

FINAL REPORT



**PHASE I
SITE SELECTION**

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LIST OF ABBREVIATION

- APL** : Other Land Use (*Areal Penggunaan Lain*)
EEA : Ecosystem Essential Area
BRGM : Peatland and Mangrove Restoration Agency
MoEF : Ministry of Environmental and Forestry
MoASP : Ministry of Agrarian and Spatial Planning
MoNDP : Ministry of National Development
MoMAF : Ministry of Marine Affairs dan Fisheries

INTRODUCTION

1.1 Background

Mangrove forest is located at the interface between land and sea, and as a consequence, this forest is playing the essential roles in both aquatic and terrestrial areas (Nagelkerken et al., 2008). The aerial roots of mangrove help to stabilize the intertidal environment and provide a substratum on which many species of plants and animals live (Rog et al., 2017). Furthermore, mangrove forest acts as a carbon sink and sequester high amount of carbon in both biomass and soil. Mangrove could store up to five times as much organic carbon as tropical upland forest (Chatting et al., 2022). Additionally, from socio-economic perspective, mangrove ecosystems provide coastal community depends on the resource available there.

However, despite its usefulness and unique niche, Indonesia is one among five countries with the largest net loss of mangrove forest over the period between 2000 and 2010. An estimated mangrove forest declines in Indonesia at annual average rate of 1.6% (FAO. 2007). Several factors which contribute to the mangrove loss are aquaculture, rice cultivation, indirect settlement, and wood extraction in 2000-2020 (FAO, 2023). These factors could further deteriorate the mangrove forest which is already susceptible to damage.

Ecological restoration is fundamentally necessary to be carried out to mitigate this problem. Ecological restoration of mangrove forest is a Nature-based Solution (NbS) which addresses social challenges, climate change mitigation recovering services for human well-being, and conserving biodiversity (CIFOR et al., 2020). A comprehensive restoration strategy that integrates social, economic, ecological, and scientific technical approach is crucial for the successful recovery of mangrove forest. Furthermore, these integrations provide a process based on ecological theory which is more likely to succeed by strengthening social welfare, economy, and sustainability. The perception and participation of the local community are crucial to ensure long term continuity of the project through the conservation efforts and its outcomes on the targeted location.

Many efforts have been made to restore mangroves including coastal restoration efforts by Ministry of Environment and Forestry in Indonesia. Based on the data from Peatland and Mangrove Restoration Agency of Indonesia, Indonesia's mangrove restoration target should reach 600 thousand hectares until 2024 with focuses on sparsely covered mangroves, abraded mangroves, and land conversion into pond areas. However, many obstacles are found when carrying out restoration activities such as biophysical of the land and socio-economic conditions of local communities.

Thus, the Faculty of Forestry at Universitas Gadjah Mada (UGM) is dedicated to advancing scientific knowledge and promoting sustainable forest management practices. In pursuit of these goals, the faculty is initiating a research and academic collaboration with Inverto, a Swiss-based drone technology company, to undertake a comprehensive mangrove restoration project in Indonesia. This collaborative seeks to harness technological innovation to address critical

ecological challenges. To begin, choosing suitable location for the project implementation is critical step to do. Field observation is needed to get accurate information on the potential target location. This also requires study on stakeholder analysis and land right policy analysis for implementing the project. These information on the potential target location are necessary as a starting point of the mangrove restoration project.

1.2 Objective

The aims of this academic collaboration are as follows:

- a) To find suitable location for mangrove restoration study in Pemalang Regency
- b) To identify related stakeholder in mangrove restoration area in Pemalang Regency
- c) To analyze existing policy related to mangrove ecosystem in Pemalang Regency

1.3 Significance of Study

The collaboration will produce:

- a) Baseline Assessment: Conduct a comprehensive baseline study.
- b) Scientific Plan Development: Formulate a scientifically mangrove restoration plan that integrates empirical data, ecological principles, and best practices in forest restoration.
- c) Utilization of Drone Technology: Employ Inverto's drone technology for planting mangrove, remote sensing, monitoring, and data acquisition, ensuring high-resolution data for accurate analysis.

METHODOLOGY

2.1 Field Observation

a) Biophysical Condition

Biophysical data collection is carried out to find out the condition of the target project location. The data obtained from the location are as follows:

(1) pH

Information on pH levels is used to determine the degree of acid-base in the target location and its suitability for mangrove growth. The pH data was collected using a Lutron pH meter type pH-220.

(2) Salinity

Information on salinity levels is used to determine the level of saltiness of the target location and its suitability for mangrove growth. Salinity levels were collected using an ATAGO Saltmeter.

(3) Dissolved Oxygen

Information on dissolved oxygen levels is used to determine the level of oxygen dissolved in the target location and the condition of the waters in the mangrove ecosystem. Dissolved Oxygen data collection using Lutron Oximeter type PDO-520.

(4) Light Intensity

Information on light intensity is used to determine the amount of light in the target location and its suitability for mangrove ecosystem restoration. Data collection of light intensity using Luxmeter Lutron type LX-101.

(5) Wind Speed

Information on wind speed is used to determine the amount of wind at the target location. Wind speed data collection using the Anenmometer.

(6) Substrate type and thickness

Information on substrate type and thickness was used to determine the type and thickness of substrate in the target location and the condition of the mangrove ecosystem. Determination of substrate type and thickness is done by means of the touch method and categorized into clay substrate, dusty mud substrate, sandy mud substrate, and sandy substrate.

b) Spatial Data

Spatial data collection was carried out using a DJI Mavic 2 Pro Model L1P Drone through flying missions for mapping in Pemalang Regency. The specific target flight locations is in Mojo Village, Ulujami, Pemalang Regency. Spatial data processing using Agisoft and ArcGIS software.

c) Rapid Assessment Vegetation

Based on information from Pemalang regency, there is no mangrove zoning system, so the vegetation survey method is carried out using the rapid assessment method, namely by taking data on mangrove species, mangrove growth rate, and mangrove diameter at points that represent the target location.

2.2 Literature Study

The literature study was conducted by studying regulations related to the Essential Ecosystem Area in Pemalang as well as grey documents such as reports and research results. Information from the literature is used as an information base to conduct further analysis such as policy analysis and stakeholder analysis.

2.3 Focus Group Discussion

Focus Group Discussion will be conducted at the village level to gather information related to mangrove management in the target area. This activity will be involving various stakeholders related to mangrove management in the targeted location such as Regional Development Planning Agency (BAPPEDA) of Pemalang Regency, Environment Agency (DLH) of Pemalang Regency, Environment and Forestry Agency (DLHK) of Pemalang Regency, Fisheries Agency, Local Government, Field Officer, and Rehabilitation Officer. The result of Focus Group Discussion activity serves as primary data to describe the current and historical land use, existing mangrove ecosystem condition, current challenges, driving force of depletion, dominant livelihood, income, population, etc.

OVERVIEW LOCATION

3.1 Description

Mojo is one of the villages located on the north coast of Java with a coastline length of 5.9 km. This village is part of Ulujami Subdistrict, Pemalang Regency. According to the Pemalang Regency District Order No. 13/1999 concerning the Pemalang Regency District Plan for the Coast of Pemalang Regency, Mojo Village is an area classified as a mangrove forest area with a wide area classified as a mangrove forest area that is 200 meters wide from the lowest tidal line to the land. Based on its geographical location, Mojo Village is bordered by Java Sea (north), Limbangan Village (east), Wonokromo Village (south), and Pesantren Village (south). Wonokromo Village (south), and Pesantren Village (west). Mojo Village is traversed by the Comal watershed, which has a surface area of Comal watershed, which has a very potential estuary for mangrove growth.

3.2 Topography and Soil

The Mojo Village area includes areas with slopes that tend to be flat, ranging from 0 to 2%, with alluvial soil types.

3.3 Demographic and Population Growth

The population of Mojo Village until 2022 is 9.184 people. Based on data from the Central Bureau of Statistics in 2023, with a population growth of 1,75% compared to the previous year. Population growth in Mojo has increased from 2018 to 2023, 484 people.

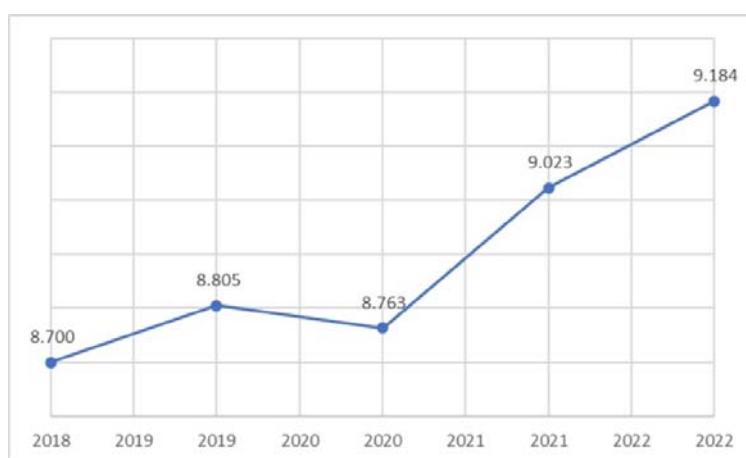


Figure 1. Population growth in Mojo from 2018 to 2022

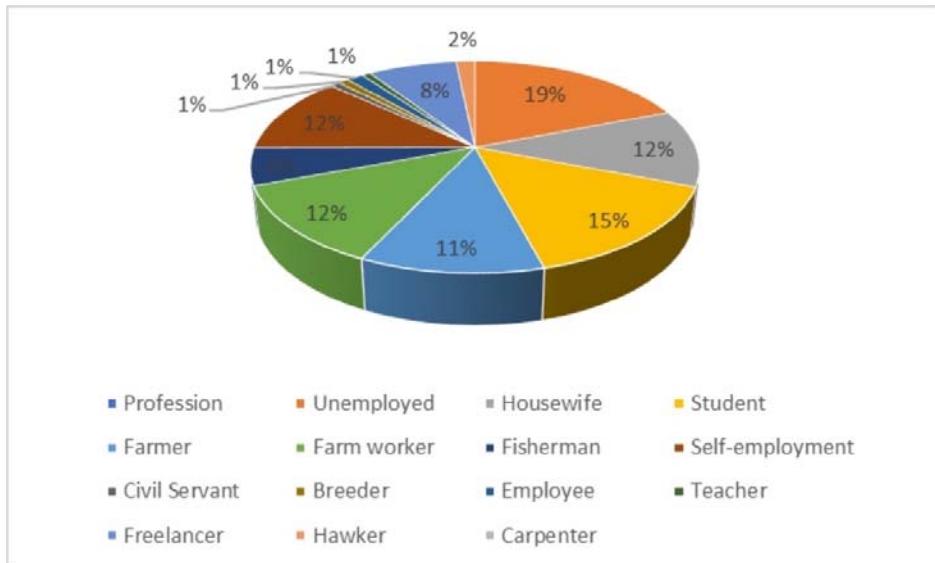


Figure 2. Job preferences in Pemalang

Based on official website <https://mojo.desakupemalang.id/> the main livelihood of the people in Mojo Village is farming, self-employment and fishing. A total of 788 people are farmers and 864 people are farm workers. Meanwhile, the percentage of fishermen in the total population is 6%. Based on data from the Central Bureau of Statistics in 2022, the production of fishery in Mojo on 2022 is 2.038.728 kilograms which value Rp 18.346.690 with the main products are Bandeng, also Vaname Shrimps. Other small industries in Mojo Village include furniture and batik.

