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付属資料 6-1

空間計画の制限

赤字：海岸防護に係る記述、青字：砂を含む鉱物採掘に関する記述

表１　海域空間計画の制限活動

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Sea port Zone	− Planting mangroves and nipa palm;Mangrove cultivation ; − Protection of biodiversity; − Environmental rescue and protection ; Anchor release ; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels ; − Transportation of cultivated fish by small fishing boats; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Development of Navigation Assistance Facilities (SBNP); − Determination of mooring ; − Determination of the place of transfer between ships; − Construction of a harbor pool for the needs of berthing and ship movement; − Construction of a container terminal; − Construction of a dry bulk terminal; CAIR bulk terminal ; Roro terminal; − Construction of a ship repair site; dead ships ; − Business of loading and unloading of goods: packaging , stacking and storage at the port; Independent tally business : activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; Jetty construction and operation ; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between regencies/inner cities, between provinces and international ports; Port water transportation services business ; − Sea transportation equipment rental service business ; − Management (TUKS) in regional feeder port DLKR/DLKP ; Province Ferry Ships ; − Determination of international shipping routes; − Loading and unloading activities by foreign ships; Ship pilotage service business ; − Construction and operation of special terminals; − Development of Infrastructure Facilities (Primary, Secondary and Water Beaches); − Repair or maintenance of ships/floating equipment only; − Activities to assist technical work on ships that are still afloat but is having a catastrophe; − Activities of transferring cargo and or fuel (cargo and fuel transferring); − Withdrawal (Towing); − Refloating ;	−Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Extreme tourism business (high risk); − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Research on conservation activities; − Education on conservation activities; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Use of poles to push the boat; − Extraction of non-fish marine resources for economic purposes; − Installation of deep water FADs; − Installation of shallow water FADs; − Unloading of fish; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fisheries research and development; - Activity of testing motorized fishing boats/fishing boats ; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Floating fish farming business (floating net); − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Genetically engineered fish farming; − Installation of floating net cages; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Development of TPI; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Construction and operation of cement grinding plants and cement packing plants; − Salt Mining Construction; − Salt industry; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Construction of fisherman refueling stations; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − Collection of coral reefs; − War training using ammunition by foreign ships;	tourist jetty business; − Entertainment and recreation business; − Domestic sea tourism business; − International tourism sea transportation business; − Scientific surveys and/or research; − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Dredging of waters by capital dredging; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; − Construction of breakwaters; − Revetment construction, groin construction; − Determination of shipping lanes to and from fishing ports; − Ship trials; − Reclamation in Port waters area; − Aviation activities over the archipelagic channel; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Shipyard Industry Activities with Ship Graving Dock system; − Industrial development that is integrated with ports; − Ship/floating equipment construction activities only; − Production of main/auxiliary machines; − Activities of making other equipment specifically used in ships; − Other maritime equipment manufacturing activities − Fishing with vessel capacity ≤ 5GT; − Fishing with vessel capacity ≥ 5 - 10 GT; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; − Diving works activities;
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Fishing Port Zone	− Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Education on conservation activities; − Anchor release; − Use of poles to push the boat; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Unloading of fish; − Fisheries research and development; - Activity of testing motorized	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Fishing with vessel capacity ≥ 5 - 10 GT; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Extraction of non-fish marine resources for economic purposes; − Installation of deep water FADs; − Installation of shallow water FADs; − Fishing using circle nets: small pelagic purse seines with one	− Tourist jetty business; − Entertainment and recreation business; − Research on conservation activities; − Scientific surveys and/or research; − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; −

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
			fishing boats/fishing boats; − Dredging of waters by capital dredging; − Determination of mooring; − Determination of the place of transfer between ships; − Construction of a harbor pool for the needs of berthing and ship movement; − Construction of a ship repair site; − Placement of dead ships; − Development of TPI; − Determination of shipping lanes to and from fishing ports; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Jetty construction and operation; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Shipyard Industry Activities with Ship Graving Dock system; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Cargo and fuel transferring activities; − Construction of fisherman refueling stations;	boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Floating fish farming business (floating net); − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Transportation of cultivated fish by small fishing boats; − Genetically engineered fish farming; − Installation of floating net cages; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Construction of a container terminal; − Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction and operation of cement grinding plants and cement packing plants; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between inner districts/cities, between provinces and international ports; − Port water transportation services business; − Sea transportation equipment rental service business; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Flight activities over the archipelagic channel; − Determination of international shipping routes; − Loading and unloading activities by foreign ships; − Ship pilotage service business; − Salt Mining Construction; − Salt industry; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Production of main/supporting machines; − Other equipment manufacturing activities specifically used in ships; − Other maritime equipment manufacturing activities; − Diving works activities; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − Collection of coral reefs; − War training using ammunition by foreign ships	Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Construction of breakwaters; − Revetment construction, groin construction; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Construction and operation of special terminals; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Industrial development that is integrated with ports; − Activities to assist technical work on ships that are still afloat but are experiencing a disaster; − Withdrawal (Towing); − Refloating; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Reclamation in Port waters area;
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Tourism Zone	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Research on conservation activities; − Education on conservation activities; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Transportation of cultivated fish by small fishing boats;	− Fishing with vessel capacity ≥ 5 - 10 GT; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Anchor release; − Extraction of non-fish marine resources for economic purposes; − Installation of deep water FADs; − Installation of shallow water FADs; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Unloading of fish; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; - Activity of testing motorized fishing boats/fishing boats; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Floating fish farming business (floating net); − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Genetically engineered fish farming; − Installation of floating net cages; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Dredging of waters by capital dredging; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Construction, transfer and/or demolition of buildings or installations; − Determination of the place of transfer between ships; − Construction of a harbor	− Extreme tourism business (high risk); − Business of villas (cottages) above the sea; − Scientific surveys and/or research; − Fishing with vessel capacity ≤ 5GT; − Use of poles to push the boat; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fisheries research and development; − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Determination of mooring; − Construction of breakwaters; − Revetment construction, groin construction; − Jetty construction and operation; −

