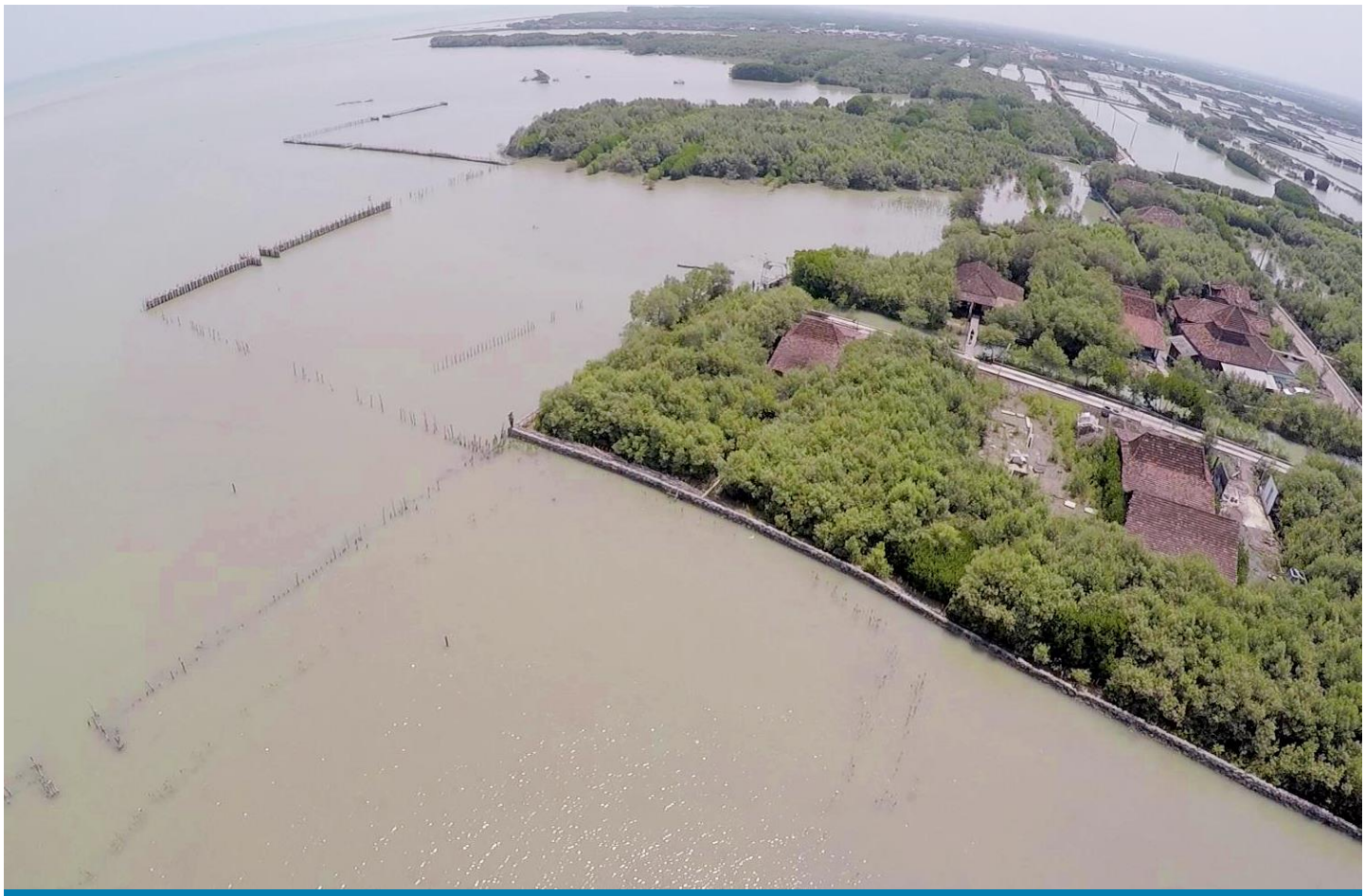

Securing Eroding Delta Coastlines of the Northern Coastal Java:

Lessons Learned of the Building with Nature Indonesia Implementation and Upscaling

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Securing Eroding Delta Coastlines of the Northern Coastal Java:

Lessons Learned of the Building with Nature Indonesia Implementation and Upscaling

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Cover image
Aerial photograph of permeable structures built along the eroding coastal villages in Demak Regency, Central Java, Indonesia. (© Wetlands International Indonesia)

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Building hybrid engineering structures by local communities (© Wetlands International Indonesia / Apri Susanto Astra)

1. INTRODUCTION

1.1 Project background

The Building with Nature (BwN) Indonesia initiative was developed and implemented by Wetlands International and Ecoshape. Implemented from 2015 to 2021, the initiative aimed to secure eroding delta coastline by introducing Building with Nature solutions, an innovative approach to infrastructure and coastal environment management that aims to work with the forces of nature, rather than opposing them [Ref 1]. The initiative combined mangrove rehabilitation with civil engineering and ecological method, while simultaneously introducing sustainable land use practices. This resulted in avoiding further coastal flooding and erosion, and a long-term perspective for sustainable economic development for local communities.

The innovative approach was implemented along 20 km coastline of Demak regency, Central Java, Indonesia. Demak regency is one of the northern coastal Java regions experiencing severe erosion and related flooding hazards for the past decade driven by mangrove conversion for aquaculture, groundwater extraction and infrastructure development. Many people suffered from major loss in income, up to 60-80% in some villages. Hard infrastructures to protect the coastline exacerbated erosion, were unstable, expensive, and failed to deliver vital services such as fisheries that the original mangroves provided. Without action, the area would fully flood by 2030. In addition, climate change driven sea level rise was projected to inundate the Demak shoreline 6 km inland by 2100 – affecting 14,700 ha land and over 70,000 people – and the loss of 6,000 hectares of aquaculture ponds, under business-as-usual scenario [Ref 34].

The BwN initiative used both technical and socio-economic measures in its intervention. Technical measures to protect the coastline in Demak included mangrove restoration following the ecological principles (i.e. ecological mangrove restoration method) and using permeable structures (hybrid engineering) at the eroding near shore bed to capture sediment that in turn enable natural mangrove regeneration. Socio-economic measures to promote sustainable land-use include development and introduction of sustainable improved aquaculture pond management and livelihoods diversification for local communities. The measures were synergised with community development plans at village level and sub-national government master planning for sustainable development. The whole measures were implemented under ***Bio-Rights*** scheme, an innovative funding mechanism for environment conservation and delivered simultaneously with extensive policy dialogue and capacity building. The BwN approach has been promoted, replicated and upscaled widely across Indonesia by Wetlands International Indonesia under different projects, Indonesian government, and other conservation consortium in which Wetlands International Indonesia participates in. More importantly, the BwN Indonesia project won the UN Decade for Restoration Flagship Award in 2022, marking its international recognition and potential future upscaling worldwide.

The insights and lessons from a landscape scale implementation of the Building with

Nature solutions between 2015 and 2021 in Demak, Central Java, Indonesia has been summarised in The Building with Nature in Indonesia:Restoring an eroding coastline and inspiring action at scale 2015-2-21 [Ref 1].

1.2 Scope of the report

This report is prepared to contribute to The Wetlands 4 Resilience (W4R) initiative supported by Sida Global. Started early 2023, the programme goal is to upscale healthy, biodiverse, and well-managed wetland landscapes globally by 2030, contributing to climate resilience and environmental, social and economic sustainability. The three main objectives of W4R are:

1. To bring together and share globally the learning and methodologies for holistic, ecosystem- led resilience building from our global wetland landscape portfolio and partner programmes;
2. To design and apply a Wetland-4-Resilience model approach, toolkit and guidance to accelerate upscaling in our major wetland landscape regeneration programmes;
3. To catalyse wetland landscape generation by other, through uptake and implementation of the W4R model approach across different sectors globally.

The report predominantly provides information on objective number one, that is to bring together and share globally the learning and methodologies, building from mangrove landscape restoration process in Demak, Central Java, Indonesia, implemented between 2015 and 2021. The learning and methodologies used and developed during the Demak landscape restoration process is expected to be replicable and upscaled in other wetland landscape regeneration programmes globally, in particular the muddy coastal landscape suffered from erosion and brackish water aquaculture issue.

The learning report focuses on the process of restoring the eroding coastal Demak landscape and the lessons learned from its early initiation through to upscaling phases. It is structured into six sections, that is Introduction (Chapter I), Historical timeline of coastal Demak landscape transition (Chapter II), Landscape restoration process (Chapter III), Context and power analysis – Gender - Policy Influencing strategy (Chapter IV), Governance-Access to finance-Access to markets (Chapter V) and Replication and Upscaling (Chapter VI). Each chapter consists of the following information:

Chapter I-Introduction provides brief background information of the Building with Nature Indonesia project, its objectives, measures and used approaches. Moreover, it describes the scope of the report.

Chapter II-Historical timeline of coastal Demak landscape transition describes the landscape historical transition timeline, encompassing the driving major events and impacts on the landscape. Moreover, interventions and lessons learned of the interventions implementation are elaborated.

Chapter III-Landscape restoration process-Replication and upscaling elucidates the extent to which the consortium built an effective landscape partnership, enhancing shared understanding of the landscape, arrived at a shared vision and action planning, facilitated enabling conditions for effective landscape governance, facilitated action by stakeholders and conducted monitoring and learning throughout the landscape restoration process.

Chapter IV-Context & power analysis – Gender – Policy Influencing strategy clarifies experiences, insights, and lessons learned in conducting context analysis, power analysis of stakeholders and actors, gender equality mainstreaming, and context-dependent policy influencing and engagement strategy for advocacy.

Chapter V-Governance-Access to finance and markets explains about the extent to which the BwN consortium managed the program governance and provided enabling conditions for community access to finance and markets. On part of access to finance, detailed explanation on Bio-Rights mechanism is presented.

Chapter VI-Replication and upscaling presents strategies developed by the consortium to influence other stakeholders and processes to achieve the target of increasing the scale of our impacts by others to implement the BwN solutions.

The report is written by reflecting back at the writers' own practical experience in delivering the BwN Indonesia program, and by referring to the program reports, manuals and publications developed by internal and external parties.

The report on lighthouse example of Demak mangrove coast – Indonesia, whenever relevant, provides synthesis and bring relevant knowledge and experience into the W4R model that will be implemented in iconic landscapes of Ziway-Shalla Central Rift Valley - Ethiopia, Jeta Pecixe-Cacheu mangrove coast - Guinea Bissau, and The Sundarbans – Bangladesh.

The majority of the best practice manuals we attach to this report are the result of development and improvement during the implementation of the BwN intervention. The manuals were developed as living documents during the BwN implementation. By the end of the project implementation the manuals were finalised in accordance with the empirical data.

2. HISTORICAL TIMELINE OF DEMAK LANDSCAPE TRANSITION

The historical timeline of Demak landscape transition over the period of 8th to 21st century below was summarised from Rahadian (2016) in his report entitled "*Sejarah Dinamika Perubahan Penutupan dan Penggunaan Lahan Pesisir Kabupaten Demak*" (The History of changes in land cover and use in Demak Regency).

2.1 Landscape status

In the 8th century, the currently called Demak area was still the waters of the Muria Strait, the strait between the mainland of Java Island and Muria Island, which is now Mount Muria. At the beginning of the 9th century, the landscape of Demak began to form. Later on, the strait was no longer navigable in the 17th century because the waters have successively transformed into the land from sedimentation. The succession was also the beginning of first colonization of the mangrove ecosystem. [Ref 2]

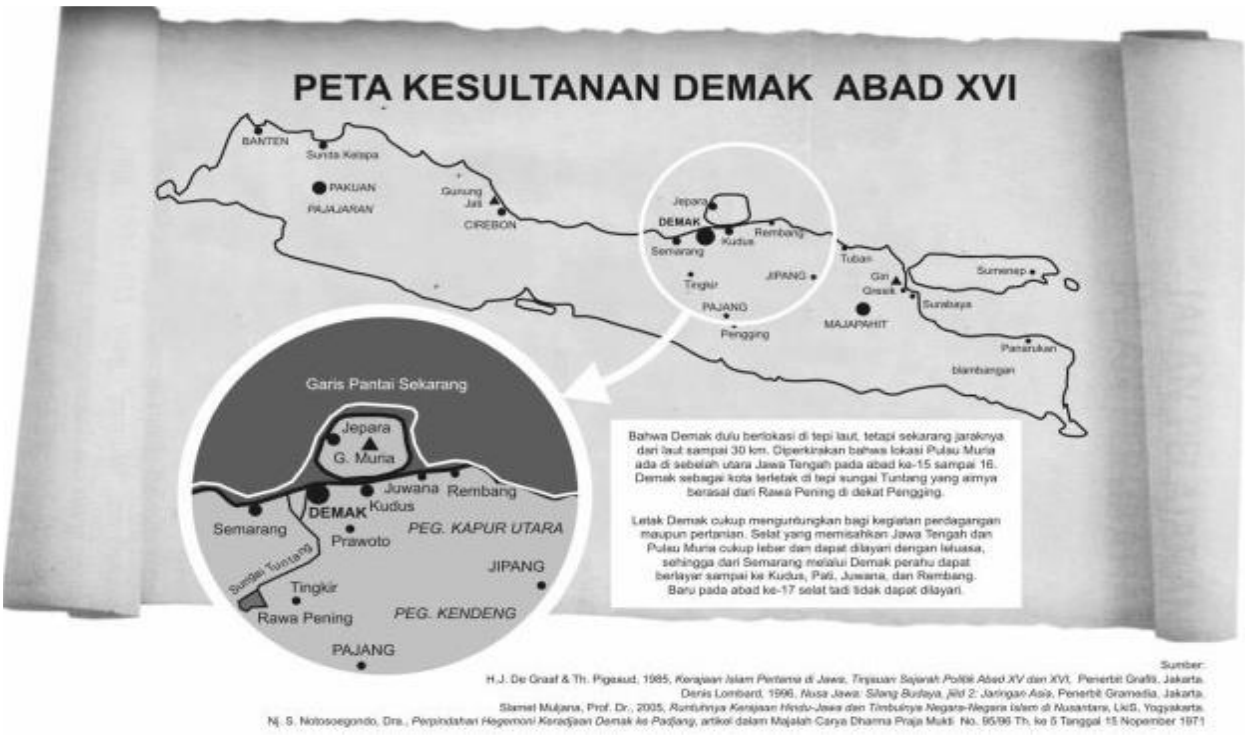


Figure 1. Map of Demak Sultanate Territory in the XVIth century. Source: de Graaf, H. J. & TH. Pigeaud, 1985; Lombart, 1996; Muljana, 2005; Notosoegondo, 1971, November 15, as cited in Rahadian, 2016.

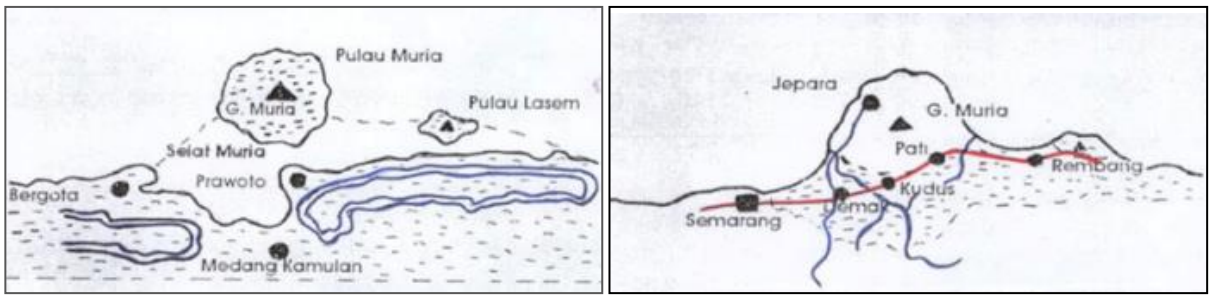


Figure 2. The transition of past Muria Island in the 8th century (left) to Demak landscape in the XVIth century (right). Source: Lombard, et al., 1996, as cited in Rahadian, 2016.

In 1740, according to the Dutch East Indies map, the coastal area of Demak was almost entirely covered by mangrove forests. Mangrove ecosystem was directly connected to agricultural land.There were no brackishwater aquaculture activities identified during that period. [Ref 2]

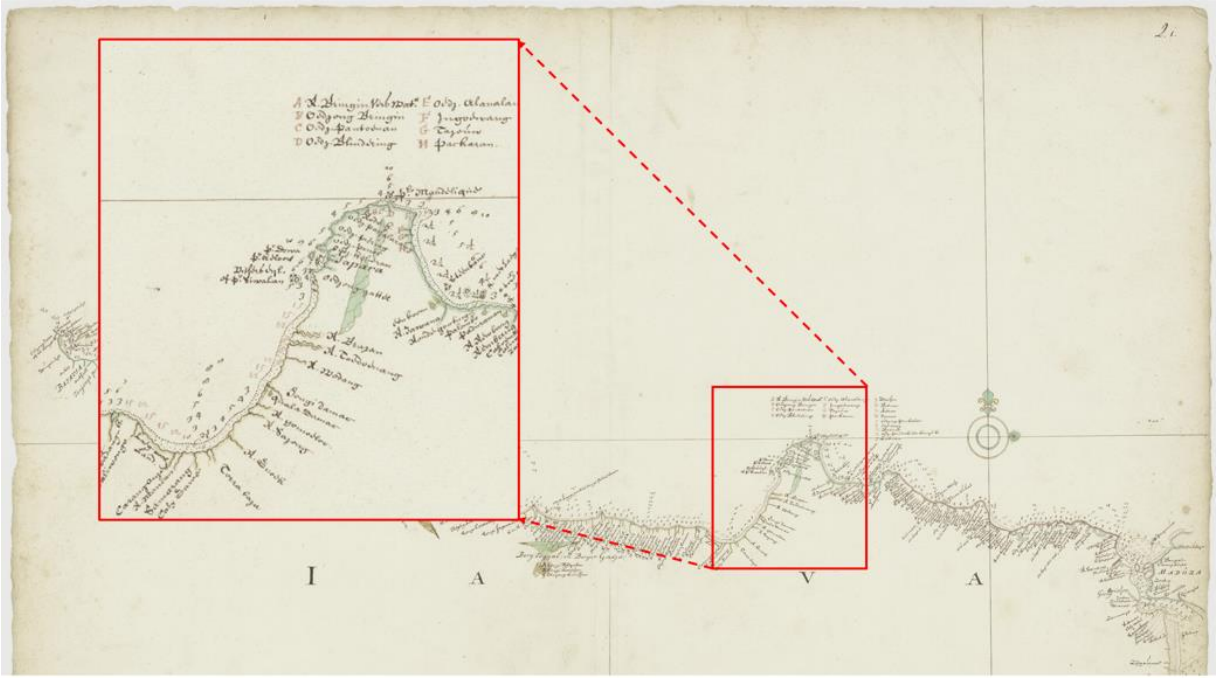


Figure 3. Map of the North Coast of Java, from Ondjong Java to the Strait of Madure in 17th century. Source: https://www.nationaalarchief.nl/onderzoeken/archief/4.VEL/invnr/372/file/NL-HaNA_4.VEL_372?eadID=4.VEL&unitID=372&query=

Later, in 1892, it was noticeable that the development of brackishwater aquaculture areas began. Since then it has expanded along the coastline of Demak and consequently decreased the extent of the mangrove ecosystem in the area. [Ref 2]

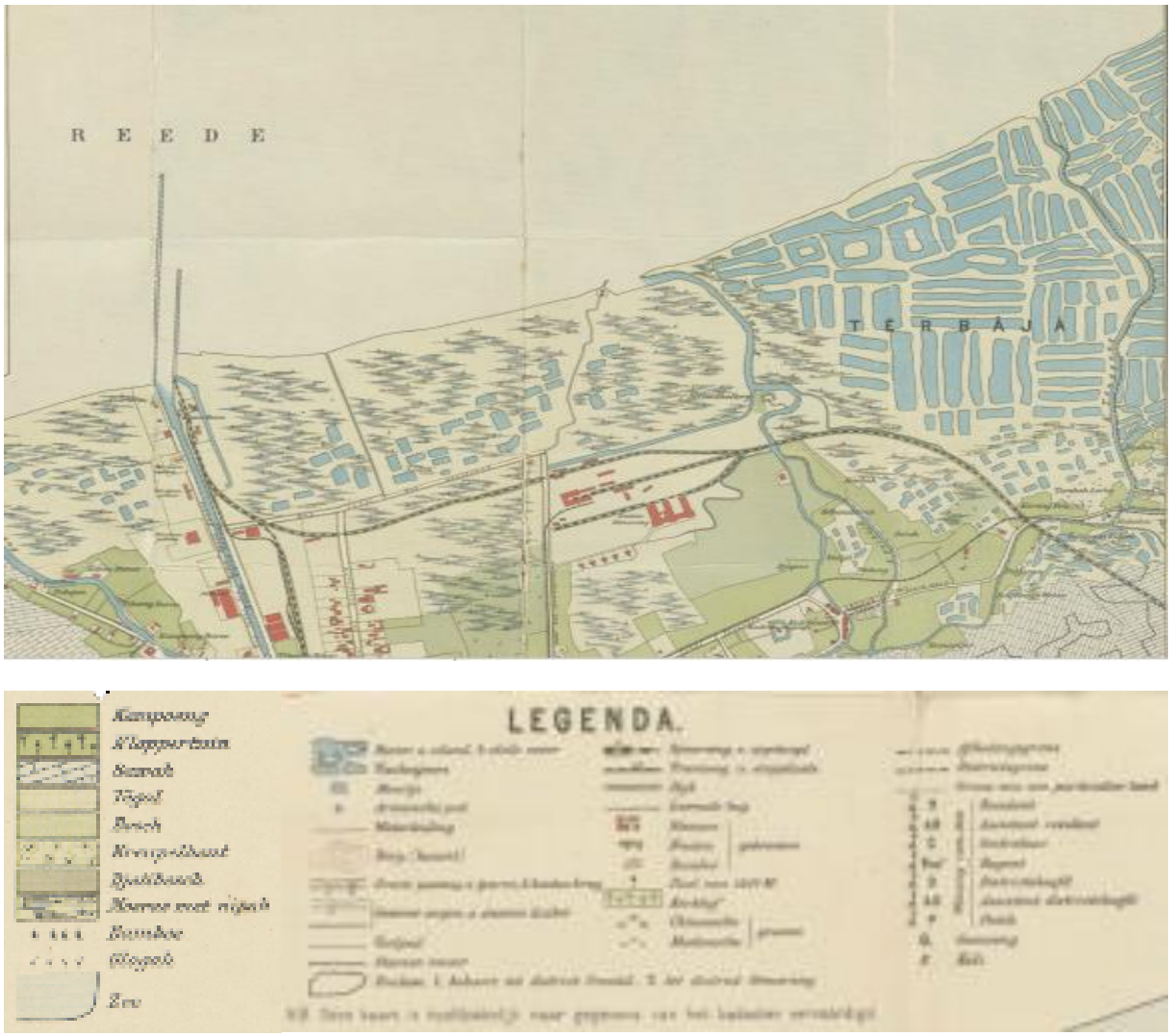


Figure 4. Map of the main town of Semarang and its surroundings in 1892.
Source: Topographisch Bureau, 1892, as cited in Rahadian, 2016

Gradually, by 1942, the coastal Demak has been dominated by brackishwater aquaculture ponds and associated with agricultural land at the back zone. Mangrove vegetation fragments still exist at the front zone, predominantly on the riverbanks and estuaries, such as along the Wulan River and Bayaran River. In southwest Demak, rice fields and settlements are still located close to the coast, indicating that the area has not yet been affected by sea water intrusion. [Ref 2]

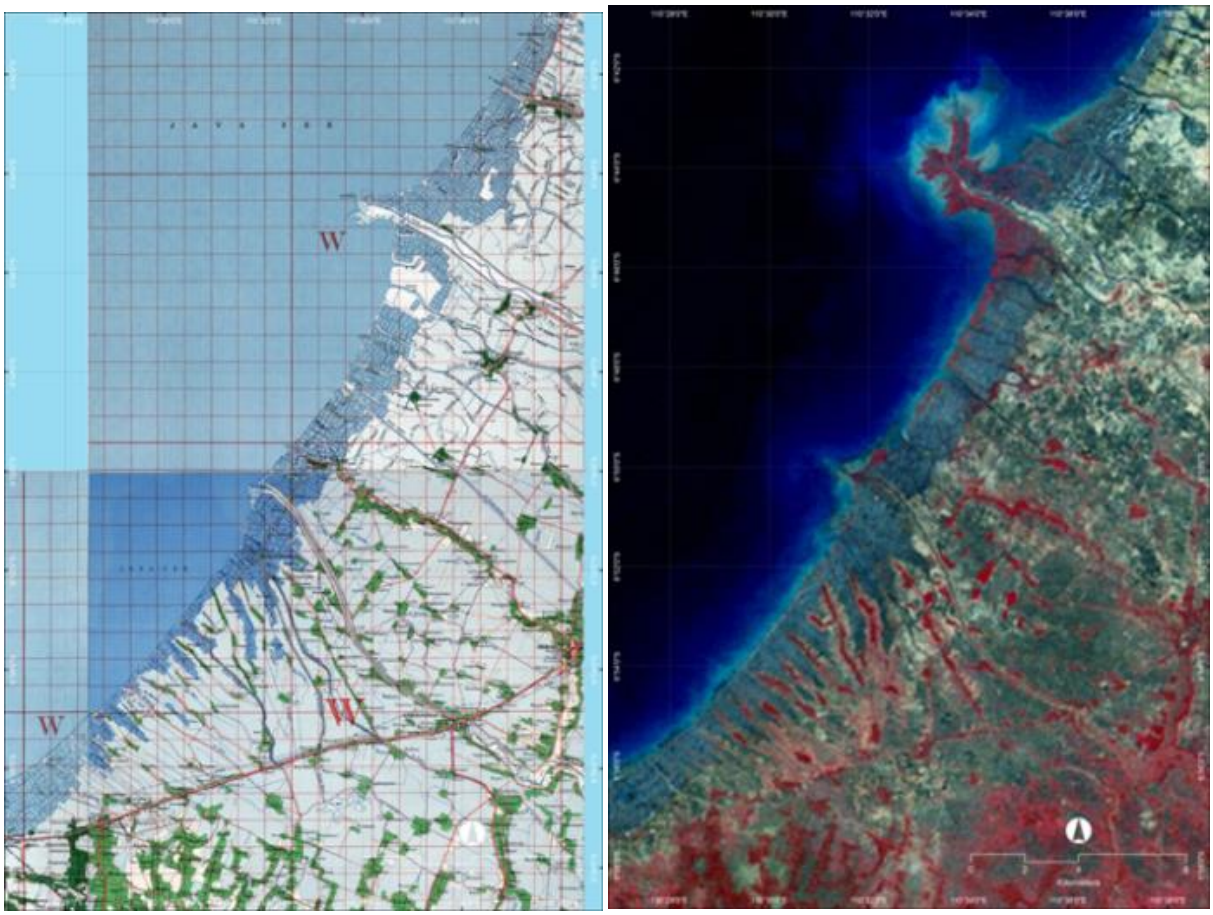


Figure 5. Map of the North Coastal Java, encompassing the regions of Semarang and Demak in 1942 (left) and 1972 (right). Source: U.S. Army Map Service Java & Madura, Series T722 1942, 1 :50.000; Landsat 1 MSS Path Row 128-065, 1972, as cited in Rahadian, 2016.

