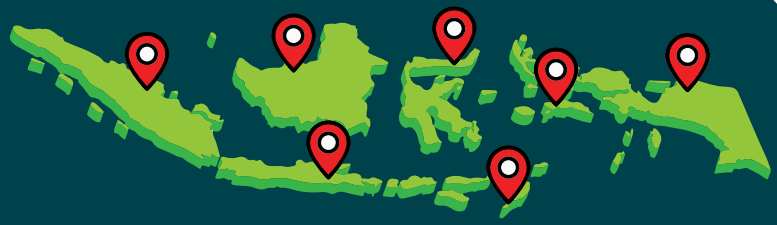
Kementerian PPN/ Bappenas

LOW CARBON DEVELOPMENT INDONESIA



BOOK 1

LIST OF PRIORITY LOCATIONS & CLIMATE RESILIENCE ACTIONS

Ministry of National Development Planning/Bappenas. 2021

BOOK 1

LIST OF PRIORITY LOCATIONS & CLIMATE RESILIENCE ACTIONS

Kementerian PPN/ Bappenas

LOW CARBON DEVELOPMENT INDONESIA

EDITORIAL BOARD

TABLE OF CONTENTS

Editorial Board 1
Table of Contents 2
List of Figures 2
List of Tables 3
List of Abbreviations 3

1. **Introduction 4**
Background 5
Purpose and Objective 7

2. **Operational Definition & Criteria for Climate Resilience 8**
Operational Definition 9
Priority Location Criteria for Climate Resilience 10

3. **Lists of Locations & Climate Resilience Actions for Marine & Coastal Sector 13**
Priority Locations for Climate Resilience in Marine & Coastal Sector: Marine Subsector 14
Lists of Action for Climate Resilience in Marine & Coastal Sector: Marine Subsector 18
Priority Locations for Climate Resilience in Marine & Coastal Sector: Coastal Subsector 24
Lists of Action for Climate Resilience in Marine & Coastal Sector: Coastal Subsector 28

4. **Lists of Locations & Climate Resilience Actions for Water Sector 33**
Priority Locations for Climate Resilience in Water Sector 34
Lists of Action for Climate Resilience in Water Sector 37

5. **Lists of Locations & Climate Resilience Actions for Agricultural Sector 43**
Priority Locations for Climate Resilience in Agricultural Sector 44
List of Action for Climate Resilience in Agricultural Sector 49

6. **List of Locations & Climate Resilience Actions for Health Sector 56**
Priority Locations for Climate Resilience in Health Sector:
- Dengue Haemorrhagic Fever (DHF) Disease 57
- Malaria Disease 60
- Pneumonia Disease 62

List of Action for Climate Resilience in Health Sector 64

7. **Field Validation for Climate Resilience Priority Location 69**
East Nusa Tenggara Province 70
North Sulawesi Province 73
Aceh Province 76

8. **Conclusion 79**

LIST OF FIGURES

Figure 3.1 Map of Priority Locations of Climate Resilience for Marine & Coastal Sector: Marine Subsector 14
Figure 3.2 Map of Priority Locations of Climate Resilience for Marine & Coastal Sector: Coastal Subsector 24
Figure 4.1 Map of Priority Locations of Climate Resilience for Water Sector 34
Figure 5.1 Map of Priority Locations of Climate Resilience for Agricultural Sector 44
Figure 6.1 Map of Priority Locations of Climate Resilience for Health Sector: DHF Disease 57
Figure 6.2 Map of Priority Locations of Climate Resilience for Health Sector: Malaria Disease 60
Figure 6.3 Map of Priority Locations of Climate Resilience for Health Sector: Pneumonia Disease 62

LIST OF TABLES

Table 2.1 Approaches to Climate Resilience Activity **9**
Table 2.2 Priority Location Criteria Components for Climate Resilience **10**
Table 3.1 List of Priority Locations of Climate Resilience for Marine & Coastal Sector: Marine Subsector **15**
Table 3.2 List of Climate Resilience Actions for Marine & Coastal Sector: Marine Subsector **18**
Table 3.3 List of Priority Locations of Climate Resilience for Marine & Coastal Sector: Coastal Subsector **25**
Table 3.4 List of Climate Resilience Actions for Marine & Coastal Sector: Coastal Subsector **28**
Table 4.1 List of Priority Locations of Climate Resilience for Water Sector **35**
Table 4.2 List of Climate Resilience Actions for Water Sector **37**
Table 5.1 List of Priority Locations of Climate Resilience for Agricultural Sector **45**
Table 5.2 List of Climate Resilience Actions for Agricultural Sector **49**
Table 6.1 List of Priority Locations of Climate Resilience for Health Sector: Dengue Haemorrhagic Fever (DHF) Disease **58**
Table 6.2 List of Priority Locations of Climate Resilience for Health Sector: Malaria Disease **61**
Table 6.3 List of Priority Locations of Climate Resilience for Health Sector: Pneumonia Disease **63**
Table 6.4 List of Climate Resilience Actions for Health Sector **64**

LIST OF ABBREVIATIONS

BMKG	*Badan Meteorologi, Klimatologi, dan Geofisika* (Meteorological, Climatological, and Geophysical Agency)
BNPB	*Badan Nasional Penanggulangan Bencana Badan Nasional Penanggulangan Bencana* (National Agency for Disaster Management)
BPPT	*Badan Pengkajian dan Penerapan Teknologi* (Agency for the Assessment and Application of Technology)
BPS	*Badan Pusat Statistik* (Central Buerau of Statistics)
CVI	Coastal Vulnerability Index
DAS	*Daerah Aliran Sungai* (Catchment Area)
DHF	Dengue Haemorrhagic Fever
GDP	Gross Domestic Product
GT	Gross Tonnage
IRBI	*Indeks Risiko Bencana Indonesia* (Indonesia Disaster Risk Index)
K/L	*Kementerian dan Lembaga* (Ministries and Institutions)
KRISNA	*Kolaborasi Perencanaan dan Informasi Kinerja Anggaran Lembaga* (Collaborative Planning and Budget Performance Information)
LIPI	*Lembaga Ilmu Pengetahuan Indonesia* (ndonesian Institute of Sciences)
MoA	Ministry of Agriculture
MoAASP/NLA	Ministry of Agrarian Affairs And Spatial Planning/National Land Agency
MoMA&F	Ministry of Marine Affairs and Fisheries
MoCSME	Ministry of Cooperative and Small Medium Enterprises
MoEC	Ministry of Education and Culture
MoE&F	Ministry of Environment and Forestry
MoF	Ministry of Finance
MoH	Ministry of Health
MoPWH	Ministry of Public Works and Housing
MoSA	Ministry of Social Affairs
MoT	Ministry of Trade
MoTCE	Ministry of Tourism and Creative Economy
MoVDDRT	Ministry of Village, Development of Disadvantaged Regions and Transmigration
SIDIK	*Sistem Informasi Data Indeks Kerentanan* (Vulnerability Index Data Information System)
UNFCCC	United Nations Framework Convention on Climate Change

INTRODUCTION

1.

Background

Building climate resilience in Indonesia is focused on four sectors affected by climate change: Marine and Coastal Sector, in the potential hazard of the increased wave height and sea level which results in inundation or flooding in the coastal areas; Agriculture Sector, in the potential decrease of rice production; Water Sector, in the potential increase of the frequency of drought and the potential decrease of water availability; and Health Sector, in the increase indicative outbreak of DHF, malaria, and pneumonia diseases. Climate change impacts are spread throughout Indonesia with different risk levels according to the hazard, vulnerability, and climate resilience capacity of the environment and its communities.

Increasing climate resilience through specific activities at the location of climate resilience action interventions aims to reduce vulnerability and strengthen the capacity for communities. Therefore, people can withstand the impacts of climate change. The locations for climate resilience interventions are the priority locations for climate resilience activities, categorized into three levels, super-priority, top-priority, and priority, based on the level of hazard, vulnerability, and the risk of potential disasters.

Profile of Potential Hazards of Climate Change in Indonesia

Marine & Coastal

MARINE

Until 2045, the wave height indicates that the total area of water which has the potential hazard for vessels with a capacity of <10 GT is around 5.8 million km^2 or about 90% of the total area of Indonesian waters.

COASTAL

Indonesia's coastline, which is approximately 102,000 km, has different levels of vulnerability. The total length of Indonesia's coast which has very high vulnerability is around 1,800 km. South Sulawesi Province is the province with the longest CVI 5 (very high), reaching 573 km.

Water

The decrease in water availability is projected to occur equally in Java and Nusa Tenggara until 2045. In 2024, the average decrease in water availability in Java shall reach 439.21 m^3/capita/year and 1,654.82 m^3/capita/year in East Nusa Tenggara.

Agriculture

Rice production is projected to decrease >25% annually in the Provinces of Gorontalo, Maluku and North Maluku until 2045.

Health

The projected case of DHF disease by 2045 shall be very high in the following cities: Pekanbaru, Palembang, Banjarbaru, Banjarmasin, Samarinda, Tarakan, Kolaka, Ambon, Semarang, Bali and Kupang. With changes in rainfall and temperature, the potential of malaria and pneumonia is also projected to increase.

Purpose & Objective

The List of Priority Locations and Climate Resilience Actions has the purpose of providing reference locations and action interventions to increase climate resilience in the development planning, with the following objectives:

Guidelines on the tagging of climate resilience activities in the planning, budgeting, and performance information system (KRISNA);

Guidelines for identifying priority locations and interventions for climate resilience. The interventions can be identified in details (outputs, benefits, and implementers);

Guidelines for the division of authority for the Ministries/Government Agencies to avoid redundancy related to climate resilience activities in priority sectors;

Reference for monitoring and evaluation function in assessing climate resilience's contribution to the predefined targets.

OPERATIONAL DEFINITION & CRITERIA FOR CLIMATE RESILIENCE

2.

Operational Definition

Climate resilience is a planned and/ or spontaneous anticipatory action to reduce potential losses due to the hazards, vulnerabilities, impacts, and risks of climate change on communities' lives in the areas affected by climate change. In the implementation of the Climate Resilient Development in 4 (four) priority sectors, it is necessary to approach the activities through infrastructure, technology, capacity building, and governance and funding. It also considers the inclusiveness aspects (gender equality, people with disabilities, children, elderly, and other vulnerable groups) and maintains the ecosystem's sustainability. The descriptions of each approach can be seen in **Table 2.1.**

In the context of implementing climate resilience actions in planning, monitoring, and evaluation, climate resilience activities are grouped into Main Activities and Supporting Activities. The main activities are activities whose benefits can be calculated and converted into rupiah, contributing directly to reducing GDP losses due to climate change. Meanwhile, the supporting activities are activities that cannot be directly converted into rupiah (intangible), but it decreases the vulnerability and increases the adaptive capacity of communities and the environment in the affected areas.

Table 2.1 Approaches to Climate Resilience Activity

Approach	Description
Infrastructure	The adaptive infrastructure needs to be developed to reduce the risk of climate change hazards and other potential hazards. This approach includes the development, maintenance, and rehabilitation of sustainable infrastructure.
Technology	Technology utilization is a necessity to improve the management of the potential risks and impacts of climate change. According to the UNFCCC (2006), resilient technology is a technology that can design appropriate responses to the potential impacts of climate change and in line with the development goals, which are cost-effective, environment-friendly, culturally compatible, and socially acceptable technology. This approach includes the development and application of technology.
Capacity Building	Capacity building that aims to reduce the negative impacts of climate change is required through arranging reasonable steps to monitor climate-related parameters, adopting new technologies and methods, and raising awareness of climate change issues. This approach includes socialization, training, and other capacity-building activities for the communities, organizational management, and government officials.
Governance & Funding	Governance is an instrument of implementation, institutional, and coordination strategy which helps regulate climate resilience activities across various development pillars, including government, private sector, academia, and society. Climate resilience funding is related to assistance mechanisms for vulnerable communities. Governance and funding require mechanisms and instruments to support climate resilience effectiveness efforts, which are the policy and operational instruments, such as regulations and information systems. Coordination between the development pillars carries out good governance and funding by applying inclusiveness, accountability, transparency, and easy access to information.

Priority Location Criteria for Climate Resilience

The priority location criteria for climate resilience in four priority sectors are determined based on seven components, which are (i) Climate Projection, (ii) Potential Hazards, (iii) Vulnerability Index Data Information System (SIDIK), (iv) Indonesian Disaster Ratio Index (IRBI), (v) Potential Economic Losses, (vi) Ministries/Government Agencies' recommendations, and (vii) Field Validation. The configuration among the components results in location category: Super Priority, Top Priority, and Priority. For more details, please refer to the table below.

Table 2.2 Priority Location Criteria Components for Climate Resilience

Component	Marine and Coastal Sector		Water Sector	Agricultural Sector	Health Sector
	Marine	Coastal			
Climate Projection	▪ **Atmospheric Climate Projection** The historical data of temperature and rainfall are projected using an ensemble model based on the RCP4.5 Scenario ▪ **Oceanic Climate Projection** The historical data of sea level and water surface temperature is projected using several models based on the RCP4.5 Scenario				
Potential Hazards	**Wave Height:** ▪ Potential wave height (increase >1m) which can threaten shipping/ transporting activities for boats <10 GT ▪ Regency/city jurisdiction as far as 4 miles from the coastline following Zoning Plan for Coastal Zone and Small Islands (RZWP3K, or Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil)	**Coastal Vulnerability:** Coastal Vulnerability Index (CVI) class 4 (high) and 5 (very high)	**Drought and Reduction in Water Availability:** Potential for drought and water availability in high and very high class	**Reduction in Rice Production:** ▪ Potential decrease in rice production by >5% ▪ Areas with rice fields >1500 ha	**Climate Parameters:** ▪ Projected increase in temperature >0.7°C (2020-2045) ▪ Projected increase in rainfall intensity >100 mm/month (2020-2045) **Disease Outbreak:** ▪ The potential incidence ratio is high and very high for DHF ▪ The incidence rate of DHF >49/100000 population ▪ The endemicity rate of malaria, moderate (Annual Parasite Incidence/API 1-5) and high (API >5) ▪ The incidence rate of pneumonia >100 in the 2017-2019 period

Component	Marine and Coastal Sector		Water Sector	Agricultural Sector	Health Sector
	Marine	Coastal			
Regional Vulnerability	The value of capture fisheries production > IDR 1 trillion/year		• The forest and swamp area of the regency/city <20%[1] • High Flood Vulnerability Index (0.6 - 1)	• Rice production centres • Has a high - very high vulnerability of food farming • Historical crop failure by floods and drought (for 10 years, >50% is crop failure year, at >50% ha of rice fields in the regency/city) • Plant disturbing organism (OPT - Organisme Pengganggu Tanaman) historical crop failure (for 10 years, >30% is crop failure year, at >10% ha of rice fields in the regency/city)	
	Data of SIDIK 2018 A Regency/City is Vulnerable if >5% of the village has SIDIK 4 and 5 classes				
Disaster Risks	**The Disaster Risk Index of Regency/City (IRBI 2018)** High and medium IRBI classes				
Potential Economic Losses	**The Provincial Data on Potential Economic Losses for in 2020-2024** As additional information in determining priority locations; showing the value of potential economic losses associated with achieving the Climate Resilience target in the 2020-2024 RPJMN				
Recommendation from Ministry/Institution	**Assessments Result from the K/L Research and Development** Strengthening the determination of priority location with potential climate hazard and vulnerability indicator at district/city scale.				
Field Validation	The validation is necessary to verify desk study results. The local data and information is gathered from Local Government and/or field surveys.				

The location categories of Super Priority, Top Priority, and Priority are determined based on the following criteria:

1. **Super Priority** has a high potential hazard and has one of the Regional Vulnerability criteria and a high IRBI risk index.
2. **Top Priority** has a high potential hazard and has one of the Regional Vulnerability criteria or a high IRBI risk index.
3. **Priority** has a high potential hazard.

[1] Consists of 9 land covers as follows: Primary Dry Land Forest, Secondary Dry Land Forest, Plantation Forest, Primary Mangrove Forest, Secondary Mangrove Forest, Primary Swamp Forest, Secondary Swamp Forest, Swamp Forest, and Swamp.

LISTS OF LOCATIONS & CLIMATE RESILIENCE ACTIONS FOR MARINE & COASTAL SECTOR

3.

