REPUBLIC OF INDONESIA
Ministry of Public Works and Housing

Project for Coastal Disaster Risk Reduction Plan Study on the North Coast of Java Island in the Republic of Indonesia

Executive Summary

July 2024

JAPAN INTERNATIONAL COOPERATION AGENCY

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CHAPTER 1 Overview of the Project

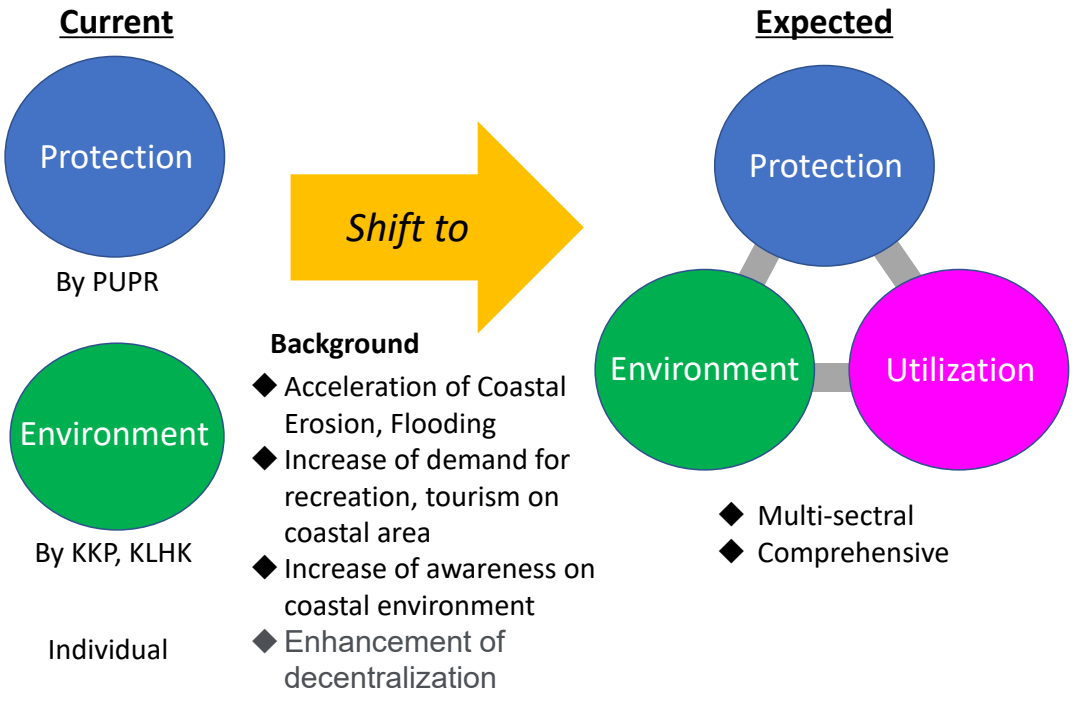
1.1 Current Conditions and Coastal Issues in the North Coast of Java Island

The current situations and issues in the north coast of Java Island are summarized below.

- The north coast of Java Island is the main economic area in Indonesia and the most important coastal area where population and national assets are concentrated. More than 90 % of the hinterland has been developed and utilized as the urban area and its surrounding transportation infrastructures, industrial areas, residential areas, and agricultural and fishery-related areas.
- On the other hand, various coastal problems and disasters such as coastal erosion, storm surge inundation, land subsidence, and large-scale topography changes at the estuary have become apparent.
- Most of the past coastal protection has been implemented without a medium- to long-term and unified coastal management plan, and also most of the coastal measures have been taken after the problems have occurred.
- Therefore, the planned coastal management with harmonizing protection, environment, and utilization is insufficient, and there are concerns about the adverse effects and negative impacts caused by this.

Therefore, a ***"comprehensive"*** and **"*wide-viewed*"** coastal management plan is strongly needed, taking into account the physical characteristics and mechanism of wave and coastal change as well as the utilization of coastal areas and hinterland.

1.2 Vision of Coastal Management in Indonesia

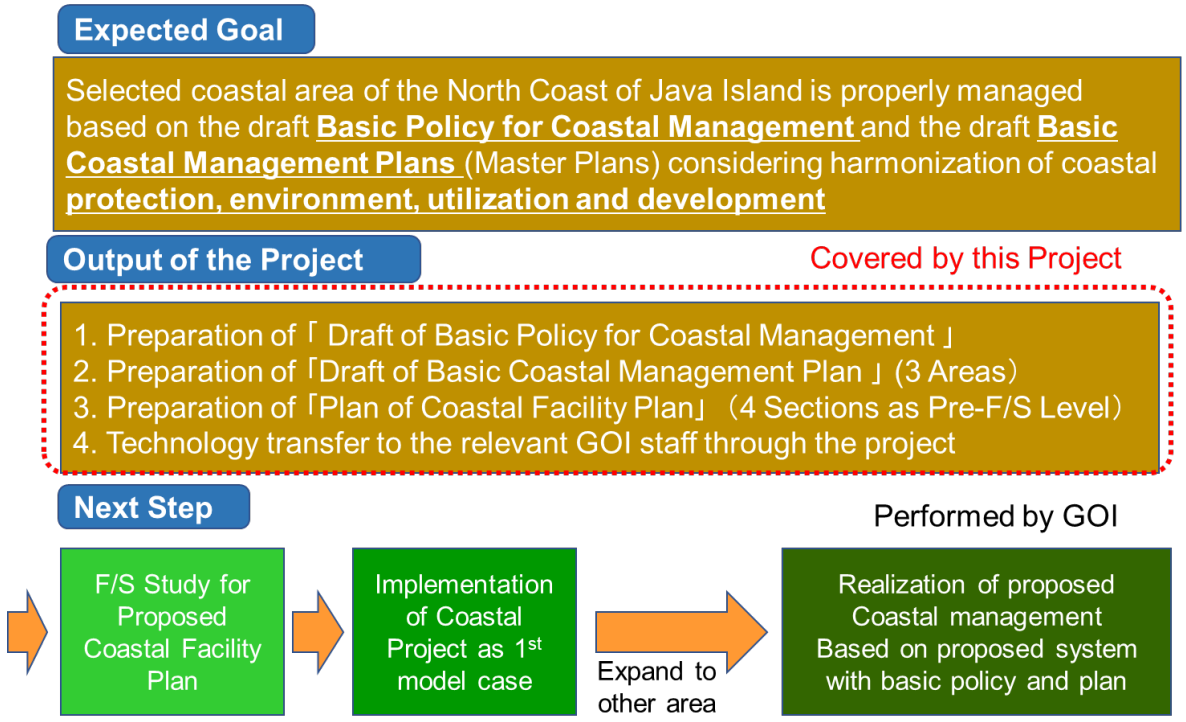


Source: JICA Study Team

Figure 1.1 Vision of Coastal Management in Indonesia

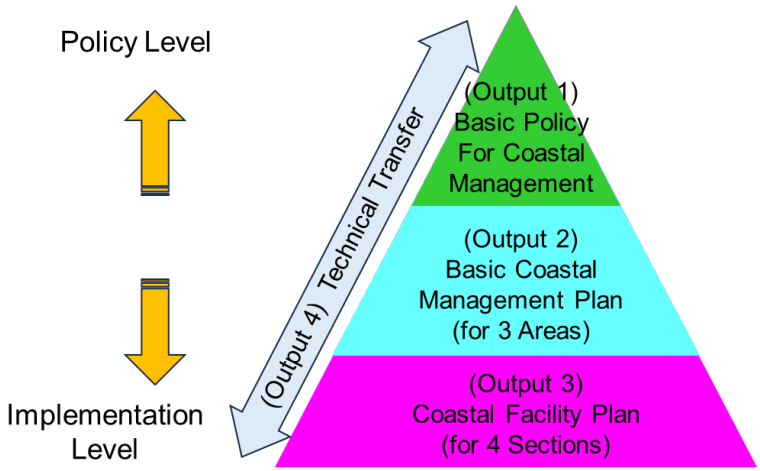
1.3 Goals, Outcomes, and Expected Subsequent Implementation of the Project

Figure 1.2 summarizes the goals and outcomes to be achieved in the Project and the expected implementation by the Government of Indonesia (GOI). Figure 1.3 shows the relationship between each outcome in the Project.



Source：JICA Study Team

Figure 1.2 Goals, Outcomes, and Expected Subsequent Implementation of the Project



Source：JICA Study Team

Figure 1.3 Relationship for Each Output in the Project

1.4 Establishment of Coordination System Between Indonesian Stakeholders and JICA Study Team in the Project (Establishment of Working Group (WG) and Close Group Discussion (CGD))

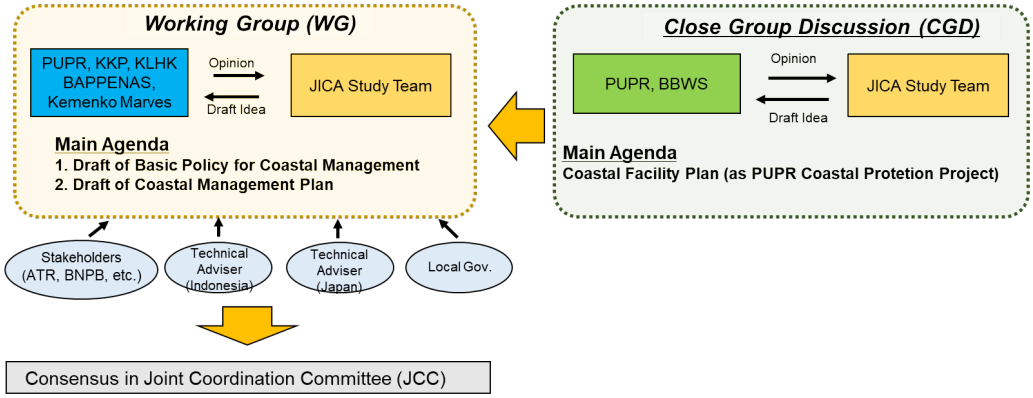
The following issues are to be addressed in the Project to realize coastal management under the unified policy and medium- to long-term plan, which is the goal of the Project.

- **First trial in Indonesia:** Proposed concept in the Project, which is to realize coastal management under a unified policy and medium- to long-term plan, is the first trial in Indonesia. Thus, it was required to newly set "Coastal Conservation Basic Policy (draft)" and "Coastal Conservation Basic Plan (draft)" and prepare a "Coastal Conservation Facilities Development Plan".
- **Mixture of many stakeholders:** In addition to three main ministries who are responsible for coastal protection and management (PUPR, KKP, KLHK), many other stakeholders are involved for realization of coastal management activities.
- **Needs for consultation, coordination, and agreement:** In the studies for three required outputs, the process of obtaining agreement through repeated consultation and coordination with stakeholders in Indonesian side is necessary and important.

To proceed under above mentioned conditions, the Working Group (WG) and Close Group Discussion (CGD) were established as shown below to discuss and exchange opinions on the Project. The WG mainly discussed the "Draft of Basic Policy for Coastal Management" and "Draft of Basic Coastal Management Plan" with relevant organizations under the leadership of BAPPENAS. The CGD mainly discussed the "Coastal Facility Plan" to be considered at the Pre-F/S level with PUPR and each BBWS.

The WG and CGD were held six times in the Project. The contents of these discussions were shared, confirmed, and agreed in the JCC (Joint Coordination Committee) members.

- 1st JCC (February 14, 2023): Confirmation for the concept of Basic Policy for Coastal Management, agreement on three priority areas for the study of Basic Coastal Management Plan, establishment of WG and CGD, and agreement on coordination and cooperation with JICA Study Team.
- 2nd JCC (January 19, 2024): Confirmation and agreement on each output, remaining issues and necessary actions by the time of the project completion.
- 3rd JCC (June 11, 2024): Confirmation of the final outputs of the Project, confirmation of issues to be addressed by Indonesian side later, and agreement on the target date.



