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Ecologies of contention: how more-than-human natures shape contentious actions and politics

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ABSTRACT



Which role plays the more-than-human world in shaping the possibilities for contentious actions and politics? We discuss this question by revisiting reflections from social movement theory, agrarian studies, and commons management, and by reviewing empirical cases of protest significantly shaped by ecological endowments. Distinct political ecological opportunities may arise from vulnerabilities in ecological cycles, ecological potentials, interspecies relationships, ecological invisibility, ecological visibility, ecological resources, and ecological connectivity, among other features. However, whether people, activists, and social movements are able to turn them into a dynamic source of power ultimately depends upon how they perceive and relate themselves to the more-than-human world.


KEYWORDS

Political ecological opportunities; ecological endowments; social movements; environmental movements; agrarian transformations; contentious actions

1. Introduction

In 1983, in Tumkur district, India, a mass movement of peasants targeted several forest nurseries to destroy eucalyptus saplings. Concerned over the adverse impacts that eucalyptus plantations would have on their livelihoods and landscapes, the movement resorted to direct action to enforce more just forms of forestry. They pulled out the vulnerable seedlings to disrupt the growth of a plantation landscape that did not fit their livelihood needs and customary land uses and replaced them with tamarind seedlings that corresponded to their needs and culture (Shiva, Bandyopadhyay, and Jayal 1985; EJAtlas 2014). In a very different context, and on the other side of the planet, several years later, about a thousand activists occupied an empty piece of land in the middle of Copenhagen, Denmark, to transform it into a garden in a single night.¹ This is one of many examples of 'guerilla gardening', in which movements demand not only different uses of urban spaces through engaging in politics, but directly create them through changing the urban ecology they would like to see transformed.

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¹See <https://www.information.dk/2000/06/noerrebro-oase-ofres>

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These cases, as different as they are, have a common feature. They are examples of how people, activists and social movements directly intervene into their biophysical environment and transform the vulnerabilities and potentials of ecological processes into possibilities for contentious actions to resist and modify ecosystems they consider unjust, while creating alternative environments according to their own perceptions of environmental justice. In such contentious events, are the ecological endowments of the place of conflict only a contextual factor, or do they distinctly influence and co-produce the pathways of protest and social change? We discuss this question in this paper with the aim to better understand the role the more-than-human world plays in shaping the possibilities for contentious actions and politics.

In addressing this question, we subscribe to recent calls and efforts for a deeper understanding of the role of more-than-human natures in the co-production of our socio-material worlds (Braun 2005; Whatmore 2006; Pellow 2017). Such efforts avoid a dualistic understanding of 'nature' and 'society' as being external and independent to each other and recognize how both human and more-than-human processes co-constitute each other (Kolinjivadi 2019). We share here the conceptualization that 'ecology' is not something external to society, but rather dialectically co-produced, while at the same time more-than-human processes may also enable and become co-constitutive of human actions in a dynamic and relational (rather than static or deterministic) way. As environmental justice scholar David Pellow (2017, 40) has argued, such a perspective may provide fresh and productive insights for our understanding of contentious actions and politics:

it is imperative that social movement scholars more closely examine the various modes through which political opportunity structures are shaped by more-than-human natures, through the interactions and flows between humans and nonhuman forces, and how that shapes access and possibilities for change for social movements.

Further attention to the dynamic interactions between social mobilizations and ecological endowments could thus reveal to both scholars and movements alike how ecology may become a dynamic source of power, offering distinct possibilities for contentious actions and politics.

While reflections on these questions are scarce and scattered across the literature, we aim here to offer a more comprehensive account of how more-than-human natures shape contentious actions and politics. Towards this aim, we first revisit some considerations on the role of ecology in contentious actions from the fields of social movement theory, studies of agrarian resistance, and studies of collective action for common pool resource management. We then complement and expand them with empirical cases from across the globe to present a diverse (rather than an impossibly complete or representative) set of illustrative examples of how ecological characteristics of more-than-human natures may co-constitute and co-produce contentious actions and politics in creative ways. In an effort to systematize our observations, we identify (at least) seven general ecological characteristics of the more-than-human world that people and movements may turn into diverse possibilities for contentious action and politics: (i) vulnerabilities in ecological cycles, enabling the sabotage of unjust environments, (ii) ecological potentials, permitting the creation of alternatives, (iii) interspecies relationships, facilitating resilience and autonomy, (iv) ecological invisibility, allowing for covert actions and everyday forms

of protests, (v) ecological visibility, facilitating overt claim-making, (vi) ecological resources to support and finance mobilizations, and (vii) ecological connectivity among non-human forces and natures, creating needs and opportunities for alliances among human forces.

While we focus specifically on the diverse ways through which the ecological characteristics of the more-than-human world may influence the possibilities for contentious actions, we do not intend to downplay the important role of agency of the diverse political actors involved in conflicts, as well as the broader social, political, and cultural processes in which protest takes place (Hadden 2015; Kroger 2020). Rather, we believe that further attention to the dynamic interactions between both human and more-than-human processes may enrich our understanding of how contentious actions and politics frequently manifest and emerge through processes of co-production between human and more-than-human entities (Pellow 2017). Following a relational approach to understand political opportunities (McAdam, Tarrow, and Tilly 2001), we will illustrate how the possibilities for mobilizations and change arising from these interactions are not static but contingent and context dependent. Whether contentious actions emerge in relation to the ecological characteristics of the more-than-human world, and the forms and functions they may take, ultimately depends upon how people perceive, experience, and relate to them, as well as how they creatively combine them within specific contexts and achieve to turn them into a dynamic source of power.

2. Ecological contexts in social movement studies

Social movement theory has addressed with detail the questions of when, why, how, and with what outcomes, civil society actors organize and engage in contentious collective actions for claim-making (Della Porta and Diani 1999; McAdam, Tarrow, and Tilly 2001; Tilly 2002). Four main theoretical perspectives – resource mobilization, political opportunities, cultural framing, and dynamics of contention – commonly inform the explanations of the characteristics, failures, and successes of social movements. Diverse contributions to these questions and perspectives have come from a variety of disciplines, particularly from organizational studies, political sciences, sociology, anthropology, social psychology, history, and others (Roggeband and Klandermans 2010; Della Porta 2016). Explicit discussions of the role of ecological endowments and the more-than-human-world in influencing and co-producing contentious actions and politics are rather scarce, despite their potential to enrich social movement theory (Pellow 2017).

