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Autonomous conservation: A literature review of concepts, local practices, and their relevance in the tropics

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ABSTRACT

Official conservation activities are absent in many tropical regions, but local people living in and around these areas nonetheless engage in practices that contribute to conservation objectives. These practices, when they arise endogenously, are referred to here as *autonomous conservation*. They are not well documented and their value and significance remain unclear and debated among scholars, practitioners, and policymakers. We reviewed literature on autonomous conservation practices, combining keyword searches, snowballing, citation tracking, and references from scholars in our network. Eighteen cases of autonomous conservation in the tropics, representing marine (n=11), terrestrial (n=6), and combined systems (n=1) were identified for additional analysis. Our review identified three common themes linking long-standing local practices and conservation. The first theme emphasizes conservation as an outcome achieved through various practices, including those associated with spiritual beliefs and taboos. These practices restrain overharvesting, sustain resources, and protect places and species. Second, the overall effectiveness of these practices is influenced by the strength of social institutions, knowledge transfer mechanisms, and deterrence measures. They are grounded in norms, legitimacy, and respect that promote compliance, maintain social processes, and sustain practices over time. The third theme highlights the nuanced perspectives on conservation ethics within local communities. Some authors view conservation as embedded in local knowledge and practice, while others emphasize the importance of discerning a recognizable conservation motive when labeling these autonomous practices as 'conservation'. As conservation policies and practices increasingly demand evidence-based approaches, understanding local practices and their relevance in conservation is crucial for more effective and inclusive conservation.

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1. Introduction

While protected areas cover a significant portion of the Earth's surface (UNEP-WCMC, and IUCN, 2024), their effectiveness in achieving conservation goals is often debated. In addition to protected areas, "other effective area-based conservation measures" (OECMs) contribute 0.1 % and 1 % to the increase in marine and terrestrial protected area coverage, respectively. However, it is possible that important conservation activities are being overlooked in these assessments, particularly in regions where official government and conservation activities are weak or absent. In such areas, local communities may independently manage and protect their environment in ways that contribute to conservation objectives. We believe such practices may be common having developed in response to social, economic, and environmental conditions. We refer to these locally developed and implemented practices as "autonomous conservation".

As environmental problems, such as climate change and biodiversity loss, intensify there has been a growing interest in conservation efforts. International organizations and governments have planned and implemented multiple initiatives to conserve natural resources and ecosystems. Simultaneously, many developing countries continue to rely on land-intensive and resource-based economies as key pathways for development. The impacts of these external interventions, including conservation initiatives, plantations and mining, on local people are multifaceted, with both positive and negative consequences. International organizations, non-government organizations, and scholars have highlighted the need for better recognizing local community rights and for conservation initiatives to involve local people, and incorporate their aspirations, and priorities (Berkes and Folke, 1994; Brosius et al., 1998; Danielsen et al., 2009; FAO and UNEP, 2020; Ostrom, 1990; Sheil and Boissière, 2006). A growing body of research and practice emphasizes the value of incorporating local knowledge and practices into conservation efforts too (Berkes, 2012b; Cullen et al., 2007; Drew and Henne, 2006; Gadgil et al., 2003; Marie et al., 2009). However, despite some progress in local participation and co-management practices within conservation organizations, these efforts are often driven by funding requirements and rarely position local people as leaders in the process, failing to fully leverage their knowledge and practices (Acheson, 2006). The inclusion of local knowledge and practices can enrich the way we approach conservation. It may be a matter of enhancing and amplifying the role of local communities by incorporating their perspectives and building upon existing practices rather than imposing a top-down approach (Berkes et al., 2000; Sheil and Lawrence, 2004).

Considerable attention has been expended on the role of local communities in causing conservation threats, such as overharvesting, land clearance, and environmental degradation (Fox, 2000; Mertz et al., 2009; Padoch et al., 2007; Rerkasem et al., 2009). This discourse remains strong, particularly when local livelihood activities intersect with internal and external pressures, such as population growth, market demands, limited land availability, changes in values and land tenure systems, and conservation agenda (Bong et al., 2016; M. Cairns, 2017; M. F. Cairns, 2015; Colfer et al., 2023; Thu et al., 2020; Wong et al., 2020). Simultaneously, numerous non-government organizations and scientists argue that local communities are often the best-placed people to protect nature (Danielsen et al., 2009; Elliott and Sumba, 2013; Sheil and Boissière, 2006; Sheil and Lawrence, 2004). Indeed, this assumption underpins the work of many organizations focused on conservation and local rights. Thus, objective assessments on the roles of local people in shaping their environment become crucial as current policies and development are increasingly moving toward evidence-based approaches (Pullin & Knight, 2001; Sutherland et al., 2004).

Our objective in this review is to investigate the conservation relevance of selected local practices and analyze the concepts and rationales underlying their assessment. In the next section, we outline our approach, methods, and an overview of the case studies. Next, we explore different perspectives on "autonomous conservation" through case studies. We then delve into the importance of local practices and the role of context, including culture, in their success. We follow with a discussion on how conservation is defined.

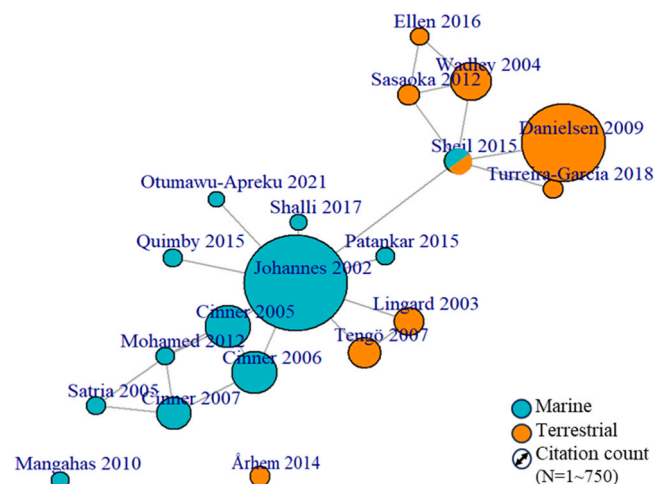


Fig. 1. Citation connection between seed articles and selected case studies (generated using "igraph" R package based on citation data from Google Scholar on 10 May 2024).

Table 1
Summary of community and area sizes in the case studies subjected to management practices.

System types	Community sizes (people)*	Area sizes (ha)*
Marine	72,951 (n=6)	18,5007 (n=4)
Terrestrial	83,281 (n=6)	832,985 (n=5)
Total	156,232	1017,992
No information	Turreira-García et al. (2018); Lingard et al. (2003); Tengö et al. (2007); Otumawu-Apreku et al. (2021); Shalli, (2017); Quimby, (2015)	Mangahas, (2010), Quimby, (2015), Shalli 2007, Satria, (2005), Otumawu-Apreku et al. (2021), Mohamed, (2012), Ellen, (2016), Arhem, (2014)

* The reported sizes in one case study (Sheil et al., 2015) cover broad forest-river-mangrove systems, but mainly terrestrial, thus counted under terrestrial.

Finally, we identify challenges and key questions for future research.

2. Methods

We searched available documents including both peer-reviewed and grey literature (unpublished theses, books, and reports) across disciplines. Incorporating unpublished literature reflects a growing trend in reviews of conservation evidence (Haddaway and Bayliss, 2015). We integrated the analysis and interpretation of literature with an iterative search process (Boell and Cecez-Kecmanovic, 2014). Our approach acknowledges the evolving nature of knowledge and the possibility of missing relevant articles. Nonetheless, our review provides a starting point for exploring how "autonomous conservation" is discussed in the literature. We began by defining "autonomous conservation" and then sought and explored case studies to expand our understanding.

Review 1: Defining 'autonomous conservation'. We searched for the term "autonomous conservation" in Google Scholar on 15 June 2023, which resulted in 158 articles. We applied the following inclusion and exclusion criteria: 1) practice is endogenous; projects initiated by external actors, e.g. non-government organizations, states and the private sector, are excluded. We included practices that were promoted or received technical or financial support from external actors, provided the article included an explanation of the endogenous origin of the practices; 2) not located within officially designated conservation areas; 3) mentioning at least one management outcome (e.g., livelihood, social, ecological), and 4) in English. After screening titles and abstracts based on the criteria, we narrowed it down to 14 articles. A further full-text reading resulted in 6 articles (Table 1 in the appendix).

Review 2: Expanding understanding through case studies. We combined snowball sampling techniques (Lecy and Beatty, 2012), citation tracking (Greenhalgh and Peacock, 2005), and expert consultation to identify a list of case studies. We applied the same four criteria from the first review and included an additional criterion to focus on practices in the tropics.

