The Pangpang Bay Mangrove Conservation and Restoration (MCR) Program

Scored by name(s): Alexander L. Q. Chen, Roskilde University (alq@ruc.dk), Teguh Kurniawan, Universitas Indonesia (teguh.kurniawan@ui.ac.id), Syifa Amania Afra, Universitas Indonesia, Salsabila Amanda Putri, Universitas Indonesia, Muhamad Imam Alfie Syarien, Universitas Indonesia and Marcel Angwyn, Universitas Indonesia

Date: 29/11/2024

Cite as: Chen-Florea, A. L. Q., Kurniawan, T., Afra, S. A., Putri, S. A., Syarien, M. I. A. & Angwyn, M. (2024). The Pangpang Bay Mangrove Conservation and Restoration (MCR) Program (GOGREEN Case Report Series No. 33), Roskilde: Roskilde University. ISBN: 978-87-7349-350-2

Is the project a case of…:

☐ State-initiated co-creation

☐ Entrepreneur-driven co-creation

☒ Grassroots-based co-creation*

**For an elaboration of the typology, please consult the GOGREEN theoretical framework p. 25.*

Integrated case analysis

Before proceeding to the scoring of the GFs, please provide a *3–5 page case analysis* in which you describe the background, history, and national, regional, and local contexts of the case, the problems, and goals addressed by the local collaboration, the participating actors and their relationships, the unfolding of the co-creation process, the most important governance factors (this may include factors other than those in focus in this project), and the generated outputs and outcomes. The conclusion may specify a few lessons learned from the case study.

1) Background, history, and national, regional, and local contexts of the case

Mangrove forests play important roles in ecological sustainability, biodiversity conservation, and disaster risk reduction. About three million hectares of mangrove forest grow along Indonesia's 95,000 km coastline. This is 23 percent of all mangrove ecosystems in the world (Giri et al., 2011). Mangrove forests are found in many parts of Indonesia, with regionally important mangrove ecosystems located in Java, Papua, Kalimantan, and Sumatra (FAO, 2007). Mangrove forests are important coastal ecosystems as they mitigate climate change and its impacts by sequestering large amounts of carbon dioxide both in the trees and in the sediments beneath them, storing up to four times relative to other forms of terrestrial ecosystems such as rain forests. Consequently, global mangrove deforestation trends have posed a significant threat to the existing climate change trajectories, as their disappearance will potentially exacerbate global warming.

In response to global mangrove deforestation, local mangrove conservation and restoration (MCR) programs holds the potential to alleviate local climate change impacts by enhancing resilience and mitigation. Wetlands such as mangroves cover a small portion but are vital ecosystems due to their high biodiversity and role as a source of chemicals and organisms. Mangrove wetlands functions as a

transitional zone between land and sea along the coast, hence it plays a vital role in protecting the surrounding ecosystem. In particular, mangrove trees help to reduce tides, moderate climate change, stabilize coastlines, and offer habitat for coastal fish and wildlife. Mangrove forests contribute to sediment stabilization, preventing coastal erosion and acting as a natural buffer, which thereby safeguards local communities from floods and storm surges. Additionally, they bolster sustainable livelihoods for local communities by providing essential ecosystem services, including fish, crabs, shrimps, shrubs, and timber, which if sourced sustainably can provide a stable source of economic income.

Over the past three decades, Indonesia has lost 40 percent of its mangroves (FAO, 2007). In consequence, Indonesia has the fastest rate of mangrove deforestation in the world (Campbell & Brown, 2015). Massive deforestation has in particular occurred on the Java Island, as Forest Watch Indonesia (FWI) reports a total deforestation of 2,050,645 ha between 2000 to 2017 at a rate of 125,460 ha/year. According to the Ministry of Environment and Forestry, currently the forest area on the island of Java is only around 24% of the area of the island of Java which is 128,297 square kilometers. From these figures, only 19% is forest cover, while the other 5% qualify as botanical gardens and biodiversity parks (KLHK, 2022). Furthermore, Prasetyo et al.'s study (2009) concluded that East Java Province has the highest deforestation rate compared to other provinces on the island of Java. Banyuwangi is a regency located in East Java Province, which has experienced an overall decline in the mangrove forest area.

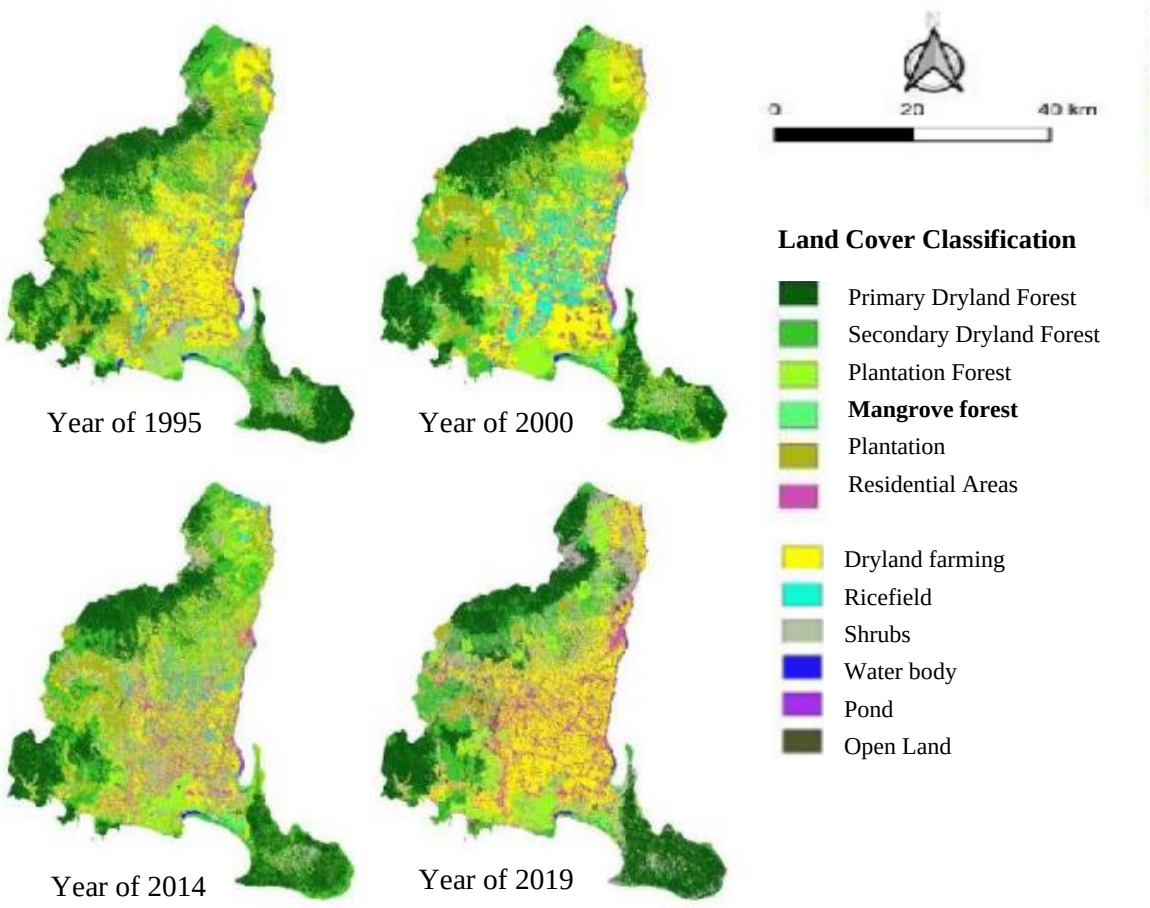

Figure 1. Map of Land Cover Changes in Banyuwangi Regency from 1995 to 2019
Sources: Jurnal WASIAN Vol.8 No.2 p.121-132, 2021

Figure 1 maps the historical changes in different types of land cover in, respectively, 1995, 2000, 2014, and 2019, provide information on land cover changes. According to Figure 1, dry land forests made up the majority of the land cover in Banyuwangi Regency between 1995 and 2019. Between 1995 and 2019, mangrove wetlands were converted to different land uses (see Table 1 below), such as agriculture (dryland farming) and housing (settlement). The total area of mangrove forests in Banyuwangi has continued to decrease since 1995 because they have continuously been converted into residential areas. Most notably, residential area in 1995 measured 29,862 ha, followed by a temporary decrease in 2000 and 2014, until it had increased to 43,490 ha by 2019.

Table 1. Land cover area in 1995, 2000, 2014 and 2019 in Banyuwangi Regency

No	Land Cover Class	Luas (ha)			
		1995	2000	2014	2019
1	Primary Land Forest	71.010	82.243	79.198	86.585
2	Secondary Dryland Forest	57.562	61.292	63.008	32.721
3	Plantation Forest	35.173	30.811	37.995	32.792
4	**Mangrove forest**	**6.573**	**3.078**	**2.387**	**1.269**
5	Plantation	37.918	30.742	34.284	10.250
6	Settlement	29.862	18.794	26.717	43.490
7	Dryland farming	66.256	82.825	60.664	85.589
8	Ricefield	9.216	28.986	12.027	1.499
9	Shrubs	25.460	12.334	33.739	51.050
10	Water body	781	711	674	420
11	Pond	1.108	2.524	4.407	2.694
12	Open Land	10.025	453	4.789	9.333

Despite the rapid deforestation in Banyuwangi, the sub-district Pangpang Bay represents an exception as they have managed to expand the mangrove area through targeted efforts based on collaborative governance. The Pangpang Bay area is a large wetland ecosystem in Banyuwangi, which is around 8km in length and 3,5 km in width, covering approximately 3.000 ha. The area has suffered from rapid mangrove deforestation over the last several decades, which rapidly accelerated in the 1990s as the authorities targeted mangrove forests for industrial development in anticipation of stimulating economic growth in the surrounding regions. A strategic partnership was created between Perum Perhutani, a state-owned enterprise authorized to manage and sustainable source timber from state forest resources, and PT. Mutiara Blambangan Permai, a conglomerate involved in aquacultural industries. The intensive exploitation of the mangrove ecosystem services resulted in a rapid decline in mangrove vegetation, which disrupted the natural protective function of mangroves in coastal protection. While the intention of the strategic partnership between Perum Perhutani and PT. Mutiara Blambangan Permai was to sustainable source timber from the mangrove forests, they instead resulted in the intensive exploitation of the mangrove forests that resulted in a rapid decline in mangrove vegetation. This mismanagement and overexploitation of the mangrove forests disrupted the natural protective function of mangroves in coastal protection, endangering the local village communities from flooding, as well as a general loss of biodiversity that has reduced the availability of ecosystem services.

The Pangpang Bay Mangrove Conservation and Restoration (MCR) program, initiated in 1999 as a small collaborative effort to combat mangrove deforestation, has since grown into a large-scale, formalized collaborative network that unifies stakeholders from the public, private, and civil society sectors. The Pangpang Bay consists of four villages (Kedungringin, Wringinputih, Kedunggebang, and Kedungasri), which mobilized in 1999 in response to several years of mangrove deforestation and in recognition of their importance for protecting local ecosystems. To this end, several local initiatives were born to collaboratively combat mangrove deforestation and to reverse the trend. These multi-actor MCR initiatives have gradually grown into a large collaborative network covering the entirety of Pangpang Bay, whereby the four village communities have coordinated with local and regional authorities, businesses, and NGOs to combat the mangrove deforestation. **We designate this collaborative network, which is the analytical focus of this case study, as the Pangpang Bay MCR program.**

The collaborative character of the MCR program is twofold. First, it involves joint problem-solving and decision-making processes for designing and executing mangrove conservation practices initiatives, which can also be described with the cognate concept of 'co-creation'. Through this collaborative network, best practices in the form of a set of MCR practices and routines tailored to the local conditions of Pangpang Bay have been developed as the collaborative output and outcome. The local village communities in Pangpang Bay historically held responsibility for the stewardship of mangrove forests within their village areas. However, due to a lack of capacity-building, expropriation from agricultural and aquacultural industries, and insufficient community awareness or motivation, the inability of local village communities to safeguard mangrove forests has resulted in a general failure to combat mangrove deforestation. To address this, the collaborative network since 1999 has proactively involved local authorities, particularly the Forestry and Fishery Agencies of Banyuwangi, in formulating, designing, and executing the MCR program. Specifically, local authorities have gradually assumed various responsibilities to assist local village communities, including collaboratively formulating management strategies, performing field operationalizations, conducting discussion forums to facilitate multistakeholder communication, providing technical support and transfer, and conducting risk mitigation assessments and planning.

Figure 2. Products as an Output of Co-Creation Activities in Pang pang Bay

Second, another co-created output from the MCR program has been commercialized mangrove consumer products (in the form of chips, syrup, carbon trading, and mangrove track tourism) and services that have been marketed in East Java Province and surrounding area. In particular, these mangrove consumer products have been spearheaded by local joint business groups, such as Pokdarwis, Pokdakan, KUB, and KTH, who represent local fishermen and farmers that have collaborated together to increase to create a livelihood from the mangroves with the support of the collaborative network.

The integrated case analysis offers a historical overview of the developments of the Pangpang Bay MCR program, illustrating how the core membership of the collaborative network has gradually expanded over the years, enhancing its collaborative scope and content. In consequence, several other actors have also joined the collaborative network since 1999 beyond the initial collaboration between the village communities of Pangpang Bay and the local authorities, contributing with a range of additional inputs and functions supporting the success of the MCR program. In particular, the scope of participation by the government/authorities have gradually expanded from the Forestry and Fishery Agencies of Banyuwangi to the regional (regency) government of East Java, which have come to recognize the importance of mangrove ecosystems and their impact on the local environment. In parallel, the civil society sectors in the form of non-governmental organizations (NGOs) have also been gradually included, which have been crucial for the capacity-building in the local village communities, providing training and knowhow that has empowered them to more effectively execute the MCR program.