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				pool for the needs of berthing and ship movement; − Construction of a container terminal; − Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction of a ship repair site; − Placement of dead ships; − Development of TPI; − Determination of shipping lanes to and from fishing ports; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Construction and operation of cement grinding plants and cement packing plants; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Reclamation in Port waters area; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between inner districts/cities, between provinces and international ports; − Port water transportation services business; − Sea transportation equipment rental service business; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Aviation activities over the archipelagic channel; − Determination of international shipping routes; − Loading and unloading activities by foreign ships; − Ship pilotage service business; − Construction and operation of special terminals; − Salt Mining Construction; − Salt industry; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Shipyard Industry Activities with Ship Graving Dock system; − Industrial development that is integrated with ports; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Production of main/supporting machines; − Other equipment manufacturing activities specifically used in ships; − Other maritime equipment manufacturing activities; − Diving works activities; − Cargo and fuel transferring activities; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Construction of fisherman refueling stations; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − Collection of coral reefs; − War training using ammunition by foreign ships;	Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Activities to assist technical work on ships that are still afloat but are experiencing a disaster; − Withdrawal (Towing); − Refloating;
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Salt Zone	− Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Education on conservation activities; − Salt Mining Construction; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Salt industry; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan;	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Fishing with vessel capacity ≤ 5GT; − Fishing with vessel capacity ≥ 5 - 10 GT; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Unloading of fish; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; - Activity of testing motorized fishing boats/fishing boats; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Genetically engineered fish farming; − Installation of floating net cages; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Dredging of waters by capital dredging; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Determination of mooring; − Determination of the place of transfer between ships; − Construction of a harbor pool for the needs of berthing and ship movement; − Construction of a container terminal; − Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction of a ship repair site; − Placement of dead ships; −	− Research on conservation activities; − Scientific surveys and/or research; − Fisheries research and development; − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Construction of breakwaters; − Revetment construction, groin construction; − Jetty construction and operation; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Anchor release; − Use of poles to push the boat; − Extraction of non-fish marine resources for economic purposes; − Installation of deep water FADs; − Installation of shallow water FADs; − Transportation of cultivated fish by small fishing boats; − Floating fish farming business (floating net); − Diving works activities;

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				Development of TPI; − Determination of shipping lanes to and from fishing ports; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Construction and operation of cement grinding plants and cement packing plants; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Reclamation in Port waters area; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between inner districts/cities, between provinces and international ports; − Port water transportation services business; − Sea transportation equipment rental service business; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Aviation activities over the archipelagic channel; − Determination of international shipping routes; − Loading and unloading activities by foreign ships; − Ship pilotage service business; − Construction and operation of special terminals; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Shipyard Industry Activities with Ship Graving Dock system; − Industrial development that is integrated with ports; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Production of main/auxiliary machines; − Activities of making other equipment specifically used in ships; − Other maritime equipment manufacturing activities; − Cargo and fuel transferring activities; − Withdrawal (Towing); − Refloating; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Construction of fisherman refueling stations; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − Collection of coral reefs; − War training using ammunition by foreign ships;	
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Capture Fisheries Zone	− Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Research on conservation activities; − Education on conservation activities; − Fishing with vessel capacity ≤ 5GT; − Fishing with vessel capacity ≥ 5 - 10 GT; − Anchor release; − Use of poles to push the boat; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; -	− Fishing with vessel capacity ≥ 30GT; − Extraction of non- fish marine resources for economic purposes; − Unloading of fish; − Fish farming for industrial purposes; − Cultivation of non-fish marine resources for economic purposes; − Genetically engineered fish farming; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Development of PLTU/PLTGU; − Determination of the place of transfer between ships; − Construction of a container terminal; − Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction of a ship repair site; − Placement of dead ships; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Construction and operation of cement grinding plants and cement packing plants; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Reclamation in Port waters area; − Port water transportation services business; − Sea transportation equipment rental service business; − Loading and unloading activities by foreign ships; − Salt Mining Construction; − Salt industry; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Shipyard Industry Activities with Ship Graving Dock system; − Other equipment manufacturing activities specifically used in ships; − Other maritime equipment manufacturing activities; − Collection of coral reefs;	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Scientific surveys and/or research; − Fishing with vessel capacity ≥10 - 30 GT; − Installation of deep water FADs; − Installation of shallow water FADs; − Fisheries research and development; − Sea fish cultivation business (grouper, snapper, baronang); − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Dredging of waters by capital dredging; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − OTEC energy exploration; − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; −

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
			Activity of testing motorized fishing boats/fishing boats; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Transportation of cultivated fish by small fishing boats; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Determination of shipping lanes to and from fishing ports; − Withdrawal (Towing); − Refloating;		Development of Navigation Assistance Facilities (SBNP); − Determination of mooring; − Construction of a harbor pool for the needs of berthing and ship movement; − Development of TPI; − Construction of breakwaters; − Revetment construction, groin construction; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Jetty construction and operation; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Determination of international shipping routes; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Ship pilotage service business; − Construction and operation of special terminals; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Industrial development that is integrated with ports; − Diving works activities; − Activities to assist technical work on ships that are still afloat but are experiencing a disaster; − Cargo and fuel transferring activities; − Introduction of genetically engineered organisms into the environment; − Construction of fisherman refueling stations; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − War training using ammunition by foreign ships; − Floating fish farming business (floating net); − Installation of floating net cages; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − Aviation activities over the archipelagic channel; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between regencies/inner cities, between provinces and international ports; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Production of main/supporting machines; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Development of generation, transmission, distribution and sales of electricity;
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Energy Management Zone	− Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Education on conservation activities; − Use of poles to push the boat; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Dredging of waters by capital dredging; − Installation of energy generator turbine	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Fishing with vessel capacity ≥ 5 - 10 GT; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Installation of deep water FADs; − Installation of shallow water FADs; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier	− Research on conservation activities; − Scientific surveys and/or research; − Anchor release; − Extraction of non-fish marine resources for economic purposes; Fishing with vessel capacity ≤ 5GT; − Fisheries research and development; − Exploration ; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; −