Source: JICA Study Team

Figure 1.4 Establishment of WG and CGD for Coordination Between Indonesian Stakeholders and JST

CHAPTER 2 (Output 1) "Draft of Basic Policy for Coastal Management"

2.1 Prepartion of the Draft of Basic Policy for Cotasl Management

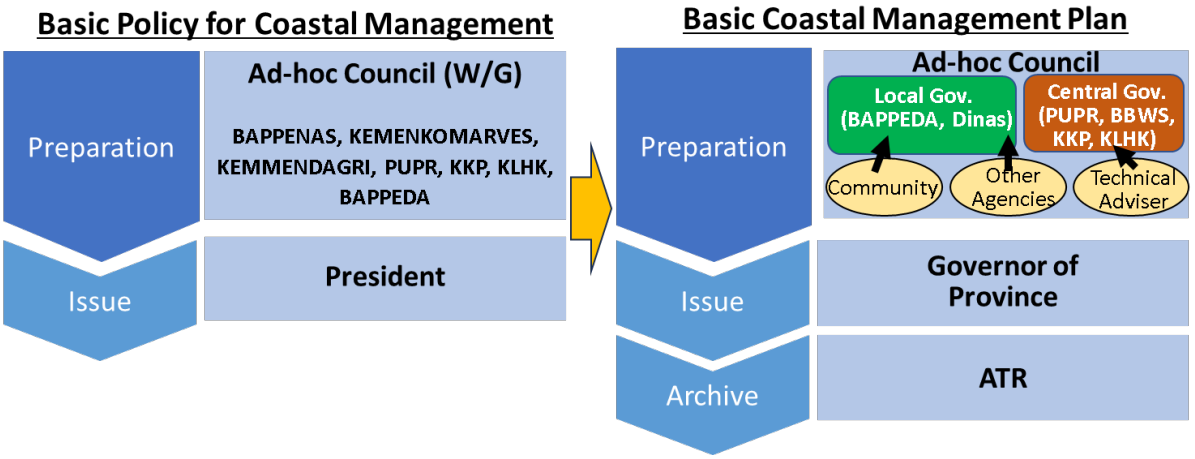
The draft of Basic Policy for Coastal Management was prepared by reflecting the coastal characteristics and coastal management system in Indonesia. The draft was prepared by referring to Japan's Basic Policy of Coastal Conservation. The draft was discussed and refined in collaboration with related agencies of GOI through the WGs. The main contents included in the draft are as follows:

- Objective of "Basic Policy for Coastal Management"
- Definition and Basic Role on "Basic Coastal Management Plan"
- Basic philosophy of coastal management
- Direction of coastal management
- Measures to achieve the direction of coastal management
- Other considerations on coastal management
- Division of Area for Preparation of Basic Coastal Management Plan
- Basic Items for Preparation of the Basic Coastal Management Plan

Based on the draft, GOI will continuously discuss the Basic Policy of Coastal Management to aim at its finalization.

2.2 Consideration for Legislative Process

In the WGs, JICA Study Team proposed the formulation process and legislation framework for the Basic Policy for Coastal Management and Basic Coastal Management Plan. The proposal has been discussed among related agencies. At the conclusion in the Project, it is determined that the most appropriate action is to be the Presidential Decree.



Source: JICA Study Team

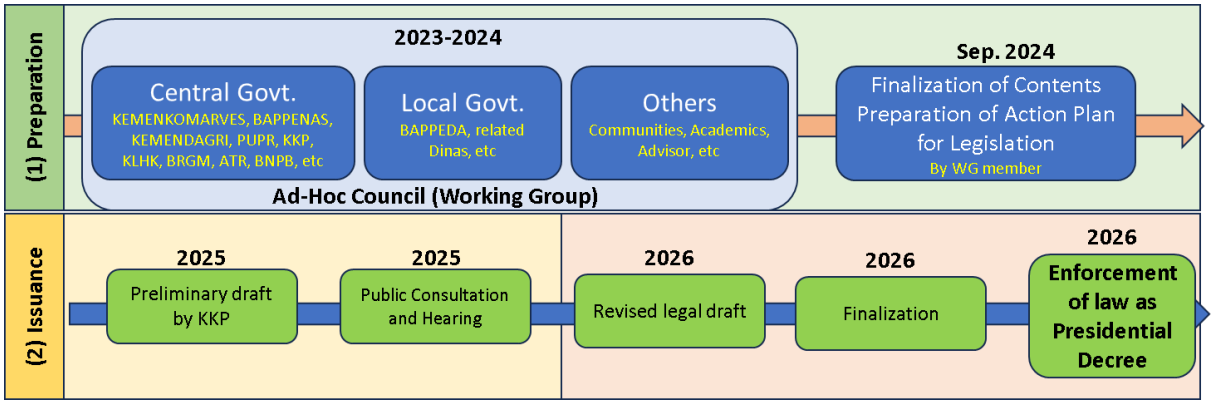
Figure 2.1 Proposal for Legislative Position and Formulation Process for the Basic Policy for Coastal Management and Basic Coastal Management Plan

2.3 Roadmap for Legislation

The roadmap for legislation of Basic Policy for Coastal Management was discussed among related agencies of GOI. In the Project, it concluded as follows:

i. The Basic Policy of Coastal Management is aimed to be legislated by 2026 as a Presidential Decree (Peraturan Presiden), a Presidential Direction (Instruksi Presiden), or other equivalent executive order issued by the President.

ii. KKP will be an initiator ministry of the legislation process in cooperation with other WG members. Each ministry/agency will hold a high-level interagency meeting, and formulate the draft of the legal document.



Source: JICA Study Team

Figure 2.2 Proposed Idea of Roadmap for Legislation of the Basic Policy of Coastal Management

CHAPTER 3 (Output 2) "Draft of Basic Coastal Management Plan"

3.1 Three Selected Priority Areas

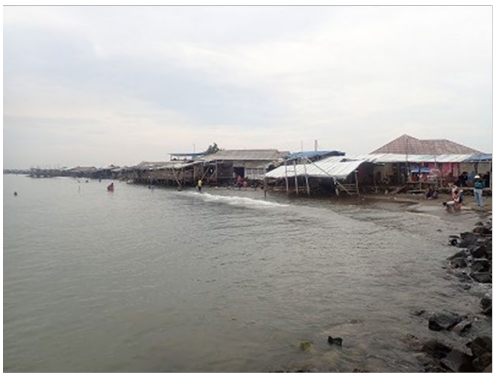
The priority areas, in which the draft of Basic Coastal Management Plan was prepared through the Project, were discussed with related agencies of GOI. Three Areas with different coastal characteristics were selected as follows:

- Area-I: Indramayu (98.9 km)
- Area-II: Pemalang- Pekalongan (45.9 km)
- Area-III: Rembang-Tuban (51.5 km)

Source: JICA Study Team

Figure 3.1 Three Selected Areas for the Preparation of the Draft of Basic Coastal Management Plan

The coastal characteristics of each area are described in the next pages.

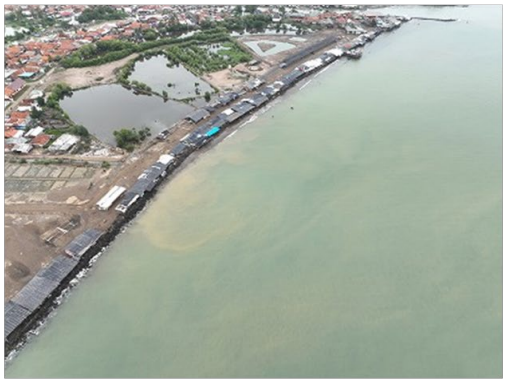


Narrow beach at domestic tourism area

Protection Measure (Rock Fill)

Land Erosion

Collapse of Seawall due to further erosion



Beach Condition at Domestic Tourism Area

Silt Diffusion due to Land Erosion

Protection Measure (by line) at Residential Area

Protection Measure (Mangrove Plantation) at Fish Pond

Source: JICA Study Team

Figure 3.2 Coastal Conditions of Area-I (Indramayu)

(Top two rows: land view photos taken in October 2022. Bottom two rows: drone photos taken in August 2022)


On-going Protection Measures by Province

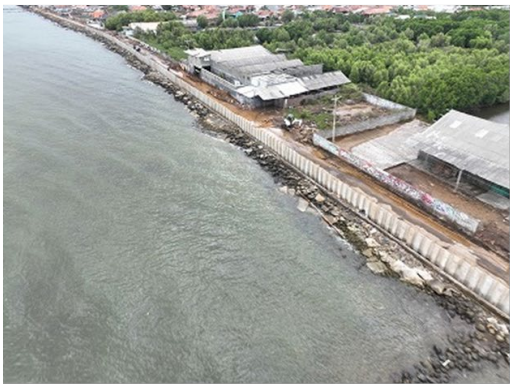

On-going Protection Measures by Province


Increased of Crown Height as Protection Measures by Province


Increased of Crown Height as Protection Measures by Province


Coastal Use at Urban Area


Coastal Protection at Urban Area (Line Protection)


Coastal Protection at Urban Area (Line Protection)


Coastal Protection at Urban Area (Line Protection)

Source: JICA Study Team

Figure 3.3 Coastal Conditions in Area-II (Pemalang-Pekalongan)

(Top two rows: land view photos taken in Oct 2022. Bottom two rows: drone photos taken in August 2022)

On-going Protection Measure by BBWS

Offshore Breakwaters

Coastal Condition at Down-drift Side

Coastal Condition at Down-drift Side

Coastal Protection by Groins and Revetment

On-going Protection Measure by BBWS

Offshore Breakwaters

Coastal Condition at Down-drift Side

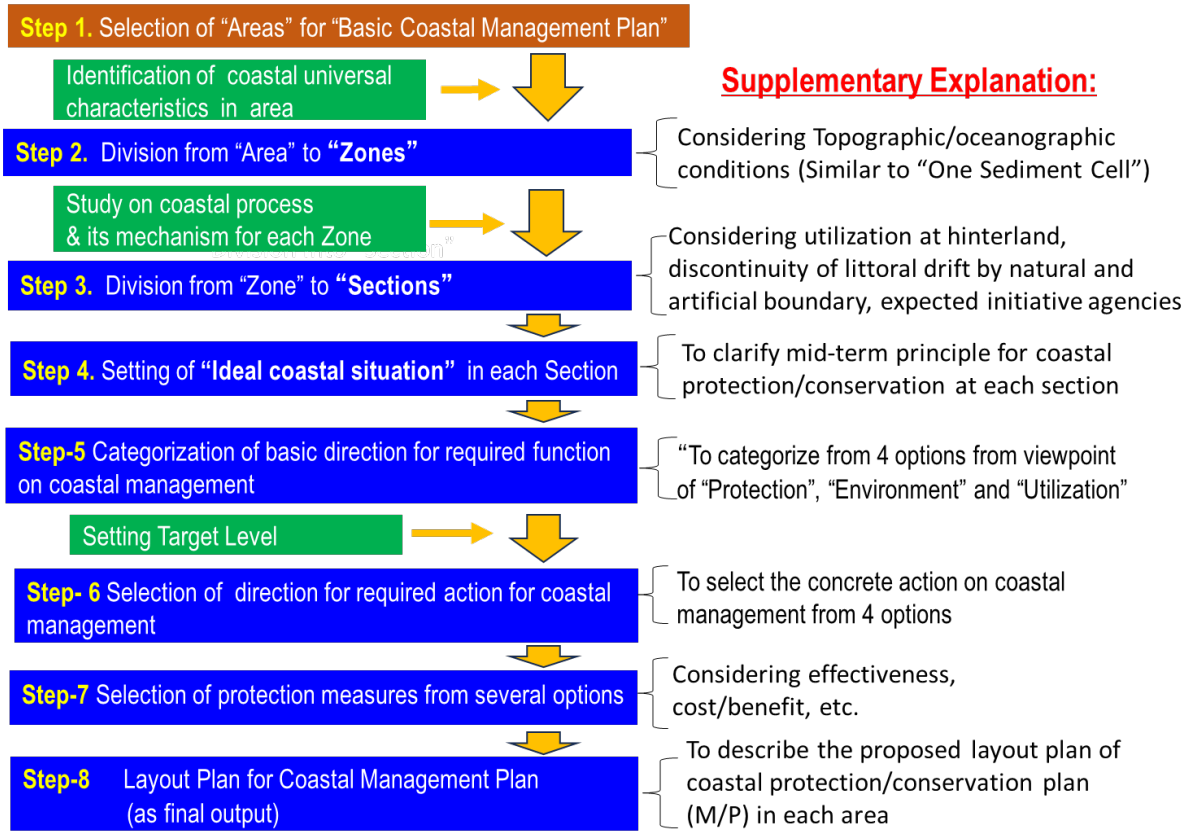
Source: JICA Study Team

Figure 3.4 Coastal Condition in Area-III (Rembang-Tuban)

(Top two rows: land view photos taken in Oct 2022. Bottom two rows: drone photos taken in August 2022)

3.2 Proposed Preparation Procedure of the Draft of Basic Coastal Management Plan

The following procedure was proposed in order to enable the preparation of the Basic Coastal Management Plan with unified content and procedures.



