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Marine Spatial Allocations of the Coastal and Small Islands Zoning Plan in West Sumatera Province

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ABSTRACT: The Coastal and Small Islands Zoning Plan (RZWP3K) is a plan that determines the direction of utilization of the resources of each planning unit is accompanied by the determination of the structure and spatial patterns in the planning regions. The purpose of this research is to analyze the marine spatial allocations and utilization arrangement of RZWP3K in West Sumatra Province. The research method used is the analysis of environmental suitability criteria is done through the procedures of Geographic Information System (GIS) in the form of overlap parameters biophysical of coastal/marine waters. Spatial utilization arrangements are based on the procedure for the preparation of the RZWP3K and the Minister of Marine and Fisheries regulations of the Republic of Indonesia (Permen KP) No. 23/2016. Results of the analysis of the RZWP3K in West Sumatra Province divided into 4 regions, i.e general utilization, conservation, certain national strategic, and cruise groove. General utilization (3,041.610, 20 ha) consist of tourism, port, capture fisheries, aquaculture, mangrove, industrial, public facility, and other utilization. Conservation (196,905.34 ha) consist of conservation of waters, coastal, and small islands. Certain national strategic regions (331,683.99 ha) consist of defence and security zones. RZWP3K are important documents of the Provincial Government in Indonesia as the basis for the business permit granting in waters (marine).

Keywords: *marine, spatial, coastal, small islands, West Sumatra*

1. INTRODUCTION

West Sumatera Province is located on the west coast of Sumatra Island on the coordinates 0°54'–3°30' south latitude and 98°36'–101°53' east longitude. Bordered in the Eastside with Riau Province and Jambi province, Westside with the Indian Ocean, Northside to North Sumatera Province, and Southside to Bengkulu province. West Sumatera Province has 19 regencies/cities, Where 7 regencies/cities have coastal regions and small islands, i.e Mentawai Islands Regency, Pesisir Selatan Regency, Padang Pariaman Regency, Agam Regency, Pasaman Barat Regency, Padang City, and Pariaman City.

West Sumatera Province has an area of seawater ± 186.580 km², territorial zone 57.880 km², exclusive economic zone 128.700 km², coastline length 2.312.71 Km, 185 small islands, and has a complete coastal ecosystem consisting of coral reefs (39,619.42 ha), mangrove (20,120.71 ha) and seagrass (394.94 ha). Where three (3) outlying islands as the national boundary and defence areas are Sibarubaru Island, North Pagai Island and Niau Island in Mentawai Islands Regency [1].

In the context of the marine spatial utilization and the basis for investment permits in the field of

marine and fisheries in the sea waters of West Sumatra Province, it is necessary to have RZWP3K. RZWP3K is very important to prevent conflicts in the use of sea space between existing stakeholders [2, 3] in accordance with the Law of the Republic of Indonesia No. 27/2007 on the Management of Coastal Region and Small Islands. The zoning planning is a plan that determines the utilization allocation of the resources of each plans unit accompanied by the determination of the structure and pattern of space in the planning regions that contains the activities that can be done and not do and that can only be done after receiving permission. RZWP3K is divided into 4 regions, i.e the general utilization, conservation, certain national strategic, and cruise groove [4], where its use/utilization is agreed together between various stakeholders and has been assigned its legal status [5]. According to [6, 7] the marine zoning in China has been integrated with its territorial layout and is an important basis for the development, arrangement and management of marine spatial, marine environmental protection and economic development of its economy.

Potential resources of coastal waters and small Islands in West Sumatra Province is very large, generally utilized for capture fisheries,

aquaculture fisheries, marine tourism, seaports, conservation, cruise groove, defence and security. As for the purpose of this research is to analyze the marine spatial allocations and utilization arrangement of RZWP3K in West Sumatra Province.