3.4 Hydrology, Climate and Natural Disasters

Mojo village is part of Ulujami sub-district area has a tropical climate which has two seasons, the rainy season and the dry season with uneven rainfall fluctuations in a year. Based on climatological data in 2022, the average rainfall per month in this area is 313 mm/month with days of rain between 9 to 20 days per month. The highest average rainfall occurred in February, amounting 541 mm with 20 days of rain, while the lowest average rainfall occurred in August , amounting to 110 mm with 9 days of rain (see table X). According to this tabele, dry months in Ulujami sub-district are between July to August.

Table 1. Rainfall data and rainy days in Ulujami sub-district 2022

Month	Days of rain (days)	Rainfall (mm)
January	20	429
February	20	541
March	20	509
April	16	267
May	14	215
June	18	381
July	9	262
August	9	110
September	13	158
October	22	314
November	14	270
December	19	311

Source : Central Bureau of Statistics (BPS) in Ulujami sub-district 2023

Mojo village is an area with a flat topography and directly adjacent to the sea. In 2021, there were 2 high tidal waves disasters that occurred in this village, the number of high tidal waves events was relatively smaller than the surrounding villages, namely Pesantren village with 5 high tidal waves events in 2021 and Kertosari village with 4 times in a year 2021.Hydrology, Climate and Natural Disasters (Source: Central Bureau of Statistics in Ulujami sub-district 2023).

POTENTIAL LOCATION

4.1 Site Candidate

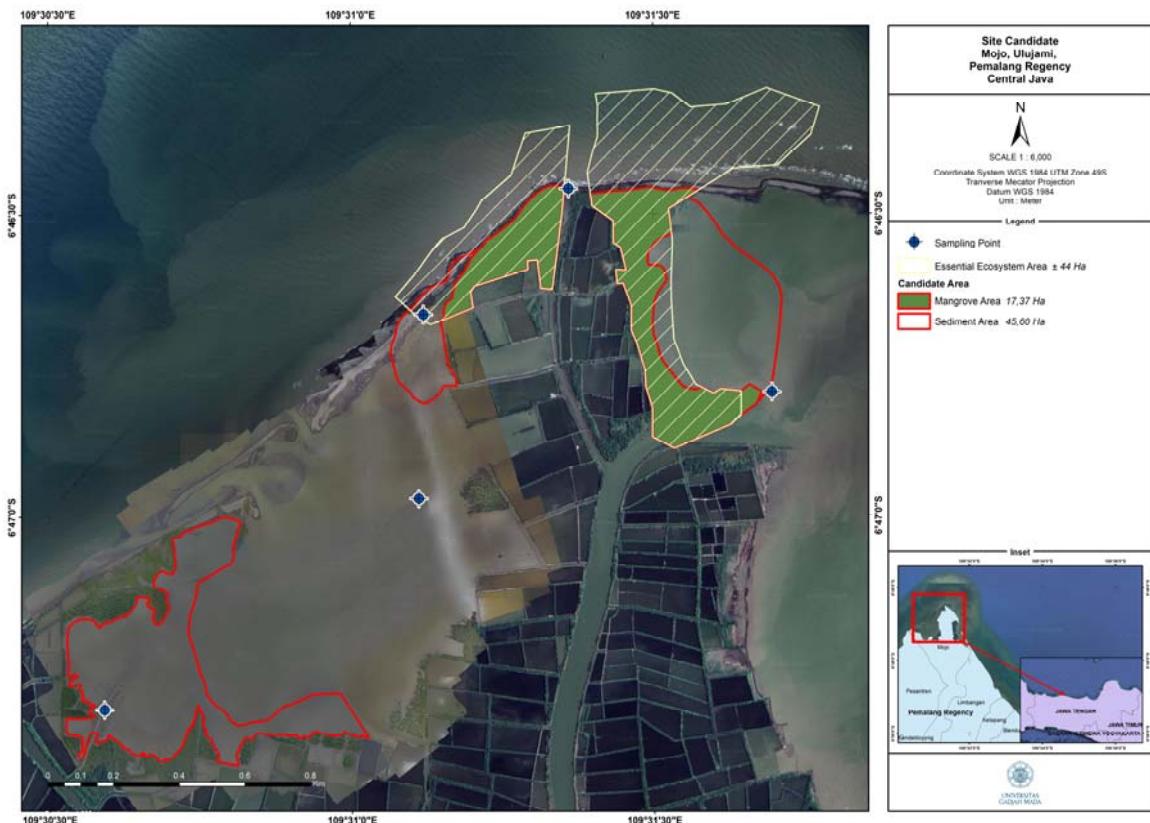


Figure 3. Site Candidate Map in Mojo Village, Pemalang Regency

The potential area to implement the study is Mojo Village, Pemalang Regency. Based on field observations, there are several potential locations for carrying out mangrove restoration project. The areas are divided into Essential Ecosystem Area (EEA) or *Kawasan Ekosistem Esensial* (KEE) Zone and Non-Essential Ecosystem Area Zone. Figure 1 is a map which illustrate the sample points collected in the area. The yellow border indicates the Essential Ecosystem Area based on the Governor's Decree No. 552.52/31 Year 2020 on the Designation of essential areas and management of mangrove wetland ecosystem areas in Central Java. The total area of EEA is approximately 44 Ha which can be seen that parts of the EEA cross the northern boundary of the mainland and extend into the sea. This indicates that there has been severe abrasion in the northern region of Mojo Village, Pemalang Regency. Several restoration efforts have been carried out from different parties (i.e. OISCA, APROBI, Government) through conventional mangrove planting thus 17.37 Ha is a forested mangrove area. Therefore, mangrove restoration activities continue to be carried out to improve landforms and mangrove ecosystems in the region.

RESULT

5.1 Land Right Policy Analysis

5.1.1 Fragmented Land Use Administration in Mangrove Ecosystem

Based on the land use administration, mangrove governance in Indonesia is fragmented, having been shaped by the interplays between tenure arrangement and land use systems. In general, mangrove governance in Indonesia is divided into two main zones according to territorial mandates: forest zones which are regulated by the MoEF and non-forest zones (also called Areal Penggunaan Lain /APL) which are regulated by the MoASP and MoMAF (Mursyid et al., 2021). At subnational levels, each of the ministries is associated with the sectoral services of the provincial and district governments based on Figure 1.

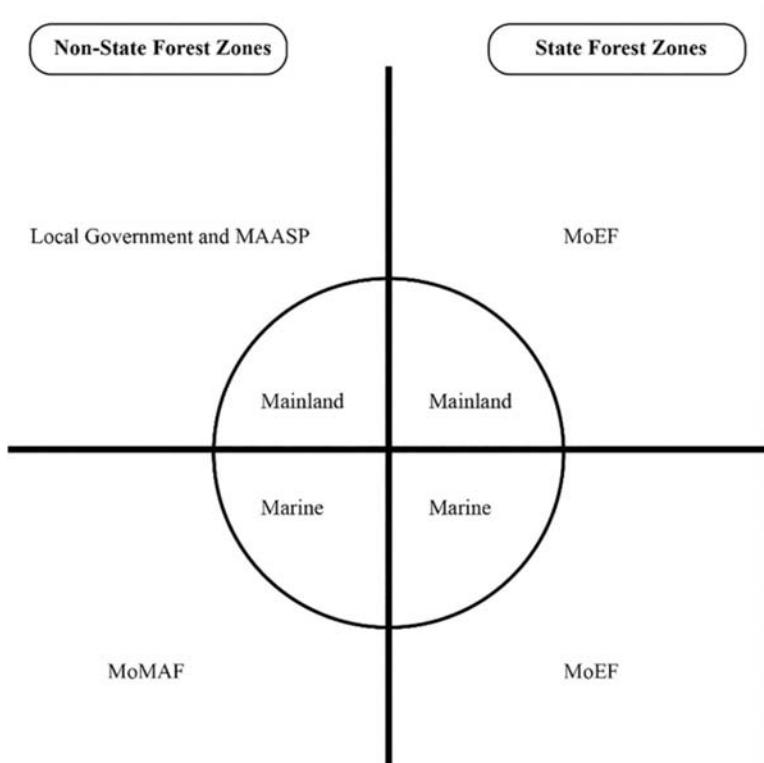


Figure 4. Jurisdictional mandates of mangrove ecosystems in Indonesia

The MoASP and local government are particularly empowered to administer APL through spatial planning and regional planning (Rencana Tata Ruang dan Wilayah). Institutional arrangement for mangrove became increasingly complex with the establishment of Peat and Mangrove Restoration Agency (Badan Restorasi Gambut dan Mangrove /BRGM) previously

known as Peat Restoration Agency (Badan Restorasi Gambut/BRG). One of the tasks of BRGM is to accelerate mangrove rehabilitation with targeted areas 600,000 ha in nine provinces by 2024 (North Sumatra, Bangka Belitung, Kepulauan Riau, Riau, West Kalimantan, East Kalimantan, North Kalimantan, Papua, and West Papua –none of them is in Java Island) as stated in the 2020-2024 National Medium-Term Development Plan.

In term of regulatory framework, the tasks of each different bureaucracies follow their respective regulatory frameworks (sectoral laws). In many cases, they tend to overlap with one another (Table 2).

Table 2. Mangrove governing institutions and mandates

Institution	Task and Responsibility	Legal Basis
Ministry of Environment and Forestry (MoEF)	Protect manage mangrove in state forest zone	Law No. 5/1990; Law No. 41/1999; Law No. 32/2009
Ministry of Marine Affairs and Fisheries (MoMAF)	Manage mangrove in coastal and small island	Law No. 27/2007
Ministry of Agrarian and Spatial Planning (MoASP)	Enforce tenure right and conduct spatial planning in non-state forest zone	Law No. 5/1990; Law No 26/2007
Ministry of National Development Planning (MoNDP)	Prepare the national strategy for mangrove ecosystem management	Decree of the National Development Planning Agency No. 89/2020
Peatland and Mangrove Restoration Agency (BRGM)	Coordinate stakeholders at various levels associated with the implementation of mangrove restoration	Presidential Regulation No. 120/2020
Local Governments	Manage mangrove at the site level	Law No. 23/2014

To accommodate the absence of synchronized intersectoral regulations which resulted in each bureaucracy to pursue their own policy goals and priorities, Indonesian government issued Presidential Regulation No. 73/2012 to establish a National Coordinating Team for Mangrove Ecosystem Management (Figure 2). However, as Peters (2010) stated, bureaucratic institution usually competes over mandates and laws to be able to expand their resources, power, and authority in the form of funding and staff. Moreover, cases of bureaucratic competitions for budgetary and functional gains are widespread especially in mangrove management and conservation (Khan and Giessen, 2021).