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
			facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Construction, transfer and/or demolition of buildings or installations; − Determination of mooring; − Determination of the place of transfer between ships; − Construction of a harbor pool for the needs of berthing and ship movement; − Construction and operation of special terminals; − Cargo and fuel transferring activities; − Withdrawal (Towing); − Refloating;	Vessels; − Unloading of fish; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fishing using fishing line: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; - Activity of testing motorized fishing boats/fishing boats; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Floating fish farming business (floating net); − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Transportation of cultivated fish by small fishing boats; − Genetically engineered fish farming; − Installation of floating net cages; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining;	Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Cable laying; − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Construction of breakwaters; − Revetment construction, groin construction; − Jetty construction and operation; − Loading and unloading activities by foreign ships; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Ship pilotage service business; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Repair or maintenance of ships/floating equipment only; − Diving works activities; − Activities to assist technical work on ships that are still afloat but are experiencing a disaster; − Development of generation, transmission, distribution and sales of electricity; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Loading and unloading of goods: packaging, stacking and storage at the port
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Oil and Gas Mining Zone	− Planting mangroves and nipa palm; − Mangrove cultivation; − Protection of biodiversity; − Environmental rescue and protection; − Education on conservation activities; − Anchor release; − Extraction of non-fish marine resources for economic purposes; − Exploration ; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Dredging of waters by capital dredging; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Determination of mooring; − Determination of the place of transfer between ships; − Construction of a harbor pool for the needs of berthing and ship movement; − Jetty construction and operation; − Loading and unloading activities by foreign ships; − Construction and operation of special terminals; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Diving works activities; − Cargo and fuel transferring activities; − Withdrawal (Towing); − Refloating	− Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Fishing with vessel capacity ≤ 5GT; − Fishing with vessel capacity ≥ 5 - 10 GT; − Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Use of poles to push the boat; − Installation of deep water FADs; − Installation of shallow water FADs; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Unloading of fish; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, chart; boating or floating charter, ami bouke, step charter; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; - Activity of testing motorized fishing boats/fishing boats; − Sea fish cultivation business (grouper, snapper, baronang); − Fish farming for industrial purposes; − Floating fish farming business (floating net); − Cultivation of non-fish marine resources for economic purposes; − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Transportation of cultivated fish by small fishing boats; − Genetically engineered fish farming; − Installation of floating net cages; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Construction of Local Port Service (LPS) telecommunication cables; − Construction of a container terminal; −	− Research on conservation activities; − Scientific surveys and/or research; − Fisheries research and development; − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of breakwaters; − Revetment construction, groin construction; − Hydrographic research or survey activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Ship pilotage service business; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Activities to assist technical work on ships that are still afloat but are experiencing a disaster;

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction of a ship repair site; − Placement of dead ships; − Development of TPI; − Determination of shipping lanes to and from fishing ports; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Construction and operation of cement grinding plants and cement packing plants; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Reclamation in Port waters area; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between regencies/inner cities, between provinces and international ports; − Port water transportation services business; − Sea transportation equipment rental service business; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Flight activities over the archipelagic channel; − Determination of international shipping routes; − Salt Mining Construction; − Salt industry; − Shipyard Industry Activities with Ship Graving Dock system; − Industrial development that is integrated with ports; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Production of main/supporting machines; − Other equipment manufacturing activities specifically used in ships; − Other maritime equipment manufacturing activities; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Construction of fisherman refueling stations; − Military exercises; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products); − Collection of coral reefs; − War training using ammunition by foreign ships;	
West Java Province	PERDA 9 TAHUN 2022 - RTRWP 2022 2042	Conservation Areas - Parks	− Planting mangroves and nipa palm; − Mangrove cultivation; Biodiversity protection; − Environmental rescue and protection; − Research on conservation activities; − Education on conservation activities; − Scientific surveys and/or research ;	− Fishing with vessel capacity ≥10 - 30 GT; − Fishing with vessel capacity ≥ 30GT; − Extraction of non-fish marine resources for economic purposes; − Installation of deep water FADs; − Installation of shallow water FADs; − Unloading of fish; − Fishing using drag nets: beach drag nets, payang, pocket drag nets; − Fishing using drag nets: pocket shrimp drag nets, pocket fish drag nets; − Fishing using a rake: a rake with a ship, a rake without a boat; − Fishing using lift nets: anco, boating charter or floating charter, bouke ami, step netting; - Activity of testing motorized fishing boats/fishing boats; − Fish farming for industrial purposes; − Cultivation of non-fish marine resources for economic purposes; − Genetically engineered fish farming; − Installation of floating net cages; − Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals; − Dredging of waters by capital dredging; − Dredging of sea waters by capital dredging which cuts coral and/or rock material; − Exploitation (Production Operation) of metal minerals ; − Metal Mineral Processing and Refining; − Installation of energy generator turbine facilities; − Installation of Sea Current Power Plant (PLTAL); − Installation of heat engine facilities; − OTEC energy exploration; − Development of PLTU/PLTGU; − Determination of the place of transfer between ships; − Construction of a container terminal; − Construction of a dry bulk terminal; − Construction of CAIR bulk terminal; − Construction of the Roro terminal; − Construction of a ship repair site; − Ship trials; − Fishing boat repair and maintenance service business; − Logistics service business and supply of fishing vessels; − Construction of a fishing wharf; − Loading and unloading of goods: packaging, stacking and storage at the port; − Independent tally business: activities of cargodoring, receiving/delivery, stuffing, and stripping of containers for their own interests; − Construction and operation of cement grinding plants and cement packing plants; − Reclamation in Port waters area; − Business entity sea transportation business on cross ports between regencies/cities within the Province; − People's shipping sea transportation business or business entities at cross ports between inner districts/cities, between provinces and international ports; − Port water transportation services business; − Sea transportation equipment rental service business; − Management (TUKS) in regional feeder port DLKR/DLKP; − Operation of In-Province Ferry Ships; − Determination of international shipping routes; − Loading and unloading activities by foreign ships; - Anchoring activities except in force majeure by foreign ships; − Construction and operation of special terminals; − Salt Mining Construction; − Construction of Infrastructure Facilities (Primary, Secondary Channels and water beaches); − Salt industry; − B3 waste collection, utilization, processing, disposal and landfilling activities; − Activities of collecting, utilizing, processing, disposing of, and stockpiling non-B3 waste; − Shipyard Industry Activities with Ship Graving Dock	− Seascape tourism; − Underwater tourism; − Historical tours; − Cultural tourism; − Water sports tourism; − Tourist jetty business; − Entertainment and recreation business; − Extreme tourism business (high risk); − Domestic sea tourism business; − International tourism sea transportation business; − Tour and travel service business; − Business of villas (cottages) above the sea; − Swimming tourism business; − Tirta Tourism Services (maritime); − Taking underwater photos/videos; − Anchor release; − Use of poles to push the boat; − Fishing with vessel capacity ≤ 5GT; − Fishing with vessel capacity ≥ 5 - 10 GT; − Transportation of caught fish by Indonesian-flagged Live Fish Carrier Vessels; − Fishing using circle nets: small pelagic purse seines with one boat, large pelagic purse seines with one boat, small pelagic purse seines with one boat, small pelagic purse seines with two boats, circle nets without wrinkles; − Catching fish using a tool that is dropped or spread: nets drop by ship, nets spread; − Fishing using gill nets: fixed gill nets, drift gill nets, circular gill nets, fixed gill nets, layered gill nets, combination gill nets; − Catching fish using traps: set nets, traps, winged traps, trawlers, togo, ambai, jermal, pengerih, sero; − Fishing using fishing rods: handline, tuna reel, fishing rod, squid, mechanical squid, kite fishing, pole line, mechanical line, bottom longline, tuna longline, troll line; − Catching fish using other fishing tools: spears, sledgehammers, arrows, trawlers, seser, pocongan; − Fisheries research and development; − Sea fish cultivation business (grouper, snapper, baronang); − Floating fish farming business