The culmination of these collaborative efforts resulted in the designation of Pangpang Bay as an Essential Ecosystem Area (EEA) in 2020 as part of The East Java Governor Decree No. 188/388/KPTS/013/2020, in recognition of its vital role in ecological protection and the provision of environmental services that has benefitted the welfare of the surrounding communities (see also Pradana et al., 2023). EEAs refer to a larger set of legal designations introduced in 2011 by the Ministry of Environment and Forestry, targeting ecosystems outside Nature Conservation Areas that are nonetheless deemed as ecologically significant for biodiversity conservation. These ecosystems include natural and cultivated ecosystems located inside and outside of conservation forest areas (KLHK, 2017). The mangrove-based EEAs were established in order to optimize the potential of the coastal environment and increase the assurance of biodiversity protection.

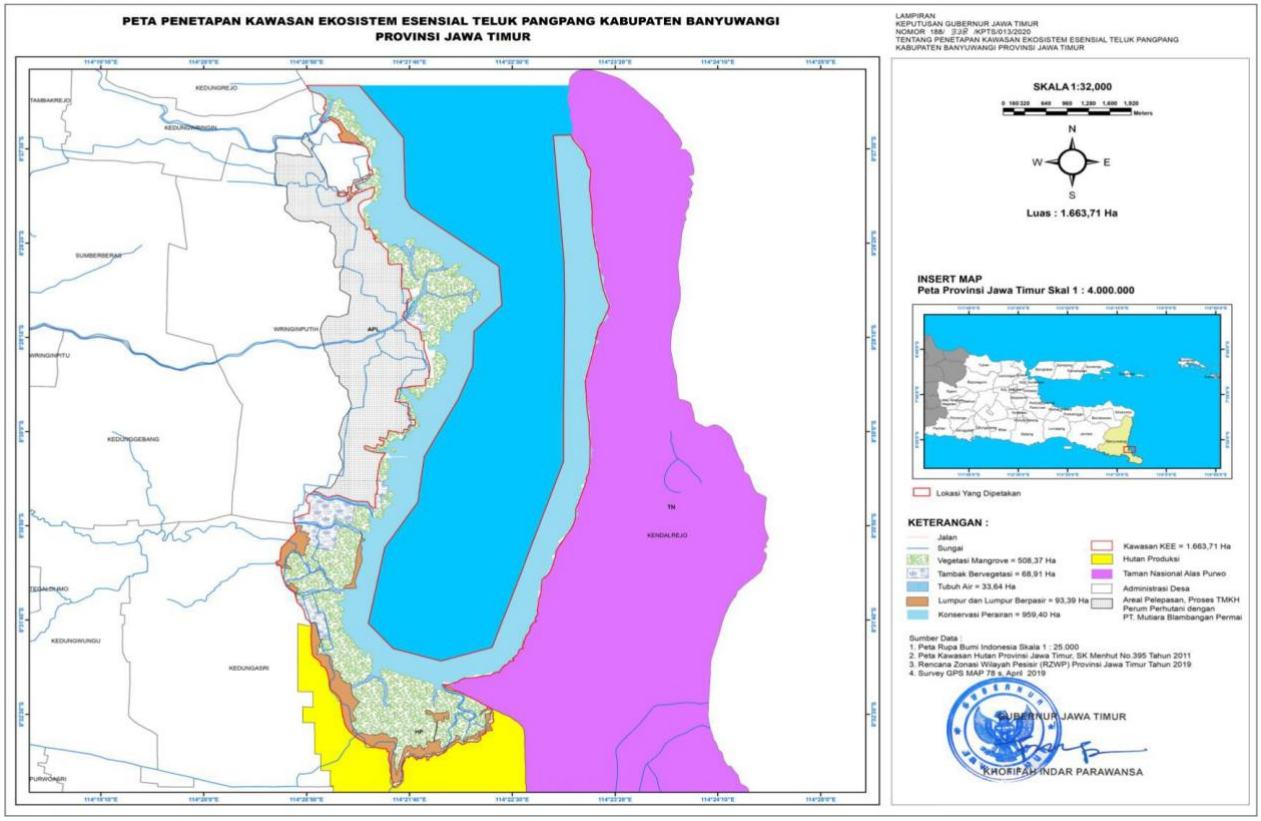

Figure 3. Mapping Area of the Essential Ecosystem Area of Pangpang Bay, East Java Province
Source: Decree of the Governor of East Java regarding Formulation of Essential Ecosystem Area of Pangpang Bay Banyuwangi in 2020

The map above (see Figure 2) depicts the administrative boundaries of the Pangpang Bay as an Essential Ecosystem Area. The Pangpang Bay area consists of diverse natural and social ecosystems such as a river, mangroves, vegetation ponds, conservation area, exclusive economic zones, production forests, national parks, and industrial areas, which are marked with the light-red color on the right side. The mangrove area itself is highlighted with a light-green color along the coastal area. The Pangpang Bay Mangrove Area, Banyuwangi Regency, is located in two sub-districts, namely: 1) Muncar District, consisting of Kedungringin Village and Wringinputih Village; and 2) Tegaldlimo District, consisting of Kedunggebang Village and Kedungasri Village. These areas are adjacent to the Perum Perhutani Production Forest Areas, Blambangan Forest Management Unit (BPKH), and South Banyuwangi Forest Management Unit (KPH) jurisdiction territories.

The MCR project receives funding from a number of sources, including non-government budget allocations that come from partnerships with the private sector, as well as funds from the federal government, regional governments, and local governments. First, the budget allocation from the central government is a transfer to the regions from the state budget, which is given to regional agencies at different levels (village fund distribution) and central agencies in the regions (tourism, forestry, fisheries, etc.). Second, the Banyuwangi Regency government provides assured and sustainable funding based on the transfer income and locally generated income (local taxes, regional retributions, grants, and special allocation funds), which is allocated to the village apparatus in line with each village's needs and priorities through

the APBD (Regional Revenue and Expenditure Budget). A subset of the budget is thereafter allocated to MCR programs, as well as from adjacent sources related to mangroves, for example enterprises product development and promotion, establishing infrastructure, responsible resource utilization, mangrove area rehabilitation, empowering village communities, and research & development which includes education in the EEA of Pangpang Bay region. Third, funding from non-governmental sources is also part of the MCR budgets, originating from commercial entities such as BCA Bank.

As a final note, although the Pangpang Bay MCR program comprises multiple concrete conservation and restoration initiatives and activities that can be considered analytically distinct, we treat them as part of an integrated output and outcome based on a coherent collaborative process. Moreover, our evaluations of the 16 governance factors (GFs) and 2 outcome variables are based on a snapshot of the current developments of the MCR program. Consequently, some of the initial challenges documented in the integrated case analysis may no longer be relevant and are thus not reflected in the individual case scoring and analysis of each GF.

2) The aims of the project and the sustainability problems that it seeks to address

The collaborative governance of the mangrove area between the village communities in Pangpang Bay, authorities and businesses officially started in 1999 with the purpose of restoring the mangrove forest coverage through targeted efforts. The assumption was that improving the mangrove forest ecosystem not only provides protective cover for potential natural disaster but would also offer a range of ecosystem services, such as fish, crabs, fruits, and lumber (Ariyanto et al., 2020). By tapping into these ecosystem services through sustainable resource management practices, the reversal of mangrove deforestation would thus also potentially benefit local communities by creating jobs and new sources of income. The MCR program is co-created insofar as all the involved stakeholders from the collaborative network jointly develop a set of organizational practices and routines tailored to the local context of Pangpang Bay with the overarching aim of optimizing the MCR efforts. Based on the co-creation of the MCR program, they have also collaboratively identified three overarching goals and aims connected to these collaborative efforts:

a) **Ecological goals:** mangroves have a multifaceted role in ecological conservation (ecosystem, species, and genetic diversity). These coastal ecosystems act as nurseries and habitats for diverse marine species, supporting biodiversity conservation. They also serve as a natural buffer against coastal erosion and storm surges, offering vital protection to coastal communities. Mangroves play a significant role in carbon sequestration by storing substantial amounts of carbon in their biomass. Moreover, their intricate root systems contribute to water quality improvement by filtering pollutants and trapping sediments.

b) **Economical goals:** well-managed mangrove forests provide substantial economic benefits by supporting various industries and local livelihoods. The thriving ecosystems of restored mangroves contribute significantly to fisheries, providing breeding and feeding grounds for fish and other marine species. This enhances fishery yields, supporting the livelihoods of local communities dependent on fishing. In parallel, also benefit farmers due to the provision of non-timber and non-timber products that can be harvested responsibly for economic gain. Additionally, mangroves can attract eco-tourism, offering unique and biodiverse environments for visitors to explore.

c) **Social goals:** The Pang pang Bay MCR has had a substantial impact on the sociocultural life of small communities**.** Not only does it bring economic advantages but also notable social benefits to the village communities, fostering community resilience and well-being. The rejuvenation of mangrove ecosystems serves as a natural buffer against natural disasters, such as storms and tsunamis, safeguarding coastal communities. Furthermore, the management of the mangroves can leverage local values and wisdom, which shapes the community identity around principles of environmental sustainability and its co-constitutive relationship with economic development and social connectivity.

3) The participants and their interaction and communication in and between meetings

The Pangpang Bay MCR has involved multiple stakeholders since 1999, which we cluster into three groups: 1) Government: central government, government at the provincial/regency level, and local government; 2) Civil society community on the national and local level; and 3) other related actors either from the private sector or academicians. The fifteen categories of actors listed below have participated in the collaborative network to varying degrees; hence, they have been ordered in descending order (within each group) in terms of their level of decision-making influence, involvement in daily operations of mangrove conservation, and centrality within the collaborative network. Most importantly, the daily management and operations of the MCR program have primarily been undertaken by the village communities and authorities in Banyuwangi.

a) Government

1. **Forestry Agency of Banyuwangi:** participate in the protection and stewardship of the EEA by designing action plans and programs to be implemented in the Pangpang Bay. Together with the Fishery Agency of Banyuwangi, they act in the capacity as facilitative leaders by coordinating the EEA management and cross-village efforts targeting mangrove conservation. They hold an important administrative function within the collaborative network, as they report on urgent matters to the stakeholders and ensure compliance with local government decrees on mangrove forest management. Finally, they also operate a small planning office located in Banyuwangi, which is designated as the meeting space for the collaborative network meetings.
2. **Fishery Agency of Banyuwangi:** The Fisheries Agency performs a functional equivalent role to the Forestry Agency of Banyuwangi, although they are instead tasked with regional government affairs in the fisheries.
3. **The village authorities**: referring to the local village representatives governing village politics and affairs, which participate in the governance of the mangrove areas as they broker relations between the local fisherman and farmers, who directly depend on the mangroves for their livelihoods, and the rest of the village. They are formally separate from the local community organizations, although they sanction their legal status based on which they receive formal recognition as legitimate actors that are entitled to have a decision-making power over the MCR program.
4. **Forest Management Bodies of the Eastern Java Regional Division (KPH):** KPH consists of the Conservation Forest Management Unit (KPHK), Protection Forest Management Unit (KPHL) and Production Forest Management Unit (KPHP), who are managing the forest resources and the ecosystem of the mangrove plantation area in EEA. Forest management in the KPH organizational context must be conducted such that sustainable forests and prosperous communities can be

realized. Sustainable forest management is the main goal of KPH development because they are expected to provide ecological, economic, and social benefits for parties interested in the forestry sector.

5. **The Environmental Agency of Banyuwangi Region**: provides environmental policy support for the management of the mangrove areas.
6. **The Planning and Development Agency of Banyuwangi Region**: are responsible for planning development programs targeting the mangrove area in Banyuwangi.
7. **The Communication, Informatics and Encryption Agency of Banyuwangi Region**: helps channel and communicate information between authorities and to the village communities.
8. **Governor of East Java Province & Mayor of Banyuwangi:** conduct strategic decision-making and provide support to various activities in the management of EEA.
9. **Natural Resources Conservation Center East Java Brach:** optimizing the management of EEA as a contribution to the sustainability of natural resources and biodiversity, sustainable development, education, and community well-being.

b) Civil Society Community

10. **Local Community organizations:** Each village community is represented through its local mangrove interest groups and management organizations, such as the Community Forest Farmer Group (KTH), Fisheries Community Group (KUI), the Joint Community Group (KUB), and the Community Tourism Awareness Group (CTAG). These communities are truly diverse due to their differing priorities and focus of the management and development of the mangrove areas, reflecting the different composition of local stakeholder interests. For example, some villages are populated by more farmers, whereas have more fishermen**.**
11. **Local mangrove farmers:** active participants who engage in the cultivation and processing of mangrove crops (timber, trees, and fruits). They have partly been responsible for the deforestation of the local mangroves but are now participating in the MCR program through their membership in the local community organizations.
12. **Local fishermen:** active participants who engage in the cultivation of aquaculture around the mangrove ecosystem (shrubs, crabs, shrimp, and fish).
13. **NGOs in Indonesia:** participate in preserving the mangrove ecosystem in EEA Banyuwangi by conducting research-based conservation initiatives. They also work towards promoting the sustainable use of natural resources within local communities.

    BISA Indonesia: BISA INDONESIA is a non-profit organization that operates in the environmental and social fields. Formed on February 1, 2016, in the Special Region of Yogyakarta, BISA Indonesia was initiated by ten people with various scientific backgrounds, who had a vision and mission to preserve natural habitats and improve human welfare. Legally, BISA Indonesia is recognized as an NGO or Self-Help Organization Society recognized by the State.