Source: JICA Study Team

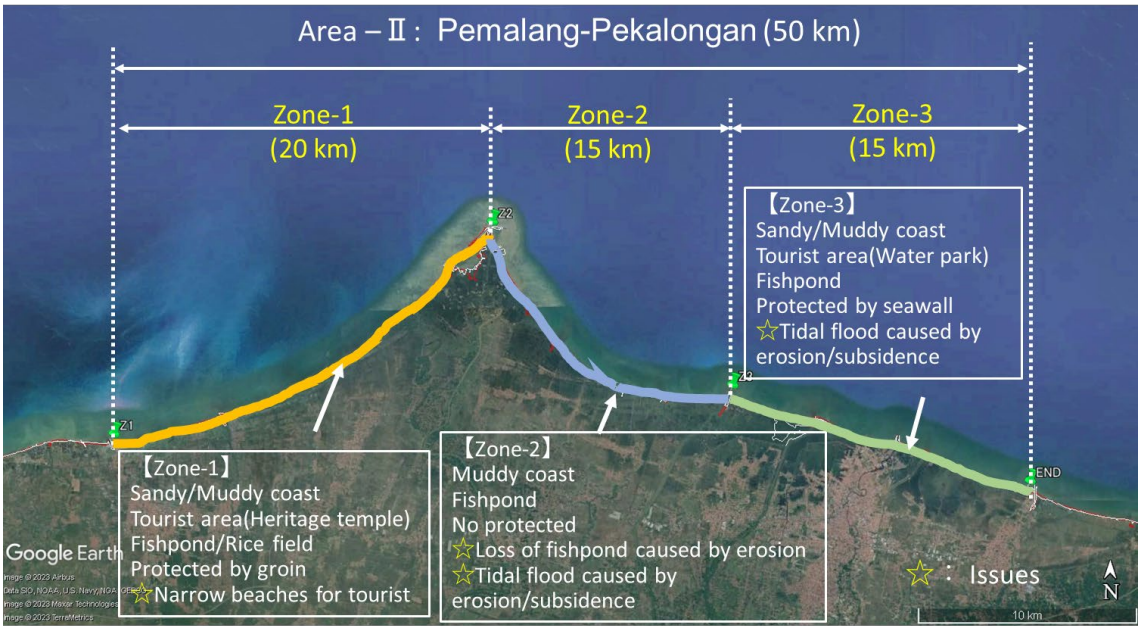
Figure 3.5 Proposed Preparation Procedure of the Basic Coastal Management Plan

3.3 Step-1: Area Setting for the Preparation of Basic Coastal Management Plan

In Step-1, the Area for the preparation of Basic Coastal Management Plan is determined. The Area is bounded by administrative boundaries, major river mouth, etc. to be the scale of several tens of kilometers to 100 kilometers. The target Areas for the Project are shown in Figure 3.1

3.4 Step-2: Zone Division from Area

In Step-2, the Area is divided into the Zone considering coastal characteristics, incident waves, and direction of shoreline angles as a universal characteristic of the coast. The Zone is set to be the scale of several tens of kilometers. Figure 3.6 shows an example of the Zone division in Area-II.

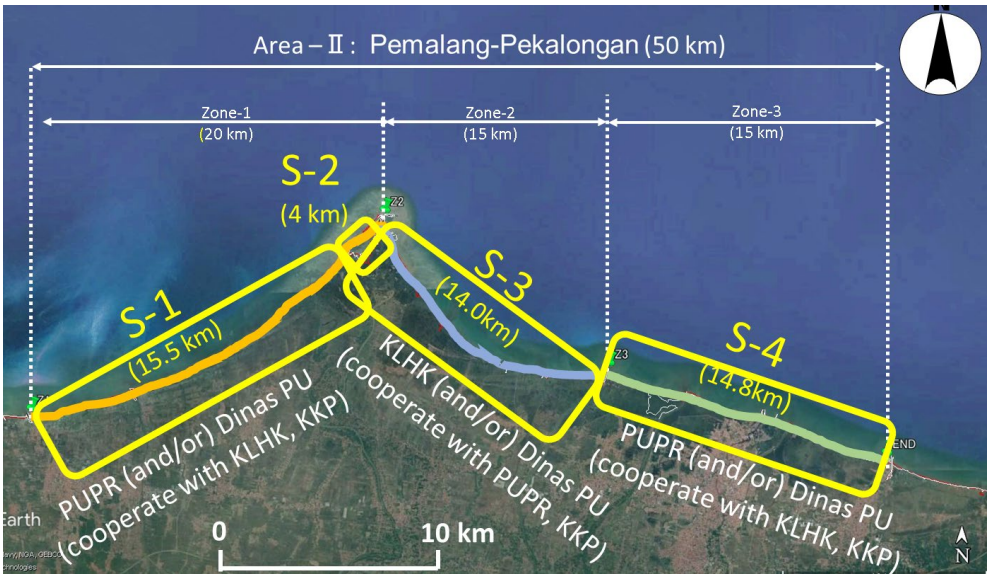


Source: Edited by JICA Study Team based on Google Earth

Figure 3.6 Zone Division (Example of Area-II Pemalang-Pekalongan)

3.5 Step-3: Division from Zone to Section (A unit of coast for coastal protection/conservation project)

In Step-3, the continuity of littoral drift and hinterland and coastal utilization has been assessed. The Zone is divided into Sections as a coastal division. The Section is one unit of coast for a coastal protection/conservation project. In addition, in dividing Sections, the initiative agencies mainly responsible for the preparation of Basic Coastal Management in the Area are proposed as a draft level. Figure 3.7 shows an example of Section division in Area-II Pemalang-Pekalongan.

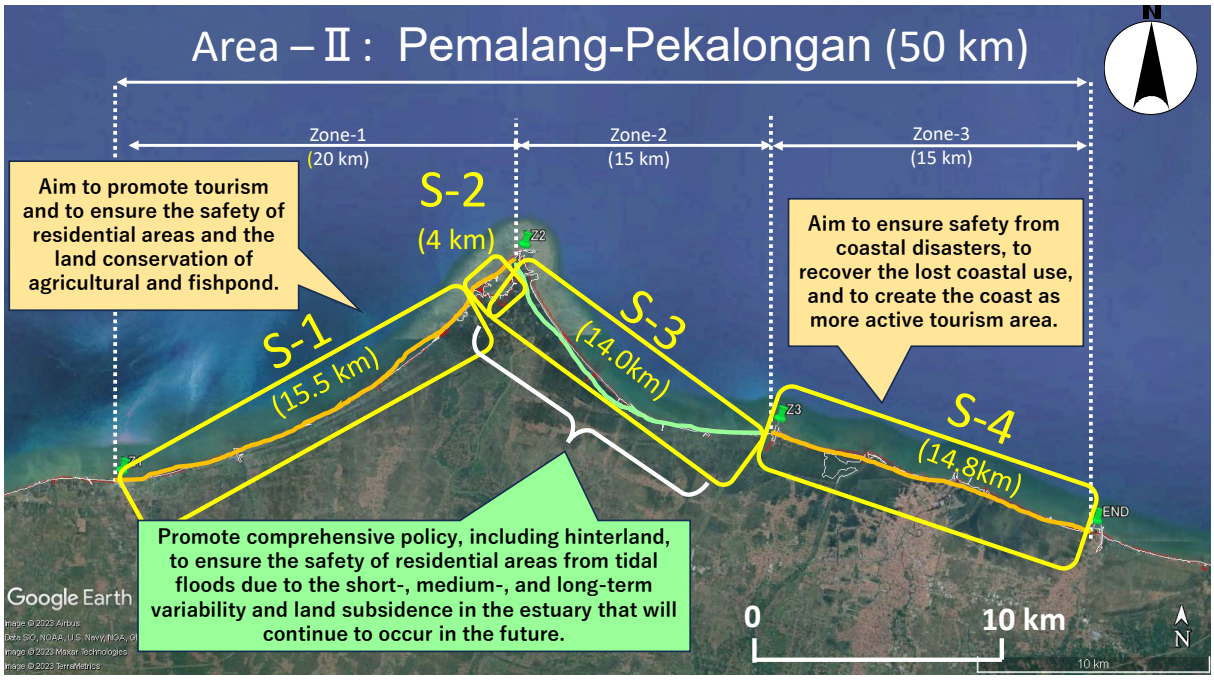


Source: Edited by JICA Study Team based on Google Earth

Figure 3.7 Section Division (Example of Area-II Pemalang-Pekalongan)

3.6 Step-4: Setting "Ideal Situation of the Coast" in Section

In Step-4, current coastal conditions were assessed to identify coastal problems and coastal issues in a Section. The ideal situation of coastal management and conservation in each Section was defined as "Ideal Situation of the Coast", as shown in Figure 3.8. The current coastal assessment in Step-4 includes 1) coastal disaster risks (coastal inundation risk, coastal erosion risk, land subsidence risk), 2) patterns of hinterland and coastal utilizations, and 3) the presence/absence of existing coastal facilities and their functionality.



Source: Edited by JICA Study Team based on Google Earth

Figure 3.8 Setting "Ideal Situation of the Coast" (Example of Area-II Pemalang-Pekalongan)

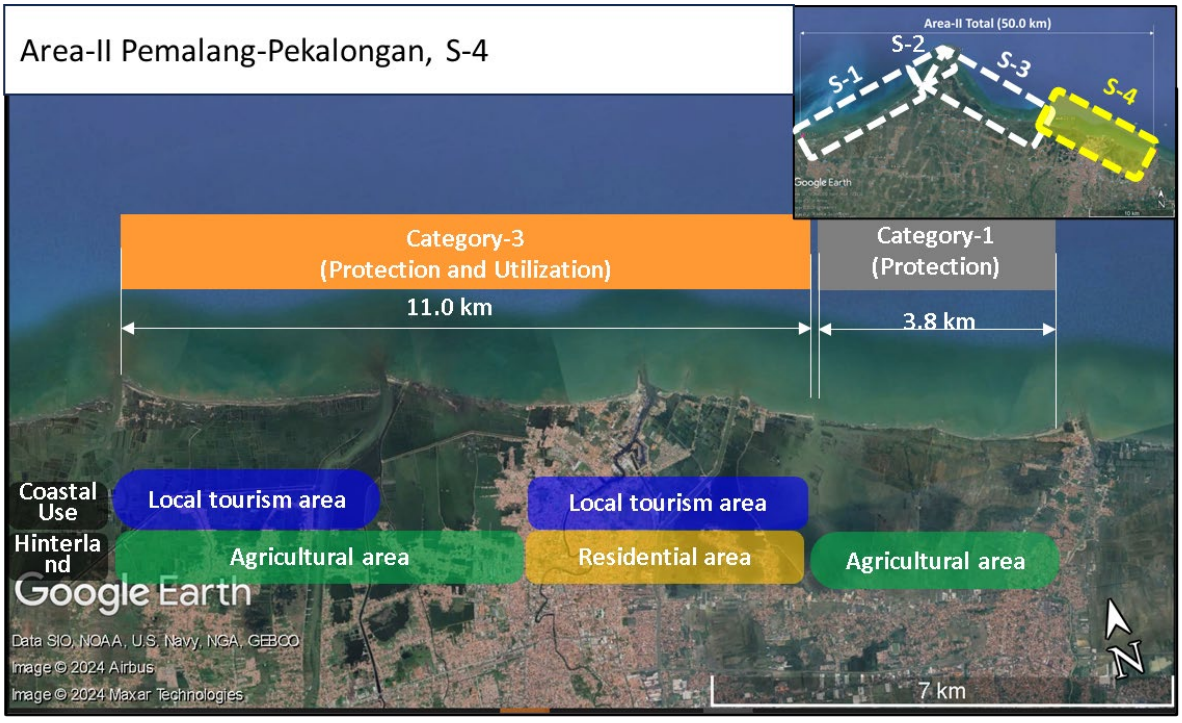
3.7 Step-5: Identification of Required Coastal Functions

In Step-5, the required coastal functions have been identified for each coast in order to achieve the Ideal Situation of the Coast. The required coastal functions were categorized into four types (Table 3.1), as a combination of "Protection," "Utilization," and "Environment," based on the hinterland and coastal utilization. In addition to setting protection function, environmental function is designated when the coast is an environmental protection area, and utilization function when the coast is currently utilized, such as for local tourism areas.

