities which commons historically inherit, these excludability and subtractability challenges remain real on an ongoing basis. Having institutions, norms and rules that cannot potentially exclude users and must ensure that use by one user does not affect resource availability for others is not a onetime task.

These questions are addressed anew every time they emerge without resort to one-size-fits-all or singular approaches or the aspiration to resolve them for once and for all. Fluctuating strengths, weaknesses, dynamics, and ups and downs related to excludability and subtractability are ongoing challenges for commoners to engage in processes of negotiation, dialogue and collaborative decision making. The complexities, uncertainties and elements of surprise associated with commons governance warrant openness to negotiate claims and counterclaims. This requires flexibility, space, opportunity and incentive for the commoners to collaborate, discuss, and collectively respond to challenges. In reality, the conundrum posed by excludability and subtractability warrants that commons be seen as a process and not as an end [25] and provides a reflection of the evolutionary dimensions inherent in matters pertaining to commons.

Figure 1 provides a model to explore commonisation and decommonisation processes using an evolutionary perspective. Both processes move along a continuum and are potentially two-way in nature. Their directionality, i.e., either towards commonisation or decommonisation, is influenced by prevalent social, cultural, economic, ecological and political history and traditions. The impacts of various internal and external drivers of change are multi-level from local to global, as in the privatization of common grazing lands at one end, to increasing global market demand for a particular resource at the other. These factors or drivers operate only at certain times and places depending on the circumstances; they are context-specific and scale-dependent. The multi-level nature of the drivers is indicated by the central triangle in Figure 1.