In the first iteration, we selected three seed articles based on an initial scoping search and author discussions. Seed articles represent the knowledge domains we are interested in, are well-cited, and are several years old to allow broad exposure (Lecy and Beatty, 2012). The seed articles selected in this review focus on local autonomous conservation practices in terrestrial and aquatic domains, have over 50 citations, and are about 10 years old (Table 2 in the appendix). Next, we assessed all the references that cited the seed articles (n=1347, based on Google Scholar and Web of Science searches on 20 June 2023). After screening titles and abstracts, we identified 57 articles for the second screening. Full-text reading of these articles resulted in 12 case studies that satisfied our five criteria.

In the second iteration, we considered the excluded references from the first iteration. Many of these references, mainly theoretical or review books and articles, provided relevant material which served as background references. One book of particular interest focused on pre-existing management systems in Southeast Asia (Ruddle and Satria, 2010). We further expanded our search by doing citation tracking of articles reviewed in this book. Following the same process and criteria, we identified two additional case studies. In the third iteration, we compiled a list of potential references (n=17) through discussions among the authors and consultations with scholars from ecology, forestry, anthropology, and geography backgrounds. Three of these references met our criteria and were included as case studies.

In the last iteration, throughout our review, we discovered reports, primarily dissertations and books from anthropological and ethnographic disciplines, which provided detailed insights into the relationships between local communities and their surroundings. They often describe these relationships within the contexts of worldviews, cosmology, or situated knowledge. One such dissertation included in our case studies discussed conservation as part of the cosmology and livelihood practices of Katuic Peoples in the uplands of Laos and Vietnam (Arhem, 2014). Although other related examples were excluded from our final list as they were not from the tropics, they provide valuable perspectives. This includes the views on water as a living entity within modern-political interference in Yukon, Canada (Wilson, 2018) and Berkes's discussion on ecological knowledge of the Cree people of Chisasabi, Canada (Berkes, 2012b). In total, 18 case studies are included in our final list (Table 3 in the appendix).

We used "igraph" R package to analyze the citation network between the seed articles and selected case studies and visualize the citation counts (Csardi and Nepusz, 2006; Csárdi et al., 2024). We summarized the sizes of communities and areas subjected to autonomous conservation practices from our cases. To give an overview of relevant themes within each system's context, we analyzed the texts in the titles, abstracts, and keywords of the selected articles using the "wordcloud" R package (<https://rstudio.com/>). Next, we assessed the reported or measured outcomes. We noted when the authors commented on the effectiveness of local practices, contributing factors, and measures used to assess effectiveness. The practices were analyzed more deeply for objectives, threats, institutions (e.g. norms and beliefs, rules and sanctions), mechanisms related to monitoring and enforcement, and factors affecting

compliance (e.g., deterrence and legitimacy). When mentioned or inferred by authors, we also noted how the information from local monitoring is evaluated and used.

3. Defining autonomous conservation

The term ‘autonomous conservation’ has been mentioned in the literature, but an explicit definition is lacking (N=6, see Table 1 in the appendix for a summary of the articles). The term is used in various contexts and often refers to an ideal concept or model of conservation that employs bottom-up approaches to conservation (Akimichi, 2001; Hunt, 2017; Nomura et al., 2017) and emphasizes collaborative partnerships (Faulstich, 2000). Some authors highlight the potential of autonomous conservation for more effective and equitable conservation efforts, particularly in remote regions of the world. They focus on aspects such as knowledge and capacity, which enable effective conservation when properly supported or legitimized (Faulstich, 2000; Hunt, 2017).

The term is also mentioned in the context of institutional characteristics and governance processes (N=5). These include a reference to forest groups with autonomy in decision-making processes, aptly referred to as autonomous conservation organizations (De Jong et al., 2018) or the ability (or lack thereof) to make independent decisions and determine what constitutes conservation (Eichler and Baumeister, 2018; Laako and Kauffer, 2021). Several existing conditions that can hinder the realization of these potentials or influence conservation outcomes were mentioned, such as elite capture (Faulstich, 2000; Hunt, 2017), lack of autonomy (Eichler and Baumeister, 2018; Laako and Kauffer, 2021), and insecure tenure (De Jong et al., 2018).

A few common themes emerge across the references. They feature autonomous conservation as a practice led and managed by a community, with no or minimal external control or influence, and embodied local knowledge and institutions. We were aware of other literature that present concepts related to autonomous conservation such as autonomous local monitoring (Danielsen et al., 2009; Sheil et al., 2015). We considered this concept as part of autonomous conservation characteristics because a locally evolved monitoring is part of resource management that aims to maintain and protect resources and other values. We expand further our understanding of autonomous conservation through case studies.

4. Overview of the case studies

We identified eighteen accounts that provide insights into autonomous conservation practices in tropical regions. Most of these focused on aquatic or marine resource management (n=10), while a smaller number addressed terrestrial resources (n=7), and one explored both terrestrial and marine systems. The two older seed articles (Danielsen et al., 2009 and Johannes, 2002b) have the highest number of citations at 584 and 750, and represent terrestrial and marine systems, respectively. The third seed article (Sheil et al., 2015) was central in bridging the knowledge exchange between marine and terrestrial systems within our selected cases (Fig. 1).

The cases described covered approximately one million hectares of sea and land, and involved 156,232 people associated with the

Marine systems

Terrestrial systems



Most mentions (N=68): “resource”
Lowest mentions (N=3): “culture”, “livelihood”, “rural”,
“individual”, “generation” ~ 45 more words

Most mentions (N=26): “local”
Lowest mentions (N=1): “properties”, “deterrence”,
“policing”, “blind”

Fig. 2. Wordcloud panel of titles, abstracts, and keywords from terrestrial and marine case studies (generated using “wordcloud” R package). Larger letters indicate more frequent mention of these words. Note: the most mentions and lowest mentions reflect the 200 words Wordcloud limit.

concerned resources and ecosystems (Table 1).

The word cloud panel (Fig. 2) illustrates common words used in the case studies' titles, abstracts, and keywords. Among the twenty most mentioned words, "local", "management", "communities", "resources", "protect", and "conserve" present in both terrestrial and marine systems with a total of 107 and 236 mentions, respectively. These words are associated with the community of interests and management outcomes. There is a greater variety of words related to the types of practices and institutions in each system. In terrestrial systems, words such as "monitor", "enforce", "taboo", "role", and "institution" are prominent (47 total mentions), while in marine systems, the words "use", "closure", "social", and "change" are more prevalent (65 total mentions). Other distinguishing words between the two systems include "fish", "marine", "island", "reef", "forest", and "tortoise". This variation is mainly contextual, they represent different resources and ecosystems in each system.

5. Conservation outcomes

The reviewed articles reported multiple outcomes. Most of these focused on maintaining cultural relevance and meeting livelihood needs. Conservation outcomes in the case studies were observed and measured directly, inferred, or considered as an inherent part of local practices (Table 2).

Among the 18 case studies (Table 1), five employed a mix of quantitative and qualitative methods and included control sites for comparison to measure conservation outcomes (Cinner et al., 2005, 2006a; Cinner, 2007; Lingard et al., 2003; Tengö et al., 2007). These cases observed and measured ecological benefits resulting from local practices. These outcomes included relatively higher biomass and larger average size of fish and other marine species in Sangihe Talaud Island, Indonesia, and Ahus and Karkar Islands, Papua New Guinea (Cinner et al., 2005, 2006a; Cinner, 2007), protection of threatened and endemic radiated tortoise (Lingard et al., 2003) and spiny forest in Madagascar (Tengö et al., 2007).

In two other cases, conservation outcomes were documented based on the observations reported by resource users. Iban hunters in West Kalimantan, Indonesia, reported a higher number of animals encountered, sighted, and captured in sacred forests than in nearby forests lacking such traditional restrictions (Wadley and Colfer, 2004). Similarly, Ivantans fishers observed relatively larger lobsters being caught after the lifting of *vanua*, an extended closed season practiced in Batanes, the Philippines, (Mangahas, 2010).

Two cases focused on the effectiveness of local monitoring. In Cambodia and Papua, local communities monitored forests and customary territories, effectively preventing unregulated exploitation (Sheil et al., 2015a; Turreira-García et al., 2018). Although monitoring mechanisms differ between the two. Rampant illegal logging in the 2000s prompted the establishment of a more organized forest monitoring group and activities by the Prey Lang Communities in Cambodia. While in Papua, much of the monitoring was carried out as part of livelihood activities where people visited and established temporary huts along territorial boundaries and also supported resident guards at access points to resource-rich areas.

Three cases measured the effectiveness of local institutions based on compliance with local regulations, norms, and taboos related to the use, access, and management of natural resources. Two studies reported declining compliance among resource users, with traditional regulations and taboos being less observed among younger fishers in the Nicobar Archipelago after the 2004 tsunami (Patankar et al., 2015) and among fishers in urban coastal areas of Tanzania (Shalli, 2017). While in Central Seram, Indonesia, local institutions were considered effective in ensuring compliance with hunting and trapping bans (Sasaoka and Laumonier, 2012). The practices were largely reliant on belief in supernatural monitoring and enforcement. The 80 % of the local forest lots under the bans were claimed to provide sanctuaries for animals.