Table 3.1 Categorization of Required Coastal Functions

Category-1	Category-2	Category-3	Category-4
Protection	Protection + Environment	Protection +Utilization	Protection +Environment +Utilization

Source: JICA Study Team



Source: Edited by JICA Study Team based on Google Earth

Figure 3.9 Identification of Required Coastal Functions (Example of Area-II Pemalang-Pekalongan)

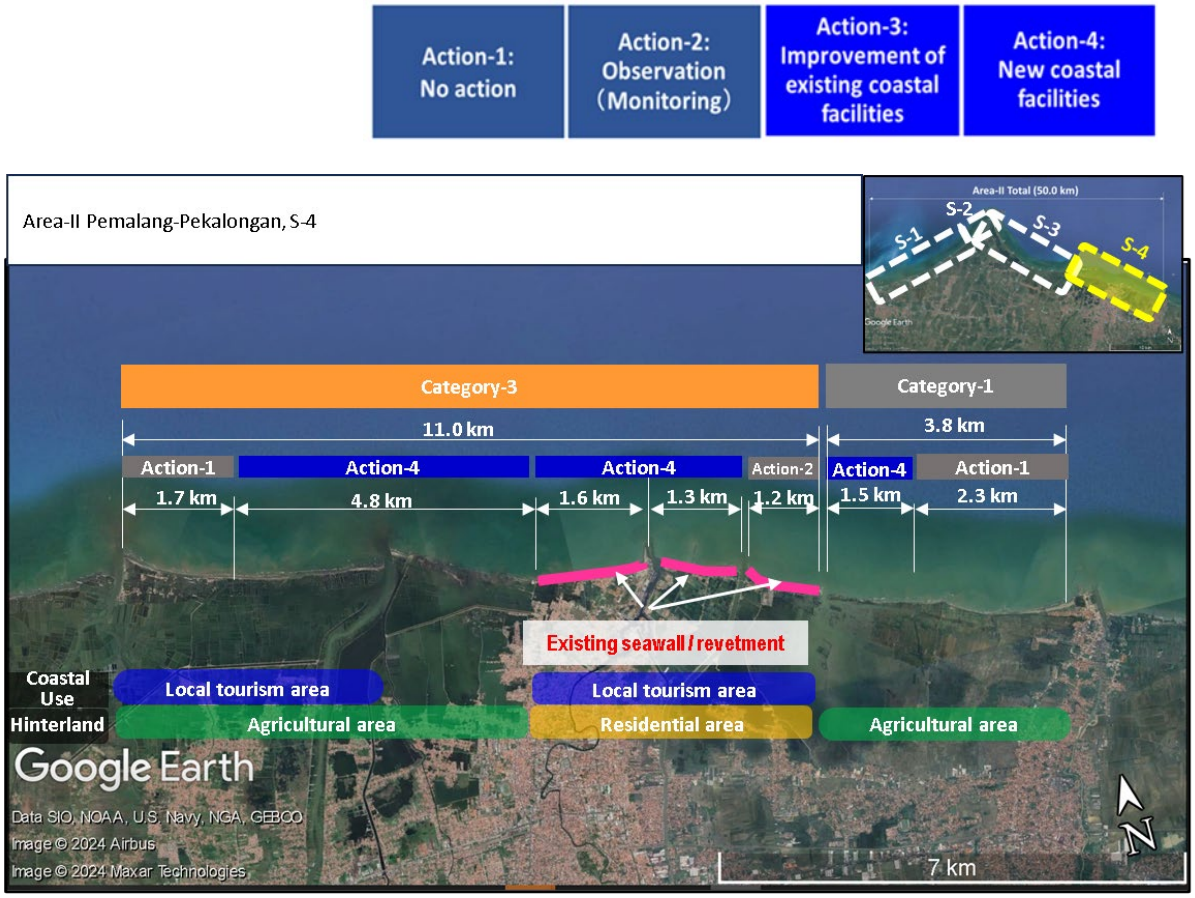
3.8 Step-6: Selecting Coastal Measures to Meet Required Coastal Functions

Prior to Step-6, the target level in each required coastal function has been set (Table 3.2). In Step-6, each coast is classified based on whether coastal development is necessary or unnecessary in order to achieve the target level. Based on the existing coastal facilities and existing development plan of coastal facilities, four Actions were allocated as shown in Figure 3.10.

Table 3.2 Setting Target Level for Each Function

Categorization	Functions	The target level for each function
Category-1	Protection	Coasts with residential areas or critical infrastructures in the hinterland: the target level of protection function is to prevent damage to human lives, human activities, and economic activities caused by high waves and/or storm surge inundation and coastal erosion. Against coastal erosion, the minimum target level is to prevent further shoreline recession (maintaining the present shoreline position). When coastal erosion progresses and hinterland protection cannot be achieved through maintaining the present shoreline position, the target level to restore the shoreline position is determined as necessary.
		Coasts with primary industry in the hinterland such as agricultural and aquacultural areas: To allow wave intrusion under extreme oceanographic conditions but prevent further shoreline recession (maintaining the present shoreline).
Category-2	Protection	To allow wave intrusion under extreme oceanographic conditions but prevent further shoreline recession (maintaining the present shoreline).
	Environment	On coasts with well-preserved natural coastal environments, the target level is to maintain and protect it. Conversely, when natural coastal environments formed by mangrove forests or sandy beaches have deteriorated or disappeared due to coastal development or coastal erosion etc., resulting in declines in protection, environmental quality, and usage, the target level is to restore and rehabilitate the original coastal environments.
Category-3	Protection	Coasts with residential areas or critical infrastructures in the hinterland: the target level of protection function is to prevent damage to human lives, human activities, and economic activities caused by high waves and/or storm surge inundation and coastal erosion. Against coastal erosion, the minimum target level is to prevent further shoreline recession (maintaining the present shoreline position). When coastal erosion progresses and hinterland protection cannot be achieved through maintaining the present shoreline position, the target level to restore the shoreline position is determined as necessary.
	Utilization	For the target level of utilization function, according to the type of coastal utilization (such as fishing activities or local tourism areas), the minimum goal is to maintain the current coastal utilization without degradation. Additionally, the target level is to enhance and promote further coastal utilization through coastal facility development, thereby contributing to improved economic benefits.
Category-4	Protection	（Same as Category-3）
	Environment	（Same as Category-2）
	Utilization	（Same as Category-3）

Source: JICA Study Team



Source: Edited by JICA Study Team based on Google Earth

Figure 3.10 Selection of Direction for Required Actions for Coastal Management

3.9 Step-7: Selection of Coastal Measures (Selection of Countermeasure Option)

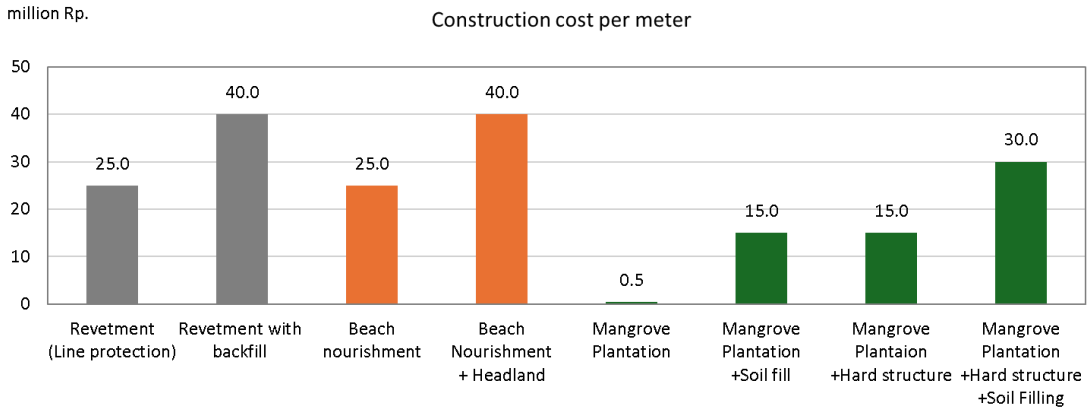
In Step-7, the coastal measure on each coast has been determined considering the flowing perspectives:

- Coastal functions (Protection, Utilization, Environment) provided by each coastal measure (Figure 3.11 shows representative applicable categories for coastal measures)
- Effectiveness of coastal measures considering coastal characteristics, coastal issues, and the target level.
- Cost-effectiveness of each coastal measure (Figure 3.12 shows the comparison of construction cost per meter under assuming the construction cost for target coasts of the project)

	coastal measure	Categories for required functions			
		Cat.1 Protection	Cat.2 Protection Environment	Cat.3 Protection Utilization	Cat.4 Protection Utilization Environment
1	**Hard (Structure) measure** (Revetment, groin)	■			
2	**Green measure** (Mangrove plantation, Coral transplantation)	■	■		
3	**Soft measure** (Beach nourishment)			■	■
4	**Combination** (hard, soft, green, gray measures)		■	■	■

Source: JICA Study Team

Figure 3.11 Representative Applicable Categories for Coastal Measures



Assumption:
- Revetment with backfill is revetment with Ave. 20 m of backfill
- Beach nourishment assumes Ave. 30 m of beach width
- Beach nourishment with headland/groin is the above + headland (250 m interval)
- Mangrove plantation is assumed 150 m width.
- Mangrove plantation + soil fill is the above + soil fill with 1 m thickness
- Mangrove plantation + hard structure + soil fill is the above + rock breakwaters

