

Building resilience through ecosystem restoration and community participation: Post-disaster recovery in coastal island communities



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ABSTRACT

In post-disaster recovery phases, many communities reduce their vulnerabilities to future disasters by implementing community-based approaches. However, since these processes impact resource allocation, access to natural resources, and benefit distributions, these efforts have changed the environment and altered social relations. Therefore, this research explores how disaster empowers or disempowers stakeholders by investigating the interdependence of social relations in post-disaster natural resource management. After the 2004 Indian Ocean Tsunami, the island of Koh Klang demonstrated resilience in restoring its ecosystem. Koh Klang island was used as a case study in this research, and this island experienced a community-based project in its recovery effects. Interviews and participant observations were conducted in the field in 2014 to collect firsthand information from local residents, NGOs, and the public sector. Text and discourse analyses were conducted based on interview data, government documents, and field notes. The findings show that after a disaster, natural resources and embedded social norms form the basis for a resilient community. Using community- and ecosystem-based methods fosters a community's environmental and social resilience and prepares it to respond to future disasters. However, such methods can also transform local politics, especially when residents' inequitable vulnerabilities and access to power are coupled with jurisdictional and land tenure issues. This research recommends that disaster recovery and mitigation policies are scaled to local levels.

1. Introduction¹

Global environmental change, local developments, and disasters are geographically intertwined and generate uncertainty in coastal regions, especially islands [1]. In addition, coastal areas provide diverse wetland ecosystems that offer ecosystem services—such as fisheries and buffer zones against storms—that further improve human welfare [2]. The 2004 Indian Ocean tsunami seriously affected coastal areas. Following this catastrophic natural disaster, governments and non-governmental organizations (NGOs) sought to build the affected coastal communities' resilience by implementing an ecosystem-based resource restoration program through a community-based approach [3,4] and adhering to the affected communities' cultures and customs [5]. In addition to altering the environment and landscape, this strategy also affected the communities' social relations because pre-existing social relations

provided a basis for offering feedback to the community [6,7]. Therefore, when using community-based natural resource management (CBNRM)² in post-disaster recovery efforts, external organizations must work as facilitators to build partnerships with local people in order to manage the natural resources, sustain livelihoods, and conserve healthy ecosystems [10].

Few studies have focused on reducing social impacts and building resilience in terms of the local social processes related to disasters and natural resource politics [11]. This is especially true for islands [12]. Koh Klang (Kang Island), a mangrove-luxuriant island on Thailand's Andaman coast, is a typical case that demonstrates the complexity of resilience building and CBNRM. Koh Klang was physically affected by flooding from the 2004 Indian Ocean tsunami, and it thus received a great deal of NGO and governmental assistance. The island experienced social and environmental changes due to the aid, which focused on

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¹ Abbreviations: Community-based natural resource management (CBNRM), disaster risk reduction (DRR), community-based mangrove management (CBMM), Biodiversity-based Economy Development Office (BEDO), Raks Thai Foundation (RTF), Mangrove Action Project (MAP), ecosystem services project (PES), community-based ecological mangrove restoration (CBEMR), Ecosystems Protecting Infrastructure and Communities (EPIC), Department of Marine and Coastal Resources (DMCR), Tourism Authority of Thailand-Krabi Office (TAT), Tambon Administrative Organization (TAO), and Provincial Administrative Office (PAO).

² CBNRM is an approach that uses scientific techniques and local knowledge to affect ecological restoration, livelihood diversification, and social resilience to environmental change [8,9].

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reducing disaster risks and building resilience by restoring the mangrove tree ecosystem. The majority of academic research on mangroves has focused on the bio-chemical processes of the trees and on quantifying mangroves' economic value to further develop economically-oriented policies [12–14]. Relatively little is known about their socio-cultural significance within the context of coastal mangrove-dependent communities, disaster and global environmental change mitigation efforts, and government and NGO restoration projects [15].

Therefore, this study uses the mangrove ecosystem recovery in Koh Klang as a case study for exploring how disasters trigger natural resource management behaviors across scales. Using the community's standpoint and involving other stakeholders, this research examines the CBNRM practices initiated in Koh Klang following the 2004 tsunami to understand the power relations generated by post-disaster natural resource practices and to shed light on the long-term resilience that is necessary for adapting to environmental change. This article delves into the nexus of social relations between stakeholders and ecosystems/environments in order to understand the role of disasters in (dis)empowering the stakeholders tasked with managing natural resources. This study investigates how disasters can generate natural resource management politics and how such politics can work to mitigate as well as magnify disaster risks, shaping local resilience in the process. This study contributes to the existing literature on cross-scalar discrepancies and inter-empowerment processes that characterize island resilience-building processes to disasters through CBNRM.

2. Disaster-driven CBNRM: a cross-scalar, inter-empowerment process

Many projects implemented in communities have directly benefited local livelihoods and have helped reduce disaster risks. Therefore, rather than focusing on biological outcomes alone, understanding the underlying reasons for conservation measures and the social context for natural resource management is critical in CBNRM, especially in vulnerable coastal areas [16]. NGOs and governmental bodies have proposed projects to communities under the banner of conserving their common resources to sustain traditional livelihoods and reduce disaster risk. While some cases show that these projects benefit communities by providing employment [17], additional research has shown that other communities are more concerned about issues of benefit sharing, resource rights, and participation in local decision-making [7,18]. Through a CBNRM approach, agreements protecting local people's rights need to be considered to reflect their importance in conservation efforts, and local voices must not be neglected during the restoration process since the locals are part of the ecosystem [19,20]. However, since people within a community may have heterogeneous values, it is possible that different goals exist between members of the community and local/global conservation actions. As such, local participation is not a panacea for disaster or natural resource management [21,22]. Therefore, examining social relations is important for understanding how a social system has developed local, environment-based practices and social mechanisms in order to adapt them in response to dynamic ecological systems [23].