Four other case studies reported the potential of local practice for conservation or resource management. These practices included

Table 2

Types of assessment and measures of conservation outcomes in the selected case studies of terrestrial and marine systems.

Observed and measured conservation outcomes	
A.	Measured resource sizes and abundance, and case-control study sites
	– Terrestrial: Lingard et al. (2003), Tengö et al. (2007)
	– Marine: Cinner et al. (2005), (2006), Cinner (2007)
B.	Based on reported observations from resource users on sizes, diversity, and abundance of resources, and case-control sites
	– Terrestrial: Wadley and Colfer (2004)
Claimed conservation outcomes	
C.	Based on effectiveness of local monitoring of use and access to resources
	– Terrestrial: Sheil et al. (2015), Turreira-García et al. (2018)
	– Marine: Sheil et al. (2015)
D.	Based on effectiveness of local institutions in ensuring compliance with norms and local rules related to use and access to resources
	– Terrestrial: Sasaoka and Laumonier (2012)
	– Marine: Patankar et al. (2015), Shalli (2017), Mangahas (2010)
E.	Stated conservation potential based on synthesis and authors' conclusion
	– Terrestrial: Ellen (2016)
	– Marine: Satria (2005), Otumawu-Apreku et al. (2021), Quimby (2015)
Embedded conservation within local practices	
F.	Inherent nature of conservation in local knowledge and belief system
	– Terrestrial: Arhem (2014)
	– Marine: Mohamed (2012)

temporal restrictions applied to forests in Seram (Ellen, 2016) and coastal fisheries in Lombok (Satria, 2005), and Aceh, Indonesia (Quimby, 2015). Similar restrictions apply to fishing in the Solomon Islands (Otumawu-Apreku et al., 2021),

Cosmology plays a role too. The conservation ethic of Katiuic people in Laos and Vietnam was embedded in their cosmology and manifested in their livelihood practices. Their beliefs influenced where and how they practiced swidden cultivation, preserving large patches of relatively intact old-growth forests, associated with spirits (Arhem, 2014). In the Maldives, the belief that certain fish are sentient coexists with their importance for food, leading to respectful behaviors that prevent overharvesting (Mohamed, 2012).

6. Local practices and their relevance

The case studies reveal various practices aimed at restraining overharvesting and protecting specific species and locations. The text and narrative syntheses (Table 2, Table 3, and Fig. 2) show that these practices are often driven by spiritual beliefs and livelihood objectives, manifested through local rules and norms such as taboos and closure. They operate through various mechanisms including deterrence, legitimacy, and knowledge transfers, which support compliance with the local rules and norms.

6.1. Sacred places and taboos

In the reviewed case studies, some communities believe that places such as mountaintops, forest groves, and water bodies, feature powerful supernatural forces. Taboos or restrictions on access and use are common within these locations. Examples include prohibitions on using resources within sacred burial places in the dry forests of southern Madagascar (Tengö et al., 2007), limitations on accessing and utilizing specific hills and their resources in upland Laos and Vietnam (Arhem, 2014), and temporal closure of fishing activities within designated areas in Sangehe Talaud Island, Indonesia, and Ahus and Karkar Island, Papua New Guinea (Cinner et al., 2005, 2006a; Cinner, 2007).

Additionally, certain species are considered taboo due to perceived “uncleanliness,” as observed in the case of restriction on consuming radiated tortoises in Madagascar (Lingard et al., 2003). These beliefs and practices protect specific species, maintain habitat integrity, and create wildlife sanctuaries. They illustrate how conservation practices emerge within specific contexts of cultural, religious, and spiritual beliefs.

These beliefs and practices highlight the connection between people and their environment, reflecting the intrinsic value that can be integrated into and motivate broader conservation approaches (Berkes, 2012b; Gavin et al., 2015; Palomo et al., 2014). However, the needs and aspirations of communities evolve and are influenced by broader political and economic processes, adding another further complexity and challenges. The case of the Maldives illustrates the changing values associated with reef resources among island communities, particularly between the older and younger generations (Mohamed, 2012). In Vietnam and Laos, the national development policies introduced modernist visions through resettlement and infrastructure, which, among others, re-shaped the social fabric and natural landscapes of the regions and influenced how people weigh older beliefs and norms (Arhem, 2014).

6.2. Deterrence, legitimacy, and knowledge transfer

Deterrence, legitimacy, and knowledge transfer are three main aspects of local institutions reported in the case studies as contributing to compliance with rules and norms. When individuals fear being detected and punished or shamed for breaking a rule, they are more likely to comply to avoid negative consequences. Fear of sanctions acts as a deterrent and promotes compliance. In some cases, these sanction and monitoring systems take the form of fines and/or community services (Cinner et al., 2005, 2006a; Tengö et al., 2007), while in others, they are spiritual in nature. This includes belief in supernatural retribution which prevents sacred places from being violated (Ellen, 2016; Sasaoka and Laumonier, 2012; Shalli, 2017; Sheil et al., 2015a; Tengö et al., 2007; Wadley and Colfer, 2004).

Compliance behavior is driven by institutional and social norms, in which individuals generally adhere to expectations of acceptable behavior within a social group, even if they may not agree with the underlying reasons for conformity (Posner, 1997). In

Table 3

Examples of different types of practices, their resource management functions, and conservation relevance.

Types of practices	Resource management functions and conservation relevance	Examples of cases
Taboos/restriction – Temporal (apply to species or area) – Species – Gear and methods	Regulating time and access to certain resources and/or habitats, maintaining resource stocks and abundance Protecting specific species Regulating types of gears used and methods of resource withdrawal	Sin Wesi forest (Ellen, 2016); sasi forest (Sasaoka and Laumonier, 2012), certain marine species and location (Mangahas, 2010; Shalli, 2017; Cinner et al., 2005, 2006, 2007; Patankar et al., 2015; Satria, 2005) Consumption of tortoises (Lingard et al., 2003) Gear for fishing in Maldives (Mohamed, 2012), fishing vessels and gear in Tanzania (Shalli, 2017)
Sacred sites	Protecting and maintaining species and habitat functions, wildlife sanctuary	Spirit hills in the uplands of Laos and Vietnam (Arhem, 2014), burial forests in Madagascar (Tengö et al., 2007) and Kalimantan (Wadley and Colfer, 2004)
Local monitoring	Detering unregulated exploitation, preventing overexploitation, protecting valuable resources	Resources within the forest and mangrove systems in Papua (Sheil et al. 2015), forest resin trees in Cambodia (Turreira-García et al., 2018)

this context, institutional and social norms themselves act as deterrence. People comply because of peer pressure and fear of social sanctions if they fail to conform to rules and norms. Examples include the social pressure of being guilty in Maldives (Mangahas, 2010) and social ostracism as part of public shaming in Lombok, Indonesia (Satria, 2005). When competing norms are present, individuals may be less motivated to adhere to one norm over others. For example, in the *wantok* system, a Melanesian cultural practice of relying on one's *wantok* ("one talk", people who speak the same language) for any need or sharing. *Wantok* motivates people to comply with rules and norms due to peer and social pressure. However, social cohesion can also be a reason why people do not report rule-breaking events or enforce sanctions, as they do not want to be seen betraying their own (Otumawu-Apreku et al., 2021). In this context, the presence of legitimate rule enforcers, such as community leaders, appears crucial in sustaining compliance.

Compliance with local conservation practices may persist under challenging circumstances, such as high population density, resource dependence, and limited occupation alternatives as seen, for example, in Ahus island, Papua New Guinea (Cinner et al., 2005). Multiple factors that motivate compliance were highlighted in this case, but two are also underlined in other examples, i.e., perceived legitimacy and the presence of knowledge transfer mechanisms. When people trust and respect the authority designing and enforcing the rules, perceiving them as knowledgeable and acting in their best interests (fairness), compliance is more likely. This aspect is particularly emphasised in marine examples (Cinner et al., 2005, 2006a; Cinner, 2007; Mohamed, 2012; Satria, 2005). In the terrestrial case of Madagascar's Androy region, residents respected restrictions on forest use imposed by a distant clan (Tengö et al., 2007). This perceived legitimacy fosters monitoring and enforcement, as people living near these forests accept that they are judged responsible for violations, compelling them to watch for offenders.

The other aspect is the presence of regular social and cultural events that act as reminders and facilitate knowledge transfer. This process reinforces and maintains institutional and social norms within the community (Haggan et al., 2007). People are reminded of the rules and restrictions during harvesting events, feasts, and celebrations (Cinner et al., 2005) or in their everyday lives when someone breaks the rules (Mohamed, 2012). Weaker comprehension and local institutions were observed when intergenerational knowledge transfer had deteriorated over several decades (Satria, 2005).