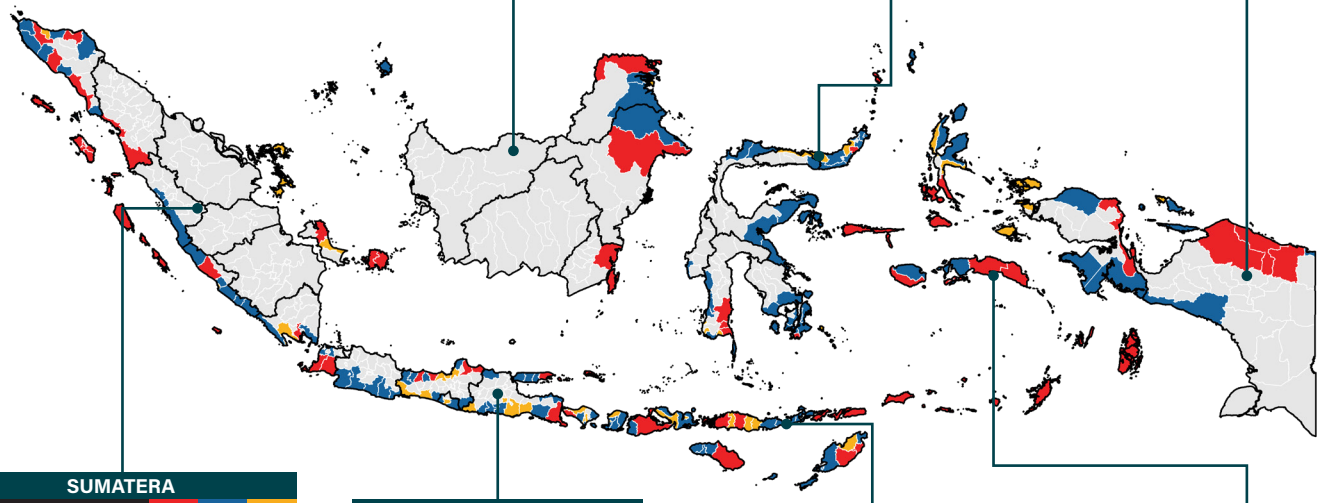
Priority Locations for Climate Resilience in Marine & Coastal Sector

Marine Subsector

KALIMANTAN			
Province	SP	TP	P
South Kalimantan	1	0	0
East Kalimantan	1	1	0
North Kalimantan	1	2	1

SULAWESI			
Province	SP	TP	P
Gorontalo	0	1	1
West Sulawesi	0	1	0
South Sulawesi	3	6	3
Central Sulawesi	0	7	0
Southeast Sulawesi	1	8	1
North Sulawesi	2	9	2

PAPUA			
Province	SP	TP	P
Papua	3	4	1
West Papua	3	3	1



SUMATERA			
Province	SP	TP	P
Aceh	6	8	2
North Sumatera	6	0	0
West Sumatera	1	4	0
Bengkulu	1	5	1
Riau Island	0	2	2
Bangka Belitung Island	3	0	1
Lampung	1	2	1

JAVA - BALI			
Province	SP	TP	P
Banten	2	1	0
West Java	0	5	0
Central Java	4	7	6
East Java	2	9	3
DI Yogyakarta	0	2	1
Bali	1	4	3

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	1	5	4
East Nusa Tenggara	7	11	4

MALUKU			
Province	SP	TP	P
Maluku	8	3	0
North Maluku	3	4	2

Note:
- Super Priority
- Top Priority
- Priority

Figure 3.1 Map of Priority Locations of Climate Resilience for Marine & Coastal Sector: Marine Subsector

Table 3.1 List of Priority Locations of Climate Resilience for Marine & Coastal Sector: Marine Subsector

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	Aceh	▪ Aceh Selatan ▪ Aceh Utara ▪ Nagan Raya ▪ Pidie ▪ Simeulue ▪ Banda Aceh City	▪ Aceh Barat ▪ Aceh Barat Daya ▪ Aceh Besar ▪ Aceh Jaya ▪ Aceh Singkil ▪ Aceh Timur ▪ Bireuen ▪ Sabang City	▪ Pidie Jaya ▪ Lhokseumawe City
2	North Sumatera	▪ Mandailing Natal ▪ Nias ▪ Nias Barat ▪ Nias Utara ▪ Nias Selatan ▪ Tapanuli Tengah		
3	West Sumatera	Kepulauan Mentawai	▪ Padang Pariaman ▪ Pesisir Selatan ▪ Padang City ▪ Pariaman City	
4	Bengkulu	Bengkulu Utara	▪ Bengkulu Selatan ▪ Bengkulu Tengah ▪ Kaur ▪ Mukomuko ▪ Seluma	Bengkulu City
5	Riau Island		▪ Anambas Island ▪ Natuna	▪ Bintan ▪ Lingga
6	Bangka Belitung Island	▪ Bangka ▪ Belitung ▪ Belitung Timur		Bangka Tengah
7	Lampung	Pesawaran	▪ Lampung Selatan ▪ Pesisir Barat	Tanggamus
8	Banten	▪ Lebak ▪ Pandeglang	Serang	
9	West Java		▪ Cianjur ▪ Garut ▪ Pangandaran ▪ Sukabumi ▪ Tasikmalaya	
10	Central Java	▪ Batang ▪ Pati ▪ Pemalang ▪ Rembang	▪ Brebes ▪ Jepara ▪ Pekalongan ▪ Purworejo ▪ Tegal ▪ Wonogiri ▪ Pekalongan City	▪ Cilacap ▪ Demak ▪ Kebumen ▪ Kendal ▪ Semarang City ▪ Tegal City
11	East Java	▪ Banyuwangi ▪ Sumenep	▪ Bangkalan ▪ Blitar ▪ Jember ▪ Pamekasan ▪ Sampang ▪ Situbondo ▪ Trenggalek ▪ Tuban ▪ Tulungagung	▪ Lumajang ▪ Malang ▪ Pacitan
12	DI Yogyakarta		▪ Gunung Kidul ▪ Kulon Progo	Bantul
13	Bali	Jembrana	▪ Karang Asem ▪ Klungkung ▪ Tabanan ▪ Denpasar City	▪ Badung ▪ Buleleng ▪ Gianyar

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
14	South Kalimantan	Kotabaru		
15	East Kalimantan	Kutai Timur	Berau	
16	North Kalimantan	Nunukan	▪ Bulungan ▪ Tana Tidung	Tarakan City
17	Gorontalo		Bone Bolango	Gorontalo Utara
18	West Sulawesi		Majene	
19	South Sulawesi	▪ Bone ▪ Bulukumba ▪ Sinjai	▪ Barru ▪ Jeneponto ▪ Kepulauan Selayar ▪ Pangkajene dan Kepulauan ▪ Pinrang ▪ Parepare City	▪ Bantaeng ▪ Takalar ▪ Makassar City
20	Central Sulawesi		▪ Banggai ▪ Banggai Kepulauan ▪ Banggai Laut ▪ Buol ▪ Morowali ▪ Morowali Utara ▪ Toli-Toli	
21	Southeast Sulawesi	Buton Selatan	▪ Bombana ▪ Buton ▪ Buton Tengah ▪ Buton Utara ▪ Konawe Kepulauan ▪ Konawe Selatan ▪ Muna ▪ Bau Bau City	Wakatobi
22	North Sulawesi	▪ Kepulauan Sangihe ▪ Minahasa Tenggara	▪ Bolaang Mongondow ▪ Bolaang Mongondow Selatan ▪ Bolaang Mongondow Timur ▪ Kepulauan Talaud ▪ Minahasa ▪ Minahasa Utara ▪ Siau Tagulandang Biaro ▪ Bitung City ▪ Manado City	▪ Bolaang Mongondow Utara ▪ Minahasa Selatan
23	West Nusa Tenggara	Sumbawa	▪ Bima ▪ Lombok Barat ▪ Lombok Tengah ▪ Lombok Timur ▪ Sumbawa Barat	▪ Dompu ▪ Lombok Utara ▪ Bima City ▪ Mataram City

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
24	East Nusa Tenggara	▪ Alor ▪ Lembata ▪ Malaka ▪ Manggarai Barat ▪ Manggarai Timur ▪ Sumba Timur ▪ Timor Tengah Selatan	▪ Belu ▪ Ende ▪ Flores Timur ▪ Kupang ▪ Rote Ndao ▪ Sabu Raijua ▪ Sikka ▪ Sumba Barat ▪ Sumba Barat Daya ▪ Sumba Tengah ▪ Kupang City	▪ Manggarai ▪ Nagekeo ▪ Ngada ▪ Timor Tengah Utara
25	Maluku	▪ Buru Selatan ▪ Kepulauan Aru ▪ Kepulauan Tanimbar ▪ Maluku Barat Daya ▪ Maluku Tengah ▪ Maluku Tenggara ▪ Seram Bagian Timur ▪ Tual City	▪ Buru ▪ Seram Bagian Barat ▪ Ambon City	
26	North Maluku	▪ Halmahera Selatan ▪ Kepulauan Sula ▪ Pulau Taliabu	▪ Halmahera Timur ▪ Halmahera Utara ▪ Pulau Morotai ▪ Ternate City	▪ Halmahera Barat ▪ Halmahera Tengah
27	Papua	▪ Jayapura ▪ Mamberamo Raya ▪ Sarmi	▪ Biak Numfor ▪ Kepulauan Yapen ▪ Mimika ▪ Jayapura City	Supiori
28	West Papua	▪ Manokwari ▪ Manokwari Selatan ▪ Teluk Wondama	▪ Fakfak ▪ Kaimana ▪ Tambrauw	Raja Ampat

Lists of Action for Climate Resilience in Marine & Coastal Sector

Marine Subsector

The Marine Subsector activities are related to marine safety improvement, especially small fishing boats (<10GT) is facing high waves as the potential threat, which reduces the safety zone. To improve its safety, the boat's capacity needs to be enhanced, access to fishermen's safety information needs to be provided, etc. A detailed list of marine climate resilience actions is shown in **Table 3.2.**

Table 3.2 List of Climate Resilience Actions for Marine & Coastal Sector: Marine Subsector

Main Activity Supporting Activity

Action Group	Action	Output	Benefit	Implementer
MAIN ACTIVITY				
The provision of fishing vessels	Provision of adaptive fishing vessels from high waves	Fishing vessels 5 GT - 10 GT	Improving the fishing trip safety and fish production stocks	MoMA&F
	Application of fibreglass material on standard small fishing vessels	Fishing vessels under 10 GT with fibreglass material	Improving the fishing trip safety and fish production stocks	▪ MoMA&F ▪ BPPT
The provision of early warning systems for marine climate	Strengthening the climatological information system and marine technology (waves, currents, and wind)	Marine climatology information and early warning system (for example buoy ocean climatology)	Improving information services for marine climatology and extreme weather trends in near real-time	▪ BNPB ▪ BMKG

Action Group	Action	Output	Benefit	Implementer
The provision of navigation information systems	Application of automatic tracking systems on vessels (Automatic Identification System - AIS and Vehicle Monitoring System - VMS, on Vehicle traffic service - VTS)	*Automatic Identification System (AIS) and Vehicle Monitoring System (VMS), with Vessel Traffic Service (VTS)*	Improving sailing safety and security for fishermen by identifying and finding fishing vessels which are lost due to high waves by electronically exchanging data with other nearby vessels, BTS, and satellites	▪ MoT ▪ MoMA&F
	Provision of navigation vessels	Navigation vessels	Improving the protection of fishing trip security for fisherman	MoT
The provision of fishing information systems	Application of marine survey technology (Remotely Operated Vehicle - ROV)	The safe vessels operation route based on sea survey results using ROV	Improving the safety and security of fishing trip	▪ BPPT ▪ MoMA&F
The provision of sea-transportation safety infrastructure	Construction and rehabilitation of navigation station - buildings and facilities	Navigation buildings for sailing purposes (for example lighthouses, monitoring posts)	Improving the supervision of the fishing trip	▪ MoT ▪ MoMA&F
	Construction of marine guard facilities	Marine and coastal guard headquarters and buildings	Marine and coastal guard offices which can monitor the overall conditions of the marine climate and sailing lanes for the fishing trip safety of the fishermen	MoT

Action Group	Action	Output	Benefit	Implementer
SUPPORTING ACTIVITY				
The strengthening of integrated marine management	Development of capture fisheries production management centers	Integrated marine and fisheries centers in 34 provinces	Improving the management of marine areas	MoMA&F
The development of marine technology and information systems	Development of shipping information system and extreme weather early warning system	Shipping information system and early warning system	Increasing the awareness of the fishermen and their families against extreme weather	▪ BNPB ▪ BMKG
	Development of cellular-based technology for fish detection in water column	Cellular-based technology for fish detection (for example acoustic radar, Laut Nusantara application)	Assisting and optimizing fish catch at low cost	MoMA&F
	Enhancement of information system for the estimation fishing ground map	Estimation of fishing ground	Assisting the fishermen in finding the strategic locations/positions effective and efficient fishing, as well as increasing the fulfillment of catching fisheries production stocks	MoMA&F
	Development of integrated database on vessel accident in big data center	Integrated database for vessel accident recorded in the big data center	Producing spatial data on marine accidents and marine weather forecast verification systems as a basis for preparing climate vulnerability in the capture fisheries and marine transportation	MoT

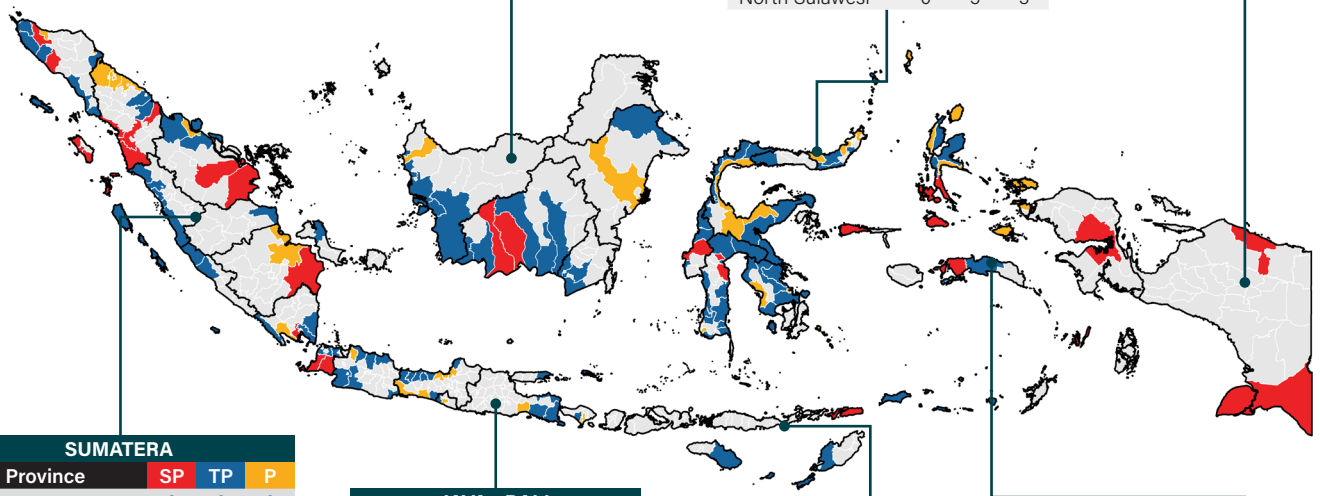
Action Group	Action	Output	Benefit	Implementer
Capacity building of government officials related to marine affairs	Capacity building for national and local governments who directly involved in the management of shipping and fishing safety	National government played an active role in increasing shipping safety and climate resilience in the marine subsector	The capacity national and local governments regarding the effects of climate change on sea transportation and the capture fisheries, as well as the importance of increasing shipping safety is developed	MoMA&F
Capacity building related to sea-transportation and fishing safety	Implementation of education and counseling for climate threats (for example: Climate Field School for Fishermen	Fishermen have the knowledge and understanding of the linkages between climate change and marine condition	Increasing the knowledge and understanding of the fishermen regarding the hazards and impacts of climate change on marine natural resources (fish, coral reefs, salt, etc.)	BMKG
	Socialization of shipping information systems and extreme weather early warning	Fishermen are able to use and utilize fishing information and extreme weather early warning systems	Increasing the knowledge of the fishermen about the benefits of fishing information systems and extreme weather early warning systems	▪ BNPB ▪ BMKG
	Training on developing design, material selection, and finalizing the adaptive vessels development (fibreglass vessels)	Fishermen are trained to design and build fibreglass fishing vessels	Increasing the knowledge of the fishermen in building an adaptive vessels independently and sustainably	MoMA&F
	Training on the utilization of fishing technology, including fish stock detection tools	Fishermen are able to utilize fish detection technology	Increasing the knowledge and ability of the fishermen in detecting fish positions/ locations effectively and efficiently	MoMA&F