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				system; − Industrial development that is integrated with ports; − Ship/floating equipment construction activities only; − Repair or maintenance of ships/floating equipment only; − Production of main/auxiliary machines; − Activities of making other equipment specifically used in ships; − Other maritime equipment manufacturing activities; − Activities to assist technical work on ships that are still afloat but are experiencing a disaster; − Cargo and fuel transferring activities; − Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry; − Introduction of genetically engineered organisms into the environment; − Development of generation, transmission, distribution and sales of electricity; − Construction of fisherman refueling stations; − Military exercises; − Collection of coral reefs; − War training using ammunition by foreign ships;	(floating net); − Transportation of cultivated fish by Indonesian-flagged Live Fish Carrier Vessels; − Transportation of cultivated fish by small fishing boats; − Determination of shipping lanes to and from fishing ports; − Exploration ; − Operation of Regional and Local Feeder Ports; − Dredging in the territorial waters of Regional and Local Feeder Ports; − Development of FPSO (Floating Production Storage and Offloading); − Installation/deployment of Oil and Gas Pipelines; − Development of oil and gas platforms/platforms; − Development of Floating Storage Offloading (FSO); − Development of Floating Facility for Oil and Gas: Mooring ; − Oil and Gas Exploitation (Production Operations); − Construction, transfer and/or demolition of buildings or installations; − Cable laying; − Construction of Local Port Service (LPS) telecommunication cables; − Planting and or laying of cables or poles and facilities at sea; − Development of Navigation Assistance Facilities (SBNP); − Determination of mooring; − Construction of a harbor pool for the needs of berthing and ship movement; − Placement of dead ships; − Development of TPI; − Construction of breakwaters; − Revetment construction, groin construction; − Jetty construction and operation; − Flight activities over the archipelagic channel; − Hydrographic research or survey activities by foreign ships; − Ship pilotage service business; − Diving works activities; − Withdrawal (Towing); − Refloating; − Collection of non-timber forest products in mangrove forests (honey; sap; leaves; fruit and seeds; tannins; fish; other non-timber forest products);
Central Java Province	Perda_No 13 Tahun 2018_RZWP3K	Tourism Area	a. provision of tourist attractions in accordance with the tourism master plan; and/or b. provision of tourism facilities and infrastructure.	a. removal and destruction of coral reefs; b. catching fish using explosives, toxic materials, and using fishing gear that is destructive to ecosystems in coastal areas and small islands; c. installation of fishing aids such as FADs; d. mining of metallic, non-metallic and rock minerals; e. other activities that reduce the value and/or function of the tourism zone; and/or f. other activities that do not support tourism	a. aquaculture; b. catching fish with fishing gear in accordance with statutory regulations; c. construction of public facilities; d. construction of coastal protection buildings; and/or e. research and education.
Central Java Province	Perda_No 13 Tahun 2018_RZWP3K	Port Area	a. construction of basic facilities, functional facilities, and supporting facilities in accordance with the port master plan and fishing port master plan and WKOPP; b. shipping lane activities, berths, places for loading and unloading between ships, port pools for the needs of berthing and ship maneuvering, scouting activities, ship repair places, and other activities in accordance with the provisions of the legislation; and/or c. the need for emergency situations, dead ships, sailing placements, ship piloting trials, ship facilities and construction, and maintenance of long-term port development and other activities in accordance with statutory provisions.	a. all types of fishing activities; b. all types of aquaculture activities; c. coral reef extraction; d. installation of fishing aids such as FADs; e. construction of buildings whose plans are not listed on the port master plan or WKOPP; f. mining of metallic, non-metallic and rock minerals; and/or g. other activities that value and/or reduce the function of the port zone.	a. dredging of harbor channel; b. laying/installing submarine cables/pipes; c. construction of public facilities; d. construction of coastal protection buildings; e. use or utilization of sea water; f. research and education; and/or g. tourism and recreation.
Central Java	Perda_No 13 Tahun	Capture Fisheries	a. fishing activities using equipment environmentally friendly;	a. fishing using explosives, toxic materials, electricity, and using fishing gear destructive to ecosystems in coastal areas and islands	a. research and education; b. construction of public facilities;