Political ecology, the study of the relationships between political, economic, and social factors with environmental issues, provides a critical view for analyzing disasters and their multi-scalar effects [24]. Moreover, political ecology is useful for exploring the socio-economic concerns that are relevant to natural resource management practices on local scales [25]. Environmental initiatives are not the result of current local events; instead, these initiatives result from processes operating over larger geographic scales. With huge-scale disasters as a concern, the post-disaster natural resource management process requires multi-scale models to examine political issues that emerge in the post-disaster period [26]. Sovacool, Tan-Mullins, and Abrahams have used the political ecological perspective to identify four key processes that appear in the disaster recovery phase: enclosure (capturing resources or authority), exclusion (marginalizing stakeholders), encroachment

(damaging the environment), and entrenchment (worsening social inequality) [27]. Using these processes as an analytic lens, it becomes clear that some post-disaster projects have the potential to create adverse social, political, and economic outcomes and that the political ecology of disasters should be prioritized more by researchers.

In developing countries, many NGO-led CBNRM initiatives for disaster risk reduction (DRR) are based on a global awareness of climate change [28,29]. For instance, the 2004 tsunami catalyzed the international community's awareness of the need for DRRs and, later, climate change adaptations. Many organizations, governmental bodies, and NGOs aim to help build resilience in vulnerable areas using a combination of CBNRM and ecosystem-based methods because they are viewed as gentle but radical ways to reduce future disaster risks [30,31]. From this perspective, community- and ecosystem-based concepts are critical since large-scale stakeholders can offer resources and affect local societies and environments, while local societies have significant power within this multilayered structure [32]. Stakeholders in this cross-scalar structure may include individuals, groups, organizations, a country, and/or the environment itself.

Even amid growing uncertainty about future disasters and climate change, human activities have increased dramatically. The environmental system is becoming an increasingly active component of the natural resource governance network [33]. Through CBNRM, natural resources can empower those who control them, while multi-scalar actors are able to modify natural resource management situations using social processes (i.e., input budgets). This study uses a conceptual framework to depict interconnections between disasters, natural resources, and communities across time, space, and social scales (Fig. 1). In the core part of the present time layer, CBNRM is a dynamic process of social (consisting of social networks, power relations, and so on) and environmental (consisting of natural resources, landscapes, and so on) systems. People's empowerment through participation can impact both social and environmental systems. At a larger scale, environmental hazards such as extreme rain events place stress on local environments and local livelihood activities. Recovery resource allocation by governments and NGOs may be strained and may also further impact local social-environmental interconnections.

During the process of place scale (as displayed in Fig. 1), empowerment is woven into the adaptation and vulnerability feedback loops through the participation process underpinning external supportive projects. The interconnections between local, social, and environmental factors cannot be fully explained without considering the larger scale of the social-environmental intersection. The local and larger scales are inseparable, as the local scale is embedded in the larger scale. This can be most easily observed through the international trend of using community- and ecosystem-based approaches to manage global environmental issues. The community is given an empowerment opportunity through local participation in post-disaster recovery initiatives. This participation can subsequently help local communities create more sustainable relationships with the surrounding environment by enabling them to again use the natural resources to sustain their livelihoods..

3. Case study

3.1. Macro-context of Thailand and its mangroves

Mangrove ecosystems are one of the most important natural resources as they provide a variety of ecosystem services such as biogeochemical cycling, carbon sequestration [12,13], livelihood support, and disaster protection [34]. Southeast Asia has the world's most extensive and diverse mangrove areas and species; however, the region is also facing the most extensive mangrove deforestation, with a 1% loss per year [35]. Thailand's Andaman coast is world-renowned for its extensive natural resources, including its mangroves. Over the past few decades, Thailand has lost a huge percentage of its coastal mangroves due to climate change and other natural and anthropogenic factors, namely, the expansion of shrimp