6.3. Change and adaptation

An interplay of factors shapes the context for autonomous conservation. Economic, environmental, and political changes shape local processes, institutions, and practices. These shifts introduce a diverse range of institutions, values, and interests, which impact local processes, including the positive and negative factors that contribute to conservation outcomes. For example, political shifts in Indonesia allowed fishers to revive older practices (Satria, 2005). Although concerns about elite capture and unequal distribution of benefits remain, this case exemplifies a unique pathway of transformation that emerged amidst major changes. In other, recognition and support from governments or conservation organizations re-strengthen autonomous practices (2006; Cinner, 2007; Mangahas, 2010). In Papua, the community adapted the FAO's introduced measures for crocodile harvesting size and considered them as *adat* rules (Sheil et al., 2015).

Conversely, changes after sudden and major environmental events, such as tsunamis, can erode compliance (Patankar et al., 2015). In others, a decrease in compliance occurs more gradually; local institutions become less effective as traditional leadership loses legitimacy, existing structures fail to represent diverse community interests, or market influence promoting more extractive practices gains prominence (Lingard et al., 2003; Mangahas, 2010; Mohamed, 2012; Shalli, 2017).

Changes in management practices were also observed as result of local knowledge and information from local monitoring. In Seram, a temporary hunting ban was implemented by the local community in response to an observed decline in game animals such as wild boar and deer. The ban was lifted only after signs of population recovery was observed. (Sasaoka and Laumonier, 2012). In Papua, a fish poison ban was imposed after the local people observed depleting fish because of the excessive use of poison for fishing (Sheil et al., 2015). They gently escalated their disapproval to those who ignored the ban—this was a slow and conservative approach but was also flexible and successful in both pressuring against non-compliance and avoiding conflict within the community. Understanding how these gradual and sudden changes, as well as other internal and external processes, influence the nature and impacts of local practices warrants further study.

7. Conservation ethic and intent

There has been an ongoing discourse and debate surrounding the concepts of conservation and its underlying motivations within the scientific community and among conservation practitioners. What is and isn't conservation has long been a subject of debate (Luque-Lora, 2023; Webb, 2002). Here our focus is intent and motivation. For instance, seasonal restrictions like taboos or *sasi* may be considered as purely economic strategies aimed at maximizing yields. Some ethnographic studies suggest limited evidence of deliberate conservation practices in some communities (Raymond, 2007; Smith and Wishnie, 2000). Others argue that recognizable conservation ethics only emerge when resources become scarce, as observed in Polynesia and Micronesia (Johannes, 2002a). This view is challenged by practices in Melanesia, where historically low population densities are present and fish were not limited (Foale et al., 2011). In this region, resource restriction practices existed but focused more on social relations and traditional rights than on explicit conservation goals. Similar conditions were observed in the Huaorani's communal land management, which primarily aims to maintain social cohesion and operates in a context of low population pressure and resource demands (Lu, 2001).

Smith and Wishnie (2000) have argued that for a practice to be considered conservation, it should prevent resource depletion or habitat degradation and be intentionally designed to achieve these goals. In reality, local practices often serve multiple purposes, and while conservation may not be an explicit objective, it can be among the outcomes these practices foster. Some scholars categorize this

unintentional or contingent conservation outcome as incidental or epiphenomenal, underlining that communities may lack explicit conservation intentions (Baland and Platteau, 1996; Hunn, 2019; Lu, 2001; Smith and Wishnie, 2000). The argument is that positive conservation outcomes may simply result from other factors, such as limited technologies, low demand, and low population density. On the other hand, an absence of empirical evidence for conservation intent does not prove absence (Lepofsky, 2009). Local overharvesting of resources may sometimes be observed, but short-term exploitation does not preclude past or existing conservation-oriented practices in other contexts.

In contemporary conservation, intent reflects the values that drive management practices. However, intent may change, and it may not be the sole determinant of conservation behavior (Sutton, 1998). The concept of “other effective area-based conservation measure” (OECM) recognized geographically defined areas, other than those designated protected areas, that achieve positive and sustained long-term outcomes for biodiversity conservation, even if conservation is not the main purpose (IUCN-WCPA Task Force on OECMs, 2019). OECM approaches should in principle recognize local practices and their conservation relevance. In practice, this remains problematic, particularly in places where governance structures and collaboration among stakeholders are still ineffective (Alves-Pinto et al., 2021; Maini et al., 2023; WCPA IUCN, 2018).

One emerging trend in the wider conservation literature is the inclusion of traditional or local knowledge and preferences in conservation research and practices (Drew and Henne, 2006; Drew, 2005; Charnley et al., 2007; Sheil and Lawrence, 2004). Conceptually, local knowledge refers to the dynamic system in which local communities have developed knowledge and practices for resource management over generations (Berkes, 2012a). Conservation researchers and practitioners hold different views and values, both ecological and ethical, as they assert what is right and what actions to be taken in conserving biodiversity and ecosystems. Despite this considerable variation, most people agree nature and natural resources should be valued. The challenge in studies and adoption of local knowledge in a conservation context is in finding common ground. Moreover, knowledge and preferences change in response to changing realities. Taking a holistic approach recognizes that conservation activities are embedded within diverse and dynamic practices, knowledge systems, and institutions (MacDonald, 2003; Brosius et al., 1998; Brosius and Hitchner, 2010).

8. Conclusion

Our review indicates that local practices, often rooted in tradition and not explicitly designed for conservation (insofar as others may define this), contribute to biodiversity and ecosystem preservation. Though widely assumed, effectiveness is poorly measured. Depending on contexts, these practices may or may not provide the same level of protection as government-managed conservation areas, but such areas often face limitations too. Studies from the Philippines, Mediterranean Sea, and elsewhere have highlighted inadequate enforcement and low compliance in the management of formal conservation areas (Edgar et al., 2014; Mazaris et al., 2018; McClanahan, 1999; Muallil et al., 2019; Pollnac et al., 2001). Evidence from our review suggests the potential for effective, adaptive, and locally driven conservation strategies. For instance, local temporal restrictions that serve community needs in the marine cases have high community compliance and resulted in increased fish biomass even without external financial aid (Cinner et al., 2005, 2006; Cinner, 2007). This provides an alternative model for conservation in places where effective protected areas are impractical. It appears promising in locations where local knowledge and information from local autonomous monitoring informed changes in management practices (Sasaoka and Laumonier, 2012; Sheil et al., 2015). Such cases offer an opportunity to acknowledge and work together with the local processes for conservation. Scaling up these practices requires collaboration and integration of diverse perspectives. Such efforts must be bottom-up, respecting local needs and worldviews. Recognizing and acknowledging the values of local practices is a prerequisite in efforts to find a common ground for meaningful engagement. Such engagement is required for identifying and developing more effective and inclusive opportunities for achieving conservation.

CRedit authorship contribution statement

Indah Waty Bong: Conceptualization, Methodology, Investigation, Visualization, Writing - Original Draft, Writing - review & editing, Funding acquisition, Formal analysis, Data curation. **Douglas Sheil:** Conceptualization, Writing - review & editing, Formal analysis, Funding acquisition, Supervision. **Manuel Boissière:** Conceptualization, Writing - review & editing, Formal analysis, Funding acquisition, Supervision. **Dyah Rahmawati Hizbaron:** Conceptualization, Writing - review & editing, Supervision. **Muhammad Anggri Setiawan:** Conceptualization, Writing - review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

No data was used for the research described in the article.