In 1972, it was identified that there was an increase in the extent of mangrove coverage in the northeastern area of coastal Demak as the sediment increasingly deposited around the estuary of the Wulan River. On the other hand, in the southwest region, many agricultural lands started to be converted into brackishwater aquaculture pond areas. Between 1942-1972 (30 years), no major coastline changes were identified, indicating that erosion/abrasion has not yet occurred significantly during the period. [Ref 2]

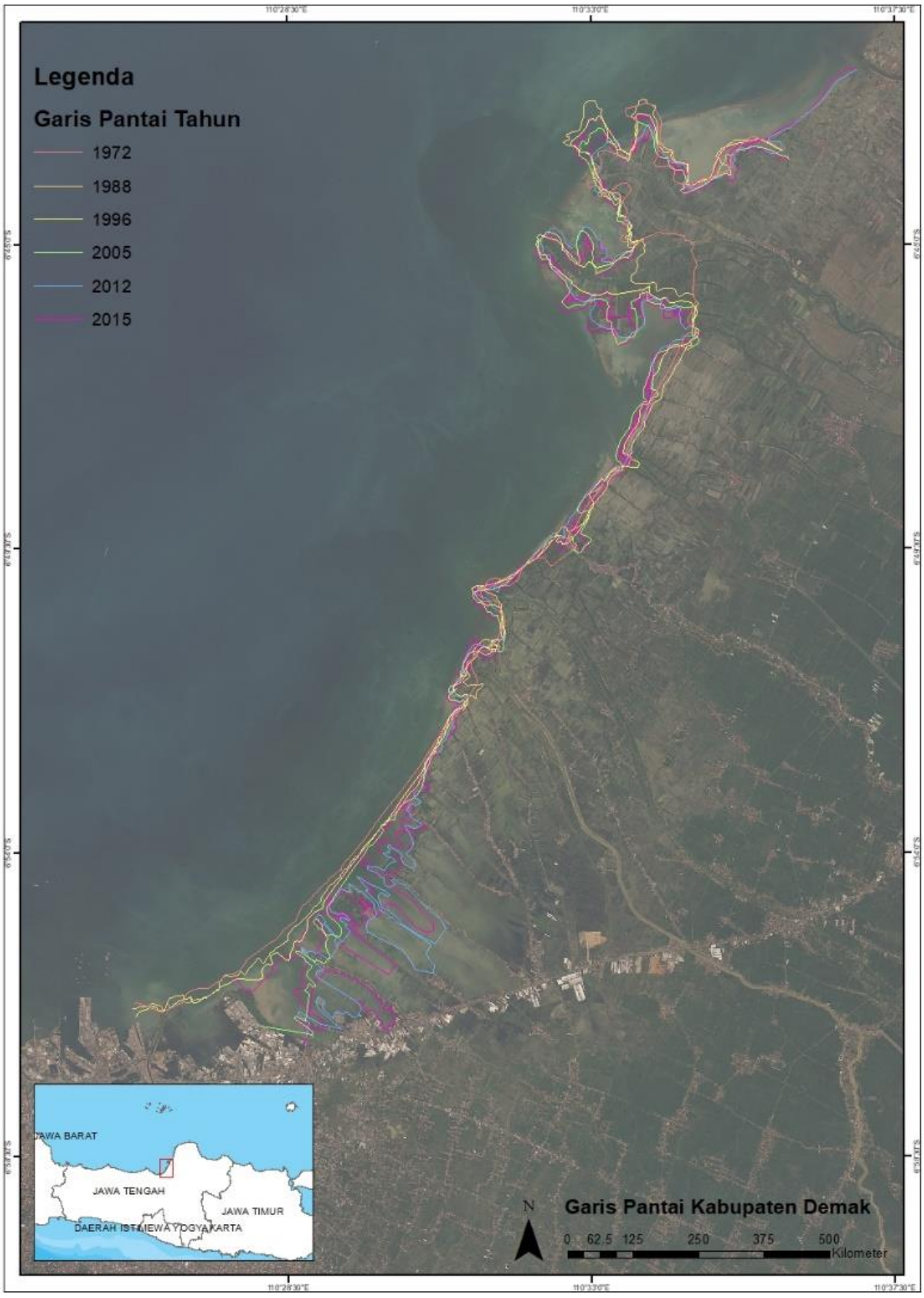


Figure 6. Demak Regency coastline changes over the period of 1972-2015.
Source: Wetlands International Indonesia, 2015.

In 1988, mangrove clearing for aquaculture development over the accreted land around the mouth of the Wulan River began to occur. Meanwhile, mangroves started to colonize in several other accreted areas. In this period, there was no significant changes to the coastline in southwestern area of coastal Demak, while rice fields and plantations started to be converted into brackish water aquaculture areas. [Ref 2]

In 1990, mangrove density in the aquaculture pond areas was decreasing, while sedimentation process around the mouth of the Wulan River was still occurring. Coastal erosion started to occur in 1996 on the southwest coast of Demak, especially in Sriwulan and Bedono village. Between 1990-1996, erosion in Sriwulan Village reached 500 meters, and Bedono up to 500 meters. [Ref 2]

In 1999, new colonization of mangroves was observed along the Demak coast, particularly over the accreted areas. Over the same period, aquaculture ponds also continued to increase, especially around the Wulan River. Between 1999-2002, erosion has encroached further 100 meters inland of Sriwulan and Bedono villages, making the total abrasion of 600 m from the previous coastline over the period of 1990-2002. Consequently, the sea water abraded the ponds, making the pond areas into water basin. [Ref 2]

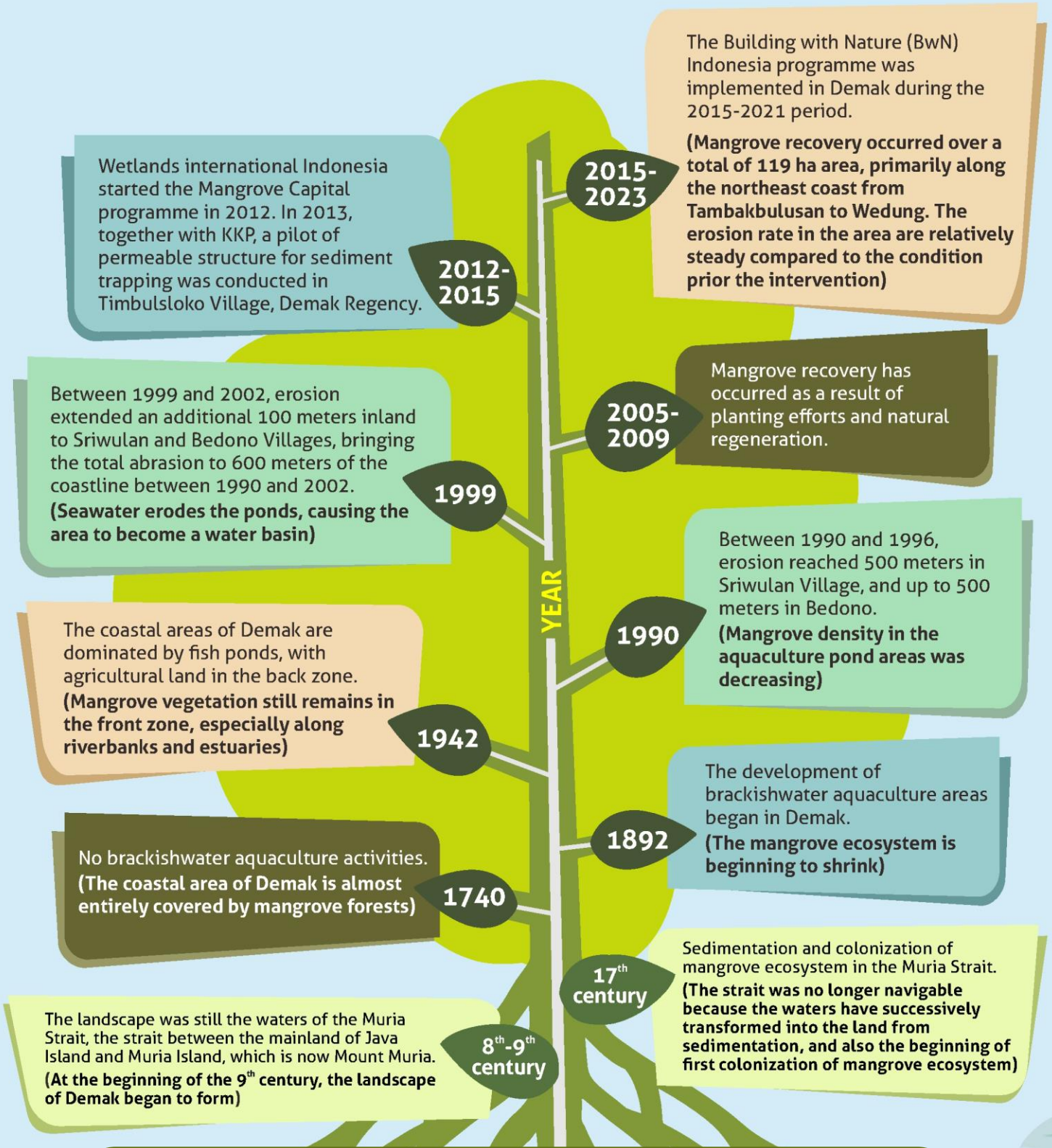
From 2005 to 2009, mangrove colonization was identified throughout the coastline of the Demak, even in the eroded areas such as in Dukuh Senik, Bedono Village. The mangrove recovery has occurred as the result of both planting efforts and natural regeneration. While sedimentation and mangrove colonization occured around the Wulan River delta, pond development also continued to expand. In the same period, abrasion on the southwest coast increasingly spread to Timbulsloko Village, followed by the formation of water basin, as well as the conversion of rice fields along the riverbanks into aquaculture ponds. [Ref 2]

In 2012, an increase in mangrove area in the eroded villages, namely Bedono and Timbulsloko villages, was identified, which was the result of a combination of natural regeneration and mangrove rehabilitation activities carried out by several stakeholders in Demak, predominantly by the local Marine and Fisheries Agency/DKP (Dinas Kelautan dan Perikanan) and Environment Protection Agency/DLH (Dinas Lingkungan Hidup). Common rehabilitation activities carried out included construction of wave breakers (APO) and mangrove planting. In 2013, more mangrove stands were observed along the pond bunds. [Ref 2]

Between 2012 and 2015, the increase in mangrove extent still occurred over the accreted land, sediment trapping areas, pond areas, riverbanks and deltas formed due to sedimentation. At the same time, abrasion on the southwest coast of Demak also got worse, encroaching Surodadi Village, and displacing several hamlets in Sriwulan and Bedono villages. On the other hand, accretion occurred on the northeast coast of Demak, starting from Tambakbulusan to Kedungmutih, bordering on Jepara Regency. Many sandbars (chenier) have also formed along the Demak coast. Apart from functioning as a natural barrier, some sandbar locations are grown with mangroves naturally. [Ref 2]

Between 2016 and 2023, mangrove recovery occurred over a total of 119 ha area, primarily along the northeast coast from Tambakbulusan to Wedung. The recovery includes the area of coastline and fishpond along the riverine system close to estuary. On the other hand, there is no significant accretion occurred in the southwest area. Nevertheless, the erosion rate in the area is relatively steady compared to the condition prior the intervention. The erosion would have been more severe if there is no intervention. In addition, chenier formations along the Demak coastline have been observed due to the coastal dynamics. The cheniers existence is relatively dynamic, moving and changing its shape from one into another. [Ref 3]

Table 1. Summary of historical timeline of Demak landscape transition as cited in Rahadian (2016).



It will take a long time to restore lost mangrove forests through successful restoration efforts. Many mangrove planting projects have been undertaken by various parties. However, these efforts to restore mangrove forests have not been effective and have often failed. One reason is a lack of understanding of the ecological and socio-economic requirements for properly restoring mangrove ecosystems.

2.2 Interventions and lessons learned on the interventions

In 2013, Wetlands International Indonesia, through the Mangrove Capital program, in collaboration with the Ministry of Maritime Affairs and Fisheries/KKP (Kementerian Kelautan dan Perikanan) and Deltares undertook pilot program to construct permeable structures aiming for trapping sediment in Timbulsloko Village, Demak Regency. It was part of the erosion control and mangrove ecosystem restoration program. In the first phase of trials in 2013, 435 meters long structures were built, which was divided into 6 sections. Moreover, another 185 meters long structure was constructed in the second phase in 2014. The constructed structures were monitored and evaluated in 2014. When we designed our Mangrove Capital Indonesia project, in 2014 we asked the Indonesian government (MMAF) about opportunities for exploring the role of mangroves in Building coastal resilience together. They introduced the issues they faced with erosion in Demak, and asked us for advice. They indicated traditional infrastructure solutions were not affective, and asked whether a more integral nature-based approach could help. We then joined forces with Deltares to perform an assessment of the root causes to erosion, and tested the permeable dam approach that was proposed by Professor Han Winterwerp, to explore if this civil engineering approach could be part of an integral solution to restore the coastline. We then continued to develop a full Building with Nature proposal with partners from Ecoshape and several Indonesian partners, raising over 12 million EUR from different sources. Later, based on the lessons learned from the implementation of permeable structure pilot program, a project proposal to implement the Building with Nature Indonesia was developed and submitted in 2014. The pilot project showed that the intervention is successful to trap the eroding sediment and bring back mangrove naturally. Reflecting on the experiment result, Wetlands International and EcoShape initiated to upscale the intervention along the Demak coastline by including the social-economic measures to improve the local community's resilience.

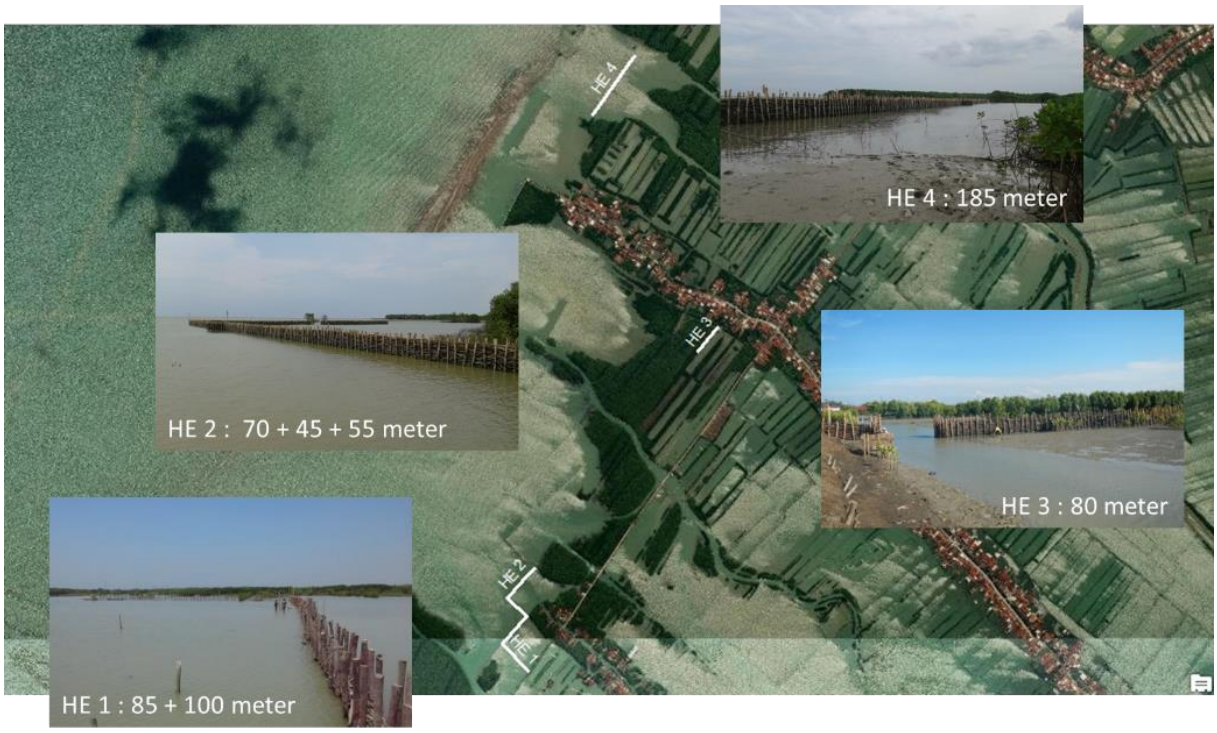


Figure 7. Permeable structures built by MMAF in Demak during the pilot project (2013-2014). (© Wetlands International Indonesia)

The intervention strategy implemented by the Building with Nature Indonesia program, which was implemented in Demak between 2015 to 2021, is as follows:

1. Large-scale implementation of Building with Nature along 20 km of coastline. The flagship program in Demak, will serve as a catalyst contributing to the mainstreaming of the BwN approach throughout Java, in Indonesia, and become an example for international outreach.

2. Policy dialogue to develop governance arrangements at national, district and community levels, with KKP, Ministry of Public Works and Housing/**KPUPR** (Kementerian Pekerjaan Umum dan Perumahan Rakyat), Provincial Development Plan Agency/Bappeda (Badan Perencanaan Pembangunan Daerah) and local communities to build an enabling environment for better coastal zone management.

3. Capacity building, which targeted government officials, private sector, university students and local communities.

Regarding to the large-scale implementation strategy, the program prepares preliminary designs depicting the types of technical and socio-economic measures that will be implemented in certain areas over the Demak coastline. The focus of the intervention was merely on coastal areas, including mangroves, fishponds, and intertidal riverine system. The main technical actions taken include the construction of permeable structures, rehabilitation of mangroves along the coastal and river green belts. Meanwhile, socio-economic measures include aquaculture management improvement and livelihoods diversification.

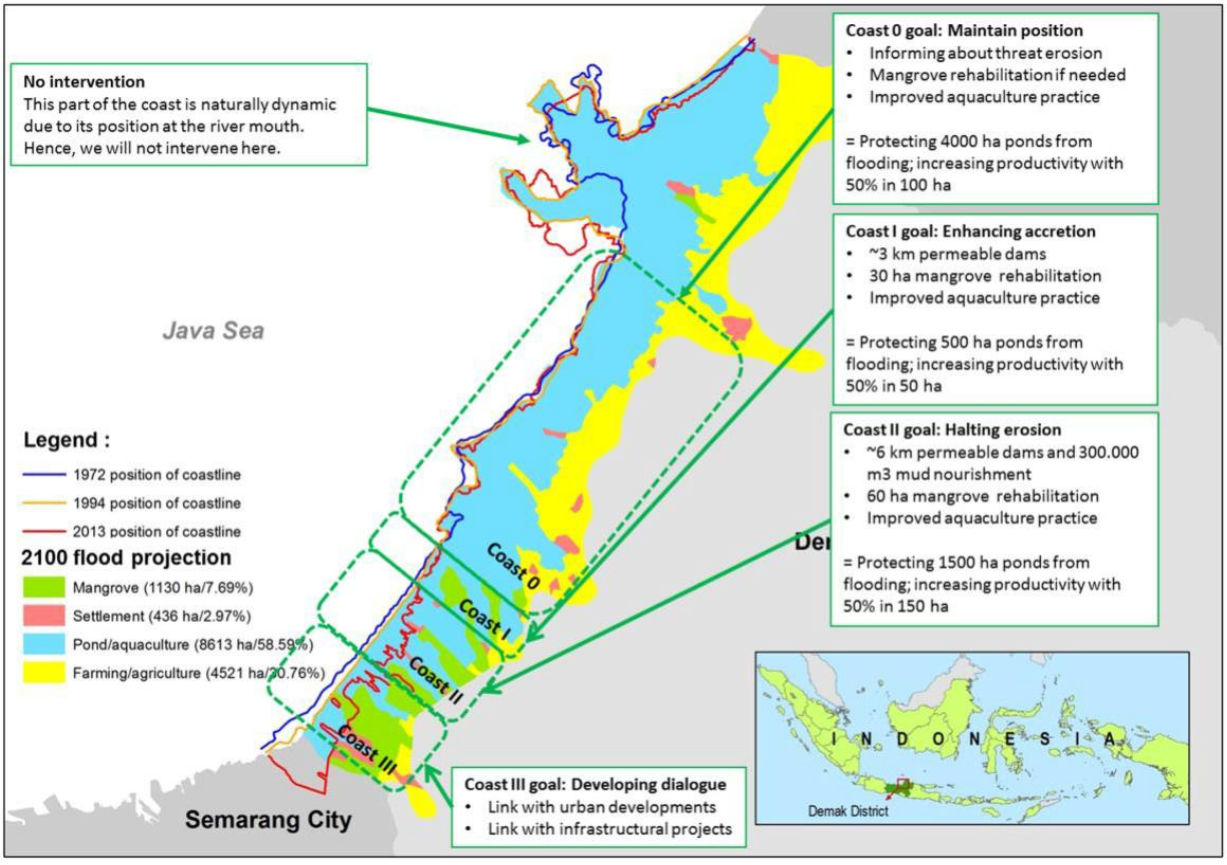


Figure 8. Intervention goals of Demak Regency coasts in accordance to vulnerability projection categorisation. Source: [Ref 4]

In general, the BwN Indonesia program, which was implemented in Demak between 2015 to 2020, can be grouped into 4 integrated components as follows: 1). Preparation and Planning, 2). Capacity and Trust Building, 3). Implementation and Monitoring, and 4) Sustainability. [Ref 5]

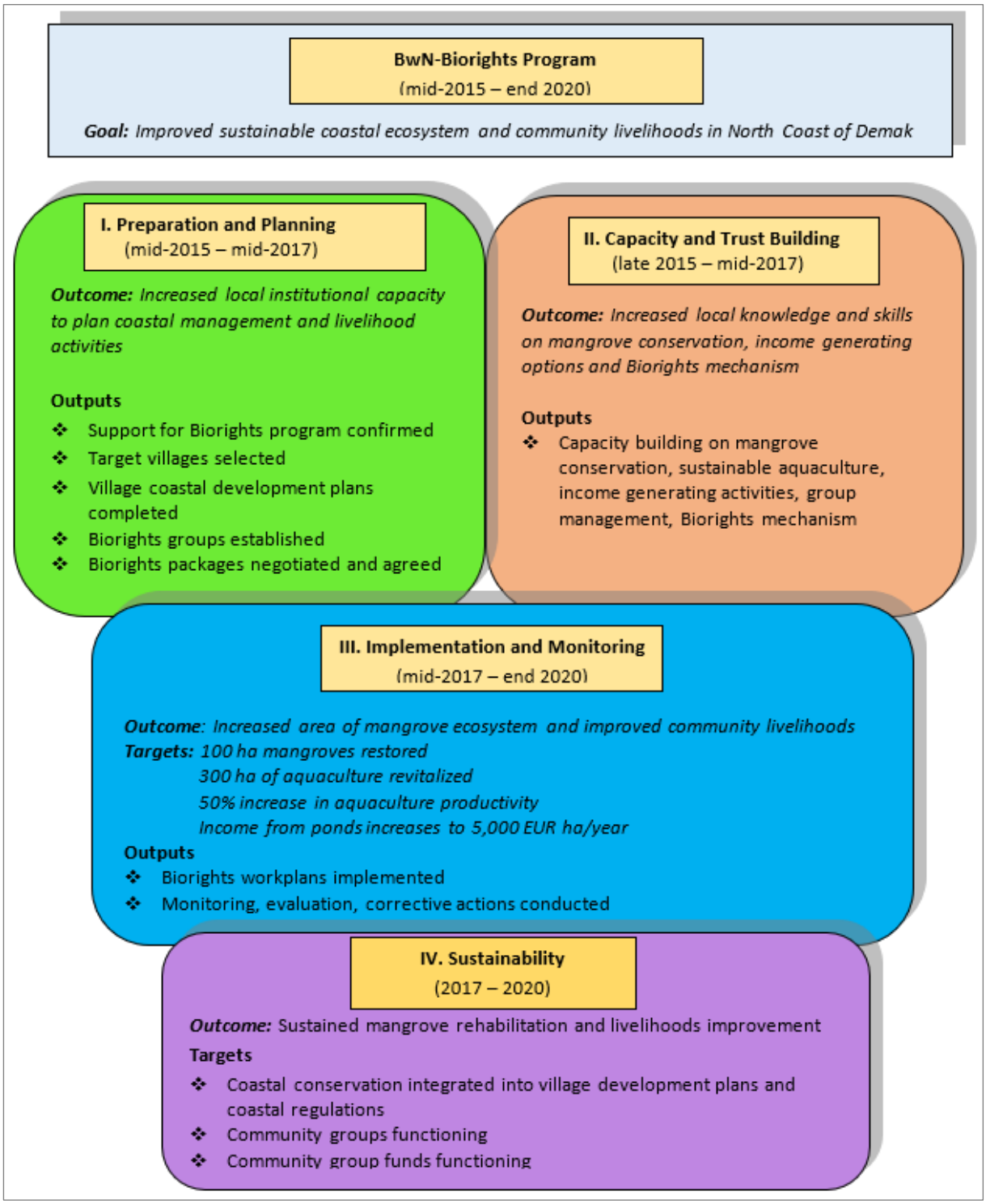


Figure 9. The BwN Indonesia program components through the Bio-Rights mechanism

Table 2. Summary of results and activities of Bio-Rights program in Demak.