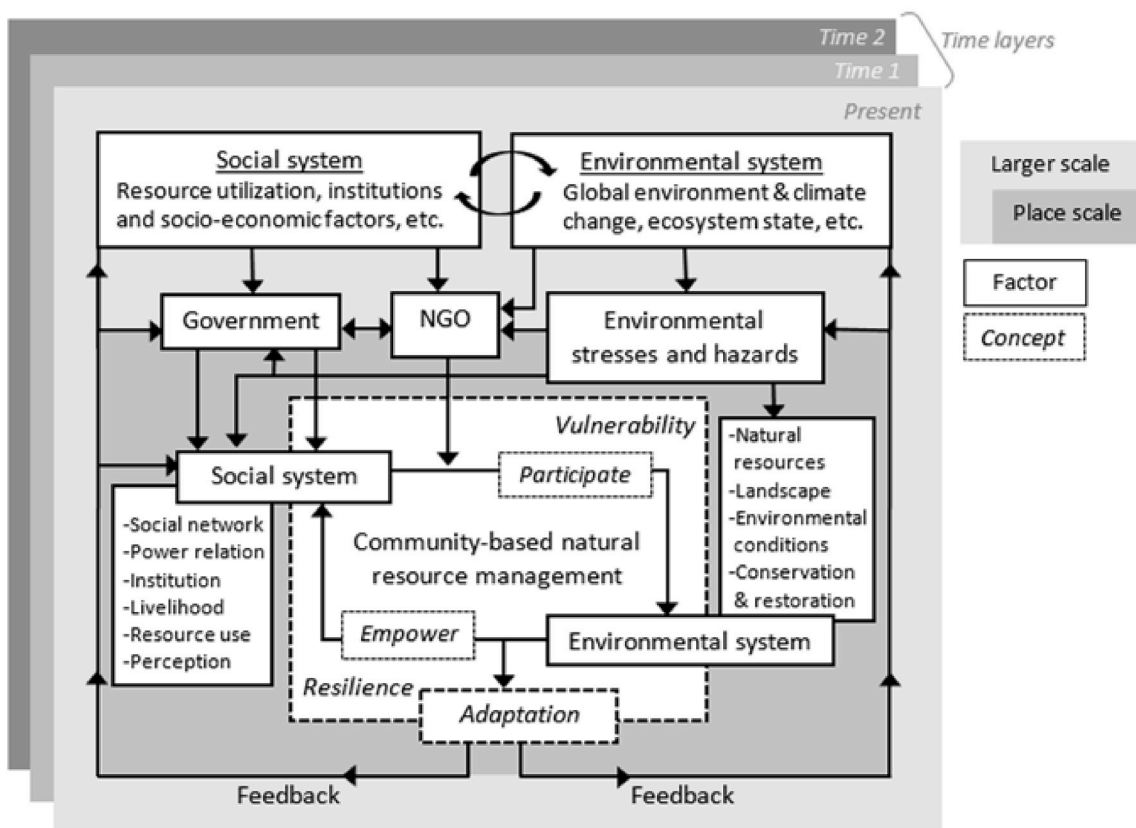


Fig. 1. Interrelations between the cross-scalar environmental and social systems that build community resilience.

farming and coastal resorts [12,36]. Since the mid-1990s, after decades of deforestation, there has been renewed interest in mangrove rehabilitation due to an increased awareness of the mangroves' value in terms of faunal diversity, abundant biomass, and community structures [37,38]. Mangroves also serve as buffer zones, and their protection abilities became apparent during the 2004 Indian Ocean tsunami [3,39].

Consequently, community-based mangrove ecosystem restorations have been promoted and implemented in southern Thailand to much success [40]. Many such programs have been funded in response to the Thai government and people's concerns about environmental restoration as a means of reducing disaster risk, particularly since 2005 [41,42]. The majority of the projects are part of a larger CBNRM scheme that is premised on a cross-scale ecosystem-based DRR vision [43]. The projects aim to strengthen coastal communities' capacities to recover from disasters—particularly those induced by extreme climate events—while also sustaining people's livelihoods [7]. Such disaster-oriented projects in Thailand have induced changes in both the environment and society [44].

3.2. Koh Klang (Klang Island)

Koh Klang is a 26 km² island on south Thailand's west coast. It is situated on the estuary of the Krabi River, which flows into the Andaman Sea. The entire island is comprised of flat land, with mangrove forests covering 80% of the island's total land area [45]. It is located in the Klong Prasong sub-district of Muang District, Krabi Province. The Klong Prasong sub-district comprises four villages, three of which are located on Koh Klang—Ban Koh Klang (Village 1), Ban Klong Prasong (Village 2), and Ban Klong Kam (Village 3); the fourth, Ban Bang Kanoon (Village 4), is located on the mainland (Fig. 2).³

Koh Klang has approximately 4500 inhabitants, with approximately 2242 villagers in Moo 1, 727 in Moo 2, 727 in Moo 4, and 1562 in Moo 3. Each Moo has its own village head, and the head of Moo 4 is the leader of the *Tambon* (sub-district) and carries the title of *Kamnan*. The general occupations are small-scale coastal and shallow water fishing and organic rice agriculture. In addition, growing ecotourism-related occupations have mushroomed in recent decades. Koh Klang has promoted ecotourism since its traditional lifestyle, mangrove forests, and proximate sea are in good condition. Thirty-one local groups, including women's groups, ecotourism groups, and farmers' groups, are registered with the *Tambon* office [46] (Fig. 2).

The 2004 Indian Ocean tsunami flooded the island, damaged houses along the shore, and washed away villagers' boats, fish rafts, and farms. Over the past decade, projects and resources funded by various units have poured into this tsunami-impacted region. These include the Thai Royal family's "National Mangrove Forest Reforestation Project." In Thailand, community-based mangrove management (CBMM) has been recognized since the mid-1990s [40]. The mangroves restoration in Koh Klang for mitigating disasters risk was a coalescence of Thai's CBMM experience and international NGO proposals on ecosystems for mitigating disasters risks after the tsunami event (see section 3.3, paragraph four, for more details).

3.3. Organizational involvement in Koh Klang (2014)

In addition to governmental units, at least 20 NGOs implemented funded projects on the island within the first three to five years following the tsunami (field note, July 2014). However, the majority of these NGOs left the island after their funding and projects ended. Only a few have accompanied the community through the long journey of recovery. By 2014, three main organizations worked on the island: Biodiversity-Based Economy Development Office (BEDO), Raks Thai Foundation (RTF), and Mangrove Action Project (MAP).

³ Both *Moo* and *Ban* mean village in Thai.