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
Province	2018_RZWP3K	Area	b. fishing activities that take into account the protection of habitats and fish populations; c. the size of fishing vessels, fishing gear (API) and fishing aids (ABPI) used in fishing activities in accordance with the regulations stipulated by the applicable laws and regulations; and/or d. installation of fish houses and fishing aids such as licensed FADs and artificial coral reefs.	small island; b. coral reef extraction; c. the use of fishing gear (API) that disturbs and destroys the sustainability of fish resources; d. the use of Fishing Aids (ABPI) which not in accordance with the applicable laws and regulations; and/or e. other activities that reduce the value and/or function of the capture fisheries zone.	c. construction of coastal protection buildings; d. tourism and recreation; e. mining in potential reserves of metal, non-metal and rock minerals that have been designated as mining business permit areas in accordance with the provisions of the law outside of 2 nautical miles from the coastline permanently in areas which, if technically, ecologically, socially, and/or culturally, do not cause environmental damage and/or environmental pollution and/or harm to the community surroundings; and/or f. all types of aquaculture activities in accordance with water and sediment quality standards to ensure food safety for all aquaculture products that do not interfere with fishing activities.
Central Java Province	Perda_No 13 Tahun 2018_RZWP3K	Mangrove Forest	a. rehabilitation of mangrove ecosystems; b. tourism and recreation; c. small-scale fishing (<=5 GT) with environmentally friendly fishing gear (API) in accordance with laws and regulations; and/or d. education and research.	a. fishing that uses explosives, toxic materials, as well as using fishing gear that is destroying the mangrove ecosystem; b. all activities that use destructive methods and methods and perform function transfers and cut down coastal vegetation for activities that damage ecosystems; c. campfire with campfire; d. mining of metallic, non-metallic and rock minerals; and/or e. other activities that reduce the value and/or function of the mangrove forest zone.	a. provision of tourism facilities and infrastructure; b. construction of public facilities; and/or c. construction of coastal protection structures.
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Aquaculture Zone	• Educational tourism business, tourist wharves, entertainment and recreation activities, tourism travel service business, spectacle tourism, marine nature tourism • Marine tourism services • Taking underwater photos/videos • Planting nipa palm, planting and cultivating mangroves • Protection of biodiversity • Environmental protection and rescue • Conservation research & education activities • Surveys and/or scientific research • Collection of non-timber forest products in mangrove forests • Marine fish farming business, fish farming for industrial purposes, floating fish farming business • Extraction of non-fish marine resources for economic purposes • Cultivation of non-fish marine resources for economic purposes • Transport of cultured fish and catches with Indonesian-flagged live fish carrier vessels • Transport of cultured fish by small fishing boats • Cultivation of genetically engineered fish • Installation of floating net cages • Fisheries research and development • Determination of shipping lanes and construction of fishing docks • Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry	• Surf tourism business • Domestic tourism sea transportation business • Tourism international sea transportation business • Collection of coral reefs • Fishing with a boat capacity of 10-30 GT and 30GT • Anchor release • Installation of deep & shallow water FADs • Unloading fish • Fishing using trawls, payang, cantrang, lampara nets, dogol, seine nets, Long bag set net, Squid Jigging, Long line, Pole & line, Bouke Ami, and its kind • Test activities for fishing boats/motorized fishing boats • Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals • Dredging the seabed with capital dredging • Dredging the seabed with capital dredging that cuts coral/rock material • Reclamation in regional and local feeder port waters • Activities for collecting, utilizing, processing, disposing, and landfilling B3 & non B3 waste	• Business of rowing tourism, diving tourism, fishing tourism, water sport tourism, extreme tourism, sea cottage business, snorkeling tour, swimming, sea restaurant • Fishing with vessel capacity < 10GT • Collecting antiquities and non-antiquities by motorized boat 5GT, 5 - 30 GT, and > 30 GT • Use of a pole to propel the boat • Transport of cultured and catching fish by foreign-flagged live fish carriers • Fishing using Gill Net, Prawe fishing gear, Bubu/Muroami, Floating chart, and its kind. • Exploration of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals • Construction of Floating Production Storage and Offloading, coal power plan, oil & gas platform, Floating Storage Offloading, oil & gas Floating Facility (Mooring) • Exploitation (Production Operation) and processing & refining of coal, metallic minerals, non-metallic minerals/rock minerals, radioactive minerals • Placement of tailings (material left behind after fractional separation) under the sea • Construction of LNG Regasification Terminal • Flaring • Destruction of oil and gas explosives • Installation of energy generator turbine facilities, Ocean Current Power Plant, & heat engine facilities • OTEC energy exploration • Construction, transfer and/or demolition of buildings or piping installations in waters • Embedding cables and pipes with diameters of 0-20 cm, 20-50 cm, 50-100 cm, and diameters above 100 cm • Development of Local Port Service (LPS) telecommunications cables • Planting/laying cables/poles and facilities at sea • Construction of shipping navigation aids • Determination of berths & places of transfer between