    ARUPA COMMUNITY: ARuPA (Volunteer Alliance for Saving Nature) is a non-governmental organization that operates in the field of preserving natural resources and the environment. This institution was formed on May 16, 1998, which was as an organizing platform for students and environmentalists that pushed for environmental reform. In Pangpang Bay, ARUPA constitutes one of the active stakeholders as they have by facilitated a forum for collaborative conservation

initiatives in Pangpang Bay, thereby bridging the involvement of cross-sectoral parties in order to protect and preserve the mangrove forests.

c) Other Supporting Actors: supportive functions in realizing the collaborative governance of sustainable mangrove management in the EEA region

14. **Indonesia Private Bank (BCA):** provide mix funding to several program especially in Wringinputih Village (for Pak Hendro's KUB/Joint Community Group). BCA is committed to a corporate social responsibility plan, which allocates part of its profits to support the sustainability and operational management of mangrove areas (seeding and planting).
15. **Several local & national universities:** research and develop reports on the environmental and biodiversity conditions in EEA areas, not limited to Banyuwangi (Universitas Indonesia, IPB, Universitas Surabaya, Universitas Tujuh Belas Agustus).

4) How often do they meet, and do they communicate between meetings?

The actors above meet and communicate through physical and virtual forums. A physical meeting is held annually, either formally or informally, by the local government or invited by the leader of the community. Formally, the meeting is arranged by the local environmental authorities and is customarily held in the CDK (Forestry Agency of Banyuwangi) office, where key stakeholders such as the village communities and Forestry/Fishery agencies discuss the progress or evaluation of the EEA program in the field. Informally, the discussion or meeting can be held anytime within the communities. Specifically, it is usually held in the leader's community home or another member's place.

There is a community forum in the form of a virtual discussion and communication space that can be accessed at any time through WhatsApp Group as a virtual forum. All stakeholders have access to this communication forum, which is judged to be highly effective and fast in solving problems and sharing progressive information both between one community of village organizations and between villages with EEA managers at the government level. Each village community organization also has its own secretariat that is located in the village office near the local residents' houses, where meetings are regularly held.

In addition, the formal annual meetings are held one or two times a year together with the leaders of the village community organizations and the formal EEA administrators. Recently, in the form of physical forums, the EEA management just established a joint secretariat and joint office in 2022. This joint office developed as an meeting space to gather and meet with the members of EEA management. The office located in Tegaldlimo Regency was agreed upon by all representatives of the village officials and EEA management.

5) The role and forms of knowledge sharing, coordination and joint problem-solving

The success of the MCR program in Pangpang Bay underscores the vital role of knowledge sharing in fostering effective collaboration. The collaborative efforts, both before and after the introduction of the EEA, have encompassed four villages. Each village employs unique strategies to utilize and develop its mangrove forests, essentially transforming them into experimental sites.

The strength of the collaborative network connecting these villages facilitates the dissemination and adoption of co-created MCR practices and routines. In instances where certain strategies prove effective, neighboring villages can attempt to incorporate these approaches. Village leaders and representatives actively seek input from more successful or established villages to optimize their own strategies. Informal information-sharing meetings cover diverse topics, including planting various mangrove species, obtaining government legal recognition for community organizations, and establishing formal channels for funding. This coordination extends beyond individual village concerns to address issues affecting the entire mangrove area. For example, when a tidal flood becomes a concern spanning multiple villages, collaboration is essential not only within the affected village but also in neighboring communities. The recognition that environmental damages in one area can lead to similar consequences in another emphasizes the need for a collective approach.

The absence of a singular, best-practice approach for MCR is underpinned by the intricate and diverse nature of these ecosystems. Mangrove areas exhibit ecological diversity, with variations in species composition, hydrology, and soil types, necessitating context-specific strategies. Local contexts, including cultural practices and socioeconomic conditions, play a pivotal role, emphasizing the need for community engagement in tailoring approaches. In Banyuwangi, villages with less mangrove coverage, such as Kedungringin and Kedunggebang, exhibit lower productivity in developing their mangrove areas and tapping into the economic benefits from exploiting the ecosystem services. In contrast, villages with more extensive mangrove coverage, like Kedungasri and Wringinputih, have successfully expanded their areas to a greater extent and have had greater success commercializing their processed mangrove products as a sustainable business. This observation highlights that participation in the collaborative network yields uneven benefits, as some villages experiencing more substantial gains than others.

6) The relation between consensus and conflict and the handling of the latter

Numerous sources affirm that the collaborative process garners widespread appreciation among participating stakeholders, effectively facilitating the exchange of interests between local actors (e.g., fishermen and village community groups) and the authorities. However, conflicts are reported to be inevitable due to competing interests and overlapping jurisdictions among stakeholders. For instance, mangrove areas fall under the purview of both fishery and forestry agencies, given the unique liminal space in which mangrove forests grow. This overlap of jurisdictions has historically created inter-bureaucratic rivalries and tensions, which has been a persistent source of latent conflict until recent years under the EEA framework that has resulted in a clearer division of labor and thus role differentiation.

The designation of Pangpang Bay as an EEA has paved the way for inter-bureaucratic collaboration rather than rivalries, as it has outlined a clearer division of labor under the formalized organizational framework for the collaborative network involved in the conservation of mangroves in Pangpang Bay. A clear assignment of roles and functions within the collaborative networks ensures a transparent system of accountability, which has enabled collective problem-solving rather than combative jurisdictional conflicts. In consequence, both the Forestry and Fishery Agencies of Banyuwangi have collectively assumed the roles as facilitative leaders and stakeholder managers, as they facilitate the communication between all the stakeholders within the collaborative network. Through formal and informal communication channels,

they coordinate with other government officials at the village levels and solicit opinions from local community organizations.

7) The role and form of leadership: lead actor, steering group and/or collective leadership

The collaborative governance framework in Pangpang Bay can be likened to a series of concentric circles. It consists of a core steering group in the form of the village communities and authorities involved in the daily coordination and operations of the MCR program, who regularly convene to deliberating and identifying improved MCR practices. Outside the core steering group, a broader group of peripheral stakeholders that play intermittent albeit impactful roles in certain phases of the collaborative network, who provide inputs to a range of MCR activities based on their relevant expertise and jurisdictional influence.

The current success of the collaborative governance framework can be attributed to two notable shifts since 1999: (a) the empowerment of local communities as central decision-makers, and (b) the introduction of a formalized organizational structure with a clear division of labor and authority.

First, the formal recognition of the village communities as relevant stakeholders and decision-makers in the MCR program has been integral to collaborative success. Historically, these communities were marginalized, functioning as passive bystanders compliant with externally imposed conservation strategies from authorities or international NGOs. The transition to a collaborative framework ensures that the MCR program revolve around community-led initiatives, with local environmental and village authorities, NGOs, and private businesses mobilized to support the villages. Specifically, the collaboration focuses on capacity-building within the local communities, responsible for mangrove forest stewardship. Through education, training, public awareness campaigns, knowledge sharing, and shared decision-making, these communities are structurally empowered for sustainable resource management, resulting in enhanced conservation outcomes. Villagers participate in decision-making, collaborating with stakeholders to access resources and expertise. Through these tasks, local communities emerge as stewards of mangrove ecosystems, fostering a sense of ownership and sustainability in their restoration initiatives. On a concrete level, the village communities are directly involved in the planning and execution of the MCR program with support from NGOs, universities, and expert authorities. Their responsibilities include:

a) site selection
b) sapling collection
c) propagation, planting, and transplanting saplings
d) erosion control measures and adapt restoration efforts to changing environmental conditions
e) maintenance and monitoring.
f) community education and awareness, ensuring members comprehend the ecological significance of mangroves in the restoration process.

Second, the emergence of a formalized organizational framework for the Pangpang Bay MCR program collaborative network enhanced the management of stakeholders. This, in turn, led to more cohesive and synchronized efforts in support of mangrove conservation and restoration. Prior to this formalized structure, the localized efforts to combat mangrove deforestation were fragmented and lacked an overarching leadership. Under the current organizational structure, the Forestry and Fishery Agencies of

Banyuwangi undertake the administrative and overarching coordination role, ensuring cross-village collaboration and knowledge sharing. To this end, they engage in three sets of organizational tasks:

a) the identification, measurement, restoration, and monitoring/evaluation of the mangrove area;
b) the development of management strategies in terms of field operationalization, problem-solving, discussion forums, technical support, technology transfer, risk mitigation, strategic planning, and mangrove product processing; and
c) facilitating multi-actor partner collaboration between regulatory actors, collaborative agreements, other binding commitments, and cross-stakeholder communication in a system of multi-level governance.

8) The temporal unfolding of the co-creation process: major shifts and ups and downs

The temporal unfolding of the Pangpang Bay MCR program can be divided into three phases:

1. *The fragmented collaborative period of the MCR program (1999-2009)*
2. *The emerging collaborative period of mangrove conservation and restoration (2010-2019)*
3. *The designation of the mangrove conservation and restoration area as an EEA (2020—now)*

Phase 1: The fragmented collaborative period of the MCR program (1999-2009)

Throughout the 2000s, local fishermen and farmers, who relied on mangroves for their livelihoods, recognized the detrimental impact of mangrove forest decline on their agricultural and aquaculture yields. Over time, the consequences of mangrove deforestation became more pronounced, leading to an increased occurrence of environmental disasters such as floods, soil erosion, and a decline in biodiversity. This escalation heightened public awareness about the crucial need to protect and conserve mangrove forests. Initially, these community members mobilized to form a small collaborative network involving the four village communities and, intermittently, the local authorities such as the Forestry and Fishery Agencies of Banyuwangi to collaboratively address the issue with the aim of reversing the trend of mangrove deforestation.

Despite these environmental disasters, mobilizing the entire village proved challenging. These local initiatives had limited success as they primarily consisted of uncoordinated local efforts. The degree of multi-actor collaboration was thus minimal and, while mangrove deforestation was a recognized issue, remained unsuccessful at reversing the mangrove deforestation trends. The lack of organizational support and collaborative intent resulted in a lot of organizational inertia, as the village communities did not have the necessary competences and technical knowledge to restore the mangrove areas. Meanwhile, the piecemeal efforts by the local environmental authorities such as the Fishery and Forestry Agencies of Banyuwangi failed to create any lasting synergies with the parallel efforts of the village communities. This is not to say that there was no collaboration altogether, as there were sustained interactions between the public and civil society sectors. However, their joint efforts to combat mangrove deforestation were hindered by a shortage of substantial resources, including financial resources, community mobilization, and organizational capabilities. This limitation impeded progress during the early stages of their initiatives, hence this phase can be described as the fragmented collaborative period of the MCR program.

Phase 2: The emerging collaborative period of the MCR program (2010-2019)

The 2010s mark a critical juncture for the collaborative network and the Pangpang Bay MCR program as the national government ratified the Indonesian Instruction no. 3 in 2011, which foregrounded equitable

development as a national policy agenda. Equitable development emphasizes the need to leverage collaborative, multistakeholder frameworks to address socioeconomic challenges such as poverty, hunger, inequality, and economic underdevelopment. As part of this national policy agenda, the legal-institutional designation of EEAs was also officially introduced, which sought to introduce new institutional frameworks for addressing the degradation of natural ecosystems as a result of climate change. In response to the national decree, the regional authorities ratified the Banyuwangi Regent Decree No. 188/1338/Kep/429.011/201 shortly after, based on which the Forum of the Pangpang Bay Mangrove Area was introduced. The forum was designed with the explicit purpose to operate as a formalized collaborative framework, aggregating the various stakeholder interests pertaining to the Pangpang Bay mangrove ecosystem. The forum thereby paved the institutional pathway to engage in targeted and systematic efforts to redress the mangrove deforestation trend, as it produced a stronger impetus for joint problem-solving, resulting in the emergence of a collaborative process proper in comparison to the prior phase of collaborative fragmentation.

One of the prior reasons for the lack of coordination was due to the plurality of interests and motivations at play within the collaborative network. While the village communities were generally concerned about the environmental consequences of deteriorating mangrove forests, which not only caused flooding but also undermined the conditions for their livelihoods due to the degradation of the coastal ecosystem and the population of fish, crabs, trees, and fruits. In contrast, the village authorities primarily expressed a strengthened interest because they recognized the potential economic benefits of conserving and rehabilitating mangroves, foreseeing opportunities for ecotourism development. In parallel, the bureaucratic rationality of the local environmental authorities, driven by institutional structures and policy mandates, diverged from the priorities of other stakeholders, as administrative efficiency and regulatory compliance sometimes overshadowed more nuanced ecological considerations in collaborative decision-making.

The chief characteristics of this emerging collaborative period was that the local environmental authorities, village communities, businesses and NGOs coalesced around joint effort in providing local training and coordination between villages to disseminate technical knowledge about optimal planting techniques and conservation strategies, although the collaborative network was not yet formally ratified into as an independent legal entity recognized by the East Java Governor. The involvement of NGOs and local government authorities (Banyuwangi and village-level) played a crucial role in empowering the village communities with the necessary technical know-how (through training and education) and resources (financial and manpower) to drive mangrove reforestation initiatives. However, it is worth noting that the participation of NGOs, while increased, still rested on a relatively weak legal-institutional foundation. The greater commitment to building joint capacities and a pooling of organizational and financial resources allowed the collaborative network to make a far more concerted and productive effort in comparison to the 2000s. Most notably, the mangrove forests were documented to have expanded for the first time in 2014, thereby reversing the deforestation trend and paving the way for its official designation as an EEA in 2020.

Phase 3: The recognition of the mangrove conservation area as an EEA (2020-onwards)
After several years of success with the MCR program within a collaborative governance framework, Pangpang Bay attained the formal designation as an Ecologically Essential Area (EEA) in 2020 following the enactment of the Governor's Regulations on the Establishment and Management of such areas. This legal-institutional recognition of Pangpang Bay as an EEA has had far-reaching policy implications by recognizing the collaborative network as a formal-legal structure enshrined in the regional (East Java) governance system.