Action Group	Action	Output	Benefit	Implementer
The enhancement of marine space management regulations	Reviewing and enhancing the content of marine and coastal area regulations, by taking into account the potential hazards of climate change	Documents of review results on the regulations on marine space and coastal areas (for example The derivative regulation of National Marine Spatial Plan and the Regional Regulation of Coastal Areas and Small Islands Zoning Plan)	Increasing disaster resilience in marine, as well as coastal spatial areas and small islands	MoMA&F
	Strengthen the regulations on the management of sea-transport traffic and fishing routes, including the regulation for fishing in restricted fishing areas or marine protected areas	The regulations on the management of sea-transportation traffic and fishing lanes	Increasing the convenience and safety of the fishermen's vessels within the sea-transportation traffic lanes	MoT
Increasing the access to financing for fishermen	Improving access to fisherman insurance on weather and climate risk-based (Weather Index Insurance)	Assistance on insurance premiums assistance are distributed to the fishermen	Increasing the safety assurance of the fishermen	MoMA&F
	Strengthening the institutional arrangements of fishermen's cooperative and group against the hazards of climate change	Independent and sustainable cooperative and fishermen groups	Increasing the sustainability of cooperative and guarantee income security for the fishermen	MoMA&F
	Development of accessible innovative financing mechanisms for coastal communities	Innovative and easily access of marine and fisheries financing schemes	Assisting fishermen and their families in developing businesses in the marine and fisheries sector through accessible and 0% interest of financial schemes	MoMA&F

Action Group	Action	Output	Benefit	Implementer
The provision of diversification of fishermen's income	Training on income diversification for the fishermen's families	The fishermen's families gained knowledge regarding income diversification	Increasing the knowledge and ability of the capture fishermen's family in acquiring an additional income when they are unable to fishing due to extreme weather	▪ MoMA&F ▪ MoTCE ▪ MoCSME
	Provision of diversification business for fishermen	The diversification of businesses for fishermen are available	Increasing the knowledge and ability of the capture fishermen's family in acquiring an additional income when they are unable to fishing due to extreme weather	MoMA&F

Priority Locations for Climate Resilience in Marine & Coastal Sector

Coastal Subsector



KALIMANTAN			
Province	SP	TP	P
West Kalimantan	0	5	1
South Kalimantan	0	3	0
Central Kalimantan	2	5	0
East Kalimantan	0	1	1

SULAWESI			
Province	SP	TP	P
Gorontalo	0	1	0
West Sulawesi	1	3	0
South Sulawesi	1	12	2
Central Sulawesi	0	8	3
Southeast Sulawesi	0	6	3
North Sulawesi	0	5	5

PAPUA			
Province	SP	TP	P
Papua	2	0	0
West Papua	1	0	1

SUMATERA			
Province	SP	TP	P
Aceh	2	8	2
North Sumatera	7	2	5
West Sumatera	0	7	0
South Sumatera	1	0	1
Riau	2	2	1
Jambi	0	1	0
Bengkulu	0	2	0
Bangka Belitung Island	0	1	0
Lampung	1	3	1

JAVA - BALI			
Province	SP	TP	P
Banten	2	2	0
DKI Jakarta	0	0	2
West Java	0	6	1
Central Java	0	8	6
East Java	0	4	1
DI Yogyakarta	0	1	1
Bali	0	1	3

NUSA TENGGARA			
Province	SP	TP	P
East Nusa Tenggara	1	4	0

MALUKU			
Province	SP	TP	P
Maluku	2	2	0
North Maluku	2	3	3

Note:
- Super Priority
- Top Priority
- Priority

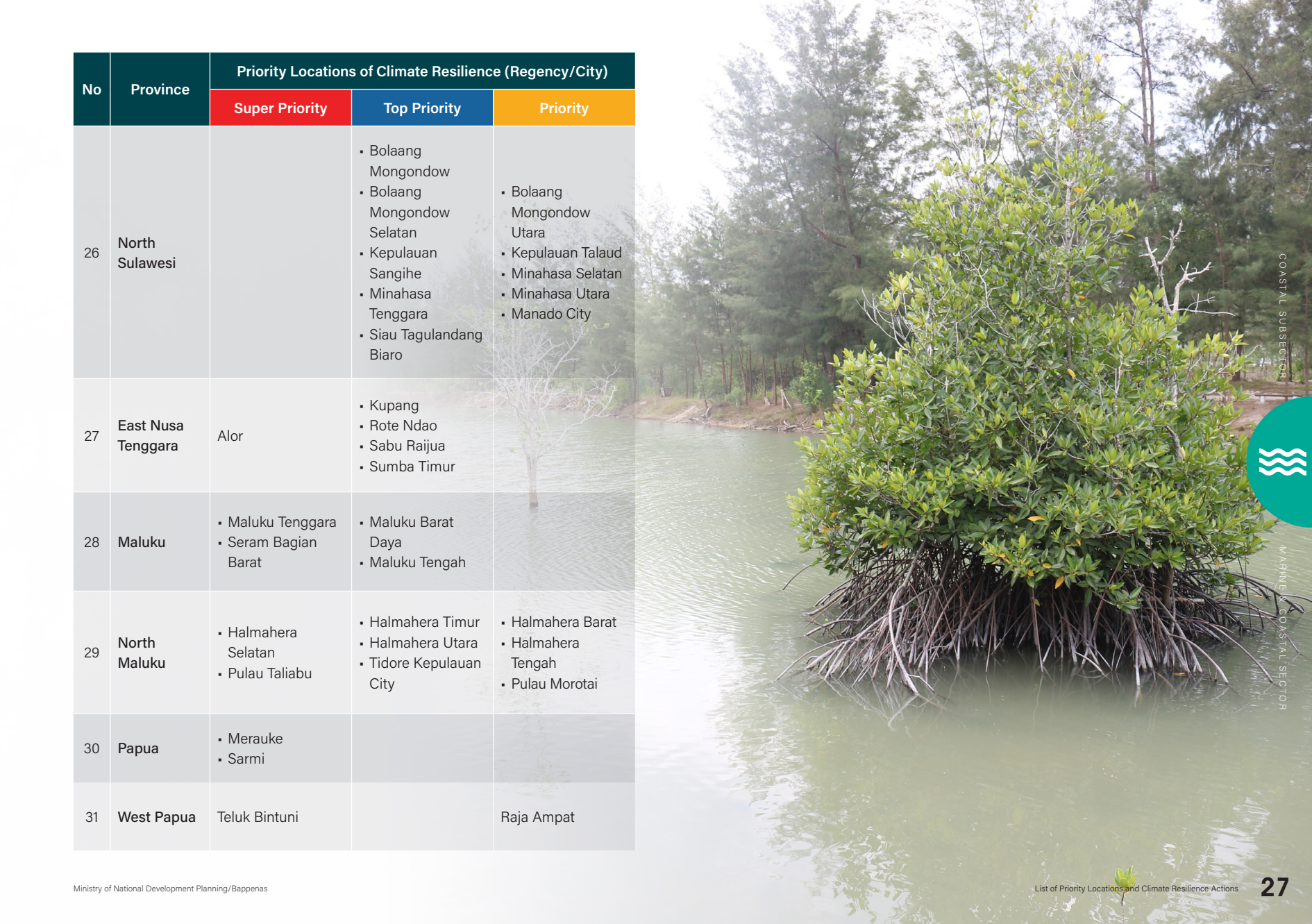
Figure 3.2 Map of Priority Locations of Climate Resilience for Marine & Coastal Sector: Coastal Subsector

Table 3.3 List of Priority Locations of Climate Resilience for Marine & Coastal Sector: Coastal Subsector

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	Aceh	▪ Nagan Raya ▪ Pidie	▪ Aceh Barat ▪ Aceh Besar ▪ Aceh Jaya ▪ Aceh Selatan ▪ Aceh Singkil ▪ Aceh Tamiang ▪ Simeulue ▪ Banda Aceh City	▪ Pidie Jaya ▪ Langsa City
2	North Sumatera	▪ Labuhan Batu ▪ Mandailing Natal ▪ Nias Barat ▪ Nias Selatan ▪ Nias Utara ▪ Tapanuli Selatan ▪ Tapanuli Tengah	▪ Asahan ▪ Labuhan Batu Utara	▪ Batu Bara ▪ Deli Serdang ▪ Langkat ▪ Serdang Bedagai ▪ Medan City
3	West Sumatera		▪ Agam ▪ Kepulauan Mentawai ▪ Padang Pariaman ▪ Pasaman Barat ▪ Pesisir Selatan ▪ Padang City ▪ Pariaman City	
4	South Sumatera	Ogan Komering Ilir		Banyu Asin
5	Riau	▪ Indragiri Hilir ▪ Pelalawan	▪ Bengkalis ▪ Rokan Hilir	Dumai City
6	Jambi		Tanjung Jabung Timur	
7	Bengkulu		▪ Bengkulu Utara ▪ Mukomuko	
8	Bangka Belitung Island		Bangka	
9	Lampung	Pesawaran	▪ Lampung Selatan ▪ Lampung Timur ▪ Pesisir Barat	Tanggamus
10	Banten	▪ Lebak ▪ Pandeglang	▪ Serang ▪ Tangerang	
11	DKI Jakarta			▪ Kepulauan Seribu ▪ Jakarta Utara City
12	West Java		▪ Cianjur ▪ Indramayu ▪ Karawang ▪ Pangandaran ▪ Subang ▪ Sukabumi	Bekasi
13	Central Java		▪ Batang ▪ Brebes ▪ Jepara ▪ Pekalongan ▪ Pemalang ▪ Purworejo ▪ Tegal ▪ Pekalongan City	▪ Cilacap ▪ Demak ▪ Kebumen ▪ Kendal ▪ Semarang City ▪ Tegal City
14	East Java		▪ Banyuwangi ▪ Jember ▪ Situbondo ▪ Sumenep	Lumajang
15	DI Yogyakarta		Kulon Progo	Bantul

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
16	Bali		Tabanan	▪ Badung ▪ Gianyar ▪ Denpasar City
17	West Kalimantan		▪ Kayong Utara ▪ Ketapang ▪ Kubu Raya ▪ Pontianak/ Mempawah ▪ Singkawang City	Bengkayang
18	South Kalimantan		▪ Banjar ▪ Barito Kuala ▪ Tanah Laut	
19	Central Kalimantan	▪ Kotawaringin Timur ▪ Seruyan	▪ Kapuas ▪ Katingan ▪ Kotawaringin Barat ▪ Pulang Pisau ▪ Sukamara	
20	East Kalimantan		Berau	Kutai Kartanegara
21	Gorontalo		Pohuwato	
22	West Sulawesi	Mamuju	▪ Majene ▪ Mamuju Tengah ▪ Pasangkayu	
23	South Sulawesi	Luwu	▪ Barru ▪ Bone ▪ Bulukumba ▪ Jeneponto ▪ Luwu Timur ▪ Luwu Utara ▪ Maros ▪ Pangkajene & Kepulauan ▪ Pinrang ▪ Sinjai ▪ Wajo ▪ Palopo City	▪ Takalar ▪ Makassar City
24	Central Sulawesi		▪ Banggai ▪ Banggai Laut ▪ Buol ▪ Donggala ▪ Morowali ▪ Morowali Utara ▪ Toli-Toli ▪ Palu City	▪ Parigi Moutong ▪ Poso ▪ Tojo Una-Una
25	Southeast Sulawesi		▪ Bombana ▪ Kolaka Utara ▪ Konawe ▪ Konawe Kepulauan ▪ Konawe Selatan ▪ Konawe Utara	▪ Kolaka ▪ Wakatobi ▪ Kendari City

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
26	North Sulawesi		▪ Bolaang Mongondow ▪ Bolaang Mongondow Selatan ▪ Kepulauan Sangihe ▪ Minahasa Tenggara ▪ Siau Tagulandang Biaro	▪ Bolaang Mongondow Utara ▪ Kepulauan Talaud ▪ Minahasa Selatan ▪ Minahasa Utara ▪ Manado City
27	East Nusa Tenggara	Alor	▪ Kupang ▪ Rote Ndao ▪ Sabu Raijua ▪ Sumba Timur	
28	Maluku	▪ Maluku Tenggara ▪ Seram Bagian Barat	▪ Maluku Barat Daya ▪ Maluku Tengah	
29	North Maluku	▪ Halmahera Selatan ▪ Pulau Taliabu	▪ Halmahera Timur ▪ Halmahera Utara ▪ Tidore Kepulauan City	▪ Halmahera Barat ▪ Halmahera Tengah ▪ Pulau Morotai
30	Papua	▪ Merauke ▪ Sarmi		
31	West Papua	Teluk Bintuni		Raja Ampat



Lists of Action for Climate Resilience in Marine & Coastal Sector
Coastal Subsector

The Coastal Subsector activities are related to coastal area protection from potential inundation by tidal waves and coastal flooding. Its impact will be amplified by sea-level rise in the high-vulnerable coastal areas. Coastal inundation can result in loss and damage to settlement infrastructure and other strategic infrastructures, i.e., aquaculture or fishponds (damage to pond structures and fish loss due to flooding and high-salinity water). The climate resilience activities focus on enhancing the readiness of settlement and cultivation in coastal areas, which support the coastal areas' stability. The detailed list of coastal climate resilience actions can be seen in **Table 3.4.**

Table 3.4 List of Climate Resilience Actions for Marine & Coastal Sector: Coastal Subsector

Main Activity Supporting Activity

Action Group	Action	Output	Benefit	Implementer
MAIN ACTIVITY				
The provision of coastal protection structures/vegetation	Construction of coastal protection hybrid structures	Coastal protection hybrid structures (for example elongated geotextile sacks)	Preventing flooding/inundation in the coastal areas due to waves, so that settlements and public facilities, and social facilities for coastal communities, as well as coastal aquaculture areas are protected	MoPWH
	Construction of coastal protection hard structures	Coastal protection hard structures (for example gabions, seawalls, etc.)	Preventing flooding/inundation in the coastal areas due to waves, so that settlements and public facilities, and social facilities for coastal communities, as well as coastal aquaculture areas are protected	MoPWH
	Construction and rehabilitation of coastal protection soft structures with an ecosystem-based adaptation approach	Coastal protection soft structures with an Ecosystem-based Adaptation (for example mangrove planting and rehabilitation)	Preventing flooding/inundation in the coastal areas due to sea waves, so that settlements and public facilities, and social facilities for coastal communities, as well as coastal aquaculture areas are protected	MoE&F

Action Group	Action	Output	Benefit	Implementer
The provision of flood control structures	Construction of automatic floodgates to reduce flooding in the coastal areas	Composite floodgates/ automatic floodgates to drain water into floodways in the coastal areas	Reducing standing water in the coastal areas rapidly when sea level increases, so that settlement areas, as well as public facilities, and social facilities for coastal communities, as well as coastal aquaculture areas are protected	MoPWH
The area management and housing, as well as the settlement relocation	Management of fishermen centers/villages	Organized fishing center/village areas to prevent flooding	Reducing the impact of flooding/tidal flood due to rising sea levels in the coastal community settlement areas and coastal aquaculture areas	▪ MoMAF ▪ MoPWH
	Reconstruction of adaptive residential settlements, public and social facilities in the coastal areas	The reconstruction of residential settlements, public and social facilities for the coastal areas	Increasing the resilience of settlements, as well as the public facilities, and social facilities of coastal communities to climate hazards	MoPWH
	Relocation of coastal communities affected by tidal flood	The implemented relocation	Increasing the ability of coastal communities in having new places to live and avoiding tidal flood, so that they can carry out activities like usual	MoPWH