In a review of the ecological contexts in social movement studies, Zhang and Zhao (2018), highlighted two ways of how ecological aspects have entered the analysis of social mobilizations. On the one side, scholars have used concepts from organizational ecology to analyze social movements, particularly aspects of competition for resources and members, niche overlap, and movement interactions. While such a perspective employs theoretical concepts for the study of ecology to the analysis of social movements, it does not address how specific ecological characteristics of the more-than-human world may co-produce contentious actions and politics. On the other side, movement scholars have paid much attention to the nature of space and how this shapes social mobilizations as well as the identities of social groups (Tilly 2000; Martin and Miller 2003; Zhang and Zhao 2018). Under this ‘spatial ecology perspective’, scholars have studied, for

example, how proximity (or distance) to environmental events, such as pollution, affects the likelihood of triggering protests. Furthermore, Zhao discussed how the ecology of the built environment significantly shapes activist networks and mobilizations, leading to the formation of '*ecology-dependent strategies of collective action*' (Zhao 1998, 1495), whose use and effectiveness depend largely on the specific ecological conditions in which activists operate. Spatial considerations are also visible in Karl Marx' work, where he identifies the density of workers in factories as a key factor for the development of class consciousness and mobilization capacity (Zhang and Zhao 2018).

Given that quite some theory has been articulated about the role of spatial aspects in social movement studies, we do not aim to discuss their role further here. In the remaining paper, we are specifically interested in understanding the ways how ecological endowments and characteristics beyond spatial aspects may shape contentious actions and politics. As illustrated in the examples in the introductory paragraph, the cutting down of tree plantation seedlings has arguably less to do with the spatial aspects of plantations, but rather with the possibilities for direct actions that emerge from specific moments in ecological cycles, i.e. the vulnerability of seedlings, that before growing into trees, can be easily destroyed.

One field that offers scattered examples on how ecological contexts shape contentious actions is the literature on environmental direct action, also known as environmental resistances, direct environmental initiatives, or direct enforcement (Mittelman 1998; Plows, Wall, and Doherty 2004; Eilstrup-Sangiovanni and Bondaroff 2014). Direct actions are part of the '*repertoires of contentions*' available to activists in a given space and time, and comprise '*what people know they can do when they want to oppose a public decision, they consider unjust or threatening*' (Della Porta 2013). Environmental direct actions specifically describe those actions motivated by environmental concerns. For example, direct actions of ecotage², – a merger of ecology and sabotage – frequently aim to produce material damage of equipment such as machineries in order to generate costs to actors involved in environmentally damaging projects (Plows, Wall, and Doherty 2004). Other direct actions draw attention to ecological concerns by aiming to avoid environmental degradation or species loss, for example by stopping whale hunting vessels through ramming, boarding, and even sinking (Eilstrup-Sangiovanni and Bondaroff 2014). While such examples illustrate direct actions in which environmental concerns are the motives of protest, other examples also illustrate how activists draw directly upon ecological characteristics of the more-than-human world to co-create new forms of protest. Illustrative examples here are the construction of tree houses, which are small platforms built into trees, where protesters can sit and protect the trees from being cut down. In this example, the spatial characteristics of trees are used for resistance. Another example is the sabotage of wildlife hunting such as doves through fly kites shaped like hawks, their natural predator (Dam Collective 2015). This illustrates how activists created direct actions by taking advantage of the ecological relationships between non-human species (doves fly away from hawk-like kites).

²Note that acts of ecotage and eco-defense have been increasingly framed and discredited as 'eco-terrorism'. Plows, Wall, and Doherty (2004), however, argue that the use of this term cannot be justified, because ecotage and eco-defense do not involve violence against people.

Resource mobilization theory is another field where further discussion of the role of ecological endowments in contentious actions could be productive. Resource mobilization theory discusses specifically the mechanisms through which social movements access and use various types of resources from different resource providers, to organize and sustain contentious politics and actions (Edwards, McCarthy, and Mataic 2018). Among the different resource categories discussed are ‘material resources’, which refer most commonly to money, office space, property, equipment, and other supplies that are indeed key in urban contexts. However, in deeply rural contexts such items may only make up a portion of the material resources used, while other ‘ecological resources’ may become much more important for mobilizations. Examples of ecological resources are any environmental goods or ‘environmental incomes’ obtained by people directly from the environment (Jiao, Smith-Hall, and Theilade 2015), such as forest products, crops (conventional ones, as well as illicit plants) or species and wildlife that could be sold to obtain cash incomes to support resistances (Scott 2009), or any other materials that could provide food, shelter, transport (i.e. animals) needed during mobilizations. The differences between ‘material’ and ‘ecological’ resources are relevant, because they describe not only different types of resources that could be used in mobilizations, but also their ‘providers’ are different. While in more urban contexts, providers of material resources may be citizens, donor organizations, and other social actors, in deeply rural contexts, ecological resources may be collected directly from the more-than-human world where conflicts take place, depending on seasonality and other ecological dynamics.

3. Ecological endowments in studies of agrarian movements and resistances

Agrarian movements have been analysed in the areas of political science, political economy, sociology, anthropology, or social movement studies, with various theoretical and methodological frameworks to explore the mobilization forms and to make sense of its meanings and implications for the rural world and beyond. Agrarian movements are generally articulated through overt struggles such as revolutions and rebellions, or (covert) everyday forms of resistances, summarized by Scott (1985) as ‘weapons of the weak’. The specific repertoires of contention used by protesters are deeply rooted in national and local histories (Tilly 2002). Their toolkits shift over time and involve borrowing and innovation (Edelman and Borras 2016, 90). Although the more-than-human world is not always explicitly highlighted in studies of agrarian movements, it is deeply entangled with the human world and frequently shapes agrarian resistances, as several scholars have often noted (Peluso, Afiff, and Rachman 2008; Akram-Lodhi and Kay 2010; Gerber and Veuthey 2010; Gerber 2020).