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Appendix

Table A1

“Autonomous conservation” term used in the literature

References	Excerpt mentioning “autonomous conservation”	Related concepts and summary
1. “Species-oriented community-based resource management: A case study from small scale fisheries in the Yaeyama islands, Southwestern Japan” (Akimichi, 2001); Type: Book section	“These meetings were intended to seek possible autonomous conservation measures for a single species of emperor fish (<i>Lethrinus mahsena</i>), which is one of the most important food fish in Okinawa. Because this project is still being informally promoted at the local level, it is relevant to contemporary questions regarding the implementation of community-based resource management (CBRM) ...”	Autonomous conservation is based on the concept of CBRM . In Japan, the CBRM is implemented by the fisheries cooperative associations (FCAs) or <i>gyokyo</i> . The institutions are a mix of community and prefecture offices, but they are not always well aligned. Limitation: the local institution depends on prefecture and local governments to mediate disputes, particularly when conflicts arise among FCAs along prefectural borders or between FCAs and non-FCA, fishery, and non-fishery sectors.
2. “Community Forestry and the Sustainable Development Goals: A Two Way Street.” (De Jong et al., 2018); Type: journal article	“Forest-based activities, with the objective to capture, produce, enhance, or sustain forest ecosystem services, can be differentiated according to the intervening actor. Actors engaged in forestry activities include forest companies that exploit timber or manage large tree plantations, governments, and autonomous conservation organizations that seek to generate conservation services or other supporting or regulating ecosystem services. ...”	Autonomous conservation is discussed in the context of a decision-making process carried out by forest actors (autonomous conservation organizations). The AC organizations consist of rural communities or smallholders who engage in forestry activities. The term “autonomous” refers to the rulemaking process of CSF being independent of “external political or special interests’ pressures and excessive top-down steering of the process”. Autonomy is considered as one factor influencing CSF success.
3. “Hunting for Justice: An Indigenous Critique of the North American Model of Wildlife Conservation.” (Eichler and Baumeister, 2018); Type: journal article	“The imposition placed upon us from a knowledge way different from the Inuit way” (quoted in Gombay 2014: 8). The “true” knowledge determined by the scientists does not take into consideration Native methodologies, thus disrespecting Indigenous communities and disregarding their ability to make autonomous conservation decisions .”	Autonomous conservation is discussed in the context of the decision-making process of which species are to be conserved and which are to be hunted. The article critiques the current decision-making process related to conservation for disregarding indigenous knowledge. Instead of involving the people who live in proximity to the animals they hunt, these decisions are predominantly made by government scientists.
4. “Globalizing Wilderness: A Perspective on Traditional Ecological Knowledge in an Interconnected World.” (Faulstich, 2000); Type: report	“The task of environmentalism—defending the wild—benefits by support from, and of, indigenous peoples. In our contemporary and increasingly interconnected world, autonomous conservation efforts of indigenous peoples offer environmental inspiration and insight of global importance...”	Autonomous conservation is discussed in relation to local ecological knowledge . It suggests that many indigenous practices are adapted to local ecosystems and also shaped the local ecosystems to be more diverse and stable, maintaining or increasing biological diversity. The author advocates for a collaborative partnership with indigenous people for more effective and equitable conservation approaches around the world.
5. “Pacific Development Sustained: Policy for Pacific Environments” (Hunt, 2017); Type: Book	“For traditional owners to undertake conservation, there must be incentives. Sufficient incentive may be generated by recognition that conservation means that the natural assets will be available for future generations. But the rate of autonomous conservation would tend to be less than	Autonomous conservation is framed as community-driven models of conservation that are rooted in traditional ecological knowledge . The article recognizes trade-offs (opportunity costs) when local people

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Table A1 (continued)

References	Excerpt mentioning “autonomous conservation”	Related concepts and summary
	optimal (given the pressure on the environment, for example from the rate of logging), and is now being quickened by a whole range of incentive structures.”	undertake conservation (e.g. forego income), thus the need for support and incentives to facilitate their participation. Fully autonomous conservation is insufficient given current environmental, social, and economic challenges (e.g. population growth, urbanization, modernization, and exposure to Western markets and ideas). Integration of formal policies, regulations, protected areas, and funding with community-based efforts is crucial for more effective, larger-scale conservation in the Pacific.
6. “Comparative Analysis of Factors Influencing Spatial Distributions of Marine Protected Areas and Territorial Use Rights for Fisheries in Japan.” (Nomura et al., 2017); Type: journal article	A comprehensive analysis including autonomous conservation management like <i>satoumi</i> or coordinated area closures could also elucidate stronger spatial trends in marine conservation. Detailed understanding of the processes transforming marine management is essential to predict responses of MSP networks to dynamic biological and socioeconomic environments.	The article analyzes factors influencing the spatial distribution of two types of marine resource management in Japan: Marine Protected Areas (MPAs) and Territorial Use Rights for Fisheries (TURF). The authors briefly present <i>satoumi</i> (coordinated area closures practiced in Japan) as a form of autonomous conservation management. They argue that <i>satoumi</i> could serve as a model for coastal management in Japan by enhancing the coordination and integration of MPAs and TURFs.

Table A2

Selected three seed articles and rationale

Seed references;# of citations*# of references**	Rationale
Danielsen et al., (2009); Citations N=538; References N=39	Among the first articles that characterizes different types of local participation in monitoring activities, one of which is “autonomous monitoring”. Autonomous monitoring is endogenously initiated and carried out by local community and is thus an element of autonomous conservation.
Johannes, (2002a) and (2002b); Citation N=937; References N=69	Focuses on indigenous marine resource management and their changes over time. It also includes case studies from Pacific Island countries representing multiple types of marine management practices including taboo and local regulations.
Sheil et al. (2015); Citation N=77; References N=87	Empirical examples of autonomous local monitoring and control practices. The article also provides a brief literature review on case studies related to local monitoring and policing of natural resources. These concepts of local monitoring and policing relate to management activities in our definition of ‘autonomous conservation’.

Note: * Citations count was based on a Google Scholar search on 15 June 2023. ** Numbers of references were based on the reference count of the original documents.

Table A3

Summary of case studies of ‘autonomous conservation’

Reference; type	Community/location; Approx. size (#people/#households)	Concerned habitat/resource; Concerned area size (hectares)	Types of practices and related concepts	Outcomes	Measures of outcomes, Research design, methods
1. Cinner et al. (2005) with additional information on Ahus from Cinner (2007) Journal article	Ahus, Papua New Guinea; 600 people (105 households)	Marine, coral reef, fish; 550 Ha coral reefs and lagoons	Temporal taboos on methods and areas Conservation ethic	Significant greater biomass and size within the restricted areas	Mixed quantitative and qualitative: underwater visual survey, aerial photograph, household survey, key informant interviews, oral histories, participant observation Comparison with control sites
2. Cinner et al. (2006); Journal article	Kakarotan (Sangihe-Talaud Island, North Sulawesi, Indonesia); 730 people (144 households)	Marine, fish; 265 ha fishing ground	<i>Mane'e</i> periodic closure, temporal taboos on methods and areas, adaptive periodic disclosure	Providing food resources for social events. Fish in the closure area were harvested for an annual cultural feast. Conservation as a by-	Mixed quantitative and qualitative: time swims, line transects, catch observation, household surveys, key informant

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Table A3 (continued)

			Traditional ecological knowledge Conservation ethic, epiphenomenal conservation Periodic disclosure vs. large, fully protected areas	product: greater biomass and average size of fish inside areas subject to periodic closures.	interviews, oral histories, participant observations Comparison of periodic closure sites with control sites
3. Cinner (2007) with additional information on Muluk from Cinner et al. (2006); Journal article	Muluk (Karkar Island, Papua New Guinea); 330 people (50 households)	Marine, fish; 92 ha fishing ground	Temporal taboos Epiphenomenal conservation	Meeting community needs, improving fish harvest. Less damaged coral and higher coral recruit, fish biomass, and density of giant clams were measured (from Cinner et al., 2006).	Mixed quantitative and qualitative: aerial photographs, household surveys, key informant interviews, oral histories, participant observation, seasonal calendars Comparison with control sites
4. Mangahas (2010); Book chapter	Ivatans, Batanes, the Philippines; 18,000 people	Marine, fish	Temporal taboos on species, methods, and areas, seasonal rituals Common property, collective action.	Meeting subsistence needs. Pleasing ancestral spirits in return for 'good luck' Potential: increase stocks of migratory and demersal species	Fisher reported observation
5. Quimby (2015); Journal article	Haloban, Aceh, Indonesia; 294 households	Marine, coral reef, mangrove, fish, octopus, lobster	Unarticulated fishing practices: behaviors of first-come privileges, self-spacing, avoidance of repetition Common property, collective action Situating practice	Claimed potential for future resource management Meeting consumption and sale Fisher individual success	Identify institutions: rules and regulations Mixed quantitative and qualitative: semi-structured interviews, informal interviews, participant observation, household survey
6. Shalli (2017); Journal article	Gando, Kojani, Bweni, Krongwe, Ununio, Mjimwema (periphery Dar es Salaam City, Tanzania)	Marine, fish	Gear restrictions, temporal taboos associated with cultural events, taboos on consumption of some fish species, fishing rituals, sacred fishing areas Traditional knowledge	Claimed reduced fishing mortality, conserving fishing habitats.	Measure compliance Mixed quantitative and qualitative: focus group discussions, key informant interviews, participant observation, questionnaire surveys.
7. Satria (2005); Book chapter	Sasak people Kayangan, North Lombok, Indonesia; 4952 people	Marine, fish	Temporal closed season of an area. <i>Sawen</i> : temporal closed season to attract fish closer to the shore <i>Petuanan laut</i> (marine tenure), <i>sasi</i> (temporal prohibitions) on a resource or area. Cosmology (integrated, connected landscapes)	Meeting food needs and livelihoods. Potential: protection of marine resources and coral reefs, prevention of destructive fishing practices.	Field study (not specify)
8. Otumawu-Apreku et al. (2021); Technical report	Verahue Anglican, Verahue Catholic, Mangakiki, Tasiloki, Hulavu, Kobiloko, Kotsatsa, Lambi (West Guadalcanal, Solomon Islands)	Marine, fish	Artisanal fishery, social capital (<i>wantokism</i>), collective actions	Claimed effective resource management. <i>Wantok</i> system can encourage effective resource management by promoting cooperation and social cohesion in resource sharing and use. But it also can prevent people from reporting rule-breaking.	Surveys (structured questionnaires) Social network analysis
9. Patankar et al. (2015); Journal article	Nicobarese and Shompen people, Nicobar archipelago, India; 36,842 people	Marine, fish; 184.100 ha	Temporal taboos on species and areas, taboos on consumption of some	Meeting food needs and livelihoods. Objective: preventing overharvest.	Measure compliance with local institutions (taboos): Qualitative: FGDs, semi-structured interviews.