Action Group	Action	Output	Benefit	Implementer
The provision and protection of aquaculture production facilities	Distribution of superior fish seed with high-temperature and high-salinity resistance	Superior fish seeds are distributed to the fishermen of coastal aquaculture	Increasing the number of broodstock which is resistant to climate threats and increasing fishery production stocks in the coastal areas	MoMAF
	Distribution of high-nutrition fish feed	Nutritious fish feed are distributed to the fishermen in coastal cultivation fisheries	Increasing the biomass and productivity of aquaculture in the coastal areas	MoMAF
	Construction of ecosystem-based climate-resilience aquaculture media - Ecosystem Approach to Aquaculture	Aquaculture infrastructure and with an Ecosystem Approach to Aquaculture (for example brackish water pond, intermittent ponds, cage, etc.)	Increasing aquaculture yields in the coastal areas and the income of coastal aquaculture fishermen	MoMAF
	Construction of pond irrigation networks	Irrigation networks are constructed in the brackish water pond area for water supply	Increasing the fulfillment of fishery water needs in the cultivated areas, so as to increase fishery yields	MoMAF
	Application of fully environmentally-controlled fish hatchery technology	The developed fully environmentally-controlled fish hatchery technology	Increasing aquaculture yields in the coastal areas	MoMAF
The provision of early warning systems	Provision and implementation of extreme weather early warning systems (flood, tidal flood information)	Early warning systems for extreme weather in the coastal areas (flood, tidal flood)	Increasing the anticipation of coastal communities to the climate threats of flood and tidal flood	▪ BNPB ▪ BMKG

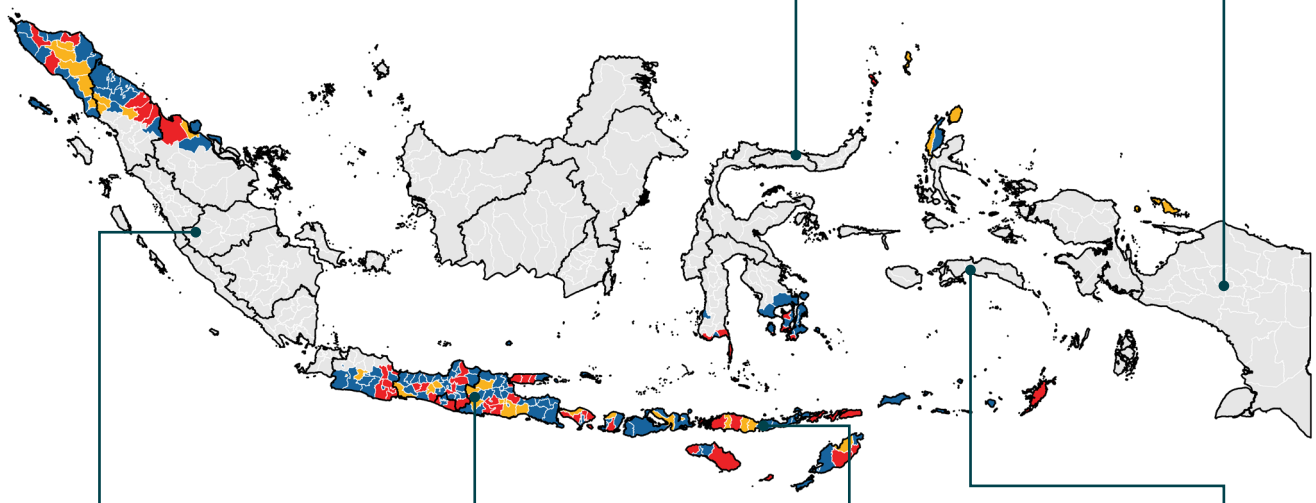
Action Group	Action	Output	Benefit	Implementer
SUPPORTING ACTIVITY				
The development of coastal protection technology	Development of innovative designs for sturdy and environmental-friendly seawalls	The prototype of sea dike structural design to mitigate the impacts of climate change in the coastal areas	Increasing coastal resilience and preventing flooding/ inundation in the coastal areas due to waves, so that settlements as well as public facilities, and social facilities for coastal communities, as well as coastal aquaculture areas are protected	BPPT
The development of adaptive fish seed and feed	Research on fisheries to identify the superior broodstock or superior seeds	Fisheries research for superior broodstock or superior seeds	Increasing the number of broodstock which are resistant to climate threats and increasing fishery production stocks in the coastal areas	MoMAF
	Development of adaptive aquaculture biotechnology	Aquaculture biotechnology which increases the resilience of species to climate change	Increasing the number of broodstock which are resistant to climate threats and increasing fishery production stocks in the coastal areas	MoMAF
Capacity building of government officials on the coastal area management	Capacity building for national and local governments regarding sustainable coastal area management	The central and local governments which implement sustainable coastal management and consider the aspects of climate resilience	The capacity building of central and local governments regarding sustainable coastal area management, as well as the technology used in coastal protection	MoMAF
The enhancement of the regulation on coastal areas	Review of disaster-related regulations in the coastal areas and small islands	Reviewed disaster-related regulations	Increasing disaster prevention and control, as well as preparedness in the coastal areas	▪ MoMAF ▪ BNPB
	Preparation of disaster risk maps in the coastal areas	Coastal disaster risk maps	Strengthening the availability of data and information on the coastal areas prone to climate change disasters, so that they can be used as a reference in preparing action plans and contingencies	▪ MoMAF ▪ BNPB

Action Group	Action	Output	Benefit	Implementer
Capacity building of coastal area protection	Knowledge sharing related to coastal ecosystems and shallow waters (for example: Sekolah Pantai Indonesia/ SPI)	Communities who have knowledge of coastal and shallow water ecosystems	Increasing community understanding of the management and preservation of coastal and shallow water ecosystems	▪ MoE&F ▪ MoMA&F
	Community assistance in reconstructing climate change adaptive houses (due to flood, tidal flood)	Assisted coastal communities in reconstructing houses which are adaptive to flood or tidal flood	Increasing the knowledge and capacities of coastal communities in the reconstruction of adaptive houses in the coastal areas	MoPWH
	Assistance to fishermen in aquaculture activities in the coastal areas	Fishermen who can develop sustainable and environmentally friendly aquaculture	Increasing the fishermen's knowledge of sustainable and environmentally friendly aquaculture activities in the coastal areas	MoMA&F
The provision of innovative financing mechanisms	Development of innovative and accessible financing mechanisms for coastal aquaculture businesses	The established financing mechanisms	Increasing access to aquaculture business financing, so that more small fishermen can have business capital to maximize production, and increasing the fishermen's economy and welfare	▪ MoF ▪ MoMAF ▪ MoCSME
	Enhancing access to aquaculture insurance financing	The distributed aquaculture insurance premium assistance	Increasing the number of coastal fishermen who have insurance, to ensure the sustainability of fisheries business even if there is a disruption or failure of the harvest	MoMA&F
	Strengthen the fishermen's group and cooperative in managing the impacts of climate change in the coastal areas	Fisherman's cooperatives	Increasing the ability of fishermen's cooperatives to develop their businesses independently, which support the improvement of the economy and welfare of fishermen's groups and other coastal communities	MoMA&F

LISTS OF LOCATIONS & CLIMATE RESILIENCE ACTIONS FOR WATER SECTOR

4.

Priority Locations for Climate Resilience in Water Sector



SULAWESI			
Province	SP	TP	P
South Sulawesi	3	2	0
Sulawesi Southeast	3	8	0
North Sulawesi	1	0	1

PAPUA			
Province	SP	TP	P
Papua	0	0	2

SUMATERA			
Province	SP	TP	P
Aceh	4	13	6
North Sumatera	3	13	3
Riau	1	1	1

JAVA - BALI			
Province	SP	TP	P
West Java	6	11	2
Central Java	8	24	3
East Java	11	21	6
DI Yogyakarta	2	3	0
Bali	5	3	1

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	1	6	3
East Nusa Tenggara	9	9	4

MALUKU			
Province	SP	TP	P
Maluku	1	1	0
North Maluku	0	1	2

Note:
- Super Priority
- Top Priority
- Priority

Figure 4.1 Map of Priority Locations of Climate Resilience for Water Sector

Table 4.1 List of Priority Locations of Climate Resilience for Water Sector

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	Aceh	▪ Aceh Utara ▪ Nagan Raya ▪ Pidie ▪ Banda Aceh City	▪ Aceh Barat ▪ Aceh Barat Daya ▪ Aceh Besar ▪ Aceh Jaya ▪ Aceh Selatan ▪ Aceh Singkil ▪ Aceh Tamiang ▪ Aceh Timur ▪ Bireuen ▪ Pidie Jaya ▪ Simeulue ▪ Langsa City ▪ Lhokseumawe City	▪ Aceh Tengah ▪ Aceh Tenggara ▪ Bener Meriah ▪ Gayo Lues ▪ Sabang City ▪ Subulussalam City
2	North Sumatera	▪ Asahan ▪ Labuhan Batu ▪ Labuhan Batu Utara	▪ Batu Bara ▪ Deli Serdang ▪ Karo ▪ Labuhan Batu Selatan ▪ Langkat ▪ Samosir ▪ Serdang Bedagai ▪ Simalungun ▪ Binjai City ▪ Medan City ▪ Pematang Siantar City ▪ Tanjung Balai City ▪ Tebing Tinggi City	▪ Dairi ▪ Pakpak Bharat ▪ Toba Samosir
3	Riau	Rokan Hilir	Bengkalis	Dumai City
4	West Java	▪ Ciamis ▪ Cirebon ▪ Majalengka ▪ Pangandaran ▪ Tasikmalaya ▪ Banjar City	▪ Bandung ▪ Cianjur ▪ Garut ▪ Kuningan ▪ Sukabumi ▪ Sumedang ▪ Bandung City ▪ Bogor City ▪ Cimahi City ▪ Cirebon City ▪ Tasikmalaya City	▪ Bandung Barat ▪ Sukabumi City
5	Central Java	▪ Banjarnegara ▪ Boyolali ▪ Grobogan ▪ Pati ▪ Purbalingga ▪ Purworejo ▪ Wonogiri ▪ Pekalongan City	▪ Banyumas ▪ Batang ▪ Blora ▪ Brebes ▪ Demak ▪ Jepara ▪ Karanganyar ▪ Kebumen ▪ Kendal ▪ Klaten ▪ Kudus ▪ Magelang ▪ Pekalongan ▪ Pemalang ▪ Rembang ▪ Semarang ▪ Sragen ▪ Sukoharjo ▪ Tegal ▪ Magelang City ▪ Salatiga City ▪ Semarang City ▪ Surakarta City ▪ Tegal City	▪ Cilacap ▪ Temanggung ▪ Wonosobo

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
6	East Java	▪ Bangkalan ▪ Blitar ▪ Kediri ▪ Magetan ▪ Pamekasan ▪ Pasuruan ▪ Sampang ▪ Tulungagung ▪ Pasuruan City ▪ Probolinggo City ▪ Surabaya City	▪ Banyuwangi ▪ Bondowoso ▪ Gresik ▪ Jember ▪ Jombang ▪ Lamongan ▪ Madiun ▪ Mojokerto ▪ Nganjuk ▪ Pacitan ▪ Probolinggo ▪ Sidoarjo ▪ Situbondo ▪ Sumenep ▪ Trenggalek ▪ Tuban ▪ Blitar City ▪ Kediri City ▪ Madiun City ▪ Malang City ▪ Mojokerto City	▪ Bojonegoro ▪ Lumajang ▪ Malang ▪ Ngawi ▪ Ponorogo ▪ Batu City
7	DI Yogyakarta	▪ Gunung Kidul ▪ Kulon Progo	▪ Bantul ▪ Sleman ▪ Yogyakarta City	
8	Bali	▪ Bangli ▪ Jembrana ▪ Karang Asem ▪ Klungkung ▪ Tabanan	▪ Badung ▪ Gianyar ▪ Denpasar City	Buleleng
9	North Sulawesi	Kepulauan Sangihe		Kepulauan Talaud
10	South Sulawesi	▪ Bulukumba ▪ Jeneponto ▪ Kepulauan Selayar	▪ Bantaeng ▪ Pangkajene dan Kepulauan	
11	Southeast Sulawesi	▪ Buton Selatan ▪ Buton Tengah ▪ Muna Barat	▪ Bombana ▪ Buton ▪ Buton Utara ▪ Konawe Kepulauan ▪ Konawe Selatan ▪ Muna ▪ Wakatobi ▪ Baubau City	
12	West Nusa Tenggara	Lombok Tengah	▪ Bima ▪ Lombok Barat ▪ Lombok Timur ▪ Sumbawa ▪ Sumbawa Barat ▪ Mataram City	▪ Dompu ▪ Lombok Utara ▪ Bima City
13	East Nusa Tenggara	▪ Alor ▪ Lembata ▪ Malaka ▪ Manggarai Barat ▪ Manggarai Timur ▪ Sabu Raijua ▪ Sumba Barat Daya ▪ Sumba Timur ▪ Timor Tengah Selatan	▪ Belu ▪ Ende ▪ Flores Timur ▪ Kupang ▪ Rote Ndao ▪ Sikka ▪ Sumba Barat ▪ Sumba Tengah ▪ Kupang City	▪ Manggarai ▪ Nagekeo ▪ Ngada ▪ Timor Tengah Utara
14	Maluku	Kepulauan Tanimbar	Maluku Barat Daya	
15	North Maluku		Halmahera Utara	▪ Halmahera Barat ▪ Pulau Morotai
16	Papua			▪ Biak Numfor ▪ Supiori

Lists of Action for Climate Resilience in Water Sector

The Water Sector's climate resilience activities focus on preserving water availability and preventing drought impact to avoid water shortage. Maintaining the water availability shall guarantee the quantity of water supply for household, industrial, agricultural, and other uses. Implementation of climate resilience actions includes conservation in the upstream watershed and development of water storage infrastructure. The detailed actions might be seen in **Table 4.2.** Flood is also one of the hazards in the Water Sector, concerning the frequency and depth. These actions consider the flood-prone area and provide a solution on how to overcome it.

Table 4.2 List of Climate Resilience Actions for Water Sector

Main Activity Supporting Activity

Action Group	Action	Output	Benefit	Implementer
MAIN ACTIVITY				
The provision of water storage buildings	The construction of dams	Dams which irrigate locations affected by drought and water scarcity	Accommodating water supply and increasing the continuity of water supply to meet the community needs	MoPWH
	The construction of reservoirs	Reservoirs which irrigate the agricultural land affected by drought and water scarcity	Accommodating water supply as a source of irrigation for the agricultural land affected by drought and water scarcity	MoPWH
	The development and adjustment of rainwater storage media for drought resilience	Infiltration wells/rainwater storage wells with adequate capacity in the coastal/non-coastal areas	Accommodating rainwater as clean water reserves both in the coastal and non-coastal areas	▪ MoPWH ▪ MoVDDRT
	The construction of water tanks or reservoirs in the coastal areas or islands which are affected by fresh water scarcity due to drought and sea water intrusion	Intake buildings, filter tanks, reservoirs, water reservoirs and pipe bridges in the archipelagic areas	Fulfilling the need for clean water supply in the coastal areas and islands through clean water reserves	MoPWH

Action Group	Action	Output	Benefit	Implementer
The rehabilitation of water catchment areas, including peatlands and swamps	The protection and rehabilitation of wetland ecosystems (for example: plantation and construction of canal blockage)	Rehabilitated wetland ecosystems	Reducing the potential for drought and the preservation of wetland ecosystems	MoE&F
	The rehabilitation of forest and land by vegetative propagation	The rehabilitated critical forest and land areas	Increasing forest and land cover as well as increasing water resources reserves	MoE&F
	The provision of good quality and productive forest vegetation seeds	Qualitative and productive forest vegetation seeds	Increasing forest cover with qualitative vegetation as well as producing fruit (Non-timber forest product) and having high economic value to improve the community welfare	MoE&F
The application of technology for increasing water debit	The application of weather modification technology (to prevent drought and to replenish water bodies such as lakes and dams)	Artificial rain in the reservoirs and wetlands affected by drought and water scarcity	Increasing the water level of the reservoirs and wetlands	▪ BPPT ▪ Ministry of Agriculture ▪ MoPWH
	The application of water injection technology from flood inundation	The constructed and improved injection wells	Reducing the number of flood points in the coastal/ urban areas (settlements/economic centers/ government)	▪ BPPT ▪ MoPWH
	The construction of infiltration wells and water absorbing asphalt (geopores) to overcome excess rainwater runoff for preventing drought	Infiltration wells and Geopore asphalt which are able to drain surface runoff into the ground	Draining direct surface runoff during rain as well as other water sources into the ground through the geopore asphalt cavities	▪ BPPT ▪ MoPWH
The application of water recycling and reclamation technology	The application of Sea Water Reverse Osmosis (SWRO) in archipelagic areas	Clean water which reaches households in the archipelagic areas	Fulfilling the supply of clean water in the coastal areas and islands affected by drought and the scarcity of fresh water/clean water through the desalination of sea water	▪ BPPT ▪ MoPWH
	The application of recycling technology that change wastewater into clean water	Clean water on a household/ communal scale	Providing an alternative to additional sources of clean water	▪ BPPT ▪ MoPWH