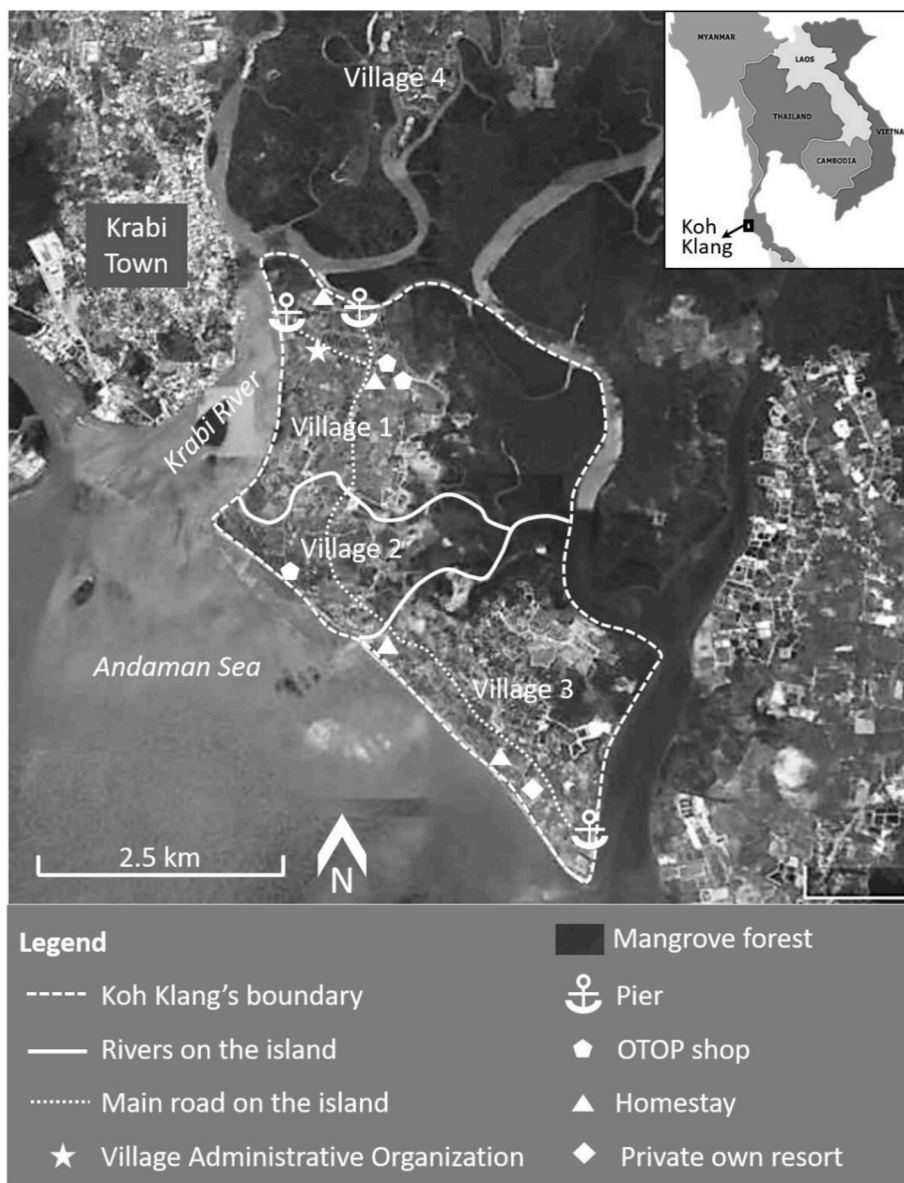


Fig. 2. Location of Koh Klang Island. Note: OTOp refers to “one Tambon [sub-district], one product”.

BEDO is a public sector of the Thai government. Since 2012, BEDO has implemented payments for an ecosystem services (PES) project in the Klong Prasong sub-district. It uses PES as a source of funding for natural resource conservation projects, including the rehabilitation of mangrove ecosystems, which support the generation of additional income for locals. By quantifying the monetary value of the mangroves, BEDO aims to involve local people in conservation work while also diversifying their incomes [47].

RTF is the only NGO still working with the island. In addition to providing immediate loans and reconstruction support after the tsunami, the RTF aims to strengthen the capacity of the local people. RTF's Krabi office has been working with the Koh Klang people for over ten years on issues such as post-hazard recovery, disaster preparedness, and risk management. Ten years after the tsunami, RTF began to turn its focus gradually to the climate change issue, holding a workshop to raise local people's awareness of it (Interviewee Nr 11, July 12, 2014).

Finally, MAP is an international NGO that promotes an ecological approach to conserving and restoring mangroves. It has an Asian office in southern Thailand. MAP works with communities and government partners to increase awareness of the mangroves' value for DRR and build

livelihood resilience in the context of climate change [48]. One of MAP's projects, “Ecosystems Protecting Infrastructure and Communities” (EPIC),⁴ is a five-year project (2012–2017) aimed at understanding how healthy ecosystems work in order to reduce disaster risk and supporting the community's efforts to adapt to climate change [49]. With these objectives in mind, MAP uses community-based ecological mangrove restoration (CBEMR) techniques to restore the mangroves in abandoned shrimp ponds in Koh Klang. MAP involves the local people in mangrove restoration while increasing and diversifying their livelihood opportunities, thereby increasing their resilience [50]. MAP and RTF have collaborated on the EPIC project in Moos 1 and 3 since 2013 [51].