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Table A3 (continued)

10. Mohamed (2012) ; Dissertation	Maldivian (Baa atoll, Haa Dhaalu atoll, Haa Alif atoll, Seenu atoll, Maldives); 11,497 people	Reef, lagoons, fish ("scads"), sand	marine species Changing values Periodic closures of fishing during low tide, gear ban. Common pool resources Traditional ecological knowledge, Sacred species	Fish as food, sand for strewing on the houses and roads during Ramadan. The elders' believe certain fish ("scads") to be "sentient beings endowed with emotions", "created by God", should be respected and shouldn't be harmed.	Generalized linear modeling (GLM). Mixed quantitative and qualitative: participant observation, assessment of reef value: cost of building an artificial breakwater, monthly income earns, or cost of buying sand.
11. Sheil et al. (2015) Journal article	Kay, Metaweja, Yoke people, Mamberamo-Foja, Papua 726 people	Forest, lake, river, mangrove, fish, crocodile, sago, crabs, shells, pig, cassowaries, 300.000 ha	Local monitoring and policing, taboos, spiritual sanctions, deterrence effect	Claimed effective protection of habitats and resources, deterrence of unregulated exploitation, prevention of local overexploitation.	Measured effectiveness of local monitoring: mainly observation. Case studies: field visits, interviews, FGDs, participatory exercises.
12. Wadley and Colfer (2004) ; Journal article	Iban (West Kalimantan, Indonesia); 98 people (14 households)	Forest, large and small game (e.g. bearded pig, deer, birds, squirrel); 2.400 Ha	Habitat taboos Sacred forest patches (burial sites) Protected forest	Sanctuary and source of food for animals. Game hunting grounds for subsistence and cash. Higher numbers of animals (birds and mammals) in sacred forests.	Hunters reported sighting, encountered, and captured animals.
13. Tengö et al. (2007) ; Journal article	Tandroy (Androy, Southern Madagascar) Southern Androy; 100–350 people /km ²	Forest; 188 forest patches (14 without <i>faly</i> , 174 with <i>faly</i>). 576 ha of 48 mapped taboo forest patches	Taboos – forest (<i>faly</i>) Sacred forest patches (burial places) Common pool resources, social-ecology theory, cultural ecology	Taboos forest patches are the only in situ conservation site in the region, protecting highly endemic dry spiny forest habitats.	Mixed quantitative and qualitative: satellite image and field mapping, participatory mapping, key informant interviews Compare species diversity and composition in taboo and non-taboo areas.
14. Lingard et al. (2003) ; Journal article	Tandroy (Lavanono, Beloha, Tsiombe; Androy, Southern Madagascar)	Semi-arid region, radiated tortoise; 9.3 ha surveyed plots	Species-specific taboos	Species protection. Higher tortoise abundance in areas where taboo is respected.	Mixed quantitative and qualitative: key informant interviews, informal conversations, tortoise surveys (a circular plot and line transect survey). Longitudinal fieldwork, observation.
15. Ellen (2016) ; Journal article	Nuaulu, Seram, Maluku; Around 2000 people in 6 settlements	Forest	<i>Sin wesie</i> (protected area), <i>sasi</i> (temporal prohibition), <i>marakau</i> (scare charms), Spiritual sanctions Common property, protected area, temporal prohibition, <i>Sasi</i> ,	Claimed protecting specific forest areas and maintaining biodiversity and sustainable extraction. Relative high value of species richness although temporal.	
16. Sasaoka and Laumonier (2012) ; Journal article	Central Seram, Indonesia; 320 people (59 households)	Forest; 257 forest lots	Supernatural agency in monitoring, enforcing, and punishing people who violate local rules.	Claimed effective "self-directed resource management". Almost 80 % of forest lots were subjected to a hunting and trapping ban in 2003. 34 lots have been closed for more than 20 years (functioning "de facto sanctuaries").	Measured the effectiveness of local institutions (supernatural monitoring and punishment beliefs and mechanisms). Field study: Key informant interviews, household interviews, group interviews, participatory forest mapping.
17. Turreira-García et al. (2018) ; Journal article	Kuy (Prey Lang, Cambodia)	Forest resin and other forest products; 530.000 Ha	Local monitoring	Claimed effectiveness of local monitoring in protecting forests and stopping illegal activities, livelihood outcomes of monitoring (receiving economic revenue, collecting NTFPs, resin extraction).	Measured the effectiveness of local monitoring based on perception, participation, and motivation. Mixed quantitative and qualitative: structured interviews (survey), semi-structured interviews, focus group discussion, ranking.

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Table A3 (continued)

18. Arhem (2014); Dissertation	Katu people (Thuong Nhat, A Vuong, Kaleum, uplands of Laos and Vietnam); 80,000 people	Forest, river, hill, stream	Cosmology (inherent conservation ethic) Sacred hills and swidden practices Modernism	Preservation of large patches of old-growth forests and resources associated with hill spirits. Conservation ethic embedded in cosmology and livelihood practices (swidden cultivation).	Field study (qualitative): Observation and forest walking, interviews, community-based mapping.
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References