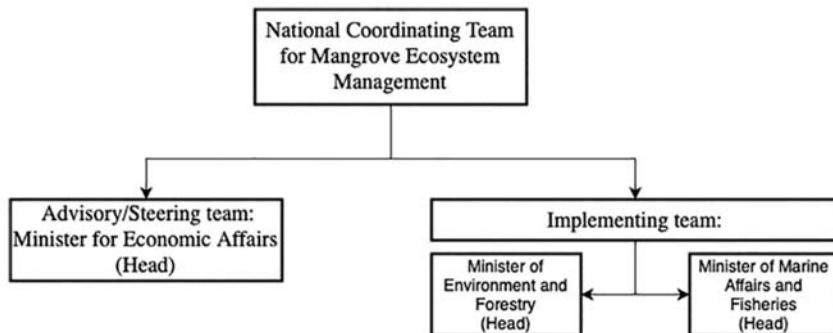


Figure 5. Structure of National Coordinating Team for Mangrove Ecosystem Management

Indonesia has long history of policy and regulation changes related to mangrove ecosystem (Figure 3), in 2020 the latest regulation on mangrove governance is Presidential Regulation 108/2020 which focusing on simplifying its complex bureaucracies. This issuance affected the dissolution of the National Coordinating Team for Mangrove Ecosystem Management. By the end of 2020, the MoNDP has issued Minister Decree No. 89/2020, which mandates the establishment of a (new) strategic coordinating team for wetland management, integrating SDGs and NDC target of Indonesian government.

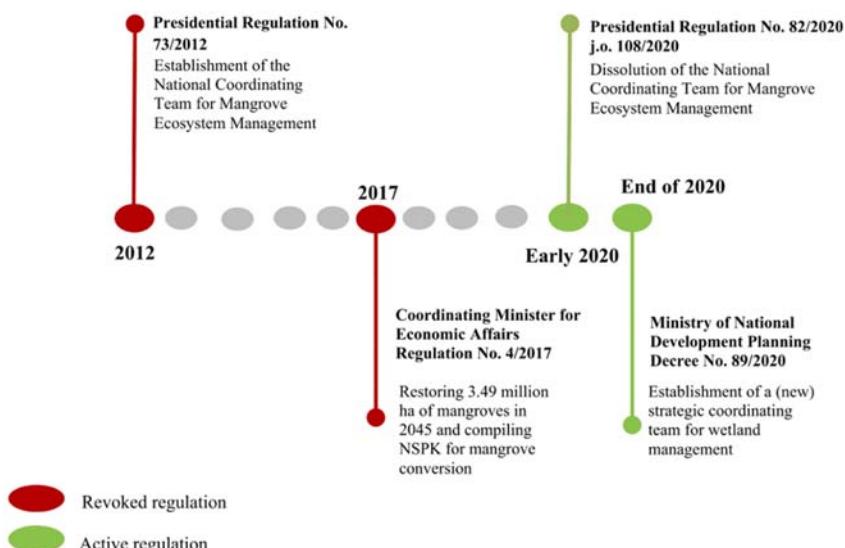


Figure 6. Timeline of synchronized mangrove governance in Indonesia

Following the decentralization policy, as stipulated by laws Nos. 22 and 25/1999, local governments have had considerable authority for natural resource management. Although its authority over forest zones has been reduced considerably (through Law No. 23/2014), local governments continue to have strong power over other natural resources, including the protection and utilization areas in non-forest zones (APL), which comprise mangrove ecosystems.

5.1.2 Essential Ecosystem Area

Indonesia has dual system of land administration consisted of state-owned forest and Other Land Use (*Areal Penggunaan Lain*/APL). However, existing conservation strategies in Indonesia which only focus on conservation areas and protected forests within state-owned forest cannot guarantee the sustainability of mangrove forests in the APL. Mangrove forest management needs to be supported by conservation efforts in the adjacent forest areas in the APL. Therefore, EEA policy is issued to reduce the gap in the unique typology area but not yet protected as conservation area and to conserve mangrove forests outside the state-owned forest. EEA is an ecosystem, area, or territory as a life support system with its uniqueness and important habitat or species function. The designation of areas as potential EEA is based on 4 different typologies, namely:

a) Wetland Ecosystems

Areas that have unique hydrological characteristics with ecological functions for biodiversity. Areas included in wetland ecosystems are mangroves, peat, river riparian zones, swamps, water bodies (e.g. lakes), karst, and migratory bird habitats. Identification refers to the Ramsar Convention

b) Wildlife Corridors

A corridor connecting ecosystems between conservation areas, animal habitats or other important ecosystems so that animals can move without obstacles.

HCV identification refers to Regulation of Director General of Natural Resources and Ecosystem Conservation No. 8/2016

c) High Conservation Value Areas

Areas that have important values for biodiversity conservation and produce environmental services for local communities.

Identification of HCV refers to Regulation of Director General of Natural Resources and Ecosystem Conservation No. 5/2017

d) Reserve Areas

Reserve areas for biological natural resources outside the forest area that have in-situ and ex-situ conservation functions, especially for plants, whose pollination process needs to be assisted by animals.

Identification of Reserve Area refers to Ministerial Regulation from MoEF No. 3/2012

Based on the typology characterization, EEA Mojo in Pemalang is considered wetland ecosystem. Some of the following criteria are owned by Mojo EEA, including having a unique ecosystem with mangrove vegetation types, as a habitat for water birds and / or migratory birds, habitat for endangered, endemic, and / or protected species, economic value, culture, and other ecosystem services. EEA Mojo has potential natural resources that can be developed for the improvement of the community's economy and environmental sustainability. Administratively, EEA Mojo Pemalang is located in Ulujami Sub-district, Pemalang Regency, Central Java. EEA Mojo is established by the issuance of Governor's decree from Central Java No. 552.52/31/2020 on Designation of Essential Ecosystem Areas and Management of Essential Ecosystem Areas in

Mangrove Wetlands in Central Java. Based on this document, the Management Structure of the Mangrove Wetland Essential Ecosystem Area of Mojo Village, Ulujami Subdistrict, Pemalang Regency, Central Java Province as well as the map of the EEA Mojo area were agreed upon. Other supporting document the EEA Mojo is Governor's decree No 522.52/32/2019 on the Establishment of a Collaborative Forum for Mangrove Essential Ecosystem Area Management in Central Java.

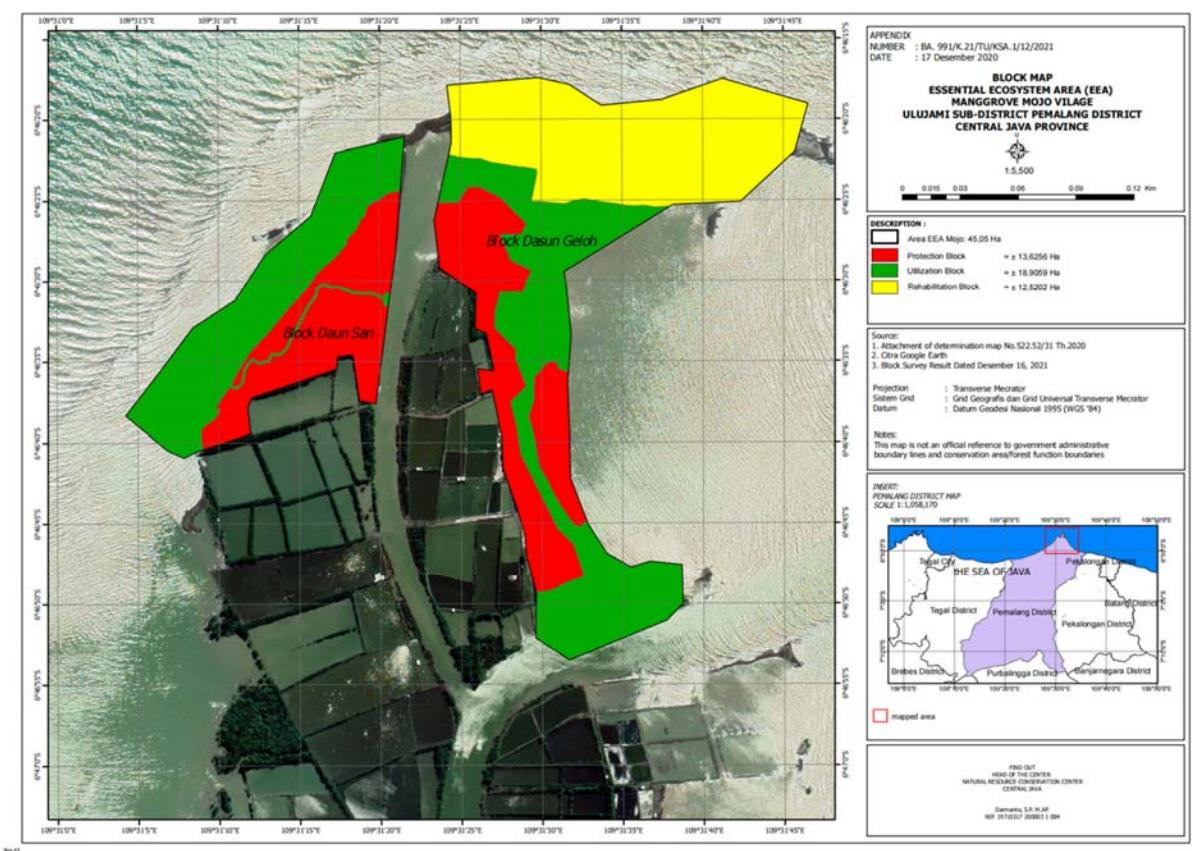


Figure 7. Block Map of EEA Mojo

Based on the Minutes of Meeting of Block Arrangement Meeting No. BA 991/K.21/TU/KSA.1/12/2021 regarding the Block Arrangement of the Mojo Mangrove Essential Ecosystem Area, the arrangement of KEE Mojo into 3 management blocks considers the ecological, social, economic, and cultural aspects of the community. EEA Mojo has an area of 45.05 ha which is divided into 3 blocks, namely the Protection Block (\pm 13.6256 ha), Rehabilitation Block (\pm 18.9059 ha), and Utilization Block (\pm 12.5202 ha). Activities that can be carried out in each block are as follows:

Table 3. Blocking system in EEA Mojo

Type	Activities
Protection Blocks	Activities that can be carried out in the protection block are protection and security of ecosystems; inventory and monitoring of biological natural resources with their ecosystems; research and development of science; education and raising awareness of nature conservation; utilization of germplasm sources to support cultivation; carbon sequestration and / or storage.
Rehabilitation Blocks	Activities that can be carried out in the rehabilitation block are protection and security; inventory and monitoring of natural resources, biological and ecosystems; research and development of science education; absorption and storage of carbon environmental services; utilization of genetic resources and germplasm to support cultivation; ecosystem restoration; animal release; and construction of facilities and infrastructure.
Utilization Blocks	Activities that can be carried out in the utilization block are protection and security; inventory and monitoring of biological natural resources and their ecosystems; fostering habitats and populations in order to maintain the existence of wildlife populations; research and development of science as well as education and raising awareness of nature conservation; tourism entrepreneurs and utilization of environmental services in the form of carbon; utilization of germplasm sources to support cultivation; construction of management facilities and infrastructure to support activities that can be carried out in the utilization block.