The work of the agrarian scholar James Scott offers illustrative examples of the diverse ways of how ecological endowments have influenced political actions in diverse contexts. For example, he describes how Malaysian village threshers took the exceptional opportunity that heavy rains caused widespread crop lodging in the irrigated season harvest in 1979 to increase their minimum wage. While farmers were desperate to save their paddy, a good part of the harvest had to be gathered by hand instead of using the harvest machine (Scott 1985, 260–261). The ecological causes and consequences of

crop lodging, to some extents, helped the Malaysian village threshers to temporarily suspend the invasion of machinery which had already started to deprive their seasonal jobs.

Scott (1998) also discusses how a variety of polycropping strategies (with many crops in the same field simultaneously) allowed West African indigenous farmers to hedge their bets about the rains, holding the soil with drought-resistant crops and interspersing among the crops that can take best advantage of the rains. Diverse polycropping was an astonishing challenge to the colonial agricultural specialists, who were persistent in their approach of creating a uniform, controlled farming environment with superior technical efficiency of large-scale farms, while the dispersed production was opaque to the state. Moreover, polycropping combined with shifting cultivation made it particularly hard for the state and the agricultural authorities to turn the fugitive cultivators to easily assessable taxpayers, given the complexity and illegibility of shifting agriculture on the fugitive fields.

More specifically, Scott (2009) systematically scrutinizes how ecological settings are applied to shape the agrarian politics in a high-altitude region defined as '*Zomia*', the Great Mountain Kingdom. By analysing various forms of cultivation, particular crops, certain social structures, and physical mobility patterns for their escape value, Scott argues that their forms of subsistence and kinship are best to be understood as political choices that take advantage of ecological endowments. Shifting cultivation was the most common agro-political strategy of hill peoples against raiding, state-making, and state appropriation. Besides its illegibility, features of its diversity in forms, botanical diversity, and spatial dispersity, made the cultivation form hard to monitor, fiscally sterile and difficult to tax or confiscate; and the mobile swiddeners hard to collect for corvée labour or conscription.³ In contemporary East Kalimantan, swidden can also be taken as a land control strategy for rural households under the pressure from the expanding plantations and mines (Thaler and Anandi 2017).

'Escape agriculture' and the friction of appropriation apply not only to shifting cultivation, but also to particular plants, which Scott (2009) termed 'escape crops'. Their ecological characteristics, making them resistant to appropriation, include storability, staggered maturity, fast growth, low labour intensity, dispersal cultivation, climate/soil(wet/dry) tolerance, disease prone, elevation bandwidth, value per unit weight and volume (if it's a cash economy), and whether it's possible to store them underground (Scott 2009: Table 3). Escape crops may have one or more of these characteristics that facilitate evasion of raiding either by states or by freebooters. In general, roots and tubers such as yams, sweet potatoes, potatoes, and cassava/manioc/yucca are nearly appropriation-proof as they can be safely left in the ground for up to two years and dug up as piecemeal when needed after they ripen. Unobtrusive crops of low stature that mimic much of the natural vegetation around them thwart appropriation by being easy to overlook.

Several other scholarly works on agrarian studies also refer to the role that ecological endowments and processes of the more-than-human world play in confrontations. Alonso-Fradejas (2015), for instance, describes for Guatemala how wage laborers buried

³Many hill populations practice irrigated-rice cultivation and shifting cultivation simultaneously, maneuvering according to political and economic advantage in different occasions; nearly all swidden cultivators also hunt, fish, and forage in nearby forests as a broad portfolio of subsistence strategies to spread risks, ensure themselves a diverse and nutritious diet, and present themselves a nearly intractable hieroglyphic to any state that might want to corral them (Burns 2003).

the agro-chemical sacks and dig drain canals just alongside the driving roads but not inside the oil palm plantations. Through these acts, they were able to block nutrient flows and damage the plantation ecology to resist the labour exploitation in the plantations. Saguin (2016) describes how Philippine fisherfolk organizations protested against the operation of a hydraulic control structure used mainly for industrial aquaculture, which, however, hindered saltwater intrusion into the lakes that was crucial for the productivity of small-scale fisheries. In doing so, they achieved that the gates were eventually opened permanently, which enabled them to re-establish at least partly the water ecology that sustained their livelihoods.

While such cases illustrate how ecological characteristics either enabled contentious actions or were the prime motivation for protests, agrarian scholars frequently highlighted also how ecological endowments may serve as transformative agents, enabling people to resist by co-creating the socio-material natures and systems surrounding them. van der Ploeg (2008), for example, has argued that resistances are frequently expressed *'in the fields in the ways in which 'good manure' is made, 'noble cows' are bred and 'beautiful farms' constructed'*, in order to organize against dominant agribusiness' practices of monocultures and transgenic breeds, and more generally against modern capitalism as the dominant way of ordering rural life. No matter flagged as agroecology (van der Ploeg 2021), occupation ecology (Gilbert 2020), or biocultural refugia (Barthel, Crumley, and Svedin 2013) and so on, the transformative power resides not only in the biophysical layer through necessary efforts towards sustainable soil, water, fuel, fodder, manure, seeds, etc., but also in the social political layer with knowledge sharing and creation, cultural and organizational practices, as well as in the imaginations, innovations and interactions among them (Weis 2010; Taş Gürsoy 2021; Carney 2021).

These selected examples illustrate well how ecological endowments may play an important role in shaping agrarian politics. In Section 5 we will further draw upon these cases to systematize these observations into more general ecological characteristics of the more-than-human world that people may turn into diverse possibilities for contentious action and politics.