Firstly, the EEA designation entails the implementation of a comprehensive legislative framework that legally recognized and solidified the protective status of mangrove forest areas. This ensured that these mangrove areas received heightened prioritization in the complex landscape of land-use planning. The acknowledgment of anthropogenic causes, particularly intensive extractive activities like logging and conversion for agriculture and aquaculture, as major contributors to mangrove deforestation highlights the need for strategic planning and intervention. The legal elevation of mangrove forests as essential ecosystems signifies a crucial step forward in integrated land-use plans, as it safeguards these ecosystems from indiscriminate conversion for industrial purposes, providing a foundation for sustainable and ecologically informed development practices. It is a strategic move to counteract the historical trends of unsustainable land use and resource extraction that have led to the rapid acceleration of mangrove deforestation in Indonesia over the last several decades.

Secondly, the legal mandate for collaborative governance not only empowered local communities but reshaped the dynamics of decision-making processes within the mangrove forest areas. The obligation for local environmental authorities to share decision-making power and engage in consultative processes with relevant stakeholders signifies a departure from traditional top-down governance models. This shift challenged the monopoly of environmental authorities and places a pronounced emphasis on joint capacity-building. While collaborative governance was already practiced in Pangpang Bay prior to its formal EEA designation, the legal acknowledgment of co-decision-making rights represents a significant enhancement of the legal standing and legitimacy of local communities. This shift not only recognizes the intrinsic value of local knowledge and involvement but also institutionalizes their role in shaping the future of MCR efforts.

In return for their increased role in decision-making processes, local communities are now better positioned to receive greater institutional support through various services provided by the regional government. This includes access to financial resources, administrative assistance, and regulatory support, creating a more sustainable framework for the collaborative efforts aimed at preserving and rehabilitating the vital mangrove ecosystems in Pangpang Bay. Overall, the formal legal recognition of the mangrove forests as essential ecosystems within the EEA framework signifies a comprehensive and strategic approach that integrates environmental conservation, community empowerment, and sustainable development.

9) The most important governance factors (may include factors other than those in focus in this project)

For GF 1 (perceived importance of biosphere conditions), we observed its substantial role throughout every phase of co-creation in this project. This factor plays a pivotal role in motivating stakeholders to safeguard the mangroves through the EEA Program. The conservation failure in the 1990s, attributed to the entry of private/commercial entities into land use that resulting in a prolonged tidal flood disaster, served as a crucial lesson. The community's aversion to repeating this catastrophe fueled the impetus in favor of natural conservation, which has enabled the continuous expansion of the mangrove forest areas in Pangpang Bay.

GF 2 (Legislation, Program, and Formal Goals) and the introduction of the EEA legal designation has become a cornerstone in fortifying collaboration. Following the legalization of the Governor's Decree on the Establishment of Essential Ecosystem Areas in Pangpang Bay in 2020, actors have engaged in a more formalized channel. This legal milestone marks a turning point and a critical development for EEA, as it enhances productivity through improved access to financing, transactions, and collaboration with various stakeholders.

GF 16 concerning facilitative leadership, emerged as a significant factor in the project's development. The facilitative leadership of the Forestry and Fishery Agencies of Banyuwangi has played a critical role, especially since the project involves multiple actors across bureaucratic hierarchies, communities, and geographical boundaries. The importance of leaders crosscuts multiple stakeholder groups, which is evident within the context of the local environmental authorities, the village leadership, and on the community organization level. One of the critical success factors that improved the success of the MCR program in the second phase onwards (2010-present) has been due to improvements to leadership structures, exemplified by the introduction of a less ambiguous division of labor between the authorities and the formalization of the collaborative network institutional framework.

10) The generated outputs and outcomes

The generated outputs and outcomes of the Pangpang Bay MCR program has been consistent with its initial project goals, that is, it has aimed to reverse mangrove reforestation trends through a joint MCR program among the plurality of local stakeholders in Pangpang Bay. The generated outputs have been twofold. First, it has involved the build-up of joint problem-solving capacities to mobilize coordinated responses to mangrove deforestation, which has resulted in a successful MCR program that has counteracted the mangrove deforestation. Such joint problem-solving capacities entail, among other things, the establishment of knowledge sharing processes of best-practice conservation and restoration strategies, shared monitoring systems to keep track of progress, and common goal setting that ensures a common collaborative vision. Second, the co-creation of sustainable mangrove products and the commercialization thereof, which has raised the livelihood of the local villagers.

We focus on the former output in this case report due to the primary focus on the green outcomes it yields. We can summarize three generated green outputs and outcome as a result of the co-creation process underpinning the Pangpang Bay MCR program.

First, regarding concrete generated outputs, previous research found that the mangrove land cover in Pangpang Bay area during 2014 to 2018 has expanded significantly. Captured by Landsat, the mangrove in area in 2014 was 288.64 ha. By 2018, the mangrove area had doubled to 571.68 ha. These significant numbers demonstrate that initiatives connected to MCR program were initiated and achieved success prior to the official commencement of the EEA program in 2020. Following the introduction of the EEA, these developmental trends have further improved, as the most recent reports from 2023 show that the mangrove area has reached 1,663.72 ha (Safitri et. al, 2023), implying a fivefold increase since 2014.
Second, the collaborative network and its institutional formalization in the form of a set of collaborative mechanisms, routines, and practices in the form of multistakeholder communication channels, accountability mechanisms, and joint problem-solving abilities is also a concrete output in itself. It provides the stakeholders in Pangpang Bay an institutional venue or platform to continuously (re)adapt and co-create MCR initiatives and solutions.

Third, a concrete generated outcome is the spillover effects of a sustainably managed mangrove forest, which has benefitted the local economy through the provision of ecosystem services such as prawns, shellfish, crabs, birds, and small fish. The village communities have tapped into these ecosystem services by processing them into high-value consumer products on the market (mangrove chips, tea, syrup, and coffee). In parallel, the mangrove areas have also been transformed into prospective ecotourism attractions, although it is an initiative that is still in its developmental phase that has yet to result in significant community-level benefits. Mangroves have also been prepared for the marketing of carbon stocks since November 2022, which have similarly not reached a mature stage yet that allows local communities to reap large-scale benefits.

11) Lessons learned about the conditions for co-creating green solutions

The Pangpang Bay MCR program teaches several lessons about the co-creation of sustainable green transitions. We highlight three aspects that are noteworthy: storylines, coordination mechanisms, and success criteria for successful mangrove conservation.

a) **Storyline:** Over the past decade, Banyuwangi has experienced economic growth and increased competitiveness, partially attributed to the conservation efforts preserving the region's natural habitat, economic development, and tourism potential. The promotion of public awareness by the local village communities in collaboration with local vocational school and university about mangrove management is seen as a pivotal factor with the potential to create a cascading impact on people's lives. This awareness becomes a critical asset in promoting sustainability policies through the Pangpang Bay EEA. Consequently, three key aspects play a defining role in shaping the EEA's existence: 1) public awareness; 2) NGO/community support; and 3) government support (local leadership). These collaborative components are already in place, and their potential needs to be fully harnessed through a robust collaborative framework.

b) **Coordination mechanisms:** the success of the MCR program has been premised on introducing coordination mechanisms, which provides a co-created actionable template for mobilizing and coordinating key stakeholders such as the local village communities and the local authorities (Forestry and Fishery Agency of Banyuwangi) towards the designated ends of the collaborative network. During its earlier phases until the late 2000s, these coordination and implementation mechanisms were absent, thereby leading to fragmented efforts that did not significantly restore

the deforestation trend. Since then, several mechanisms have become formalized as part of the collaborative governance framework. A key aspect of planning is to create coordination mechanisms based on which all participating stakeholders can collaborate efficiently towards shared goals. To this end, the formulation of five-year action plans and annual activity plans by local, regional, and central governments in relation to MCR program has been an important coordination mechanism. Another example are cross-cutting performance indicators, serving as shared, actionable standards and benchmarks. In comparison to other mangrove areas in Indonesia, Pangpang Bay stands out as a best practice for mangrove conservation, showcasing considerable progress. However, despite the developmental strides made under the EEA framework, there are lingering concerns among informants about budgetary limitations and the absence of clear Key Performance Indicators (KPIs) that could provide a distinct vision for the continued advancement of mangrove conservation efforts in Pangpang Bay. This suggests the need for ongoing attention and refinement to ensure sustained success in their conservation endeavors.

c) **Success criteria for successful mangrove conservation:** four necessary conditions had to obtain for the cultivation/restoration of mangrove forests to succeed: (1) motivation, (2) resources, (3) competences, and (4) coordination. The failure in the 2000s to reverse the mangrove deforestation trends was putatively due to the absence of any of these four necessary conditions (see also Primavera and Esteban, 2008).
    1. The first necessary condition is the community-driven efforts to mobilize villagers as part of the planting campaigns, insofar as it is a relatively labor-intensive process to manage and plant the individual saplings.
    2. The second necessary condition has been accessing financial support from private sector actors (through CSR) or government-sponsored programs, as mangrove planting campaigns require initial investments to procure and grow the saplings.
    3. The third precondition has been the build-up of technical competences and skills training through government-sponsored projects or NGO training programs in order to maximize the survival chances of mangrove planting campaigns.
    4. The fourth necessary condition has been a clarification of roles and a division of authority between local environmental authorities. By clarifying their role within the collaborative governance framework, it has been possible to mitigate inter-bureaucratic conflicts and rivalries that had hitherto undermined collaborative efforts in combating mangrove deforestation. With a clear division of labor, different branches of the local and regional authorities have been able to assist rather than controvert the agenda-setting, planning, and implementation of the MCR program.

12) Points of interest in subsequent studies

These findings could lead to additional investigations in a variety of development areas. Firstly, the carbon trade idea was initially so popular that the government intended to develop and implement it in the future. In the Presidential Regulation Number 98 of 2021, Indonesia submitted a GHG emission reduction target to the UNFCCC with its own capacity of 29% and with international support of 41%. Then, on September 23, 2022, Indonesia announced an increase in its ambition to reduce greenhouse gas emissions through an Enhanced NDC document with its own capacity of 31.89% and with international support of 43.20%. As

part of this broader environmental plan, the potential of carbon trading has the potential to strengthen the incentives to advance mangrove restoration in EEA Banyuwangi due to its carbon sequestration mechanisms (Locatelli et al., 2014). However, it is unclear whether subjecting the MCR efforts to market-based mechanisms will be advantageous or not. Another cognate area of study is to understand whether eco-tourism will benefit mangrove conservation efforts. Eco-tourism can boost the economy of local communities by diversifying the sources of value-generation of mangroves beyond the exploitation of ecosystem services such as fish, shrimps, crabs, and shrubs. It furthermore also creates a synergistic relationship to these marketable consumer products created by the mangrove ecosystem services. Future research should investigate whether the diversification into eco-tourism will benefit the collaborative dynamics or if they undermine the collaborative mechanisms by allowing commercial interests dominate the mangrove conservation efforts.

A notable feature of the collaborative MCR program has been the uneven development between the participating village communities. Some village communities have benefitted more from their participation in the collaborative network, as they have managed to expand their mangrove areas at a greater rate and also tapped into the ecosystem services more successfully to generate profitable streams of income for the local community. Future research should establish the reasons for the uneven distribution of benefits from participating in collaborative networks and to identify the preconditions for all actors to benefit equally (Le, 2021).

Scoring and analysis of governance factors

1. Perceived importance of biosphere conditions

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

All stakeholders in the Pangpang Bay MCR program unanimously agree that environmental issues are of paramount importance and serve as a significant motivational factor for participating in the collaborative network. The driving environmental issues behind this initiative include (a) the damage to mangrove land, causing prolonged flooding for local communities, and (b) unsustainable mangrove plants leading to low mangrove productivity, on which local farmers and fishers depend for their livelihoods. Consequently, the environmental fallouts of mangrove deforestation significantly impact the livelihoods of village communities contiguous with the mangrove forest areas.

From the perspective of the East Java Governor (regional authorities), the designation of Pangpang Bay as an EEA has been largely shaped by environmental and ecological concerns. East Java Governor Decree Number 188/123/KPTS/013/2021 asserts that the mangrove forests "have important value for ecological protection and provide environmental service benefits for the welfare of the surrounding community."

This designation has increased responsibility for higher-order authorities, such as regional environmental authorities, which were previously less involved in the MCR program. There is a tendential convergence of motivations around environmental concerns among all stakeholders.

In summary, all informants acknowledge the importance of environmental factors as a motivating force for collaboration around the MCR program. While several actors express a broader aim to conserve mangrove forests to exploit ecosystem services (timber, fish, ecotourism) for sustainable living, they assert that achieving this goal is contingent on meeting overarching sustainability and environmental objectives.

Specifically, the primary motivations for participating in collaborative MCR program are narrowed down to environmental and economic factors. Environmentalists emphasize that mangrove conservation is necessary to improve the quality of life by preventing floods and maintaining the preservation of the natural environment. On the economic front, stakeholders such as the local village communities hold that mangrove conservation can enhance fisheries production and leverage other socio-economic functions for their village. Recognizing that the economic potential of mangroves hinges on securing environmental sustainability, stakeholders thus underscore the reciprocal interdependence of economic and environmental objectives.

2. Legislation, programs, and formal goals

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The overall success with collaborative governance in Pangpang Bay can to a great degree be attributed to various enabling legislative reforms and proposals, which have encouraged collaborative problem-solving and joint decision-making processes as an integral part of the MCR program. While the introduction of the EEA in 2020 is a significant milestone in this regard, several legal precedents precede its introduction that are noteworthy.