4. Methods

This research was approved by the National University of

⁴ EPIC is supported by the German Federal Ministry for the Environment, “Nature Conservation and Nuclear Safety's International Climate Initiative” (BMU-ICI) and is coordinated by the IUCN [49].

Singapore's Institutional Review Board on June 2014 as posing no more than minimal risk to the participants. This project also obtained formal research approval from the Office of the National Research Council of Thailand on July 2014.

Preliminary face-to-face individual meetings with local leaders/elders (e.g., village heads, Muslim leaders, etc.) were held to introduce participants to the scope of the research and to obtain consent before approaching other residents. Verbal consent was sought from all participants before commencement of any data-collection activities. Study information sheets in Thai were also made available to participants. In addition, participants were informed of their right to stop their involvement in the study at any point in time.

This study applied mixed qualitative methods at the research site [51]. In-depth semi-structured interviews and participant observations were conducted during fieldwork from July to September 2014. The interviews were conducted in natural settings to allow participants to feel comfortable when speaking, and they were conducted in Thai with simultaneous, on-site Thai-English translations. Interviews were conducted in person, followed an interview guide, and were recorded with the participant's permission. Each interview lasted for an average of 60 min. Several community leaders were interviewed first. Snowball sampling was then used to identify others until no new information about the study's purpose was being offered from participants [52]. All participants were volunteers and all were informed of the research's aims and its ethical considerations before they were interviewed. This research involved 47 people (35 males and 12 females) (Table 1).

Participant observation sessions were conducted to understand their environment, livelihood activities, and social conditions [53]. Informal interviews were held during the daily observations in the villages. These observations provided opportunities to learn the local context. Participant observation took place while the villagers conducted their daily activities: collecting shells, harvesting fish, sorting nets, and nighttime gatherings. Observational data were recorded in many forms, including written field notes, photos, and videos. A local young male accompanied the researcher during participant observations to avoid disturbing local lives or misinterpreting the local context. When the researcher participated in activities, self-introductions were conducted and permission was requested. Then, the researcher verbally revealed the research topic to obtain people's consent before asking questions (i.e., informal interviews). Field notes were made during both participant observations and informal interviews to record what was seen and

Table 1
Classification of interviewees.

Interviewee attributes	Number of interviewees
Villagers	35
Moo 1	17
Moo 2	6
Moo 3	7
Moo 4	5
Government officials	6
Mangrove management unit number 26	1
Department of Marine and Coastal Resources (DMCR)	1
Tourism Authority of Thailand-Krabi office (TAT)	1
Division of Disaster Prevention and Mitigation of Krabi Provincial Administrative Organization	1
Biodiversity-based Economy Development Office (BEDO)	1
Office of Natural Resource and Environmental Policy and Planning	1
NGO staff	5
Rak Thai Foundation (RTF)	3
Mangrove Action Project (MAP)	2
Resort representative	1
Total	47

Note: Three of the interviewed villagers held sub-district government positions in the Tambon Administrative Organization (TAO).

heard. The interviews were recorded and subsequently transcribed.

Field notes, interview transcriptions, and secondary data (NGO and governmental reports, statistics, and maps) were triangulated and cross-referenced during analysis. Since this study aimed to explore an under-researched issue, an editing analysis style [[54], pp. 17–21] was used to develop categories and sub-categories from the data and then crystallize them into concepts for further interpretation [55]. Text, narrative, and discourse analyses were used during the process [56].

5. Results

5.1. Mangroves, social norms, and resilience

Koh Klang's rich natural resources are a large part of the reason why the island has experienced a good post-tsunami recovery. Of these, its pristine mangrove forests and its nearby sea are key to sustaining the local people's livelihoods. The locals view the two ecosystems as one interconnected system. As one interviewee stated, "The mangroves are closely involved with our livelihood. They provide our homes and our food sources ... It is also the place where sea animals grow. They are very close to people's lives and villagers know how important the mangroves are" (Interviewee Vk13g, July 13, 2014). Most of the villagers engage in coastal fishery as their main livelihood, with mangrove fishery comprising a second source of support for the villagers.

The mangroves increase island resilience in several respects. In addition to providing shelter for the mud crab, one of the most important crabs with a good market price, they serve as a nursery for all aquatic animals. In addition, the mangroves protect the canal banks from erosion and help reduce wave impacts on the seashore. This is especially important on Moo 2, which is a particularly vulnerable area because people live along the seashore. Furthermore, the mangrove forests attract tourists to the island. With the popularization of ecotourism on the island, the mangrove forests have added recreational value, particularly for Moo 1 (field note, July 2014). It is clear that mangroves' role on Koh Klang extends beyond merely serving as vegetation for the villagers. Mangroves also act as an ecosystem that links individuals, society, and the environment together in an interrelated loop. As Interviewee Vk18g (September 8, 2014) said, "The roots of the people are from the mangrove, so we will protect the mangrove."

Villagers' dependence on the mangroves resulted in enduring informal social norms for sustainably managing the ecosystem. For example, the villagers understand that they can only fell a few trees for domestic use, such as repairing bungalows, and that they must plant ten new trees when they take one tree (field note, August 2014). Although there are no exact boundaries in the mangrove forests, people take care of the forests in their areas (Interviewee Vb11k, September 10, 2014). Instead of creating rules or setting penalties for illegal cutting, simply increasing the awareness of the importance of mangroves helps people desire to maintain the mangroves. For instance, an interviewee stated:

With conservation in your heart, you're doing it for your livelihood. It's in your way of living. It's not that the projects come, put money in your pocket, and you tell people to conserve. No one is going to follow you (Interviewee Vk03, July 13, 2014).