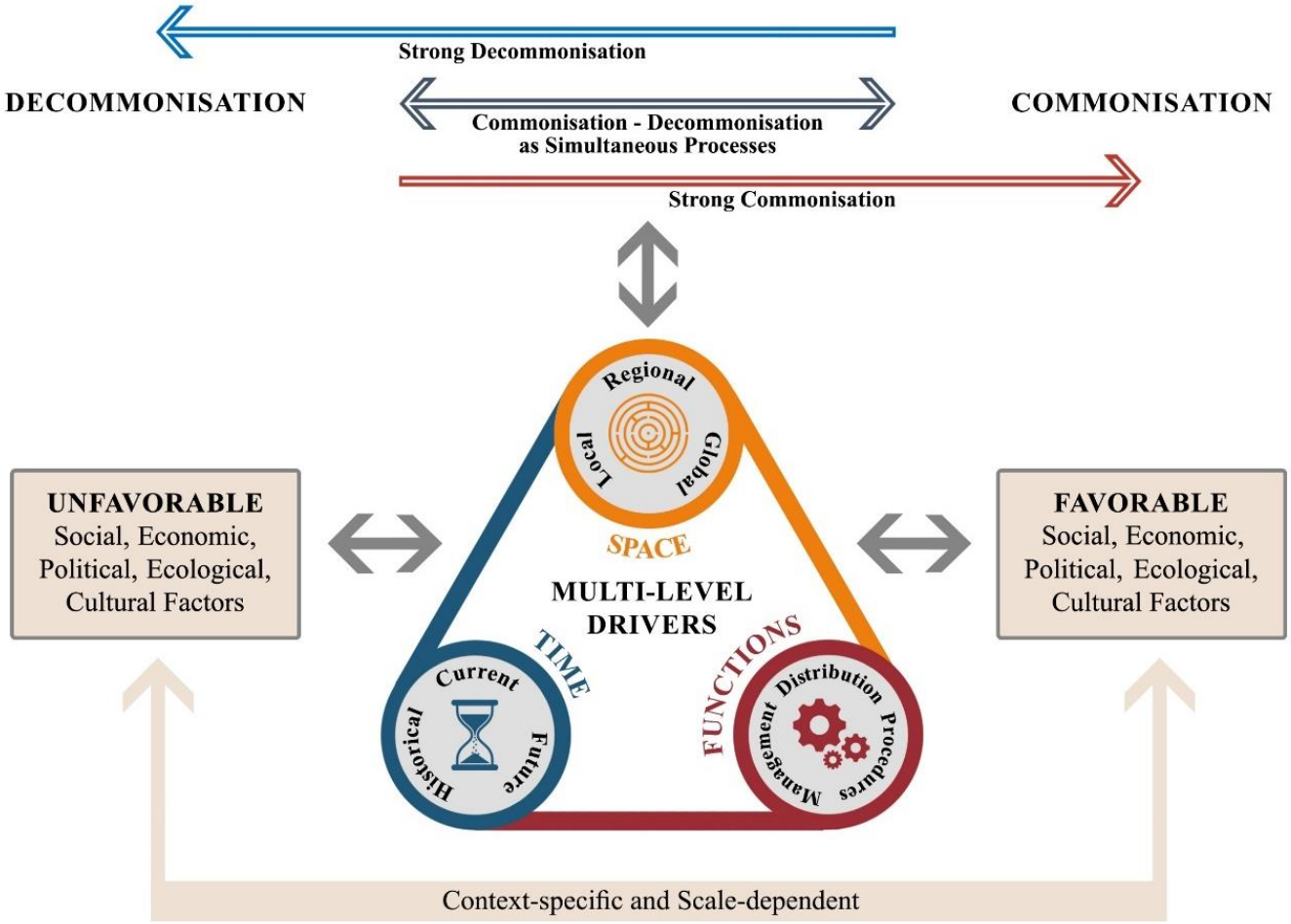


**Figure 1.** The commonisation–decommonisation perspective. Source: Nayak and Berkes [25] (p. 7).

Figure 1 delineates three possible governance outcomes with regard to commonisation–decommonisation processes, shown by the top three arrows. First, the prevailing commons

institutions and collective action arrangements may be robust enough to drive a resource towards processes of commonisation, indicated as "favourable" conditions in Figure 1. Second, commons or resources under common-property regimes could possibly fall back into a process of decommonisation due to problems associated with the two commons principles and arrangements, indicated as "unfavourable" conditions in Figure 1. Third, as the two processes are not mutually exclusive, commons may be undergoing both processes simultaneously. In this case, some elements of the commons may be undergoing commonisation, whereas other elements are subject to decommonisation challenges, as in the Seri fisheries case [23].

Fluctuations in the realisation of excludability and subtractability principles put commons on a two-way pathway. Appropriate governance mechanisms, principles, institutions and interactions in relation to the context-specific and scale-dependent factors ultimately guide the processes of commonisation and decommonisation. Governance arrangements help maintain commons as common property and ward off the challenges posed by decommonisation. We argue that commons may be considered a stage for complex evolutionary processes. On their own, commonisation and decommonisation represent unidirectional evolutionary processes. Both running together, but in opposite directions, may signify a co-evolutionary process if the two processes are connected by mutual feedbacks. These three processes together provide three possible evolutionary trajectories to engage in new ways of thinking about commons. The model is dynamic and evolutionary.

## 4. Evolutionary Perspectives on the Commons

As the previous sections illustrate and theorize, commons can change identity over time; they take time to build and can become weaker or stronger. Thus, the study of com-mons requires an evolutionary understanding of governance processes, as the various property rights regimes for commons are governance arrangements. Governance is never entirely static or stable, nor does it change randomly. As every governance path is unique, commons regimes will be unique, even if the organizational structure in one area may be similar to that in another. We have made the argument that what evolves or changes are the conditions that affect the two primary characteristics of commons: excludability and subtractability [3,6]. How these characteristics change, in turn, affects the directionality of commonisation/decommonisation.

Why commons governance evolves is another complex question. In this section, we approach this question by first considering some of historical background of the issue and the reasons for considering cooperation among commoners possible. Second, we provide a sketch of the evolution of commons scholarship towards an interdisciplinary understanding of the complexities of the commons dilemma.

### *4.1. From Hardin to Ostrom*

The idea of the commons as a dynamic and evolutionary process is based on a number of conceptual developments. In this section, we step back and consider two of the most important ones in this regard: the critique of the tragedy of the commons paradigm, and re-building commons theory from the ground up.

No discussion of commons is ever complete without addressing the tragedy of the commons. In a very influential and much-cited paper, Hardin [26] framed the commons issue as a tragedy, in the sense of a classical Greek tragedy: users of commons are caught in an inevitable process that leads to the destruction of the resources on which they depend. Hardin invoked a medieval English village commons in which a number of herders graze their cattle. Each herder, as a rational decision-maker, has incentives to add one more cow to the herd, and the same logic goes for all herders—until the carrying capacity of the grazing area is eventually exceeded. Each herder receives all the benefit from his/her extra animal but would bear only a fraction of the cost of overgrazing. Thus, individual rationality leads to collective tragedy for all.