Component I: Preparation and Planning *Outcome: Increased local institutional capacity to coastal management and livelihood activities*	
Outputs	**Activities**
1. Local community and government support for BwN-Bio-Rights program confirmed	1.1 Hold village meetings to introduce BwN-Bio-Rights program to local communities 1.2 Introduce BwN-Bio-Rights program to district government
2. Target villages selected	2.1 Conduct bio-physical and socio-economic feasibility survey 2.2 Map the status of aquaculture ponds in villages 2.3 Analyze problems and solutions for each village
3. Village coastal development plans completed	3.1 Identify long-term village development visions, problems faced, strategies to address problems, funding sources 3.2 Prepare coastal development plan for each village
4. Community-based Bio-Rights implementing groups established	4.1 Select group members 4.2 Establish legally recognized groups 4.3 Establish group administrative and financial systems
5. Bio-Rights packages negotiated and agreed	5.4 Design initiatives and prepare and negotiate Bio-Rights packages 5.5 Sign Bio-Rights contracts
Component II: Capacity and Trust Building *Outcome: Increased local knowledge and skills on mangrove conservation, income generating options and Bio-Rights mechanism*	
Outputs	**Activities**
1. Capacity building on mangrove conservation, sustainable aquaculture, income generating activities, group management, Bio-Rights mechanism	1.1 Conduct coastal field school on sustainable aquaculture 1.2 Conduct training and other capacity building activities 1.3 Introduce BwN-Bio-Rights program
Component III: Implementation and Monitoring Outcome: *increased capacity of community group members to implement mangrove conservation and restoration (coastal and riverine greenbelt) and income generating activities*	
Outputs	**Activities**
1. Bio-Rights workplans implemented	1.1 Prepare annual workplans 1.2 Implement Bio-Rights initiatives
2. Monitoring, evaluation, corrective actions conducted	2.1 Monitor, evaluate and conduct corrective actions
3. Loan converted to grant, when criteria met	3.1 Conversion of loan to grant
Component IV: Sustainability Outcome: Sustained mangrove restoration and livelihoods improvement	
Targets	
1. Coastal conservation measures integrated into village development plans and coastal regulations 2. Community groups functioning 3. Community group funds functioning	

The preparation and planning component and the capacity and trust building component were implemented in parallel from mid-2015 to mid-2017, with the latter component was being continued until the end of the program. The implementation and monitoring component, as the main deliverables to achieve the main goal of coastal restoration, was delivered between mid-2017 through to the end of 2020. Meanwhile, the sustainability component was built integratively throughout the program components from 2017 until the end of the program in 2020.

The outcome of each component was the result of a combination of outputs, in which each output was achieved through a series of activities. The implementation of all components was delivered under the package deal of Bio-Rights (see Chapter 5 on Access to finance). One of the important elements of Bio-Rights mechanism is its flexibility in adapting to local bio-physical and socio-economic conditions, so that the element of the Bio-Rights process cannot be viewed as a blueprint.

2.2.1 COMPONENT 1. Preparation and Planning (mid 2015 – mid 2017)

Securing community-level support for the BwN program and Bio-Rights mechanism was a priority in the beginning months of the program. During this period the BwN field team engaged in an intense process of socialization.

The purpose of the socialization meetings was to introduce the BwN approach to community members and learn more about the situation in the villages. During the meetings the field team provided a general overview of the program and the two main types of field activities: i) mangrove restoration through construction of permeable structures to restore sediment and pond conversions into mangrove ecosystems and, ii) the revitalization of aquaculture ponds in order to improve the livelihoods of coastal communities. The Bio-Rights implementation mechanism and coastal field schools (CFS) approach were also introduced.

Identification of the long-term village development vision, problems faced, strategies for overcoming problems, funding sources, is carried out using the Participatory Rural Appraisal (PRA) method. The purpose of the PRA was to:

- Contribute to village coastal area planning processes
- Embed the BwN concept into village planning processes
- Obtain more detailed information about each target village to ensure appropriate BwN interventions
- Strengthen the critical thinking, analytical and planning skills of community members

During the process, tools such as telling village histories, visioning, seasonal calendars, trend analyses and participatory mapping were used to encourage participants to think critically and creatively about their village coastal environment and plan. Results from the PRA includes:

- Agreed visions for the villages
- Maps prepared by community members of their local environment
- Analysis of the village assets, problems, strategies to address the problems, suggested activities and funding sources

Following the PRA assessment, in each village a small drafting team including representatives from the village government, the Village Consultative Body/**BPD** (*Badan Permusyawaratan Desa*) and community leaders worked with the BwN field team to analyze and organize the information from the PRA into a strategic management plan for the coastal area of the village. The strategic plans were intended to:

a. Provide input to the identification of priority activities for consideration of the government, the private sector and other parties wishing to develop programs in the village.
b. Determine the division of roles and responsibilities in the implementation of coastal area management in the village.
c. Identify joint steps to manage village coastal areas.
d. Ensure sustainability beyond program lifetime.

These plans provided both a framework for planning of BwN-Bio-Rights activities, and were used in the annual village planning processes/Musrenbangdes (Musyawarah Perencanaan Pembangunan Desa).

Each plan included:

- A vision for the village.
- A matrix showing village assets, problems and their scope, strategies to address the problems, activities to implement the strategies, sources of support.
- A map of the village from an ecological perspective.

Implementation of the Preparation and Planning component activities started in September 2015, in which nine villages in Demak Regency were selected as the implementation sites of the Building with Nature Indonesia program in mid 2016. Moreover, the selected villages were then facilitated to develop its coastal area management. By mid 2017, the program has also formed ten community groups equipped with improved technical, legal and administrative capacity to undertake the planned activities under the Bio-Rights mechanism. It required nearly two years preparation prior the field implementation. This long gap implicates the dynamics of community development program planning and communication with the community. During the period, impatience among the communities was observed, however in the end the local stakeholders expressed their high appreciation for the comprehensive preparation and planning process.

Lessons learned from the preparation and planning component

Experience in Demak showed that location of target ponds in the landscape can serve different purposes**. When the program targets high environmental impacts, then the inclusion of the adjacent (clustered) ponds can meet this goal**. **On the other hand, having scattered ponds implementing the introduced approach across the landscape may also increase the program visibility among the local communities as the 'farmers may look over the fence' and copy the introduced approach and therefore increasing local replication.** In future planning, it is advisable to set the program objectives by considering the pros and contras of the possible approaches. Moreover, the program design did not consider the requirement that the intervened ponds have to be situated in a cluster (side by side). Consequently, it turned out that the selected community members' ponds were in scattered areas. Because it is not possible to change the members who have been selected, the intervention continued to be applied in scattered ponds. The condition of the scattered ponds made the expected function of the greenbelt mangrove being less effective. The lesson from this process is that there is no integration between the intervention locations and the selection criteria for pond group members. The criteria in recruiting members of community groups to be involved in the Building with Nature Indonesia program should be reviewed and improved in the future. Such criteria must be determined at the onset of the program. Questions that are relevant to program implementation priorities can be used to review these criteria. Furthermore, criteria can also be weighted based on priority.

Regarding gender issue, gender analysis must be considered as an integral part of the program design. Moreover, a gender strategy should also be developed from the outset of the program for implementation guidance. Furthermore, gender mainstreaming should be an integrated policy throughout the program components. Through gender mainstreaming, the delivery of activities is inclusive, reducing the delivery of additional activities or processes specifically for single gender group.

At the field level, documentation of activities has been carried out very well, both by community group members and field facilitators. This information-rich documentation is very valuable for program management, especially regarding field progress, and also inspiration for across the country scaling-up. In the future, it is necessary to think about integrating this documentation into the knowledge management system so that it contributes to program monitoring, evaluation, and learning.

The successful implementation of the BwN program had been possible due to active participation of the local community. Moreover, community's active participation can be achieved through winning the community's trust. Building the trust was quite challenging at the beginning primarily due to inconsistencies in the information released by the program to the communities. Negotiations with community groups are carried out while the scheme package is still under re-development. Consequently, the field facilitators must be toing and froing repeatedly to communicate the program intention until it is finalized. The situation consequently made the program team have to make appropriate adjustments in order to meet the local conditions of Demak. For example, the local cultural norms related to gender led to male-dominated community group selection. Adjustment was later made by forming women's groups to ensure that women's participation in coastal natural resource management could be accommodated. In the future, the program must ensure that the local conditions are considered in the development of the scheme package. Moreover, the program must develop communication strategy and plan to guide the program team in delivering appropriate messages to the relevant stakeholders.

A five-year plan is ideal to carry out the whole package of the Bio-Rights scheme, considering the extra time to observe the results of mangrove rehabilitation. Bio-Rights can be applied with various time schemes, with the implementation plan can be adjusted to the available time scheme. Setting up the Bio-Rights scheme required nearly two years preparation prior the field implementation. This long gap implicates the dynamics of community development program planning and communication with the community. During the period, impatience among the communities was observed, however in the end the local stakeholders expressed their high appreciation for the comprehensive preparation and planning process. A five-year plan is an ideal timeframe to deliver the Bio-Rights scheme. With such timeframe, there is sufficient time to observe the results of the mangrove rehabilitation. Basically, Bio-Rights can be applied with various time schemes. The implementation plan can be adjusted to the available timeframe. In future programs sufficient time should be devoted to the set-up of Bio-Rights schemes for impactful implementation. The set-up process must be developed during the project planning phase.

2.2.2 COMPONENT 2. Capacity and Trust Building (early 2016 – early 2020)

Capacity building regarding coastal conservation and sustainable livelihoods of the local communities was carried out throughout the program period, that is from early 2016 to early 2020. This capacity building took the form of coastal field schools, training on the topics of mangrove restoration, sustainable aquaculture, alternative livelihoods, group management, and monitoring and evaluation.

The aim of this capacity and trust building activity included to increase the group members' knowledge about coastal and mangrove conservation, sustainable aquaculture, alternative livelihoods, and group management, to increase prospective group members' understanding of the BwN program so that they may have informed decision upon their participation in the program, as well as to get input from the community on the design of the BwN program so that it suited local needs and conditions.

Capacity and trust building activities carried out by the BwN program have resulted in changes in the intervened communities, such as increased awareness of the value and importance of mangrove ecosystems, increased awareness and practical skill on sustainable aquaculture, improved knowledge on coastal erosion prevention, widened perspectives on alternative livelihood options, increased organizational management capacity and community participation, as well as increased capacity in networking and partnership building which attract supports from the local government in implementing the BwN activities.

Lessons learned from the capacity building and trust component

Increasing community capacity played an important role in promoting the BwN program, which in turn helped the community to make informed decision on their involvement in the program. The capacity building activities delivered at the beginning of the project constituted the natural process for group members recruitment. Those who remained in the group were those who were committed to the program. A capacity building and trust component should be part of the long-term development of the program, as it is important to build trust and assess individual commitment. In addition, it is important to strengthen the community's social capital such as environmental awareness, technical knowledge, social communication, networking and collective trust.

The implementation of the BwN program in the field was closely related to issues happening within the community, such as tenurial (land ownership status), where the program required the community's contribution to 'sacrifice' part of their lands (ponds) for mangrove rehabilitation activities. The Wetlands International Indonesia field team took the time in the initial phase of program planning to stay in the village to approach and communicate both formally and informally with the relevant stakeholders at the village level. This is very important to build relationship and trust with the community until we arrived at the shared vision of the program.

The BwN program encouraged the community to identify alternative livelihood options to generate income since many of their ponds were damaged from abrasion and tidal flood or even did not have ponds to manage. In its implementation, there are still several challenges faced by the community in developing this alternative livelihood. In the future, the program is expected to be able to provide special assistance related to livelihood diversification, including business development and product marketing.

The BwN program has not included marketing component in its effort to increase the community's livelihoods and income. The majority of the developed products were merely marketed in the village. In the future, to enable improved marketing and sales of the developed products, the program must conduct value chain and market analysis, especially for fishery products.

2.2.3 COMPONENT 3. Implementation and Monitoring (mid 2017 – end 2020)

Implementation and Monitoring was carried out from mid 2017-end 2020. This took the form of technical and social economic measures. The main technical actions implemented at the project site included rehabilitation of mangroves for coastal and intertidal riverine green belt. Mangrove rehabilitation for coastal greenbelt was undertaken by administering permeable structures (sediment trapping approach) to recreate suitable near shore bed for mangrove regrowth. Meanwhile, the rehabilitation of mangroves for riverine greenbelt was implemented by administering ecological mangrove rehabilitation (EMR) method and Associated Mangrove Aquaculture (AMA) design, in which the ponds located along the riverbanks will be partly converted into mangroves while the other part will be maintained for fish/shrimp farming.

Furthermore, the socio-economic actions implemented in Demak involved aquaculture revitalization through improved pond management and administering Low External Input and Sustainable Aquaculture (LEISA) principles, diversification of mangrove-associated livelihoods and collective entrepreneur development.

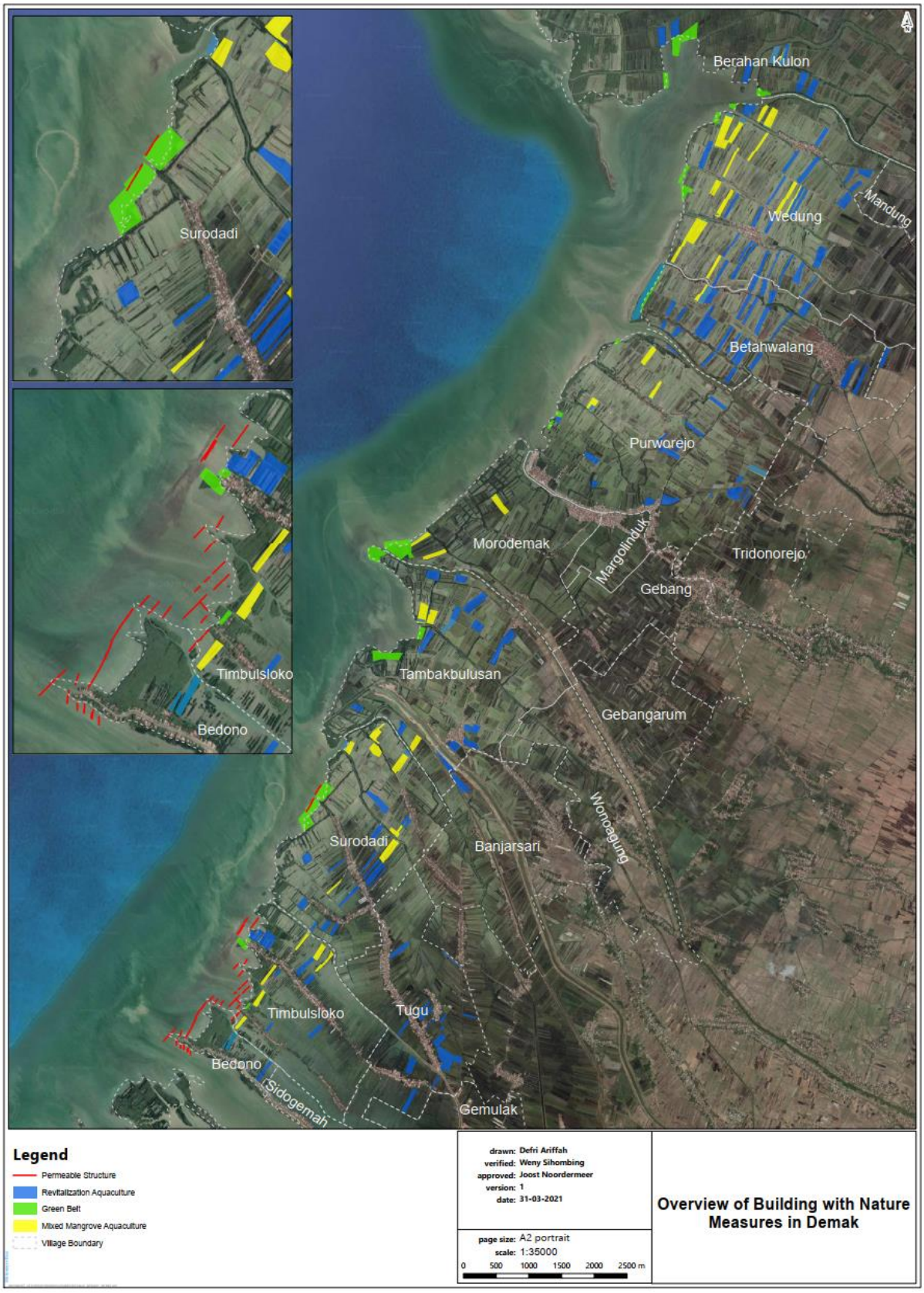


Figure 10. Map of initiatives implementation locations in Demak Regency, encompassing aquaculture revitalisation, and coastal and riverine greenbelt. Note: Green belt in the legend refers to coastal greenbelt; Mixed Mangrove Aquaculture (AMA) refers to riverine greenbelt. These initiatives involved mangrove restoration.

Lessons learned from the implementation and monitoring component

Participation in the BwN program required clean and clear land status. This matter constituted a significant challenge because the affected coastal area, especially productive ponds, will be converted back into mangrove forest permanently. Apart from that, the majority of the pond's owners were not residing in the village in which the intervention was delivered. Having such issues, **the intervention that can be taken is by developing a management plan of the restored area**, either by having an agreement with the ponds owners or enacting local regulation, such as at village or regency level.

In addition to the tenurial issue, **scattered aquaculture ponds posed a significant challenge to achieving the greenbelt objective**, as they often led to conflicts with neighboring farmers whose ponds were vulnerable to damage from strong river currents. **In future interventions, a refined approach involving the creation of clustered pond groups and structured group membership is recommended**. This strategy proved effective in Demak, where the Bio-Rights mechanism inspired over 30 pond owners to express interest in joining. The existing group successfully agreed on a process to accommodate new members. Moving forward, this cluster-based model can be replicated by forming new groups, with current members serving as champions to promote the approach. While upscaling should continue within the Demak district, the same strategy could be applied in North and East Kalimantan under new proposals. However, a key challenge remains: many farmers live far from their pond areas. To address this, awareness-raising efforts targeting local communities, government bodies, and stakeholders have been initiated, though the issue persists and requires ongoing attention.

Compensation arrangements over the ponds that were included in mangrove rehabilitation activities along the coastal greenbelt and riverine greenbelt area were done in accordance with the ponds size. However, it turned out that the proposed ponds had different conditions and consequently affected the rehabilitation costs and definitely the level of success of mangrove rehabilitation activity over the area. **In the future, in assessing the compensation amount for each pond, it is highly recommended to ensure first that the proposed ponds are in feasible conditions for rehabilitation, apart from the size.**

The BwN program focused on village level policies to manage coastal areas at the village level. However, since many coastal degradation events are crossing administrative boundaries, therefore policy for coastal area management must be developed beyond the village level, being in parallel with provincial and national level policy and encompassing all related drivers, such as aquaculture expansion due to increased market demand for fish produce, groundwater extraction that leads to land subsidence, and so on.

Community's involvement in activities monitoring is very crucial for the success of program implementation in the field. By conducting periodic monitoring, problems could be identified early and appropriate adjustment actions could be taken for program improvement. The monitoring activities undertaken by the community were funded by the program. It is advisable that the mechanism for self-funding could be encouraged within the groups, so that they are able to continue the monitoring and maintenance activities in the villages once the program ends. The funding for monitoring can be collected by the community group from membership fee, pond harvest fee, and interest rate from saving and loan program.

In addition, here are some specific lessons learned from each technical and socio-economic actions implemented at the project site:

- Mangrove rehabilitation along the coastal greenbelts.
    a. Group members recruitment should target villagers whose the ponds are located at the coastal green belt zone.
    b. More attention should be given to improve community's awareness regarding the approach of mangrove rehabilitation over aquaculture areas using Associated Mangrove Aquaculture (AMA) design and the concept of To Plant or Not To Plant (TPNTP).

c. The negotiation of the package deal, encompassing the disbursed financial compensation and group members' contributions, must be mutually agreed by both parties in advance.

- Permeable structure.

a. The Hybrid Engineering structure design and its placement considerations should be scrutinised for more effective implementation and results.
b. The structures placement has been critisised by stakeholders for resulting in less optimum sedimentation. A few of the critics included 1). the structures were built far from the shore, and 2). the unprecedented strong sea waves flushed out the accumulated sediment.

- Mangrove rehabilitation along the riverine green belt.

a. Group members recruitment should target villagers whose the ponds are located at the riverine green belt zone.
b. More attention should be given to the provision of intensive awareness raising and capacity building for the group members about the concept and implementation guide of Associated Mangrove Aquaculture (AMA) design.
c. The negotiation of the package deal, encompassing the disbursed financial compensation and group members' contributions regarding aquaculture management, must be mutually agreed by both parties in advance.

- Improved aquaculture management practice.

a. The implementation of aquaculture field schools is evident to increase the capacity of fish farmers in conducting farm's agroecosystem analysis.
b. The replication of LEISA principle in pond management is proven to increase the survival rate of stocked fish and shrimp.
c. The application of synthetic chemicals-based inputs in pond management is declining among the group members.

- Alternative livelihoods development.

a. Small scale business development provides alternative livelihood options for group members who do not own ponds.
b. Collective small scale business run by the groups provides benefits for all the group members.
c. The developed businesses have also involved other villagers from non-group members.
d. Community based mangrove tourism has started to develop and been empowering the groups and the village government.

- Policy dialogue at the village level.

a. Good communication and relationships with village government are built and maintained by the group members in each village.
b. Group members have been actively involved in village government programs, especially in village-level policy development processes.
c. Increased authority of the village government has enabled them to prioritise coastal rehabilitation activities and allocate village funds for the implementation.

Reflecting on this timeline, Wetlands International changed its intervention strategy throughout the program phase. The changes are described as follows:

Program planning phase

- Intervention site selection
  Evaluation of the pilot project in 2014 showed that the target area is feasible for mangrove rehabilitation. The result was considered in determining Demak as the project site. Upon the completion of the pilot project, Wetlands International intended to intervene majority of the coastal villages of Demak, from Sriwulan to Wedung. The decision to shift from a pilot to a landscape-scale approach in the Building with Nature (BwN) initiative likely emerged following the positive outcomes observed during the trial application of permeable structures between 2013 and

2014. These early interventions demonstrated promising results in restoring eroded coastal land and enabling natural mangrove regeneration, which encouraged the team to expand the scope beyond isolated pilot sites to a broader landscape-level strategy. This shift allowed for a more integrated and sustainable restoration effort, aligning with the ecological and social complexities of the region.

However, after further observation, Sriwulan Village was declined because the condition of the village's coastline was severely eroding. Moreover, the area was deeply inundated and prone to strong wave exposure, making it challenging to implement the technical intervention in the field.

Apart from that, it was also decided to involve one landlock village, namely Tugu Village. The selection of this village was aimed at connecting it to adjacent coastal vilage, namely Timbulsloko, to encourage collaborative action in managing the coastal areas.

Program implementation phase

- Stakeholder collaboration evolved significantly over time. During the pre-implementation phase in 2015, engagement primarily involved international and national-level actors such as EcoShape, Deltares, Witteveen+Bos, Imares, and the Indonesian Ministries of Marine Affairs and Fisheries, and Public Works. While the details of this early engagement process are not fully documented. In contrast, the implementation phase saw a more localized and strategic engagement with stakeholders such as Diponegoro University (UNDIP), Blue Forests, and KotaKita. These partnerships were formed based on the specific expertise and experience each organization brought to the project—UNDIP contributed knowledge on aquaculture, Blue Forests facilitated coastal field schools, and KotaKita supported collaboration with the Semarang city government. This evolution reflects a growing recognition of the importance of local knowledge and institutional support in achieving long-term restoration goals.

- Collaboration between Wetlands International Indonesia and Blue Forests in delivering field implementation.
  Initially, Wetlands International Indonesia and Blue Forests delivered their activities in the field independently. Later, in order to create an orchestrated delivery of the activities in the field, it was decided that the two teams worked together as a team under the coordination of Wetlands International Indonesia's field coordinator.

- The order of community capacity building activities implementation.
  It was planned that community capacity building activities, encompassing coastal field schools and other trainings, were to be delivered after the formation of community groups. However, since the group formation process took longer than expected, it was finally decided that the activities were delivered in parallel with the group formation process and the Bio-Rights package deal negotiation. In addition, a series of training activities also had been used as a means of group members selection, which were finally formed in the middle of the BwN program period.

- Bio-Rights agreement period
  Similar to the previous point, the contract period of the Bio-Rights scheme for the community groups became three years, while the ideal scheme is five years. It occurred because the process of negotiating the activity package deal took longer than it was planned. The decision was taken corresponding to the remaining project duration of BwN, which was merely three years left since the agreement between the community groups and the BwN had been reached. Despite the shortened implementation period, all the Bio-Rights steps and package deal (agreed benefits and responsibilities attached to the community groups) can be accomplished successfully within the timeframe. On the contrary, mangrove rehabilitation progress and results could not be observed optimally within the compact timeframe. For future recommendation, while a three-year implementation can fulfill contractual obligations, a five-year timeframe is essential

to **achieve optimal ecological outcomes**, **build lasting community engagement**, and **ensure the long-term success** of the Bio-Rights scheme.

A **five-year time frame** is considered ideal for successfully delivering the Bio-Rights scheme due to several key reasons:

1. **Time-Intensive Negotiation Process**: The initial phase of negotiating the Bio-Rights activity package with community groups took longer than expected. This delayed the start of implementation, reducing the available time within the project's overall duration.
2. **Comprehensive Implementation Needs**: While the Bio-Rights steps and agreed benefits/responsibilities can technically be completed within a shorter period (e.g., three years), the **full ecological impact**, particularly **mangrove rehabilitation**, requires more time to be observed and evaluated effectively.
3. **Ecological Restoration Timeline**: Mangrove ecosystems regenerate slowly. A longer timeframe allows for monitoring natural regeneration processes, adjusting interventions based on ecological feedback, and ensuring sustainability and resilience of restored areas.
4. **Community Engagement and Capacity Building**: A five-year period provides more space for strengthening community ownership, building local capacity, and institutionalizing practices and governance mechanisms.

- The cancellation of mud nourishment technical action.
  One of the technical actions planned for mangrove rehabilitation in Demak coastal areas was mud nourishment. It is a technical action undertaken by adding mud, taken from other places, into the target rehabilitation site in order to create appropriate subtrate and surface elevation for mangroves to regenerate naturally. The cancellation of mud nourishment was done by considering that the planned action might have disrupted the environmental balance of the area if the action (mud extraction) proceeded.

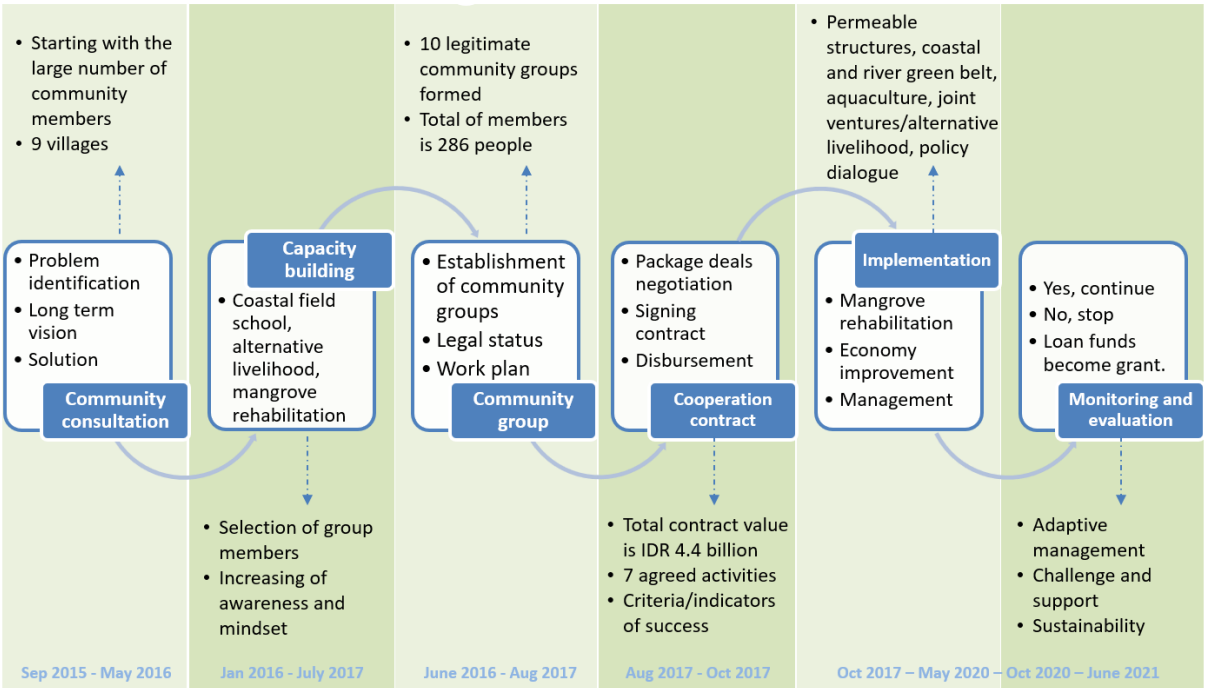


Figure 11. Bio-Rights scheme implementation process and results over the program period (2015-2021).