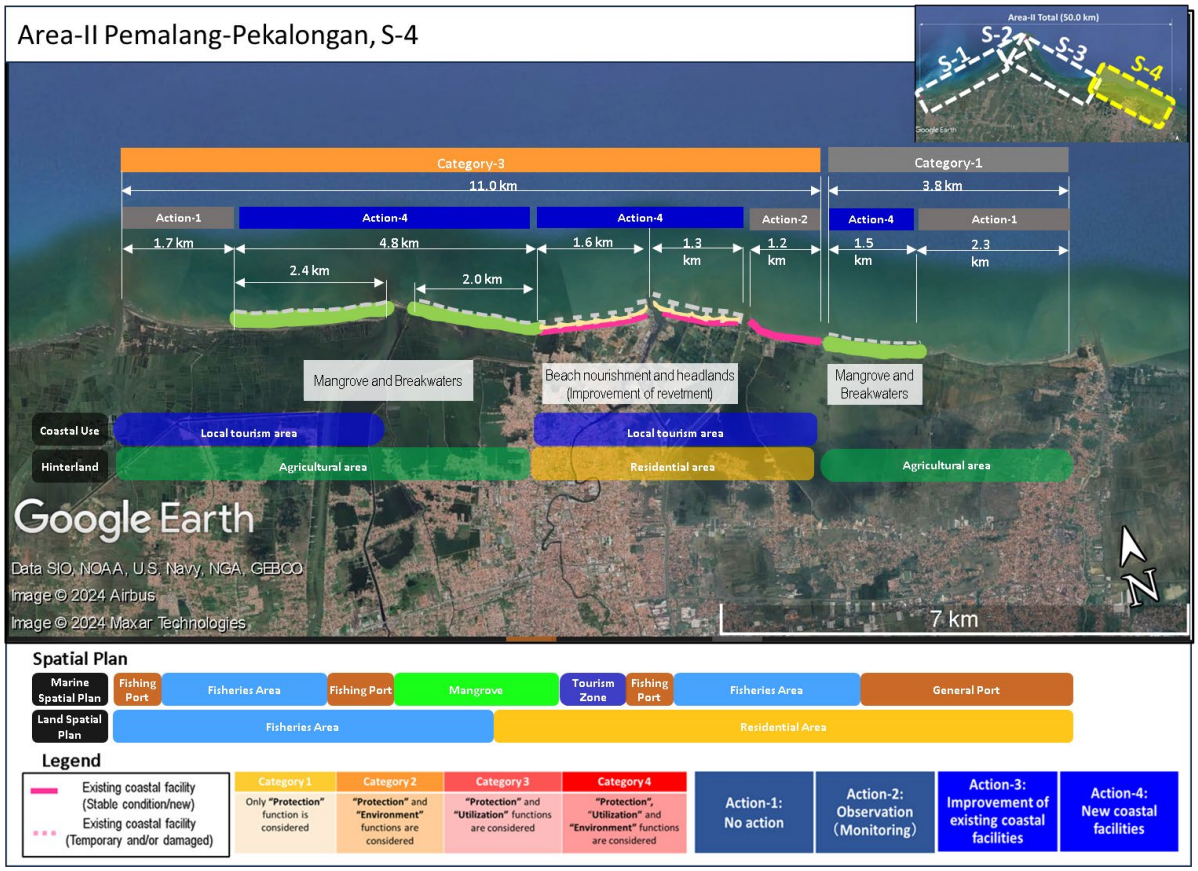
Source: JICA Study Team

Figure 3.12 Comparison of Construction Cost per Meter (Assume: Target Coasts of the Project)

3.10 Step-8: Preparation of Basic Coastal Management Plan

In Step-8, the draft of Basic Coastal Management Plan was proposed as a medium- and long-term Master Plan. Figure 3.13 shows the draft of Basic Coastal Management Plan in Section-4, Area-II Pemalang-Pekalongan as an example.

This coastal area, with urban areas situated behind it, frequently experiences flooding caused by high waves and storm surges, intensified by land subsidence and coastal erosion. Thus, a combination of beach nourishment and headlands is proposed as a new coastal facility to enhance coastal protection and promote coastal utilization in front of urban areas. In addition, for coastal areas with primary industries in the hinterland, a combination of mangrove planting and breakwaters is proposed.

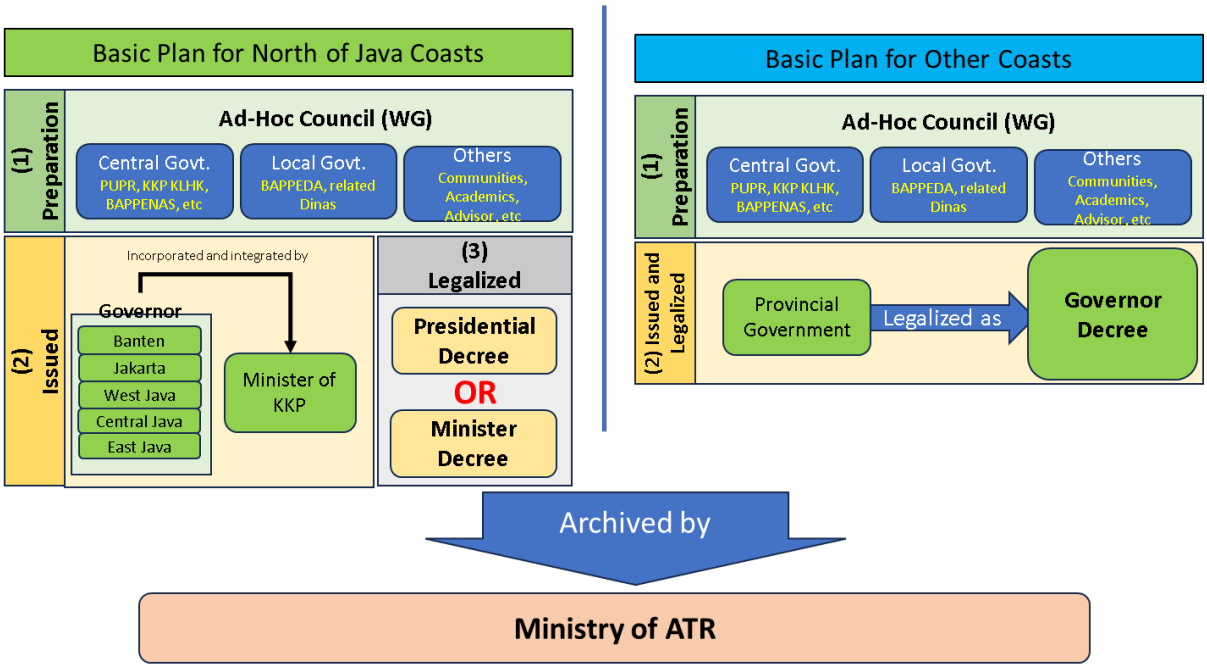


Source: Edited by JICA Study Team based on Google Earth

Figure 3.13 Proposed Draft of Basic Coastal Management Plan (Example of Area-II Pemalang-Pekalongan)

3.11 Proposed Legislation Framework of Basic Coastal Management Plan

BAPPENAS proposed a distinction in the legislation procedures and issuers of the Basic Coastal Management Plan between the north coasts of Java Island and other coastal areas, due to the economic importance of the north coasts of Java Island. Figure 3.14 shows the idea of the legislation framework of the Basic Coastal Management Plan. Further discussion will be carried out among related agencies of GOI.



Source: JICA Study Team

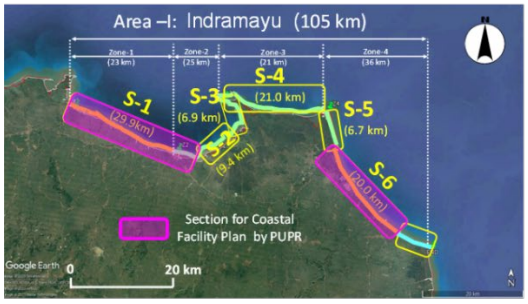
Figure 3.14 Idea of Legislation Framework of Basic Coastal Management Plan

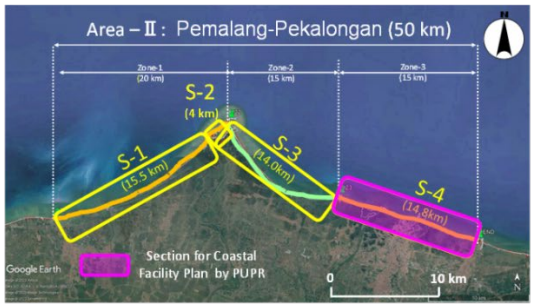
CHAPTER 4 (Output 3) Coastal Facilities Plan in Selected Sections

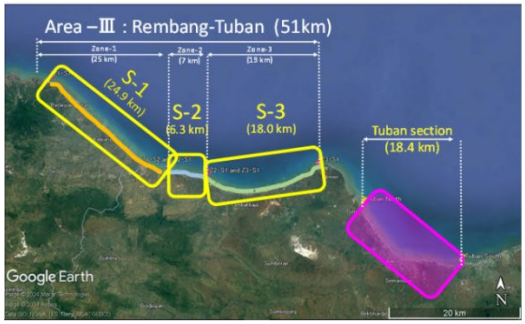
4.1 Selected Four Sections

The Coastal Facility Plan was studied in the pre-F/S level study in the four sections shown below, taking into account the following matters and in consultation with PUPR.

- Sections that include high-priority coasts as PUPR projects, coasts used as tourism areas, and coastal areas with residential areas or important infrastructure behind them.
- Sections that include coastal areas that need integrated protection measures using soft measures, such as beach nourishment and green infrastructure, including environmental and utilization considerations, instead of conventional hard protection measures.
- Sections of around tens of kilometers as the countermeasure area are selected looking ahead to future loan project and its impact.
- Requests from PUPR including each BBWS







Name	Area	Zone	Section	Coastal Length
Indramayu West	Area-1	Zone-1	S-1	29.6 km
Indramayu East	Area-2	Zone-4	S-6	20.0 km
Pekalongan	Area-3	Zone-3	S-4	14.8 km
Tuban	-	-	T	14.4 km
Total				78.8 km

Source: JICA Study Team

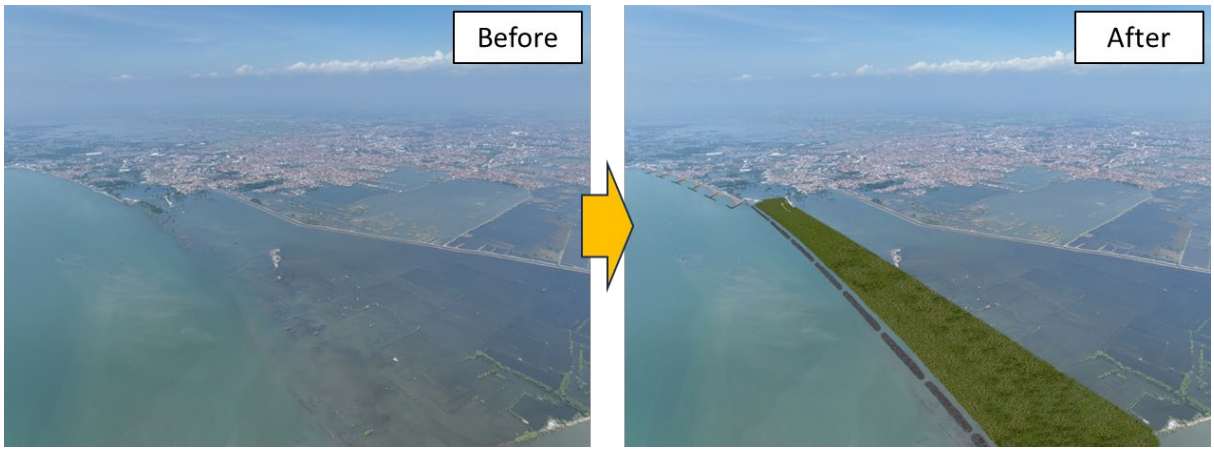
Figure 4.1 Selected Four Sections for Coastal Facility Plan

4.2 Design of Coastal Protection/Conservation Facilities

The proposed coastal protection/conservation facilities (beach nourishment, groin/headland, wave breakwater for mangrove protection, revetment, mangrove plantation) are designed to meet the required functions (protection, utilization, environment) of each coast. Figure 4.2 to Figure 4.5 show before- and after- images of each coastal facility. The specifications of each coastal facility are set based on the basic concept of functional design. As an example, Figure 4.6 shows the study of the cross section, layout and specifications of beach nourishment. For consideration of other coastal facilities, refer to Section 13.4 of the final report.