2. RESEARCH METHOD

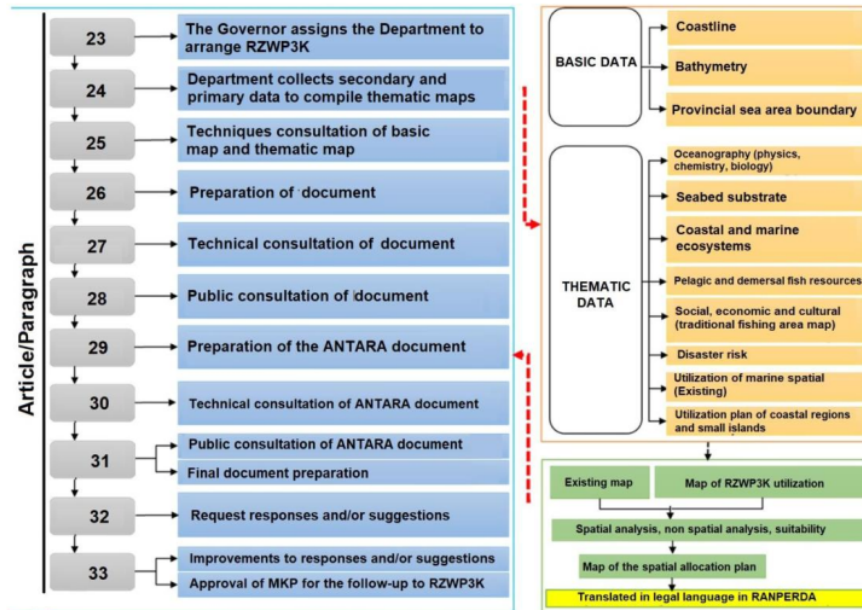


Fig 1. Stages of the preparation RZWP3K

The collected data i.e 1) primary data from observation, interviews, focus discussion Group, questionnaire, and field survey; and 2) Secondary data derived from Indonesian Institute of Sciences (LIPI), Agency of Geospatial Information (BIG), Ministry of Marine and Fisheries (KKP), Agency for the Assessment and Application of Technology (BPPT), Center of Coastal and Marine Resource Management (BPSPL) Padang, Report Work Unit of Regional Apparatus (SKPD) of West Sumatra Provincial Government, the document of Spatial plans (RTRW) West Sumatera (Provinces/Regencies/Cities), and Aqua Modis satellite Data 2010-2015. Base map derived from Indonesia Beach environmental Map BIG scale 1:50,000 and 1:250,000, map of "Rupa Bumi Indonesia" scale 1:50,000, map of Hydrographic and Oceanography from Pushidros the Indonesian Navy (TNI AL), and map of seafloor sediment from the Center for Marine Geology Research and Development (P3GL) Bandung.

Stages of the preparation of the RZWP3K based on the Guidebook for the Procedure for Preparing

fishery ports, marine The research location is the sea waters of West Sumatra Province 0 -12 nautical miles measured from the coast at the used is a descriptive method describing the characteristics of the population or the phenomenon being researched [9, 10]. Where the stages of preparing RZWP3K are described in Fig. 1 below.

the RZWP3K [11] and Permen KP No. 23/2016 concerning Management of coastal regions and small islands [12]. The stages of the preparation of RZWP3K can be seen in Fig. 1. Where the RZWP3K Documents data analysis uses the spatial analysis, non-spatial analysis, and land suitability criteria from the socio-economic, cultural, and biophysical data of coastal waters and small islands in the West Sumatra region. Analysis of environmental suitability criteria is done through the procedures of GIS in the form of overlap parameters biophysical of coastal/marine waters. The spatial utilization arrangements are based on the procedure for the preparation of the RZWP3K and Permen KP No. 23/2016 [11, 12]. The results of the formulation of zoning and allocation for spatial utilization (map) are carried out based on public consultations and suggestions from the Ministries/Institutions concerned in Jakarta. The last stage is the Governor sends a draft document, map and draft Regional Regulation (Perda) concerning RZWP3K for approval by the Minister of Marine and Fisheries (KKP).

3. RESULTS AND DISCUSSION

3.1 General utilization

General utilization regions are part of a coastal area that is defined for various sectors of activities equal to the cultivation area in the Law No 26/2007 on spatial arrangement [12]. General utilization regions (in RZWP3K) is divided into 8 zones, i.e tourism, port, capture fisheries, aquaculture, mangrove, industrial, general facilities, and other utilization.