Target output of EEA Mojo management activities:

- a) Security patrols and monitoring of the area carried out by Central Java Natural Resource Conservation Center, Tanjungsari Navy Post, Forestry Service Branch (CDK) V, Pelita Bahari Group, Pemalang Police Water Police Unit
- b) Identification, inventory and monitoring of species, research and development of potential sustainable utilization by Central Java Natural Resource Conservation Center and Environment and Forestry Service Central Java
- c) Planting / Enrichment of species with native plants / naturally growing and maintenance by Forestry Service Branch (CDK) V
- d) Nature tourism development in the form of group tourism capacity building
- e) Mojo Mangrove EEA management activities carried out are able to maintain the existence of mangrove areas.

To avoid land conflicts in APL areas for mangrove rehabilitation activities, site selection will be focusing on EEA Mojo. This is due to the issuance of Governor's Decree for the establishment of EEA Mojo locations thus land use and land changes will be lower and the actors who play a role in it are already regulated in the collaboration forum. The EEA Mojo is experiencing severe abrasion in the northern part, based on the delineation data provided by Natural Resources Conservation Center (BKSDA) of Central Java. Therefore, hopefully the selection of rehabilitation sites in the EEA Mojo will increase the target achievement of the action plan for mangrove protection activities in the EEA Mojo area to protect coastal areas from abrasion.

5.2 Location Selection

The proposed area is chosen after field observation based on the biophysical and suitability of the location. The data collected from the potential location are biophysical condition and spatial data. Biophysical conditions were measured by collecting information on pH, salinity, dissolved oxygen, light intensity, wind speed, substrate type, and substrate thickness. Spatial data were collected using DJI Mavic 2 Pro Model L1P Drone to capture the general condition of the area. Selection of sampling areas using purposive sampling according to areas that have a favourable substrate sedimentation as one of the requirements of mangrove restoration activities. Each of potential locations is assessed based on biophysical condition, land status, and challenges in regard to carry out the restoration project. The suitability assessment is ranging between 1 to 5 point scales, which are:

Table 4. Suitability category

Score	Suitability Category	Descriptor
0	Constrained area	Conflicting uses or poor biophysical condition
1	Extremely unsuitable	Low scores on all factors mitigate against the mangrove restoration project development
2	Unsuitable	Low scores on most factors mitigate against the mangrove restoration project development
3	Moderately suitable	Low scores on more than one factor
4	Suitable	High scores in most factors
5	Extremely suitable	Scores very highly on all factors considered

Factors affecting the suitability status are categorized as mangrove growth factors (tidal frequency, soil substrate, pH, light intensity, salt, temperature, dissolved oxygen, wind speed, mud thickness); location near the healthy mangrove forest trees; and challenges (low germination rate, biodiversity (vegetation), pest and disease, improper seed storage, environmental condition, and social condition). Based on the field observation data and potential conflict analysis, “Sampling 1” within Essential Ecosystem Area (EEA) will be proposed as project area. The detailed information on each sampling are as follows:

5.2.1 Essential Ecosystem Area

5.2.1.1 Sampling 1



(a)



(b)



(c)

Figure 8. (a) site map sampling 1 (b) aerial photograph overview (c) site-specific overview

Table 5. Suitability Assessment of Sampling 1

Code	Sampling 1	
Land Status	State-Owned (Within EEA)	
Mangrove Growth Factors		
Month	December	
Time (Jakarta Time)	12.01	
Tidal Frequency	mild to no tidal (tidal occurs due to the passing boat)	
Soil Substrate	dusty clay mud	Favourable condition
pH	7	standard pH 7-7.5
Light Intensity (Lux)	1154.33	
Salt (%)	2.3	standard range 0.5% - 3.5% depends on the sea tide
Temperature (C)	33.4	
Dissolved Oxygen (mg/L)	11.5	minimum requirement 5 mg/L for aquatic biota to survive
Wind speed (km/hour)	20	
Mud Thickness (cm)	50-75 (Emerging Land)	
Location Selection		
Near Healthy Forest Trees	yes, adjacent to mangrove area and "sudetan" or diversion channel in the river bank which support the sedimentation on the area	
Challenges		
Low Germination Rate	<i>Rhizophora mucronata</i> : survival rate 90% in nursery but low in natural habitat (susceptible to death after being exposed to barnacles); <i>Avicennia sp.</i> and <i>Soneratia sp.</i> : survival rate 30% in nursery but high chance of survival in natural habitat (related to barnacles exposure)	
Biodiversity (Vegetation)	<i>Rhizophora mucronata</i> , <i>Avicennia sp.</i> , <i>Sonneratia sp.</i> (No zonation)	
Pest and Diseases	Barnacles; it will directly affect the growth of the mangrove. It can be easily found in the area where supply of fresh water is low (directly adjacent to sea water)	
Improper Seed Storage	The seed is gathered from natural habitat thus it is very important to understand the harvest season for each species	
Environmental Condition	Upstream Flood (December to March) and Tidal Flood (April, May, June)	
Social Condition	State-owned forest thus potential conflict with local people is low	
Suitability Status	4 out of 5	

5.2.1.2 Sampling 2

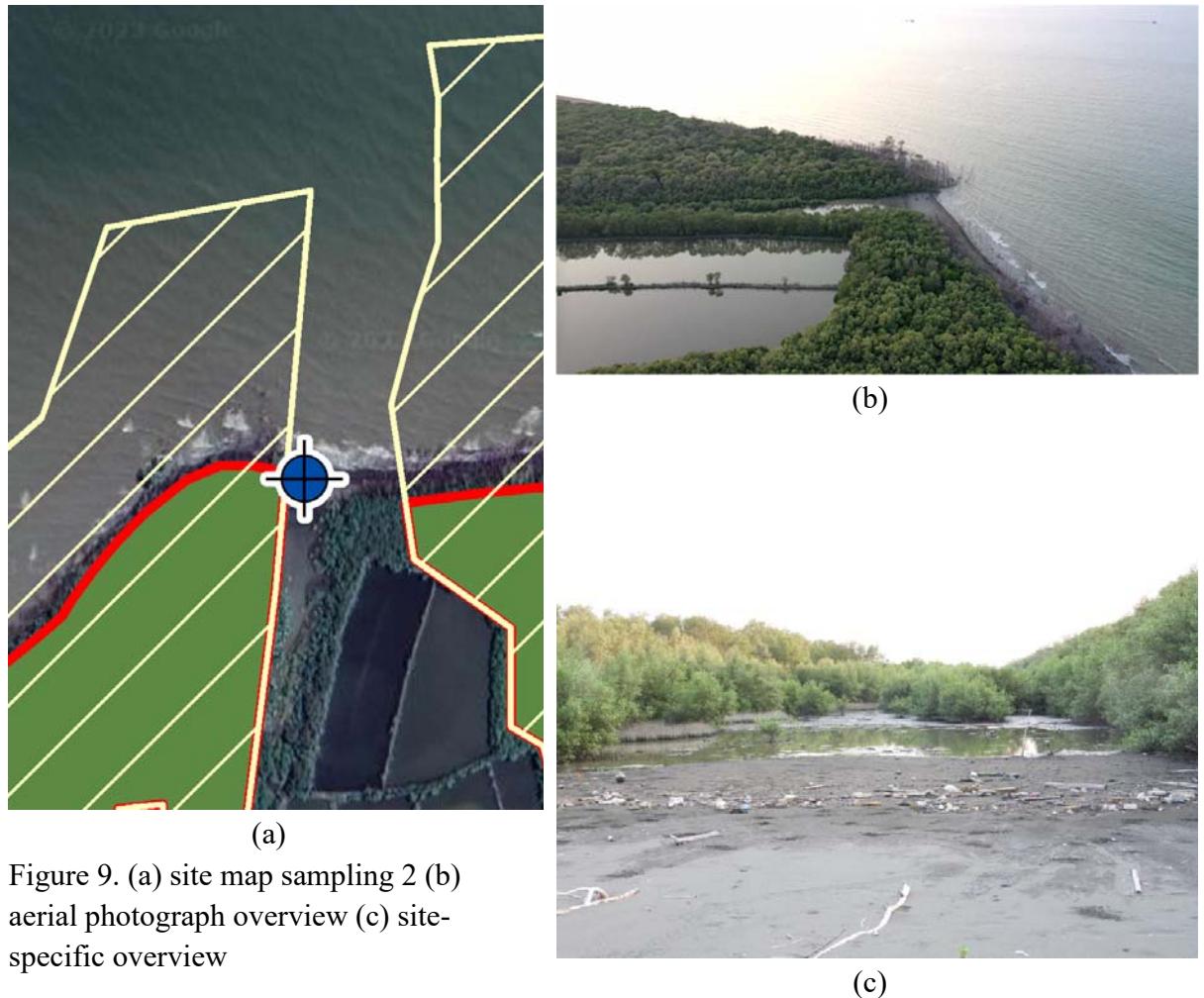


Figure 9. (a) site map sampling 2 (b) aerial photograph overview (c) site-specific overview

Table 6. Suitability Assessment of Sampling 2

Code	Sampling 2	
Land Status	State-Owned (Within EEA)	
Mangrove Growth Factors		
Month	December	
Time (Jakarta Time)	17.50	
Tidal Frequency	no tidal	Unfavourable condition for aquatic life
Soil Substrate	mix dusty clay and sandy area	Favourable condition
pH	7.65	standard pH 7-7.5
Light Intensity (Lux)	147.33	
Salt (%)	2.72	standard range 0.5% - 3.5%
Temperature (C)	32.33	
Dissolved Oxygen (mg/L)	4.73	minimum requirement 5 mg/L for aquatic biota to survive
Wind speed (km/hour)	23.67	
Mud Thickness (cm)	-	
Location Selection		
Near Healthy Forest Trees	yes, adjacent to sea and mangrove area	
Challenges		
Low Germination Rate	<i>Rhizophora mucronata</i> : survival rate 90% in nursery but low in natural habitat (susceptible to death after being exposed to barnacles); <i>Avicennia sp.</i> and <i>Soneratia sp.</i> : survival rate 30% in nursery but high chance of survival in natural habitat (related to barnacles exposure)	
Biodiversity (Vegetation)	<i>Rhizophora mucronata</i> , <i>Avicennia sp.</i> , <i>Sonneratia sp.</i> (No zonation)	
Pest and Diseases	Barnacles; it will directly affect the growth of the mangrove. It can be easily found in the area where supply of fresh water is low (directly adjacent to sea water)	
Improper Seed Storage	The seed is gathered from natural habitat thus it is very important to understand the harvest season for each species	
Environmental Condition	the area is only available in linear form in the northern side of Comal River and no tidal occurrence, several part mangrove area are damaged due to severe abrasion and high salinity.	
Social Condition	State-owned forest thus potential conflict with local people is low	