Source: JICA Study Team

Figure 4.2 Image of Before- and After-Implementation of Beach Nourishment and Headlands (Area-I, S-1a)



Source: JICA Study Team

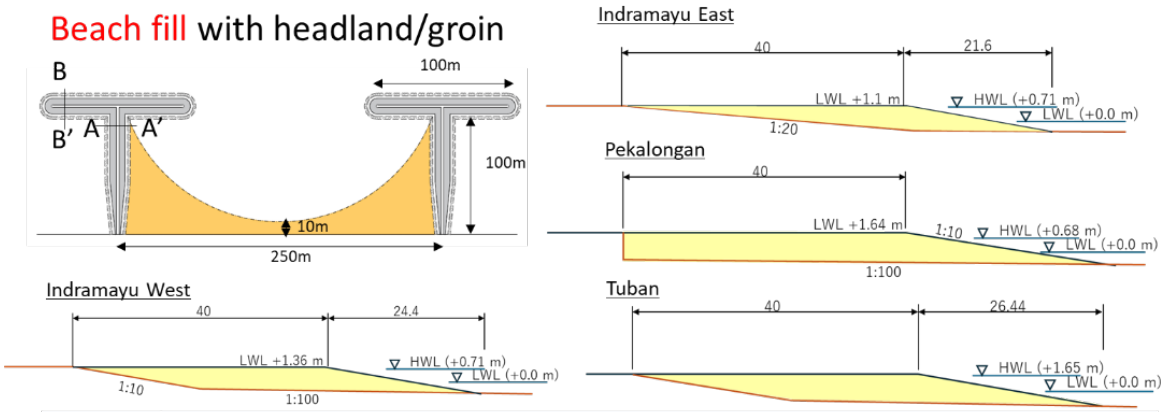
Figure 4.3 Image of Before- and After-Implementation of Mangrove Plantation and Breakwater for Mangrove Protection (Area-II, S-4a)

Source: JICA Study Team

Figure 4.4 Image of Before- and After-Implementation of Revetment Type-1 (T-b)

Source: JICA Study Team

Figure 4.5 Image of Before- and After-Implementation of Revetment Type-2 (T-c)



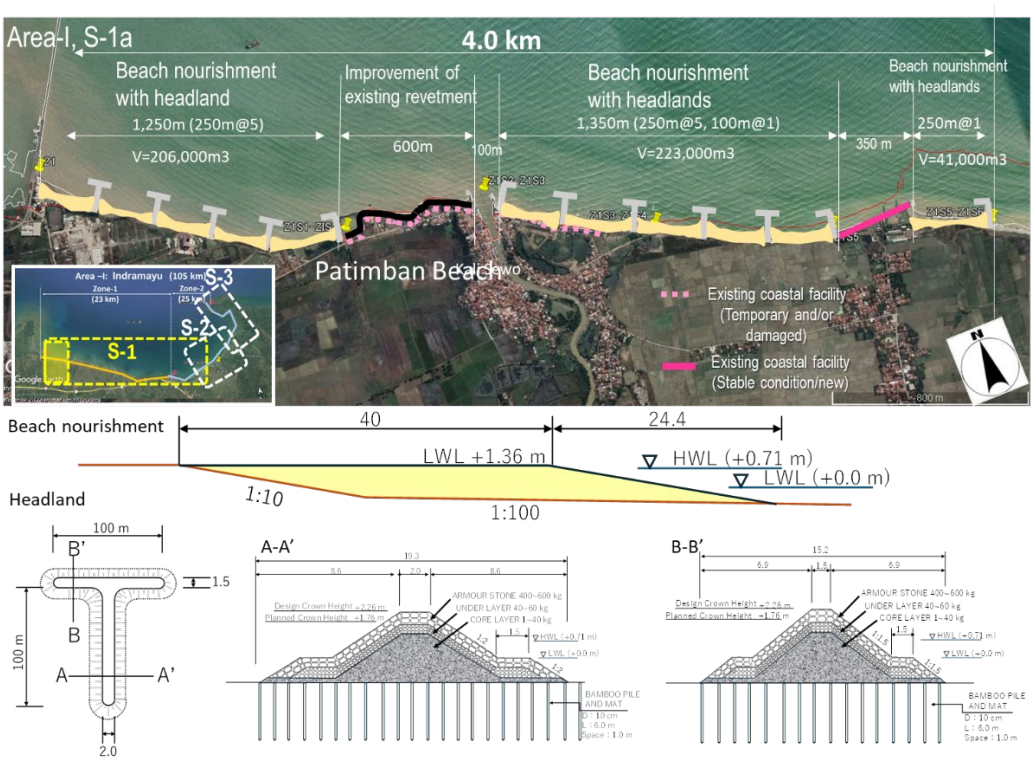
Facilities	Specifications	
Beach fill	Sand quality	Grain size of sand: Same size with natural beach (= about 0.20 mm) Color of sand: Same color with natural beach
	Crown height (i)+(ii)	(i) Planned height to satisfy necessary function Same as backshore height of berm top in natural beach. (ii) Freeboard Pekalongan: 0.25m for land subsidence
	Backshore width	Minimum: 20m and Average: 40m - Prevention against wave runup (Validated by wave of 50 years return period) - Necessary for beach use
	Foreshore slope	1:10 (=natural beach)

Source: JICA Study Team

Figure 4.6 Cross Section, Layout and Specifications of Beach Nourishment

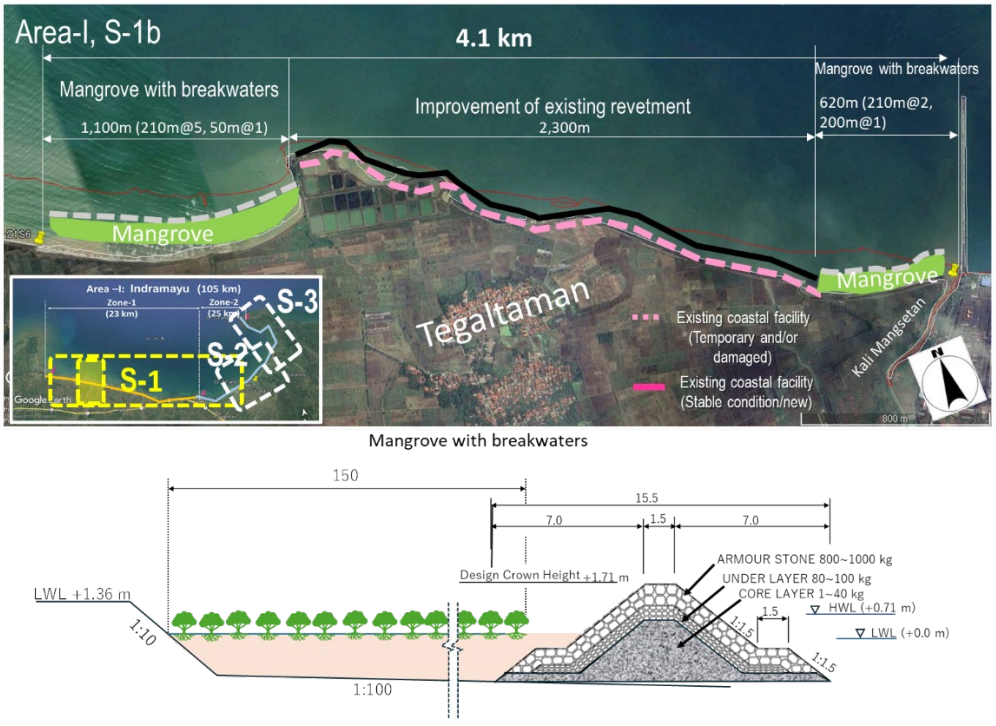
4.1 Examples of Coastal Facility Plan

Figure 4.7 to Figure 4.9 show examples of Coastal Facility Plan. Refer to Section 13.6 of the final report for the Coastal Facility Plan in other sections.



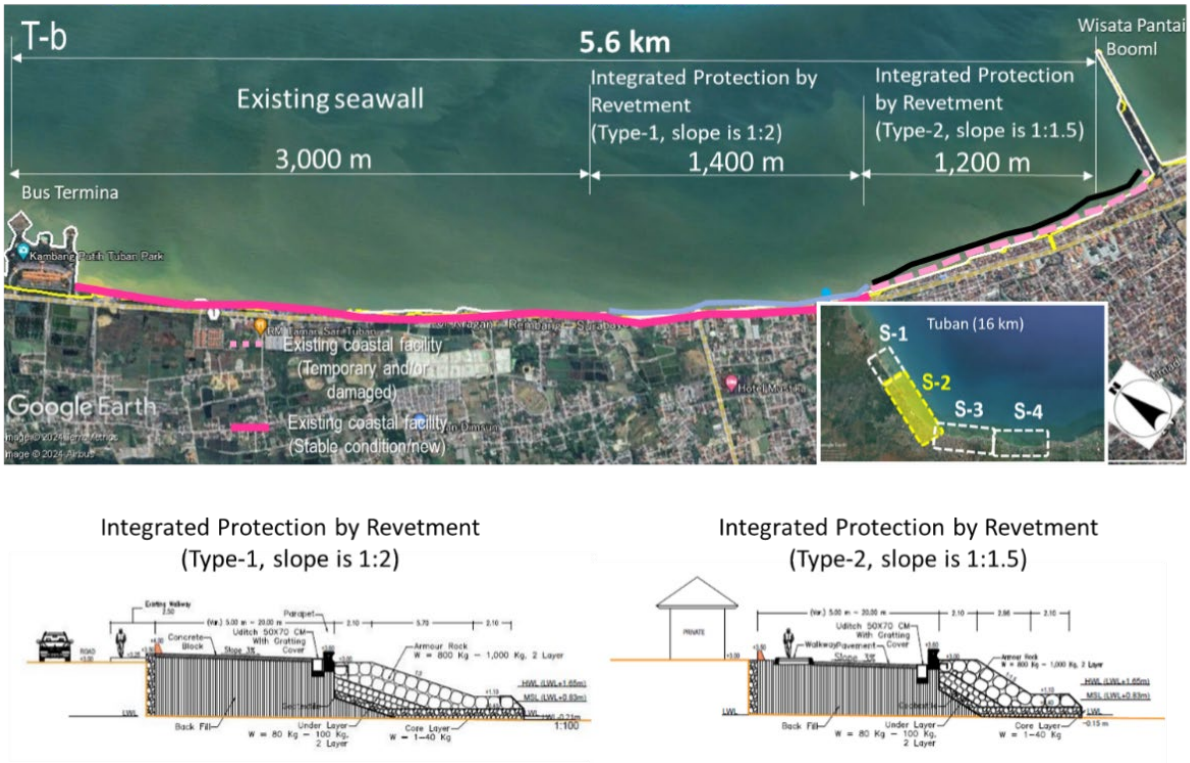
Source: Edited by JICA Study Team based on Google Earth

Figure 4.7 Coastal Facility Plan Indramayu Section-1a



Source: Edited by JICA Study Team based on Google Earth

Figure 4.8 Coastal Facility Plan Indramayu Section-1b



Source: Edited by JICA Study Team based on Google Earth

Figure 4.9 Coastal Facility Plan Tuban T-b

4.4 Construction Work and Cost Estimate

Based on the proposed Coastal Facility Plan, rough construction and project cost were estimated. Regarding the construction, the procurement of materials and equipment was studied. Based on these studies, the unit prices for each construction type were calculated and construction costs and project costs were estimated. Table 4.1 shows the basic specifications of coastal facilities in each section. Table 4.2 shows the estimated rough construction costs. Table 4.3 shows the estimated rough project cost, which was calculated by adding the following necessary expenses based on the project implementation and schedule to the estimated construction cost.

The above results cover only the facility for Action-4 (New Coastal Facilities). However, since PUPR requested to add the facilities for Action-3 (Improvement of Existing Coastal Facilities) at the 6th CGD, for reference, Table 4.4 shows the project cost including Action-3. In addition, Table 4.5 shows a comparison of the project cost for Action-4 (Option 1) and the project cost with Action-3 added (Option 2) .