Action Group	Action	Output	Benefit	Implementer
Water loss prevention	The construction, maintenance and repair of pipelines	The transmission of raw water, drinking water and distribution pipelines	Increasing the quality and distribution services of raw water and drinking water	MoPWH
	The application of water pipe leak detection technology	Clean water which is distributed according to the consumers' demand	Maintaining the amount of water which is distributed until it is received by consumers	▪ MoPWH ▪ BPPT
Flood mitigation	The development and adjustment of water resource infrastructure for flood disaster resilience	Supporting flood control buildings (flood gates/weirs, flood canals, etc.)	Reducing the point of standing water when there is excess water runoff	MoPWH
	The construction of drainage which is adaptive to climate change (considering the increased rainfall/inundation points)	Drainage design which considers the increased rainfall/inundation point	Increasing inundation tide times and decreasing inundation points	MoPWH
	The construction of river bank protection (made of concrete or vegetation)	River bank/cliff protection buildings, both with hard infrastructure and with vegetation	Keeping river banks/cliffs from erosion damage and maintaining the function of the river during the rainy and dry seasons	MoPWH
	The dredging of reservoirs, lakes, rivers and waterways	Reservoirs, lakes, rivers and waterways which have increased their carrying capacity	The capacity building of reservoirs, rivers and waterways in the anticipation of flooding in the rainy season	MoPWH

Action Group	Action	Output	Benefit	Implementer
SUPPORTING ACTIVITY				
The development of watershed protection innovations and technologies	The development and application of information technology-based watershed ecosystem damage detectors	The information system on watershed conditions in real-time, reliably and easily accessible to the public	Increasing the accuracy and speed of intervention against watershed damage	▪ BPPT ▪ MoE&F
	The development and application of Online Monitoring Technology for the detection of river water levels, groundwater levels, and environmental damage/ pollution	Information systems for the detection of river water levels, groundwater levels, and environmental pollution in real-time, reliably and easily accessible to the public	Increasing the accuracy and speed of intervention against the condition changes of the river's water levels and groundwater levels as well as environmental pollution control	▪ BPPT ▪ MoE&F ▪ MoPWH
	The development of monitoring the vulnerability of water supply systems and networks to the impacts of climate changes in real-time	Climate and water information systems in real-time, reliably and easily accessible to the public	Increasing the accuracy and speed of intervention against damage to water supply systems and networks	▪ MoA ▪ MoE&F ▪ BPPT ▪ BMKG ▪ BNPB
	The development of technology which reduces the silting of rivers, reservoirs, dams and other water reservoirs	Technology which reduces sedimentation in the rivers, reservoirs, dams and other water reservoirs	Optimizing the capacity of rivers, reservoirs, dams as water storage media	MoPWH
	The development of ecohydraulic technology on rivers	Locked Concrete Block technology in the rivers to maintain the function of rivers as raw water providers	Optimizing river functions for raw water fulfillment through controlling water levels and riverbed elevations as well as accommodating temporary sediments	MoPWH
	The dissemination of vulnerability information systems for raw water supply ecosystems and water supply networks	Information systems for the vulnerability of raw water supply ecosystems and water supply networks	Increasing the public access and understanding of information on the effects of climate change on drought and water scarcity	▪ MoE&F ▪ Local Government

Action Group	Action	Output	Benefit	Implementer
The capacity building of government related to Water Resources	The capacity building of central and local governments related to climate resilience in the water sector	Central and local governments which implement sustainable water resources management	Increasing the understanding of the central and local governments regarding water resources management, so that they can play an active role in the development of climate resilience in the water sector	MoPWH
	The provision of technical guidance on water resources infrastructure standards which are adaptive to climate change	Regency/City Public Works Offices which can apply standardized drainage and adaptive to the impacts of climate change	Increasing the capacity of Regency / City Public Works Offices in planning and building drainage networks	MoPWH
	The training of Operation and Maintenance (O&M) officers of dams, reservoirs, and other water storage structures	The O&M operators of dams, reservoirs, and other water storage structures who are able to operate and maintain the function of water structures	Increasing the ability and technical knowledge of operation and maintenance officers so that the effectiveness of function and benefits of the dams and reservoirs can be guaranteed	MoPWH
The capacity building of community related to Water Resources	An assistance in the conservation and efficient use and management of water to households	Households that are able to manage and utilize water independently and sustainably	Increasing community initiatives for use water efficiently	MoE&F
	The socialization of the utilization of seawater desalination and recycled water-based water treatment technology	Communities who utilize seawater desalination and recycled water-based water treatment technology	Increasing public insight in utilizing seawater desalination and recycled water-based water treatment technology	BPPT

Action Group	Action	Output	Benefit	Implementer
The reinforcement of Water Resources regulations	The preparation of policies on the limitation of special spaces for Protected Groundwater Areas	Standard regulations on the management and utilization of watersheds as Protected Groundwater Areas	Optimizing the balance of water discharge in the watershed during the dry season and the rainy season	MoE&F
	The preparation of Norms, Standards, Procedures, and Criteria (NSPC) of the Development of Master Plan for a Drinking Water Supply System	The regulation of Drinking Water Supply System which is adaptive to climate change	Optimizing the continuity of water supply for the household, public places, agriculture, livestock and other users' needs	MoPWH
	The preparation of NSPC for water resources	Water reserve preservation regulations	Maintaining the ecosystem of water sources and water reserves during the rainy and dry seasons so that the water storage facilities and the quality of water resources management are still fulfilled	MoPWH
	The review of regional spatial plans (the spatial plan of Regency/City, the detailed spatial plan of Regency/City)	The spatial plan of Regency/City, the detailed spatial plan of Regency/City which consider the potential hazards of the water sector	Increasing the effectiveness of water management so that water resilience can be achieved	MoAASP/NLA
	The development of Payments for Ecosystem Services Mechanism	The regulation on the Payments for Ecosystem Services Mechanism	Increasing the added value for environmental services so that water management, quantity and quality are preserved	MoE&F

LISTS OF LOCATIONS & CLIMATE RESILIENCE ACTIONS FOR AGRICULTURAL SECTOR

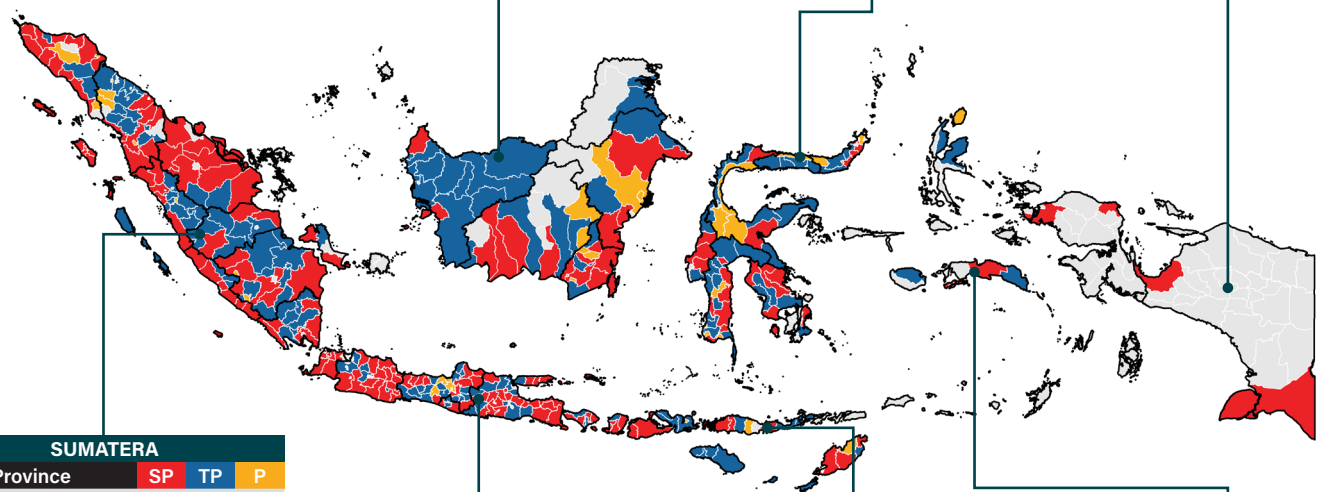
5.

Priority Locations for Climate Resilience in Agricultural Sector

KALIMANTAN			
Province	SP	TP	P
West Kalimantan	2	11	0
South Kalimantan	6	3	4
Central Kalimantan	4	4	2
East Kalimantan	3	2	2
North Kalimantan	0	2	0

SULAWESI			
Province	SP	TP	P
Gorontalo	0	4	1
West Sulawesi	3	2	0
South Sulawesi	6	13	4
Central Sulawesi	2	5	3
Southeast Sulawesi	5	4	0
North Sulawesi	3	3	3

PAPUA			
Province	SP	TP	P
Papua	2	0	0
West Papua	2	0	0



SUMATERA			
Province	SP	TP	P
Aceh	12	3	4
North Sumatera	12	11	4
West Sumatera	5	9	2
South Sumatera	6	8	2
Riau	8	2	0
Jambi	3	7	0
Bengkulu	6	3	0
Bangka Belitung Island	2	1	0
Lampung	6	8	0

JAVA - BALI			
Province	SP	TP	P
Banten	6	0	0
West Java	15	5	0
Central Java	11	15	4
East Java	19	11	0
DI Yogyakarta	2	2	0
Bali	5	4	0

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	5	4	1
East Nusa Tenggara	6	10	2

MALUKU			
Province	SP	TP	P
Maluku	1	2	0
North Maluku	0	2	1

Note:
- Super Priority
- Top Priority
- Priority

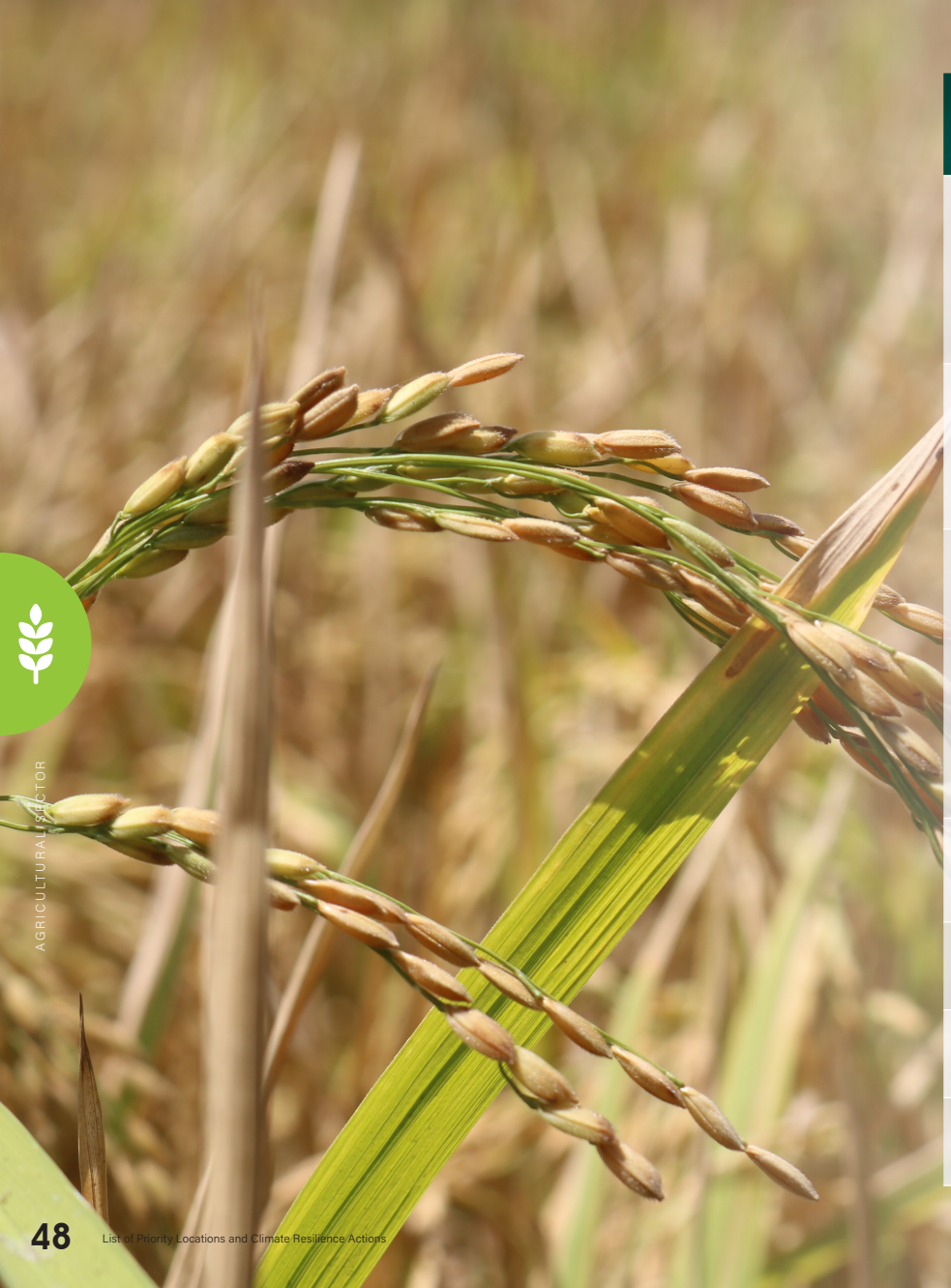
Figure 5.1 Map of Priority Locations of Climate Resilience for Agricultural Sector

Table 5.1 List of Priority Locations of Climate Resilience for Agricultural Sector

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	Aceh	▪ Aceh Barat ▪ Aceh Barat Daya ▪ Aceh Besar ▪ Aceh Jaya ▪ Aceh Selatan ▪ Aceh Tamiang ▪ Aceh Timur ▪ Aceh Utara ▪ Bireuen ▪ Nagan Raya ▪ Pidie ▪ Simeulue	▪ Aceh Tenggara ▪ Gayo Lues ▪ Pidie Jaya	▪ Aceh Tengah ▪ Langsa City ▪ Lhokseumawe City ▪ Subulussalam City
2	North Sumatera	▪ Asahan ▪ Labuhan Batu ▪ Labuhan Batu Utara ▪ Mandailing Natal ▪ Nias ▪ Nias Barat ▪ Nias Selatan ▪ Nias Utara ▪ Padang Lawas ▪ Tapanuli Selatan ▪ Tapanuli Tengah ▪ Gunungsitoli City	▪ Batu Bara ▪ Deli Serdang ▪ Humbang Hasundutan ▪ Langkat ▪ Padang Lawas Utara ▪ Samosir ▪ Serdang Bedagai ▪ Simalungun ▪ Tapanuli Utara ▪ Toba Samosir ▪ Pematang Siantar City	▪ Dairi ▪ Karo ▪ Binjai City ▪ Padangsidimpuan City
3	West Sumatera	▪ Agam ▪ Padang Pariaman ▪ Pasaman ▪ Pasaman Barat ▪ Pesisir Selatan	▪ Dharmasraya ▪ Kep. Mentawai ▪ Lima Puluh Kota ▪ Sijunjung ▪ Solok ▪ Solok Selatan ▪ Tanah Datar ▪ Padang City ▪ Pariaman City	▪ Payakumbuh City ▪ Sawah Lunto City
4	South Sumatera	▪ Empat Lawang ▪ Muara Enim ▪ Musi Rawas ▪ Musi Rawas Utara ▪ Ogan Komering Ilir ▪ Ogan Komering Ulu	▪ Banyu Asin ▪ Lahat ▪ Musi Banyuasin ▪ Ogan Ilir ▪ Ogan Komering Ulu Selatan ▪ Ogan Komering Ulu Timur ▪ Penukal Abab Lematang Ilir ▪ Palembang City	▪ Lubuklinggau City ▪ Pagar Alam City
5	Riau	▪ Bengkalis ▪ Indragiri Hilir ▪ Kampar ▪ Kepulauan Meranti ▪ Pelalawan ▪ Rokan Hilir ▪ Rokan Hulu ▪ Siak	▪ Indragiri Hulu ▪ Kuantan Singingi	
6	Jambi	▪ Merangin ▪ Tanjung Jabung Barat ▪ Tanjung Jabung Timur	▪ Batang Hari ▪ Bungo ▪ Kerinci ▪ Muaro Jambi ▪ Sarolangun ▪ Tebo ▪ Sungai Penuh City	
7	Bengkulu	▪ Bengkulu Selatan ▪ Bengkulu Tengah ▪ Bengkulu Utara ▪ Kaur ▪ Mukomuko ▪ Seluma	▪ Kepahiang ▪ Lebong ▪ Rejang Lebong	