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
					ships • Construction of harbor ponds for the needs of berthing and ship movement, container terminals, dry & liquid bulk terminals, ro-ro terminals, ship repair sites • Placement of dead ships • Construction of a fish auction place • Construction of breakwaters, revetments and groins • Ship trials • Business of repair and maintenance of fishing vessels, logistics service business and supply of fishing vessels, loading and unloading of goods, independent tally business • Jetty construction and operation • Construction and operation of cement grinding plants and cement packing plants • Operation of regional and local feeder ports • Dredging in the territorial waters of regional and local feeder ports • Sea transportation business for people/business entities at cross ports between regencies/cities within the province of East Java, between provinces and international ports • Port water transportation services business • Marine transportation equipment rental service business • Management (TUKS) within DLKR/DLKP regional feeder ports. • Operation of ferry transport within the province • Flight activities over the archipelagic channel • Determination of international shipping routes • Loading and unloading activities by foreign ships • Hydrographic research or survey activities, anchoring activities except in force majeure conditions, war training using ammunition by foreign ships • Business of ship piloting services. • Construction and operation of special terminals • Transport and sale of salt, construction of salt mines, construction of salt industry facilities • Shipyard industry activities with a ship graving dock system • Industrial development that is integrated with ports • Ship/floating equipment building activities & repair/maintenance activities • Main/auxiliary machinery manufacturing activities • The activity of making other equipment specifically used in ships • Other maritime equipment manufacturing activities • Diving works within the framework of the maritime industry • Activities to assist technical work on ships that are still afloat but are experiencing a disaster • Cargo and fuel transferring • Towing • Refloating • Introduction of genetically modified organisms into the environment • Development of electricity generation, transmission, distribution and sales • Construction of fisherman's refueling station • Military training • Salt industry intake and output pipes
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Fishing Port Zone	• Protection of biodiversity • Environmental rescue and protection • Research and education on conservation activities • Scientific surveys and/or research • Anchor release • Use of poles to propel the boat • Transport of cultured fish and caught fish using	• Surfing tourism business, water sports, extreme tourism (high risk), domestic and international tourism sea transportation business, tourism travel services, seaside cottages, snorkeling & swimming tourism business, marine tourism services • Underwater photo/video capture • Collection of coral reefs and non-timber forest products in mangrove forests (honey, sap, leaves, fruit and other non-timber forest products) • Floating aquaculture business (floating nets and pen systems ≥ 5 Ha with a total of 1000 units)	• Educational tourism business, fishing tourism business, tourist wharf business, entertainment & recreation activity business, spectacle tourism business, seaside restaurant, aquatic natural tourism business • Planting nipa palm, planting and cultivating mangroves • Fishing with boat capacity < 10GT, 10-30 GT, and 30GT • Collection of antiquities (by motorized boats ≤ 5GT & 5 -

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
			Indonesian-flagged live fish carriers • Transportation of cultivated fish by small fishing boats • Unloading of fish • Construction of shipping navigation aids • Determination of berths and transfers between ships • Development of harbor ponds and ship maneuvers • Construction of a ship repair place and a fish auction place • Construction of breakwaters, revetments and groins • Determination of shipping lanes to and from ports • Logistics service business and fishing vessel supplies • Construction of fishing wharf • Construction and operation of Jetty • Marine transportation equipment rental service business & ship pilotage service business • Activities to assist technical work on ships that are still afloat but are experiencing a disaster • Cargo and fuel transferring • Towing • Refloating • Construction of fishing fuel stations	• Taking and cultivating non-fish marine resources for economic purposes • Cultivation of genetically engineered fish • Installation of floating net cages & FADs in deep and shallow water • Fishing using trawls, payang, cantrang, lampara nets, dogol, gill nets, seine nets, long bag set nets, squid jigging, basic Prawe fishing lines, long lines, pole & line, Bubu/Muroami, Bouke Ami, Floating Bagan and its kind • Exploration and transportation of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals • Development of Floating Production Storage and Offloading, steam power plant, oil & gas platform, floating storage offloading, oil & gas floating facility (mooring) • Exploitation (Production Operation) of coal, metallic minerals, non-metallic minerals or rock minerals, radioactive minerals • Processing & refining of coal, metallic minerals, non-metallic minerals or rock minerals, radioactive minerals • Placement of tailings under the sea • Construction of LNG Regasification Terminal • Flaring • Destruction of oil and gas explosives • Installation of energy generator turbine facilities • Ocean Current Power Plant Installation • Installation of heat engine facilities • OTEC energy exploration • Construction of container terminals, dry & liquid bulk terminals, ro-ro terminals • Dead ship parking • Business of loading and unloading of goods: packaging, stacking and storage at the port • Independent tally business: cargodoring, receiving/delivery, stuffing, and stripping of containers for their own benefit. • Construction and operation of cement grinding plant & cement packing plant • Regional & local feeder port operations • Dredging & reclamation in regional and local feeder port areas • Sea transportation business for people or business entities in cross-ports between regencies/cities within the province of East Java, between provinces and international ports • Port water transportation services business • Management (TUKS) within DLKR/DLKP regional feeder ports • Operation of In-Province Ferry Ships • Determination of international shipping routes • Loading and unloading activities & anchoring by foreign ships except in force majeure conditions • War training using ammunition by foreign ships • Construction and operation of special terminals • Activities for the collection, utilization, processing, disposal, and landfilling of B3 and non-B3 waste • Introduction of genetically modified organisms into the environment • Development of electricity generation, transmission, distribution and sales	30 GT), antiquities and other than antiquities (by motorized boats 5 - 30 GT and > 30 GT) • Marine fish farming business (grouper, snapper, baronang) • Fish farming for industrial purposes • Transportation of cultivated fish & caught fish by foreign-flagged live fish carriers • Fisheries research and development • Activity of testing motorized fishing boats/fishing boats • Sea bed dredging with capital dredging • Sea bed dredging by capital dredging which cuts coral and/or rock material • Construction, transfer and/or demolition of buildings or piping installations in waters • Cable embedding • Planting Pipe diameter of 0-20 cm, 20-50 cm, 50-100 cm, and above 100 cm • Construction of Local Port Service telecommunication cables • Planting and or laying of cables or poles and facilities at sea • Ship trials • Fishing boat repair and maintenance service businesses: dock/slipway, workshops and net repair sites • Flight activities over the archipelagic channel • Hydrographic research or survey activities by foreign vessels • Transportation and sale of Salt • Salt Mining Construction • Construction of Infrastructure Facilities (Primary, Secondary Canals and water beaches) for Salt Industry • Shipyard Industry Activities with Ship Graving Dock system • Industrial development that is integrated with ports • Ship/floating equipment construction activities • Repair or maintenance of ships/floating equipment • Production of main/auxiliary machines • The activity of making other equipment specifically used in ships • Other maritime equipment manufacturing activities • Diving works within the framework of the maritime industry • Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry • Military training • Salt industry intake and output pipes
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Capture Fisheries Zone	• Educational tourism businesses, rowing tours, diving tours, fishing tours, surfing tours, water sports tours, tourist dock businesses, entertainment and recreational activities, extreme tourism (high risk), domestic & international tourism sea transportation businesses, travel service businesses , cottages on the sea, snorkeling tours, spectacle	• Collecting coral reefs • Fishing using trawls, payang, cantrang, lampara nets, dogol, seine nets and others • Transportation of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals • Reclamation in regional and local feeder port waters area • Activities for collecting, utilizing, processing, disposing of B3 and non-B3 waste • Activities of making, repairing or maintaining ships/floating equipment	• Extraction of non-fish marine resources for economic purposes• Transportation of cultivated fish by Foreign-flagged Live Fish Carrier Vessels • Installation of floating net cages • Transport of fish caught by foreign-flagged live fish carriers • Unloading of fish• Exploration of metal minerals, non-metallic minerals, rocks, coal, radioactive