The legal precedent to the introduction of the EEA can be traced back to 2010 as part of the broader presidential campaign to promote equitable development as part of the broader commitment to the Millenium Development Goals, which placed great policy emphasis on eradicating poverty, promoting equality, gender empowerment, and developing (global) partnerships for development. The Indonesian Instruction no. 3 of 2011 ratified this commitment to equitable development as a national policy agenda, which specifically highlighted the importance of leveraging collaborative solutions to address problems such as poverty, hunger, inequality, and economic underdevelopment. In the backdrop of this national policy agenda, the Representative of the Banyuwangi Government ratified the Banyuwangi Regent Decree No. 188/1338/Kep/429.011/201 in 2011, which initiated the so-called Forum of the Pangpang Bay

Mangrove Area. The forum was intended as a collaborative platform, which would function as an institutional precursor to the collaborative governance framework formalized as part of the EEA. More concretely, the forum would be centered around joint capacity-building, exemplified by initiatives such as the preparation of new local regulations on mangrove conservation, construction of public seed gardens, regional mangrove restoration plans, and public investments into wastewater treatment plans.

Major progress was achieved under the regulatory framework created out of the national policy agenda on equitable development, although it did not provide a robust institutional setting to systematically advance the agenda on multi-actor collaboration. The introduction of EEAs can be viewed as a path-dependent continuation of these prior policy agendas, as it mandates the MCR program to be systematically organized through multistakeholder collaborations. On a concrete level, the EEA has compelled local environmental authorities to allocate budgetary resources to not only the MCR program but also the collaborative governance thereof. For example, the local offices of the Forestry Agency of Banyuwangi serve a dual function as a shared meeting space for the collaborating stakeholders.

In conclusion, since the introduction of the EEA and cognate policies and legal frameworks, the coordination and collaboration between the different stakeholders within the collaborative network of the MCR program has radically improved. This contrasts with the period before its implementation, during which collaborative processes between villages and local authorities were fragmented.

3. Relative openness of public governance paradigms

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The relative openness of Indonesia's public governance paradigm plays an important role in enhancing opportunities for non-state actors to provide inputs and influence in solving local problems in Pangpang Bay. Under President Suharto's authoritarian rule, political solutions were dictated by the central government and implemented by local authorities. However, following a prolonged period of nationwide unrest, Suharto resigned from his post in 1998 after 30 years of military dictatorship. This marked a watershed in the Indonesian political system, as governance authority was decentralized and delegated to lower-tier administrative units. Following the passing of Law 22 in 1999, the hierarchical structure of Indonesia’s administrative system, as illustrated in Figure 3, has consisted of five administrative tiers. The central government operates at the highest level followed by the provinces (propinsi), district municipalities (walkota/kabupater), sub-districts (kecamatar), and finally villages (kelurahar/desa).

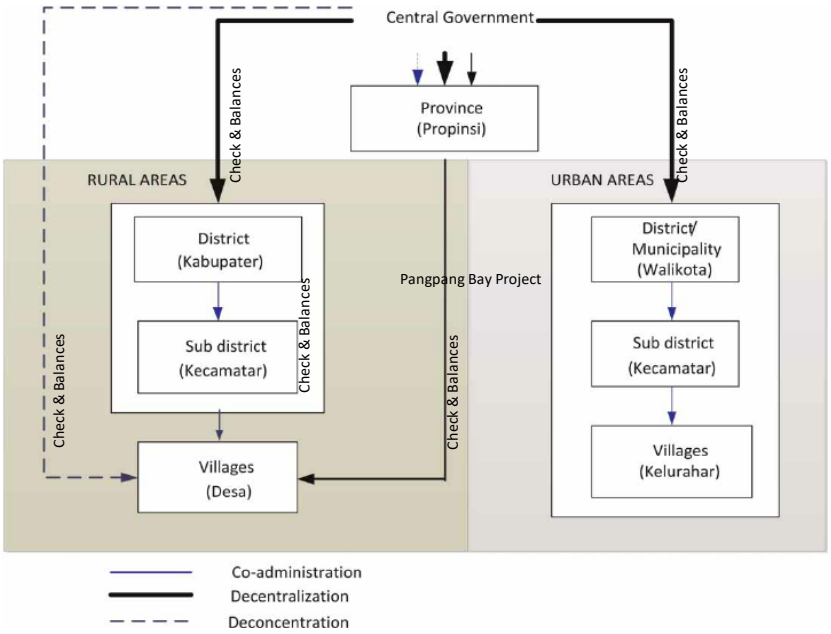

Figure 4. Government levels in Indonesia.
Sources: I. Simanjuntak et al. / Water Policy 14 (2012) 561–580

The success of the MCR program in Pangpang Bay can understood in light of the transfer of powers and regulatory responsibilities from the central to the regional (provincial and district-level) authorities in policy sectors such as forestry, fishery, and land policy. This scalar reshuffling of political authority created a power vacuum, creating a window of opportunity for non-state actors (such as village communities, NGOs, and private businesses) to assume a proactive role (in collaboration with the regional and local authorities) in identifying and solving perceived local challenges. In the case of the Pangpang Bay MCR program, collaborative ties emerged between the local environmental authorities (the Forestry and Fishery Agency of Banyuwangi) and the village communities and authorities since the 1999 and has gradually involved multiple other non-state actors. The distinctiveness of these collaborative ties lies in their gradual formalization and institutionalization into a comprehensive, cross-level and cross-regional framework. This collaboration has over the years centered around two recurring objectives: (a) capacity building within village communities tasked with managing the mangrove forests, and (b) the co-creation and commercialization of sustainably sourced products to improve the livelihoods of local villagers.

Throughout the 2000s, the local authorities were relatively passive collaborators as they primarily functioned as administrative gatekeepers from which the local village communities had to seek approval for their MCR program. In the 2010s, local authorities started to assume a more proactive role in MCR program and would solicit inputs from local village communities in the planning, execution, monitoring, and evaluation of the MCR program, resulting in a shift towards a collaborative process based on the empowerment of village communities supported by the authorities.

Following the introduction of the EEA, several institutional mechanisms have been embedded in the collaborative governance framework to solicit systematic inputs from the village communities, which, in turn, have benefitted the collaborative processes underpinning the MCR program profoundly.

On the policy level, there are several policies that encourage the stakeholder's participation, for example in The East Java Governor Decree Number 188/123/KPTS/013/2021 under the clause 3(a). The clause specifies that specifically encourage stakeholder participation, outlining activities related to mangrove protection, biodiversity development, and recovery. The decree emphasizes coordination and communication between authorized agencies and stakeholders, indicating a collaborative and inclusive approach. The EEA regulatory framework has also been effective in breaking down organizational silos within local government agencies. In the context of mangrove conservation, the clear stakeholder mapping ensures that various actors, including non-state entities such as local communities, interest groups, and organizations, are recognized and involved in the co-creation of the MCR program. This mapping serves as a guide to avoid a truncated policy perspective in favor of an integrated and inclusive approach to MCR efforts. Accompanying the regulatory framework mandating collaboration, multistakeholder participation, and non-state actor inputs in the management of EEA, a complementary set of institutions have also been introduced that offer funding and capacity-building opportunities supporting the development and formalization of collaborative networks. Consequently, the EEA legal-institutional framework both mitigates barriers but also offer institutional enablers that collectively support the collaborative, multistakeholder potential around EEAs in general, and the Pangpang Bay MCR program in particular.

4. Formalized institutional channels for citizen participation and community mobilization

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

In the backdrop of the scalar reshuffling of political authorities, several formalized institutional channels for either citizen participation and/or community mobilization have enabled collaborative processes of the MCR program in Pangpang Bay.

First, a formalized channel for community mobilization on the regional level is the annual multi-stakeholder evaluation program at the district/village level, commonly referred to as the Development Plan Deliberation (Musrenbang), is conducted on behalf of all regional and local authorities to report and take stock of the progress in the EEA as well as the obstacles and challenges that have emerged over the course of the year. It represents a dialogue forum aimed at formulating a regional development plan in which all stakeholders in the EEA area of Pangpang Bay are invited, including village and regional officials, village communities, business actors, interest groups, and NGOs.

Second, community organizations aggregating local stakeholder interests (fishermen and farmers) in the villages function as formalized institutional channels for community mobilization as they have the organizational power to rally local actors to support and execute the MCR program. These community organizations furthermore are in close dialogue with the village authorities, with whom they coordinate

to plan and organize a range of village-level programs (not necessarily limited to MCR). These community organizations are important for the success of the MCR program insofar as they carry out a wealth of volunteering activities such as monitoring the biodiversity and health of the mangrove ecosystems, cleaning the mangrove areas, planting mangrove saplings, and supporting the cultivation of biotics (living organisms) in the mangrove ecosystems. A concrete illustration of the significant of community organization is how the Forest farmer Group (KTH) Makmur has mobilized the village community of Wringinputih to process and commercialize mangrove crops. The commercial success of the community organization based on the sustainable extraction of mangrove ecosystem services has subsequently been awarded legal recognition for its mobilization of local interest groups to promote MCR initiatives.

5. Mechanism for ensuring top-down government and bottom-up social accountability

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☒ Medium confidence	☒ Documents
☐ 0.66	☐ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Several accountability mechanisms are integral to the collaborative network, particularly following the introduction of the EEA designation in 2020. The Forestry Agency of Banyuwangi plays a pivotal role in fulfilling these accountability measures due to its leadership status within the collaborative network. These mechanisms target both higher-level authorities and village communities, contributing significantly to the collaborative processes supporting the MCR program.

From the perspective of top-down accountability, the Forestry Agency of Banyuwangi is held accountable to higher-level regional authorities under the EEA regulatory framework, which mandates the formulation of five-year action plans (FYAPs) for Pangpang Bay management. The 2020-2025 plan highlights seven action points, with several related to the collaborative aspects of the MCR program: advancing area development, strengthening collaborative institutions, improving environmental knowledge and awareness, empowering communities, enhancing EEA environmental protection, promoting scientific and academic activities for regional development, and developing regional infrastructure and capacity. For instance, the action points related to strengthening collaborative institutions and empowering communities both aim to bolster the collective problem-solving capabilities of the collaborative network and augment the effectiveness of community led MCR program. Given that these action points in the FYAPs carry legal obligations, the Forestry Agency of Banyuwangi has assumed the role as facilitative leaders within the collaborative network. This commitment underscores the agency's responsibility to actively contribute to the enhancement of collaborative structures, the empowerment of local communities within the MCR program, and reporting on the progress of the FYAPs.

Local environmental authorities, serving as facilitative leaders, are also held accountable to the village communities. They regularly update these communities on the overall progress in of MCR program across the villages. The integrated case analysis reveals the involvement of local environmental authorities, with

support from other environmental bodies and NGOs, in activities such as identifying, measuring, restoring, and monitoring/evaluating mangrove areas. They also contribute to developing management strategies, encompassing field operationalization, problem-solving, discussion forums, technical support, technology transfer, risk mitigation, and planning. Finally, they facilitate multi-actor partner collaboration within a system of multi-level governance, involving regulatory actors, collaborative agreements, binding commitments, and cross-stakeholder communication. Consequently, there is a parallel bottom-up accountability process as the Forestry Agency of Banyuwangi, in their capacity as facilitative leaders, has been in regular dialogue with all the stakeholders in the collaborative network, accommodating requests and occasional grievances regarding the MCR program. For example, the lack of capacity-building has historically been a major barrier to the success of the MCR program, which is a concern that has been voiced by the local village communities. In response, the Forestry Agency of Banyuwangi has brokered relations with universities and higher-level environmental authorities, which in turn has support capacity-building efforts through the provision of experts that have trained local community organizations in adopting the best practices of MCR.

6. Strategic agenda-setting by means of translation

QCA score:	Scoring confidence:	Data sources:
☒ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Several informants representing the local and regional authorities have declared that they possess a basic familiarity with the sustainable development goals (SDGs), although they concede that it has not fundamentally shaped the collaborative processes of the MCR program in any discernible way. While the higher-order authorities seem to be more familiar with the SDGs, they explain that they are outside the scope of the MCR program because the village communities are not familiarized with them. This conclusion is reaffirmed by several local community organization managers, who appear to either not know about the SDGs altogether or have only a rudimentary knowledge about their policy content. By extension, the villagers had even less familiarity with the SDGs, thus leading to the conclusion that they have been absent as mechanisms for agenda-setting (by means of translation).Insofar as the SDGs are incorporated into the national plans of Indonesia, reflected in its National Medium-Term Development Plan (RPJMN) and are thus at the very least indirectly influencing policy programs, the SDGs do have a latent presence in the project. However, this latent presence also suggests that it is not significant within the context of the project.

7. Construction of narratives about successful multi-actor collaboration

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Narratives of successful multi-actor collaboration has positively shaped the collaborative processes of the MCR program in two notable ways: (1) negative stories and experiences that yield lessons on the importance of collaboration, (2) communitarian values and community spirit that enables community mobilization.

First, interviews with several informants in the village communities who participated in the MCR program since the late-1990s retold several stories that have enabled a collaborative outlook. For example, Pak Hendro from Wringinputih argued that most village communities have reached the conclusion that collaboration is paramount for the success of MCR program, as past efforts in the 1990s failed because of their "single-shot orientation". These so-called single-shot MCR initiatives were characterized by isolated and intensive efforts in planting new mangroves, which were unsustainable because of the absence of coordinated follow-up activities to monitor and sustain these conservation activities. All the efforts invested by the village communities into reversing the mangrove deforestation trends were thus ultimately failures. These negative experiences and narratives about past failures has strengthened the motivation to find collaborative solutions, as they realized the need to build joint problem-solving capacities, e.g. collectively developing skills and knowledge for managing the stewardship of the mangrove forests more efficiently.

Informants from the local environmental authorities (Fishery and Forestry Agencies of Banyuwangi) narrate similar stories about the sub-optimal results from their conservation and restoration program, leading to the exact same conclusion as the informants from the village communities. Because of the similarities between their narratives, it might suggest that these narratives have already been internalized within the project as organizational stories, that is, narratives or anecdotes that are shared and circulated within an organization that play a crucial role in shaping the organizational culture.