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
8	Bangka Belitung Island	▪ Bangka Barat ▪ Bangka Selatan	Bangka	
9	Lampung	▪ Lampung Barat ▪ Lampung Selatan ▪ Lampung Timur ▪ Pesawaran ▪ Pesisir Barat ▪ Tulang Bawang	▪ Lampung Tengah ▪ Lampung Utara ▪ Mesuji ▪ Pringsewu ▪ Tanggamus ▪ Tulang Bawang Barat ▪ Way Kanan ▪ Metro City	
10	Banten	▪ Lebak ▪ Pandeglang ▪ Serang ▪ Tangerang ▪ Cilegon City ▪ Serang City		
11	West Java	▪ Bandung ▪ Ciamis ▪ Cianjur ▪ Cirebon ▪ Garut ▪ Indramayu ▪ Karawang ▪ Kuningan ▪ Majalengka ▪ Pangandaran ▪ Subang ▪ Sukabumi ▪ Sumedang ▪ Tasikmalaya ▪ Banjar City	▪ Bandung Barat ▪ Bekasi ▪ Bogor ▪ Purwakarta ▪ Tasikmalaya City	
12	Central Java	▪ Blora ▪ Boyolali ▪ Brebes ▪ Grobogan ▪ Pati ▪ Pekalongan ▪ Pemalang ▪ Purworejo ▪ Rembang ▪ Tegal ▪ Wonogiri	▪ Banjarnegara ▪ Banyumas ▪ Batang ▪ Cilacap ▪ Demak ▪ Jepara ▪ Karanganyar ▪ Kebumen ▪ Klaten ▪ Kudus ▪ Magelang ▪ Purbalingga ▪ Sragen ▪ Sukoharjo ▪ Temanggung	▪ Kendal ▪ Semarang ▪ Wonosobo ▪ Semarang City
13	East Java	▪ Banyuwangi ▪ Blitar ▪ Bondowoso ▪ Jember ▪ Jombang ▪ Kediri ▪ Madiun ▪ Magetan ▪ Mojokerto ▪ Nganjuk ▪ Pamekasan ▪ Pasuruan ▪ Probolinggo ▪ Sampang ▪ Situbondo ▪ Sumenep ▪ Trenggalek ▪ Tuban ▪ Tulungagung	▪ Bangkalan ▪ Bojonegoro ▪ Gresik ▪ Lamongan ▪ Lumajang ▪ Malang ▪ Ngawi ▪ Pacitan ▪ Ponorogo ▪ Sidoarjo ▪ Probolinggo City	
14	DI Yogyakarta	▪ Gunung Kidul ▪ Kulon Progo	▪ Bantul ▪ Sleman	

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
15	Bali	▪ Bangli ▪ Jembrana ▪ Karang Asem ▪ Klungkung ▪ Tabanan	▪ Badung ▪ Buleleng ▪ Gianyar ▪ Denpasar City	
16	West Kalimantan	▪ Kayong Utara ▪ Sambas	▪ Bengkayang ▪ Kapuas Hulu ▪ Ketapang ▪ Kubu Raya ▪ Landak ▪ Melawi ▪ Pontianak/ Mempawah ▪ Sanggau ▪ Sekadau ▪ Sintang ▪ Singkawang City	
17	Kalimantan Selatan	▪ Balangan ▪ Banjar ▪ Barito Kuala ▪ Hulu Sungai Selatan ▪ Kotabaru ▪ Tanah Bumbu	▪ Tabalong ▪ Tanah Laut ▪ Tapin	▪ Hulu Sungai Tengah ▪ Hulu Sungai Utara ▪ Kota Banjar Baru ▪ Kota Banjarmasin
18	Central Kalimantan	▪ Kotawaringin Barat ▪ Kotawaringin Timur ▪ Pulang Pisau ▪ Seruyan	▪ Barito Selatan ▪ Kapuas ▪ Katingan ▪ Sukamara	▪ Barito Timur ▪ Barito Utara
19	East Kalimantan	▪ Kutai Timur ▪ Paser ▪ Penajam Paser Utara	▪ Berau ▪ Kutai Barat	▪ Kutai Kartanegara ▪ Samarinda City
20	North Kalimantan		▪ Bulungan ▪ Tana Tidung	
21	Gorontalo		▪ Boalemo ▪ Bone Bolango ▪ Gorontalo ▪ Pohuwato	Gorontalo Utara
22	West Sulawesi	▪ Mamasa ▪ Mamuju ▪ Mamuju Tengah	▪ Pasangkayu ▪ Polewali Mandar	
23	South Sulawesi	▪ Barru ▪ Bone ▪ Jeneponto ▪ Luwu ▪ Sinjai ▪ Wajo	▪ Bulukumba ▪ Enrekang ▪ Gowa ▪ Kepulauan Selayar ▪ Luwu Timur ▪ Luwu Utara ▪ Maros ▪ Pangkajene & Kepulauan ▪ Pinrang ▪ Soppeng ▪ Tana Toraja ▪ Toraja Utara ▪ Palopo City	▪ Bantaeng ▪ Sidenreng Rappang ▪ Takalar ▪ Makassar City
24	Central Sulawesi	▪ Buol ▪ Morowali Utara	▪ Banggai ▪ Donggala ▪ Morowali ▪ Tojo Una-Una ▪ Toli-Toli	▪ Parigi Moutong ▪ Poso ▪ Sigi
25	Southeast Sulawesi	▪ Bombana ▪ Buton Utara ▪ Kolaka Utara ▪ Konawe ▪ Konawe Utara	▪ Buton ▪ Kolaka ▪ Kolaka Timur ▪ Konawe Selatan	



No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
26	North Sulawesi	▪ Bolaang Mongondow Timur ▪ Minahasa ▪ Minahasa Tenggara	▪ Bolaang Mongondow ▪ Bolaang Mongondow Selatan ▪ Minahasa Selatan	▪ Bolaang Mongondow Utara ▪ Minahasa Utara ▪ Kotamobagu City
27	West Nusa Tenggara	▪ Lombok Barat ▪ Lombok Tengah ▪ Lombok Timur ▪ Sumbawa ▪ Sumbawa Barat	▪ Bima ▪ Dompu ▪ Lombok Utara ▪ Mataram City	Bima City
28	East Nusa Tenggara	▪ Belu ▪ Ende ▪ Malaka ▪ Manggarai Barat ▪ Manggarai Timur ▪ Timor Tengah Selatan	▪ Kupang ▪ Manggarai ▪ Nagekeo ▪ Rote Ndao ▪ Sabu Raijua ▪ Sikka ▪ Sumba Barat ▪ Sumba Barat Daya ▪ Sumba Tengah ▪ Sumba Timur	▪ Ngada ▪ Timor Tengah Utara
29	Maluku	Maluku Tengah	▪ Buru ▪ Seram Bagian Timur	
30	North Maluku		▪ Halmahera Timur ▪ Halmahera Utara	Pulau Morotai
31	Papua	▪ Merauke ▪ Nabire		
32	West Papua	▪ Manokwari ▪ Sorong		

Lists of Action for Climate Resilience in Agricultural Sector

The climate resilience actions of the Agricultural Sector are focusing on managing the climate change impact on crop production, especially rice. The changing climate, both temperature rise, and rainfall changes affect the crop physiology which leads to a decrease in rice production. The decrease in rice production also can be caused by drought, flood, and plant disturbing organisms. Climate resilience actions will be implemented through the provision of crop water use, flood control in rice fields, and other actions such as Climate Smart Agriculture to support production stability and food security. The detailed actions might be seen in **Table 5.2.**

Table 5.2 List of Climate Resilience Actions for Agricultural Sector

Main Activity Supporting Activity

Action Group	Action	Output	Benefit	Implementer
MAIN ACTIVITY				
The provision of structures for collecting irrigation water	The construction of dams, reservoirs, and detention-retention ponds for agricultural irrigation	Dams, reservoirs, and detention-retention ponds	Increasing rainwater storage and runoff, which can be used to irrigate rice fields and fields, prevent drought, and control flooding in the fields	MoPWH
	Rainwater harvesting through integrated small reservoirs around the agricultural lands for irrigation	Integrated small reservoirs	Increasing rainwater storage and runoff around the agricultural lands, which can be used for irrigation and flood control	▪ MoPWH ▪ MoA
	The rehabilitation of dams/ reservoirs, and other water storage structures for irrigation	The rehabilitated dams/ reservoirs, and other water storage structures	Increasing the function of the damaged or inadequate water storage structures to meet the irrigation water availability	MoPWH

Action Group	Action	Output	Benefit	Implementer
The provision of irrigation networks	The development of tertiary irrigation networks in the agricultural lands	Tertiary irrigation networks	Evenly distributing irrigation water to all agricultural lands	▪ MoPWH ▪ MoA
	The new construction or modification of irrigation systems into piped irrigation, drip irrigation, and sprinklers	The irrigation of pipes, drip irrigation and sprinklers	Increasing the efficiency of irrigation networks by reducing the rate of evaporation, water absorption by the soil, and can be directly flowed to the agricultural lands in need, as well as saving water through watering according to the needs	MoA
	The rehabilitation and maintenance of irrigation networks	The rehabilitated and maintained irrigation networks	The increased function of the damaged and not optimal irrigation networks to drain (flow) water to the agricultural lands	▪ MoPWH ▪ MoA
The application of technology to increase irrigation water discharge	The application of weather modification technology to prevent drought and flooding on the agricultural lands	The applied weather modification technology	Preventing drought and floods by diverting rainfall to the drought areas, so as to avoid crop failure	▪ MoA ▪ BPPT
The provision of flood protection buildings	The restoration and construction of polders in the paddy fields	Paddy polders	Protecting rice fields from flooding, thus avoiding failure	▪ MoPWH ▪ MoA
	The construction of river embankments around the agricultural lands to prevent flood overflow	River embankments	Holding the river overflow when there is high rainfall; so as not to flood the agricultural lands	MoPWH

Action Group	Action	Output	Benefit	Implementer
Penyediaan Sarana pertanian adaptif	The provision of superior plant seeds which have high productivity and are resistant to climate and OPT stresses	The disseminated superior plant seeds	Facilitating farmers in accessing superior seeds to increase agricultural productivity	MoA
	The provision of organic fertilizers	The disseminated organic fertilizer	Facilitating farmers in accessing organic fertilizers needed to increase agricultural productivity	MoA
	The provision of pest and OPT control	The disseminated pest and plant diseases control	Facilitating farmers in accessing pest and plat diseases control to avoid crop failure by pests and plant diseases	MoA
	The provision of modern agricultural machinery and tools which streamline the production process (e.g. moisture and nutrient level sensors for automated watering and fertilization, multi-function tractors)	The disseminated agricultural tools and machineries	Facilitating farmers in accessing agricultural equipment and machinery which can streamline the agricultural production process	MoA
The expansion of agricultural land	The establishment of new rice fields on unproductive lands	New agricultural lands	Increasing agricultural production processes through agricultural extensification in the new paddy fields which can be cultivated by farmers, without changing the function of forest	MoA

Action Group	Action	Output	Benefit	Implementer
SUPPORTING ACTIVITY				
The research and development of agricultural technology	The development of superior crop varieties that are resistant to climate and OPT stresses	Superior plant varieties that are resistant to climate and plant diseases	Increasing agricultural productivity and avoiding crop failure by planting superior seeds that are more resistant to climate and plat diseases	▪ MoA ▪ BPPT ▪ LIPI
	The development of a planting calendar adjustment system which considers climate change	Planting calendar system	Can be used as a reference for adjusting planting times to changes in weather and climate, so as to avoid planting and harvesting failure	▪ MoA ▪ BMKG
	The modeling of water balance and plant nutrition on the agricultural lands and the development of geographic information systems for the distribution points of nutrient and water	Water balance and plant nutrition models, and geographic information systems for the distribution points of nutrients and water	Can be used as a reference to determine appropriate watering and fertilization for the agricultural lands, as well as the location	MoA
	The development of efficient agricultural equipment and machinery for agricultural production processes	New agricultural equipment and machinery	Increasing the efficiency of agricultural production processes, facilitating farmer activities during planting and harvesting, as well as shortening the production time	MoA

Action Group	Action	Output	Benefit	Implementer
The development of agricultural information system	The development of an integrated agricultural information system application	Integrated agricultural information system application	Facilitating access to data and information needed by farmers related to weather, climate, and other needs in the agricultural process	▪ MoA ▪ BMKG ▪ BPPT ▪ LIPI
	The mapping of data and information sources to support the development of agricultural information systems	The map of data and information sources	Facilitating the collection of data and information needed for the development of an integrated agricultural system	▪ MoA ▪ CBS
	Conducting an audit of paddy fields and irrigation network performance in the context of the evaluation and inventory of land use	The audit of paddy fields and irrigation network performance	The availability of database of paddy fields and irrigation networks, as well as information on their function status, so as to facilitate the implementation of rehabilitation and repairment	MoA
The capacity building of government related to agriculture	The capacity building of central and local governments which are directly involved in agricultural management	Central and local governments which implement sustainable agricultural management	The capacity building of central and regional governments regarding sustainable agricultural management, so that they play an active role in achieving climate smart agriculture for climate resilience	MoA
	The training of officers, agricultural extension workers and agricultural institutions on the adaptation of the Agricultural Sector	Officers, agricultural extension workers and agricultural institutions who can provide assistance to farmers	The capacity building of extension officers in providing assistance for farmers in the context of adapting the Agricultural Sector	MoA

Action Group	Action	Output	Benefit	Implementer
The capacity building of community related to climate smart agriculture	The assistance and facilitation of farmers related to climate-resilient sustainable agricultural production (for example: Climate Field School)	Farmers or farmer groups participating in Climate Field School	Increasing the knowledge and ability of farmers or farmer groups in recognizing and understanding climate change which affects agriculture	▪ MoA ▪ BMKG
	An assistance to rural communities in the centers of agricultural and food production in food resilience (for example: Program Kampung Iklim, Desa Tangguh Bencana)	Rural households in the center of agricultural and food production which participate in the Program Kampung Iklim	Increasing the community's understanding in agricultural villages for adaptive climate change and managing food resilience (security)	▪ MoA ▪ MoE&F ▪ Ministry of Village, Development of Disadvantaged Regions and Transmigration
	The implementation of farmer training in using farming production applications, tools, and machinery which support precision farming and smart farming	Farmers or farmer groups who are able to use applications, and agricultural machinery	Increasing the skills of farmers or farmer groups in using applications and agricultural machinery that support precision farming and smart farming	MoA
The increased access to agricultural finance	The increasing access to agricultural business credit for poor farmers	Kredit Usaha Tani (KUT) – financial mechanism for agricultural business	Increasing access to agricultural finance for underprivileged farmers to continue the production process	MoA
	The reinforcement of Village-Owned Enterprises (BUMDes, or Badan Usaha Milik Desa) and Small and Medium Enterprises for the agricultural sector	BUMDes and agricultural SME	Expanding agricultural businesses, increasing the welfare of villages in the agricultural production centers	▪ MoCSME, ▪ Ministry of Village, Development of Disadvantaged Regions and Transmigration, ▪ MoA
	Farming protection through agricultural insurance based on weather index insurance	Climate-based agricultural insurance	Reducing farmers' losses in case of crop failure, so that they can still produce in the next planting season, and do not fall into poverty	MoA

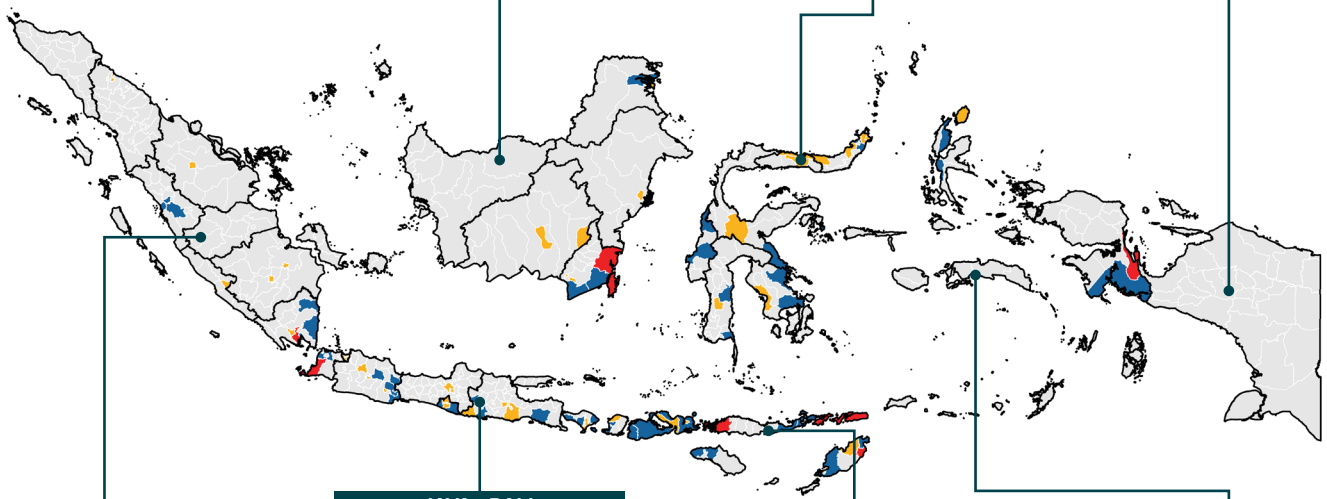
Action Group	Action	Output	Benefit	Implementer
The provision of alternative income for farmers	Training and introduction to income diversification for the farmers' families	Farming families who acquire knowledge of income diversification	Increasing the knowledge and ability of the farmer's families in generating side income/additional income during extreme weather	▪ MoA ▪ MoCSME
	Increasing the involvement of farmers in the development/ maintenance/rehabilitation of agricultural infrastructure through labor-intensive schemes	Labor-intensive schemes for the development of agricultural facilities	Increasing the incomes of farmers through their involvement in the construction of agricultural facilities, while increasing the ownership of the developed agricultural resources	▪ MoA ▪ MoPWH

LISTS OF LOCATIONS & CLIMATE RESILIENCE ACTIONS FOR HEALTH SECTOR

6.