5.2.1.3 Sampling 3

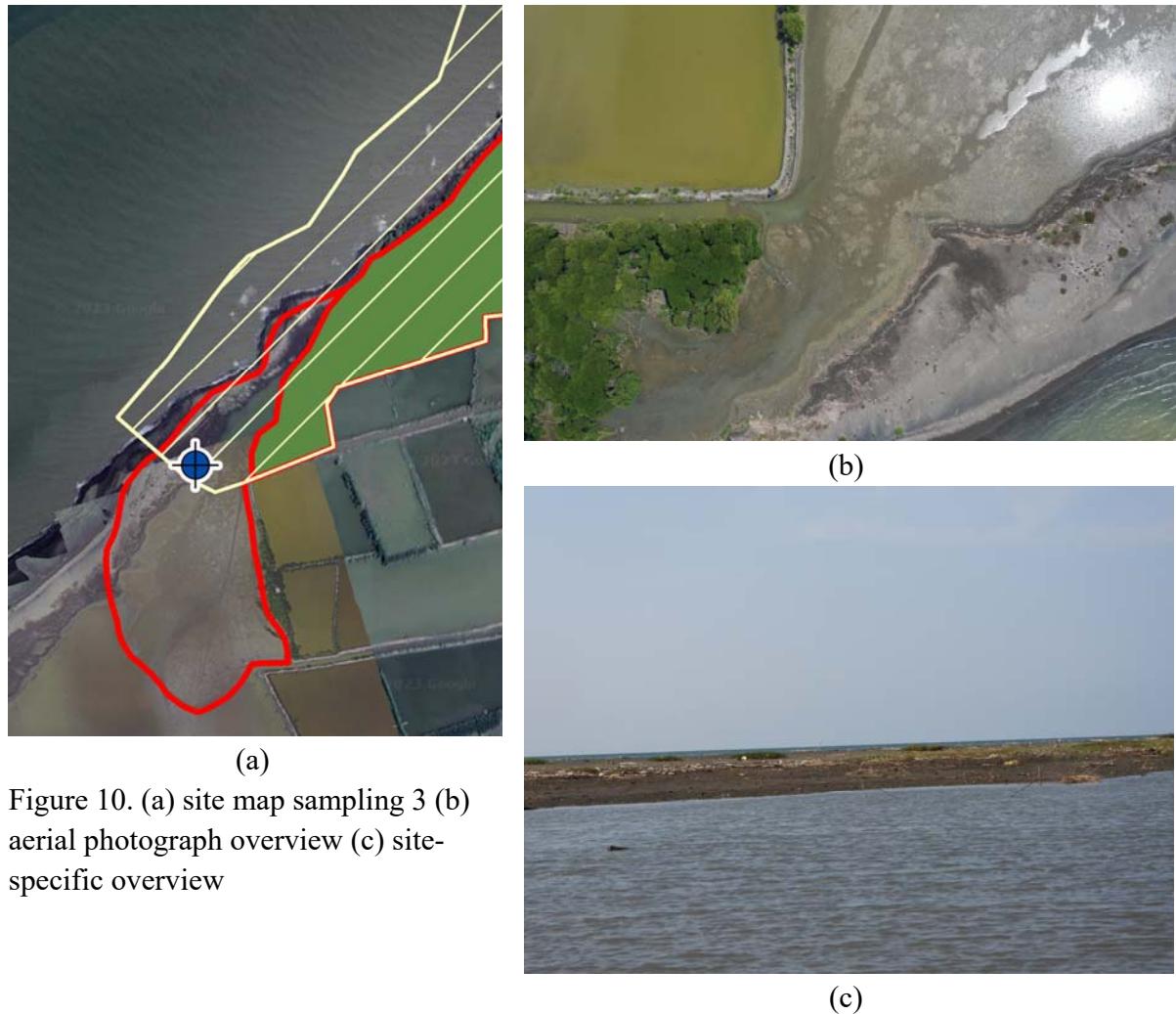


Figure 10. (a) site map sampling 3 (b) aerial photograph overview (c) site-specific overview

Table 7. Suitability Assessment of Sampling 3

Code	Sampling 3	
Land Status	State-Owned (Within EEA) and Private Owned	
Mangrove Growth Factors		
Month	December	
Time (Jakarta Time)	16.35	
Tidal Frequency	mild to no tidal (tidal occurs due to the passing boat)	Flooded area 15-20 cm (unfavourable condition)
Soil Substrate	mix dusty clay and sandy area	Favourable condition
pH	7.46	standard pH 7-7.5
Light Intensity (Lux)	395.33	
Salt (%)	2.71	standard range 0.5% - 3.5%
Temperature (C)	35.37	
Dissolved Oxygen (mg/L)	5.50	minimum requirement 5 mg/L for aquatic biota to survive
Wind speed (km/hour)	16	
Mud Thickness (cm)	60-75 (Emerging Land)	
Location Selection		
Near Healthy Forest Trees	yes, adjacent to sea, dense mangrove area, and fishpond	
Challenges		
Low Germination Rate	<i>Rhizophora mucronata</i> : survival rate 90% in nursery but low in natural habitat (susceptible to death after being exposed to barnacles); <i>Avicennia sp.</i> and <i>Sonneratia sp.</i> : survival rate 30% in nursery but high chance of survival in natural habitat (related to barnacles exposure)	
Biodiversity (Vegetation)	<i>Rhizophora mucronata</i> , <i>Avicennia sp.</i> , <i>Sonneratia sp.</i> (No zonation)	
Pest and Diseases	Barnacles; it will directly affect the growth of the mangrove. It can be easily found in the area where supply of fresh water is low (directly adjacent to sea water)	
Improper Seed Storage	The seed is gathered from natural habitat thus it is very important to understand the harvest season for each species	
Environmental Condition	Upstream Flood (December to March) and Tidal Flood (April, May, June)	
Social Condition	must use a lease system with the landowner and if there is sedimentation, there is a high possibility the land will be converted into a fishpond after the contract is finished.	

5.2.2 Non-Essential Ecosystem Area

5.2.2.1 Sampling 4

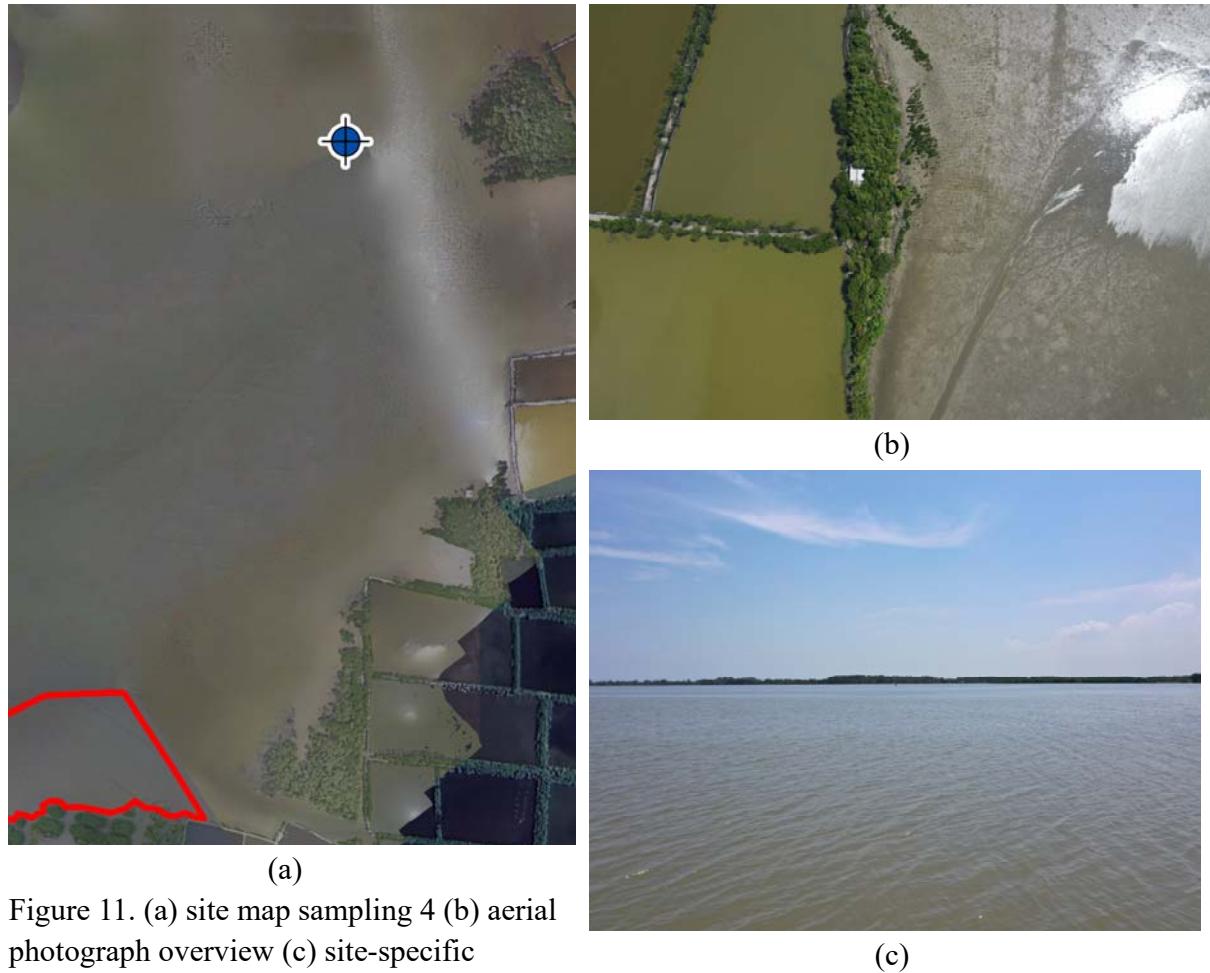


Figure 11. (a) site map sampling 4 (b) aerial photograph overview (c) site-specific overview