4. Biophysical features in common pool resource management scholarship

Finally, we briefly discuss here how ecological aspects have been addressed in the common pool resource (CPR) management scholarship, which at times are also connected to social movement activities (Villamayor-Tomas and García-López 2018). Although, the field has been less concerned with contentious actions (see Scholtens 2016 and Villamayor-Tomas, García-López, and Scholtens 2020 for exceptions), it does offer explicit reflections on the role of biophysical features in facilitating or hindering collective action.⁴

Much of CPR theory has problematized around the open access and degradable nature of most environmental goods and the collective management problems associated to

⁴Although CPR theory is only tangential to (or partially at odds with) the epistemological foundations of this paper, the theory is nevertheless an important reference for us due to our common interest in collective action and its effectiveness, and a common focus on the ways how ecological endowments, collective management, and social mobilization relate to each other.

those biophysical features (Ostrom et al. 1994). Additionally, the theory has pointed to biophysical properties such as the mobility, visibility and storability of resources, size of the resource system, topography, resource regeneration rates, or predictability (Agrawal 2001; Poteete, Ostrom, and Janssen 2010), all of which that can hinder or facilitate cooperation within and among local communities.

Interestingly, the attention paid to the ‘ecological’ has allowed CPR scholars to transcend and in turn compare lessons emerging from different ‘resource’ contexts (i.e. forest, fishery, or water resource systems). More importantly for us, those developments resonate with properties of the more-than-human world (i.e. mobility, visibility, and storability) described by Scott as key features enabling contentious actions, albeit, in different ways. Storability benefits both contentions for resistances and/or collective management. While mobility and invisibility support specifically escape agriculture for resistances (Scott 2009), they also influence whether certain types of management rules are effective in promoting sustainable common pool resource use (Schlager, Blomquist, and Tang 1994). We contend that while these properties are indeed relevant to consider, the ways in which they may favor or hinder contentious or collective action ultimately depends on the aims of such these actions and on how people may be able to take advantages of them in different situations. We will discuss some of them, i.e. ecological visibility and invisibility and their relation to contentious actions, in more detail in the next section.

5. Seven ecological characteristics of the more-than-human world shaping possibilities for contentious actions and politics

In this section we draw together examples from the above literature, as well as further empirical cases from across the globe in which ecological endowments played an important role for contentious actions. We call the resulting set of contentious actions an ‘ecological repertoire of contention’ to highlight how ecological characteristics of the more-than-human world co-produce distinct possibilities for individuals and collectives to develop actions for creating change or making claims.⁵ Based on the review of this diverse set of cases, we identify seven general ecological characteristics of the more-than-human world that may offer distinct possibilities for contentious actions and politics. These are (i) ecological vulnerabilities, (ii) ecological potentials, (iii) ecological relationships, (iv) ecological invisibility, (v) ecological visibility, (vi) ecological resources, and (vii) ecological connectivity (Table 1). Table 2 shows a summary of empirical cases and how they are related to a combination of these specific ecological characteristics (for details on these cases, see Annex 1).

5.1 Ecological vulnerabilities to disrupt environmental injustices

The *ecological vulnerabilities* of more-than-human natures enable distinct possibilities for direct action targeting to disrupt undesired environmental processes. With ecological vulnerabilities we refer to the specific characteristics and stages within ecological cycles that

⁵Note that with ‘contentious actions’, we refer not only to collective social mobilizations, but include here also covert and individual contentious actions, such as everyday forms of resistance that aim for *de facto* benefits, not necessarily *de jure* ones (Scott 1985), and which are not necessarily part of a broader social movement, however, are acts of resistance against a dominant social regime or group.

Table 1. Seven ecological characteristics of the more-than-human world and their potential role in co-producing contentious actions and politics. For details see main text.

Characteristics of more-than-human natures	Description and use of the term	Potential relevance for co-producing contentious actions and politics
<i>Ecological vulnerabilities</i>	Specific ecological characteristics and stages within ecological cycles of more-than-human natures that are relatively easily being harmed, disrupted, or entirely destroyed.	Ecological vulnerabilities may enable direct action to harm, disrupt or destroy undesired, unjust, or unsustainable environmental processes.
<i>Ecological potentials</i>	The latent capacity of ecological systems to develop into something else, or the latent capacity of ecological systems to provide future benefits to humans, for example, through resource provision.	Ecological potentials may enable the creation of alternatives based on the creation of new land uses, either as symbolic actions for claim-making or to obtain tangible benefits.
<i>Ecological relationships</i>	The types of interactions between more-than-human organisms inhabiting the same ecosystem as humans. These may consist of symbiotic relationships (mutualism, commensalism, and parasitism), as well as competition and predatory relations	Symbiotic ecological relationships between more-than-human processes may strengthen resilience and autonomy of human beings. Predatory ecological relationships between more-than-human processes may enable direct actions to disrupt undesired human processes targeting non-human species.
<i>Ecological invisibility</i>	Those ecological processes, structures, and entities of the more-than-human world that are relatively hidden to human entities, hard to be seen by the eyes of outsiders, or difficult to be mapped and controlled by states.	Ecological invisibility of more-than-human natures may facilitate covert contentious actions, or support people in everyday resistances to evade state control and taxation.
<i>Ecological visibility</i>	Those processes, species and resources of the more-than-human world that receive relatively more socio-political attention than others because of their symbolic value, their endangered status, and/or because they are ecologically more central to the integrity of the larger ecosystem they inhabit, as is the case for keystone species.	Ecological visibility of endangered and charismatic keystone species of the more-than-human world may support overt protest by increasing the visibility of people's actions and claims.
<i>Ecological resources</i>	Any resources, goods and materials obtained by people directly from the ecosystem they form part of, depending on their interactions, as well as on seasonality and other non-human processes.	Ecological resources collected from more-than-human natures may provide important resources for organizing and sustaining contentious actions and politics.
<i>Ecological connectivity</i>	Ecological connectivity refers to the interactions of ecological structures and processes across a given area, for example through the interdependency and movement of non-human species or the flow of resources such as water, air, and others.	Ecological connectivity may act as a linking mechanism, that establishes relationships among distinct and distant social actors and groups across different spaces linked by the ecological structures and processes of the more-than-human world that surrounds them.

are easily being harmed, disrupted, or entirely destroyed by people and movements. Forms of direct action relying on ecological vulnerabilities could be seen as a form of *ecotage* (Plows, Wall, and Doherty 2004), however, in this case it is the ecological process and cycle, and not machineries or equipment, that is sabotaged.