Priority Locations for Climate Resilience in **Health Sector**

Dengue Haemorrhagic Fever (DHF) Disease



KALIMANTAN			
Province	SP	TP	P
South Kalimantan	1	2	2
Central Kalimantan	0	0	2
East Kalimantan	0	0	1
North Kalimantan	0	1	1

SULAWESI			
Province	SP	TP	P
Gorontalo	0	1	2
West Sulawesi	0	2	0
South Sulawesi	0	2	1
Central Sulawesi	0	2	1
Southeast Sulawesi	0	2	1
North Sulawesi	0	2	5

PAPUA			
Province	SP	TP	P
West Papua	1	1	0

SUMATERA			
Province	SP	TP	P
North Sumatera	0	0	1
West Sumatera	0	2	0
South Sumatera	0	0	2
Riau	0	0	1
Bengkulu	0	0	2
Lampung	1	3	2

JAVA - BALI			
Province	SP	TP	P
Banten	1	1	0
DKI Jakarta	0	0	6
West Java	0	5	3
Central Java	0	0	1
East Java	0	3	2
DI Yogyakarta	0	2	2
Bali	0	4	2

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	0	4	3
East Nusa Tenggara	4	6	2

MALUKU			
Province	SP	TP	P
Maluku	0	0	1
North Maluku	0	2	1

Note:
- Super Priority
- Top Priority
- Priority

Figure 6.1 Map of Priority Locations of Climate Resilience for Health Sector: Dengue Haemorrhagic Fever (DHF) Disease

Table 6.1 List of Priority Locations of Climate Resilience for Health Sector: Dengue Haemorrhagic Fever (DHF) Disease

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	North Sumatera			Medan City
2	West Sumatera		▪ Padang City ▪ Solok	
3	South Sumatera			▪ Palembang City ▪ Prabumulih City
4	Riau			Pekanbaru City
5	Bengkulu			▪ Kepahiang ▪ Bengkulu City
6	Lampung	Pesawaran	▪ Lampung Timur ▪ Tulang Bawang ▪ Bandar Lampung City	▪ Pringsewu ▪ Metro City
7	Banten	Pandeglang	Serang	
8	DKI Jakarta			▪ Kepulauan Seribu ▪ Jakarta Barat City ▪ Jakarta Pusat City ▪ Jakarta Selatan City ▪ Jakarta Timur City ▪ Jakarta Utara City
9	West Java		▪ Ciamis ▪ Kuningan ▪ Pangandaran ▪ Sumedang ▪ Banjar City	▪ Purwakarta ▪ Tasikmalaya City ▪ Bandung City
10	Central Java			Semarang
11	East Java		▪ Jember ▪ Magetan ▪ Trenggalek	▪ Malang ▪ Pacitan
12	DI Yogyakarta		▪ Gunung Kidul ▪ Kulon Progo	▪ Bantul ▪ Sleman
13	Bali		▪ Jembrana ▪ Karang Asem ▪ Klungkung ▪ Tabanan	▪ Gianyar ▪ Denpasar City
14	South Kalimantan	Kotabaru	▪ Tanah Bumbu ▪ Tanah Laut	▪ Banjar Baru City ▪ Banjarmasin City
15	Central Kalimantan			▪ Barito Timur ▪ Palangkaraya City
16	East Kalimantan			Samarinda City
17	North Kalimantan		Tana Tidung	Tarakan City
18	Gorontalo		Gorontalo City	▪ Gorontalo ▪ Gorontalo Utara

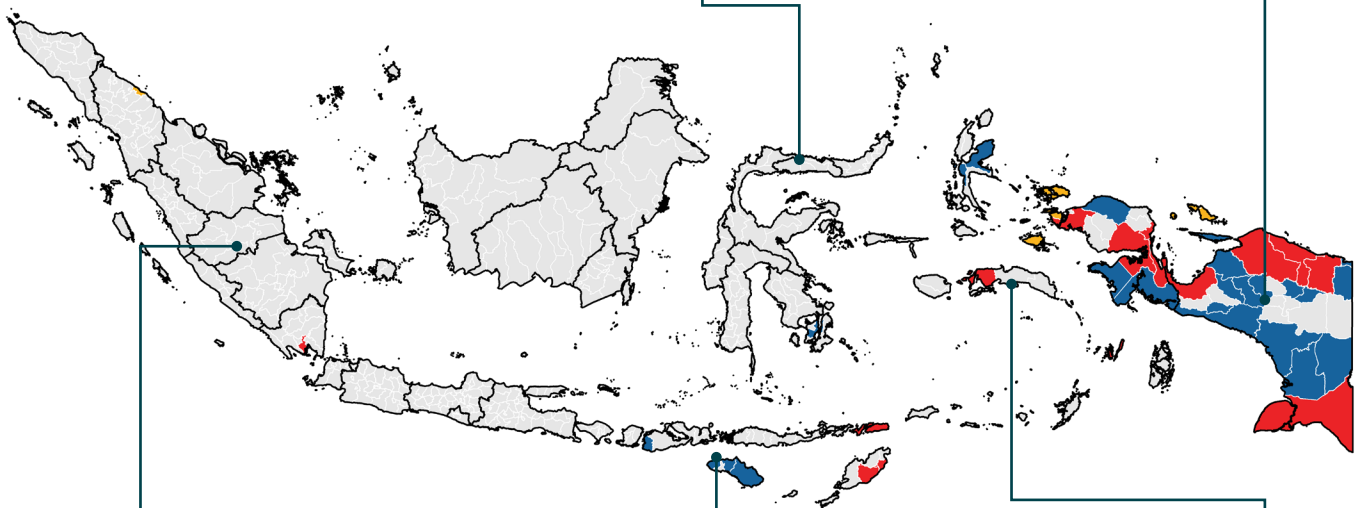
No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
19	West Sulawesi		▪ Mamuju ▪ Pasangkayu	
20	South Sulawesi		▪ Bulukumba ▪ Wajo	Soppeng
21	Central Sulawesi		▪ Banggai Laut ▪ Morowali	Poso
22	Southeast Sulawesi		▪ Konawe Selatan ▪ Konawe Utara	Kolaka
23	North Sulawesi		▪ Kepulauan Siau Tagulandang Biaro ▪ Minahasa	▪ Bolaang Mongondow Utara ▪ Minahasa Selatan ▪ Minahasa Utara ▪ Bitung City ▪ Manado City
24	West Nusa Tenggara		▪ Bima ▪ Lombok Barat ▪ Sumbawa ▪ Sumbawa Barat	▪ Dompu ▪ Lombok Utara ▪ Bima City
25	East Nusa Tenggara	▪ Alor ▪ Lembata ▪ Malaka ▪ Manggarai Barat	▪ Belu ▪ Flores Timur ▪ Kupang ▪ Sikka ▪ Sumba Barat Daya ▪ Sumba Tengah	▪ Timor Tengah Utara ▪ Kupang City
26	Maluku			Ambon City
27	North Maluku		▪ Halmahera Utara ▪ Tidore Kepulauan City	Pulau Morotai
28	West Papua	Teluk Wondama	Kaimana	

Priority Locations for Climate Resilience in Health Sector

Malaria Disease

SULAWESI			
Province	SP	TP	P
Sulawesi Southeast	0	1	0

PAPUA			
Province	SP	TP	P
Papua	5	14	2
West Papua	4	3	1



Note:
- Super Priority
- Top Priority
- Priority

SUMATERA			
Province	SP	TP	P
North Sumatera	0	0	1
Lampung	1	0	0

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	0	1	0
East Nusa Tenggara	3	3	0

MALUKU			
Province	SP	TP	P
Maluku	2	0	0
North Maluku	0	2	0

Figure 6.2 Map of Priority Locations of Climate Resilience for Health Sector: Malaria Disease

Table 6.2 List of Priority Locations of Climate Resilience for Health Sector: Malaria Disease

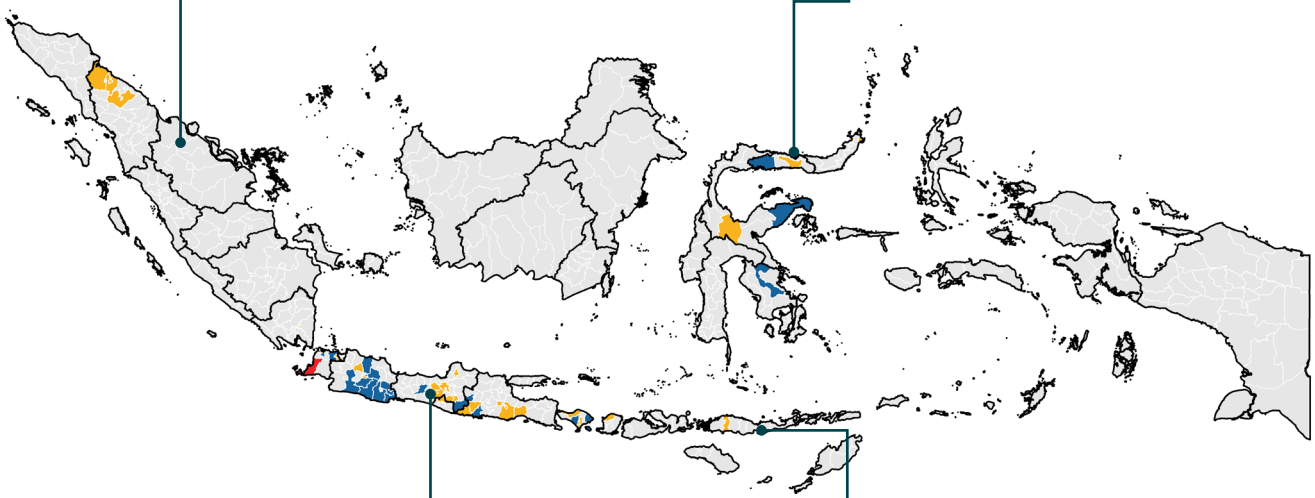
No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	North Sumatera			Batu Bara
2	Lampung	Pesawaran		
3	Southeast Sulawesi		Muna	
4	West Nusa Tenggara		Sumbawa Barat	
5	East Nusa Tenggara	▪ Alor ▪ Malaka ▪ Timor Tengah Selatan	▪ Sumba Barat Daya ▪ Sumba Tengah ▪ Sumba Timur	
6	Maluku	▪ Maluku Tenggara ▪ Seram Bagian Barat		
7	Maluku Utara		▪ Halmahera Timur ▪ Tidore Kepulauan City	
8	Papua	▪ Jayapura ▪ Mamberamo Raya ▪ Merauke ▪ Nabire ▪ Sarmi	▪ Asmat ▪ Boven Digoel ▪ Deiyai ▪ Intan Jaya ▪ Keerom ▪ Kepulauan Yapen ▪ Mamberamo Tengah ▪ Mappi ▪ Mimika ▪ Puncak ▪ Puncak Jaya ▪ Waropen ▪ Yalimo ▪ Jayapura City	▪ Biak Numfor ▪ Supiori
9	West Papua	▪ Manokwari Selatan ▪ Sorong ▪ Teluk Bintuni ▪ Teluk Wondama	▪ Fak Fak ▪ Kaimana ▪ Tambrauw	Raja Ampat

Priority Locations for Climate Resilience in Health Sector

Pneumonia Disease

SUMATERA			
Province	SP	TP	P
North Sumatera	0	0	5
Lampung	0	0	1

SULAWESI			
Province	SP	TP	P
Gorontalo	0	2	1
Central Sulawesi	0	1	1
Southeast Sulawesi	0	1	0
North Sulawesi	0	0	2



JAVA - BALI			
Province	SP	TP	P
Banten	1	3	2
West Java	0	9	4
Central Java	0	2	6
East Java	0	2	5
DI Yogyakarta	0	0	1
Bali	0	3	4

NUSA TENGGARA			
Province	SP	TP	P
West Nusa Tenggara	0	0	1
East Nusa Tenggara	0	0	1

Note:
- Super Priority
- Top Priority
- Priority

Figure 6.3 Map of Priority Locations of Climate Resilience for Health Sector: Pneumonia Disease

Table 6.3 List of Priority Locations of Climate Resilience for Health Sector: Pneumonia Disease

No	Province	Priority Locations of Climate Resilience (Regency/City)		
		Super Priority	Top Priority	Priority
1	North Sumatera			▪ Deli Serdang ▪ Langkat ▪ Simalungun ▪ Medan City ▪ Pematang Siantar City
2	Lampung			Metro City
3	Banten	Pandeglang	▪ Tangerang ▪ Cilegon City ▪ Serang City	▪ Tangerang City ▪ Tangerang Selatan City
4	West Java		▪ Bandung ▪ Ciamis ▪ Cianjur ▪ Garut ▪ Pangandaran ▪ Subang ▪ Sumedang ▪ Tasikmalaya ▪ Banjar City	▪ Purwakarta ▪ Kota Cimahi ▪ Sukabumi City ▪ Bandung City
5	Central Java		▪ Banjarnegara ▪ Wonogiri	▪ Klaten ▪ Kudus ▪ Magelang ▪ Semarang ▪ Sukoharjo ▪ Temanggung
6	East Java		▪ Magetan ▪ Trenggalek	▪ Lumajang ▪ Malang ▪ Pacitan ▪ Ponorogo ▪ Malang City
7	DI Yogyakarta			Sleman
8	Bali		▪ Karang Asem ▪ Klungkung ▪ Tabanan	▪ Badung ▪ Buleleng ▪ Gianyar ▪ Denpasar City
9	Gorontalo		▪ Pohuwato ▪ Gorontalo City	Gorontalo
10	Central Sulawesi		Banggai	Poso
11	Southeast Sulawesi		Konawe	
12	North Sulawesi			▪ Bitung City ▪ Manado City
13	West Nusa Tenggara			Lombok Utara
14	East Nusa Tenggara			Manggarai

Lists of Action for Climate Resilience in Health Sector

The climate resilience actions of the Health Sector focus on preventing and controlling the outbreaks caused by climate-sensitive diseases: Dengue Haemorrhagic Fever (DHF), malaria, and pneumonia. Climate resilience actions will be implemented through improving health facilities and services, preventing and controlling disease outbreaks, and other actions under the framework of environment and public health. The detailed actions might be seen in **Table 6.4.**