Table 4.1 Basic Specifications of Facilities in Each Section (Coastal Length, Quantities)

	Indramayu West	Indramayu East	Pekalongan	Tuban	Total
● Coastal length to be protected					
Beach Nourishment	2.9 km	5.0 km	2.9 km	3.1 km	**14.0 km**
Mangrove with breakwaters	7.8 km	-	5.5 km	-	**13.2 km**
Integrated Protection by Revetment	-	-	-	11.3 km	**11.3 km**
Total	**10.7 km**	**5.0 km**	**8.4 km**	**14.4 km**	**38.5 km**
● Main quantities for facility plan					
Beach nourishment	289,866 m3	369,851 m3	438,531 m3	200,043 m3	**1,298,219 m3**
Headland/ groin	11 Nos	15 Nos	11 Nos	5 Nos	**42 Nos**
	2,200 m	3,500 m	2,100 m	500 m	**8,300 m**
Breakwater for mangrove	39 Nos	-	27 Nos	-	**42 Nos**
	7,430 m	-	5,190 m	-	**12,620 m**
Mangrove	117 ha	-	82 ha	-	**199 ha**
Soil fill for mangrove	1,167,000 m3	-	819,000 m3	-	**1,986,000 m3**

Source: JICA Study Team

Table 4.2 Rough Estimate of Construction Cost

	Pay Item (category-level)	Indramayu West	Indramayu East	Pekalongan	Tuban	Total
1	General and Preparatory Works	35,843,000,000	16,138,000,000	35,775,000,000	42,520,000,000	**130,276,000,000**
2	Health, Safety and Environmental Works	5,000,000,000	3,000,000,000	5,000,000,000	5,000,000,000	**18,000,000,000**
3	Beach Nourishment	78,843,573,253	100,599,562,484	119,280,447,633	54,411,696,000	**353,135,279,370**
4	Headland/ Groin Works	42,652,251,200	56,406,026,480	54,833,528,000	5,841,318,000	**159,733,123,680**
5	Mangrove Protection and Plantation Works	228,175,646,000	0	175,215,411,000	0	**403,391,057,000**
6	Integrated Protection by Revetment	0	0	0	359,203,609,000	**359,203,609,000**
7	Initial Maintenance Work	3,757,678,067	1,369,819,751	3,424,394,075	740,900,000	**9,292,791,893**
Construction Cost (IDR)		**394,272,148,520**	**177,513,408,714**	**393,528,780,709**	**467,717,523,000**	1,433,031,860,943

Source: JICA Study Team

Table 4.3 Rough Estimate of Project Cost (Action-4 New Coastal Facilities)

Item	Amount	Note
(1) Total Construction Cost	1,433,031,860,943 Rp	Sum of 4 sections
(2) Consultant fee for E/S	143,303,186,094 Rp	10% of (1)
(3) Consultant fee for S/C	15,000,000,000 Rp	Estimated from similar projects
(4) Physical Contingency	79,566,752,352 Rp	5 % of sum of (1),(2),(3)
(5) Price Escalation	284,053,305,896 Rp	17 % of sum of (1),(2),(3),(4)
(6) Project Cost	1,954,955,000,000 Rp*	Sum of all of the above

122 mil USD

*121,794,000 USD or 18,963,000,000 JPY

(Note: 1 Rp=0.0097 yen, 1 Rp=0.0000623USD)

Source: JICA Study Team

Table 4.4 Rough Estimate of Project Cost (Action-4 New Coastal Facilities and Action-3 Improvement of Existing Coastal Facilities)

Item	Amount	Note
(1) Total Construction Cost	1,595,634,617,743 Rp	Sum of 4 sections
(2) Consultant fee for E/S	159,563,461,774 Rp	10% of (1)
(3) Consultant fee for S/C	15,000,000,000 Rp	Estimated from similar projects
(4) Physical Contingency	88,509,903,976 Rp	5 % of sum of (1),(2),(3)
(5) Price Escalation	315,980,357,194 Rp	17 % of sum of (1),(2),(3),(4)
(6) Project Cost	2,174,688,000,000 Rp*	Sum of all of the above

135 mil USD

*135,483,000 USD or 21,945,000,000 JPY

(Note: 1 Rp=0.0097 yen, 1 Rp=0.0000623USD)

Source: JICA Study Team

Table 4.5 Rough Estimate of Project Cost for Two Options

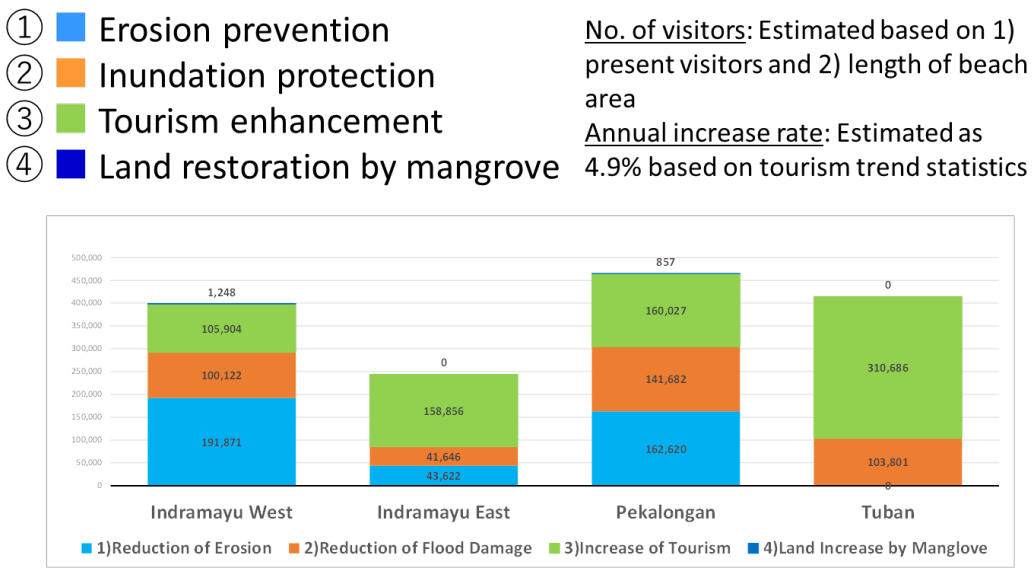
Option	Facility	Project Cost
1	Only Action-4 (New Coastal Facilities)	1,955 billion Rp (approximately 122 million USD)
2	Action-4 (New Coastal Facilities) and Action-3 (Improvement of Existing Coastal Facilities)	2,175 billion Rp (approximately 135 million USD)

(Note: 1 Rp=0.0000623USD)

Source: JICA Study Team

4.5 Economic Analysis

Economic analysis regarding project implementation was conducted per section. Economic costs were calculated based on the project costs shown in Section 4.4. As economic benefits, the following were quantified: 1) benefits of reduced damage by erosion, 2) benefits of reduced damage by inundation, 3) benefits of increased tourists by created beach and 4) benefits of land increase by mangrove plantation. Figure 4.10 shows the composition of economic benefits at net present value. Table 4.6 shows the result of economic analysis of the Project. Figure 4.11 shows the cost and benefit flow of Indramayu West. Refer to Chapter 16 of the final report for the prerequisites for economic analysis and details of the analysis.



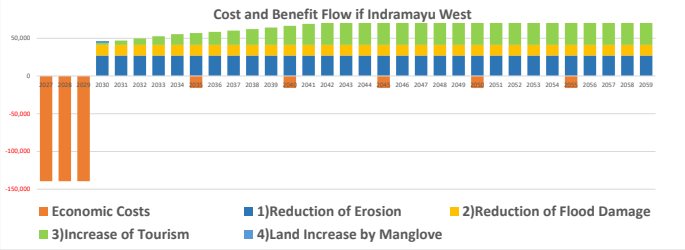
Source: JICA Study Team

Figure 4.10 Composition of Economic Benefits at Net Present Value

Table 4.6 Results of Economic Analysis

Section	EIRR	B/C	NPV (mil Rp.)
Indramayu West	11.0%	1.10	36,130
Indramayu East	14.2%	1.50	81,188
Pekalongan	12.8%	1.29	103,222
Tuban	10.0%	1.00	-588
Total	11.6%	1.17	219,982

Source: JICA Study Team



Other conditions:
- Base year: 2024
- Construction period: 3 years
- Evaluation period: 30 years after the implementation
- Discount rate: 10%

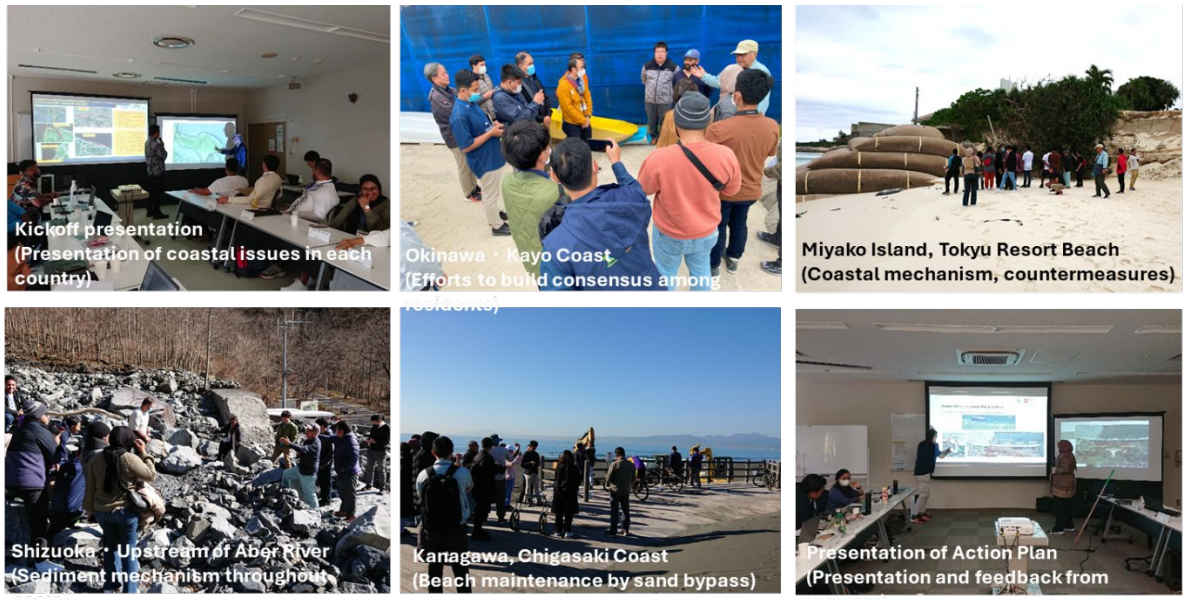
Source: JICA Study Team

Figure 4.11 Flow of Economic Costs and Economic Benefits in Indramayu West

CHAPTER 5 (Output 4) Technical Transfer and Capacity Development

5.1 Training in Japan

The first training program in Japan was held from November to December 2022 and the second training program was held from November to December 2023 based at the JICA Okinawa Center. These trainings aim to transfer technology related to coastal protection/conservation measures to practitioners from PUPR, BAPPENAS, and KKP who are involved in the Project. Specifically, the aim is to acquire knowledge in both hard and soft aspects, from planning to maintenance and management, including not only successful cases but also lessons from failed cases in Japan. In addition, the aim is to utilize this knowledge in the participants' future activities. Figure 5.1 shows a photo of the training sites.