Table 3. Typical Bio-Rights Initiatives in BwN program

Core Initiatives (Measures)		Field Activities
1.	Coastal Greenbelt (HE/ permeable structures)	• Monitor and maintain HE/ permeable structures (e.g., monitor regularly, repair the structures' poles, filling material/ brushwood, install/ fasten the wires, safeguard the sediment). • Convert ponds into mangroves, e.g., land leveling (sediment dredging, fill material), hydrology restoration (breaching of dike walls, plugging or filling of drainage channels). • Maintain existing mangroves.
2.	Riparian greenbelt (Mixed-mangrove aquaculture)	Implement mixed-mangrove aquaculture techniques on ponds adjacent to the river. A portion of ponds bordering waterway was converted into mangrove restored areas.
3.	Livelihoods	***Individual ventures***: • Revitalize existing aquaculture, e.g., implementing LEISA, with or without innovative methods (e.g., polyculture). • Other income generating activities, e.g., procuring fisheries gear, chicken raising, retail.
		Group ventures: Procure fisheries gear, cat fish aquaculture, build mangrove tracks for tourism (as a group venture), saving-lending, etc..
Supporting Initiatives (Non-Measures)		**Field Activities**
4.	Group legal status and functioning mechanisms	• Obtain community group's legal status from the Ministry of Law and Human Rights. • Hold regular group meetings.
5.	Annual workplans	• Annually develop and update group workplans.
6.	Village development plans	• Involve in the preparation of village development plans. • Advocate coastal conservation into village development programs.
7.	Village regulations	• Involve in the preparation of village coastal regulations. • Village coastal regulation information dissemination to other community members. • Actively participate to enforce village coastal regulations.
8.	Monitoring	Monitor overall implementation of the BwN-Bio-Rights initiatives.
9.	Capacity building	Participate in training and other capacity building measures for implementation of livelihoods and other activities.

3. LANDSCAPE RESTORATION PROCESS

3.1 Building an effective landscape partnership

To promote collaboration across various sectors, partnerships between the public and private sectors, as well as multi-sectoral consortia or alliances, are emerging as a result of tenders and funding programs like the Dutch Sustainable Water Fund (SWF). We took a phased approach where started with a system analysis, to understand key challenges and potential solutions in the Demak area. We then tested different solutions at a small scale. Key factor to success was that we aligned our funds with those from the government. This helped to cement a true collaboration between government and non-government partners. We then secured large-scale funding to implement a full-fledged demonstration project. The results of this work have led to the Indonesian government committing funds to replicate our approaches elsewhere and supported the development of a national strategy to curb soil subsidence along coastlines, among others. We developed the long-term vision, based on which we designed the different project phases. We adapted our approach based on emerging new realities and as our understanding of the functioning of the coastal system expanded.

Stakeholder engagement in the implementation period since 2015, especially local stakeholders such as Diponegoro University (UNDIP), Blue Forests and Kota Kita, emerged after the programme identified the need to work with them due to their expertise and experience. For example, knowledge on aquaculture with UNDIP, field school with Blue Forests, and cooperation with the Semarang city government through KotaKita. Moreover, the implementation of Building with Nature Indonesia was carried out through a public-private partnership. This program brought together international expertise and experience along with local, context-specific knowledge in fields such as engineering, aquaculture, ecosystems, capacity building, and governance. Each partner contributed specific expertise, experience, and skills, with distinct roles within the project, including policymakers, engineers, biologists, ecologists, economists, and aquaculture experts

The following are principles embraced in building an effective landscape partnership during the BwN project implementation [Ref 32]:

1. Facilitating transdisciplinary collaboration

Enabling transdisciplinary and cross-sector collaboration is crucial for the successful and sustainable execution of water infrastructure projects. The driving force behind the establishment of EcoShape was the facilitation of such collaboration. EcoShape is a consortium comprising 20 (twenty) organizations, encompassing government agencies, dredging companies, engineering firms, research institutions, and non-governmental organizations (NGOs). These entities collaborate to develop and exchange knowledge and experience related to Building with Nature. Members collectively share the belief that innovation is best achieved through collaboration across multiple sectors and the public-private domain.

In Indonesia, the Building with Nature initiative played a pivotal role in fostering collaboration among national, provincial, and district

departments of two Indonesian ministries responsible for coastal and marine resource management, as well as technical and large-scale infrastructure, including coastal and river flood defenses. This initiative primarily focused on planning, testing, and implementing measures within the project while also working on creating a conducive environment for nationwide implementation of Building with Nature. WI was responsible for the project development and its management, including field implementation, policy dialogue with government at national and sub-national level.

2. A multi-stakeholder approach

The Building with Nature Indonesia program was launched to bolster the protection of local communities from land erosion and flooding, aiming to steer their economies towards an inclusive and sustainable utilization of the restored coastal mangrove system. The program brought together a wide-ranging network of professionals with diverse expertise and interests. Stakeholder engagement in the early implementation phase in 2015 involved EcoShape, Deltares, Witteveen+Bos, Imares, MMAF/KKP, and KPUPR. Moreover, stakeholder engagement in the implementation period started in 2015, involved Diponegoro University (UNDIP), Blue Forests and Kota Kita. Consideration for stakeholder engagement corresponded to the required expertise and experience. For example, knowledge on aquaculture with UNDIP, coastal field school with Blue Forests, and cooperation with the Semarang city government through Kota Kita.

The active participation of local governments, universities, and citizens played a central role in the planning, execution, and maintenance of coastal adaptation measures. In Demak, Coastal Field Schools improved farmers' resource management capabilities by providing guidance on sustainable aquaculture practices. Subsequently, a financial incentive mechanism known as Bio-Rights was introduced to harmonize economic productivity with environmental conservation and restoration efforts.

3.2 Enhancing shared understanding of the landscape

Transforming a Building with Nature project into a true success story involves more than just collaborating with the local natural environment; it also requires engaging with the local social economic framework. Having good understanding of both has enabled the BwN consortium to design and implement the most relevant solutions to the target landscape and its community. In addition to that, it enabled the local stakeholder's engagement since the early stage in addressing the local issues.

The Building with Nature design approach encourages all parties to approach the project differently, urging them to adopt a fresh perspective. This perspective extends beyond the conventional engineering problem-solving approach and embraces an attitude inspired by ecology and sensitive to governance issues, seizing opportunities as they arise. From a project development standpoint, this means beginning with an understanding of the entire system rather than focusing solely on the intervention. This broader comprehension of the system aids in a better understanding of the problems for which solutions are being sought. In this context, 'the system' encompasses not only the natural components (biotic and abiotic) but also the socio-economic and institutional sub-systems. Equipped with this comprehensive knowledge of the system, the Building with Nature project developer and stakeholders collaborate to explore possibilities for mutually beneficial solutions. Achieving this necessitates an open-minded approach, embracing creativity and a transdisciplinary method. [Ref 32]

Demak landscape system consists of the interconnectedness of coastal zones, river basin and water resource management (natural system) and socio-economic system. To improve understanding of coastal Demak landscape system comprehensively, the project consortium comprising NGOs and experts conducted a system analysis or baseline study. The analysis examines

the driving natural processes as well as the underlying socio-economic factors that shape the coastal Demak landscape. The study also involved problem analysis and risk assessment. [Ref 31]

During the system analysis, a hydrological and morphological study was conducted to investigate the factors behind coastal erosion and flooding in Demak. This study provided a comprehensive analysis of how waves and currents affect the movement of sediment. The findings revealed that the primary reasons for erosion are the clearing of mangrove areas for aquaculture expansion, the erection of coastal structures that disrupt the accumulation of sediment from offshore origins, and the canalization of rivers, which hinders the dispersion of sediment within the system. [Ref 31]

Subsequent investigations revealed that unsustainable groundwater extraction was a fundamental cause of land subsidence, underscoring the significance of continuous monitoring [Ref 6]. While subsidence had been acknowledged as a concern previously, it wasn't immediately apparent that extracting water to serve urban and industrial needs could lead to significant land -level changes over 20 kilometers away along the coast. The realization of the extent of land subsidence occurred when monitoring poles, positioned in the intertidal area three years earlier, vanished from sight. It was discovered that they had sunk along with the ground, descending below sea level, by as much as 30 centimeters in just three years [Ref 34]. Subsidence not only results in the land surface sinking but also elevates water levels, causing larger waves. A doubling of wave height quadruples the erosive forces. In regions like Demak, where the primary sediment is fine silt, increased wave forces pose a unique challenge because fine sediment particles are easily displaced. Consequently, it became evident that sustained landscape restoration wouldn't be possible if this subsidence persisted. Traditional, small-scale infrastructure would also be inadequate in addressing this problem. The conclusion was that institutional changes were imperative to provide alternative water sources, conserving groundwater and preventing land subsidence. Building with Nature initiatives improved the resilience of coastal communities and ecosystems in the short term and on a smaller scale, mitigating and delaying the impact of hazards while allowing time to address subsidence. Adaptive management measures were implemented, including encouraging communities to voice their needs in policy discussions and supporting them in reducing damage, adapting, or transforming their livelihoods (more information in Chapter IV).

The socio-economic baseline analysis revealed that the primary source of income for rural households within the project region was either fish farming or fishing, accounting for 70% of households. However, economic productivity had been significantly hampered by the absence of coastal safety measures (dealing with flooding and erosion) and a disjointed approach to water management. Additionally, land subsidence had made it increasingly challenging to drain fishponds. These ponds had been maintained using traditional methods, involving the use of artificial feed and antibiotics, resulting in low productivity. Many ponds were abandoned due to their low profitability and damage caused by erosion.

3.3 Arriving at a shared vision and action planning

A comprehensive policy review was carried out at the local, provincial, and national levels with the aim of gaining insights into the institutional framework and establishing a foundation for outreach and policy discussions [Ref 7]. The primary objectives were to ensure that the proposed project plan and design were in alignment with local policies and societal customs while fostering a shared local vision for the sustainable management and conservation of the Demak coastline.

During the review, it was discovered that existing regulations concerning coastal and river greenbelts, as well as land ownership, strictly prohibited any infrastructure or agricultural development within 50 meters of the river and 100 meters of the coast. According to the law, land lost to the water automatically became the property of the national government. Simultaneously, community discussions indicated

that new ponds were being constructed in the coastal area and within the mangrove greenbelt, despite these regulations, highlighting the inadequacies in their implementation and enforcement (inadequate law enforcement). Formal engagement of the local government was seen as an effective means to address challenges related to land tenure and usage rights.

To align policies and plans, it was concluded that the project should concentrate on promoting the adoption of Building with Nature principles in the district's masterplan and spatial plan, as well as in the coastal zoning plans at the provincial level and within national ministerial training programs and guidelines. Recognizing the seriousness of land subsidence, an initiative was launched to develop a Regional Roadmap on Land Subsidence in collaboration with Central Java Province and the Coordinating Ministry of Maritime and Investment Affairs and Wetlands International as part of Partners for Resilience program in 2018 (See Chapter IV for more details).

At the outset of the Demak project, various options of interventions were considered, each with its pros and cons. These alternatives encompassed both conventional engineering solutions and ecological restoration measures, in addition to nonstructural strategies for coastal safety. Additionally, there were different approaches for managing aquaculture and mangroves, which had the potential to rejuvenate the local economy, as discussed in Tonneijck et al. (2015).

In the case of Demak, the use of hard infrastructure meant to shield the coastline from flooding not only exacerbated erosion but also proved to be unstable and costly. Furthermore, it failed to support critical ecosystem functions like fisheries, which were originally provided by the natural mangrove greenbelt. Consequently, communities faced extensive flooding, income losses, and even displacement. Most aquaculture farmers experienced low yields due to insufficient training and the adoption of poor practices, such as the use of chemicals that disrupted the ecological balance. Stakeholders in the region recognized the need for a comprehensive, long-term solution addressing the underlying causes of these issues while simultaneously improving the economic and social well-being of the residents. In alignment with this approach, the vision was set as "A secure and prosperous Demak district where a mangrove greenbelt ensures coastal safety and resilience, allowing communities to flourish and, in turn, sustain the mangrove ecosystem they depend on," as depicted in figure 12 below.

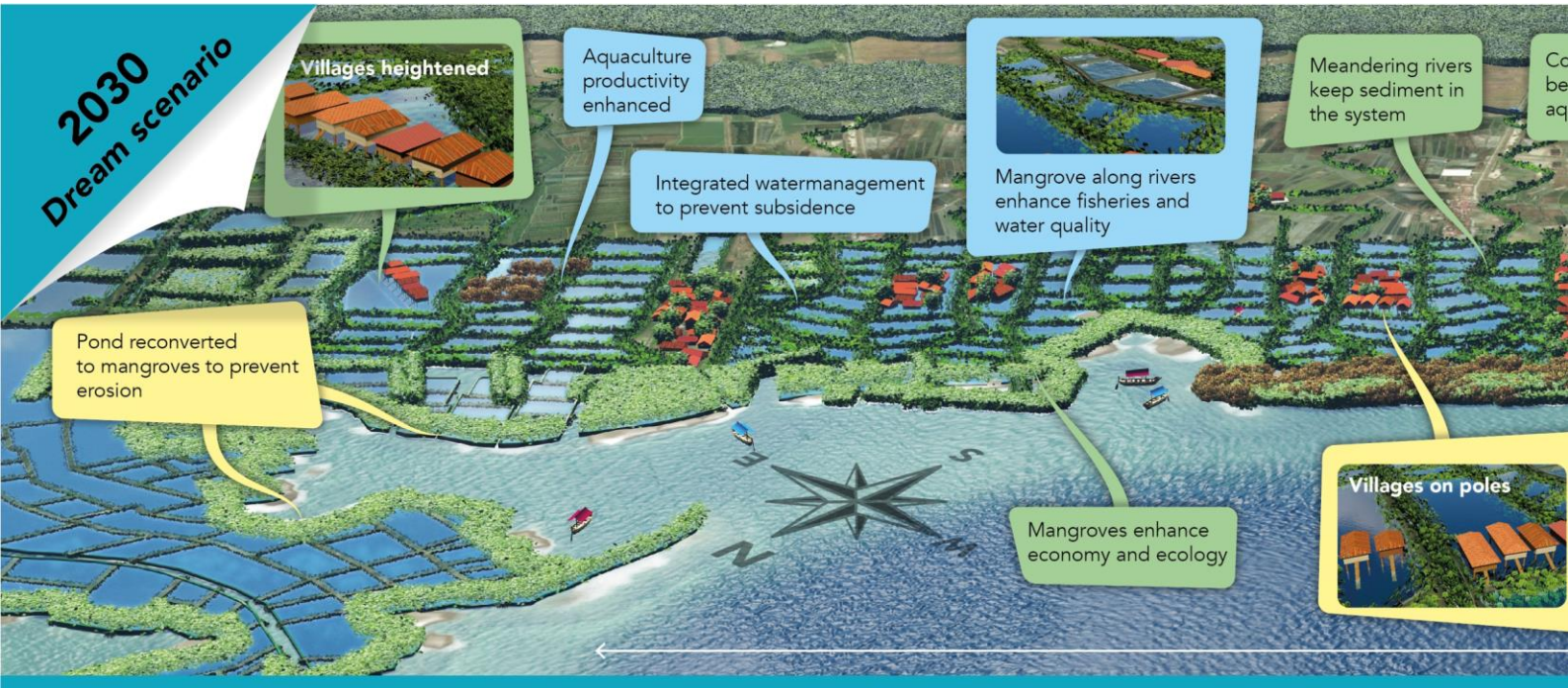


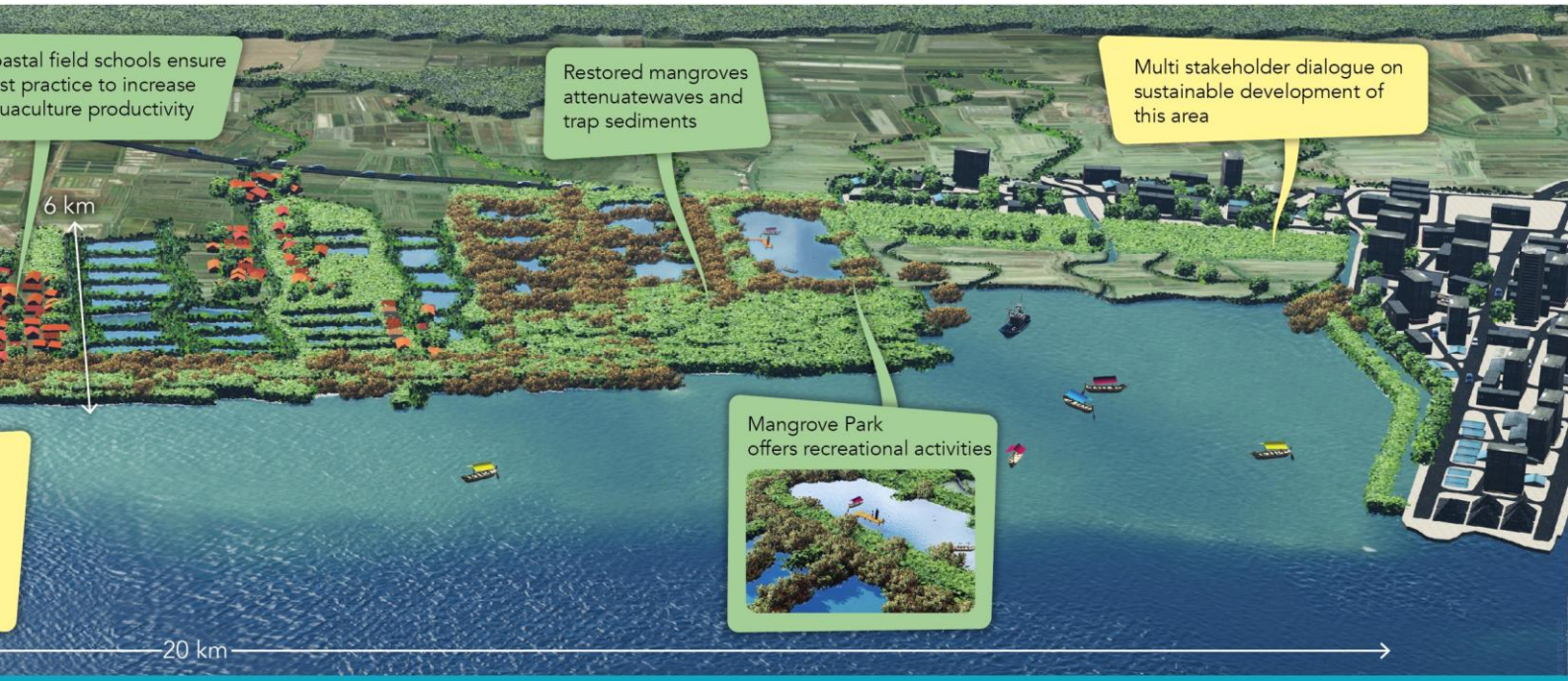
Figure 12. Visualisation of dream scenario 2030 of the Demak coastline, from Wulan Delta to Semarang, under the scenario of mangrove ecosystem restoration, providing coastal protection and improving aquaculture productivity. Illustration: Frederik Ruijs

The dream scenario was created based on our early stage landscape (system) analysis, and following a participative planning process with experts from different disciplines and stakeholders in the target areas. Interventions where then crafted based on an adaptive management process, where we performed in-depth planning as our understanding of the system expanded over time. We also implemented interventions in the field in a phased approach, so that we could improve our approaches based on lessons learned. Communities were engaged in all phases of design and implementation

At the onset of the process for devising alternative solutions, it was acknowledged that mangroves served multiple ecological roles, such as coastal protection, carbon storage, fish habitat, bird nesting, water purification, and recreational value. For mangrove saplings to thrive, a stable coastal environment is essential. Thus, the project identified measures aimed at reestablishing the ecological and socio-economic conditions required for mangrove restoration, as detailed in a design and engineering plan [Ref 8]. These proposals were developed through workshops and discussions involving both international and local experts, local communities, and government officials, with the goal of truly integrating socio-economic and structural interventions to achieve a mutually beneficial outcome.

3.4 Taking or facilitating action by stakeholders and (societal) support for this action

The project's vision statement underscored the need for a close integration of coastal safety measures with socio-economic initiatives. As a result, the decision was made to introduce the **Bio-Rights approach**, a financial incentive system that harmonizes economic productivity with environmental preservation and restoration [Ref 9]. Under this approach, communities received financial and technical support to develop



sustainable income sources in exchange for their active involvement in conservation and restoration efforts. These Bio-Rights agreements were subject to successful participation in restoration measures, which encouraged a long-term commitment to conservation work. This approach also covered the costs that communities incurred during the transition from unsustainable practices (which involved degrading the very mangrove greenbelt crucial for coastal safety) to more sustainable livelihoods.

Rather than establishing contractual agreements with individuals, agreements were formed with 10 community groups, witnessed by village officials. This approach promoted stronger group cohesion and accountability in implementing the agreement and allowed for a wider geographical distribution of measures. Within these community groups, some members focused primarily on mangrove restoration along the coast and rivers, while others concentrated on revitalizing aquaculture practices. Collectively, these community groups achieved both coastal safety and sustainable development goals.

To ensure ongoing financing for local measures, community groups engaged in economic activities, such as aquaculture, alternative livelihoods, and joint ventures, setting aside a portion of their profits in a group savings fund dedicated to mangrove rehabilitation. These joint venture activities encompassed activities like milkfish and shrimp aquaculture, tourism development, compost production for aquaculture, and the creation of fish feed using crab flour. Additionally, the Bio-Rights mechanism supported participants in enforcing these measures within local bylaws and integrating them into community development plans, thus strengthening village regulations and securing government support for sustainability beyond the project's duration.

Through maintaining consistent communication with local authorities and effectively conveying project details, planned activities, and project outcomes, a foundation of trust and support was established. Over time, the local government allocated funding for the maintenance of the permeable structures, supplied fish and shrimp seeds, and implemented regulations to safeguard mangrove rehabilitation areas while promoting environmentally friendly aquaculture practices. Additionally, the local government embraced the Coastal Field School approach as a component of their community capacity building program [Ref 10]. The adoption of these measures underscores the compatibility of our Building with Nature approach with the Indonesian context.

The following elaborate the coastal safety and socio-economic measures undertaken by the community groups participating in the Bio-Rights contractual agreement:

1. **Biophysical measures: permeable structures and pond conversion**

The initial step in addressing erosion and stabilizing the coastline was to restore the sediment balance. Various strategies were employed to enhance the deposition rate of sediment and reduce the rate of loss. Traditional materials like rocks and concrete are known to mitigate wave energy, but in this context, the project explored alternative options like permeable structures constructed from bamboo or brushwood. These structures mimic the root system of mangrove trees and act as wave dampeners, creating sheltered zones near the coast where sediment can accumulate. As the nearshore bed level increased, mangroves were able to naturally reestablish themselves along the coast, forming a natural defense against further erosion. This approach is called *Ecological Mangrove Restoration* /EMR [Ref 11]. In addition, creeks for tidal and freshwater flow were allowed to form between these permeable barriers, replicating the natural system on a larger scale.

Introducing permeable structures was a novel concept in Indonesia, and there was uncertainty regarding the selection of suitable local materials and their effectiveness. To manage these uncertainties, risks associated with construction, maintenance, and durability were identified. Potential materials were chosen in collaboration with local communities, scientists, and government bodies. The performance of

these permeable structures was closely monitored and evaluated, allowing for adaptive management. Initially, several promising materials were selected based on available data. However, it became evident in the first year that wooden and bamboo poles were susceptible to damage from shipworms, significantly reducing their lifespan. In subsequent years, the designs and materials were adjusted, and maintenance efforts were intensified. This led to a continuous cycle of constructing new permeable structures, repairing existing ones, and ensuring their ongoing effectiveness. The materials used were locally sourced, user-friendly, and easy to maintain, with an acceptable lifespan and a reasonable life cycle cost.

In areas where coastal erosion was not yet severe and ponds extended up to the coastline, restoring the mangrove greenbelt required the reestablishment of hydrological connectivity. It was crucial to determine whether former aquaculture ponds received sufficient freshwater, seawater, and sediment to support mangrove habitat. When necessary, targeted breaches in the bunds were made to allow sediment-rich water to inundate the former ponds, creating favorable conditions for mangrove recolonization. This approach facilitated the restoration of the coastal greenbelt, providing protection against erosion, wind and wave exposure, and saltwater intrusion to safeguard the hinterland.

Despite the well-known benefits of mangroves, such as enhancing fisheries, sequestering carbon, and providing non-timber forest products, the majority of farmers were reluctant to give up their ponds for mangrove restoration, even when these ponds were severely degraded. This highlights the importance of intensive stakeholder engagement in driving a paradigm shift.

2. Socio-economic measures: sustainable aquaculture and diverse livelihoods

In addition to the technical measures, the program facilitated the integration of mangroves into sustainable aquaculture practices and cultivated other environmentally friendly livelihoods based on mangrove resources. To enhance their knowledge and confidence, farmers received training through Coastal Field Schools. Sustainable aquaculture initiatives were devised, put into practice, and closely monitored in collaboration with the farmers. These initiatives encompassed various activities, including preparing land and ponds, which involved processes like drying ponds, repairing dikes and sluice gates, providing compost and local micro-organisms (MoL) to stimulate the growth of natural fish food, and regularly monitoring water quality to ensure suitable conditions for fish and shrimp growth.