Second, communitarian values have been noticeable drivers that has strengthened the participation and support from the village communities. These communitarian values are partly embedded in Indonesian culture, as they are rooted in the concept of 'Gotong Royong' (mutual collaboration). Gotong Royong captures the metaphor of collectively and collaboratively addressing community-level problems "shoulder to shoulder", that is, through community mobilization and joint problem-solving. These values crosscut the various stakeholders, as it is common for Indonesians to embrace it as a cultural ideal. According to the focus group interviews with village residents, the local community have been regularly mobilized in various parts of the MCR program, especially in relation to labor-intensive work such as planting the saplings, cleaning the mangrove forest areas, or harvesting agricultural goods from the mangroves. These experiences with mass mobilization in the village to execute the MCR program and the accompanying

success has thus turned into recurring narratives, which are recalled whenever further assistance is required from the local village communities

8. Building or harnessing institutional platforms and arenas

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☐ Interviews
☐ 0.33	☒ Medium confidence	☐ Documents
☒ 0.66	☐ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The collaborative meetings within the MCR program predominantly occur as face-to-face gatherings, fostering in-person interactions crucial for effective communication and coordination. These physical meetings take place at the Banyuwangi Forestry Agency's office, which is fitted with all the prerequisite amenities necessary for holding a meeting, including spacious meeting rooms equipped with projector screens. Monthly sessions serve as forums for local environmental authorities and the four Pangpang Bay village communities to address daily operational and management aspects of the MCR program. To supplement the scheduled face-to-face interactions, daily communication channels are maintained through digital messaging platforms like WhatsApp. These platforms play a crucial role in disseminating real-time information and updates about the MCR program to stakeholders. In addition to the monthly meetings, the collaborative network also schedules annual meetings that bring together all stakeholders within the EEA, creating a space for deliberation on long-term plans and visions. These gatherings facilitate comprehensive discussions, allowing stakeholders to share diverse viewpoints and experiences.

However, the physical meeting spaces have inherent limitations. While they provide a valuable platform for stakeholder to assemble, they lack additional institutional support to actively facilitate collaboration beyond serving as a gathering point. Another notable drawback is the geographical distance, as the Forestry Agency's offices are located at a considerable distance from both the villages and regional authorities. This geographical constraint impacts accessibility and contributes to the relatively low frequency (annually) of comprehensive meetings where all stakeholders convene. The governance factor thereby qualifies as significant insofar as a coherent system is in place for convening the collaborative processes of the MCR program, although several barriers hinder them from fully enabling collaborative processes.

9. Provision of access to blended financing

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

In the initial phase spanning from 1999 to 2009, the collaborative network primarily relied on a self-financing method to establish mangrove conservation efforts. Over time, there was a gradual shift as support started to come in from national and subnational government budgets through various government programs. However, these funding sources were limited and failed to sustain the necessary organizational capacity to reverse the mangrove deforestation trend.

The transition to the second phase, starting from 2010 to the present, marked a significant change. During this period, the collaborative network successfully diversified its funding sources. These ranged from national and subnational government budgets to contributions from local and international profit and non-profit organizations. This diversification played a crucial role in the success of the Pangpang Bay MCR program, enabling them to rapidly scale their operations.

These varied funding sources brought with them demands for accountability in the form of reporting mechanisms and additional funding requirements. For example, the 2015 reforestation program began with the planting of 10,000 seedlings and expanded to 50,000 by 2017. This initiative was funded by AUTO 200, a private manufacturing company, as part of their corporate social responsibility (CSR) strategy. Additionally, local government budgets, including those from CDK and the Banyuwangi Regency Government, have consistently supported the daily operations of the collaborative network and the maintenance of essential infrastructure. These accountability measures directly or indirectly supported the collaborative processes of the MCR program. Three instances highlight how specific funding requirements facilitated collaborative processes:

a) Conditional Public Funding: In recent years, new public funding sources have been contingent on the MCR program adopting a multistakeholder collaboration approach. The financing scheme was notably an outgrowth of the EEA framework, for which reason the MCR program needed to specify the collaborative nature and goals of the recipient project. The conditional funding was thus also implicitly a co-financing scheme as other stakeholders had to be demonstrably incorporated in the MCR program, instilling a sense of shared ownership among the multiple stakeholders.
b) Financial Assistance from RRCEA: As an EEA, Pangpang Bay received financial assistance from the Ramsar Regional Centre East Asia (RRCEA). Established by the Ministry of Environment in South Korea, RRCEA provided funding with requirements tied to capacity-building in wetland management, conservation, and restoration. This included training workshops and seminars aimed at advancing capacity-building in local communities and NGOs.
c) Private Funding as In-Kind Resources: Private funding sources also played a role, with some qualifying as in-kind resources. In 2022, BCA Bank sponsored thousands of mangrove saplings and tree shoots through their Corporate Social Responsibility (CSR) program. These resources were utilized in a community-based joint planting campaign that brought together various stakeholders at the local and regional levels. The funding not only supported the initiative but also created a collaborative setting, mobilizing all stakeholders in the network and building a robust joint capacity for future initiatives and campaigns.

These instances demonstrate how funding requirements have not only contributed to the financial support of the MCR program but have also shaped and enhanced collaborative processes within the network.

10. The capacity to leverage support from authorities to enable local collaboration

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☒ 0.33	☒ Medium confidence	☐ Documents
☐ 0.66	☐ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Over the years, collaboration among local authorities, such as the Forestry and Fishery Agency of Banyuwangi, village authorities, and village communities, has seen improvement. However, the capacity to garner support from higher-level authorities, specifically the regional government, has been inconsistent. Historically, these higher-level authorities have been somewhat passive and detached from the collaborative processes of the MCR program.

The designation of Pangpang Bay as an EEA in 2020 has elevated its political status and priority. Consequently, this has strengthened the bargaining position of local stakeholders, enabling them to seek support from higher-level authorities. Despite this positive development, the participation of these higher-level authorities in collaborative processes remains limited. They mainly attend annual meetings but are excluded from day-to-day activities managed by the Forestry and Fishery Agency of Banyuwangi. This limited participation reflects a scalar division of labor between different bureaucratic agencies and government levels.

Leveraging support varies among villages, with not all able to cultivate long-term positive relations with higher-level authorities to receive concrete support. Wringinputih stands out as an exception, having achieved some success in securing support from regional governments. For instance, Pak Hendro, the leader of the community organization in Wringinputih, successfully requested support for mangrove planting from the regional government, resulting in training on planting techniques. In contrast, other villages remain marginalized and lack the capacity to make similar requests.

Pak Andik, representing the village community organization of Kedunggebang, points out their organizational weakness, citing an inability to request the same level of support as other villages from authorities. The success of Wringinputih is attributed to the networking abilities of the village, with active efforts by village authorities to broker positive relations and lobby influence across bureaucratic channels. In contrast, other villages have been less proactive in establishing such inter-scalar bureaucratic relationships, minimizing their influence. The overarching conclusion is that Wringinputih's success in leveraging support from higher-level authorities is an exception rather than the norm.

11. Inclusion and empowerment of relevant and affected actors

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

In the first subphase (1999-2009), the level of inclusion was notably low. Local fishermen and farmers, who directly relied on mangroves for their livelihoods, mobilized collectively to address the issue and reverse mangrove deforestation. During that period, MCR program had limited resources, and broader involvement of village communities and authorities was extremely limited. The capacity of local forest farmers and fishermen to combat mangrove deforestation was fragmented and limited, lacking the technical skills or knowhow needed for efficient MCR program implementation. The impacts of mangrove deforestation became more pronounced over time, resulting in increased occurrences of environmental disasters such as floods, soil erosion, and biodiversity loss. This escalation raised public awareness of the critical importance of protecting and conserving mangrove forests.

Since the first subphase, the collaborative network has significantly expanded in successive rounds, now involving a multitude of relevant stakeholders in the MCR program (see subsection 3 in the integrated case analysis). The network notably began expanding in the second phase onwards (2010-present), introducing several NGOs, universities, and regional authorities to the collaborative processes. The culmination of the Pangpang Bay MCR program occurred in 2020 following its designation as an EEA. This formalized the collaborative governance framework supporting the MCR program and strengthened the legitimacy of the collaborative network. Since then, several more NGOs have joined the collaborative processes, playing a crucial role in building the MCR capacities of the village communities. For instance, NGOs have been instrumental in providing technical know-how (through training and education) and resources (financial and manpower) for conducting the mangrove reforestation program. In conclusion, the designation of Pangpang Bay with EEA status in 2020 has facilitated the mobilization and coordination of a broader range of stakeholders, resulting in a more focused and cohesive approach to encouraging mangrove replanting.

When inquiring about the inclusivity of the projects, several informants from the village communities noted how the dialogue and collaboration with local environmental authorities have markedly improved. This improved dialogue has instilled a sense of empowerment in the village communities, further catalyzing the community mobilization of a wider part of the local population in the MCR program. For example, women and seniors have started participating in product development processes of traditional mangrove foods and beverages, whereas they were previously uninvolved in the MCR program.

A concrete example of inclusivity is the introduction of educational programs and campaigns targeting elementary and high school students in the village communities. These programs aim to raise awareness about the importance of mangrove forests and their environmental benefits. Consequently, the increased awareness of the vital ecological function of mangroves has improved the community engagement of children in the MCR program. An adjacent example is the involvement of the local vocational school (SMK)

that trains culinary chefs, which has participated in designing marketable products based on mangrove leaves, fruits, and other byproducts. In exchange for their applied knowledge, these students receive training on the ecological and commercial value of mangrove forests.

12. Clarification of interdependence vis-à-vis common problem and joint vision

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The main actors of the community organizations have collectively acknowledged the significance of each participant's role in advancing the MCR program in Pangpang Bay to their full potential. This recognition of interdependence is closely linked to the previous discussion on successful multi-actor collaboration. Past unsuccessful attempts with MCR have heightened awareness about the crucial role of collaboration and the shared capacity for problem-solving. The designation of Pangpang Bay as an EEA in 2010 has further solidified these perceptions of interdependence, as it legally mandates the coordination of MCR program within a collaborative framework.

Local environmental authorities readily concede that the success of MCR program hinges on the community-led initiatives of the village communities, such as undertaking the stewardship of the mangrove forests related to water quality management, planting mangroves (site selection, species selection, sapling preparation), and infrastructure maintenance. Simultaneously, village communities recognize the importance of local environmental authorities, acknowledging their organizational capacity to coordinate and lead the collaborative network of MCR program in each respective village.

Some actors not yet involved in the collaborative network, such as tourism groups, have been pre-emptively identified. Despite differences among the four villages in terms of mangrove forest characteristics, they all acknowledge their interdependence due to the interconnectedness of mangrove ecosystems. For instance, the intricate root systems of mangroves provide vital habitat and nursery grounds for numerous marine species, fostering biodiversity. The exchange of nutrients and organic matter through tidal flows creates a symbiotic relationship, supporting the overall health of all ecosystems involved. This interconnectedness emphasizes the significance of a holistic approach to conservation and management, recognizing that the health and resilience of one area profoundly impacts the sustainability and functionality of the others. Preserving the integrity of all adjacent mangrove ecosystems is therefore essential for maintaining the delicate balance of coastal biodiversity and ecosystem services.

These perceptions of interdependence have fostered collaboration, with all stakeholders internalizing the importance of a shared vision and capacity for problem-solving. When discussing the content of this joint vision, various stakeholders emphasized its focus on converging aims around environmental conservation

through the broad mobilization of local communities, including women and the youth. (who were hitherto excluded from the community led MCR program).

13. Trust-building and conflict mediation

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☒ 0.33	☒ Medium confidence	☐ Documents
☐ 0.66	☐ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The overarching conclusion drawn from observations and interviews is that the level of trust within the collaborative network is uneven and patchy. While the core group of key stakeholders, referring to the village communities and local environmental authorities, demonstrates a fundamental level of trust forged over two decades of collaborative interactions, the trust towards other stakeholders, such as private businesses, NGOs, and higher-level authorities, varies significantly. The variation in trust levels can be attributed to the contingent development of trust over time through enduring bilateral interactions, rather than any systematized efforts across the collaborative network to deliberately enhance trust. Trust among village communities is similarly rooted in sustained interactions and shared experiences during the implementation of MCR program, creating an alignment of organizational views that contributes to trust-building. This trust is not institutionally anchored but rather negotiated bilaterally between different sets of stakeholders. Some level of mistrust (or latent tension) thereby continuously lingers between stakeholders, such as dissatisfaction with village authorities' competence and engagement, skepticism towards higher-level regional authorities, and lingering suspicion among the village communities towards private businesses, although the latter has improved through CSR programs (see GF 9 on blended financing).

Over the years, latent conflicts between interest groups and jurisdictional tensions between forestry- and fishery-sector community organizations and between the Forestry and Fishery Agencies of Banyuwangi, have persisted. Different bureaucratic agencies and interest groups with divergent priorities, interests, and resource needs associated with forestry and fisheries have contributed to a fragmentation in the collaborative processes surrounding MCR program. However, recent efforts to clarify the division of labor under the EEA regulatory framework have mitigated these conflicts, emphasizing collaboration over competition. Conflict-resolution mechanisms, including forums facilitated by the Forestry Agency of Banyuwangi, have been introduced but are rarely used, as tensions tend to be latent rather than openly expressed. While conflict mediation mechanisms exist, they currently lack significant influence and do not have far-reaching power to actively intervene and defuse latent tensions.