The management of people's shared resources cooperatively strengthens social cohesion [21,23], which further contributes to a foundation for post-disaster recovery efforts.

5.2. Geographically inherent powers manifests on DRR initiatives

Although Koh Klang is a small island, it is environmentally and socially heterogeneous. Moo 1, 2, and 3 each have different characteristics that affect their vulnerability to disaster risk. Moo 1 – the most populated village – is situated at the entrance to the island (Fig. 2). Since the Tambon Administrative Organization (TAO) office is located in this Moo, this village became the islanders' *representative*.

Given that the main transportation route runs through the island from Moo 1 to Moo 3 and that most governmental resources and external supports are located in Moo 1, visitors often come to the island and only stop in Moo 1. As one interviewee explained, “Usually people from Moo 1 take part in all the activities because they are informed first, it’s the beginning of the information” (Interviewee Vm12o, July 16, 2014). Geographically and socially, Moo 1 is the most developed village of the three. It does not face the open sea; therefore, it has a relatively low risk of flooding.

Moo 2 has the fewest villagers, the smallest area, and it is located along the open sea, making it the most vulnerable village to serious erosion and disasters. Since it has a small land area and a small population, most of the resources and visitors unintentionally neglect it and do not stop there (field note, July 2014). Moo 3 is far from town (i.e., Moo 1), and since government resources rarely come this far, most of its villagers are not interested in public affairs. Thus, Moo 3 is less developed than the other villages. People in Moo 3 have relatively fewer connections with one another and are thus less concerned about the local environment (Interviewee Vm11p, July 17, 2014). Therefore, the post-tsunami recovery in Moo 3 is relatively slow and stands in isolation from other initiatives.

Although Moo 4 is not located within the borders of Klang Island, it has an influential role in the island. Moo 4 has a close spatial and social relationship with Moo 1 because of its geographic proximity and kinship ties, with the majority of the ancestors and current relatives of those in Moo 4 from Moo 1. Moo 4, combined with Moos 1, 2, and 3, fall under the jurisdiction of the Klong Prasong sub-district. The Moo 4 village head is “the head of village heads,” the *Kamnan*, and possesses decision-making and resource allocation power over the entire sub-district, including the island (field note, September 2014; Interviewee Vb11k, September 10, 2014). Moos 1 and 4 are less vulnerable to disasters than the other Moos because Moo 4 is on the mainland and Moo 1 does not face the open sea. However, power flows from Moos 1 and 4 through the island’s social system, manifested in the mangrove restoration initiative, with environmental and other feedback loops amplifying the vulnerability of other Moos.

Village heads play critical roles in this issue. They are responsible for helping villagers satisfy the needs of their village, as well as for collaborating with the other villages. Mangroves, as an important livelihood source, are critical for both Koh Klang’s ecosystems and social systems; thus the village heads are responsible for taking good care of the mangroves (field note, August 2014; Interviewee Vk01t, July 13, 2014; Interviewee Vp11p, July 15, 2014). Besides internal affairs, the village heads also assist with organizations’ mangrove restoration activities. Since the organizations are mostly comprised of outsiders, they are required to consult with or acknowledge the local leaders before the activities commence (Interviewee Vm11p, July 17, 2014; Interviewee Vk14o, July 14, 2014). As the local representative, the village heads’ power is evident in the social systems – such as resource allocation – that legitimize their role in governing the environment, changing the landscapes, and mitigating disaster risks. Disaster events may trigger the investment of resources, but there may be the political construction of risk by local leaders that distorts the resilience building process [24,25].

5.3. The politics of jurisdiction and legitimacy

The relatively simple notion of using the mangroves to reduce future disaster risks became a complicated process intertwined with jurisdictions, authorities, and varying power allocations on Koh Klang Island. This is in part because there are two parallel, coexisting civil administrative authorities: the governor system and the local administration system. Established in 1892, the governor system consists of the village heads and the *Kamnan*. This system is regarded as the local governing body responsible for the villagers. Established in 1997, the decentralized local administration system consists of TAO and Provincial

Administrative Office (PAO). Although there is a tacit understanding that the local administration system focuses on infrastructure while the governor system takes care of the villagers’ lives, it is difficult to clearly and independently define DRR and natural resource issues within this division of labor (field note, July 2014).

While villagers acknowledge TAO/PAO’s support for local development, the majority still have many connections with the village heads regarding local public affairs, including post-disaster recovery, mangrove maintenance, and resource matters. In people’s minds, TAO represents the government and is associated with budget distribution rather than locals’ lives (field note, July 2014). As one interviewee stated, “TAO provides facilities, takes care of the water, electricity, etc. But it is the village head who makes the village decisions and has the power in the village” (Interviewee Vp01g, July 14, 2014). However, external organizations such as NGOs or governmental units usually contact TAO before external resources are brought in because TAO’s office and staff are easier for outsiders to access for outsiders. This has been a problem since the 2004 tsunami.