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
			tours, swimming, restaurants on the sea, aquatic nature tours, marine tourism services • Underwater photo/video capture • Nipah plantation, mangrove planting and cultivation • Protection of biodiversity; • Environmental rescue and protection • Research and education on conservation activities • Scientific surveys and/or research • Collection of non-timber forest products in mangrove forests (honey, sap, leaves, fruits and seeds, tannins, fish, other non-timber forest products) • Fishing with vessel capacity < 10GT, 10-30 GT, and ≥ 30GT • Retrieval of archaeological and non-archaeological goods by motorized boat 5GT, 5 - 30 GT, and > 30 GT • Anchor release • Use of poles to propel the boat • Marine fish farming business (grouper, snapper, baronang) • Fish farming for industrial purposes • Floating aquaculture business (floating nets and pen systems ≥ 5 Ha with a total of 1000 units) • Transportation of cultivated fish & catches by Indonesian-flagged live fish carriers • Transportation of cultivated fish by small fishing boats • Cultivation of genetically engineered fish • Installation of deep & shallow water FADs • Fishing using Gill Net, Long bag set net, Squid Jigging, Basic Prawe Fishing, Long line, Pole and line, Bubu/Muroami, Bouke Ami, floating chart • Fisheries research and development • Activity of testing motorized fishing boats/fishing boats • Determination of shipping lanes • Construction of fishing wharf • Cargo and fuel transferring • Towing and refloating • Marine biota cultivation activities for the benefit of the Biopharmacology/Marine Biotechnology industry	• Production of main/auxiliary machines • Activities for the manufacture of other equipment specifically used on ships • Other maritime equipment manufacturing activities	minerals• Development of Floating Production Storage and Offloading• Seabed dredging with capital dredging• Seabed dredging with capital dredging which cuts coral and/or rock material• Construction of steam power plants, oil and gas platforms/platforms, floating storage offloading, oil and gas lloating facility (mooring)• Exploitation (production operations) of coal, metallic minerals, non-metallic minerals or rock minerals, radioactive minerals• Processing & refining of coal, metallic minerals, non-metallic minerals or rock minerals, radioactive minerals• Placement of tailings (material left after separation of fractions) under the sea• Construction of LNG Regasification Terminal• Flaring• Destruction of oil and gas explosives• Installation of energy generator turbine facilities, Sea Current Power Plant installation, installation of heat engine facilities• OTEC energy exploration• Construction, transfer and/or demolition of buildings or piping installations in waters• Cable laying & planting of pipes with diameters of 0-20 cm, 20-50 cm, 50-100 cm and diameters above 100 cm• Construction of Local Port Service telecommunications cables• Planting and or laying of cables or poles and facilities at sea• Development of Navigation Assistance Facilities• Determination of anchorage & place of transfer between ships• Development of harbor ponds, container terminals, dry & liquid bulk terminals, ro-ro terminals, ship repair sites• Parking dead ship• Construction of a fish auction place • Construction of breakwaters, revetments, groins• Ship trials• Fishing boat repair and maintenance service business, fishing boat logistics and supply services, loading and unloading of goods, independent tally business.• Construction and operation of Jetty• Construction and operation of cement grinding plants and cement packing plants• Operation of regional and local feeder ports• Dredging in the territorial waters of regional and local feeder ports• Sea transportation business for people or business entities in cross-ports between regencies/cities within the province of East Java, between provinces and international ports, water transportation services business, & marine transportation equipment rental service• Management (TUKS) within DLKR/DLKP regional feeder ports.• Operation of ferry transport within the province• Flight activities over the archipelagic channel• Determination of international shipping routes • Loading and unloading activities by foreign vessels• Hydrographic research or survey activities, anchoring activities except in force majeure circumstances, and war training using ammunition by foreign ships• Business of ship piloting services.• Construction and operation of special terminals • Transportation and sale of salt• Salt mining construction• Construction of salt industry infrastructure facilities•