14. Use of experimental tools for innovation

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The collaborative network employs a form of prototyping that involves the village communities engaging in an iterative process of testing and evaluating various MCR strategies to determine the most effective approach. It can alternatively be described as an 'adaptive management' strategy (Ellison et al., 2020) as it involves a continuous cycle of planning, evaluation, and evaluation of MCR strategies with the aim of tailoring the strategies to local conditions (see GF 15 for a parallel explanation from the perspective of evaluation mechanisms). More concretely, adaptive management involves five broad steps (Ellison et al. 2020):

a) Identification of local contextual factors and variables pertinent for MCR
b) Design locally tailored MCR strategy
c) Implementation and testing of the MCR strategy
d) Evaluation and feedback (see GF 15 below for an elaboration of types of evaluation data)
e) Iterative refinement

The use of this form of 'adaptive management' of MCR program has enabled collaboration because it encourages knowledge sharing between the villages, as each village becomes sites of experimentation. However, the level of commitment to these rigorous evaluation practices are also uneven, so the degree to which it can enable cross-village collaboration is currently still limited. Some villages either have an inadequate organizational capacity to follow the best-practice MCR program documented in other villages or are characterized by other context-related properties of their local mangrove systems that hinder an optimal knowledge sharing and collaborative strategy for MCR.

15. Ongoing critical self-reflection and learning (i.e., process and/or developmental evaluation):

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

When engaging in mangrove planting, a minimum of one year is necessary to evaluate the success of these efforts, focusing on parameters like survival and growth rates. The MCR program implement summative and joint evaluation practices, varying in intensity among village communities. The primary goal of these evaluation practices is to document the outcomes of mangrove planting endeavors, whether they are successful or encounter challenges.

The local environmental authorities, represented by the Forestry and Fishery Agency of Banyuwangi, play a partial role in documenting this information. Their involvement extends to monitoring the overall progress of the MCR program in Pangpang Bay. Simultaneously, the village communities collaborate with external partners, such as NGOs and universities, to leverage diverse evaluation practices. This collaboration aids in the analysis of several crucial aspects as part of the MCR program:

a) Water Quality and Hydrological Assessments: Evaluating the impact of mangrove planting on water quality and assessing the hydrological conditions ensures the suitability of the environment for mangrove growth.
b) Biotic/Abiotic Surveys of Biodiversity: Conducting surveys helps understand the ecological health of the mangrove ecosystem, including the diversity of plant and animal species.
c) Remote Sensing and Geographic Information Systems (GIS): These tools are employed to assess changes in mangrove cover and land use, offering a comprehensive view of the spatial dynamics within Pangpang Bay.
d) Forecasting Measures for Mangrove Cover Expansion: Utilizing forecasting measures enables anticipation of potential changes in mangrove cover over time.

These evaluation practices collectively contribute to the MCR learning process, fostering knowledge-sharing between village communities. The identification of successful planting practices tailored to the local context of Pangpang Bay allows communities to learn from each other's experiences, facilitating continuous improvement in their MCR program.

However, despite regular knowledge exchange during collaborative gatherings, the transfer of best practices between village communities is not always straightforward. The feasibility of such transfers hinges on various contextual factors, notably the local capacity for MCR initiatives. Additionally, ecosystem conditions, such as the biophysical carrying capacity of the soil in local mangrove forests, play a crucial role in determining the adaptability and success of specific planting practices. This recognition underscores the importance of considering the unique environmental context of each village when sharing and implementing successful MCR strategies.

16. Exercise of facilitative leadership:

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Facilitative leadership has been one of the critical success factors for the collaborative processes of the MCR program. The positive influence of facilitative leadership can be observed across different stakeholder groups, showcasing how leadership improves coordination and joint problem-solving:

The leadership role of the Forestry and Fishery Agencies of Banyuwangi is implicit in their overarching responsibility and management of the collaborative network. They play a crucial role in coordinating a broader strategic response to the Mangrove Conservation and Restoration (MCR) efforts across the entire Banyuwangi region, encompassing multiple villages. In this capacity, they have been instrumental in facilitating communication channels among various stakeholders within the collaborative network. The agency ensures that joint consensus can be reached around targeted MCR program. Their involvement is pivotal in ensuring cohesive and coordinated efforts, aligning the objectives of different stakeholders. By managing the collaborative process, the Forestry and Fishery Agencies of Banyuwangi contribute significantly to the success of MCR initiatives, fostering effective communication and consensus-building among diverse stakeholders involved in the mangrove conservation efforts.

The importance of village leadership is equally critical at the village leadership level. Different village leaders have provided varying degrees of support, reflecting their differential concerns and commitments for the MCR program. For example, the Head of Kedungasri Village allocates more support and financing to the EEA program within their village area compared to the Head of Kedunggebang Village, which has hindered the latter from expanding its mangrove area to the same high degree as its neighboring villages.

The role of leaders of the community organizations has also significantly impacted the development of MCR program. An illustrative example is Pak Hendro, a leader of the local community organization in Wringinputih village, who has had a notable effect on facilitating the expansion of the mangrove area of his village. He has received certified training by the local and regional authorities on subjects like mangrove development and organizational management, which has strengthened his bargaining position within the collaborative network, especially when negotiating and coordinating with local environmental authorities due to his qualifications. His network centrality allows him to connect with all collaborative network stakeholders, notably benefiting the overall development of his village (Wringinputih). For instance, he has regularly solicited inputs from experts of the local universities to collaborate on refining mangrove cultivation methods, leading to the identification and adoption of the most effective planting techniques for Wringinputih village that, in return, has led to a direct increase in the mangrove population. Additionally, he has partnered with the national bank (Bakti BCA) through its CSR programs, which has financed the procurement of mangrove sprouts for the planting program.

Outcome variable: Successfully co-created green transitions

The outcome variable 'co-created green transitions' will be scored in two parts. First, 'co-creation' will be scored based on an assessment of whether the participants in the initiative, project or process engaged in collaborative problem-solving that fostered creative ideas and innovative solutions (data will consist of survey data combined with interviews and documents). Next, 'green transitions' will be scored based on an assessment of whether the initiative, project or process has fulfilled or is expected to fulfill its green goals, ambitions and aspirations (data will consist of survey data combined with interviews and internal and/or external evaluation reports, including scientific publications).

The scoring of this variable is done in two parts:

1. *Is the developed solution based on collaborative problem-solving spurring creativity and innovative solutions?*

2. *Does the developed solution engender a green transition?*

This scoring should be conducted based on both the survey and complementary green outcome evaluations. Please consult Sections 4.4 and 6.10 in the Research Protocol for more details.

1. Is the developed solution co-created?

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Survey
☐ 0.33	☐ Medium confidence	☒ Interviews
☐ 0.66	☒ High confidence	☒ Documents
☒ 1		☒ Observations

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring.

Based on the survey findings, a substantial majority of respondents either agree or strongly agree with all survey items. There is widespread acknowledgment that the MCR program have facilitated high levels of collaboration, leveraging experiences across the public, private, and civil society sectors. In turn, the collaborative problem-solving process has seen a diverse range of inputs and ideas, challenging the conventional wisdom behind MCR programs in general. These sentiments are reinforced by the majority of interviewed informants, confidently asserting that the improved collaborative processes among sectoral stakeholders have created a supportive environment for devising more sustainable MCR initiatives, contributing to the success of Pangpang Bay in reversing mangrove deforestation trends.

However, the survey results identify two outliers regarding whether the collaborative processes break with established practices or conventional wisdom. This is perplexing, given the high score on cognate survey items (e.g., item 3 that pertains to going beyond standard or textbook solutions and the green transition problem). Upon closer examination of the lower scores (0.13 and 0.4, indicating a neutral response) and follow-up discussions with the informants, it became evident that the barrier to successful a MCR program is not the absence of novel, innovative planting techniques or approaches based on new scientific findings. Instead, it is contingent upon capacity-building in the village communities responsible for the management and stewardship of the mangrove forests. The innovative aspects of the MCR program in Pangpang Bay are thus linked to social innovation, where the successful development of technical know-how and competences in mangrove management has resulted in an improved MCR strategy. In this regard, the collaborative network has provided a support structure for the village communities to leverage the collaborative problem-solving inputs of cross-sectoral partners, paving the way for the success of the MCR program in Pangpang Bay.

A 2021 report also documents 38 collaborative activities registered between 2020-2021. Due to Covid-19 pandemic restrictions, 18 planned activities were postponed, indicating that more collaborative events were initially planned.

If possible, please insert your survey responses in the table below (in % for each response), including the mean/average % for each survey item.

n = 15 (out of 32)	Not Answer	Strong. dis.	Dis.	Slight dis.	Neither agr/dis	Slight agree	Agree	Strong agree	Mean score
1. Problem-solving mobilized different experiences, and/or ideas and/or forms of knowledge to develop new perspectives	-	-	-	-		6,67%	46,67 %	46,67%	2,40
2. Through the collaborative problem-solving process, different experiences and/or ideas and/or forms of knowledge have been mobilized to search for unconventional solutions	-	-	-	-	6,67%	6,67%	53,33 %	33,33%	2,13
3. The collaborative problem-solving process mobilized different experiences, and/or ideas and/or forms of knowledge to search for solutions that go beyond standard/text-book solutions	-	-	-	6,67%	-	6,67%	40%	46,67%	2,47
4. The co-created solution breaks with established practices	-	13,33 %	20%	20%	6,67%	-	33,33 %	6,67%	0,13
5. The co-created solution disrupts conventional wisdom	-	-	26,67 %	20%	-	13,33 %	20%	20%	0,40
6. The co-created solution offers new ideas to address the green transition problem	-	-	-	-	-	-	60%	40%	2,40
7. I'm supportive of the co-created solution	-	-	-	-	-	6,67%	33,33 %	60%	2,53
8. I'm content with the overall collaborative process of the project	-	6,67%	-	6,67%	-	20%	26,67 %	40%	1,93
9. I feel the multi-actor collaboration process was a prerequisite for the success of the project	-	-	-	-	-	-	40%	60%	2,60

10. I'm satisfied by the results of the co-creation effort in terms of expected impact on the welfare of the community	-	-	13,33 %	-	-	6,67%	33,33 %	47,67%	1,87
11. The collaborative interaction in the project has led to an innovative solution	-	-	-	13,33 %	6,67%	6,67%	26,67 %	46,67%	1,87
12. The actors involved in the project are engaged in collaborative interaction that stimulated creative problem-solving	-	6,67%	-	-	-	13,33 %	40%	40%	1,93
13. The co-created solution meets the proposed goals of the project	6,67%	-	13,33 %	-	-	-	53,33 %	26,67%	1,60
14. The co-created solution will be durable and robust in the long run	6,67%	-	6,67%	-	-	20%	20%	46,67%	1,87
15. The co-created solution is expected to significantly improve sustainability for the whole community	-	6,67%	-	-	-	-	33,33 %	60%	2,27
Overall score / Average									**1,89**

2. Does the developed solution engender a green transition[1]?

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Survey
☐ 0.33	☐ Medium confidence	☒ Interviews
☐ 0.66	☒ High confidence	☒ Documents
☒ 1		☒ Observations

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring:

The survey results demonstrate that the EEA program can be considered a successful green transition initiative. Specifically, only 13.33% of respondents disagree that the MCR program have already yielded a green transition solution. In contrast, 60% agree, and the remaining 26.27% are unsure how to respond. The ambiguity in the responses to the first question about whether the MCR program have produced a

[1] By "green transitions", we mean objectives and aspirations that correspond to at least one of the Green SDGs (SDG 6, 7, 11, 12, 13, 14, 15). The project does not have to refer explicitly to the green SDGs, but the project's green objectives

green transition stem from the use of double negation, leading several respondents to answer, "don't know." However, in response to the final item on whether the MCR program have generated a green transition solution that improves upon the status quo of comparable MCR programs elsewhere, 73.33% affirmatively respond.

In addition to the survey data, we have obtained further documentation that supports our scoring of the outcome variable. As captured by Landsat, the mangrove forest coverage was 288.6 ha in 2014, 327.3 ha in 2015, 382.1 ha in 2016, 460.7 ha in 2017, and finally, 571.7 ha in 2018. In other words, between 2014 and 2018, there has been approximately a doubling of the mangrove forest coverage (refer to Figure 4 below). More recent findings indicate that the mangrove forest coverage has continued to increase, expanding from 959.4 ha in 2020 to 1,663.8 ha in 2022 (Safitri et al., 2023). Consequently, between 2014 and 2022, the mangrove forest coverage has multiplied fivefold (from 288.6 ha to 1,663.8 ha).