BEDO’s PES project illustrates this misalignment. Although BEDO invited islanders to participate in the kick-off meeting, it later primarily worked with the local administrative systems-TAO, PAO, and TAT (Interviewee Gt01, September 10, 2014; Interviewee Gb01, September 5, 2014; Interviewee Gb11, September 5, 2014). To gain local support, BEDO also cooperated with the *Kamnan* to establish a mangrove conservation group (Interviewee Gb01, September 5, 2014). In this regard, as interviewee Vb11k (September 10, 2014) stated, “There was the MOU [memorandum of understanding] signing between BEDO and the different organizations on the island. Because if there were no forest, none of the restaurants, boats, or tricycle-taxi drivers would survive.” However, the *Kamnan*, as discussed in 5.2, is merely the “official” representative of the island; the islanders do not identify with this representative in terms of managing the island’s natural resources. Thus, the gap between locals and external organizations has not closed but has actually intensified.

Only with TAO’s involvement could the PES project achieve local legitimacy. With the *Kamnan*’s participation, this project could now be considered a community-based approach to resilience building; however, few islanders are actually involved with it. As Interviewee Vp02 (July 16, 2014) explained, “We do not work well with PES. They plant [mangroves] here, but they do not consult with the local to see if it’s going to work. PES is like an entrepreneur, with its business people and donation box.” Only those villagers whose occupations are related to mangrove ecotourism benefit from the PES project, and most of those villagers are located in Moo 1. Thus, the natural resource has been unintentionally turned into tangible benefits that are not enjoyed equally by all four villages. Although the external organization has a well-intentioned aim of fostering resilient ecosystem-based stewardship by restoring ecosystems while generating local income, the way in which the organization interacts with the local communities changes the environmental interactions; thus, instead of strengthening community resilience, the external organizations actually weaken it [7,23,57].

6. Discussion

NGOs play an important role in linking the local to the larger scales and vice versa. After the 2004 disaster event, RTF uniquely initiated a follow-up project to further strengthen communities’ disaster risk management capabilities. As Interviewee Nr11 (July 12, 2014) noted, “TAO’s target is infrastructure, but maintaining the natural resources and doing the resilience work was beyond what that they could picture. The RTF was trying to get them to see this important part.” RTF helped plan a detailed evacuation route and identify vulnerable households and facilitated the establishment of disaster group networks in each village (Interviewee Nr12, July 18, 2014). Moreover, RTF held workshops to teach villagers about climate change and disasters. Interviewee

Vp11p (July 15, 2014) noted that “now, the villagers are more aware of disaster issue. If there's a disaster now, they know how to deal with it. Whenever there is a problem, the [RTF] will help.” During this process, the villagers learned more about environmental change, gained the ability to speak for themselves, and learned to make their own decisions with regard to conservation and disaster reduction projects. RTF, as the regional office of an international NGO, positioned itself as a hub for the communication of knowledge and local needs and a channel for negotiation between stakeholders across scales [1,7].

Furthermore, RTF extended its mandate to include broader disaster issues related to building coastal resilience and has deepened its concern with regard to social and environmental issues. These changes were initiated in order to build a sound foundation of disaster awareness on the island (field note, July 2014). One of the outcomes of these changes was a request by Moo 2 villagers for the PAO's support building bamboo fences along the shore to reduce wave energy and associated hazards. This request demonstrated that, although the villagers of Moo 2 are the ones most vulnerable to flooding, they can access NGO support, demonstrating their acquired knowledge and empowerment with regard to environmental hazards and NGO capabilities. The islanders are now better equipped with the necessary knowledge and power to effectively manage the environment based on their needs. According to an interviewee from the NGO, “People know what they really need after working with us for years. For example, in the past, if the government wanted to build a road there ... [They say] okay! Now, if you want to do something in the village, you have to ask them.” (Interviewee Nr11, July 12, 2014).

MAP's mangrove restoration project also contributed to the empowerment of villagers. MAP identified two abandoned shrimp ponds as demonstration sites – one in Moo 1 and the other in Moo 3 – for its EPIC project that used the innovative CBEMR method. In addition to restoring mangroves in the ponds as a bio-shield for the village, silvo-fisheries were added to provide local food security incentives with villager participation [58]. Thus, the owners were directly empowered by the disaster recovery project as they turned abandoned land to ecologically and economically productive land. This means that they were indirectly empowered by the disaster itself, as the recovery project would not have existed without it. Moreover, through this project, MAP gradually attracted the attention of Moo 3 residents who have historically shown little interest in public affairs. RTF began to better understand how ecosystems could support disaster recovery through the realization of the EPIC project's goals, gaining experience in mangrove restoration efforts by using the community participation approach.

An NGO's bridging role in the post-disaster recovery is well-illustrated by Fig. 1. An NGO, as an external unit to a community, usually builds relationships with a community after a certain event, such as environmental stress or disaster. Its involvement within a community often aims at either reducing vulnerability or strengthening resilience through a participatory process that usually involves empowerment. To eliminate the different goals existing between local and global concerns [21], the NGO has to transform its projects to match local needs and help facilitate sustainable local initiatives. The activities by both RTF and MAP demonstrate the reciprocal nature of this process. The community benefits in terms of becoming an increasingly resilient island, and the government is availed of projects that may drain their budget. Furthermore, the area benefits in terms of an increase in healthy ecosystem coverage, which may in turn work to benefit the entire globe. The two NGOs' work maintained a very limited situation of enclosure (e.g., capturing resources/authority) and exclusion (e.g., marginalizing stakeholders) and helped the island harmonize so that no encroachment (e.g., damage to the environment) or entrenchment (e.g., worsening of social inequality) occurred [27].