- Acheson, J.M., 2006. Institutional failure in resource management. *Annu. Rev. Anthropol.* 35, 117–134. <https://doi.org/10.1146/annurev.anthro.35.081705.123238>.
- Akimichi, T., 2001. Species-oriented community-based resource management: A case study from small-scale fisheries in the Yaeyama islands, southwestern Japan. *Understanding the Cultures of Fishing Communities: A Key to Fisheries Management and Food Security*. FAO, pp. 109–132.
- Alves-Pinto, H., Geldmann, J., Jonas, H., Maioli, V., Balmford, A., Latawiec, A.E., Crouzeilles, R., Strassburg, B., 2021. Opportunities and challenges of other effective area-based conservation measures (OECMs) for biodiversity conservation. *Perspect. Ecol. Conserv.* 19 (2), 115–120.
- Arhem, N. (2014). Forests, spirits, and high modernist development. *A Study of Cosmology and Change among the Katuic People in the Uplands of Laos and Vietnam*. Ph.D. Diss., University of Uppsala.
- Baland, J.-M., & Platteau, J.-P. (1996). *Halting degradation of natural resources: Is there a role for rural communities?* Food & Agriculture Org.
- Berkes, F., 2012a. Implementing ecosystem-based management: evolution or revolution? *Fish Fish* 13 (4), 465–476. <https://doi.org/10.1111/j.1467-2979.2011.00452.x>.
- Berkes, F., 2012b. *Sacred ecology*. Routledge.
- Berkes, F., Colding, J., Folke, C., 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecol. Appl.* 10 (5), 1251–1262 [https://doi.org/10.1890/1051-0761\(2000\)010\[1251:ROTEKA\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2000)010[1251:ROTEKA]2.0.CO;2).
- Berkes, F., & Folke, C. (1994). *Linking social and ecological systems for resilience and sustainability*.
- Boell, S.K., Cecez-Kecmanovic, D., 2014. A hermeneutic approach for conducting literature reviews and literature searches. *Commun. Assoc. Inf. Syst.* 34 (1), 12. <https://doi.org/10.17705/1CAIS.03412>.
- Bong, I.W., Felker, M.E., Maryudi, A., 2016. How are local people driving and affected by forest cover change? Opportunities for local participation in REDD+ measurement, reporting and verification. *PLOS ONE* 11 (11), e0145330. <https://doi.org/10.1371/journal.pone.0145330>.
- Brosius, J.P., Hitchner, S.L., 2010. Cultural diversity and conservation. *Int. Soc. Sci. J.* 61 (199), 141–168. <https://doi.org/10.1111/j.1468-2451.2010.01753.x>.
- Brosius, J.P., Tsing, A.L., Zerner, C., 1998. Represent. communities: Hist. Polit. Community-Based Nat. Resour. Manag. <https://doi.org/10.1080/08941929809381069>.
- Cairns, M.F., 2015. *Shifting cultivation and environmental change: Indigenous people, agriculture and forest conservation*. Routledge.
- Cairns, M., 2017. *Shifting cultivation policies: Balancing environmental and social sustainability*. CAB International.
- Charnley, S., Fischer, A.P., Jones, E.T., 2007. Integrating traditional and local ecological knowledge into forest biodiversity conservation in the Pacific Northwest. *For. Ecol. Manag.* 246 (1), 14–28. <https://doi.org/10.1016/j.foreco.2007.03.047>.
- Cinner, J.E., 2007. Designing marine reserves to reflect local socioeconomic conditions: lessons from long-enduring customary management systems. *Coral Reefs* 26 (4), 1035–1045. <https://doi.org/10.1007/s00338-007-0213-2>.
- Cinner, J.E., Marnane, M.J., McClanahan, T.R., 2005. Conservation and community benefits from traditional coral reef management at Ahus Island, Papua New Guinea. *Conserv. Biol.* 19 (6), 1714–1723. <https://doi.org/10.1111/j.1523-1739.2005.00209.x-11>.
- Cinner, J.E., Marnane, M.J., McClanahan, T.R., Almany, G.R., 2006. *Periodic closures as adaptive coral reef management in the Indo-Pacific*. *Ecol. Soc.* 11 (1).
- Colfer, C.J.P., Dudley, R.G., Hadikusumah, H., & Sakuntaladewi, N. (2023). *Shifting cultivators of Indonesia. Marauders or managers of the forest? Rice production and forest use among Uma Jalan of east Kalimantan*.
- Csardi G., Nepusz T. (2006). "The igraph software package for complex network research." *InterJournal, Complex Systems*, 1695. (<https://igraph.org/>).
- Csárdi G., Nepusz T., Traag V., Horvát S., Zanini F., Noom D., Müller K. (2024). *igraph: Network Analysis and Visualization in R*. doi:10.5281/zenodo.7682609, R package version 2.0.3, (<https://CRAN.R-project.org/package=igraph>).
- Cullen, L.C., Pretty, J., Smith, D., Pilgrim, S.E., 2007. Links between local ecological knowledge and wealth in indigenous communities of Indonesia: Implications for conservation of marine resources. *Int. J. Interdiscip. Soc. Sci.* 2 (1), 289–299.
- Danielsen, F., Burgess, N.D., Balmford, A., Donald, P.F., Funder, M., Jones, J.P., Alviola, P., Balete, D.S., Blomley, T., Brashares, J., 2009. Local participation in natural resource monitoring: A characterization of approaches (b). *Conserv. Biol.* 23 (1), 31–42. <https://doi.org/10.1111/j.1523-1739.2008.01063.x>.
- De Jong, W., Pokorny, B., Katila, P., Galloway, G., Pacheco, P., 2018. Community forestry and the sustainable development goals: A two way street. *Forests* 9 (6), 331. <https://doi.org/10.3390/f9060331>.
- Drew, J.A., 2005. Use of traditional ecological knowledge in marine conservation. *Conserv. Biol.* 19 (4), 1286–1293. <https://doi.org/10.1111/j.1523-1739.2005.00158.x>.
- Drew, J.A., Henne, A.P., 2006. Conservation biology and traditional ecological knowledge: integrating academic disciplines for better conservation practice. *Ecol. Soc.* 11, 2.
- Drew, J.A., Henne, A.P., 2006. Conservation biology and traditional ecological knowledge: Integrating academic disciplines for better conservation practice. *Ecol. Soc.* 11 (2). (<https://www.jstor.org/stable/26266033>).
- Edgar, G.J., Stuart-Smith, R.D., Willis, T.J., Kininmonth, S., Baker, S.C., Banks, S., Barrett, N.S., Becerro, M.A., Bernard, A.T., Berkhout, J., 2014. Global conservation outcomes depend on marine protected areas with five key features. *Nature* 506 (7487), 216–220.
- Eichler, L., Baumeister, D., 2018. Hunting for justice: An indigenous critique of the North American model of wildlife conservation. *Environ. Soc.* 9 (1), 75–90. <https://doi.org/10.3167/ares.2018.090106>.
- Ellen, R., 2016. Nuaulu ritual regulation of resources, sasi and forest conservation in eastern Indonesia. *South East Asia Res.* 24 (1), 5–22. <https://doi.org/10.5367/sear.2016.0290>.
- Elliott, J., Sumba, D., 2013. Conservation enterprise: What works, where and for whom. *Biodivers. Conserv. Poverty Alleviation: Explor. Evid. a Link.* 206–221. <https://doi.org/10.1002/9781118428351.ch13>.
- FAO and UNEP. (2020). *The State of the World's Forests 2020. Forests, biodiversity and people* (SOFO). FAO and UNEP.
- Faulstich, P. (2000). *Globalizing Wilderness: A Perspective on Traditional Ecological Knowledge in an Interconnected World*. USDA Forest Service Proceedings RMRS-P-14.
- Foale, S., Cohen, P., Januchowski-Hartley, S., Wenger, A., Macintyre, M., 2011. Tenure and taboos: Origins and implications for fisheries in the Pacific. *Fish Fish* 12 (4), 357–369. <https://doi.org/10.1111/j.1467-2979.2010.00395.x>.
- Fox, J. (2000). How blaming "slash and burn" farmers is deforesting mainland Southeast Asia. *East-West Center, Asia Pacific Issues*.
- Gadgil, M., Olsson, P., Berkes, F., Folke, C., 2003. Exploring the role of local ecological knowledge in ecosystem management: Three case studies. *Navig. Soc. -Ecol. Syst.: Build. Resil. Complex. Change* 189, 209.