An illustrative example is the uprooting, or cutting down, of tree plantation seedlings, as it has occurred in Karnataka, India on a large scale for Eucalyptus plantations during the 1980s, as well as in many other countries (Table 1, 1). Similar are also the numerous cases of destruction of GMO crops worldwide (Table 1, 2) well-documented in the literature (Doherty 1999; Kuntz 2012; Seifert 2017), which can be seen as reactions and resistances

Table 2. An ecological repertoire of contentious action: forms of protest drawing upon key ecological characteristics of the more-than-human world. Source: own elaboration, see Annex 1.

	Contentious actions and resistances, co-produced by ecological features of the more-than-human world	Ecol. Vulnerabilities	Ecol. Potentials	Ecol. Relationships	Ecol. Invisibility	Ecol. Visibility	Ecol. Resources	Ecol. Connectedness	Further reading, reference
1	Uprooting of tree plantation saplings (e.g. India, China)								Annex, Table 1-1,2
2	Uprooting, destruction of GM crops (e.g. Philippines)								Annex, Table 1-3
3	Arson of oil palm plantations (e.g. Guatemala)								Annex, Table 1-4
4	Sabotage of agricultural processes (e.g. Guatemala)								Annex, Table 1-5
5	Hunting sabotages (e.g. United Kingdom)								Annex, Table 1-14
6	Agroecological corridors to resist agribusiness (e.g. Brazil)								Annex, Table 1-13
7	Decentralized small-scale power generators to resist large hydropower (e.g. Myanmar)								Annex, Table 1-6
8	Seed bombing using drones (e.g. Indonesia)								Annex, Table 1-7
9	Cultivation of 'escape crops' to evade states (e.g. "Zomia")								Annex, Table 1-12
10	Piecemeal squatting to enhance livelihoods (e.g. Southeast Asia)								Annex, Table 1-11
11	Guerrilla gardening in conservation zones (e.g. Uganda)								Annex, Table 1-10
12	Guerrilla gardening within plantations (e.g. Guatemala)								Annex, Table 1-8
13	Guerrilla gardening in urban spaces (e.g. United Kingdom)								Annex, Table 1-9
14	Use of endangered species as 'ecological allies' to oppose road extension project (e.g. Austria)								Annex, Table 1-15
15	Use of charismatic megafauna and keystone species to oppose large hydropower (e.g. Thailand, China)								Annex, Table 1-16
16	Land occupation for protest camps and agro-ecological gardens, to oppose large-scale infrastructure (e.g. France)								Annex, Table 1-17
17	Community forestry to finance community mobilizations and politics (e.g. Mexico)								Annex, Table 1-18
18	Circular food gardens in dam-threatened area to resist migration and displacement (e.g. Brazil)								Annex, Table 1-19
19	Burning of illegal timber logs to block finance resources of timber mafias, (e.g. Cambodia)								Annex, Table 1-20
20	Broad regional alliances of cross-sectoral groups on ecological grounds, threats to common ecologies (e.g. Myanmar)								Annex, Table 1-21

to the 'bio-hegemony' (Motta 2015). For annual plants, such as most GMO crops frequently planted in monocultures, ecological vulnerability permitting their destruction persists along the entire cycle of the plant. For perennial plants, and particularly for tree plantations, saplings represent perhaps the most vulnerable stage across their entire cycle of life. Even without contentious interventions, survival rates of tree plantation saplings are roughly only between 50% and 70%.⁶ During the sapling stage, only little intervention is required to completely disrupt their ecological process, while at a later stage, interventions, such as through arson (Table 1, 3), or the felling of trees are

⁶<http://www.fao.org/3/v8330e/V8330E05.htm>

possible but much more laborious. In that sense, ecological cycles can also be expected to influence the trajectories and forms of contentious actions. Their timing depends, among other factors, on the seasonality and the distinct ecological stages of plantation development.

A more covert form of direct-action taking advantage of ecological vulnerabilities is the secret boycott of plantation workers in applying fertilizers to those oil palm plantations that previously had dispossessed them, as discussed previously for a case in Guatemala (Alonso-Fradejas 2015) (Table 1, 5). These actions almost led to bankruptcy of the main oil palm company operating in the area. Given that industrial oil palms, planted in high densities, are unable to absorb the required nutrients on their own, they rely on nutrients provided by humans. The active blocking of these nutrient flows through covert boycotts illustrates a further way of how ecological vulnerabilities of the more-than-human world have been used by agricultural laborers for resistance.

5.2 Ecological potentials to realize alternatives

Activists may take not only advantage of ecological vulnerabilities to resist unjust environments, but also make use of *ecological potentials* of the more-than-human world to create tangible change and alternatives. With ecological potentials, we refer to the latent capacity of ecosystems to develop into something else, as well as to their potentials to provide future benefits and meet the needs of humans, for example, in the form of food or resource provision. The realization of ecological potentials, and the forms and functions they may take in practice, depend fundamentally on the knowledge and capacity of actors to recognize them, develop actions that feed and support them, and their imaginaries of alternatives and resistance informing their actions. Guerrilla gardening (Table 1, 11–13) and piecemeal squatting (Table 1, 10) are similar in that they are examples of contentious actions that actively make use of the ecological potentials of fertile soils and seeds.

When done as covert action, the *de facto* benefits, such as enhanced access to agricultural land and food crops, are often the main aim of such direct actions (Scott 1985). When conducted as overt actions and in public spaces, such as guerilla gardening in cities, or working the land to ‘plough protest’ as frequently seen in Myanmar (TNI 2015), the *de facto* benefits resulting from these actions are often symbolic and come along with claims for *de jure* changes, such as claims for more public green spaces and gardens in urban areas, or land reform and redistribution.