Table 8. Suitability Assessment of Sampling 4

Code	Sampling 4	
Land Status	Private Owned	
Mangrove Growth Factors		
Month	December	
Time (Jakarta Time)	10.56	
Tidal frequency	mild to no tidal (tidal occurs due to the passing boat)	Flooded area 15-20 cm (unfavourable condition)
Soil Substrate	sandy clay	Favourable condition
pH	6.87	standard pH 7-7.5
Light Intensity (Lux)	1016.67	
Salt (%)	2.39	standard range 0.5% - 3.5%
Temperature (C)	39.13	
Dissolved Oxygen (mg/L)	18.50	minimum requirement 5 mg/L for aquatic biota to survive
Wind speed (km/hour)	43	
Mud Thickness (cm)	-	
Location Selection		
Near Healthy Forest Trees	yes but adjacent to fishpond	
Challenges		
Low Germination Rate	<i>Rhizophora mucronata</i> : survival rate 90% in nursery but low in natural habitat (susceptible to death after being exposed to barnacles); <i>Avicennia sp.</i> and <i>Soneratia sp.</i> : survival rate 30% in nursery but high chance of survival in natural habitat (related to barnacles exposure)	
Biodiversity (Vegetation)	<i>Rhizophora mucronata</i> , <i>Avicennia sp.</i> , <i>Sonneratia sp.</i> (No zonation)	
Pest and Diseases	Barnacles; it will directly affect the growth of the mangrove. It can be easily found in the area where supply of fresh water is low (directly adjacent to sea water)	
Improper Seed Storage	The seed is gathered from natural habitat thus it is very important to understand the harvest season for each species	
Environmental Condition	Upstream Flood (December to March) and Tidal Flood (April, May, June)	
Social Condition	must use a lease system with the landowner and if there is sedimentation, there is a high possibility the land will be converted into a fishpond after the contract is finished	

5.2.2.2 Sampling 5

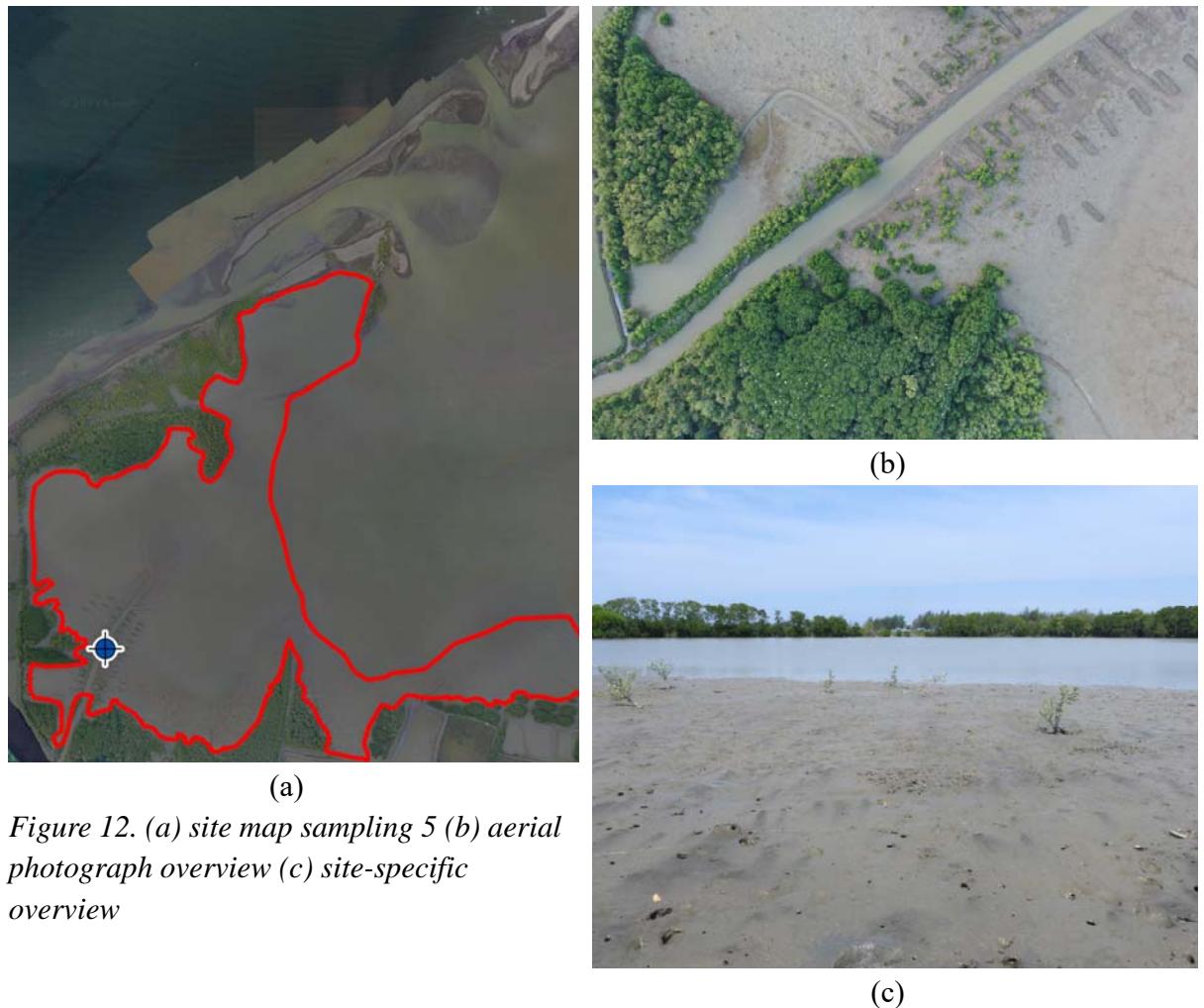


Figure 12. (a) site map sampling 5 (b) aerial photograph overview (c) site-specific overview

Table 9. Suitability Assessment of Sampling 5

Code	Sampling 5	
Land Status	Private Owned	
Mangrove Growth Factors		
Month	December	
Time (Jakarta Time)	09.39	
Tidal Frequency	mild to no tidal (tidal occurs due to the passing boat)	High frequency of small fisherman (potential danger to mangrove seedling)
Soil Substrate	dusty clay	Favourable condition
pH	6.98	standard pH 7-7.5
Light Intensity (Lux)	873.33	
Salt (%)	1.45	standard range 0.5% - 3.5%
Temperature (C)	34.70	
Dissolved Oxygen (mg/L)	12.43	minimum requirement 5 mg/L for aquatic biota to survive
Wind speed (km/hour)	0.13	
Mud Thickness (cm)	50-75 (Emerging Land)	
Location Selection		
Near Healthy Forest Trees	yes, adjacent to mangrove area	
Challenges		
Low Germination Rate	<i>Rhizophora mucronata</i> : survival rate 90% in nursery but low in natural habitat (susceptible to death after being exposed to barnacles); <i>Avicennia sp.</i> and <i>Soneratia sp.</i> : survival rate 30% in nursery but high chance of survival in natural habitat (related to barnacles exposure)	
Biodiversity (Vegetation)	<i>Rhizophora mucronata</i> , <i>Avicennia sp.</i> , <i>Soneratia sp.</i> (No zonation)	
Pest and Diseases	Barnacles; it will directly affect the growth of the mangrove. It can be easily found in the area where supply of fresh water is low (directly adjacent to sea water)	
Improper Seed Storage	The seed is gathered from natural habitat thus it is very important to understand the harvest season for each species	
Environmental Condition	Upstream Flood (December to March) and Tidal Flood (April, May, June)	
Social Condition	must use a lease system with the landowner and if there is sedimentation, there is a high possibility the land will be converted into a fishpond after the contract is finished.	
Suitability Status	3 out of 5	

5.3 Stakeholder Analysis

The application of stakeholder analysis in development and the natural resources management literature has partly been stimulated by projects that did not adequately understand stakeholder dynamics and failed as result. Stakeholder analysis has focused on understanding power dynamics and enhancing the transparency and equity of decision-making in development projects. For example, Lindenberg and Crosby (1981) suggested making an inventory of those who could have a role in decision-making, gauging their importance through their level of influence and their interest for particular outcome, mapping the relationships between the actors, and understanding their potential for developing alliances. The “4Rs” tool analyses how people relate to one another over natural resource use by splitting stakeholder roles into rights, responsibilities, and revenues (benefits), and then assessing the relationship between these roles.

Ecosystem Essential Area (AAE) Mojo is an area where there are quite complex roles of different stakeholders, varying from government, community groups, NGO, academic institutions, and private company, each of which has an interest and influence in the management of the area.

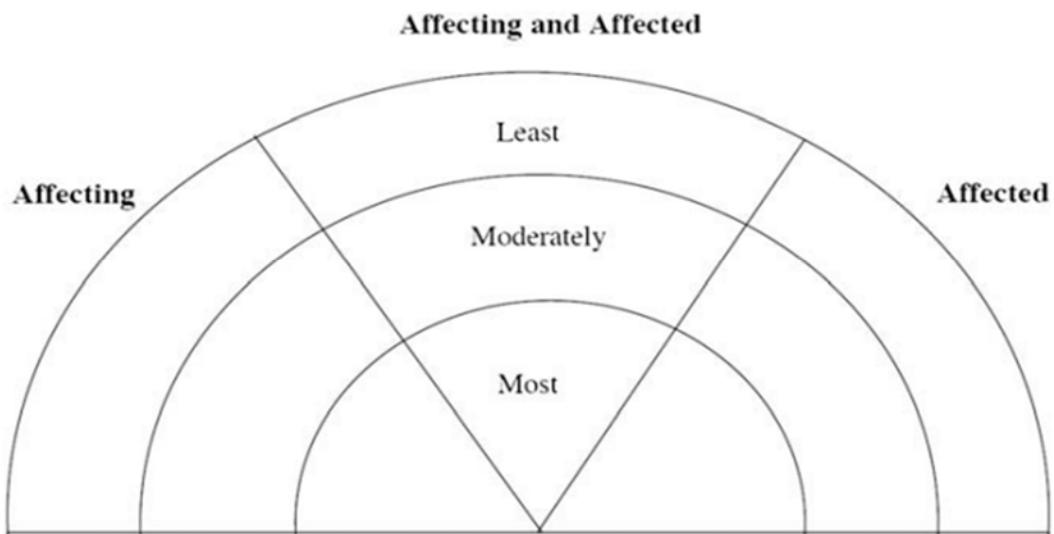


Figure 13. Rainbow diagram for classifying stakeholders according to the degree they can affect or be affected by a problem or action (Chevalier and Buckles, 2008)

5.3.1 Stakeholder Identification

Stakeholder identification was conducted based on their role in the management of the Mojo Mangrove Essential Ecosystem Area (EEA) Block, Mojo Village, Ulujami Sub-district, Pemalang District. The stakeholders were categorized into three types, namely:

- a. Primary stakeholders are the main stakeholders who are in direct contact with activities. These stakeholders directly experience both positive and negative impacts of an activity.
- b. Key stakeholders are stakeholders who have a strong or important influence on the needs and concerns for the smooth running of an activity. These stakeholders come from

government elements, especially at the local level, namely the executive/legislative and its staff who have formal authority in making policies or decisions.