Hardin's paradigm suggested that all commons are destined to be overexploited, and it was used as a rationale to extend the coercive powers of the state, or to privatize re-sources. However, many case studies and syntheses published mainly in the late 1980s, the 1990s and the 2000s showed that, contrary to Hardin's argument, shared resources could in fact be successfully managed by communities of users through collective action. The subsequent consensus among commons scholars was that the tragedy applied to open-access conditions (with no property rights), but not to those used in common-property regimes. In fact, Hardin's own story was historically incorrect. Medieval English commons were typically used under local rules, such as stinting, whereby the number of animals allowed for each herder was limited [27].

Hardin's argument for the necessity of a higher authority to protect the common good calls to mind a classical debate that goes back a few centuries. This is the philosophical debate between Thomas Hobbes and Jean-Jacques Rousseau. Hobbes believed that people were not capable of collective action towards the common good. By nature, the world was a violent place, and life was "nasty, brutish and short", requiring an external authority to impose the rule of law. What Rousseau, by contrast, believed in is a cooperative world in which the rule of law need not be externally imposed, but could come from within. He wrote of egalitarian communities, "bands of peasants regulating the affairs of state under an oak tree". Hence, the basic debate dates back to the 17th and 18th centuries, and commons dilemmas can be traced historically to Hobbes vs. Rousseau.

Decades of research by commons scholars documenting the ability of groups to collectively govern their commons support the existence of cooperation, in dynamic tension with competition, if not in Hobbesian "red in tooth and claw" existential conflict. Hardin's tragedy is in essence a tension between individual interests and societal interests, technically a collective action problem; but can people cooperate? What compels people to cooperate toward collective action? These questions are crucial for the analysis we present in this paper, as we start with the assumption that cooperation and collective action are possible under the right circumstances (See Figure 1). In fact, a number of alternative framings exist regarding the issue of cooperation.

Foucault's [28] notion of governmentality is about everything that is relevant for governing successfully. This includes institutions, procedures and tactics. Criticizing conventional conceptualizations of power commonly held by authorities, which are punishment-driven and top-down, Foucault argues that possessing power is not the same as possessing the art of being able to govern successfully. Effective ways of governing involve working with the agency of people, building trust and creating change from within the people themselves.

The Prisoner's Dilemma (PD) game provides another approach. Axelrod [29] and colleagues developed a model based on the PD game in which two individuals ("prisoners") can each decide either to cooperate or defect. The payoff is in terms of some benefit (e.g., resources). No matter what the other player does, the selfish choice (defection) yields a higher payoff than cooperation. However, if both defect, both do worse than if both had co-operated. In a single round game, defection wins. However, in a multi-round game, cooperation wins. Computer experiments show how cooperation can evolve and spread based on reciprocity and trust.

Richerson and Boyd [30] take an evolutionary approach to collective action, looking for mechanisms that favour cooperation. In all societies people hold moral beliefs and norms about right and wrong. Beliefs and norms are culturally transmitted, guided by natural selection. When a community member violates social norms, he/she will suffer social sanctions. Because norm-violators suffer costs, those who follow the norms do better than those who do not. Since self-interest requires adherence to norms, behaviours that undermine norms do not spread. When societies and their collective action problems are relatively small, norms that benefit the group naturally establish themselves.

These three formulations are not specific to commons management but apply to cooperation and collective action in general. They have been tested over the years and

have been shown to be robust. Notably, each of the three framings is evolutionary in nature, whereas Hardin's tragedy is remarkable for its lack of evolution (just how stupid were these herders not to communicate and learn from mistakes? How did the medieval grazing commons last for centuries?). The three formulations are in support of empirical findings of cooperation and collective action, but they do have limitations. Problems arise when dealing with large-scale societies and large, complex issues such as climate change. Nevertheless, models of cooperation provide insights about strategies for commonisation, and suggest the kinds of factors (e.g., breakdown of trust and reciprocity) that may lead to decommonisation.