Table 6.4 List of Climate Resilience Actions for Health Sector

Main Activity Supporting Activity

Action Group	Action	Output	Benefit	Implementer
MAIN ACTIVITY				
The addition of health facilities	The capacity building of health facilities (hospitals, community health centers, public clinics, etc.)	The increased health facility capacity	Increasing public access to the health facilities, so that they can fulfill comprehensive health services	MoH
	The construction of micro-scale health service centers in the residential areas (Integrated Helath Service Center, Integrated Foster Center, etc.)	Micro-scale health service centers	Increasing equitable access to health services to the remote settlements which are less accessible	MoH

Action Group	Action	Output	Benefit	Implementer
The improvement of residential environmental health	The construction of integrated residential areas which are in harmony with nature and taking into account the aspects of climate change	Integrated residential areas which are in harmony with nature and taking into account the aspects of climate change	Increasing the environmental health of residential areas	▪ MoPWH ▪ MoAASP/NLA
	The construction of sanitation facilities and infrastructure in the settlements	Sanitation facilities and infrastructure	Increasing environmental hygiene and public health in the residential areas	MoPWH
	The construction of clean water facilities and infrastructure	Clean water facilities and infrastructure	Increasing access to clean water to meet needs and maintain public health	MoPWH
	The utilization of simple technology to prevent the development of mosquito larvae	Simple affordable technology which can prevent the development of mosquito populations	Increasing access to disease prevention and the protection of public health, especially for the less fortunate; in addition, also training the independence of the society	MoH

Action Group	Action	Output	Benefit	Implementer
SUPPORTING ACTIVITY				
The increased early detection of disease outbreaks	The development of health biomonitoring tools for diseases caused by climate change	Health biomonitoring tools	Increasing the process of early detection of disease occurrences in the community, preventing disease outbreaks	MoH
	The development of disease vulnerability models	Disease vulnerability models	Increasing knowledge regarding regional vulnerability to disease, so that more efficient outbreak prevention and disease risk management can be carried out	MoH
	The increased quality of laboratory examination equipment, especially for DHF, malaria, and pneumonia	Specific laboratory Equipment	Increasing the accuracy of the better laboratory examinations	MoH
The development of health information system	The development of information and early warning systems for climate-based diseases	Information system and early warning system for climate-related disease	Increasing access to the information and public awareness of disease outbreaks	▪ BMKG ▪ MoH
	The mapping of data and information needed for developing an integrated health system	Map of data and information of dengue, malaria and pneumonia	Increasing the quality of data and information which can be accessed by the public, so that the efforts to prevent disease outbreaks can be maximized	MoH

Action Group	Action	Output	Benefit	Implementer
The capacity building of government related to health	An assistance to central and local governments (National, Provincial, Regency/City) for the preparation of response maps for climate-related disease outbreaks and their actions	Disease response map and the implemented action	Improve the understanding of central and local governments in mapping disease outbreaks and planning appropriate responses	MoH
	The training of health extension workers on climate risks in the Health Sector	Health extension workers who can provide services to patients affected by climate change	The capacity building of the health officers, extension workers and institutions to prevent disease outbreaks, especially those caused by climate change	MoH
The capacity building of community related to the prevention of disease outbreaks	The socialization of the prevention and control of vector diseases in potentially endemic areas (for example Climate Healthy Village Program)	Households participating in the Climate Healthy Village Program	Increasing the community's understanding regarding the spread and control of disease, thereby increasing the awareness and preparedness of disease outbreaks control in potentially endemic areas	▪ MoH ▪ BNPB
	Early education about the impact of climate change on health and the environment	Student age citizen who have knowledge of the impacts of climate change on health and the environment	Increasing the understanding of young people to be more aware of the impacts of climate change in the Health Sector	MoEC
	The implementation of health crisis simulations	Implemented health crisis simulations	Increasing the community's preparedness in case of disease outbreaks	MoH
	The implementation of community-based disease prevention and control by utilizing natural resources and local wisdom	Community-based disease prevention and control (for example Community-based Total Sanitation, and Disaster Preparedness Villages)	Increasing the active role of the community in easier, environmentally friendly, and affordable disease prevention and control to the community	▪ MoH ▪ MoSA ▪ BNPB

Action Group	Action	Output	Benefit	Implementer
The reinforcement of health regulations	The supervision of the implementation of building and structure's health standards	Building standards which meet environmental and community health	Increasing the number of buildings and structures in accordance with the health standards	MoH
	The supervision of minimum service standards (MSS) for health services	MSS standards for health services	Increasing MSS for health services according to standards, which is beneficial in improving environmental and community health	MoH
Health financing	The provision of community assistance for access to health service financing	Assistance for access to health services and subsidies for health financing	Increasing access to public health services, especially for the disadvantaged communities	MoH

FIELD VALIDATION FOR CLIMATE RESILIENCE PRIORITY LOCATIONS

7.

East Nusa Tenggara
Province

1

2

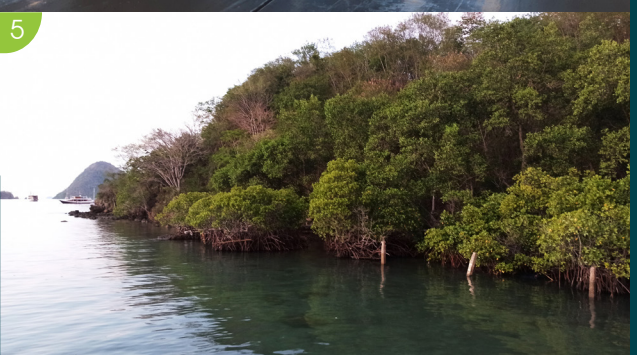
Photo caption

1. *Fishermen's boats in Nagalili Village, South Lembor Subdistrict.*
2. *Agricultural land in Lembor Subdistrict.*
3. *Settlements of fishing village in Labuan Bajo Subdistrict.*
4. *Discussion on climate resilience issues in Bappeda of West Manggarai District.*
5. *Mangrove cover in Labuan Bajo Subdistrict.*

3

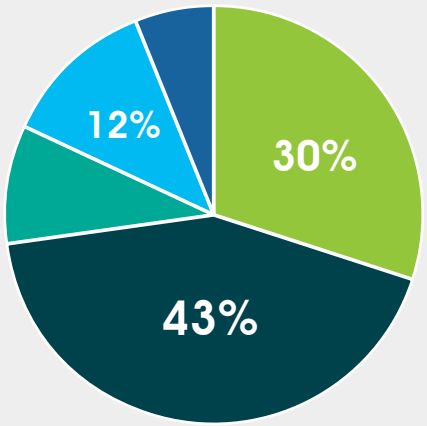
4

5



Fact

Hydrometeorological Disaster 1990-2019



Source: BNPB, 2020

The average temperature in 1981-2016 in Eltari Kupang Station shows an increase from ± 26.8°C to ± 27.6°C.

(BMKG in RAN API Review, 2018)

28% of the **GRDP** of East Nusa Tenggara Province in 2019 was contributed from climate affected sectors such as agriculture, forestry, and fishery.

(BPS, 2020)

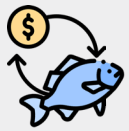
The trend in fraction of **extreme rainfall** is observed to decrease in Eltari Kupang Station.

(BMKG in RAN API Review, 2018)

The main **drinking water resources** is water springs which accessible by 31.6% of households.

Issue

The fishing boats are transforming into tourist transport because of the massive tourism development (Labuan Bajo Subdistrict).



The capture fishery production is low due to the small capacity of the fishing boats (<10 GT) and small fishermen are still using barter system (South Lembor Subdistrict).

The accesibility to drinking water is low (15% in West Manggarai District).

The settlements in coastal area are mostly nonpermanent buildings (Labuan Bajo and Boleng Subdistrict).

- Not all farmers use agricultural machinery and the use has not been optimized (Lembor Subdistrict).
- The rainfed rice field can only produce once a year as the irrigation and water supply are limited.

The hygine management issue needs to be strengthen to increase the environmental health (Labuan Bajo Subdistrict).

Recommendation

Responding the facts and issues as well as the effort of climate resilience development, the interventions for East Nusa Tenggara Province are:

Considering the farmers' well-being and capacity building by:

- Providing training on effective and efficient sustainable agriculture to meets the quantity and quality tourism standards (increase cash flow).
- Increasing the financial access and agricultural insurance.

Considering the fishermen's well-being and capacity building by:

- Providing alternative livelihood.
- Increasing the fishery capacity, such as fishing boat program, fishing gear, insurance, and others.

Increasing the climate resilience with infrastructure development and management by:

- Building pond, irrigation, and supporting infrastructure for catchment area management.
- Building irrigation system for rainfed rice field in coastal area.
- Providing boats support with >10GT capacity and agricultural machinery to improve production efficiency.

North Sulawesi
Province

1

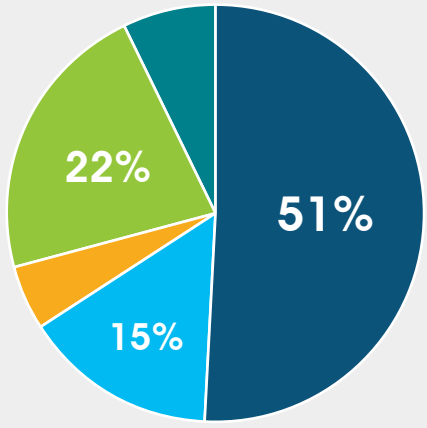
2

Photo caption

1. *Fishing boats in Tombariri Subdistrict.*
2. *Rainfed rice field in East Tondano Subdistrict.*
3. *Discussion on climate resilience issues in Bappelitbangda of Minahasa District.*
4. *Discussion on climate resilience issues in Bapelitbang of North Minahasa District.*
5. *Wave height data survey in BMKG Maritim, Bitung City.*

Fact

Hydrometeorological Disaster 1990-2019



Source: BNPB, 2020

The average temperature in 1981-2016 in Samratulangi Station shows an increase from ± 26°C to ± 27.5°C.
(BMKG in RAN API Review, 2018)

21% of the **GRDP** of North Sulawesi Province in 2019 was contributed from climate affected sectors such as agriculture, forestry, and fishery.
(BPS, 2020)

The trend in fraction of **extreme rainfall** is observed to increase in Samratulangi Station.
(BMKG in RAN API Review, 2018)

The North Sulawesi waters has **wave height** varies with 3m is the highest.
(BMKG Maritim, 2019)

Issue

The facilities and infrastructures for rainfed rice field irrigation are minimal in Minahasa and North Minahasa District.

Most of fishermen are not well-informed about climate change and its impact to the marine activities including capture fishery.

The early warning system from BMKG is not well-informed due to limited internet access and few smartphone users (Tombariri Subdistrict).

The farmers' access to agricultural insurance and sosial security is still low (East Tondano Subdistrict).

- The coastal inundation occurs in several villages in North Minahasa District.
- The mangrove area decreases significantly in the islands and Tombariri Subdistrict.

The fogging activity is not yet optimized for handling DHF outbreak in Minahasa District.

Recommendation

Responding the facts and issues as well as the effort of climate resilience development, the interventions for North Sulawesi Province are:

Increasing climate resilience with infrastructure development and management by:

- Building effective and efficient pond and irrigation to increase agricultural productivity.
- Providing infrastructure/ vegetation to protect the coast.

Increasing farmers' and fishermen's well-being by:

- Increasing the implementation of *Sekolah Lapang Cuaca* for fishermen.
- Increasing the financial access for farmers, particularly farming protection through agricultural insurance.

Increasing the environment and community health by:
Increasing the early detection of disease and outbreak as well as disease management.

Aceh
Province

1

2

Photo caption

1. *Observation in Samudera Lampulo fishing port, Banda Aceh City.*
2. *Rainfed rice field in Padang Tiji Subdistrict.*
3. *Discussion on climate resilience issues in Bappeda of Aceh Province.*
4. *Discussion on climate resilience issues in Bappeda of Pidie District.*
5. *Settlements affected by abrasion in Kembang Tanjong Subdistrict.*

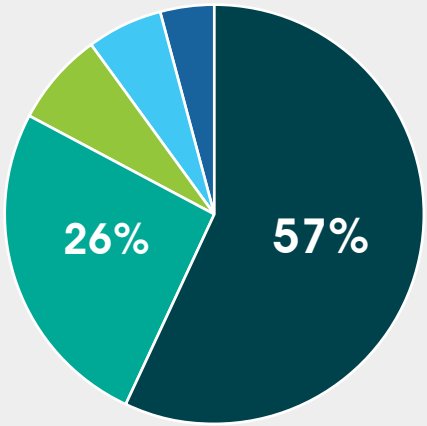
3

4

5

Fact

Hydrometeorological Disaster 1990-2019



Note:
- Flood
- Strong Wind
- Drought
- Landslide
- Surge

Source: BNPB, 2020

The average temperature in 1981-2016 in Meulaboh Station shows an increase from ± 26°C to ± 27°C.
(BMKG in RAN API Review, 2018)

The trend in fraction of **extreme rainfall** is observed to increase in Meulaboh Station.
(BMKG in RAN API Review, 2018)

30% of the **GRDP** of Aceh Province in 2019 was contributed from climate affected sectors such as agriculture, forestry, and fishery.
(BPS, 2020)

The Sedimentation from post-tsunami 2004 blocks the passage of fishermen in several rivers.

The Aceh Green is one of the 15 strategic programs in RPJMD 2017-2022 of "Aceh Hebat" development vision.

Issue

The extreme weather during west monsoon also affects the marine activities, even for boats with capacity >10 GT are affected, thus the fish production decrease and the price increase 2 times (PPI Samudera Lampulo, Kuta Alam Subdistrict).

The low water availability, minimal irrigation system, and dry land characteristic cause the rice field can only produce rice once in a year (Padang Tiji Subdistrict).

The river silting exacerbated by high water discharge causing floods during rain season, but dry during dry season (Tiro Catchment, Kembang Tanjong Subdistrict).

The settlements near the coastlines are mostly affected by abrasion and inundation (Kembang Tanjong Subdistrict).

Recommendation

Responding the facts and issues as well as the effort of climate resilience development, the interventions for Aceh Province are:

Managing land use change and upstream by:

- Managing peatlands and controlling land use change from peatlands into plantations.
- Rehabilitating peatlands and critical lands as well as upstream conservation to avoid floods and prevent drought in agricultural land and settlements.

Considering the fishermen's well being and capacity by:

- Providing alternative livelihoods.
- Providing livable settlements and increasing the fishery capacity such as fishing boat program, fishing gear, insurance, and others.

Increasing climate resilience & infrastructure development and management by:

- Coastal planning based on coastal vulnerability and RZWP3K to consider the distance between buildings and coastline.
- Building sea wall to protect the vulnerable settlements.
- Building pond, irrigation, and supporting infrastructure for catchment area management.
- Building river embankment and flood gate.

CONCLUSION

8.

The Government of Indonesia is committed to increasing climate resilience. In its planning aspect, the climate-resilient developed by the Ministry of National Development Planning shows consistency and seriousness. Establishing disaster and climate resilience as one of the national priorities is an endeavour that requires collaboration among Ministries/Agencies. The following step is how the Climate Resilience Development can be mainstream into the Strategic Plan and Work Plan of Ministries/Agencies. Improvement of the policies and implementation of the national climate resilience actions require intensive coordination and active involvement of all development elements, such as the private sectors, development partners, academia, NGOs, and the community.

The limitations of this book:

1. Field validation has not been performed optimally due to pandemic COVID-19.
2. The data and information used are at the national scope, so it is necessary to deepen the analysis with field data.

6 Books Published

by **the Climate Resilience Team of the Ministry of National Development Planning/Bappenas**

Book 1
List of Priority Locations and Climate Resilience Actions

Book 2
Institutional Arrangement for Climate Resilience

Book 3
The Roles of Non-State Actors in Climate Resilience

Book 4
Funding for Climate Resilience

Book 5
Monitoring, Evaluation, and Reporting of Climate Resilience Actions in the Framework of National Development Planning

Executive Summary
Climate Resilience Development Policy

BOOK 1

LIST OF PRIORITY LOCATIONS & CLIMATE RESILIENCE ACTIONS

Kementerian PPN/ Bappenas

LOW CARBON DEVELOPMENT INDONESIA

Ministry of National Development Planning/Bappenas
Jl. Taman Suropati No.2 Jakarta, 10310
Phone: (+62 21) 3193 6207

lcdi-indonesia.id
lcdi.id @lcdi.id @LCDI_Indonesia
Low Carbon Development Indonesia