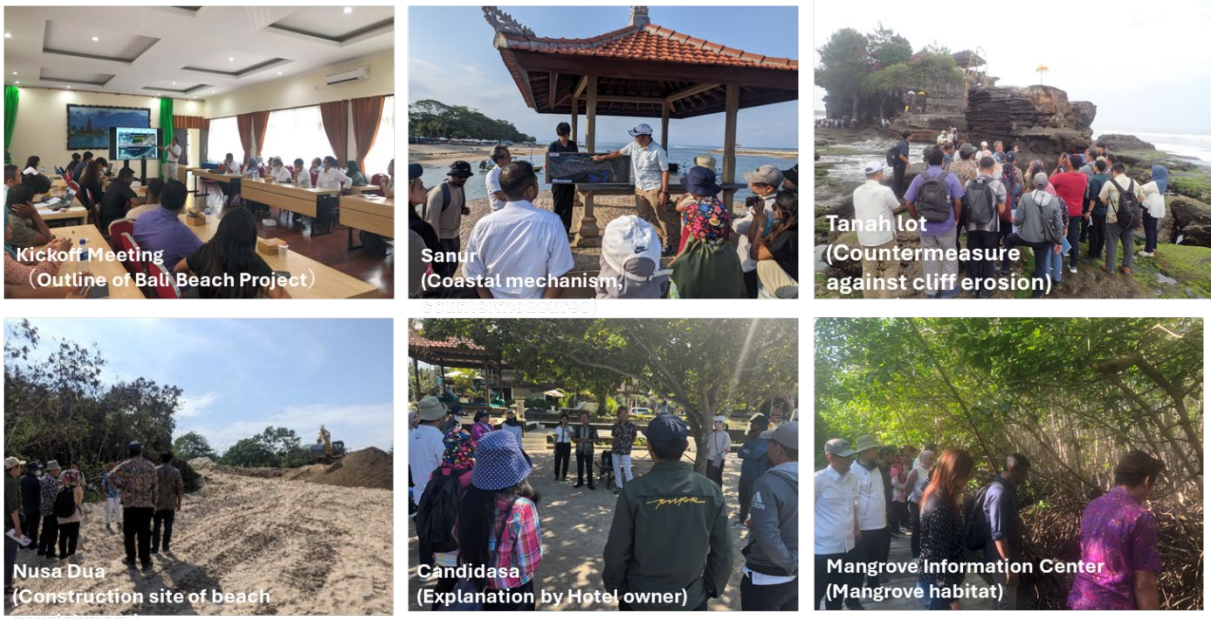


Source: JICA Study Team

Figure 5.1 Photo of Training Sites (Training in Japan)

5.2 Training Program in Bali Island

In September 2023, domestic training in Bali was conducted for PUPR, BAPPENAS, KKP, KLHK, and BBWS involved in the Project. In this training, the project sites of the Bali Coastal Conservation Project Phase 1 and Phase 2 were visited. Phase 1 was implemented as a Japanese ODA loan project in Bali and Phase 2 is currently being implemented. In particular, the purpose of this training was to promote an understanding of the overview of coastal conservation projects and the issues involved in maintenance and management after project implementation. The knowledge gained through this training can be utilized in future projects. Figure 5.2 shows a photo of the training sites.



Source: JICA Study Team

Figure 5.2 Photo of Training Sites (Training in Bali Island)

5.3 WG and CGD

The Project held WG (Working Group) and CGD (Close Group Discussion). Six sessions of each WG and CGD was held from 31st May 2023 to 10th June 2024. In WG, the draft of Basic Policy for Coastal Management and the draft of Basic Coastal Management Plan were discussed among related agencies responsible for coastal management such as PUPR, KKP, KLHK, BAPPENAS, KEMENKO MARVES, BRGM. In CGD, in order to prepare Coastal Facility Plan by PUPR, the discussion was held between PUPR, BBWS in each selected Area, and Balai Teknik Pantai. Through WG and CGD, the participants obtained an understanding for a comprehensive and wide-viewed coastal management that takes into account topographical and oceanographic conditions, the continuity of littoral drift, and the utilization of the hinterland and coastal areas.

(1) CGD **(2) WG**

Source: JICA Study Team

Figure 5.3 Photo of WG and CGD

CHAPTER 6 Summary of Project Outputs and Draft Idea of Project Formulation based on Remaining Issues

6.1 Summary of Project Output

Table 6.1 shows the summary of the project outputs and evaluation index which was described in Project Evaluation Table in the Detail Survey Report on November 2022.

Table 6.1 Summary of Project Outputs and Evaluation Index

Output	Achievement (in the Project)	Evaluation Index Outcome (after 3 years)
Draft of Basic Policy for Coastal Management	Draft of basic policy for English and Indonesian version was prepared and submitted	● The proposed draft of Basic Policy, Basic Plan, and Coastal Facilities Plan are incorporated as part of the policies and plans for the implementation of coastal protection projects by PUPR ● Coastal protection projects (one or more) referring to the above three plans have been planned or implemented by PUPR
Draft of Basic Coastal Management Plan	Draft of basic plan for three areas (Indramayu, Pemalang-Pekalongan, Remban-Tuban) was prepared	
Coastal Facility Plan	Coastal facility plan for selected 4 sections (3 from above 2 areas, 1 from Tuban) was prepared as pre-F/S level	
Technical Transfer	● Conducting WG & CGD ● JICA training in Okinawa 2023 ● Training in Bali Beach Project (BBCP1 &2) 2023	

Source: JICA Study Team

6.2 Required Actions to be Implemented on Coastal Management by Indonesian Side to Achieve Expected Goals

In order to achieve the goal of coastal management in Indonesia as indicated in Section 1.3, it is basically necessary to realize the following three actions

- To implement coastal protection and management based on the basic unified policy and mid-term M/P as proposed system (currently, no system exists like this plan).
- To apply coastal protection measures from various options (green & gray, soft & hard) based on setting "Ideal coastal situation" at each coast, taking into account "Protection", "Environment" and "Utilization" (currently most of coastal measures are focus only "Protection").
- To establish and realize implementation/management system in cooperation with related agencies for coastal protection (currently, protection by using hard-structure measures is implemented by PUPR, conservation by using green-infrastructure is implemented by KKP, KLHK. Also, coordination for coastal management seems insufficient for coastal problems).

6.3 Issues that need to be discussed continuously by Indonesian Side after the Project

The following is a summary of issues that should continue to be discussed and examined by related agencies of Indonesia in order to realize the coastal management proposed in this project.

Table 6.2 Issues that Need to be Discussed Continuously by Indonesian Side after the Project

Item	Remaining Subjects	Expected Target Period
Basic Policy for Coastal Management	Finalization of contents	Sep. 2024
	Action taking for legislation	Dec. 2025
Basic Coastal Management Plan	Acceptance of procedure and proposed plan for 3 areas	Sep. 2024
	Issuing of enactment for prepared basic plan	Dec. 2025
	Expansion to prepare the basic plan to other areas	From Dec. 2024
Coastal Facility Plan	Concrete procedure and structure for implementation of combined green & gray infrastructures by multi-agencies	June 2025
Others (Project Formulation)	Project formulation as JICA Loan Project following current Blue Book	From now

Source: JICA Study Team

6.4 Subjects of Required Technical Study on Coastal Facility Plan in the Next Step (F/S)

The Coastal Facility Plan studied and proposed in the Project is at the Pre-F/S level. There are several technical subjects to be considered for future Feasibility Studies. The following is a summary of the technical subjects that need to be considered for each proposed coastal facility.

Table 6.3 Technical Subjects that need to be Studied for Coastal Facility Plan in Next F/S Step

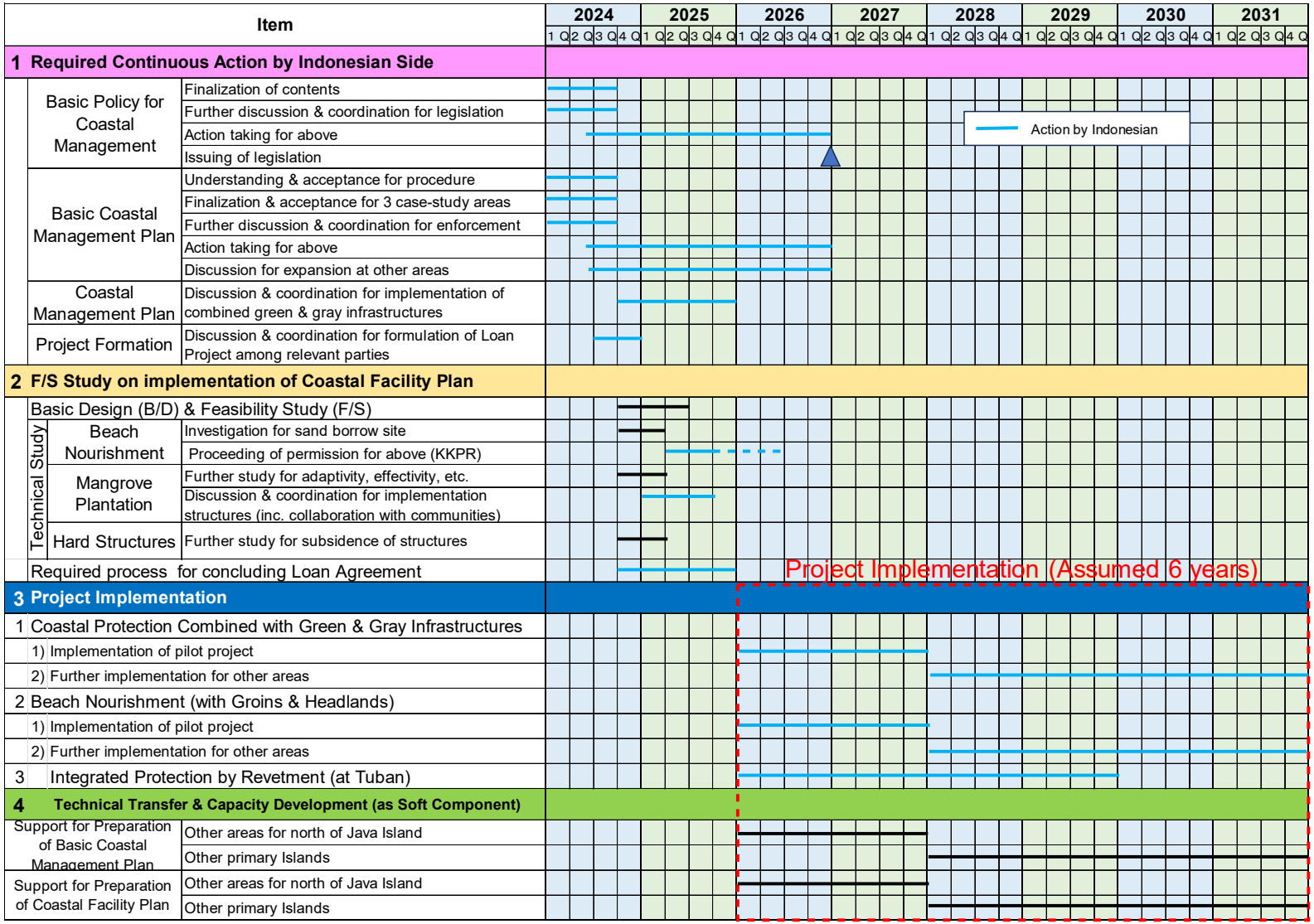
Coastal Facility	Remaining Subjects	Outline
Beach Nourishment	Sand borrow investigation at offshore seabed	For beach nourishment, the unit cost of sand must be reduced. Potential area at offshore will be Investigated.
	Permission procedure (especially KKPR of Spatial Plan) for above	Currently, it is no need to revise the spatial plan itself, but approval from the ATR is required (KKPR: Conformity of Space Utilization Activities). Based on the Bali Beach Conservation Project, it may take about one year for this approval. Considering AMDAL and Mining Permit afterward, it is recommended to proceed in advance.
Mangrove Plantation	Reviewing on appropriate site selection, protection effectiveness, implementation & maintenance method and organization, etc.	Although the above-mentioned studies are not conducted in this Pre-F/S level study, it is necessary to obtain some evidence and assurance for formulation of the project
	Discussion & study of implementation structures for combination with green- & gray-infrastructure with cooperation of related agencies	It is desirable to promote discussions on mechanisms and systems to promote active collaboration among related agencies, including the possibility of implementing the project with multiple agencies.
Hard Structures	Clarification on design for necessity of countermeasure for settlement due to construction of structures and land subsidence	Some areas and facilities may or may not have subsidence control measures. The effectiveness of such measures is also unclear. Since this will affect the project cost, it is desirable to collect and study further information in advance.

Source: JICA Study Team

6.5 Draft of Expected Project Formulation

In order to formulate the project for the proposed Coastal Facility Plan by GOI, there are issues to be discussed and examined continuously on Indonesian side as mentioned above, as well as technical issues in the examination of the facility plan. The project can be implemented after these studies for remaining issues are completed, and discussions and coordination with related agencies (PUPR, BAPPENAS, and JICA) for formulation as Japanese loan project are concluded.

Figure 6.1 shows the draft image of road map for the project of proposed coastal facility plan as Japanese Loan Project.



Source: JICA Study Team

Figure 6.1 Draft of Roadmap for Expected Project as Japanese Loan Project