- Gavin, M.C., McCarter, J., Mead, A., Berkes, F., Stepp, J.R., Peterson, D., Tang, R., 2015. Defining biocultural approaches to conservation. *Trends Ecol. Evol.* 30 (3), 140–145. <https://doi.org/10.1016/j.tree.2014.12.005>.
- Gombay, N., 2014. Poaching—What's in a name? Debates about law, property, and protection in the context of settler colonialism. *Geoforum* 55, 1–12.
- Greenhalgh, T., Peacock, R., 2005. Effectiveness and efficiency of search methods in systematic reviews of complex evidence: Audit of primary sources. *Bmj* 331 (7524), 1064–1065. <https://doi.org/10.1136/bmj.38636.593461.68>.
- Haddaway, N.R., Bayliss, H.R., 2015. Shades of grey: Two forms of grey literature important for reviews in conservation. *Biol. Conserv.* 191, 827–829. <https://doi.org/10.1016/j.biocon.2015.08.018>.
- Haggan, N., Neis, B., & Baird, I.G. (2007). Fishers' knowledge in fisheries science and management. *UNESCO Pub.*
- Hunn, E.S., 2019. Mobility as a factor limiting resource use in the Columbia Plateau of North America. *Resource managers: North American and Australian hunter-gatherers*. Routledge, pp. 17–43.
- Hunt, C., 2017. Pacific development sustained: Policy for Pacific environments. NCDS. Asia Pacific Press.
- IUCN-WCPA Task Force on OECMs, 2019. Recognising and reporting other effective area-based conservation measures. IUCN Gland Switz.
- Johannes, R.E., 2002b. The renaissance of community-based marine resource management in Oceania. *Annu. Rev. Ecol. Syst.* 33 (1), 317–340. <https://doi.org/10.1146/annurev.ecolsys.33.010802.150524>.
- Johannes, R.E., 2002a. The renaissance of community-based marine resource management in Oceania. *Annu. Rev. Ecol. Syst.* 33 (1), 317–340. <https://doi.org/10.1146/annurev.ecolsys.33.010802.150524>.
- Laako, H., Kauffer, E., 2021. Conservation in the frontier: Negotiating ownerships of nature at the southern Mexican border. *J. Lat. Am. Geogr.* 20 (3), 40–69. <https://doi.org/10.1353/lag.2021.0049>.
- Lecy, J.D., & Beatty, K.E. (2012). Representative literature reviews using constrained snowball sampling and citation network analysis. Available at SSRN 1992601. <https://doi.org/10.2139/ssrn.1992601>.
- Lepofsky, D., 2009. The past, present, and future of traditional resource and environmental management. *J. Ethnobiol.* 29 (2), 161–166. <https://doi.org/10.2993/0278-0771-29.2.161>.
- Lingard, M., Rabarison, N., Rabakonandrianina, E., Rakotoarisoa, J.-A., Elmqvist, T., 2003. The role of local taboos in conservation and management of species: The radiated tortoise in southern Madagascar. *Conserv. Soc.* 223–246.
- Lu, F.E., 2001. The Common Property Regime of the Huaorani Indians of Ecuador: Implications and Challenges to Conservation. *Hum. Ecol.*
- Luque-Lora, R., 2023. What Conservation Is: A Contemporary Inquiry. *Conserv. Soc.* 21 (1), 73. <https://doi.org/10.4103/cs.cs.26.22>.
- MacDonald, I. (2003). *Community-Based Conservation: A Reflection on History*.
- Maini, B., Blythe, J.L., Darling, E.S., Gurney, G.G., 2023. Charting the value and limits of other effective conservation measures (OECMs) for marine conservation: A Delphi study. *Mar. Policy* 147, 105350.
- Mangahas, M.F., 2010. Seasonal ritual and the regulation of fishing in Batanes Province, Philippines. *Manag. Coast. Inland Water.: Pre-Exist. Aquat. Manag. Syst. Southeast Asia* 77–98.
- Marie, C.N., Sibelet, N., Dulcire, M., Rafalimaro, M., Danthu, P., Carrière, S.M., 2009. Taking into account local practices and indigenous knowledge in an emergency conservation context in Madagascar. *Biodivers. Conserv.* 18, 2759–2777.
- Mazaris, A.D., Almpandidou, V., Giakoumi, S., Katsanevakis, S., 2018. Gaps and challenges of the European network of protected sites in the marine realm. *ICES J. Mar. Sci.* 75 (1), 190–198. <https://doi.org/10.1093/icesjms/fsx125>.
- McClanahan, T.R., 1999. Is there a future for coral reef parks in poor tropical countries? *Coral Reefs* 18 (4), 321–325.
- Mertz, O., Padoch, C., Fox, J., Cramb, R.A., Leisz, S.J., Lam, N.T., Vien, T.D., 2009. Swidden change in Southeast Asia: understanding causes and consequences. *Hum. Ecol.* 37, 259–264. <https://doi.org/10.1007/s10745-009-9245-2>.
- Mohamed, M. (2012). *Changing reef values: An inquiry into the use, management and governance of reef resources in island communities of the Maldives*.
- Muallil, R.N., Deocadez, M.R., Martinez, R.J.S., Campos, W.L., Mamauag, S.S., Nañola Jr, C.L., Aliño, P.M., 2019. Effectiveness of small locally-managed marine protected areas for coral reef fisheries management in the Philippines. *Ocean Coast. Manag.* 179, 104831 <https://doi.org/10.1016/j.ocecoaman.2019.104831>.
- Nomura, K.J., Kaplan, D.M., Beckensteiner, J., Scheld, A.M., 2017. Comparative analysis of factors influencing spatial distributions of marine protected areas and territorial use rights for fisheries in Japan. *Mar. Policy* 82, 59–67. <https://doi.org/10.1016/j.marpol.2017.05.005>.
- Ostrom, E., 1990. *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.
- Otumawu-Apreku, K., Higashida, K., Yamazaki, S., & Kiyama, S. (2021). *Artisanal fisheries in the Solomon Islands: The Wantok paradigm in West Guadalcanal* (Kyoto University). (<https://doi.org/10.14989/tr.afsi.2021.1>).
- Padoch, C., Coffey, K., Mertz, O., Leisz, S.J., Fox, J., Wadley, R.L., 2007. The demise of swidden in Southeast Asia? Local realities and regional ambiguities. *Geogr. Tidsskr. -Dan. J. Geogr.* 107 (1), 29–41. <https://doi.org/10.1080/00167223.2007.10801373>.
- Palomo, I., Montes, C., Martin-Lopez, B., González, J.A., Garcia-Llorente, M., Alcorlo, P., Mora, M.R.G., 2014. Incorporating the social-ecological approach in protected areas in the Anthropocene. *BioScience* 64 (3), 181–191. <https://doi.org/10.1093/biosci/bit033>.
- Patankar, V., D'Souza, E., Alcoverro, T., Arthur, R., 2015. Erosion of traditional marine management systems in the face of disturbances in the Nicobar Archipelago. *Hum. Ecol.* 43, 697–707. <https://doi.org/10.1007/s10745-015-9781-x>.
- Pollnac, R.B., Crawford, B.R., Gorospe, M.L., 2001. Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. *Ocean Coast. Manag.* 44 (11–12), 683–710. [https://doi.org/10.1016/S0964-5691\(01\)00075-8](https://doi.org/10.1016/S0964-5691(01)00075-8).
- Posner, R.A., 1997. Social norms and the law: an economic approach. *Am. Econ. Rev.* 87 (2), 365–369.
- Pullin, A.S., Knight, T.M., 2001. Effectiveness in conservation practice: pointers from medicine and public health. *Biol. Conserv.* 15 (1), 50–54.
- Quimby, B., 2015. Emerging customs: small-scale fishing practices in Aceh, Indonesia. *Appl. Geogr.* 59, 125–130. <https://doi.org/10.1016/j.apgeog.2014.11.026> (Get rights and content).
- Raymond, H., 2007. The ecologically noble savage debate. *Annu. Rev. Anthropol.* 36, 177–190. <https://doi.org/10.1146/annurev.anthro.35.081705.123321>.
- Rerkasem, K., Lawrence, D., Padoch, C., Schmidt-Vogt, D., Ziegler, A.D., Bruun, T.B., 2009. Consequences of swidden transitions for crop and fallow biodiversity in Southeast Asia. *Hum. Ecol.* 37, 347–360. <https://doi.org/10.1007/s10745-009-9250-5>.
- Ruddle, K., Satria, A., 2010. *Managing coastal and inland waters: Pre-existing aquatic management systems in Southeast Asia*. Springer Science & Business Media.
- Sasaoka, M., Laumonier, Y., 2012. Suitability of local resource management practices based on supernatural enforcement mechanisms in the local social-cultural context. *Ecol. Soc.* 17 (4) <https://doi.org/10.5751/ES-05124-170406>.
- Satria, A. (2005). *Sawen: Institution, local knowledge and myth in fisheries management in North Lombok, Indonesia. Fishers' Knowledge in Fisheries Science and Management*.
- Shalli, M.S., 2017. The role of local taboos in the management of marine fisheries resources in Tanzania. *Mar. Policy* 85, 71–78. <https://doi.org/10.1016/j.marpol.2017.08.017>.
- Sheil, D., Boissière, M., 2006. Local people may be the best allies in conservation, 868 *Nature* 440 (7086), 868. <https://doi.org/10.1038/440868d>.
- Sheil, D., Boissière, M., Beaudoin, G., 2015. Unseen sentinels: local monitoring and control in conservation's blind spots. *Ecol. Soc.* 20 (2) <https://doi.org/10.5751/ES-07625-200239>.
- Sheil, D., Lawrence, A., 2004. Tropical biologists, local people and conservation: new opportunities for collaboration. *Trends Ecol. Evol.* 19 (12), 634–638. <https://doi.org/10.1016/j.tree.2004.09.019>.
- Smith, E.A., Wishnie, M., 2000. Conservation and subsistence in small-scale societies. *Annu. Rev. Anthropol.* 29 (1), 493–524. <https://doi.org/10.1146/annurev.anthro.29.1.493>.
- Sutherland, W.J., Pullin, A.S., Dolman, P.M., Knight, T.M., 2004. The need for evidence-based conservation. *Trends Ecol Evol* 19 (6), 305–308.
- Sutton, S., 1998. Predicting and explaining intentions and behavior: how well are we doing? *J. Appl. Soc. Psychol.* 28 (15), 1317–1338. <https://doi.org/10.1111/j.1559-1816.1998.tb01679.x>.

- Tengö, M., Johansson, K., Rakotondraso, F., Lundberg, J., Andriamaherilala, J.-A., Rakotoarisoa, J.-A., Elmqvist, T., 2007. Taboos and forest governance: Informal protection of hot spot dry forest in southern Madagascar. *AMBIO: J. Hum. Environ.* 36 (8), 683–691 [https://doi.org/10.1579/0044-7447\(2007\)36\[683:TAFGIP\]2.0.CO;2](https://doi.org/10.1579/0044-7447(2007)36[683:TAFGIP]2.0.CO;2).
- Thu, T.P., Moeliono, M., Wong, G.Y., Brockhaus, M., 2020. The politics of swidden: a case study from Nghe An and Son La in Vietnam. *Land Use Policy* 99, 103050. <https://doi.org/10.1016/j.landusepol.2017.10.057>.
- Turreira-García, N., Meilby, H., Brofeldt, S., Argyriou, D., Theilade, I., 2018. Who wants to save the forest? Characterizing community-led monitoring in Prey Lang, Cambodia. *Environ. Manag.* 61, 1019–1030. <https://doi.org/10.1007/s00267-018-1039-0>.
- UNEP-WCMC, & IUCN. (2024). *Explore the World's Protected Areas*. (<https://www.protectedplanet.net/en>).
- Wadley, R.L., Colfer, C.J.P., 2004. Sacred forest, hunting, and conservation in West Kalimantan, Indonesia. *Hum. Ecol.* 32, 313–338. <https://doi.org/10.1023/B:HUEC.0000028084.30742.d0>.
- WCPA IUCN, 2018. PARKS: the international journal of protected areas and conservation. *IUCN World Comm. Prot. Areas (WCPA)* 24 (1). <https://doi.org/10.2305/IUCN.CH.2018.PARKS-24-1ND.en>.
- Webb, G.J., 2002. Conservation and sustainable uses of wildlife – an evolving concept. *Pac. Conserv. Biol.* 8 (1), 12–26.
- Wilson, N.J. (2018). *“More precious than gold”: Indigenous water governance in the context of Modern land claims in Yukon*.
- Wong, G.Y., Moeliono, M., Bong, I.W., Pham, T.T., Sahide, M.A.K., Naito, D., Brockhaus, M., 2020. Social forestry in Southeast Asia: evolving interests, discourses and the many notions of equity. *Geoforum* 117, 246–258. <https://doi.org/10.1016/j.geoforum.2020.10.010>.