Two successful approaches were introduced and tested by local communities:

1. Associated Mangrove Aquaculture Farms (AMA)

In this approach, a portion of the aquaculture pond is allocated to create space for riverine mangroves. These areas quickly accumulate sediment and facilitate the natural recruitment of mangroves within a year. The mangroves along the pond's edge act as water filters, allowing higher-quality water to enter the aquaculture pond. The sediment trapped by the mangroves safeguards the riverbank and fortifies the pond dikes, reducing maintenance expenses. Implementing AMA systems involves farmers setting back the river dike and adjusting the sluice system to create a mangrove greenbelt along the river. Monitoring revealed that proper pond management is crucial for success, such as timely opening and closing of sluice gates to allow for natural sedimentation. Farmers who dedicated part of their pond to AMAs received support to enhance yields in an ecologically responsible manner. [Ref 12]

2. Implementation of Low External Input Sustainable Aquaculture (LEISA)

This aquaculture approach adheres to principles of best practices and environmentally friendly fish farming by minimizing the use of external production inputs, particularly those containing synthetic chemicals. The project demonstrated that employing LEISA practices enabled farmers to triple their income from milkfish and shrimp farming farming. [Ref 10]

3.5 Conducting monitoring and learning

The Building with Nature approach consists of five sequential steps that create an iterative cycle. The project team utilized monitoring and evaluation as tools to guide project management, leading to adaptive management practices that capitalized on opportunities and mitigated risks. Local communities also leveraged monitoring to make informed decisions regarding their aquaculture and mangrove management. Furthermore, two research programs have yielded valuable insights into coastal dynamics and aquaculture production systems. The process of monitoring and evaluation has significantly contributed to enhancing the understanding of the entire system.

Figure 13. Monitoring activities by local community ((© Wetlands International Indonesia / Kuswantoro)

4. CONTEXT AND POWER ANALYSIS, GENDER, AND POLICY INFLUENCING STRATEGY

4.1 Context and power analysis

4.1.1 Context analysis

Building with Nature (BwN) is a holistic and inclusive approach that integrates Nature-based Solutions (NbS) in water. There is a growing enthusiasm for the integration of BwN into various locations and applications at different levels, presenting a forward-thinking strategy to construct climate-resilient landscapes that offer numerous advantages to both people and the environment. This burgeoning interest necessitates a fundamental shift in the way we conceive marine and water infrastructures to effectively tackle climate, environmental, and developmental challenges in Indonesia simultaneously.

To facilitate the incorporation of the BwN approach into Indonesia's water infrastructure sector, a comprehensive policy review was undertaken in 2021 [Ref 7]. This review encompassed an examination of the national development plan, strategic plans of ministries/agencies, and strategies pertaining to water infrastructures, climate change adaptation (CCA), disaster risk reduction (DRR), natural resource management, and the spatial plan for the period 2020-2024.

This policy review employed three distinct methodologies: firstly, a thorough examination of existing policies and potential opportunities was conducted; secondly, interviews and focus group discussions were orchestrated at both the national and sub-national levels, involving diverse institutions such as ministries, regional and local governments, private companies, and universities; thirdly, lessons gleaned from the Demak project were incorporated, offering valuable insights pertinent to this study.

The examination of policies reveals that Indonesia has integrated supportive principles into its policies and institutional framework at various government levels. This integration underscores the country's dedication to address climate change and disaster management while concurrently advancing sustainable infrastructures. The existing policies and institutional structure create a conducive environment for the broader implementation of the BwN approach in Indonesia. Financially, the Indonesian government has established channels to fund programs that facilitate the scaling up of NbS, drawing support from both domestic and international public and private sources. The opportunities provided by International Financial Institutions (IFIs) are particularly noteworthy, given that Indonesia is a member of these institutions, and they explicitly prioritize NbS and climate change in their agendas. Below is the list of channels to fund programs that facilitate the scaling up of NbS:

1. Permen KP 2016_08 Rencana Kerja KKP Tahun 2016 Struktur Hybrid, Permen KP 2016_55 Rencana Kerja KKP Tahun 2017 Struktur Hybrid, Permen KP 2017_65 Rencana Kerja KKP Tahun 2018 Struktur Hybrid. The inclusion of permeable structure in this KKP work plan shows their support for the implementation and mainstreaming of one of BwN measures in Indonesia through the allocation of funds and programs. Wetlands International Indonesia, as a member of the BwN Indonesia consortium, contributed by providing technical input during the document writing and sharing lessons learned from program implementation.

2. Hybrid engineering (terminology used by the Indonesian government for Building with Nature) was mentioned in the National Mid-term Development Plan 2015-2019 under the Directorate General of Marine Spatial Management workplan. This policy is further stated in the Minister of Marine Affairs and Fisheries Regulation: No. 8/Permen-KP/2016, No. 55/Permen-KP/2016, and No. 65/Permen-KP/2017. As a member of the BwN Indonesia consortium, Wetlands International Indonesia played a role in introducing the new terminology, principles, and practices of Building with Nature in Indonesia. It is also advocated to policy makers to be applied in their development plans and activities.

3. The National Mid-term Development Plan 2020-2024 (RPJMN 2020-2024) specifically mentions *'green infrastructure'* and provides various entry-points for Building with Nature as an innovative approach, in particular for building resilience against climate change and increased disaster risk, and for strengthening infrastructure, where healthy coastal ecosystem will play an important role. Further, as a result of flagship partners' engagement with The Coordinating Ministry for Maritime Affairs and Investment/Kementerian Koordinasi Bidang Kemaritiman dan Investasi (Kemenkomarves), hybrid structures will be included in their National Ocean Policy and in their workplan under RPJMN 2020-2024. As a member of the BwN Indonesia consortium, Wetlands International Indonesia played a role in introducing the new terminology, principles, and practices of Building with Nature in Indonesia. It is also advocated to policy makers to be applied in their development plans and activities.

4. Building with Nature was mentioned in Indonesia's country position to the Ramsar CoP in 2018. Ecological intertidal restoration was flagged as one of the national priorities. In 2019 flagship partners actively contributed as lead author on the nomination of two Indonesian cities under the Ramsar's Wetlands City Accreditation. The nomination has been submitted to the Ramsar Secretariat.

Despite the opportunities, the BwN concept is still facing several barriers in the way forward for scaling up in Indonesia. The barriers include the nature of institutional and multi-stakeholder principle, concrete business case, unfamiliarity with the concept itself and the community capacity to implement the approach, procurement and contracting procedures.

However, the policy review shows that delivering policy changes to accommodate BwN requires multisectoral collaboration governance, both with a top-down and bottom-up approach to mainstream the concept across sectors and at multiple scales. As BwN is a new concept, the approach has not been well-adopted into policies and programs that are defined by existing names and codes, limiting the government spending budget towards the new approach. There are ample opportunities to introduce BwN to decision-makers in Indonesia as a cutting-edge approach providing ecosystem-friendly water infrastructure development, along with many socio-economic and environmental co-benefits, that is financially viable in both the short and the long term.

During the implementation of the program, the government from the national, provincial, district, and village levels, provided support in the form of program allocations and/or funding to the community groups. Recent legal developments may facilitate further scaling up. There has been an opportunity through the

Indonesian Environmental Fund/Badan Pengelola Dana Lingkungan Hidup (BPDLH), as a funding mechanism that has a clearer policy framework. In 2019, the Indonesian government established the BPDLH, supported by two new regulations—PP No. 46/2017 on Environmental Economic Instruments and Perpres No. 77/2018 on Environmental Fund Management. BPDLH collects funds from public and private sources including state and regional budgets, philanthropy, NGOs, private companies, and international development funds. It has flexibility in distributing benefits to communities and businesses across a range of sectors, including mangroves.

4.1.2 Power analysis of stakeholders

Identification of the roles of key stakeholders (actors)

The framework for identifying and analyzing the roles of key stakeholders can be done by mapping their institutions according to their authority in each function of the mangrove ecosystem area. Identification of key stakeholders in the national task force is necessary for structuring the role of related institutions in accordance with the authority, duties and functions as well as the connectivity of policies, programs and activities of the parties in the protection and management of mangrove ecosystems.

The grouping of key stakeholders in the national task force, namely the central government and other stakeholders at the national level. Elements of the central government that have authority, duties and functions related to the protection and management of mangrove ecosystems, both directly and indirectly, encompassing Kemenko Marves, KLHK, KKP, BRGM, Ministry of Villages and Development of Disadvantaged Regions and Transmigration/KemenDes, Ministry of National Development Planning/BAPPENAS, and Ministry of Home Affairs/Kemendagri. Local government elements consist of provincial governments, district/city governments and village governments as stipulated in Law No. 32/2014 on Environmental Protection and Management, Law No. 23/2014 on Local Government, and Law No. 6/2016 on Villages. Moreover, the last key stakeholder group in the protection and management of mangrove ecosystems is business license holders, community groups, and other stakeholders, namely universities and non-governmental organizations (NGOs) working for environment issues.

Ministry of Marine Affairs and Fisheries (KKP)

KKP has the task of organizing government affairs in the field of marine and fisheries which are authorized under Presidential Regulation No. 63 of the year 2015 concerning the Ministry of Marine Affairs and Fisheries. KKP formulates and determines policies in the field of marine spatial management, marine conservation and biodiversity management, coastal and small island management, management of capture fisheries and aquaculture and others. Based on Law No. 1 of 2014 concerning Amendments to Law No. 27 of 2007 concerning Management of Coastal Areas and Small Islands and KKP Ministerial Regulation No. 24 of 2016 concerning Procedures for Rehabilitation of Coastal Areas and Small Islands, KKP is authorized to formulate and determine mangrove rehabilitation policies outside forest areas or other land uses/area penggunaan lain (APL) with habitat improvement and mangrove protection. Therefore, KKP plays a role in making Norms, Standards, Procedures and Criteria (NSPK) for the implementation of mangrove rehabilitation in marine and coastal areas. KKP also mobilizes related work units to carry out mangrove rehabilitation in APL with intensive coordination, establish working relationships and collaborate.

BwN Indonesia program was under Water MoU, that is a bilateral agreement between the Indonesian Government, which was represented by KPUPR, and the Dutch Government . KKP, as the government partners of BwN Indonesia, supported the initiative by enabling the environment and aligning the BwN with their field programmes. From 2015 to 2019, the government partner KKP funded a marine spatial management programme to restore eroding coastlines with more than 23 kilometres of permeable structures placed in no less than 13 sites within and outside Java, worth approximately EUR 2.5 million.

Coordinating Ministry for Maritime Affairs and Investment/Kementerian Koordinasi Bidang Kemaritiman dan Investasi (Kemenko Marves)

Kemenko Marves has the task of coordinating, synchronizing, and controlling the affairs of the K/L that it coordinates. At the central level, the ministries/agencies that have direct responsibility for the implementation of mangrove protection and management are KLHK, KKP, and BRGM. In addition, coordination and synergy of program activities with other K/L, including the Ministry of Home Affairs, Ministry of National Development Planning/BAPPENAS, and Ministry of Villages and Development of Disadvantaged Regions and Transmigration are also very important according to the authority and duties of each related K/L. Based on the provisions of Presidential Regulation No. 92/2019 on the Coordinating Ministry for Maritime Affairs and Investment, Kemenko Marves has the function of coordinating and synchronizing the formulation, determination, and implementation of policies across ministries/institutions which include the Ministry of Environment (KLHK) and Forestry and the Ministry of Marine Affairs and Fisheries (KKP). Thus, Kemenko Marves plays a role in coordinating mangrove rehabilitation programs carried out in forest and marine-coastal areas.

Kemenko Marves follows two guidelines as their main policy: The national medium-term development plan 2020-2024 (RPJMN 2020-2024) and the Presidential directions. One of the disasters he mentioned was land subsidence, which is included in the RPJMN, especially in the northern part of Java: Demak, Pekalongan, Semarang and also in-line with other institutions (K/L) which also refers to the RPJMN. Kemenko Marves is not a member of the BwN consortium, but they are working in Demak and surrounding areas focusing on land subsidence management and actively coordinating with BwN Indonesia.

Ministry of Environment and Forestry/Kementerian Lingkungan Hidup dan Kehutanan (KLHK)

KLHK has the task of organizing government affairs in the field of environment and forestry based on Law No. 32 of 2009 concerning Environmental Protection and Management and No. 41 of 1999 concerning Forestry. Based on Presidential Regulation No. 92 of 2020 concerning the Ministry of Environment and Forestry, KLHK is authorized to formulate, determine and implement policies in the field of organizing the stabilization of forest areas and sustainable environmental management, conservation management of natural resources and ecosystems, increasing the carrying capacity of watersheds and forest rehabilitation, sustainable forest management, climate change control, social forestry and environmental partnerships, and law enforcement in the field of environment and forestry. KLHK has the broadest authority in the implementation of mangrove ecosystem protection and management. KLHK's role is to prepare the Annual Plan for Forest and Land Rehabilitation (RTn-RHL) which includes mangrove rehabilitation in conservation, protection and production forest areas. KLHK also mobilizes related work units to carry out mangrove rehabilitation within the forest area with intensive coordination, establishing working relationships and collaborating with various parties.

KLHK is the main stakeholder of landscape management. Mangrove ecosystem on the downstream cannot be separated from ecosystem management on the upstream, this needs to be looked at as integrated watershed management. KLHK is not a member of the BwN consortium, but they work in Demak and surrounding areas in accordance with their authority, both inside and outside the forest area. The two Directorate Generals under KLHK that are most relevant to mangrove management authority are Directorate General of Climate Change and Directorate General of Watershed Management and Forest Rehabilitation.

Peatland and Mangrove Restoration Agency (BRGM)

BRGM is assigned by the President of Indonesia to carry out the task of Accelerating Mangrove Rehabilitation (PRM) of 600 thousand hectares by the end of 2024 in forest and APL areas in 9 (nine) priority provinces, namely: North Sumatra, Riau, Riau Islands, Bangka Belitung, West Kalimantan, East Kalimantan, North Kalimantan, Papua, and West Papua. BRGM is given the authority based on Presidential Regulation No. 120 of 2020 concerning the Peat

and Mangrove Restoration Agency to utilize resources within the internal organization and support the resources of other organizations related to PRM activities. The main activities of BRGM in institutional strengthening effectively are: establishing coordination, establishing working relationships, and conducting effective management collaboration. Coordination in the first stage is focused on the MoEF as the ministry with the most dominant authority in the rehabilitation and management of mangrove ecosystems; encouraging the strengthening of laws and regulations by relevant ministries and agencies for the smooth implementation and success and sustainability of mangrove rehabilitation results; and encouraging the strengthening or development of mangrove ecosystem management organizations at the site level, namely forming Regional Mangrove Rehabilitation Teams (TRMD) - including strengthening the role of communities and villages as the spearhead of mangrove ecosystem rehabilitation and conservation at the site level.

BRGM is not a member of the BwN consortium. The agency was only established (from previously only working on peat issues) after the BwN Indonesia project in Demak completed. The BwN approach in Demak, such as the Associated Mangrove Aquaculture (AMA) design, LEISA principles for improved aquaculture management, hybrid engineering/permeable structures, and coastal field schools, has become their interest, especially regarding the process of learning for replication and upscaling in other locations in Indonesia.

Ministry of Public Works and Public Housing (KPUPR)

PUPR is responsible for the formulation, stipulation, and implementation of policies in the field of, among others, water resources management including conservation and utilisation of water resources (including ground water), as well as controlling the destructive power of water (including ground water) under the provisions of laws and regulations. Along with supportive regulation, there are two platforms relevant to water. At the national level, based on the Ministerial Decree (Kepmen PUPR No. 463/2013), the Center for River Basin Organization and Management (Pusat Tata Kelola Wilayah Sungai) provide services to develop capacity on water resource management and knowledge management in organisations and river basins for all stakeholders in Indonesia and countries in the Asia-Pacific region.

Ministry of Home Affairs

The Ministry of Home Affairs/KEMENDAGRI (Kementerian Dalam Negeri) has the task of organizing domestic government affairs. One of its functions is the formulation, determination, and implementation of policies in the fields of politics and general government, regional autonomy, guidance on territorial administration, guidance on village administration, guidance on government affairs and regional development, and guidance on regional finance. Therefore, the role of the Ministry of Home Affairs is expected to encourage the attention and involvement of local and village governments in the rehabilitation and conservation of mangrove ecosystems in accordance with their authority.

Ministry of National Development Planning/Kementerian Perencanaan Pembangunan Nasional (PPN/BAPPENAS)

The Ministry of PPN/BAPPENAS is tasked with organizing affairs in the national development planning section of government with functions including formulation and stipulation of policies in the national development planning section and coordination and synchronization of policy implementation in the national development planning section. Based on Presidential Regulation No. 20 of 2016 concerning Amendments to Presidential Regulation No. 66 of 2015 concerning the National Development Planning Agency, BAPPENAS is tasked with integrating and synchronizing mangrove rehabilitation in national development planning, so that mangrove rehabilitation can be implemented according to predetermined targets by involving the role of various parties in an orderly and measurable manner. Bappenas has released the document National Strategy (Stranas) for Wetland Management in Indonesia: Peat and Mangrove Ecosystems to support sustainable development goals in a low-carbon economy according to Indonesia's Vision 2045.

Ministry of Villages and Development of Disadvantaged Regions and Transmigration/Kementerian Desa, Pembangunan Daerah Tertinggal, dan Transmigrasi (KemenDesPDTT)

The KemenDesPDTT has the task of organizing government affairs in the fields of village and rural area development, village community empowerment, accelerating the development of disadvantaged regions, and transmigration. Based on Presidential Regulation No. 85/2020 of the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration, the main tasks and functions of the KemenDesPDTT are to formulate, determine and implement village development. In integrating mangrove ecosystem rehabilitation and conservation programs and activities for village development, the role of the KemenDesPDTT is very important to optimize the work of Desa Mandiri Peduli Mangrove (DMPM).

Regional Government

Local governments are authorized to manage mangrove ecosystems in forest and coastal areas based on regional autonomy as stipulated in Law No. 23/2014 on Local Government.

a. Province: The Provincial Government is responsible for carrying out mangrove rehabilitation outside the forest area in the form of property land and Other Use Areas (APL), as well as conservation forest areas of the Great Forest Park (Tahura). Based on Law No. 23 of 2014 concerning Regional Government and Government Regulation No. 23 of 2021 concerning the Implementation of Forestry, the implementation of mangrove forest rehabilitation and protection is carried out by establishing a Forest Management Unit (FMU) by the Regional Government with a Governor Regulation. Provincial Regional Apparatus Organizations (OPD) that have duties related to the Mangrove Rehabilitation Program are: The Department in charge of Forestry and/or Environment, and the Regional Technical Implementation Unit (UPTD) of the Forest Management Unit (KPH), in the implementation of Mangrove Rehabilitation activities outside the forest area and Tahura, and supporting the implementation of Mangrove Rehabilitation activities within the forest area; The Department in charge of Maritime Affairs and Fisheries, in the implementation of PRM activities outside the forest area is given the responsibility to manage mangroves in other use areas based on KKP Ministerial Regulation No. 24/2016 concerning Procedures for Rehabilitation of Coastal Areas and Small Islands. 24 of 2016 concerning Procedures for Rehabilitation of Coastal Areas and Small Islands and establish regional conservation areas in accordance with the mandate of KKP Ministerial Regulation No. 31 of 2020 concerning Management of Conservation Areas stipulated by the Governor with the Conservation Area Management Organization Unit (SUOP).

b. District: The Regency Government supports mangrove rehabilitation activities by mobilizing OPDs within the Regency that have community empowerment tasks and village governments, as well as community organizations including farmer groups, farmer groups, fishermen groups and related Non-Governmental Organizations, especially those that are targeted for mangrove rehabilitation activities. District/City Governments carry out mangrove rehabilitation in conservation forest areas categorized as botanical forest parks (TAHURA) for district/city areas in accordance with Law No. 23 of 2014 concerning Regional Government and Minister of Environment and Forestry Regulation 10 of 2022 concerning the Preparation of General Plans for Watershed Forest and Land Rehabilitation and Annual Plans for Forest and Land Rehabilitation.

c. Village: In addition to the parties at the provincial and district/city levels, the implementation of mangrove rehabilitation will also involve the village government. The position of the village is very strategic because it is the smallest unit of government that is in direct contact with the community and the mangrove ecosystem. This is mandated by Law No. 6 of 2014 concerning Villages which states that all sector programs within the scope of the village must be integrated in village development. Mangrove ecosystems located in village-owned forests are assets managed by the Village Government for the public interest.

Business License Holders/Private Sector

License holders are obliged to participate in carrying out mangrove rehabilitation at locations targeted for mangrove rehabilitation in their business work areas. Based on Government Regulation No. 23 of 2021 concerning the Implementation of Forestry, mangrove rehabilitation in forest areas encumbered by management rights or utilization permits is carried out by permit holders of forest management/utilization rights. These license holders include Holders of Business Licenses in the Forestry Sector and other Business License Holders whose work areas include existing mangroves and potential mangrove habitats.

Community Group

Community groups targeted by the mangrove rehabilitation program are forest farmer groups, pond farmer groups; and/or and fishermen groups. These groups, under the coordination of the respective village governments, will serve as the main implementers of mangrove rehabilitation technical activities at the site level. Communities can participate in conserving mangroves with counselling and education activities based on Law No. 5 of 1990 concerning Conservation of Natural Resources and Ecosystems.

Other Stakeholders

a. Universities (HEIs); Universities as educational institutions can play a role in strengthening government organizations, local governments, village governments and communities according to their function as a repository of knowledge by providing scientific and technological advocacy that can be applied in supporting the implementation of protection and management of mangrove ecosystems.

b. Non-Governmental Organizations (NGOs); NGOs engaged in the field of Environment and Forestry are expected to participate and tangibly support the success of the Mangrove Ecosystem Protection and Management Program by providing input on locations targeted by the Mangrove Ecosystem Protection and Management Program. One form of the expected role of NGOs is community assistance in line with the objectives and work procedures for mangrove rehabilitation that have been established in accordance with the applicable NSPK.

Stakeholders Analysis

The diverse concerns in Coastal Demak are organized in layers resembling an onion. The Stakeholder Onion Diagram is a way of visualizing the relationship of stakeholders to a project goal. The innermost layer comprises parties that are both interested and influential (1). The middle layer consists of parties that are either interested or influential (2), while the outermost layer includes parties that lack both interest and influence.

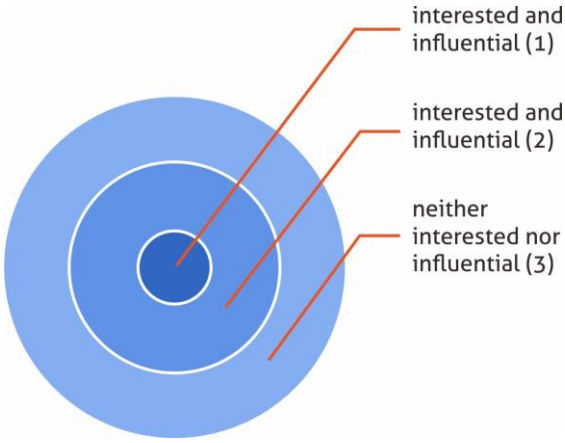


Figure 14. Stakeholder Onion Diagram

These categories are arranged based on their level of involvement in the Demak coastal restoration project. It is crucial for the restoration plan to specifically address these parties, giving priority to those with a direct interest and influence (primary stakeholders - P-type), followed by those with either interest or influence (secondary stakeholders - S-type). The analysis also considers those beyond the realm of interest and influence but are indirectly affected (E-type). The primary goal of this analysis is to comprehend the diverse interests and influences in the context of coastal restoration. Presented in matrix form, the subsequent results outline the findings of the onion-like analysis in Coastal Demak, assessing potential impacts in three categories: positive (+), negative (-), neutral (0), or uncertain (?) impact associated with each interest.

Table 4. Summary of Stakeholder Analysis Result of Building with Nature Indonesia

Stakeholder	Indonesian Acronym	Type	Role	Potential impact	Priority (1-3)
National Government					
1. Ministry of Marine Affairs & Fisheries – Small Islands and Coastal Management Agency	KKP – KP3K	P	KKP formulates and determines policies in the field of marine spatial management, marine conservation and biodiversity management, coastal and small island management, management of capture fisheries and aquaculture and others. In BwN context, already investing in some permeable structure in the landscape	+	**1**
2. Ministry of Public Works and Housing	KPUPR	P	Responsible for the formulation, stipulation, and implementation of policies in the field of, among others, water resources management.	+	**1**
3. Coordinating Ministry of Maritime & Investation Affairs	Kemenkomarves	P	Coordinating, synchronizing, and controlling the affairs of the K/L (for the implementation of mangrove protection and management are KLHK, KKP, and BRGM)	+	**1**
4. Peat and Mangrove Restoration Agency	BRGM	S	Accelerating Mangrove Rehabilitation (PRM) of 600 thousand hectares by the end of 2024 in forest and APL areas in 9 (nine) priority province	+	**1**
5. Ministry of Forestry & Environment - Directorate General of Watershed Management and Forest Rehabilitation	KLHK – Ditjen PDASRH	S	The lead agency in charge of forest restoration outside & outside of forest state	+	**2**
6. Ministry of Forestry & Environment – Directorate General of Climate Change	KLHK – Ditjen Perubahan Iklim	E	Targets for emissions reductions and carbon sequestration	0	**1**
7. Ministry of Planning	PPN/BAPPENAS	S	Interested in improved spatial planning	+	**2**

Stakeholder	Indonesian Acronym	Type	Role	Potential impact	Priority (1-3)
8. Ministry of Home Affairs	KEMENDAGRI	E	Interested in resolving illegal land use – potentially interested in re-gazetting the Nature Reserve	0	**2**
9. Ministry of Villages and Development of Disadvantaged Regions and Transmigration	Kemen Desa dan PDTT	E	organizing government affairs in the fields of village and rural area development, village community empowerment, accelerating the development of disadvantaged regions, and transmigration	0	**2**
Provincial Government					
1. Planning Agency	BAPPEDA	P	Formal mandate for planning and integration	0	**1**
2. Fisheries Department	DKP - Province	P	Currently services aquaculture farmers. Some interest in silvofisheries. Pushed for re-gattezing of Nature Reserve	-	**1**
3. Provincial Watershed Mgmt Agency	BPDAS	S	Line agency formerly/currently in charge of restoration in District Protected Forest	+/-	**2**
4. Mangrove Management Working Group - Provincial	KKMD – Central Java	S	Strong advocates of restoration in Central Java	+	**1**
5. Governor's Office	PEMDA – Province level	E	Interest in restoring fisheries values; upset about lack of taxes/value coming from fish farming	0	**2**
6. Planning Agency	BAPPEDA	S	Charged with Planning and Integration – home for KKMD	0	**1**
District & Village Government					
1. District Head's Office (Demak)	Bupati – PEMDA Tingkat Kabupaten	P	Supports mangrove rehabilitation activities by mobilizing OPDs	+	**1**
2. Head of Village	Kades- 9 Desa target	P	Supports mangrove rehabilitation activities by mobilizing community	+	**1**
3. Mangrove Management Working Group – District	KKMD – Demak	E	Strong advocates of restoration in Demak	+	**1**

Stakeholder	Indonesian Acronym	Type	Role	Potential impact	Priority (1-3)
4. House of Representatives – District	DPRD	S	Key Decision makers at District Level	0	**1**
5. Department of Public Works	PU	E	Service the fish farmers (roads)	0	**3**
6. Department of Small Villages	Dinas Perdesaan	S	Service the fish farmers (solar panels for houses)	0	**3**
7. Koperasi Agency	Dinas Koperasi	S	Service cooperatives and the aquaculture businesses	-	**3**
Local community & community groups					
1. Mangrove Community Nursery Group	KBR Mangrove	P	Small community group formed to plant mangroves	+	**2**
2. Women's support group	PKK	S	Relatively low interest	0	**3**
3. Community empowerment group	KPMD	S	Relatively low interest	0	**3**
4. Farmer groups (including fish farmers)	GAPOKTAN	P	Formal groups which receive government support for farming and fish farming	-	**1**
Private Sector					
1. Milkfish businesses		S	Interested in continued aquaculture	-	**1**
2. Excavator businesses		S	Interested in continued aquaculture and pond expansion	-	**2**
3. Feed & Fertilizer		S	Interested in continued aquaculture	-	**2**
4. Fish fry/hatchery		S	Interested in continued aquaculture	-	**2**
NGO's & Academia					
1. KeSEMaT	KeSEMaT (Kelompok Studi Ekosistem Mangrove Teluk Awur)	E	Student Organization from UNDIP Semarang – Experienced mangrove plant restoration in some areas at Central Java	+	**1**
2. Diponegoro University – Semarang	UNDIP	E	Research on carbon sequestration, fisheries, and mangrove coverage	0	**2**
3. BwN Team	Wetlands Indonesia, WiBo,	E	Consorsium BwN project in Demak	+	**2**

Stakeholder	Indonesian Acronym	Type	Role	Potential impact	Priority (1-3)
	Witteven Bosch, etc				
4. Blue Forests	YHB	E	Providers of technical EMR support and Coastal Field School methods	+	**2**
5. Kota Kita		E	Indonesian NGO that has expertise in urban planning and citizen participation	+	**2**

Upon understanding the various types, potential impacts, and priorities, the stakeholder analysis is tasked with proposing solutions for the subsequent phase: the restoration of coastal Demak. This restoration endeavour should be inclusive, accommodating diverse interests, participatory by engaging all stakeholders, and transparent in terms of managing information and policy discussions with the public. These three fundamental principles act as the bedrock that needs to be constructed alongside the essential components of consensus and mutual trust, and then reinforced through commitment. It's important to emphasize that these fundamental principles don't necessitate a revision of the existing tenure system; the government and the community can still maintain tenure over the pond area. However, when it comes to access and control (supervision), various interested parties in coastal Demak should be involved to ensure that restoration efforts are not redundant, and the activities of one party, such as farmers, do not adversely affect other stakeholders.