Marine tourism zones is an zone used to enjoy the biophysical views of the beauty of the sea waters. Marine tourism sub-zone is divided into 3 zones, i.e the zone of beach/coastal and small islands (2,046.01 ha), underwater nature tourism (4,439.68 ha), and water sports tourism (502.14 ha) (Fig 2 and Tabel 1). All regencies and cities in West Sumatera Province have great potential in marine tourism development. Marine tourism is one type of special interest tourism whose activities are related to water [13 - 15]. According to [16, 17] that environmental suitability is defined as the match level for certain purposes with geomorphological and biological approaches.

Port zones is a zones used by marine port and fishery port activities. The port zone is divided into 2 sub-zones i.e Working Environment (DLKr), Environmental Interests (DLKp) (7,995.39 ha), Working and Operating Area of Fisheries Port (WKOPP) 360.38 ha. In the seaport known as the DLKr are the waters and lands of the port used directly for port activities [18]. DLKp is the waters surrounding the DLKr of the port waters used to ensure the safety of the cruise. At the fishing port are known terms of WKOPP. A working area is a place consisting of the waters and lands that are used directly for the activities of the fishing port, the operating area of fisheries harbour is a place consisting of the waters and lands that directly affect the operation of the fishery port. [19] explain that the DLKr waters are used for a cruise, anchored, ship to ship areas, port fields for sanding areas, and boat movements (playfields), driving areas, and other activities as required. While DLKp waters are used for emergency purposes such as the ship caught fire or the ship leaked, placement of dead vessels, waters for sailing vessel experiments, vessels as well as repair facilities or vessel maintenance, and for the development of long-term ports.

Capture fishery zones are the most extensive in West Sumatera Province. Capture fisheries zone is divided into the demersal pelagic fisheries sub-zone (697,332.85 ha), and the pelagic fisheries sub-zone (2,299,624.45 ha). Demersal pelagic fisheries sub-zone is the catching area for base fish, and surface fish with a depth of 0-100 m.

While the pelagic fisheries sub-zone is a fishing area that lives underwater, generally waters with a depth of > 100 m [20].

Aquaculture zones is used for marine cultivation such as grouper, snapper, pearls, seaweed and others. Aquaculture zones has an area of 4,532.89 Ha. Regions that have the potential for marine cultivation are the waters of Pesisir Selatan Regency, Padang City, Pasaman Barat Regency, and Mentawai Islands Regency. Mentawai Islands Regency has the most widespread potential for marine aquaculture. The requirements for marine aquaculture i.e naturally protected, depth of 10-15 m, the brightness of 80 - 100%, sand base substrate and coral fragments, Dissolved Oxygen/DO of >5 mg/L, and salinity of 31-34. The marine aquaculture in West Sumatera Province is a floating net cage/KJA grouper fish. The marine aquaculture of grouper fish in Sungai Nipah and Sungai Nyalo (Pesisir Selatan Regency) and Sikakap (Mentawai Islands Regency) with commodities that can be cultivated in KJA is milkfish (*chanos sp*), snapper (*lutjanus sp*), grouper (*epinephelus sp*), rabbitfish fish (*siganus sp*), cake fish (*Caranx sp*), lobster (*panulirus sp*) [21-23].

Mangrove zones is a forest type zone that grows in tidal areas whose growing community is tolerant of salt content. Broad of mangrove zone is 7,331.14 ha in all Regencies/Cities in West Sumatera Province. The most widespread mangrove zone in Mentawai Islands Regency covering an area of 5,978.88 ha. According to [24 -28] that in coastal regions can be located many mangroves that grow and spread to the bay or protected from the physical influence of the waves permanently. According to [13, 29] the area that has a muddy substrate, muddy sand, sandy mud strongly supports the growth of mangrove.

Industrial zones is an activity related to the utilization of marine resources, such as the shipyard industry, the procurement, and manufacturing industry of spare parts, the ship equipment industry, and the ship maintenance industry [30]. Industrial zones is comprised of sub-zones of maritime industries destined for shipyards. Industrial (shipyard) zone has an area of 2.24 ha located at Kambang (Pesisir Selatan Regency), Padang Sarai and Sungai Pisang (Padang City), Air Bangis and Panjang Island (Pasaman Barat Regency). According [31], the shipyard is a strategic industry and future industry that is important to be grown by the government of industry as a strategic program in the sector of maritime where shipyard as the backbone in producing the necessary facilities and infrastructure of vessels until the year 2030.