Having established the limits of the tragedy of the commons and some possible mechanisms for cooperation (or lack of it), we turn to the evolution of thinking about the commons. Following an updated definition of commons [3], scholars have identified four commons regimes—common property, state property, private property, and open access (Box 1). Using communities and small-scale resource users as "laboratories", scholars developed case studies and found universal use of communication, negotiation, and collaborative decision-making. Collective action was foundational, based on commons institutions, norms and rules. Consolidation of this work led Ostrom [6] to propose eight principles for the design of durable commons institutions (Box 2):

**Box 2.** Ostrom's design principles for collective action and sustainable commons. Adapted from [6].

1. Clearly defined resource and user boundaries
2. Congruence between rules and local conditions, and proportionality between benefits and costs
3. Collective-choice arrangements for rule creation
4. Monitoring
5. Graduated sanctions
6. Local mechanisms for conflict resolution
7. Recognition of rights and political space
8. Nested institutions and governance structure

Cox et al. [31] subsequently re-examined these design principles based on the empirical evaluation of 91 studies and found strong support for them. They also revised the eight principles to give a total of eleven: Principles 1A and 1B were created to address the difference between resource boundaries and user boundaries; 2A and 2B to separate the congruence and proportionality principles; and 4A and 4B to separate rule monitoring from resource status monitoring.

Supplementing these developments were debates on the nature of commons theory and the dynamics of commons. This prompted further conceptualisation and theory-building on several fronts. One criticism was that commons theory overemphasised rational choice at the cost of values, norms and culture, resulting in an apparently apolitical theory of commons that did not take into account the multiple complexities of social and cultural factors [32,33]. Other scholars observed a normative and methodological tension within commons theory, identifying two schools of thought, collective action and entitlements [34]. Nayak and Berkes [1,25] observed that it was important to recognize that commons were often situated within layers of complexities, rooted in past, present and future discourses, and changing social and political circumstances which shaped commons governance.

### *4.2. Interdisciplinary Evolution of Commons Scholarship*

Challenges to commons are multidimensional and require inputs from a multitude of disciplines for interdisciplinary innovation in concepts and methods. Such theoretical and methodological developments owe their origin to the increase in complexity, diversity, and conflicting demands in the contemporary world. Recent work has underscored the interdisciplinary emphasis to conceptualise commons governance and sustainability [2,35]. Theoretical attention within commons scholarship has turned to the nature of relationships,

interactions and connections between commoners and their commons [36]. A number of disciplines and subdisciplines have been impacted by the evolutionary perspectives in commons and, in turn, contributed to the evolution of commons thinking. Here we touch upon four (overlapping) areas: social-ecological system resilience, political ecology, social equity and justice, and governance.

Are commons systems stable over time, or are they subject to social, political, economic and environmental perturbations? Understanding resilience, the ability of a system to persist and adapt in the face of perturbations, was originally about the adaptive capacity of ecosystems. After about the year 2000, resilience came to focus on the adaptive capacity of people and nature as interdependent systems [11]. This social-ecological systems perspective is supplemented by a holistic view requiring a transdisciplinary approach and the refutation of a purely equilibrium-based consideration of complex systems [13]. Commons represent integrated human–environment dynamics in which the social and biophysical subsystems are coupled, interdependent and co-evolutionary. Defining the human system as part of a broader unity, rather than simply as an agent that subjects ecosystems to external disturbances, brings social science into the analysis as an integral part of resource and environmental management. It also opens the door for the consideration of evolutionary mechanisms. Conceptualising commons as involving evolutionary processes (as in adaptations based on social learning), and their theoretical manifestation as complex social-ecological systems, have resulted in combining commons and resilience thinking [12].

Commons are directly impacted by historically driven power dynamics and prevailing politics through socio-political organisation and environmental cross-influences [37]. Political ecology captures these discursive processes by promoting the idea that commons are intensely contested domains and highly political spaces (Robbins 2019). It adds value by asking critical questions on differentiated resource control, power dynamics, entitlements, and the politics of governance. These questions have helped orient commons scholarship towards the importance of understanding how access, property rights, and entitlements in the commons may have changed historically and under what circumstances. Who has the power, who controls, who takes decisions, and with what consequences have become central questions for commons theory-building. Power and knowledge are often intimately connected, and questions of control and legitimacy of knowledge are an important part of political ecology. The co-creation of knowledge and power in the Foucauldian sense is therefore important. Although Foucault has rarely written about resource management, Van Assche et al. [38] consider his notion of the unity of power and knowledge to be foundational in the analysis of adaptive governance.