In the short term, establishing an institution that can engage all stakeholders interested in Coastal Demak is crucial for its restoration. This institution should actively involve these stakeholders in specific restoration efforts and broader coastal management initiatives. The Demak community, known for its openness and willingness for change, provides a favorable environment for such an institution. With recent challenges such as declining pond yields and annual tidal floods, the community is motivated for positive transformations. Given the presence of various government institutions at different levels, including DKP, BKSDA, KPH, and BKSDA, the provincial government holds a strategic position to act as a facilitator. The Central Java Provincial Government has proven to be effective in fostering collaboration among relevant agencies and institutions. However, facilitating this at the district level faces challenges due to the dominant role of the central government. The legal significance of the provincial government's involvement in establishing collaborative institutions strengthens the policies adopted by stakeholders.

NGOs operating in the Demak coastal region can play a crucial role in creating a representative media or community forum to effectively channel the aspirations of local communities. Initiatives like Gapoktan, KUBE, and groups facilitated by BWN through programs like the coastal field school and environmental services (Bio-Right) have already begun to emerge. These initiatives are pivotal in ensuring the enduring success of the restoration program in Coastal Demak.

4.2 Gender

In BWN Indonesia's activities, achieving gender balance was a challenge due to local customs. In certain segments of society in Java, a patriarchal system persists along with social norms and unwritten laws that

constrain women's involvement in public and political spheres. Women frequently encounter obstacles and prejudice in their pursuit of equal educational opportunities compared to men, and they also confront restricted prospects for careers and leadership roles. Women are particularly vulnerable to economic shocks due to gender disparities in asset ownership, and lower levels of access to formal financial institutions and inclusion in livelihood development programs.

Gender analysis has not been an integral part of BwN program design. Ideally, gender strategies should be developed at an early stage. But in implementation, we are adaptive to gender issues. In the last year the project's female trainers therefore recruited a women's group for two coastal field schools. By the end of the BwN initiative, 13.8% out of 260 direct beneficiaries are female. Hopefully, this strategy will address gender disparities in access to economic opportunities, including by promoting the conditions for women's entrepreneurship and reducing skill gaps and occupational sex segregation.

Furthermore, gender mainstreaming should be an integrated policy throughout the program components. Through gender mainstreaming, the delivery of activities is inclusive, reducing the delivery of additional activities or processes specifically for single gender group.

During the BwN implementation, gender mainstreaming has also been exercised by incorporating a gendered representative criterion in the Bio-Rights scoring. Maximum 25 score will be attributed to the total score of each community group's Bio-Rights assessment when they evidently participated in the village development planning meeting (Musrenbangdes), by having at least two women representatives for the meeting.

Despite the fall short in gender strategies, women participation in the BwN activities has evidently increased their capacity and household incomes. Coastal field school (CFS) on sustainable aquaculture has enabled the female beneficiaries to support their husbands in improving their pond management practices, which was previously predominantly done by male, which in turn increasing the pond harvest and income. The fund from Bio-Rights has been used to support their husbands, by purchasing a small boat and gears for fishing and collecting crabs. Moreover, a few have been able to improve their roles in household income generation by setting up a small business such as making fish and shrimp feed out of local ingredients for sale locally, and even enlarge the existing business. [Ref 1]

Furthermore, participation in BwN activities enabled women participants to develop self-confidence and public speaking skill to express their aspiration in the village planning meetings, increase proposal writing skill to submit to local government for production inputs support, for example for aquaculture improvement and post-harvest processing. A few of them have been confidently involved in water policy dialogue and expressed aspiration to urged the local government to immediately resolve the underground water pumping issue in Semarang that causes their village in Demak to subside and frequently flooding. [Ref 1]

"Before, our husbands mostly ran the fishponds, but now women are much more involved."

Siti Amanah, from Wedung village, Demak

"I organise village planning meetings and write and present our proposals to local governments."

Sifatul Khoiriyah, from Timbulsloko village, Demak.

4.3 Policy influencing strategy

Given the successful experience in restoring the eroded coastal Demak landscape, Wetlands International Indonesia has developed a long term logframe for Demak landscape, which describes further interventions and its sustainability strategy. Moreover, Wetlands International Indonesia will use Demak as the lighthouse (learning) landscape for upscaling the BwN solutions nation wide. At the national level, the upscaling will focus on the following policy influencing engagement strategy:

a. Indonesian Ministry of Marine Affairs and Fisheries/KKP report, entitled *"Struktur Hybrid Engineering—Solusi Rekayasa Berbasis Ekosistem untuk Restorasi Kawasan Pesisir"*. This technical guidance document prepared by MMAF shows that they have placed permeable structure as an option that can be carried out by the government in dealing with the problem of coastal erosion and mangrove rehabilitation on muddy beaches. Wetlands International Indonesia, as a member of the BwN Indonesia consortium, contributed by providing technical input during the document writing and sharing lessons learned from program implementation.[Ref 13]

b. The National Mangrove Ecosystem Management Strategy, endorsed by the Coordinating Ministry of Economy in Aug 2017. Flagship partners engage in the Provincial Strategies for Banten, Central Java Provinces and Demak district and in local level policy-making activities. Central Java's Mangrove Working Group, of which WI Indonesia was a member, supported the release of Governor Decree No. 24 of Year 2019. This involvement has a positive impact on support from local governments for our activities in their areas, especially for Building with Nature in Demak. Wetlands International Indonesia, as a member of the BwN Indonesia consortium, contributed by providing technical input during the document writing and sharing lessons learned from program implementation.

c. In 2018, Indonesia's country report to the UNISDR included the concept of Eco-DRR and green-infrastructure based on inputs from the flagship team, e.g. on how Building with Nature Indonesia contributes to the objectives and strategies in Indonesia's national plan. In 2019, Indonesia's country report for the Global Platform on DRR also included Eco-DRR and green-infrastructure concepts. Wetlands International Indonesia (staff) contributed as co-author on the country report.

d. Indonesia's Nationally Determined Contribution (NDC) to the UNFCCC highlights its vulnerable low-lying coastal areas and its intention to employ a landscape approach to support ecosystem and landscape resilience, including through ecosystem conservation and restoration, coastal zone protection, integrated watershed management and climate resilient cities [Ref 14]. Greater uptake of Nature Based Solutions and targets to complement grey with green infrastructure in the revised NDCs in 2020 might foster demand for Building with Nature. As a member of the BwN Indonesia consortium, Wetlands International Indonesia played a role in introducing the new terminology, principles, and practices of Building with Nature in Indonesia. It is also advocated to policy makers to be applied in their development plans and activities.

e. National Roadmap on Land Subsidence launched by Presidential Working Group in 2019, to which the flagship partners contributed to. The mandate of the Working Group currently finished, and a new Decree is being discussed. The Presidential Working Group was established as a spin-off of the National Seminar on Land Subsidence organised by the Kemenko Marves, Wetlands International and the Partners for Resilience (PfR) alliance in 2018. Wetlands International has further been stimulating

development of a Land Subsidence Roadmap for Central Java through our water dialogues. The Water Dialogue program is a collaborative initiative involving the Dutch Government and the Provincial Government of Central Java. Its primary objective is to tackle land subsidence in the northern coastal areas of Central Java, particularly in Semarang and Demak. The program focuses on developing a roadmap for adapting to and mitigating land subsidence in the Central Java Province. The creation of this roadmap is facilitated by the Water Dialogue Consortium Team, which includes Wetlands International, Kota Kita, UNDIP, ITB, Deltares, and Witteveen + Bos. The aim of this endeavour is to serve as the initial step for the Central Java Provincial Government in devising comprehensive long-term strategies for addressing land subsidence, while also aligning with the National Land Subsidence Roadmap at the regional level.

f. Assessment and Roadmap towards Adapting and Mitigating Land Subsidence in Central Java Province [Ref 24] launched in May 2021 and developed in collaboration with Central Java province, pending formal government approval. It aims to provide a framework for adaptation and mitigation measures to address land subsidence in Central Java. This roadmap was presented and adopted in a dissemination workshop in 2021 [Ref 15].

g. In 2021, BRGM (Peatland and Mangrove Rehabilitation Agency) plans agreed to adopt the BwN approaches, such as mangrove rehabilitation techniques without planting (EMR method), Associated Mangrove Aquaculture (AMA) design, and coastal field school (CFS). This concept will be stated in the mangrove field school guideline which will be used as a guide for mangrove rehabilitation activities in Indonesia. Several personnel from Wetlands International Indonesia were involved as contributing authors in the creation of the guidebook and conducted training sessions at various locations in Indonesia in collaboration with BRGM.

h. A policy review published in December 2021, with consultation of national and local authorities and other stakeholders that clarifies how Building with Nature solutions can contribute to achieving policy targets, and what government actions are needed to make that happen. Several personnel from Wetlands International Indonesia were involved as authors and reviewers the report of this policy review. Wetlands International Indonesia also facilitated the organization of discussions conducted by the drafting team [Ref 7].

i. Land Subsidence Policy Dialogue
From early 2018 onwards, Wetlands International Indonesia, under Partnership for Resilience Program (PfR), join hand with other stakeholders (relevant ministries, government agencies and CSOs) to support the Kemenko Marves develop the National Roadmap on Land Subsidence.

The roadmap was launched on September 19, 2019, during the International Conference on Land-Subsidence. An expert from Bandung Institute of Technology (ITB), Dr Heri Andreas, is the leading author of the roadmap. The launching was timely as numbers of coastal cities in northern part of Java Island and peatland area in some districts in Sumatera and Kalimantan Island areas are increasingly sinking. Coastal areas of Demak District, Semarang City, Jakarta City, Pekalongan District and peatland area of Meranti Islands, Indonesia, are a prominent example of locations regularly inundated by sea flooding during high tide.

Land subsidence increasingly jeopardizes coastal communities with floods and erosion. Land subsidence is caused by water extracted from the ground, which lowers the land surface downwards. In Indonesia, it even lowers the land in some areas below river or sea level. Sea level rise due to climate change is further contributing to flood risks (even though less than the extraction of ground water), and will further exacerbates the risk in the future.

One of the issues identified during the development of the roadmap, was that there are already several efforts in many parts of Indonesia against land subsidence, but all these initiatives are isolated, and there is no mainstreaming within overall investments nor little coordination of efforts. Without coordinated action to reduce the pace of massive water extraction, or stop it, land subsidence will continue to increase flooding events and land erosion. This has massive impact on coastal communities, wetlands and peat lands in the entire country.

After releasing the roadmap, in May 2020 Kemenko Marves and the working group on land–subsidence developed mid-term and long-term work-plan. Work-plan will strengthen coordination, supporting multi-stakeholder initiatives and filling any gaps. The Workplan is expected to strengthen policy and law-enforcement in preventing land-subsidence, especially from massive exploitation of ground water. Meeting of working group in May-June 2020 identify some initiatives that would contribute to achieve some roadmap outcomes. Establishment of monitoring stations, further study on ground-water extraction and its impact in some prone cities, designing improved water management and flood management are among on-going activities. Significant increase in investment in water supply is key to prevent land subsidence. On the other hand, the development of the work plan process still requires further attention since there are still challenges in several areas.

Land subsidence calls for integrated disaster risk management approaches. Coastal zone and water management, urgent climate action, investments in sustainable ecosystem management and restoration, and empowered local people who can turn to sustainable livelihoods.

Several initiatives at policy and community level are taking place and would have significant contribution to halt land-subsidence. At national level, for example, development of Sustainable Development Agenda (SDG) include improvement on sustainable river management and provision of accessible clean water, and on integration climate change and disaster risk reduction into spatial planning. City-level roadmap on land-subsidence is being discussed in Semarang and Pekalongan City.

Wetlands International has further been stimulating development of a Land Subsidence Roadmap for Central Java through our water dialogues. Assessment and Roadmap towards Adapting and Mitigating Land Subsidence in Central Java Province launched in May 2021 and developed in collaboration with Central Java province, pending formal government approval. It aims to provide a framework for adaptation and mitigation measures to address land subsidence in Central Java.

Entry-points to Enhance the Regulatory and Investment Climate for BwN in Indonesia

Building on our desk review of policies as well as institutional and investment barriers (Policy Review of Building with Nature Indonesia, 2019) and focus group discussions with stakeholders, we use above model to identify six entry-points for creating a more enabling regulatory environment that incentivises BwN in Indonesia within national planning and development processes, sectoral policy and regulatory frameworks, as well as local and community planning processes.

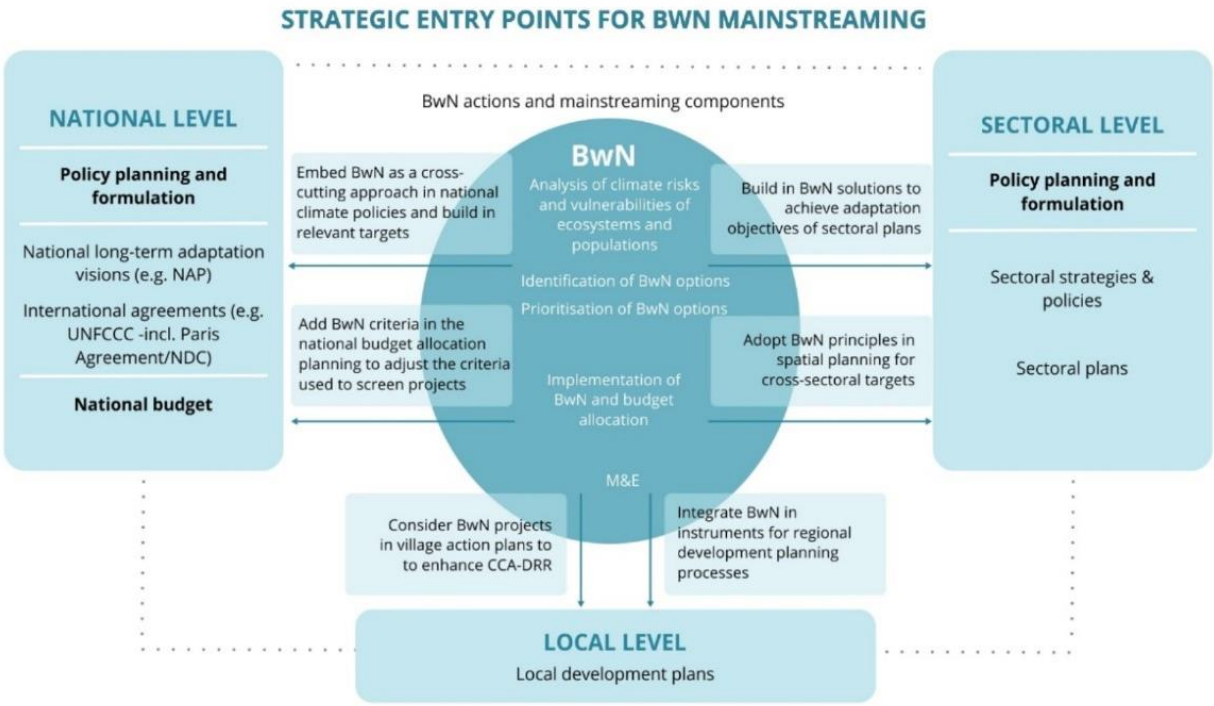


Figure 15. Strategic Entry Points for BwN Mainstreaming

BwN holds the capability to address multiple concerns simultaneously within a specific area, involving various ministries such as infrastructure, disaster management, biodiversity conservation, and recreation. However, the practice of combining public budgets is not widely adopted in Indonesia. BwN stands to gain from collaboration with International Financial Institutions (IFIs) to establish additional pilot projects. Simultaneously, this collaboration can exert influence on the government, encouraging greater support and facilitation for the widespread adoption of the BwN approach.

Establishing policy objectives for the incorporation of natural capital in infrastructure projects, particularly in rich ecosystem environments, could encourage a shift from traditional development practices towards a more ecosystem-friendly approach. The RAN API (National Action Plan for Climate Change Adaptation, or National Adaptation Plan) defines green infrastructures as facilities and infrastructure that align with the landscape, utilizing environmentally-friendly and cost-effective technologies for maintenance. This aligns with the concepts of Nature-based Solutions (NbS) and Building with Nature (BwN), both of which advocate for collaboration with nature rather than opposing it. Consequently, the integration of green infrastructure into existing national development plans, as well as sectoral and local plans, becomes imperative. For instance, incorporating compensation requirements for projects impacting aquatic or terrestrial environments could serve as a compelling incentive for investments in the natural capital approach of BwN.

Building with Nature (BwN) should allocate resources to demonstrate the practicality and effectiveness of its approach by implementing additional pilot projects. Subsequently, the gained experience should be shared with relevant stakeholders and potential partners, highlighting the performance and cost-benefits of these pilots. Investing in robust monitoring and information-sharing networks becomes a potent strategy to expand and formalize the evidence base, facilitating a shift towards more

integrated and holistic project evaluations. This approach enables the promotion of BwN by providing evidence related to its: (1) cost-effectiveness across various cases; (2) quantification of uncertainty and risk, along with the development of management perspectives; (3) revenue generation concepts aimed at enhancing the bankability of BwN projects; and (4) technical feasibility.

ENTRY POINT 1: Embed BwN as a cross-cutting approach in national climate policies and build in relevant targets

Indonesia's updated NDC is predicated on principles i.e. employing a landscape approach, highlighting existing best practices, mainstreaming climate agenda into development planning, and promoting climate resilience in food, water and energy. Further, these principles are translated into key programmes, strategies and actions on adaptation laid out in the NDC aim at reducing drivers of vulnerability to climate change impacts, responding to climate change impacts and managing risks, enhancing capacity of communities and sustainability of ecosystem services, and enhancing engagement of stakeholders at all levels in building climate resilience. All these principles and actions call for cross-sectoral that must be integrated in national, sectoral and local plans as well as policies.

As mentioned in RAN-API's Executive Summary, Climate Change Adaptation Strategies will focus on four priority sectors within 2020-2045 [Ref 16]. Two of the priority sectors are potential for BwN to contribute, i.e., water as well as marine and coastal sectors. BwN offers opportunities to both the water as well as the marine and coastal sectors to develop or revise the adaptive Engineering Design/technical standards through the BwN technical guidelines derived from key learnings in the Demak pilot project.

The principle of BwN-approach is that (surface) water infrastructure development works with nature rather than against it [Ref 17]. BwN principles are distinctive in that they require understanding of system functioning, system's envisaged function, natural processes, governance process, and monitoring (during and after project completion). For Indonesia, BwN potentially delivers a sustainable option in the water sector to develop or revise the adaptive Engineering Design/technical standards. In marine and coastal sectors, BwN offers climate-resilient, ecosystem-based, and retrofit to face the challenges and impacts of climate change, including hybrid structures and soft structures, to develop climate-resilient coastal areas. Specifically for muddy mangrove coasts, 5 technical guidelines were developed. So first general as we promote the overall BwN approach, then specific for one BwN solutions that has already been piloted.

BwN has also implemented Coastal Field School where local communities were encouraged to apply ecosystem-based coastal management, also favored in the Executive Summary. This activity is in line with the RAN-API that encourages local community involvement in ecosystem-based coastal management. Community involvement is central to the Building with Nature approach, which relies on inputs of and creates outputs for multiple stakeholders and their functions within the system context. Moreover, local involvement of community and stakeholders is critical as they will benefit from the solutions once implemented, and sometimes even maintain them. Without community support and involvement, Building with Nature cannot be successful.

Being parallel to achieve targets in two RAN-API priority sectors Bwn has identified process of RANAPI and NDC roadmap as its entry point. With Indonesia's updated NDC in place, there are two possible options to integrate BwN within NDC. Firstly, BwN approach could be integrated into RAN-API as a cross-cutting approach, then policies and sectoral and local plans will integrate with them. Secondly, BwN approach could be integrated into the evaluation and revision phases of the NDC document in 2024.

Bappenas' Decree on the Establishment of a Strategic Coordination Team for Wetland Management for Achieving SDGs and Low Carbon Development (Kepmen PPN No. 89/2020 concerning the establishment of a strategic coordination team for wetland management to achieve the implementation of sustainable development and low carbon development goals) is another entry-point for BwN. As part of the EcoShape consortium, Wetlands International Indonesia was appointed as a member of the Working Group for Synchronizing Multi-Stakeholder Policies and Supporting Data and Information. This will be a concrete step forward with YLBA being part of the Working Group, Wetlands International Indonesia can promote BwN approach and have it mainstreamed in relevant policies, supported by its experience implementing the pilot in Demak, thus taking a bigger role on CCA and DRR in Indonesia, especially on the new low carbon development initiative through mangrove restoration.

New concepts like BwN could not be easily adopted into the government policies and programs due to the need for reliable data and tangible result of the BwN program. It will affect the extent to which the government spends the budget, which is regulated in accordance with the allocated program and budget code, as well as its rigid budgeting policies. The recognition of the role of ecosystem in RPJMN 2020-2024 (DA6), SDGs (number 13), NDC, and the future National Action Plans (NAP) is strongly emphasized to achieve Indonesia's development goals. The process of NAP development is currently ongoing providing an opportunity for BwN concept to be mainstreamed in activities addressing climate-related problems in Indonesia. At the same time this will ensure budget allocation for BwN pilot implementation in Indonesia. Despite not having been referred to by the GoI during the development of the strategic documents such as NAP, Wetlands International Indonesia's involvement in such high-level national climate policy development provided an opportunity to promote and mainstream the BwN solutions into the government's development plans.

In addition, provision of technical guidelines could help standardise the approach or workflow so that it would be easily adopted into future programs, especially in water infrastructure. The consortium of BwN Indonesia has released five technical guidelines providing key learning from the pilot project in Demak with technical and socio-economic measures that help restore eroding muddy tropical coasts. There are two possible ways for the technical guidelines to influence in standardising the government's approach or workflow—1). by embedding them in the training curriculum and capacity building programs, 2). by incorporating these documents into the government knowledge product that can be used as technical guidelines in training their contractor partners that will work on the infrastructure projects.

ENTRY POINT 2: Add BwN-relevant criteria in the national budget allocation planning and the screening process of projects

APBN (National Budget) comes as one of the fiscal instruments to actualise programmes in the 2020-2024 RPJMN as well as to achieve Indonesia's NDC target in 2030. To ease tracing fiscal policies and monitoring outputs that contribute to climate adaptation and mitigation, the concept of Climate Budget Tagging (CBT) has been introduced and implemented in APBN since 2016. From 2016 to 2020, the Government of Indonesia has disbursed fund worth IDR 256.7 trillion for climate change mitigation and IDR 75.9 trillion for climate adaptation [Ref 18].

Both national and regional governments have strategic roles in improving economic and social welfare, ensuring inclusive development, maintaining environmental quality, and managing climate change. Thus, the Ministry of Finance initiates CBT at the regional level, and the progress started at the end of 2019 by developing a guidebook for Regional CBT. In early 2020, 11 pilot areas tried to implement regional CBT, whereas in 2021, regional CBT will be administered in six new pilot areas. In implementing the regional CBT, the national government through Kemenkeu expects to encourage local governments to formulate appropriate

regional fiscal policy proposals, as well as identify adequate and effective financial resources to fund climate change actions [Ref 19]). There are several channels in which APBD could be allocated for CCA programmes, for example Co-administration Fund (DTP), Dana Desentralisasi/DD (Decentralisation Fund), Dana Alokasi Umum/DAU (General Allocation Fund), Hibah Daerah/HD (Regional Grant), Dana Bagi Hasil/DBH (Revenue Sharing Fund), or Dana Alokasi Khusus/DAK (Special Allocation Fund). The eligible criteria to access these financial resources is that the program aims at increasing the communities and other stakeholders participation in strengthening adaptation capacity to the impacts of climate change. A good example of such programs is PROKLIM that has been implemented by KLHK. One strategy to mainstream BwN could be through having the concept be adopted by major program like PROKLIM that is targeting to achieve 20,000 implementation locations by 2024.

Besides fundings from APBN or APBD, through the Government Regulation on Economic Instrument for Environment (PP No. 46/2017 tentang Instrumen Ekonomi Lingkungan Hidup) and the Presidential Regulation on Environmental Fund Management (Perpres No. 77/2018 tentang Pengelolaan Dalam Lingkungan Hidup), climate mitigation and adaptation, as well as disaster measures, could be funded by international funds managed by BPDLH. This scheme provides potential fundings for BwN. However, it must be noted that the implementation of the Presidential Regulation requires development of general policies in the management of environmental funds, development of technical policies to be funded; and evaluation of the implementation of policies.