Public facility zones consist of religious, education, and other public facilities. Religious sub-zone (13.91 ha) is a floating mosque building in Pariaman City and floating mosque in Carocok Painan. Education sub-zone (52.54 ha) is the waters of the Sailing education facility at West Sumatera Sailing Polytechnic in Nagari Tapakis in Padang Pariaman Regency. Other public facility sub-zones (0.92 ha) are the location of the waters for the construction of the Lolong Bridge in Padang City. Whereas for other utilization zones (17,375.66 ha) are Japanese and dutch heritage mines. The location of this water is a vast area stretching from Sinyaru Island to Bintangor Island in the waters of Padang City and Pesisir Selatan Regency. The booby trap area location must have permission from the Ministry of Defence and Security, and TNI AL.

3.2 Conservation

Conservation regions is a part of coastal and small islands that have certain characteristic as a unit of the protected ecosystem, preserved, and/or sustainably to realize the region management of coastal and small islands sustainably [32]. Conservation regions in West Sumatera Province has a broad of 196,905.34 ha that divided into water conservation, coastal conservation, and small islands. Water conservation zone in West Sumatera Province has a broad of 193,879.20 ha consisting of the water travel park Pieh Island and the surrounding sea, aquatic nature reserve of Pesisir Selatan Regency, Regional of Water Conservation (KKPD) Pariaman City, KKPD Agam Regency, KKPD Pasaman Barat Regency, and aquatic park of Selat Bunga Laut. Coastal and Small Island Conservation Regions (KKP3K)

3,026.14 ha consist of small island park of Padang City and coastal park of Batang Gasang - Padang Pariaman Regency.

3.3 Certain national strategic

Certain national strategic regions are region related to state sovereignty, environmental control, and/or world heritage sites which were developed for national interests [33]. Certain national strategic regions are divided into 331,625.90 ha of defence and security zones (divided into 58.09 ha of ammunition disposal sub-zones and 331,625.90 ha for the outer small islands, as Pagai Utara Island, Niau Island and Sibarubar Island in Mentawai Island Regency). Based on the Permen No. 68/2014 on State Defense Administration that disposal ammunition and other hazardous defence equipment is a place prepared/used to destroy ammunition or other hazardous defence equipment established by the Armed Forces [34].

3.4 Cruise groove

Cruise groove is the waters that are used, among others, for shipping lines, pipes/cables under the sea, and migration of marine life (35). Cruise groove in West Sumatera Province is allocated and utilized for the international, national and regional and local cruise groove. Based on the PERMEN No. 68/2011 that the groove-sailing in the sea is the waters that in terms of depth, width and barrier-free shipping are considered safe and secure for marine transport boats [36]. Cruise groove and the port pool should be fairly quiet against waves and currents, where the planning of the cruise plot and the port pool is determined by the largest vessel to enter the port [37].

Table 1: Marine spatial allocations in West Sumatera Province

Regions	Zone	Sub-zones	Area (ha)	Designation	
General utilization	Tourism	Natural beaches/coastal and small islands tourism	2,046.01	Beach tourism	
		Underwater tourism	4,439.68	Diving tour	
		Water sports tourism	502.14	Surfing tours	
	Port	DLKr/DLKp	7,995.39	Seaport	
		WKOPP	360.38	Fishing port	
	Capture fisheries	Demersal-pelagis	697,332.85	Fish capture	
		Pelagic fisheries	2,299,624.45	-	
	Aquaculture	Marine aquaculture fisheries	4,532.89	Marine farming	
	Mangrove		7,331.14		
	Industrial	Maritime industry	2.24	Shipyard	
		Religious	13.91	Floating mosque	
	Common facility	Education	52.54	Education facility Lolong bridge	
		Other utilization	Other public facilities	0.92	Japanese and dutch heritage
			Mine area	17,375.66	
	TOTAL			3,041,610, 20	
Conservation	Coastal and small islands	Core zones, limited utilization, other	3,026.14	-	

	Waters	Core, sustainable fisheries, utilization, other	193,879.20	-
TOTAL			196,905.34	
Specific national strategic	Defence and security	Outlying islands Ammunition disposal	331,625.90 58.09	Defence, security, conservation
TOTAL			331,683.99	
Cruise groove	-		-	-
Cruise plot	National, regional and international cruise flows			