Questions of equity, inclusion, fairness, and distributional and procedural justice are important in the commons. Commonisation/decommonisation processes may therefore be tested through their ability to influence outcomes for social equity and justice [22]. Questions regarding the distribution of benefits, and the decisions that disproportionally impact commoners, are critical to understanding commons dynamics and evolution, marked by the boxes "Favorable/Unfavorable" in Figure 1. These questions take us to the areas of distributive and procedural justice. Distributive justice refers to distribution, sharing, allocation and entitlements in the commons; procedural justice highlights democratic, inclusive and fair procedures as the cornerstone of commons. Under these perspectives, commons processes are put to test through their ability to respond to the question of fairness in how outcomes impact social and ecological systems. Questions of who benefits and who loses; what the dominant framings and narratives are; how costs and benefits are distributed across stakeholders; and what decisions disproportionately impact commoners, are crucial components in the evolution of commons scholarship.

Issues of governance are key to understanding commons dynamics and evolution. Starting with the Ostrom design principles (Box 2), commons successes and failures have been largely seen in relation to institutional and governance arrangements [6,39]. Social learning provides the feedback for governance to move forward [40] (Berkes 2009),

and more specifically, policy learning and adaptation provide the foundation for co-evolutionary approaches to governance [41]. Key principles of partnerships, collaboration, trust, institution-building, social learning and problem-solving strongly influence commons processes and outcomes. They offer the tools to analyse the kinds of institutions (rules-in-use) that may be appropriate for maintaining connectedness between commoners and the commons. Adaptive co-management [7] and adaptive governance [42] approaches have added the notions of learning-by-doing, power sharing, partnerships, and policy experimentation to the evolution of commons scholarship. Operationalising adaptive governance requires, at the minimum, a social-ecological systems perspective, a resilience approach to address uncertainty and adaptation to unforeseen future changes, and collaborative approaches to improve social and institutional learning through networks and knowledge co-production [43].

## 5. Onward to Commons Evolution

From the community grazing area to the global ocean, commons are places of continuous interaction between people and nature. Thus, the dynamics of commons has implications for sustainability at multiple levels from local to global. Commons are social-ecological systems, complex adaptive systems of humans and nature [12,44]. They are characterized by two-way feedback relationships between social and biophysical subsystems, but in our case, perhaps more so within the social sub-system itself. Lejano [45] argues for relationality—the understanding of a system not so much as a set of interacting mechanical components but as a web of human relationships. Commonisation and decommonisation respond to various kinds of economic, social, ecological and political drivers. The dynamic nature of the commons is manifested as adaptations and fine-tuning over time, or may result in the replacement of one kind of rights-and-access regime by another. Hence, it is imperative to understand commons as an ongoing process and not as a final end point.

The notion of commons in an evolutionary process that responds to multiple drivers is forward-looking by nature. Examples in Making Commons Dynamic [2] and many others,(e.g., [4,8,10]) inform the evolution of commons theory. The multiple manifestations of processes of commonisation and decommonisation offer possible evolutionary trajectories. These are captured by the various expressions, interpretations and terms used by authors in chapters of Making the Commons Dynamic (Table 1). Commonisation and decommonisation processes are about drivers impacting institutions and rules that govern excludability and subtractability. Negotiations and contestations about sharing, trust-building and reciprocity happen through the working together of people in a constantly changing relationality within their broader milieu—the process of commoning [23,46].

Actors who actively engage in commoning are the commoners, and they also play crucial roles in times of decommonisation [47]. Decommonisation forces varying levels of loss or weakening of excludability and subtractability, turning commons into non-commons [48]. Decommonisation is pervasive and, in some systems, deeply entrenched. Due to the complexities involved, it is difficult to ascertain exactly when decommonisation processes emerge within commons development. The commoners in many places around the world have used decommonisation as opportunity to strengthen commonisation. This phenomenon of reinforcement of commonisation in the face of decommonisation threats has been referred to as re-commonisation, (re)commonisation and new-commonisation [17,20,44,49]. Successes in this type of commonisation can bring into place new common-pool resources [50].