ENTRY POINT 3: Build in BwN to achieve adaptation objectives of sectoral plans

BwN offers a solution for cross-cutting sectoral targets, such as infrastructure development, climate adaptation, and disaster management. BwN, by replacing or complementing grey infrastructure development, could be an alternative to hinder the negative externalities from climate change and disasters. Of four pillars embedded in the 2020-2024 RPJMN, one pillar is highly relevant as it is related to BwN, sustainable development, with disaster resilience and climate change already embedded in the pillar. BwN also could help the Government of Indonesia to achieve three of seven Development Agenda's (DA) in the 2020-2024 RPJMN, which are DA1 Strengthening Economic Resilience for Growth Quality, DA5 Strengthening Infrastructure to Support Economic Development and Basic Services, and DA6 Building the Environment, Improving Disaster Resilience and Climate Change.

The 2020-2024 RPJMN already includes one main pillar and three development agendas (DA1, DA5, and DA6) to which BwN is relevant. To support the implementation of the development plan, BwN could target the annual revision of sectoral targets and indicative funding reflected in the ministry's annual work plan. As implementation tools in ensuring the regulation and funding allocation in the RPJMN, government annual work plan (RKP) and APBN, Major Projects whose fundings requiring updates through Ministry/Agency annual work plans provide opportunities, such as coastal protection for five urban areas in the North Coast of Java to address coastal flooding, and 61 multipurpose dams for water, irrigation, and flood control. According to Bappenas, at the time of implementation of RKP for year 3 of ministry/agency workplan coincides with the mid-term review [Ref 21]– this is an entry points for BwN to be adopted into the RKP.

In DRR, BwN could target in developing disaster resilient infrastructure for 20 provinces with high disasters experience through: (1) integrated programme in disaster risk management, specifically flood risk in urban areas, with a combination of structural and non-structural approaches including green infrastructure; (2) development of regional policies and master plan for disaster resilience and the strengthening of disaster resilience

infrastructures; (3) recovery of the four critical watersheds to reduce the impacts of flooding in the provinces of Banten, DKI Jakarta, West Java, and North Sumatra. In developing nature while improving resilience in disaster and climate change, BwN has prospects to contribute in the DA6, i.e., in area conservation and protection of endangered biodiversity both on land and in water, provision of biodiversity and ecosystem diversity data, and information, as well as strengthening DRR Plans through: (1) national and regional DRR action plans that will be integrated with the CCA action plan; (2) coastal and marine sector vulnerability protection in the form of strengthening infrastructures through ecosystem-based adaptation, community awareness, technology development, and diversification of coastal livelihoods; (3) protection of water security in climate risk areas, through increased supply of raw water and protection against water disasters; (4) restoration of mangrove and coastal ecosystems to reach low-carbon seas and coasts.

ENTRY POINT 4: Adopt BwN principles in spatial planning for cross-sectoral targets

The integration of cross-sectoral targets within spatial planning remains a challenge for the Government of Indonesia. For example, the Government has several commitments and targets in CCA, DRR, development plans, NDC, and multilateral environmental agreements like CBD, Ramsar Convention, and SFDRR. To address those challenges, adopting the BwN approach in spatial planning becomes promising as BwN provides better services to society while enhancing the natural environment, increasing climate resilience, and reducing disaster risk. To support the adoption, there are several entry points from which BwN could start: (1) the Middle-Term Integrated Planning and Investment Programme for Infrastructures (RPI2JM) as a document integrating spatial policies and sectoral policies; (2) the Indonesian Biodiversity Strategy and Action Plan to be mainstreamed into the national development plan and RKP from KLHK, LIPI (now under BRIN) and KKP (focusing on crosssectoral issues of disaster management, climate change adaptation and mitigation) as well as indicative funding sources.

The Law on Spatial Planning (UU No. 26 Tahun 2007 tentang Penataan Ruang) has the principal on designing with nature. Some articles, in particular, give the mandate that spatial planning must consider the capacity of the environment, which creates opportunities for BwN approach: (1) 30% of a watershed land cover should be for the forest; (2) 30% of green open space in urban areas; (3) local protected areas including beaches, which could be translated that beach border should be planted with mangroves; (4) spaces that are allocated for natural space to reduce future disaster risks (geology or slow onset like climate change).

As mandated by the Ministerial Regulation on the 2012-2020 RAN-API within PUPR (Permen PUPR No.11/2012 tentang Rencana Aksi Nasional Mitigasi dan Adaptasi Perubahan Iklim Tahun 2012-2020 Kementerian Pekerjaan Umum), the integration of green infrastructure, like BwN, into spatial planning responsive to the impacts of climate change could be done through: (1) identification of districts or cities affected by climate change and thus requires revision of vulnerability mapping and spatial planning; (2) mainstream the city concept and community role who have the endurance to climate change impacts/climate change resilience through the responsive-detailed spatial plan; (3) improve integrated Infrastructures and spatial planning that is responsive to the impacts of climate change e.g. green infrastructures, climate change-responsive regional development concept; (4) inputs into spatial planning (taking into account the integration of DRR, spatial guidelines, and the Guidelines for Integrating Climate Change Adaptation (API) into spatial planning; (5) acceleration of revision of RTRW province/district/municipal level; (6) the development of Detailed Spatial Plan (RDTR) by Subdirectorate of Spatial Plan (PUPR) and Ministry of Agrarian Affairs and Spatial Planning.

ENTRY POINT 5: Consider BwN micro-projects in village action plans to enhance CCA-DRR

BwN has been enhancing CCA-DRR as coastal protection in Demak since 2015. The eroding muddy tropical coasts are being restored by employing a nature-based technical approach combined with the introduction of sustainable aquaculture model. Considered a best practice in the application of Integrated Risk Management, the BwN project in Demak was included in the 2019 Indonesia's Voluntary National Reviews because of efforts in protecting the coastline while also raising local livelihoods and capacity. [Ref 20]

Challenges as in Demak commonly occur in many coastlines in Indonesia, and thus, mainstreaming the approach becomes probable if integrated into village action plans and funded by the Village fund. As such happened in Demak, the project is not only integrated with the Village Fund, and in line with Village Regulations, the BwN Programme has also been replicated by members of the consortium (KKP and PUPR) in many other regions throughout Indonesia.

In Demak, village development plans and land-use regulations incorporating Building with Nature have been adopted by communities and formalised within local government. These developments have received government support and resulted it enhanced funding for the maintenance of permeable structures, mangrove rehabilitation and improved aquaculture. But continued success is not guaranteed. Despite the plans, there has been growing pressure to zone land in severely eroded areas of Demak for industrial development. Speculators have bought up land from villagers suffering from flooding. Industrial developments will likely involve heavy investment in hard structures to prevent flooding. While such investment might be cost-effective for the developer, it would damage the wider environment and communities by abstracting more groundwater, accelerating subsidence, and increasing land loss and flooding along the coast of Demak.

To further mainstream best practices from BwN in Demak, Building with Nature solutions should be registered to the National Registration System (SRN) and AKSARA. SRN is a web-based system for managing data and information on mitigation, adaptation, and means of implementation (finance, capacity building, and technology transfer and development) managed by KLHK so that its impacts could be tracked and the transparency principle could be implemented. SRN accommodates implemented actions and supports climate change adaptation and mitigation in its system, providing potential for mainstreaming BwN. Registering BwN mangrove restoration effort (mangrove map) and approaches used in Demak like Coastal Field Schools, the Bio-Rights mechanism, and technical solutions shows that BwN can be applied in other landscapes for different challenges where Naturebased Solutions can be integrated with water infrastructure development.

In addition, the AKSARA platform managed by Bappenas - a mechanism for monitoring, evaluation, and reporting of climate resilience measures [Ref 22]. This is an integrated process from planning, budgeting, monitoring and evaluation, to reporting, and involves all relevant Ministries/Agencies, Local Governments, and Non-Governmental Institutions. However, accoding to the ExSum KPBI [Ref 21], until now, this process is only applied to programs and activities of Ministries/Institutions (K/L).

ENTRY POINT 6: Integrate BwN in instruments of regional development planning processes

Integrating BwN in regional development planning needs support from regional governments and alignment between national and regional governments. However, stakeholder alignment remains a challenge as such happened in the implementation of the Regional Regulation of Central Java on Zoning Plan of Coastal Areas and Small Islands in the Central Java Province in 2018-2038 (Perda Jateng No.13/2018 tentang Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil Provinsi Jawa Tengah Tahun 2018-2038). Although the district and city government also have the authority to collaborate in coastal development along with the Provincial government in the 12 miles from the coastline, in fact, the misinterpretation limits the involvement of the district government in planning processes. Thus, entry point to integrate BwN approach in regional development planning, notably for coastal development, is through the Revision of the attachment of Law on Regional Government (UU No. 23/2014 tentang Pemerintahan Daerah) which regulates the roles and responsibilities of the central, provincial, and district/city government affairs concerning the nautical miles.

One of the development agendas in the 2020-2024 RPJMN is building the environment while enhancing disaster resilience and climate change. To support the implementation in the regional level, BwN could target: (1) Revision of Government Regulation on Implementation of Disaster Management (PP No. 21/2008 tentang Penyelenggaraan Penanggulangan Bencana); (2) Revision of Government Regulation on Procedure for Determination of Carrying Capacity (PP Tata Cara Penetapan Daya Dukung dan Daya Tampung).

BWN Indonesia Events

The Building with Nature Indonesia was featured in the UNFCCC COP26 side event hosted by the KKP *'Using Nature-Based Solutions for Adapting to Climate Change and Building Economic Resilience based on Blue Economy Principles'* [Ref 28]. Further, MMAF's deputy director for disaster mitigation and climate change adaptation presented the flagship in the COP26 Asia Water Hub event on Cities & Infrastructure [Ref 29]. The Secretary of Directorate General of Marine Spatial Management at Ministry of MMAF also spoke in Wetlands International side event at the COP26 Water Pavilion in Glasgow [Ref 30].

5. GOVERNANCE, ACCESS TO FINANCE AND MARKET

5.1 Project Governance of Building with Nature Indonesia

On a strategic level, a Steering Committee aligns projects and initiatives that contribute to the shared vision. Decisions by the steering committee will be succeeded by the management team of BwN Indonesia, i.e. Wetlands International and Ecoshape.

An operational committee is established to facilitate hands-on collaboration within BwN Indonesia and to align operational implementation of the BwN Indonesia measures with other programs from the Indonesian partners. The operational committee mandate is to materialize the strategic decisions of the steering committee in close consultation with the BwN Indonesia management team.

In addition at steering committee level (see organogram below) an Advisory board is established, which reports to the steering committee and in which most important stakeholders along the Demak Coastline are represented (including a.o. regional authorities, universities and knowledge institutes). The advisory board serves as a platform to establish a shared commitment for anticipated measures and informs stakeholders on progress and anticipated decisions.

In the organogram below, the steering committee, the advisory board and the operational committee are indicated as part of the organizational chart for the BwN Indonesia project. Below the different platforms enabling interaction are described in more detail. [Ref 23]

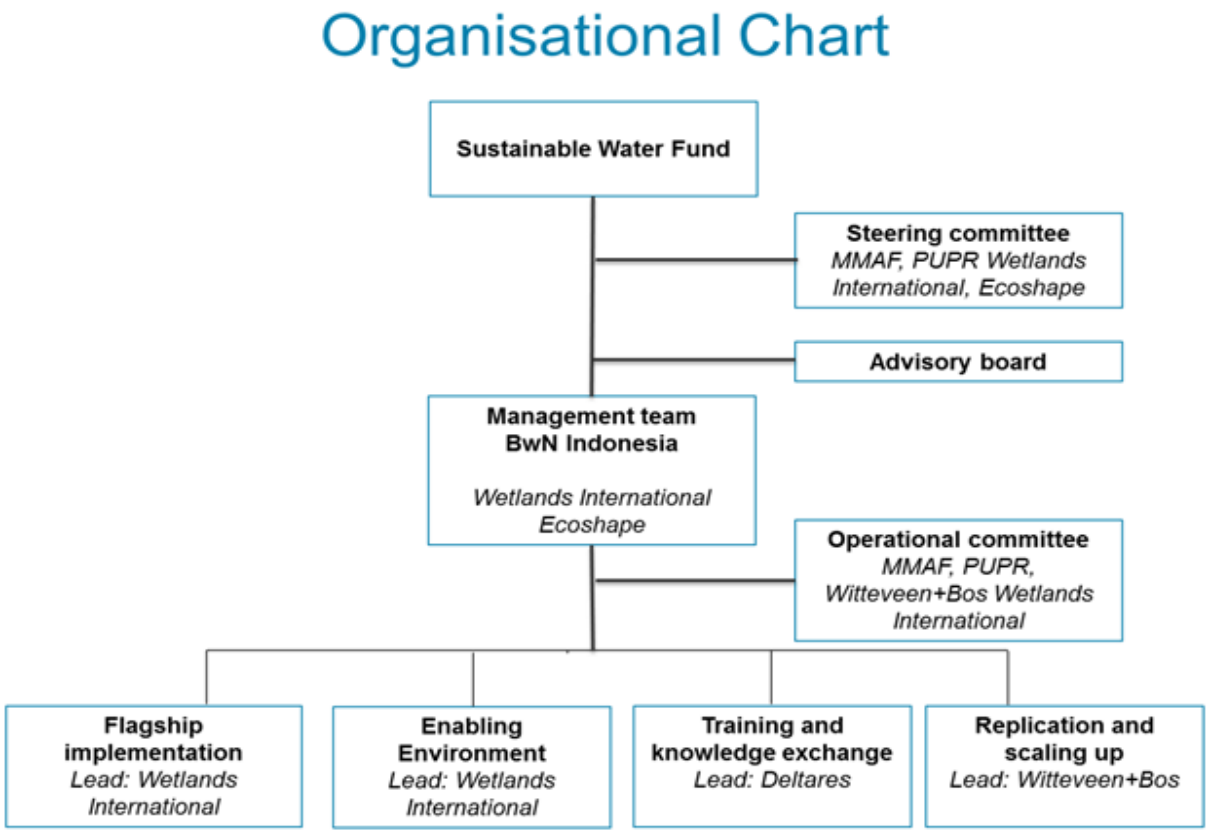


Figure 16. Organizational Chart of BwN Program Indonesia

1. Steering committee

Steering committe's aim to align the Project activities with (possible) other ongoing initiatives, projects and policy developments in Indonesia. The steering committee meets annually.

The Steering committee consist of the following parties:

a. Director General of Marine, Coastal and Small Island, the Ministry of Marine Affairs and Fisheries (KKP)
b. Director General of Water Management, the Ministry of Public Works and Housing (KPUPR)
c. Governor of Central Java
d. Regent of Demak
e. Chief Executive Officer of Wetlands International
f. Director Ecoshape

The steering committee plays a role in identify and stimulate opportunities to leverage greater impact of BwN project.

2. Advisory board

Advisory board aims to provide input to discussions and influence decisions within the Steering Committee by being non-committal advice. The advisory board provides suggestions and advice on further projects which are then incorporated into community plans and local policy developments for sustainability. Additionally provide advice on communication strategies.

The advisory board meets every two years prior to the steering committee.

3. Management team of BwN Indonesia

The management team monitors project progress, manages risks, and optimizes opportunities in consultation with the Steering committee and Operational committee. The management team is responsible for financial management and formal reporting to SWF. The project manager oversees coordination of the daily project activities and implementation of the pilot in Demak.

In the management team, Wetlands International is the overall project manager and Ecoshape is responsible as a liaison to RVO.

4. Operational committee

The operational committee has the aim of aligning operational design and implementation (construction, community involvement, etc.) along the north coast of Java (Demak Regency) and related improvement activities in Indonesia.

The operational committee plays a role in integrating and aligning design and construction activities, training activities and implementing communication strategies at local and national levels. Operational committee meetings are held every six weeks and more regularly if necessary. Operational committee members consist of representatives from KKP, KPUPR, Provincial representatives, BwN Indonesia: Witteveen+Bos and Wetlands Internasional Indonesia.

In addition to the project governance structure above, the BwN Indonesia program was implemented through a public-private partnership. Interdisciplinary collaboration among stakeholders was essential for successful BwN solutions. Each partner brought specific knowledge, experience and skills and had their unique roles. In addition to the important roles played by local communities of Demak in the design, implementation and maintenance of coastal safety and socio-economic measures, the following are the elaboration of the extent to which the partners actively participated in the project as summarised in the figure 17.

Government agency
Planning and implementation of measures in Demak were undertaken in line with the program of the Ministry of Maritime Affairs and Fisheries (KKP) and the Ministry of Public Works and Public Housing (KPUPR). Both ministries aim to create an environment that supports the implementation of BwN solutions nationally. KKP is a government agency responsible for managing coastal and marine resources. The KPUPR is the government agency responsible for technical and major infrastructure, including roads and coastal and river flood defense.

Non-profit organization
Wetlands International managed partnerships, coordinated community outreach and field activities, delivered community capacity building activities, facilitated policy and stakeholder dialogue, and contributed its technical ecology expertise. Wetlands International is a global, non-profit organisation dedicated to preserving and restoring wetlands for nature and people.

EcoShape acted as consortium lead that coordinated and managed the BwN partnership in collaboration with Wetlands International.

Blue Forests is an Indonesian non-profit organisation dedicated to community-based mangrove conservation and restoration. Blue Forests delivered coastal field schools to improve the local farmers' capacity in improved pond management and community-based mangrove restoration in the project site.

Kota Kita is an Indonesian NGO that has expertise in urban planning and citizen participation. Kota Kita facilitated a series of Water Dialogues to address land subsidence in Semarang and Demak coastal areas through the formulation of a roadmap together with the wider stakeholder of target catchment area to reduce groundwater extraction.

Knowledge institute
Deltares and Wageningen University & Research (WUR) contributed and shared their expertise on coastal ecology and geomorphology, as well as aquaculture and alternative livelihoods. Moreover, they were responsible for the design and monitoring of BwN interventions. Deltares also coordinated the BwN approach training program, together with the international water educational institute, namely UNESCO-IHE. In addition, Diponegoro University (UNDIP) of Semarang contributed their local system knowledge for the design and support of field monitoring.

Consulting and engineering companies and contractors

Consulting and engineering firm Witteveen+Bos is responsible to manage and supervise the implementation of coastal safety engineering measures conducted by the Indonesian contractor. Moreover, it performed the overall social cost-benefit analysis. Witteveen+Bos also facilitated program replication in other locations. There were two leading global dredging and maritime engineering contractors involved in the EcoShape consortium, including Boskalis and Van Oord. In addition, the engineering firm von Liebermann was also involved.

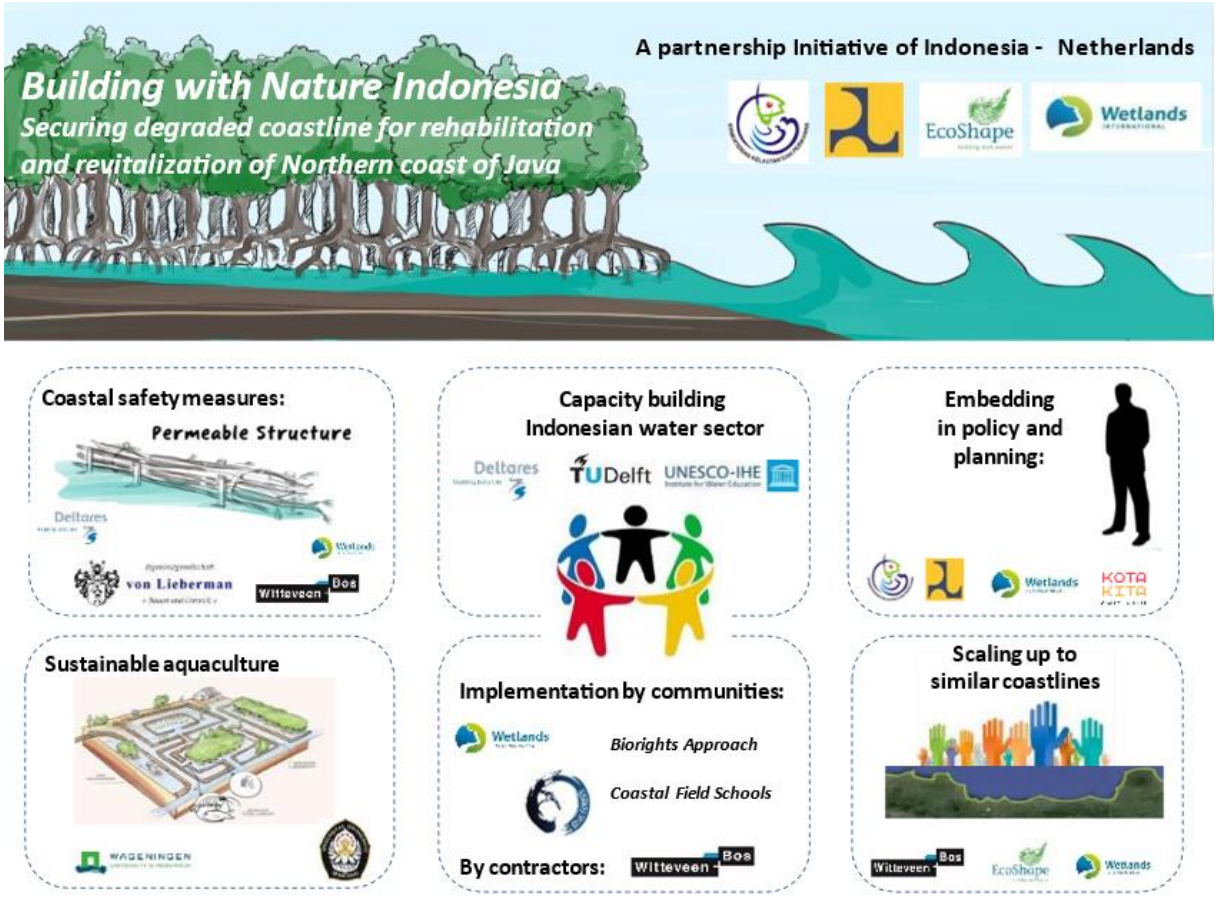


Figure 17. Types of activities of BwN program supported by various organizations

5.2 Access to finance

Bio-Rights mechanism: financial incentive mechanism for sustainable community development [Ref 5].

Bio-Rights is a financial incentive mechanism that aligns community's livelihoods development with environmental conservation and restoration. The combination of BwN project with Bio-Rights mechanism enables the integration of innovative approaches in working with nature solutions with the long-term goal of sustainable development. The Bio-Rights incentive mechanism was first proposed in the late 1990s.

Since that time, Wetlands International has been at the forefront of implementing the Bio-Rights mechanism in Indonesia. Innovation and learning have been at the core of the

concept since its inception, whether through implementation in different ecosystem types (mangroves and peatlands) or under different socio-economic and land tenure conditions across Indonesia (for example, in Aceh, Jambi, South Sumatra, Central Kalimantan, West Java, Central Java, and Flores). A further preoccupation has been sustainability, whether in terms of the results from individual Bio-Rights interventions or how to integrate the concept into government planning processes to facilitate replication (scaling-up).

The BwN-Bio-Rights program provided technical and financial support to community groups in Demak to revitalize aquaculture management and other livelihoods options and restore mangroves. In the BwN program, it consisted of core initiatives such as: maintaining the permeable structures built with local materials that aim to trap sediment and then encourage natural mangrove recovery, converting aquaculture ponds to mangroves along the coastal and riverine green belt zones, revitalizing aquaculture ponds management, conserving the existing mangroves, and supporting alternative livelihoods for those whose ponds were no longer viable or have been lost to the sea due to land subsidence. The supporting initiatives include establishing and strengthening community groups to lead the implementation of local activities, supporting the involvement of community groups in the regional planning process and developing coastal village regulations, and monitoring the implementation of activities. These initiatives are supported by a strong and sustainable capacity building process for the community members. By the end of the BwN implementation, the Bio-Rights mechanism has rehabilitated 100 hectares mangrove ecosystem, revitalized 300 hectares of aquaculture pond and improved the target community's livelihood, with increased pond productivity by 50% and income by 5,000 EUR per hectare per year.

The component of BwN's Bio-Rights financing consisted of operational compensation, reimbursable costs, and conditional loans – each of which was linked to the costs of implementing the “core” and “supporting” initiatives. In the mechanism, the community groups shared their in-kind contributions, such as time, labor, local materials, etc. Biorigths financing can be used on behalf of the group, which can then be used for both collective and individual income generating activities. The conditional loans will be converted into grants when the set criteria are met.

The steps of Bio-Rights implementation:

- Preparation and planning. At this stage, the BwN's field team facilitated the groups' institutional capacity in coastal management and went through the signing of the contract.

- Capacity and trust building. The community outreach team delivered capacity building activities, for instance through coastal field schools and other training methods, to increasing local knowledge and skills regarding mangrove conservation, alternative income generating activities and the Bio-Rights mechanism.

- Implementation and monitoring. The field team provided mentoring and supervision to the community group members to implement mangrove conservation and restoration and develop income-generating activities. At this stage, the conditional loans can be converted into grants.

- Sustainability. The mangrove conservation sustainability in the village had been enabled through improved capacity of the group members in improved coastal and aquaculture management. Moreover, their participation in the village development plans meeting (Musrenbangdes) and drafting of village regulations ensured that the conservation and management of the restored areas can sustain upon the project completion.

Conditional loan

The loans covered the operational costs of ponds conversion to green belts, supporting inputs and practices to improve aquaculture management, for instance administering AMA and LEISA, and income generating activities from aquaculture and non-aquaculture sector.

The loan amount varied from one group to another, depending on the size of the ponds covered by the scheme. Loans for non-aquaculture income/livelihood generating activities were received as a lump sum, both for individual and group businesses.

The following are the amount of financial compensation (conditional loans) for each type of initiative:

Table 5. The amount of financial compensation (conditional loans) for each type of initiative

No	Initiatives (Community's contributions)	Financial Compensation (conditional loan, in IDR)
1.	Pond conversion to mangrove greenbelt	18.000.000/ha
2.	administering Associated Mangrove Aquaculture (AMA) design and LEISA principles in pond management	9.000.000/ha
3.	Administering aquaculture revitalisasion (improved management) (for instance, managing non-AMA pond by administering LEISA principles)	4.500.000/ha
4.	Individual non-aquaculture alternative livelihoods	5.000.000/orang
5.	Collective (group) business	20.000.000/group/village

The total amount of loan for each group ranged from IDR 170,000,000 to IDR 660,000,000, and were disbursed in four installments, i.e. first installment 50 percent, second installment 25 percent, third installment 20 percent, and the last installment 5 percent. Particular conditions were required for each disbursement. The following is the example of conditions for the case of the first installment:

- The contract has been signed by both parties (program leader and community group).
- All the requirements for group formation were met.
- Bio-Rights annual work plan was completed.
- All group members showed the document of pond ownership or managing right.

Loans conversion to grants

Conversion of loans to grants was subject to satisfactory implementation of the package deal. Each initiative had a cumulative score totaling 100 percent, with parameters weighted proportionally. Parameters and scores were developed by the field teams in consultation with the community groups.