One of the results of the residents' empowerment is that some villagers subsequently achieved different social positions because they *represented* the village. In particular, those who were viewed as the most vulnerable to disasters had more chances to access help from the external organizations, and these most-vulnerable villagers thus became

the most empowered villagers. With access to key contacts in multiple external organizations, the empowered villagers are now able to influence the future of both the mangrove forests and the environment.

In Koh Klang, disaster management projects and natural resource restoration initiatives have also significantly empowered women, another group that is incredibly vulnerable to disasters. Women have been given opportunities to work and learn from NGOs. Women have trained to be local coordinators, and they also take care of vulnerable people and organize the local networks. Several female leaders emerged after the women's groups were established. From their experiences working with NGOs to help villagers adapt to climate change, these leaders empowered themselves through learning and were invited to share their experiences with others as well. Some of them subsequently achieved different social positions because they “represented” the village. Interviewee Vp02 (July 16, 2014) remarked, “Not many people believe that I, a lady, can make it, so I have to do it and prove I can make it. I went to meetings and got invited to meetings in other provinces several times.” With access to key contacts in external organizations, empowered women are now able to influence the future of both the mangrove forests and their environment. Such empowerment has allowed these women to acquire power as local leaders during disasters and with regards to natural resource issues.

In addition to women's capacity building, local groups have mushroomed and united to manage different resources. As mentioned in section 3.2, 31 local occupational groups have been registered (field note, July 2014), and most of these groups were established after the tsunami to serve as a co-working team for fostering collaborative efforts to manage the changing environment. As one interviewee stated, “It's difficult to access the post-tsunami external assistance if you're not grouped together” (Interviewee Vp12t, July 15, 2014). Through these local groups, people help one another and share experiences and knowledge about managing their common resources. The 2004 tsunami not only targeted the island physically but also changed the social fabric deeply [24,57]. This observation reflects the local social system's feedback loops depicted in Fig. 1, and these local people are the most important actors for impacting and influencing others. However, in Koh Klang, most local group presidents come from Moo 1 (field note, August 2014). This suggests that there are differences regarding social resilience across the island, with Moo 1 occupying a relatively strong position of power that can be used to modify the island.

Ultimately, the people of Koh Klang have learned to work together to protect the natural resources that sustain their livelihoods, aggregating their power to speak for themselves. This case study exemplifies the Sendai Framework for Disaster Risk Reduction 2015–2030's call for the enhancement of collaboration among local people and the use of community-based approaches for DRR to “Build Back Better” [59].

7. Concluding remarks and lessons learned from the island

“We cannot fight against nature, but we have to find a way to live with it” (Interviewee Vp01g, July 14, 2014).

This study delved into the nexus of social relations between stakeholders and environments, with a particular focus on local matters, to understand how disasters work to (dis)empower the stakeholders managing natural resources. This study offers insights into both disaster-induced resource management and the political issues generated by these practices. The case of Koh Klang shows that the natural resources themselves and the embedded social norms provide the basis for a resilient community. These factors can even dissolve the boundaries between environmental and social systems. However, geographical factors intertwined with power flows may be the root cause of misalignment both between the island and external organizations and across the island's villages.

Given the stresses caused by disasters and environmental change, a community-based approach to disaster recovery may provide a

foundation for increasing local resilience. It is important to note that this approach may also be misused under the guise of empowerment. For instance, an unfair allocation of resources might actually increase inequality. Collaborative natural resource management efforts such as restoring mangroves to enhance a community's resilience can be interpreted as an inter-empowerment process between local and larger scales and between social and environmental systems, which is a feedback loop that is induced by a disaster and entails further changes to a community's socio-ecological system to foster community resilience.

NGO-initiated CBNRM projects in developing countries' coastal areas aim to reduce people's vulnerability. However, the politics underpinning these initiatives will alter the environment, landscape, and social relations among stakeholders—especially those of the local people. Discrepant values and goals might exist between external organizations and local people and among local groups. The basis for CBNRM is comprised of resource allocations, access to natural resources, and the distribution of benefits, all of which provide feedback to the environment. These scale differences ultimately have the most significant effect on local cultures, introducing fundamental social changes.

Given how disasters impact social systems, post-disaster initiatives and recovery projects should focus on not only the ecosystem and environmental conditions but also social conditions. The politics of governing resources from outside the local scale may plant the seeds of disharmony at the local level. Global environmental change appears in the form of extreme climate events and disasters, often bringing with it flows of knowledge and resources from international NGOs to the grassroots communities. Cross-scalar support efforts often have the inherent purpose of empowering the local people to negotiate with upper-scale stakeholders such as their governments. This study recommends that policies, particularly those focused on building community resilience using a natural resource management approach, should be scaled to local perspectives and that jurisdictional issues should be managed with special care. In the long term, policies should strengthen the social processes related to international environmental change projects. Doing so will ensure that the village, its social relations, the villagers' livelihoods, and environmental ecosystems are all managed appropriately going forward, and that its adaptations to environmental change are both resilient and sustainable.

It is important to note that while this study provides support for the scaling of disaster recovery policies to the local level, it was limited in several respects. First, the study's discourse analysis methods were limited, in part, by a language barrier, as the researcher did not speak the local language. Although an experienced interpreter provided interpretations in real time, it is possible that distortion still occurred. This case also suffers from limited generalizability, as the focus was on one island and one ecosystem. Nonetheless, this study contributes significantly to existing knowledge regarding the social dimension of environmental disasters and post-disaster recovery efforts.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdr.2019.101249>.

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