**Table 1.** Diversity of pathways for commonisation and decommonisation in the future of commons evolution.

| Perspectives | Description/Definition |
| --- | --- |
| **Commoning** | Coming together of humans with(in) their broader milieu, a constantly changing and evolving relationality between humans, nonhumans, their territories and histories, and the forging of subjectivities that ultimately give meaning to commons issues |
| **Commoning** | When well-governed common-pool resources are shared and giving is respected and socially rewarded to achieve reciprocity between what is given and what is taken. |
| **Commoners/Absent commoners** | Users engaging in processes and actions to defend, reshape, and rebuild the commons through social practices in the face of changes. |
| **Non-commons** | Distortions in governance configurations and social organizations leading to situations where they are unable to facilitate long-term conservation of the commons. |
| **Re-commonisation** | Commoners successfully avoiding an outcome of decommonisation, and engaging in a process of re-commonisation involving new uses, rules, rights and obligations. |
| **Re-commonisation** | Governance attributes supporting pathways for transformative change and sustainable outcomes to replace features of decommonisation through coordination of actor networks, strategies, power sharing, rule-making processes and distribution of rights. |
| **(Re)commonisation** | Process through which threats of decommonisation are replaced by processes of commonisation through the use of ancient knowledge, traditions, local forms of production, and re-connecting communities with one another and the natural world and the life within it. |
| **New-commonisation** | Process through which resources are converted into joint-use or new transformative arrangements with refined rules and management systems complementing resource use and protection in synergy with traditional practices and values. |
| **New common-pool resource** | Process in which a social-ecological system experiences changes in resource regimes, replacing historical experiences of decommonisation and facilitating dynamic institutional processes. |
| **Ephemeral commons** | Processes (natural or human) through which resource commons are created lead to ecologically ephemeral territories and associated instabilities and uncertainties in the life of the community dependent on it.<br>Ephemeral commons are subject to cyclical and frequent processes of creation and dissolution that devoid it of acquiring any permanent character but retain only temporary features. |
| **'Uncommon' common-pool resource** | Although generally not seen as commons, these resources do exhibit the two principal characteristics of excludability and subtractability. |

Source: Adapted from Nayak [2] (pp. 343–344).

It is important to understand the ways in which commoners respond to decommonisation challenges and impacts. Decommonisation processes can proceed in parallel with commonisation. Singh [51] reports that in certain contexts, the very resource around which commonisation and decommonisation processes revolve often remains elusive, leading to the suggestion that they are ephemeral commons. As an extension of the meaning of ephemeral commons, Lichtenstein and Cowan Ros [17] use the term 'uncommon' common-pool resource to explain unusual resources, e.g., vicuñas that have come to be managed as commons.

## 6. Conclusions

An evolutionary perspective is imperative to understand commons as a process and not as a final configuration. The questions of how collective action and governance institutions evolve to address issues around excludability and subtractability in the context of jointly used resources (commonisation) and what causes the loss or weakening of these essential characteristics (de-commonisation) are core to commons being a dynamic and complex process. Excludability, which pertains to the question of exclusion, inclusion,

and legitimacy of commons use and its users, is not impossible to resolve but remains tricky. Subtractability takes on the task of addressing who gets what, how much and when from the commons so that future tragedies of the commons may be avoided. The type of questions that both excludability and subtractability principles seek to engage make them continuous processes. This requires that resource-sharing issues remain open for discussion, negotiation and possible resolution, without any definite endpoint [2].

However, unequal power relations make negotiations difficult, if not impossible, as in the case of Chilika Lagoon privatised for aquaculture production (Nayak and Berkes 2010). In general, new technology and changing knowledge/power relations, along with surging regional and global market demands, can drastically affect commons use. The political economy of colonialism and neoliberalism leads to the evolution of such larger, embedding governance systems involving a change in power relations. The enclosure movement in historical England, which involved the privatisation of land for agricultural production, resulted in the displacement of communities of herders, a case of new power relations leading to new actors undermining an earlier property rights regime [9]. Similarly, the push for the privatisation of marine resources (Blue Economy) has the potential to lead to the "enclosure" of ocean space, comparable to the historical enclosure of land resources. This has serious implications for social justice and environmental sustainability involving commonisation and decommonisation processes.