Another example of the realization of ecological potentials is the development of decentralized, micro power generators in small rivers for domestic use by Karen communities in Mutraw District, Myanmar. By realizing electricity production potentials through small interventions into the river ecology, villagers have not only obtained *de facto* benefits through access to electricity, but also mobilized other communities to claim that small-scale and community-centered energy governance is a viable alternative to state-driven, and socio-environmentally destructive large hydropower projects like the Hatgyi dam (Table 1, 7). This example also points to the role that alternatives play in acts of resistances, whereas contemporary movements frequently engage simultaneously in resisting by creating alternatives (Temper et al. 2018; Pelenc et al. 2019). The realization of ecological potentials offers many possibilities of resistance based on the creation of alternatives.

5.3 Ecological relationships to extend resilience and create autonomy

Ecological relationships describe the types of interactions between organisms within the same ecosystem. They consist of symbiotic relationships (mutualism, commensalism, and parasitism), as well as competition and predatory relations.

Symbiotic ecological relationships between non-human beings may strengthen resilience and autonomy of human beings. The creation of agroecological corridors by the Popular Peasant Movement (MCP) in Brazil, which combine crops with natural fertilizer species that restore soil fertility, illustrates this well. The fertilizer species, planted on former monoculture areas, produce a large amount of leaves and branches that feed the microfauna in the soil and increase its fertility. In this system, farmers resist agribusiness' push for fertilizer use and are able to continue producing food while restoring the soil (Table 1, 6). Indeed, many community-based conservation initiatives are taking advantage of symbiotic ecological relationships and potentials, which sometimes also take the form of a critique to large-scale modernization and land rationalization programs (Hecht and Cockburn 1989; Scott 1998; Lima 1999; Watts and Peets 2004). Knowledge about how to take advantage of ecological relationships – i.e. agro-ecological knowledge (Altieri, Funes-Monzote, and Petersen 2011) – is also a prerequisite for realizing the ecological potentials we discussed above and for constructing the previously mentioned 'beautiful farms' that are part of everyday forms of resistance to large-scale agrobusiness (van der Ploeg 2008).

Not only *symbiotic* ecological relationships offer possibilities for resistances and alternatives. Activists also rely on *predatory ecological relationships between non-human organisms* for developing environmental direct actions. Illustrative examples are hunting sabotage actions, described well in eco-defense and direct-action manuals of the 1970s (e.g. Dam Collective 2015). For the sabotage of dove hunts, activists describe how in the US a group of 60 people used fly kites – some of which were shaped like hawks, the dove's natural predator – to keep the doves away from the hunting area (Table 1, 5). Other tactics relying on the use of ecological relationships between non-human species were also described by the Hunt Saboteurs Association (HSA) founded in the UK in 1964. These included whistles to misdirect hounds, spraying scent dullers, or the amplification of barking hounds via cassette players and megaphones, causing the hunting dogs to stop the chase.

5.4 Ecological invisibility to enable covert actions

James Scott's (2009) description of 'escape crops' in Southeast Asia are an emblematic example of how *ecological invisibility* creates opportunities of resistance. With ecological invisibility we refer to those ecological processes, structures, and resources belonging to the more-than-human world, that, compared to others (such as charismatic megafauna), are relatively hidden to humans and particularly hard to be seen by the eyes of outsiders. Escape crops are crops, such as cassava, yams, peanuts, sorghum, and others that are well adapted to environmental niches and that are difficult to be mapped and controlled by states. While the visibility of resource units is an important characteristic for facilitating sustainable common pool management, it is precisely the invisibility of crops resulting from the specific ecological niche they inhabit that facilitate people to engage in everyday resistances to evade state control and taxation. According to Scott (2009), the escape value of crops increases when they are fast growing ('invisible' in time), are hidden,

grow below ground, or mimic the natural vegetation ('invisible' in space), have large value per unit of weight, are resistant to diseases, and are moreover storable. The cultivation of escape crops also relies on other previously discussed ecological characteristics, particularly the capacity of actors to realize ecological potentials, and their knowledge about species relationships enabling the cultivation of escape crops.

The use of escape crops by subaltern groups is not limited to Southeast Asia but can be found globally. One specific example from Uganda is the case of farmer communities living adjacent to the volcano Mount Elgon, who have been suffering from discrimination and exclusion from their ancestral land since colonial times (Table 1, 11). The situation has worsened after the creation of the Mount Elgon Forest Reserve and its upgrade to a Forest Park (1989) and later to National Park status in 1993. To ensure their supply of food, they took advantage of both the ecological potentials and the invisibility of certain processes to cultivate fast-yielding food crops in patches of land neglected by ranger patrols. The land is cleared during the collection of permitted forest resources (e.g. firewood), after which farmers plant and harvest their hidden food crops. In doing so, they resist the spaces zoned exclusively for the preservation of non-human life while creating relative autonomy from conservations organizations and the state alike (Cavanagh and Benjamin-sen 2015).

Such direct actions enabled by the invisibility of species and ecological processes largely remain hidden to outsiders. Thus, probably many more direct actions based on ecological invisibility are being conducted by people globally than what is documented in reports and the literature.

5.5 Ecological visibility to support overt claims

Not only 'invisibility' creates possibilities for resistances, but also the highly visible entities of the more-than-human world. With *ecological visibility* we refer to those more-than-human species, processes and structures that receive relatively more socio-political attention than others because of their symbolic value, their endangered status, and/or because they are central to the integrity of the larger ecosystem they inhabit, as is the case for *key-stone species*. Many keystone species are 'charismatic megafauna', such as elephants, mountain lions, or grizzly bears that have widespread popular appeal, but they can be also smaller animals such as bees or ants.

Several empirical examples show how endangered and charismatic keystone species have become important 'more-than-human allies' in social mobilizations. For example, Austria's controversial road extension project *Ennsnahe Trasse* planned during the 1990s was several times stalled because of local grassroots resistances that showed how the project would threaten the natural habitat of the protected corncrake (*crex crex*) (Table 1, 14). Another example is the case of widespread resistance against the Nam Choan Dam in Thailand during the 1980s. (Table 1, 15). The project was finally shelved indefinitely in March 1988 and a large area was instead declared as conservation zone. Among the main motives for mobilizations were the project's devastating environmental impacts on the rare wild ox (*Bos javanicus*), the green peafowl (*Pai'io muticus*), and the red-headed vulture (*Sacrogyaps calhus*), among others. Local groups and the anti-dam movement seized the opportunity of the high media visibility of these species to successfully oppose the dam project.