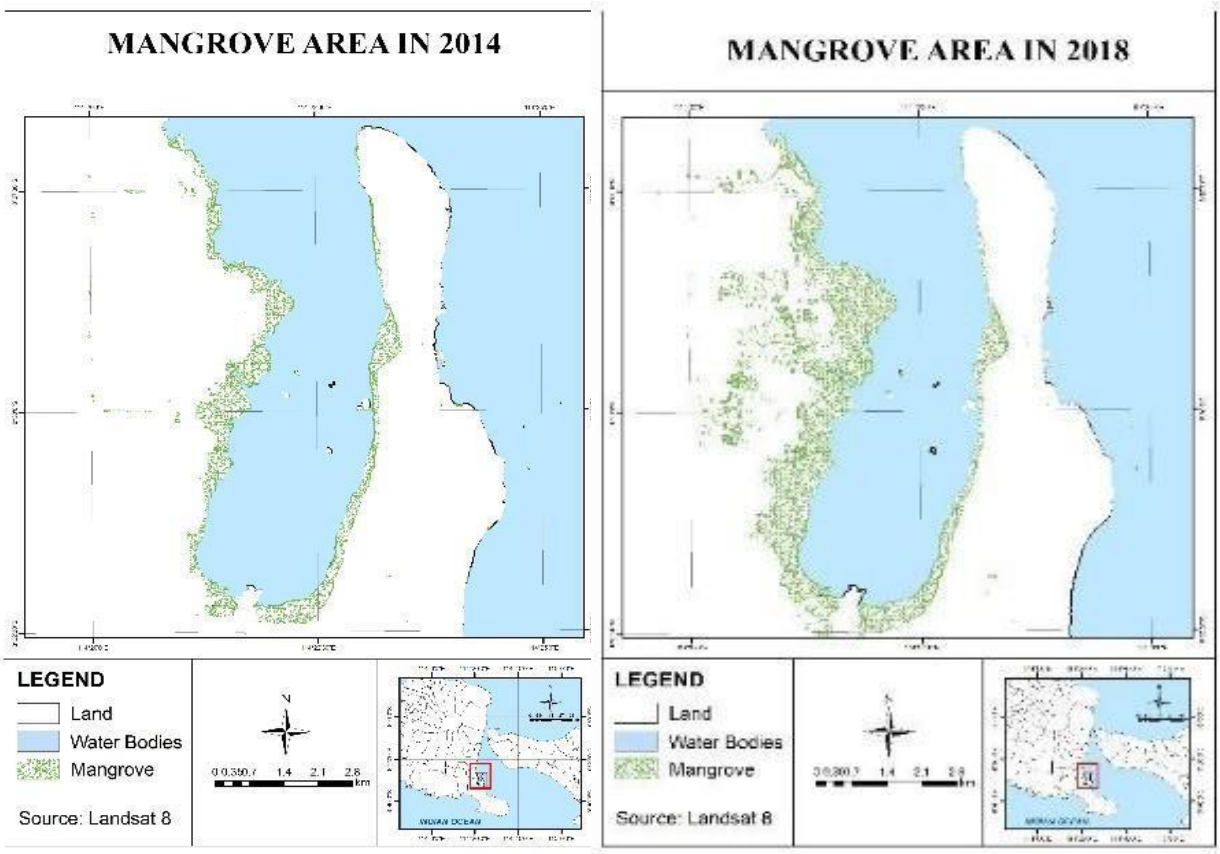

Figure 5. Development of Mangrove Area of Pangpang Bay, East Java Province
Source: Hapsari, K. C. P., & Permatasari, D. A. (2020, April). Changes of mangrove area in Pangpang Bay, Banyuwangi 2014-2018 using Landsat-8 imagery. In Journal of Physics: Conference Series (Vol. 1528, No. 1, p. 012063). IOP Publishing.

If possible, please insert your survey responses in the table below (in % for each response).

1. The project:	Yes	No	Don't know
…did not produce any green transition solution	13,33% (n = 2)	60% (n = 9)	26,67% (n = 4)
…has produced or is expected to produce a green transition solution aiming to avoid a worsening in the status quo	60% (n = 9)	6,67% (n = 1)	33,33% (n = 5)
…has produced or is expected to produce a green transition solution aiming to maintain the status quo	80% (n = 12)	0% (n = 0)	20% (n = 3)
…has produced or is expected to produce a green transition solution aiming to improve the status quo	73,33% (n = 11)	13,33% (n = 2)	13,33% (n = 2)

Please list all the informants you have interviewed for the case study (list project role + interview date):

We conducted fieldwork in Pangpang Bay three times during the write-up of the case report. The first visit occurred on November 10–12, 2021, where our objective was to explore the overarching conditions for collaboration, gaining an overview of the collaborative network and the nature of their interactions. The second visit, on January 27–31, 2022, included an in-depth investigation of the case in Wringinputih Village and Kedunggebang Village, conducted with Dr. Alexander L. Q. Chen. During this visit, we also interviewed 17 individuals from both villages, as well as representatives from regional governments, local communities, and local environmental and village authorities. The interviews were conducted in Indonesian, with a team of research assistants facilitating the translation process to involve Dr. Alexander L. Q. Chen directly in the interview process. The third fieldwork took place on August 23–25, 2023, where we met with 32 individuals for follow-up interviews with previous interviewees or new ones from village communities we had not interviewed before. In addition to interviews, we administered a survey to 27 relevant respondents out of the 60 informants.

Note: Several interviews were conducted as focus group interviews.

List of informants:

a) 2 People from Natural Resources Conservation Center East Java Branch
b) 2 People from Forest Management Bodies of the Eastern Java Regional Division (KPH)
c) 3 People from Conservation Forest Management Unit (KPHK), Protection Forest Management Unit (KPHL), and Production Forest Management Unit (KPHP)
d) 10 People from The Banyuwangi Forestry Branch (CDK)
e) 2 People from The Environmental Agency of Banyuwangi Region
f) 4 People from The Planning and Development Agency of Banyuwangi Region
g) 2 People from The Communication, Informatics and Encryption Agency of Banyuwangi Region
h) 2 People from Fishery Agency of Banyuwangi

i) 11 Local Mangrove Farmers
j) 3 Local fishermen: active participants engaged in the cultivation of living creatures around the mangrove ecosystem of Pangpang Bay (shrubs, crabs, shrimp, and fish).
k) 4 Local Community organizations (The Community Forest Farmer Group (KTH), Fisheries Community Group (KUI), the Joint Community Group (KUB), and the Community Tourism Awareness Group (CTAG)).
l) 3 Representatives from Kedunggebang Village
m) 4 Representatives from Kedungasri Village
n) 2 Representatives from Wringinputih Village
o) 1 Representative from Tegaldlimo Sub-region

The informants are displayed anonymously, but we have a full list of names.

Please list all the observations you have made (type of meeting/workshop/etc. + observation date):

Three field trips were conducted in total. On the first visit (Aug 2022), we were welcomed by a focus group interview with representatives from various relevant regional agencies, attended by 12 people, which was held at the offices of the Forestry Agency of Banyuwangi. During the second field trip (Dec – Jan 2022), we conducted further interviews at the same location, involving more actors (around ten agencies and local communities, attended by 20 people). Through these initial interviews, we mapped out the relevant stakeholders based on which we solicited new interviews. On the third field trip (Aug 2023), we visited and interviewed several additional actors who had been omitted in the two initial field trips, particularly a village community and its community organizations that were not available for interviews on prior occasions. We tried a new approach by not bringing these actors together in one place in the hope that they would be more open when giving answers separately.

Please list all the documents you have analyzed (document name + source + year):

Ariyanto, A., Hidayati, E., Iswandi, W. (2020). Managing Mangrove Essential Ecosystem Area: A Strategy Analysis in Pangpang Bay Area, Wringinputih Village, East Java, Indonesia. Journal of Saemaulogy, 5(2), 33-64.

Buwono, Y. R. (2017). Identification And Density Mangrove Ecosystem in The Areas Pangpang Bay Banyuwangi. Samakia: Jurnal Ilmu Perikanan, 8(1), 32-37.

Decree Of The Governor Of East Java Number 188/123/Kpts/013/2021 Concerning Management Of The Guel Angpang Essential Ecosystem Area, Banyuwangi Regency, East Java Province

Ellison AM, Felson AJ and Friess DA (2020) Mangrove Rehabilitation and Restoration as Experimental Adaptive Management. Front. Mar. Sci. 7:327. doi: 10.3389/fmars.2020.00327

Fatmawati, D., Rahardja, B. S., Lutfiah, L., & Ulkhaq, M. F. (2020, February). Structure communities of macrozoobenthos in mangrove tourism area, Wongsorejo sub-district, Banyuwangi regency, East Java. In IOP Conference Series: Earth and Environmental Science (Vol. 441, No. 1, p. 012104). IOP Publishing.

Hakim, L., Siswanto, D., & Makagoshi, N. (2017). Mangrove conservation in East Java: the ecotourism development perspectives. Journal of Tropical Life Science, 7(3), 277-285.

Hapsari, K. C. P., & Permatasari, D. A. (2020, April). Changes of mangrove area in Pangpang Bay, Banyuwangi 2014-2018 using Landsat-8 imagery. In Journal of Physics: Conference Series (Vol. 1528, No. 1, p. 012063). IOP Publishing.

Hidayati, E., Himawan, M. R., Hiliyana, S., Buhari, N., Valentino, N., & Salsabila, N. P. (2022, December). Early performance of mangrove seedlings in abandoned fishpond rehabilitation using silvofishery approach. In IOP Conference Series: Earth and Environmental Science (Vol. 1107, No. 1, p. 012076). IOP Publishing

Primavera, J. H., & Esteban, J. M. A. (2008). A review of mangrove rehabilitation in the Philippines: Successes, failures and future prospects. Wetlands Ecology and Management, 16(5), 345–358. https://doi.org/10.1007/s11273-008-9101-y

Locatelli, T., Binet, T., Kairo, J. G., King, L., Madden, S., Patenaude, G., … Huxham, M. (2014). Turning the Tide: How Blue Carbon and Payments for Ecosystem Services (PES) Might Help Save Mangrove Forests. Ambio, 43(8), 981–995. https://doi.org/10.1007/s13280-014-0530-y

Mutohharoh, N. (2020). Pengembangan masyarakat pesisir melalui pemanfaatan hutan mangrove Desa Wringinputih Kecamatan Muncar Kabupaten Banyuwangi (Doctoral dissertation, Fakultas Dakwah Program Studi Pengembangan Masyarakat Islam).

Neka, W. Analisis Potensi Hutan Mangrove Di Teluk Pangpang Banyuwangi Dalam Pengembangan Ekonomi Masyarakat Pesisir. Jurnal TECHNO-FISH, 3, 31-45.

Pradana, Y. Y., Pulansari, F., & Priyadarshini, R. (2023). Mangrove Ecosystem sustainability Effort in Essential Ecosystem Areas (KEE) of Teluk Pangpang Banyuwangi Regency. Journal of Social Science, 4(3), 875-886.

Primavera, J. H., & Esteban, J. M. A. (2008). A review of mangrove rehabilitation in the Philippines: Successes, failures and future prospects. Wetlands Ecology and Management, 16(5), 345–358. https://doi.org/10.1007/s11273-008-9101-y

Purnamasari, E., Kamal, M., & Wicaksono, P. (2021). Comparison of vegetation indices for estimating above-ground mangrove carbon stocks using PlanetScope image. Regional Studies in Marine Science, 44, 101730.

Putra, P. G., Priadarsini, N. W. R., & Resen, P. T. K. (2019). Peranan JICA dalam Konservasi Mangrove di Indonesia Sebagai Bagian dari Program the Project For Mangrove Ecosystem Conservation And Sustainable Use in the ASEAN Region (MECS). Online] in https://ojs. unud. ac. id/index. php/hi/article/view/30064/18444 [accessed August 27 2019].

Raharja, A. B., Widigdo, B., & Sutrisno, D. (2014). Study on the potency of mangrove ecosystem in the coastal area of Gulf Pangpang, Banyuwangi. Depik, 3(1), 36-45.

Rahardja, B. S., Prayoga, A. I., Kenconojati, H., & Ulkhaq, M. F. (2020, February). The relation between quality of the sediment (nitrate, phosphate) and Avicennia sp density, case study; Mangrove Center Bengkak, Banyuwangi Regency, East Java. In IOP Conference Series: Earth and Environmental Science (Vol. 441, No. 1, p. 012089). IOP Publishing.

Rodiana, L., Yulianda, F., & Sulistiono, M. (2019). Kesesuaian dan Daya Dukung Ekowisata Berbasis Ekologi Mangrove di Teluk Pangpang, Banyuwangi. JFMR (Journal of Fisheries and Marine Research), 3(2), 194-205.

Regulation Of The Minister Of Environment And Forestry Of The Republic Of Indonesia Number 21 Of 2022 Concerning Procedure For Implementing The Economic Value Of Carbon

Saifullah, S., & Harahap, N. (2013). Strategi Pengembangan Wista Mangrove Di" Blok Bedul" Taman Nasional Alas Purwo Kabupaten Banyuwangi Jawa Timur. Journal of Indonesian Tourism and Development Studies, 1(2), 79-86.

Santoso, B., Hendrijanto, K., Hariyono, S., & Nufus, B. H. (2020, May). Local wisdom for mangrove conservation and ecotourism: Case study from Wringinputih, Muncar, Banyuwangi. In IOP Conference Series: Earth and Environmental Science (Vol. 485, No. 1, p. 012092). IOP Publishing.

Setyaningrum, E. W. (2016). Area Development Model Based on Mangrove Wetland Essential Ecosystem, in Pangpang Bay Banyuwangi Indonesia. Journal of resources development and management, 18, 93-99.

Setyaningrum, E. W. (2017). Pelestarian Mangrove Berbasis Masyarakat Sebagai Dasar Ekologi dan Ketahanan Ekonomi di Teluk Pangpang Banyuwangi.

Setyaningrum, E. W., Erwanto, Z., Prapti, K. P., & Jayanti, A. L. (2020). Community Economic Innovation in Mangrove Area at East Beach of Java Island. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Vol, 3(4), 3968-3975.

Utomo, D. P., Handayani, T., Susiloningtyas, D., & Mansessa, M. D. M. (2021, May). The spatial dynamics of mangrove forest in the Alas Purwo Banyuwangi National Park marine tourism area using remote sensing images. In IOP Conference Series: Earth and Environmental Science (Vol. 771, No. 1, p. 012012). IOP Publishing.

Wahyuni, N. I., Hasyim, A. W., & Soemarmo, S. (2021). Dynamic of the Land Use and Land Cover Change in Banyuwangi Regency From 1995-2019. Jurnal Wasian, 8(2), 121-132.

Winarso, G., Rosid, M. S., Kamal, M., Asriningrum, W., Margules, C., & Supriatna, J. (2023). Comparison of Mangrove Index (MI) and Normalized Difference Vegetation Index (NDVI) for the detection of degraded mangroves in Alas Purwo Banyuwangi and Segara Anakan Cilacap, Indonesia. Ecological Engineering, 197, 107119.

Please note the response rate for the survey/measurement of outcome variable:

We conducted 27 interviews with Indonesian actors. Some of the respondents we met were deemed to lack the knowledge to answer the survey. Therefore, the survey was circulated among 27 people, 15 responses of which were deemed valid and relevant. The survey was administered directly in the form of a paper questionnaire which was translated into Indonesian by the research team.