A key aspect of these two processes is the variety of property-rights regimes under which commons may be held. While it is possible that private-property, common-property, and state-property regimes are all able to provide viable conditions for commons, there is no one type of property regime that is inherently superior to the others. The distinction between "favourable" and "unfavourable" in Figure 1 is a normative position that reflects our preference for local social and economic controls and values under a common-property regime. An analyst who has a position that aligns with big companies and corporate profits may well aim for privatisation as the "favourable" direction. The comparison of the relative social and economic merits of common property involving local stewardship vs. privatisation with large corporations which are by nature driven by profit and not by sustainability, is beyond the scope of the present paper. It has been dealt with by Béné [52] and Schreiber et al. [21], among others.

The four property-rights regimes (Box 1) are ideal, analytic types, and in practice many resources are held in overlapping combinations of these [4] (Bromley 1992). Accordingly, governance arrangements based on mixed regimes may show mixed characteristics. Depending on the case, hybrid governance models are possible and may produce sustainable outcomes [7]. The ever-changing nature of drivers and the fluid nature of commons facilitate the emergence of overlapping combinations of property rights and formulations of hybrid regimes. These include co-management, which is a combination of common-property and state-property regimes, and public-private partnerships, which are a combination of private-property and state-property [53].

Hardin's Tragedy of the Commons paradigm suggested that all commons are destined to be overexploited, without sufficient heed to the possibility of co-operation and the ability of groups to collectively govern their commons. Three mechanisms towards cooperation and collective action have been provided by (1) Foucault's [28] notion of governmentality that includes institutions, procedures and tactics in relation to the art of governing successfully through working with the agency of people, building trust and creating change from within the people themselves; (2) Axelrod's [29] Prisoner's Dilemma game that puts individuals in a commons situation to either cooperate or defect, and where win–win outcomes are related to how cooperation can evolve and spread based on reciprocity and trust; and (3) Richerson and Boyd's [30] approach to collective action that is facilitated by mechanisms favouring cooperation, with emphasis on the evolutionary advantage of moral beliefs and values guiding human behaviour. Notably, each of the three framings is evolutionary in nature. However, there is no need to resort to classic Darwinian natural selection mechanisms regarding this evolution. The cases reviewed here indicate a wide

variety of mechanisms leading to evolution and co-evolution, illustrating the diversity of factors that can erode or reinforce common property.

The field of commons has been evolving in reciprocal exchanges with a number of other fields. We have touched upon four of them. First is the complex adaptive-systems thinking that integrates humans and nature, and draws attention to adaptive processes that help make commons resilient [11,12]. Second, ongoing contestations and power play for claiming and reclaiming opportunities and spaces in the commons, highlighting the political dimensions of resource-sharing [34,37]. Third, the fair distribution of benefits and access to decision-making procedures, vexed issues without short-term solutions, keep the question of justice, equity and inclusion alive as long as commons persist. Fourth, institutional and governance arrangements that are adaptive and collaborative, and based on principles of partnership, trust and power-sharing, act as criteria for commons success [6,38]. These disciplines (and others) contribute to the interdisciplinary evolution of commons scholarship, and are in turn influenced by commons scholarship.

The motivation to adopt an evolutionary perspective on commons is influenced by on-going concerns about how commons can be governed as common property in the long run. The future remains uncertain and the path to success is complex, diverse and dynamic. The consideration of the two characteristics of commons directly speak to these issues by focusing primarily on processes of change and their implications for sustainability. New approaches are required to better articulate and respond to decommonisation and ensure environmental resilience and sustainability through fostering commonisation. Armitage et al. [35] argue that the challenges confronting the commons cannot be resolved through incremental change in conventional practices and approaches, and that deliberate and novel approaches are required to govern commons towards sustainability. Figure 1 emphasizes the potential of such a framework as an analytical tool to examine multiple possibilities around making or breaking the commons in the face of change. This is akin to the idea of commons as an evolutionary process, and so is the interdisciplinary scholarship that surrounds it.

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