However, whether keystone species turn into ‘more-than-human allies’ or ‘more-than-human enemies’ for customary groups depends also on cultural framings, and how people relate themselves strategically to public and academic debates, i.e. whether the activities of customary groups such as Indigenous Peoples and Local Communities benefits or threaten conservation aims (Büscher et al. 2017). The capacity of local groups to relate to such debates is key to frame their co-existence with charismatic keystone species as an opportunity for mobilization to protect their own territories, instead of being threatened by exclusion. Unfortunately, while the Nam Choan Dam was successfully cancelled and the area was turned into a nature conservation zone, concerns over the displacement of hill tribes remained – not anymore because of eviction threats from the dam construction, but then over conservational concerns. This illustrates that the possibilities for resistance enabled by ecological endowments are not static and structurally given but are deeply relational and depend on specific cultural and ecological contexts, and how people relate to them (cf. McAdam, Tarrow, and Tilly 2001).

5.6 Ecological resources to support mobilizations

The more-than-human world can also provide important ecological resources for humans to organize and sustain contentious actions and politics. For example, the French ZAD (*Zone A' Défendre*, later on called *Zone d'Autonomie Définitive*)⁷ movement against the Grand Ouest Airport Project, planned to be developed on a marshland in Notre Dame des Landes, created agroecological gardens and homes within the project area. This made it not only difficult to evict the activists but moreover enabled them to develop some forms of self-sufficiency in food provision that supported the resistance movement (Table 1, 16). In rural (but also urban) contexts, the choice of the location of protest camps might be well shaped by considerations such as access to fresh water, possibilities for food from hunting or gathering to sustain protest activities. These aspects may also shape the trajectories of protest, as resource provision through ecosystems depends on seasonal dynamics.

The more-than-human world serves also as a resource provider for mobilizations in cases where groups engaged in common pool resource management become political actors and finance their activities through their community-based resources. Villamayor-Tomas, García-López, and Scholtens (2020) describe the symbiotic relation between collective and contentious actions for the case of the El Salto Forest Association in 1968, Mexico (Table 1, 17). The group ‘became a *‘political arm’ of the forest communities, a form of social movement organization – led and financed by the forest communities through their forestry activities – advocating on their behalf* (Villamayor-Tomas, García-López, and Scholtens 2020, 4). Resource mobilization through forestry was thus key to defend their interests, which resulted in a new national law that recognized forest communities’ rights, as well as in institutional structure of co-management between the government’s agencies and the communities (ibid).

All these examples show that more-than-human entities can become key provider of material means for social mobilizations. But moreover, activists may not only *mobilize* such ecological resources, but may also aim to *block* resource mobilization by opposing

⁷See https://www.liberation.fr/france/2018/01/15/pourquoi-dit-on-zadiste_1622519

groups. For example, the burning of large amounts of illegal timber logs found by activists during grassroots patrols in the Prey Lang Forest, Cambodia, illustrates how local forest defenders intervene into the mobilization of ecological resources (and thus finance) of the timber mafia that threatened their lands and livelihoods (Table 1, 19). Further attention to ecological resources offered by the more-than-human world and the distinct mechanisms of how they are mobilized, or blocked by opposing groups, could well enrich resource mobilization theory, particularly when applied to more rural contexts of social mobilization.

5.7 Ecological connectivity as linking mechanism

Finally, the diverse interactions of species and flows of the more-than-human world may also act as a linking mechanism among activists, which ‘establish[es] relationships among people and groups operating in quite different perceived, conceived, and lived spaces’ (Martin and Miller 2003, 157). Ecological connectivity, referring to the interactions of ecological structures and processes across a given area, for example through the interdependency and movement of non-human species, or the flow of resources such as water, air and others, can serve as a linking mechanism for distinct and distant social groups. Groups who are ecologically connected may achieve to mobilize together and create strong alliances when the larger ecosystem upon which they commonly depend (e.g. rivers, forests, coastal areas) becomes under threat from outside actors, such as extractivist projects.

An example here is how the proposed construction of a massive Special Economic Zone (SEZ) in Dawei, Myanmar, has linked together different sectoral groups. The SEZ, located on former peasants’ fields, would be constructed together with other large infrastructures linked to the SEZ, i.e. a fresh-water supply dam located in an Indigenous territory, a deep-sea port, a coal-fired power plant, an access highway cutting through a forest landscape, and a quarry using a neighbouring hill. The massive infrastructure complex would entirely transform the larger ecosystem in which the SEZ is embedded. Protests against the project and its components have not come only from one, but from several different sectoral groups linked together across the ecologically connected landscape: peasants displaced by the project, coastal fisherfolks affected by the deep-sea port, forest dwellers and others affected by the freshwater dam and access way. All these groups are linked together through the expected impacts of the SEZ on their common ecology (Table 1, 20).

Ecological connections may thus be turned into political connections and may provide reasons to link different group beyond aspects of ethnicity, class, gender, or generation. Ecological connectivity may enable unique possibilities for alliances to mobilize together, beyond social bonds.

6. Towards a better understanding of ‘political ecological opportunities’

The above examples illustrate seven general ecological characteristics and conditions of the more-than-human world that have become co-constitutive of contentious actions and politics. This list is surely not complete, and more properties can be added and further discussed, such as for example how storability may facilitate the mobilization of

ecological resources, or how the non-predictability of ecological process may support hidden resource appropriation.⁸ Yet, the ecological characteristics and empirical examples described above illustrate well the diverse ways through which the more-than-human world offers distinct possibilities for the co-production of contentious actions and politics.