- c. Secondary stakeholders are individuals, groups or organizations both formal and informal that are not directly related to the project but have considerable concern for a particular policy/decision such as being an intermediary in the process of implementing activities.

Based on this categorization, the results of stakeholder identification based on their role in the management of the Mojo Mangrove EEA Block, Mojo Village, Ulujami Subdistrict, Pemalang Regency can be described as Table 10 as follows.

Table 10. Stakeholder identification matrix based on their role in the management of Mojo Mangrove EEA Block, Mojo Village, Ulujami Sub-district, Pemalang District

No	Stakeholders	Roles
Primary stakeholders		
1.	Community (Farmers Group and Tourism Awareness Group)	EEA Block managers and users
Key stakeholders		
1.	Environment and Forestry Agency (DLHK) of Central Java Province	Policy formulation, community development, and technical support
2.	Natural Resources Conservation Center (BKSDA) of Central Java	Policy formulation and technical support
3.	Environment Agency of Pemalang Regency	Policy formulation and technical support
4.	Regional Planning Agency (BAPPEDA) of Pemalang Regency	Policy formulation, planning, monitoring, and evaluation of policies
5.	Regional Secretariat (SEKDA) of Pemalang Regency	Policy formulation, facilitation, and coordination
6.	Watershed and Protected Forest Management Center (BPDASHL) of Pemali Jratun	Policy planning and evaluation
7.	River Basin Center (BBWS) of Pemali Juana	Policy planning and evaluation
Secondary stakeholders		

1.	Regional Forestry Service Branch V of Central Java Province	Community development and technical support
2.	Tourism, Youth, and Sports Agency of Pemalang Regency	Community development and technical support
3.	Ulujami Sub-district Government	Community development
4.	Mojo Village Goverment	Community development
5.	Water Resources Management Center (Pusdataru) of Pemali Comal	Community development and technical support
6.	Agriculture Agency of Pemalang Regency	Community development and technical support
7.	Fisheries Agency of Pemalang Regency	Community development and technical support
8.	Industry Agency of Pemalang Regency	Community development and technical support
9.	Trade Agency of Pemalang Regency	Community development and technical support
10.	Health Agency of Pemalang Regency	Community development and technical support
11.	Housing and Settlement Agency of Pemalang Regency	Community development and technical support
12.	Work and Spatial Planning Agency of Pemalang Regency	Community development and technical support
13.	Investment and One-Stop Integrated Service Agency (DPMTSP) of Pemalang Regency	Community development and technical support
14.	Civil Service Police Unit of Pemalang Regency	Secure the area
15.	Western Region Marine Service Branch, Marine and Fisheries Agency of the Central Java Province	Community development and technical support
16.	Faculty of Fisheries and Marine Sciences, Universitas Diponegoro Semarang	Community empowerment
17.	Military Rayon 05/Ulujami	Secure the area
18.	Police Sector of Ulujami	Secure the area
19.	The Indonesian National Army Navy (Pos TNI AL) of Tanjungsari	Secure the area
20.	Air and Water Police of Pemalang Resort Police	Secure the area
21.	Village Representative Council of Mojo	Community facilitation

22.	Branch Council (DPC) of the Indonesian Fishermen's Association of Pemalang Regency	Community facilitation
23.	Village-Owned Enterprise of Mojo Village	Community facilitation
24.	OISCA (NGO)	Advocacy, facilitation and community empowerment

From the results of stakeholder identification in the management of the Mojo Mangrove EEA Block, Mojo Village, Ulujami Sub-district, Pemalang Regency, it is known that the primary stakeholder is the community, which in this case is represented by the Farmers Group and the Tourism Awareness Group. The role of the community is to manage and utilize the EEA Block. The community manages the EEA Block in their area simply by maintaining the existing forest conditions and planting in certain areas. The community around the EEA Block generally utilizes the area directly and indirectly. Direct utilization is in the form of forest products (in the form of wood) and marine catches (in the form of fish, crabs, etc.). Indirect utilization is in the form of nature tourism activities. In the past, nature tourism was expected to fulfill the needs of the community, but this is no longer done due to the degraded condition of the Mojo Mangrove forest.

Key stakeholders are those with legal authority (Parera et al., 2022). Key stakeholders in the management of the Mojo Mangrove EEA Block, Mojo Village, Ulujami Sub-district, Pemalang District include Environment and Forestry Agency (DLHK) of Central Java Province, Natural Resources Conservation Center (BKSDA) of Central Java, Environment Agency of Pemalang Regency, Regional Planning Agency (BAPPEDA) of Pemalang Regency, Regional Secretariat (SEKDA) of Pemalang Regency, Watershed and Protected Forest Management Center (BPDASHL) of Pemali Jratun, and River Basin Center (BBWS) of Pemali Juana. The seven key stakeholders have their respective roles according to their main tasks and functions, including:

- Environment and Forestry Agency (DLHK) of Central Java Province
- Natural Resources Conservation Center (BKSDA) of Central Java
- Environment Agency of Pemalang Regency
- Regional Planning Agency (BAPPEDA) of Pemalang Regency
- Regional Secretariat (SEKDA) of Pemalang Regency
- Watershed and Protected Forest Management Center (BPDASHL) of Pemali Jratun
- River Basin Center (BBWS) of Pemali Juana

Meanwhile, secondary stakeholders consist of Regional Forestry Service Branch V of Central Java Province; Tourism, Youth, and Sports Agency of Pemalang Regency; Ulujami Sub-district Government; Mojo Village Goverment; Water Resources Management Center (Pusdataru) of Pemali Comal; Agriculture Agency of Pemalang Regency; Fisheries Agency of Pemalang Regency; Industry Agency of Pemalang Regency; Trade Agency of Pemalang Regency; Health Agency of Pemalang Regency; Housing and Settlement Agency of Pemalang Regency; Work and Spatial Planning Agency of Pemalang

Regency; Investment and One-Stop Integrated Service Agency (DPMTSP) of Pemalang Regency; Civil Service Police Unit of Pemalang Regency; Western Region Marine Service Branch, Marine and Fisheries Agency of the Central Java Province; Faculty of Fisheries and Marine Sciences, Universitas Diponegoro Semarang; Military Rayon 05/Ulujam; Police Sector of Ulujam; The Indonesian National Army Navy (Pos TNI AL) of Tanjungsari; Air and Water Police of Resort Police Pemalang; Village Representative Council of Mojo; Branch Council (DPC) of the Indonesian Fishermen's Association of Pemalang Regency; Village-Owned Enterprise of Mojo Village; and OISCA (NGO). These secondary stakeholders have their respective roles according to their main tasks and functions, including:

- Regional Forestry Service Branch V of Central Java Province
- Tourism, Youth, and Sports Agency of Pemalang Regency
- Ulujam Sub-district Government
- Mojo Village Goverment
- Water Resources Management Center (Pusdataru) of Pemali Comal
- Agriculture Agency of Pemalang Regency
- Fisheries Agency of Pemalang Regency
- Industry Agency of Pemalang Regency
- Trade Agency of Pemalang Regency
- Health Agency of Pemalang Regency
- Housing and Settlement Agency of Pemalang Regency
- Work and Spatial Planning Agency of Pemalang Regency
- Investment and One-Stop Integrated Service Agency (DPMTSP) of Pemalang Regency
- Civil Service Police Unit of Pemalang Regency
- Western Region Marine Service Branch, Marine and Fisheries Agency of the Central Java Province
- Faculty of Fisheries and Marine Sciences, Universitas Diponegoro Semarang
- Military Rayon 05/Ulujam
- Police Sector of Ulujam
- The Indonesian National Army Navy (Pos TNI AL) of Tanjungsari
- Air and Water Police of Pemalang Resort Police
- Village Representative Council of Mojo
- Branch Council (DPC) of the Indonesian Fishermen's Association of Pemalang Regency
- Village-Owned Enterprise of Mojo Village
- OISCA (NGO)

5.3.2 Stakeholder categorization

Interests and influence are key in stakeholder analysis. Interests are closely related to expectations, benefits, resources, commitments, potential conflicts, and relationships,

while influence is closely related to power over an activity, including oversight of decisions that have been made and facilitation of the implementation of agricultural development programs/activities, and handling of negative impacts (Iqbal, 2007). Ackermann & Eden (2011) categorize stakeholders based on their influence and interests into four types, namely:

- Key players are stakeholders who are active because they have a high interest and influence on the development of a policy.
- Context setters are stakeholders who have high influence but low interest in the development of a policy.
- Subjects are stakeholders who have a high interest but low influence on the development of a policy. These stakeholders can become influential if they form alliances with other stakeholders.
- Crowds are stakeholders who have low interest and influence on the development of a policy. However, the presence of these stakeholders can be a consideration in decision making.

Based on this categorization, the matrix for categorization stakeholders based on their influence and interest in the management of the Mojo Mangrove EEA Block, Mojo Village, Ulujami Subdistrict, Pemalang Regency can be described as in Table 11. The stakeholder mapping diagram can then be categorized according to Figure 10.

Table 11. Stakeholders categorization matrix based on influence and interest in the management of Mojo Mangrove EEA Block, Mojo Village, Ulujami Sub-district, Pemalang District.