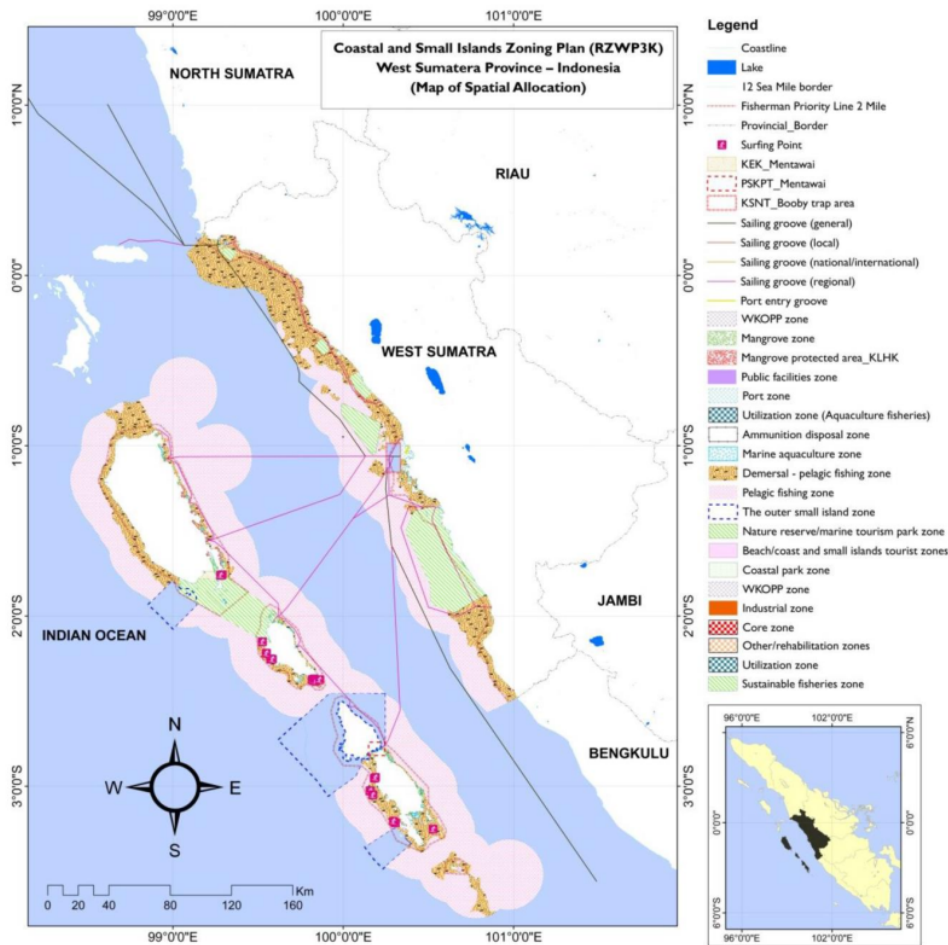


Figure 1: Spatial allocation map of RZWP3K in West Sumatera Province

3.5 Spatial utilization allocations of coastal and small islands

Spatial utilization settings contain provisions governing the requirements for the utilization of coastal resources and small islands and the provisions for its control which are prepared for each zone and its uses (Table 2).

This regulation contains settings on spatial utilization consisting of activities that may or not may be carried out as well as activities that can

only be carried out after obtaining permits in the regions of general utilization, conservation, certain national strategic and cruise groove.

Tabel 2. Utilization allocations of coastal waters and small islands in West Sumatra