Recognizing the role of more-than human forces in co-producing possibilities for action and claim-making may enrich our understanding of political opportunities. Political opportunity structures generally refer to *'features of regimes and institutions that facilitate or inhibit a political actor's collective action and to changes in those features'* (Tarrow and Tilly 2007, 440). If we aim to take seriously the role of more-than-human natures in the co-production of political opportunities, we must pay more attention to the role of 'ecological features' across 'social-ecological regimes' to further understand the enabling and inhibiting factors of contentious actions and politics within a more-than-human world. In the past, we have occasionally used the term 'biophysical opportunity structure' to emphasize how ecological endowments may shape diverse forms of mobilization and direct actions (Scheidel et al. 2018). Pellow proposed the term 'political ecological opportunity structure' *'to recognize that both human and nonhuman forces shape and constitute the myriad political structures and opportunities in which social movements function'* (2017, 39) – a choice of term that well reflects both human and more-than-human dynamics at play.

One aspect that stands out is the *relational character of political ecological opportunities*. While the above-described general ecological characteristics and conditions are present in many contexts of environmental conflicts or protest actions, this does not mean that activists will use them in the same way, if at all, to develop contentious actions and politics. Rather, whether contentious actions and politics draw upon ecological characteristics, and the forms and functions they may take, ultimately depends on the way how people relate to them. We illustrated this above for the case of keystone species that have received high conservation value, by showing that whether they may turn into 'more-than-human allies' or 'enemies' depends on the ability of movements to mobilize the conservation value of keystone species strategically to their own benefit, as well on the prevailing discourses of conservation that may give credibility, or not, to the proposals made by movements. This context-dependency also applies to the other ecological features discussed above. For example, the mere presence of ecological potentials does not directly translate into contentious actions, but their realization depends on human agency, specifically, whether people observe them in a given landscape, recognize their potential strategical value, and have the agro-ecological knowledge, capacity, and willingness to act upon them. The same can be argued for ecological vulnerabilities, or the use of ecological resources to finance and sustain protest. In other words, we do not see a static one-to-one relationship between ecological properties and the emergence of political ecological opportunities, but rather a dynamic, contingent, and context-dependent process of co-production of protest dynamics.

Similar reflections are shared by Kroger (2020) in his discussion of the role of ecological endowments of mines for resistances. Regarding the immobility of mines, compared to

⁸Non-predictability of ecological processes, such as crop yields, may also enable important forms of protest. Harvest, for example could be low because yields have been bad, allowing people to appropriated production in acts of everyday forms of protest, without being traced.

movable investments, he argues that *'ecological endowments are not fate, but the geographical particularity of mines is an important political component that movements can use strategically'* – however, only if movements are able to use the potential immobility of these investments strategically as a bargaining tool and if the context for resistances is favorable (Kroger 2020, 211). Such considerations are in line with McAdam et al.'s (2001) proposal for a dynamic approach to study political opportunities, who, in response to the frequently static approximations to political opportunities, argue that political opportunities, rather than being structurally given, must be understood relationally and within their specific contexts. Political opportunities do not simply appear and translate into specific forms of contentious actions, but people and movements play an important role in actively creating, shaping, as well as ignoring them (Hadden 2015; Kroger 2020). What we observe in the above empirical examples is that political ecological opportunities are co-produced by human and more-than-human natures in a dynamic process in which the presence of certain ecological characteristics may influence the form and functions of contentious actions and politics, but where context, agency and the choices of political actors plays a central role in their creation and realization.

In this regard, we note also how the forms and functions for contentious actions depend strongly on how specific ecological characteristics and conditions are creatively combined by activists into diverse political ecological opportunities (Table 2). For example, ecological potentials can be realized in hidden ways, by relying on the ecological invisibility of crops, to gain *de facto* benefits through covert actions or to secretly mobilize resources for mobilizations. However, when ecological potentials are combined with ecological visibility, such as through the creation of well-visible urban guerilla gardens or the proclamation of agroecological corridors, the same ecological characteristics can support the overt defense of alternatives to dominant regimes, combined with claims for *de jure* changes. It is the specific combination of ecological features of the more-than-human world, combined with how people perceive, experience, and ultimately relate to them in specific social, economic and political contexts, that shape how political ecological opportunities are created and taken advantage of in the development of contentious actions and politics.

7. Conclusions

We have illustrated that our understanding of contentious actions and politics may be enriched by paying further attention to the specific ecological characteristics of the more-than human world in which they unfold. The presence of ecological characteristics, combined with people's knowledge, capacities, and willingness to creatively act upon them within specific contexts, may co-produce unique political ecological opportunities for contentious actions and politics. This does not mean that ecological endowments are always co-constitutive in social mobilizations, and even less that their mere presence would enable movements or scholars to foresee the diverse forms of contention that may arise. However, in many cases, the ecologies in which contentions occur may strongly interact with the social dynamics of contention at play. Further attention to these interactions may offer scholars and movements alike new ways to creatively think and learn about the potential roles the more-than-human world may play in contentious actions and politics.

Interdisciplinary approaches and efforts aiming to grasp with the complex assemblages of human, non-human, and more-than-human processes, may thus open new avenues for a rich and nuanced understanding of contentious actions and politics. As Pellow (2017, 40) has argued, '*attention to political ecological opportunity structures can have a productive impact on social movement theory*'. We see such a productive potential particularly for ongoing efforts that explore the contentious actions and politics arising in current agrarian struggles (Borras Jr and Franco 2013; Pahnke, Tarlau, and Wolford 2015) and movements for environmental justice (Martinez-Alier et al. 2016). In these contexts, increased attention to the role of more-than-human natures may illuminate important questions, such as how people and movements achieve to resist the creation of environments they perceive as unjust; how specific ecological characteristics may enable them to create alternatives they perceive as more just and sustainable; how ecosystems may become important resource providers to finance and sustain protest networks through the provision of ecological resources; or how ecological dynamics of the more-than-human world, such as seasonality or environmental change, may shape the trajectories of resistances, in their favor, or against them.

In summary, further attention to the ecologies of contentions in which protests and mobilizations occur may help activists and academics to think and learn about how ecology can become a dynamic source of power in contentious actions and politics, and more broadly, how social and ecological processes actively co-shape each other, thus co-producing current agrarian and environmental transformations.

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