Simulation of Bio-Right scoring:

Table 6. Simulation of Bio-right scoring

Initiatives	Score	Parameter	Score
Administering LEISA principles for improved aquaculture management	10	administering compost	25
		administering Local Microorganism (MoL)	25
		No synthetic chemical based inputs	25
		Documenting activities (notebooking) in a log book	25
Associated Mangrove Aquaculture (AMA)	10	administering AMA design	20
		Applying compost appropriately	20
		administering Local Microorganism (MoL)	20
		No synthetic chemicals based inputs	20
		Documenting activities (notebooking) in a log book	20
Hybrid engineering/ permeable structure maintenance	20	administering regular monitoring of the permeable structures	20
		administering maintenance of the structure pole holes	10
		tightening the loosen knot	20
		rechanging the brushwood in the structures as needed	20
		improve or replace the unstable poles	20
		documenting the maintenance activities delivered in a log book	10
Mangrove greenbelt	10	Administering land preparation	40
		No mangrove conversion to aquaculture pond along the greenbelt zone	20
		No mangrove deforestation along the greenbelt zone	20
		Promoting ecological mangrove restorasi approach	20
Group/individual alternative livelihood activities	5	Productive alternative livelihood activities managed by the community groups	50
		Other non-aquaculture productive alternative livelihood activities managed by the community groups	25
		Development of sustainable alternative livelihood activities	25
Legal status from the Ministry of Law and Human Rights	5	Document of organisation statutes	100
Holding group meetings regularly	10	All the group members attend the regular meetings	50
		Group meeting held at least once a month	50
Annual workplan	5	Annual workplan document is approved by the village head	100
Participation in village development planning meetings (Musrenbangdes)	10	Community group's representatives actively participate in the village development planning meeting (Musrenbangdes)	25
		at least having 2 (two) gender balance representatives for the meeting	25
		Proposing the community group's activities in the meeting	25
		The activities proposed by the group are adopted in the village's medium-term development plan	25
Active in drafting and socializing village regulations	10	the community group representatives are involved as the drafting team	50
		Promoting the group's aspirations	25
		The proposed activities are included in the regulation draft	25
TOTAL	**100**		

The conditions of the loan repayment corresponding to the total score achieved, as follows:

- If the score was 80 percent or more, then the loan was 100 percent converted into grant (no repayment).
- If the score was between 61-80 percent, then the group must repay 20 percent of the total loan.
- If the score was between 41-60 percent, then the group must repay 40 percent of the total loan.
- If the score was between 21-40 percent, then the group must repay 60 percent of the total loan.
- If the score was less than 20 percent, the the group must pay back 80 percent of the total loan.

5.2.1 Achieved BwN-Bio-Rights score

The BwN-Bio-Rights fund was disbursed in four instalments. To receive subsequent funding disbursements, the groups were required to achieve a minimum score of 80 percent on the Bio-Rights assessment. The loans have been fully converted into a grant since all the initiatives were implemented satisfactorily. This means that the group performance score reached the minimum requirement score, i.e. 80 percent in all four phases. The most recent program monitoring and assessment, conducted at the end of 2020, showed that all the ten groups ultimately implemented all initiatives satisfactorily, with a few corrective actions.

Out of the 10 community groups, the score ranged between 82.2 percent at the lowest and 97 percent at the highest.

The following are the BwN-Bio-Rights scores achieved by each group:

Table 7. The BwN-Bio-Rights scores achieved by each group

No	Village	Community Groups	Score (%)
1.	Bedono	Bedono Bangkit	89,90
2.	Betahwalang	Sido Makmur	97.00
3.	Morodemak	Mina Sido mumbul	86,92
4.	Purworejo	Purwo Gumilar	82.20
5.	Timbulsloko	Barokah	85.00
6.	Tugu	Semi Jaya Al Barokah	88.00
7.	Wedung Seklenting	Bergembiralah Mulyo	82.20
8.	Wedung Gojoyo	Onggojoyo Jaya	91.61
9.	Surodadi	Berkah Alam	88.86
10.	Tambak Bulusan	Jaya Bhakti	83.00

5.2.2 The Innovativeness of the Bio-Rights scheme

Bio-Rights could be seen as a community-based conservation approach. This program provided microcredit for the farmers to improve their livelihoods in exchange for their active participation in conserving and rehabilitating their mangrove ecosystem. The microcredit was converted into cash payments once conservation services were successfully implemented.

Bio-Rights was considered as an innovative scheme for the following reasons:

- Bio-Rights was proven to be a viable and flexible approach for implementing innovative mangrove restoration measures such as building permeable structures to promote natural mangrove recovery and establishing associated mangrove aquaculture and administering sustainability principles in pond management using LEISA.
- Bio-Rights brought together development and conservation goals into a doable and replicable framework. The financial packages were provided as contractually binding conditional loans with gradual disbursement. Consequently, the loans had to be used to improve sustainable livelihoods and to achieve mangrove conservation goals in the area. Therefore, every loan disbursement should meet certain mutually agreed criteria and conservation indicators. These contractual obligations were evident to be more effective to increase community's participation in environmental conservation measures compared to voluntary participation, thereby increasing the likelihood of success. Since the criteria and indicators for loan disbursement had been negotiated in advance, resistance and conflict were minimal.
- Although the loans were received by individual farmers, the Bio-Rights contracts were signed between the program and the established groups, not individuals. Group based contracts created collective responsibility among the members to comply with the loan conditions, in which individual performance of the group members contributed to the entire group performance. In addition, since the contract signing was carried out publicly and witnessed by the village government, their performance toward the contract conditions were unofficially monitored by the wider community. To conclude, group (collective) contracts were more manageable compared to the ones with individual.

The main obstacles faced during the implementation:

- The Bio-Rights concept was not yet popular among the BwN project stakeholders. It took some time for them to understand the mechanism and then made informed decision on their participation.
- The group board did not have capacity to manage the group fund sustainably.
- It is quite challenging in understanding and figuring out the appropriate Bio-Rights' package deal to support the project success.

Overcoming the obstacles during the implementation:

- The field facilitator team had to explain carefully about the Bio-Rights concept, its mechanism and also how to prepare the key performance indicators.
- The field team conducted community members income survey to calculate their income and to decide the amount allocated for the community organisation.
- The field facilitator team facilitated regular discussions to design the appropriate package deal that corresponded to the project objectives, then formulated the package deal into the group's annual work plan.

Although the BwN-Bio-Rights approach has been successfully implemented by the community, this conditional loan-based approach is difficult to adopt into development plans and routine budgeting by the Indonesian government. Government funding is usually only provided in a one-year cycle, and is sometimes not available every year. Meanwhile, the BwN-Biorigts approach applies a five-year cycle that continues throughout the program period.

The mechanism for conditional loans to become grants does not exist in the government mechanism, because loan and grant funding comes from different allocations.

5.2.3 Tools and methods used in the implementation of BwN program

The commonly used mangrove-aquaculture design by the local farmers is traditional silvofishery, in which the mangroves are planted on the pond dykes and in the pond platforms (pelataran). The planting of mangrove in the pond does not provide ecosystem function that the natural mangrove ecosystem provides. The BwN project introduced innovative Associated Mangrove Aquaculture (AMA) design, with the objectives to restore mangrove greenbelts in the estuary along inland waterways to protect the adjoining fishponds located adjacent to the river. To implement AMA systems, farmers set back the river dyke and adjust the sluice system to create a mangrove greenbelt along the river. Proper pond management is key to success, for instance by allowing natural sedimentation by opening and closing sluice gates at the right moment in time. For the application of AMA systems farmers need to give up a portion of their ponds and invest in building extra dykes and gates [Ref 12]. To build their knowledge and confidence, the BwN project in Demak engaged farmers through Coastal Field School (CFS) to demonstrate that applying Low External Input and Sustainable Aquaculture (LEISA) and other good aquaculture management practices, can indeed improve their yields and their income in an ecologically sound way. It is demosntrated that applying a LEISA allows farmers to triple their income from milkfish and shrimp farming. [Ref 10]

The AMA design has been implemented by the community groups members and the results have shown increased production. AMA design constituted a new technique among the target farmers. However, the target communities have not yet had the courage to fully adopt this concept due to a large amount of capital required in converting to the AMA system.

Regarding the implementation of the Bio-Rights mechanism through banks or microcredit institutions, it is unlikely that it will be able to be adopted by banking system because the main reason for the existence of banks and microcredit institutions is to issue loans that are repaid and accompanied by interest. It's hard to see how Bio-Rights' mechanisms, which ultimately convert loans into grants, could fit into this business model. It is possible that banks and microcredit institutions could act as managing intermediaries, but there are some concerns about this idea. First, banks and microcredit institutions are expected to incur high transaction costs reflected in the fees paid for their services. Second, these organizations do not have the skills and technical knowledge to manage Bio-Rights contracts and therefore need to hire experts, which will likely increase costs. Third, one of the strengths of the Bio-Rights mechanism is its flexibility. Given the way banks operate and the importance of rules, regulations and compliance, it can be difficult to maintain that flexibility when working with banks or microcredit institutions.

5.3 Access to market

The BwN has delivered various kind of capacity building actvities related with alternative livelihoods development for the target communities in Demak, except marketing. Access to the market has not been well planned or thoroughly analyzed in the project, which presents a significant gap in ensuring the long-term sustainability of community-based mangrove restoration efforts. Linking to the market can be improved, and there is a clear need for targeted support in this area. Specifically, communities must be empowered to meet market standards for their aquaculture and other mangrove-related products, ensuring competitiveness and quality. Additionally, there is an opportunity to explore innovative financing mechanisms that go beyond selling products alone. These mechanisms should aim to monetize the ecological value of restored mangrove areas, such as through carbon credits, conservation-linked incentives, or eco-labelling. This approach would help ensure that restored areas are not only maintained but also generate ongoing benefits, reinforcing the importance of keeping these ecosystems intact.There was no analysis of the value chain and barriers of the main commodities, as well as marketing strategies such as market research, product development, marketing techniques.

It is actually easy to provide something like digital marketing training to farmers via social media (e.g. WhatsApp, Facebook) which can be a useful capacity building initiative. Productivity from LEISA can show good benefits, and can be extended to other community members to switch to LEISA. Large companies (including government and private banks) allocate 2.5 percent of their profits to corporate social responsibility (CSR) initiatives; This source of fund could be accessed by the groups to develop the marketing of their product.

6. REPLICATION AND UPSCALING

6.1 Facilitating upscaling of activities

The Building with Nature Indonesia Program, during its implementation period, collaborated with government partners, such as the Ministry of Maritime Affairs and Fisheries (KKP) and the Water Resources Research and Development Center (PUSAIR) of the KPUPR (which has now merged into the National Research and Innovation Agency/BRIN (Badan Riset dan Inovasi Nasional). After the program period ended in 2021, Wetlands International Indonesia continued communication and policy dialogue with the government, some of which were the Peat and Mangrove Restoration Agency (BRGM) and the Ministry of Environment and Forestry/KLHK (Kementerian Lingkungan Hidup dan Kehutanan), to encourage ecological mangrove rehabilitation approaches into the program -mangrove rehabilitation program managed by the government and related stakeholders in Indonesia. Some of the achievements of cooperation with the Indonesian government include development of mangrove rehabilitation field school training module, collaborating in capacity building training related to mangrove rehabilitation, conducting exchange visits to mangrove rehabilitation sites in Demak and contributing to draft the government regulation on the protection and management of mangrove ecosystems.

Moreover, to maintain the partnership with Indonesian government beyond the BwN program, Wetlands International Indonesia applies several strategies, such as intensive communication with officials of ministries/agencies, delivering presentations at meetings, workshops, and/or trainings and facilitating (learning) exchange visits. Several lessons learnt from engagement with the government included establishing and maintaining good communication with ministries/agencies, and providing sufficient and relevant communication materials that align with government programmes such as success story and best practice document. Upscaling can be within a wider landscape/watershed, within a country or across countries. WI is currently developing an upscaling Strategy.

Since 2015, KKP, one of the government partners of the BwN consortium, has implemented the BwN approach in restoring the north coast of Java and several other places beyond Java island. This nature-based solution approach used ecosystem technology engineering called hybrid engineering (HE). HE is a semi-permeable structure technology which imitates the healthy functional mangrove root system in trapping sediment by using bamboo poles and brushwood. The HE construction program was contained in the KKP work plan document stipulated through Minister of Maritime Affairs Regulation No. 8 of 2016, No. 55 of 2016, and No. 65 of 2017 concerning Work Plans of the Ministry of Maritime Affairs and Fisheries for 2016, 2017 and 2018. Between 2015-2019 KKP built HE structures in 13 coastal areas threatened by abrasion in Indonesia, with a total length of 23.51 km.

Table 8. Construction locations and length of HE structures built by KKP (2015-2019)

Year	Location	The structure extent (meter)	Total Length (meter)
2015	Regency of Cirebon, West Jawa	2.910	14.160
	Regency of Brebes, Central Jawa	910	
	City of Semarang, Central Jawa	3.145	
	Regency of Demak, Central Jawa	915	
	Regency of Jepara, Central Jawa	3.140	
	Regency of Pati, Central Jawa Tengah	3.140	
2017	Regency of Cirebon, West Jawa	1.850	7.450
	Regency of Demak, Central Jawa	3.300	
	Regency of Rembang, Central Jawa	1.100	
	Regency of Gresik, East Jawa	1.200	
2019	Regency of Lombok Timur, West Nusa Tenggara	200	1.900
	Regency of Bombana, Southeast Sulawesi	1.100	
	Regency of Bone, South Sulawesi	600	
Total			**23.510**

One of the result of advocacy and policy dialogue of the BwN program is the replication of hybrid structure by KKP.

During the period of BwN Indonesia programme, Wetlands International Indonesia maintained intensive communication and cooperation in several parts of BwN programme. From this process, KKP admitted that some of the BwN program could be applied through their national programmes. The reasons for this is because the hybrid structure program is aligned with the KKP programmes related to the management of eroded coastal areas and considering that the technique is relatively simple to be applied by the community. The enabling factors included simple and appropriate technology, alignment with government programmes, community involvement, maintenance and monitoring mechanisms, and capacity building for government and communities. On the hand, the replication might bear some barriers factors, including 1). the government programme period cannot exceed one year, 2). the government does not have a maintenance mechanism, 3). the government cannot allocate intensive assistance, 4). limited resources, and 5). limitations in multi-stakeholder cooperation. There are no specific tools/methods/approaches for this process with KKP, and the learning is almost the same as mentioned above when we do advocacy and policy dialogue with the government (with BRGM and KLHK). We think one of the key moments in this process was when trials of permeable structures successfully demonstrated a positive response in sediment capture and natural mangrove recovery.

PUSAIR, the government research center in water resource development working under PUPR ministry, also developed the PEGAR (Low Threshold Breakwater Structure), that was an offshore breakwater structure with a peak elevation below the highest tide level and above the mean sea level. The PEGAR was designed with the function of 1). reducing wave energy, in which the height of the waves behind the structures transmitted into weaker

energy when they reach the coast, 2). diverting the coastal currents that enable soil accumulation behind the PEGAR structure, and 3). trapping the transported sediment that break through the permeable PEGAR structure and retain the substrate when the low tide current returns to the sea. PEGAR was also considered as one of the KPUPR guidelines, called Building Construction Materials and Civil Engineering. The PEGAR structure experiment conducted by PUSAIR in Timbulsloko Village, Demak Regency, was carried out under the cooperation mechanism of BwN programme.

Figure 18. The PEGAR structure built in Timbulsloko village, Demak Regency. (© Wetlands International Indonesia)

In 2022, the Wetlands International Indonesia team collaborated with Peatlands and Mangrove Restoration Agency of Indonesia (BRGM) to develop a Mangrove Rehabilitation Field School Training Module. This module would be used as a guideline in implementing community based mangrove rehabilitation by BRGM nationally as an effort to increase community capacity and understanding of the importance of mangrove rehabilitation. It is also expected that this module can be used as a guideline for both facilitators and participants in delivering community based mangrove rehabilitation. Several of the approached of Building with Nature Indonesia are integrated in the Mangrove Rehabilitation Field School Training Module [Ref 25], including 1). field school concepts and methods, 2). ecological mangrove rehabilitation technique which includes sediment-trapping permeable structures and improving the hydrological pattern my removing barriers of the tidal flows, and 3) implementation of Associated Mangrove Aquaculture (AMA) that integrate mangrove rehabilitation along the riverine green belt and sustainable aquaculture management.

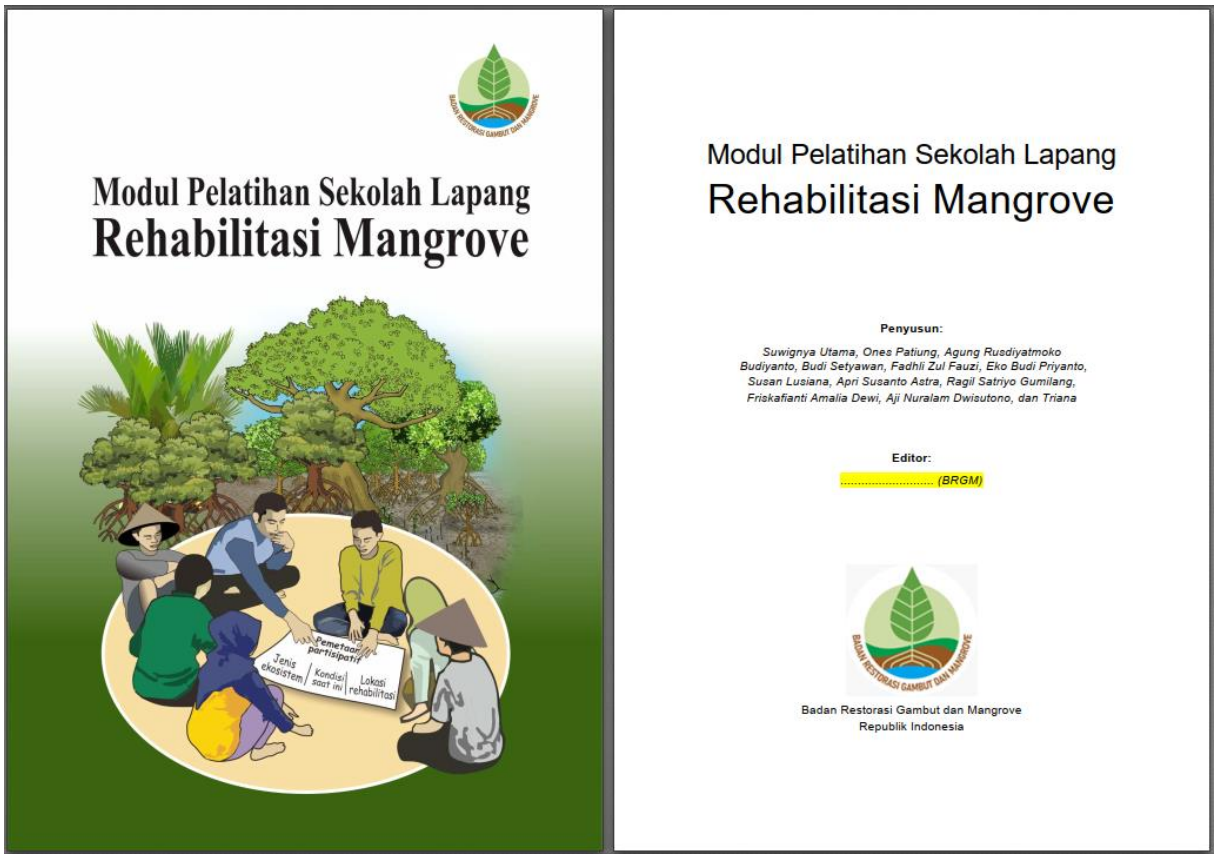


Figure 19. The Training module of BRGM Mangrove Rehabilitation Field School, in which GMA Indonesia has contributed to.

Wetlands International Indonesia, in collaboration with partners from Global Mangrove Alliance (GMA) chapter Indonesia, namely the Nusantara Nature Conservation Foundation (YKAN) and the Indonesian Cakrawala Conservation Foundation (KI), and also partners from the Indonesia Mangrove Society (IMS), contributed to the review and development of several important mangrove policy documents in Indonesia. One of which included supporting Bappenas in the drafting of National Strategy for Wetlands Management: Peatland and Mangrove Ecosystems. The document includes the policies on mangrove ecosystem management, its integration in the spatial planning, and its increased protection and restoration. The action plan of the national strategy document promotes mangrove ecosystem restoration either through assisted rehabilitation or natural succession. Apart from that, we also support the government in drafting the Draft Government Regulation on the Protection and Management of Mangrove Ecosystems or RPP PPEM. In the draft document we proposed that the objective of mangrove rehabilitation should focus on assisting in the recovery of the ecosystem to the state which is approximately similar to its original characteristics and ecological benefits through natural succession, hydrological restoration, vegetation enrichment, and/or any other methods which abide by the state of the art science and technology. We recommend integrating the principles of Ecological Mangrove Rehabilitation (EMR) as one approach for successful and sustainable mangrove rehabilitation. These policy documents will guide policy development by relevant ministries to include mangrove management policies, integrate mangrove ecosystems in spatial planning, and increase the protection and restoration of mangrove ecosystems.

As part of its sustainability measure, Wetlands International Indonesia also manages to integrate the Building with Nature approach that was implemented in Demak into any following programs, such as the Global Mangrove Alliance (GMA) Indonesia program in Demak Regency, the To Plant or Not To Plant program in Liagu Village, Bulungan Regency, North Kalimantan, the Building with Nature (BwN) Asia program, which has prepared 5 landscape propositions for its implementation, encompassing Cimanuk River in Garut, the coastal area of Semarang City, the Welang River in Pasuruan, the coastal area of Bima City and the coastal area of East Lombok, as well as the Nature-based Solutions for Climate-smart Livelihoods in Mangrove Landscapes (NASCLIM) in East Kalimantan and North Kalimantan.

Wetlands International in collaboration with the Ministry of Maritime Affairs and Fisheries, EcoShape and the Global Center on Adaptation has been developing 'Accelerating Adaptation through Building with Nature in Asia' initiative, which is built on the pilot programs in the Netherlands and Indonesia [Ref 26]. The initiative aims to facilitate joint leadership of the Asian countries in using the BwN approach and to mobilize the public and private sector to encourage multisectoral and regional collaboration. The shared commitment in this initiative is to work together with all interested countries in the region to explore the possibility of implementing Building with Nature programs in 15 landscapes in 5 countries by 2030. Moreover, it will deploy a participatory planning process involving local stakeholders, which will ultimately increase communities' resilience in vulnerable cities and settlements along the coasts and rivers in Asia. In addition to the objective, it aims to restore the coastal ecosystem, increase biodiversity and carbon sequestration capacity. Currently, Wetlands International in Indonesia, Malaysia, India, the Philippines and China are collaborating with EcoShape and One Architecture in the development of a landscape proposition to enable the implementation of BwN in 5 climate resilient landscapes and the mobilization of the BwN Asia platform. The initiative is geared towards exploiting opportunities and overcoming threats through collective actions by the right stakeholders and leaders. [Ref 27]

The following are the undertaken measures to support or facilitate increasing the scale of Building with Nature Indonesia:

1. **Delivering presentations at various national and international forums**

   The delivery of presentations about the Building with Nature Indonesia program may disseminate information and mainstream the BwN approach to a wider stakeholders at local, national as well as global levels. The events that Wetlands International Indonesia participated in and presented the Building with Nature Indonesia program included events held by universities (Brawijaya University, Diponegoro University, UNRIKA, IKAHIMBI), events held by the government (KKP, BRGM, Central Java Provincial Government, East Java Provincial Government, Demak Regency Government), as well as several events at the global level (Archipelagic & Island States 2019, World Water Week 2021, IORA Blue Carbon Hub 2021 and 2023).

2. **Facilitating learning visits to the BwN Indonesia program site**

   'Seeing is believing'. A field visit to the Building with Nature program site is an effective way to show case directly the program results in the field, its successful and failed results. The Building with Nature Indonesia program site in Demak has been visited by various parties, both domestic and international, ranging from the government, universities, the private sector, NGOs, and the media. On the other hand, the Building with Nature Indonesia program also facilitated learning visits of the high level officials of Indonesian government to several BwN program locations abroad, such as in Vietnam and the Netherlands.

3. **Collaborating with the Indonesian government partners**

   During the implementation of the Building with Nature Indonesia program, the consortium worked together with government partners such as the Ministry of Maritime Affairs and Fisheries (KKP) and PUSAIR-Ministry of Public Works and Public Housing. The collaboration enabled shared understanding and program alignment with the government. Moreover, it made an entry point to replicate and mainstream the Building with Nature approach in the country's policies and mangrove rehabilitation programs. As a result of this collaboration, Wetlands International Indonesia is still maintaining the collaboration with KKP, especially in the Building with Nature Asia initiative. After the program was completed in 2021, Wetlands International Indonesia maintains partnership with the Peatland and Mangrove Rehabilitation Agency (BRGM), especially in sharing knowledge regarding the Ecological Mangrove Rehabilitation approach, sediment trapping structures (HE) and Associated Mangrove Aquaculture (AMA) design.

4. **UN Decade on Ecosystem Restoration.**

   The Building with Nature Indonesia program received 'World Restoration Flagship' award from the UN Decade on Ecosystem Restoration. The program was one of the 10 best programs in the world in ecosystem restoration. This prestigious award is very helpful in promoting the BwN approach at global level. Being popular internationally, the approach has attracted wider interest from various parties, including donors to invest in and scale up the BwN program in Indonesia.

6.2 Lessons learned on upscaling

Lessons learned from the scaling up process of Building with Nature Indonesia include:

1. Communication products are considered as indispensable ammunition for program information dissemination. In order to mainstream the BwN approach and make greater influence out of it, the communication products have to be prepared accordingly to the target audience. Communication products must be prepared according to the targets you want to influence with different backgrounds. Communication products that will be addressed to different targets such as government/policy makers, NGOs, private parties, universities, communities and others, need to be designed with a language style that is tailored to each target, so that the message can be conveyed properly.

2. The promotion and dissemination of the BwN program and its approach should be done through various communication media, encompassing conventional and online media, presentation delivery in various events, exchange (learning) visits, and many other ways. The dissemination will definitely boost the replication and scaling up of the BwN program. **It will be particularly valuable to continue discussions on what works best in terms of upscaling**, so that in the future we can allocate our limited resources in the most strategic and effective way. One area that requires further attention is **market access**, which has not been well planned or analyzed in the current project. Strengthening market linkages is crucial, and support is needed to help communities **meet market standards** and explore **innovative financing mechanisms**. These mechanisms should not only focus on selling products but also on monetizing the **ecological value of restored mangrove areas**, thereby ensuring long-term sustainability and reinforcing the importance of maintaining these ecosystems.

3. It is necessary to maintain good communication with the government, both at the local and national levels, to enable BwN program replication and scaling up in the government's rehabilitation program.

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