No	Stakeholders	Influence	Interest
1.	Community (Farmers Group and Tourism Awareness Group)	Low	High
2.	Environment and Forestry Agency (DLHK) of Central Java Province	High	High
3.	Natural Resources Conservation Center (BKSDA) of Central Java	High	High
4.	Environment Agency of Pemalang Regency	High	High
5.	Regional Planning Agency (BAPPEDA) of Pemalang Regency	High	High
6.	Regional Secretariat (SEKDA) of Pemalang Regency	High	High

7.	Watershed and Protected Forest Management Center (BPDASHL) of Pemali Jratun	High	High
8.	River Basin Center (BBWS) of Pemali Juana	High	High
9.	Regional Forestry Service Branch V of Central Java Province	High	Low
10.	Tourism, Youth, and Sports Agency of Pemalang Regency	Low	Low
11.	Ulujami Sub-district Government	Low	Low
12.	Mojo Village Goverment	Low	Low
13.	Water Resources Management Center (Pusdataru) of Pemali Comal	Low	Low
14.	Agriculture Agency of Pemalang Regency	Low	Low
15.	Fisheries Agency of Pemalang Regency	High	Low
16.	Industry Agency of Pemalang Regency	Low	Low
17.	Trade Agency of Pemalang Regency	Low	Low
18.	Health Agency of Pemalang Regency	Low	Low
19.	Housing and Settlement Agency of Pemalang Regency	Low	Low
20.	Work and Spatial Planning Agency of Pemalang Regency	Low	Low
21.	Investment and One-Stop Integrated Service Agency (DPMTSP) of Pemalang Regency	Low	Low
22.	Civil Service Police Unit of Pemalang Regency	Low	Low

23.	Western Region Marine Service Branch, Marine and Fisheries Agency of the Central Java Province	Low	Low
24.	Faculty of Fisheries and Marine Sciences, Universitas Diponegoro Semarang	Low	Low
25.	Military Rayon 05/Ulujamai	Low	Low
26.	Police Sector of Ulujamai	Low	Low
27.	The Indonesian National Army Navy (Pos TNI AL) of Tanjungsari	Low	Low
28.	Air and Water Police of Pemalang Resort Police	Low	Low
29.	Village Representative Council of Mojo	Low	Low
30.	Branch Council (DPC) of the Indonesian Fishermen's Association of Pemalang Regency	Low	Low
31.	Village-Owned Enterprise of Mojo Village	Low	Low
32.	OISCA (NGO)	Low	Low

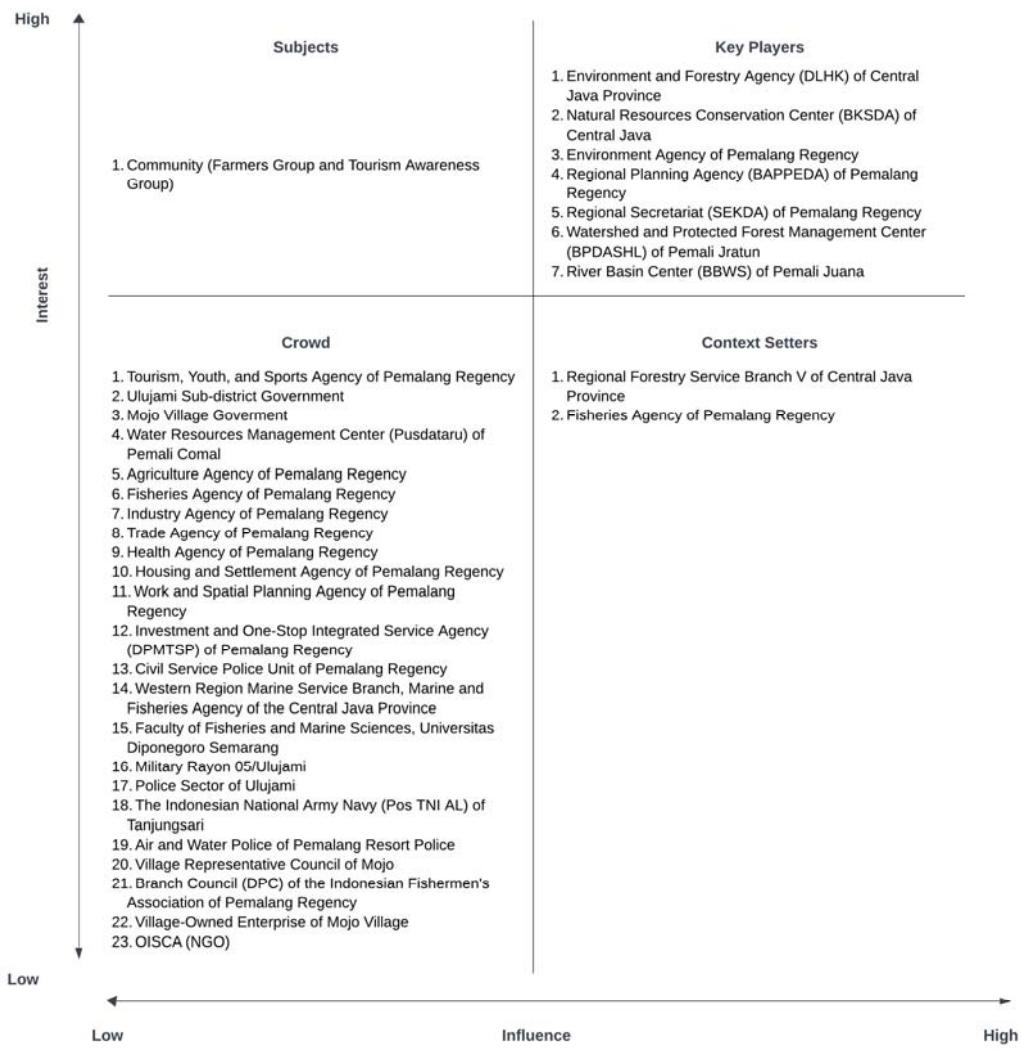


Figure 14. Stakeholder mapping based on influence and interest in the management of Mojo Mangrove EEA Block, Mojo Village, Ulujami Sub-district, Pemalang District.

CONCLUSION

In conclusion, from the observation data and study desk we can conclude:

- a) The location of the rehabilitation area to be selected based on the suitability category is sampling area 1. The following indicators are used to select the sampling area: tidal frequency, soil substrate, pH, light intensity, salt, temperature, dissolved oxygen, wind speed, mud thickness); location near the healthy mangrove forest trees; and challenges (low germination rate, biodiversity (vegetation), pest and disease, improper seed storage, environmental condition, and social condition)
- b) Stakeholders that have a high level of influence and interest are Environment and Forestry Agency (DLHK) of Central Java Province, Natural Resources Conservation Center (BKSDA) of Central Java, Environment Agency of Pemalang Regency, Regional Planning Agency (BAPPEDA) of Pemalang Regency, Watershed and Protected Forest Management Center (BPDASHL) of Pemali Jratun, and River Basin Center (BBWS) of Pemali Juana
- c) Site selection is based on selected areas with relatively low levels of conflict, thus EEA area that already have a Governor's decree is selected, which have a lower potential for land use change than privately owned areas in APL areas.

REFERENCES

- Ackermann, F., & Eden, C. (2011). Strategic Management of Stakeholders: Theory and Practice. *Long Range Planning*, 44(3), 179–196. <https://doi.org/10.1016/j.lrp.2010.08.001>
- Ahmed, S., Sarker, S. K., Friess, D. A., Kamruzzaman, M., Jacobs, M., Islam, M. A., Alam, M. A., Suvo, M. J., Sani, M. N. H., Dey, T., Naabeh, C. S. S., & Pretzsch, H. (2022). Salinity reduces site quality and mangrove forest functions. From monitoring to understanding. *Science of the Total Environment*, 853. <https://doi.org/10.1016/j.scitotenv.2022.158662>
- Central Bureau of Statistics (BPS) in Ulujami sub-district 2019 -2023
- Chatting, M., Al-Maslamani, I., Walton, M., Skov, M. W., Kennedy, H., Husrevoglu, Y. S., & Le Vay, L. (2022). Future Mangrove Carbon Storage Under Climate Change and Deforestation. *Frontiers in Marine Science*, 9. <https://doi.org/10.3389/fmars.2022.781876>
- Chevalier, J.M., Buckles, D.J., 2008. SAS2: a Guide to Collaborative Inquiry and Social Engagement. Sage Publications.
- CIFOR, CINVESTAS_IPN, UNAM-Sisal, & PMC. (2020). *MANGROVE ECOLOGICAL RESTORATION GUIDE: LESSONS LEARNED*.
- Data Jenis Pekerjaan <https://mojo.desakupemalang.id/> diakses pada 6 Januari 2023 pada pukul 10.43
- FAO. (2023). The world's mangroves 2000–2020. In *The world's mangroves 2000–2020*. FAO. <https://doi.org/10.4060/cc7044en>
- Iqbal, M. (2007). Analisis Peran Pemangku Kepentingan dan Implementasinya Dalam Pembangunan Pertanian. *Jurnal Litbang Pertanian*, 26(3), 89–99. <http://pustaka.litbang.pertanian.go.id/publikasi/p3263071.pdf>
- Khan, M.F.A., Giessen, L., 2021. Exceptional bureaucratic rivalry in mangrove forest policy: Explanations from the Sundarbans, Bangladesh. *Ocean Coast. Manag.* 203 <https://doi.org/10.1016/j.ocecoaman.2020.105510.105510>
- Lindenberg, M.M., Crosby, B.L., 1981. Managing Development: the Political Dimension. Kumarian Press, West Hartford, CT.
- Nagelkerken, I., Blaber, S. J. M., Bouillon, S., Green, P., Haywood, M., Kirton, L. G., Meynecke, J. O., Pawlik, J., Penrose, H. M., Sasekumar, A., & Somerfield, P. J. (2008). The habitat function of mangroves for terrestrial and marine fauna: A review. In *Aquatic Botany* (Vol. 89, Issue 2, pp. 155–185). <https://doi.org/10.1016/j.aquabot.2007.12.007>
- Mursyid, H., Daulay, M.H., Pratama, A.A., Laraswati, D., Novita, N., Malik, A., Maryudi, A., 2021. Governance issues related to the management and conservation of mangrove

- ecosystems to support climate change mitigation actions in Indonesia. *For Policy Econ.* <https://doi.org/10.1016/j.forpol.2021.102622>
- Peters, B., 2010. *The Politics of Bureaucracy. An Introduction to Comparative Public Administration*. Routledge, New York.
- Poedjirahajoe, E., Marsono, D., Frita, &, Wardhani, K., Konservasi, D., Hutan, S., Kehutanan, F., Kehutanan, J. I., Penelitian, H., & Masuk, N. (2017). Penggunaan Principal Component Analysis dalam Distribusi Spasial Vegetasi Mangrove di Pantai Utara Pemalang Usage of Principal Component Analysis in the Spatial Distribution of Mangrove Vegetation in North Coast of Pemalang Riwayat naskah. *Jurnal Ilmu Kehutanan*, 29–43. <https://jurnal.ugm.ac.id/jikflkt>
- Poedjirahajoe, dkk. 2019. Laporan Akhir Pengabdian Bersama Berbasis Laboratorium Tahun 2019. Fakultas Kehutanan UGM.
- Parera, E., Purwanto, R. H., Permadji, D. B., & Sumardi. (2022). Identifikasi Pemangku Kepentingan dan Peranan dalam Pengelolaan Hutan Lindung Gunung Sirimau, Kota Ambon, Provinsi Maluku. *Jurnal Pulau-Pulau Kecil*, 6(1), 34–43.
- Rog, S. M., Clarke, R. H., & Cook, C. N. (2017). More than marine: revealing the critical importance of mangrove ecosystems for terrestrial vertebrates. *Diversity and Distributions*, 23(2), 221–230. <https://doi.org/10.1111/ddi.12514>
- Yoshikai, M., Nakamura, T., Suwa, R., Sharma, S., Rollon, R., Yasuoka, J., Egawa, R., & Nadaoka, K. (2022). Predicting mangrove forest dynamics across a soil salinity gradient using an individual-based vegetation model linked with plant hydraulics. *Biogeosciences*, 19(6), 1813–1832. <https://doi.org/10.5194/bg-19-1813-2022>