Description	Activities that may be carried out	Activities that may not be done
Tourism	<ul style="list-style-type: none"> - Provision of tourism facilities and infrastructure - Fishing activities with hand fishing in the event of no tourism activity - Disaster mitigation, and rescue in emergency conditions at sea 	<ul style="list-style-type: none"> - Specific aquaculture activities that counterproductive with this type of tourism - All types of fishing activities in the event of tourism activities capture tool - Installation of the fishing device
Sea port (DLKr/DLKp) and fishing port (WKOPP)	<ul style="list-style-type: none"> - Construction of basic facilities and supporting facilities already listed in the port master plan 	<ul style="list-style-type: none"> - Fishing with stationary and/or mobile - Catching fish using explosives, pushers and/or toxic substances - All kinds of aquaculture activities - Installation of fish homes and fishing devices
Fishing arrest demersal pelagic	<ul style="list-style-type: none"> - Capture fisheries with a fleet size below 10 GT with the capture equipment allowed by statutory regulations - Utilization that does not exceed the potential of his or her number of catches 	<ul style="list-style-type: none"> - The placement of the capture equipment may not be within the cruise lines - Using a capture tool that damages the environment such as explosives, potash and fishing devices that are potentially damaging to the environment - The arrest of protected biota
Aquaculture fisheries	<ul style="list-style-type: none"> - Small-scale marine cultivation with undestructive materials, methods, tools and technologies - Small-scale fishing activities in the event of no marine cultivation 	<ul style="list-style-type: none"> - Marine aquaculture activities that can damage ecosystems - Installation of fishing devices - Catching fish with stationary and/or moving tools that interfere with marine cultivation activities - Catching fish using explosives, pushers and/or toxic substances - Waste disposal
Mangrove	<ul style="list-style-type: none"> - Protection and security of mangrove 	<ul style="list-style-type: none"> - Occupying, cutting, burning and polluting the mangrove - Utilizing wood originating from mangrove for economic interests - Transporting and trading timber originating from mangrove
Industry	<ul style="list-style-type: none"> - Industrial p-artificial, maintenance, repair and maintenance of fishing vessels 	<ul style="list-style-type: none"> - Vessel waste disposal in the environment around the waters
Public facilities	<ul style="list-style-type: none"> - Construction of floating mosques, educational facilities, and environmentally friendly bridges 	<ul style="list-style-type: none"> - Space utilisation activities that can cause damage to floating mosques, educational facilities, and bridges and coastal environments/ecosystems.
Other utilization	<ul style="list-style-type: none"> - Local Cruise Transport 	<ul style="list-style-type: none"> - Unlicensed mine clearing of the Lantamal (TNI AL) II - All activities that can cause explosive use of the existing mines
Conservation	<ul style="list-style-type: none"> - Protection of coastal and marine ecosystems and coastal vegetation - Cultivating small-scale fish with allowed methods - Small-scale fishing with fleets and allowable capture equipment 	<ul style="list-style-type: none"> - Catching fish using explosives, pushers and/or toxic substances - All types of mining activities - Doing the coral reef mining activities, taking the coral reefs in the conservation area - The arrest of protected biota - Disposal of waste and waste
Certain national strategic	<ul style="list-style-type: none"> - Central government authority 	<ul style="list-style-type: none"> - Central government authority

Cruise groove	<ul style="list-style-type: none"> - Boat traffic from and/or towards the collecting port/feeder port - Dredging the cruise groove - Activities aligned with environmental preservation/protection 	<ul style="list-style-type: none"> - All kinds of aquaculture and fishing activities with sedentary tools - Installation of fish houses and fishing aids such as devices and artificial reefs - Catching fish using explosives, pushers and/or toxic substances - Tourism and Recreation
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4. CONCLUSION

Provincial/Regencies/Citie Regional Governments that have sea regions, by Law No. 7/2007 are required to draw up RZWP3K. A zoning plan is a plan that determines the direction of resource use of each planning unit accompanied by the determination of the structure and pattern of space in the planning area that contains activities that may or may not be carried out and activities that can only be done after obtaining a permit. With the issuance of the aforementioned Law, it is necessary to harmonize previously prepared documents such as the Coastal and Small Islands Strategic Plans and Zoning Plans that have been made. The coastal management plan documents are very important for the implementation of the Marine Waters Concession Rights (HP-3) in the regions. Based on the research results of marine spatial allocations of RZWP3K in West Sumatra Province, that divided into 4 regions, i.e general utilization, conservation, certain national strategic, and cruise groove. Where general utilization has a broad 3,041,610, 20 ha consisting of 8 zones, i.e tourism, port, ca pture fisheries, aquaculture, mangrove, industrial, general facilities, and other utilization. Conservation regions has a broad 196,905.34 ha that divided into water conservation, coastal conservation, and small islands. Certain national strategic regions has a broad 331,683.99 ha consist of defence and security zones. Cruise groove in West Sumatera Province is allocated and utilized for the international, national and regional and local cruise groove. For utilization allocations of coastal waters and small islands in West Sumatra consist of activities that may be carried out and activities that may not be done.

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