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
					Shipbuilding industry activities with a ship graving dock system • Industrial development that is integrated with ports• Diving work activities within the framework of the maritime industry.• Activities to assist technical work on ships that are still afloat but are experiencing a disaster• Introduction of genetically modified organisms into the environment • Development of electricity generation, transmission, distribution and sales• Construction of fueling stations for fisherman• Military training• Salt industry intake and output pipes
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Oil Mining Zone	• Protection of biodiversity • Environmental rescue and protection • Conservation research and education activities • Scientific surveys and/or research • Flaring • Construction of Local Port Service telecommunications cables • Activities to assist technical work on ships that are afloat but are experiencing a disaster	• Educational tourism business, rowing, diving, fishing, surfing, water sports, jetty tourism, entertainment and recreation, extreme tourism, domestic & international tourism, tourism travel services, sea villas (cottages), snorkeling, spectacle tourism , swimming, restaurants above the sea, water nature tourism, marine tourism services• Taking underwater photos/videos• Planting of mangroves and palm trees• Mangrove cultivation• Collection of coral reefs• Collection of non-timber forest products in mangrove forests • Fish catching• Retrieval of antiquities and items other than antiquities• Anchor release• Use of poles to propel the boat• Fish farming business• Collection and cultivation of non-fish marine resources• Transportation of cultivated and caught fish• Cultivation of genetically engineered fish• Installation of floating net cages, deep & shallow water FADs• Unloading of fish• Fishing using trawls, payang, cantrang, lampara nets, dogol, gill nets, seine nets, long bag set nets, squid jigging, prawe fishing rods, long lines, pole and line, Bubu/Muroami, Bouke Ami, floating charts• Fisheries research and development • Activity of testing motorized fishing boats/fishing boats• Exploration, transportation, processing & refining of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals• Seabed dredging with capital dredging• Seabed dredging with capital dredging which cuts coral and/or rock material• Construction of a coal power plan• Placement of tailings under the sea• Destruction of oil and gas explosives • Installation of energy generator turbine facilities, Ocean Current Power Plant Installation, heat engine facilities• OTEC energy exploration• Determination of berths & places of transfer between ships • Development of harbor pools, container terminals, dry & liquid bulk terminals, ro-ro terminals, ship repair sites, dead ship placement, fish auction sites• Construction of breakwaters, revetments, groins• Determination of shipping lanes to and from fishing ports• Ship trials• Fishing boat repair and maintenance service business & fishing boat logistics and supply services• Construction of a fishing wharf • Business of loading and unloading of goods & independent tally business• Jetty construction and operation • Construction and operation of cement grinding plants and cement packing plants• Operation of Regional and Local Feeder Ports• Dredging & reclamation in the territorial waters of Regional and Local Feeder Ports • Sea transportation business & equipment rental services• Management (TUKS) within DLKR/DLKP regional feeder ports.• Flight activities over the archipelagic channel• Determination of international shipping routes • Loading and unloading activities by foreign vessels• Hydrographic research or survey activities by foreign ships• Activities anchoring foreign ships except in force majeure• War training using ammunition by foreign ships• Ship pilotage service business.• Construction and operation of special terminals• Transportation and sales, salt mining construction, construction of salt industry facilities• Collection, utilization, processing, disposal and landfilling of B3 & non-B3 waste• Shipyard Industry Activities with a Graving Dock system • Industrial development that is integrated with ports• Activities of making, repairing or maintaining ships/floating equipment• Production of main/auxiliary machines;• The activity of making other equipment specifically used in ships• Other maritime equipment manufacturing activities• Diving works within the framework of the maritime industry• Refloating• Marine biota cultivation activities for the benefit of the Biopharmacology / Marine Biotechnology industry• Introduction of genetically modified organisms into the environment• Development of electricity generation, transmission, distribution and sales• Construction of fishing refueling stations	• Construction of Floating Production Storage and Offloading, oil and gas platforms, Floating Storage Offloading and Mooring• Exploitation (production operations) of coal, metallic minerals, non-metallic minerals or rock minerals, radioactive minerals• Construction of LNG Regasification Terminal• Construction, transfer and/or demolition of buildings or piping installations in waters• Cable & pipe laying• Planting and or laying of cables or poles and facilities at sea• Development of Navigation Assistance Facilities• Cargo and fuel transferring• Towing• Military exercises• Salt industry intake and output pipes
East Java	Perda_No 1	Industrial	• Protection of biodiversity	• Educational tourism business, rowing, diving, fishing, surfing, tourist wharf, entertainment and recreation	• Water sport tourism business & spectacle tourism

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
Province	Tahun 2018_RZWP3K	Zone	• Environmental rescue and protection • Conservation research & education activities • Scientific surveys and/or research • Fish farming for industrial purposes • Fisheries research and development • Determination of anchorage • Business loading and unloading of goods • Construction and operation of cement grinding plants and cement packing plants • Transportation and sale of salt • Shipyard Industry Activities with a Graving Dock system • Industrial development that is integrated with ports • Repair or maintenance of ships/floating equipment • Production of main/auxiliary machines • The activity of making other equipment specifically used in ships • Other maritime equipment manufacturing activities • Diving works within the framework of the maritime industry • Activities to assist technical work on ships that are still afloat but have been in a disaster • Cargo and fuel transferring • Towing • Refloating	activities, extreme tourism, domestic & international tourism sea transportation, tourism travel service business, villas (cottages) over the sea, snorkeling, swimming, restaurants above the sea, aquatic natural tourism, marine tourism services• Nipa planting and mangrove cultivation• Collection of coral reefs• Collection of non-timber forest products in mangrove forests• Catching and cultivating fish• Retrieval of antiquities and other antiquities• Collection & cultivation of non-fish marine resources• Transportation of cultivated and caught fish• Cultivation of genetically engineered fish• Installation of floating net cages, deep & shallow water FADs• Unloading of fish• Fishing using trawls, payang, cantrang, lampara nets, dogol, gill nets, seine nets, long bag set nets, squid jigging, prawe lines, long lines, pole & line, Bubu/Muroami, Bouke Ami, and floating charts • Activity of testing fishing vessels• Exploration, transportation, exploitation, processing & refining of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals• Development of Floating Production Storage and Offloading • Seabed dredging with capital dredging• Development of coal power plans, oil and gas platforms, Floating Storage Offloading (FSO), Mooring Facility• Placement of tailings under the sea • Construction of LNG Regasification Terminal, flaring and destruction of oil and gas explosives• Installation of energy generator turbine facilities, Installation of Sea Current Power Generators, & heat engine facilities• OTEC energy exploration • Construction, transfer and/or dismantling of pipeline installations in waters• Determination of place of transfer between ships• Construction of harbor ponds, dry & liquid bulk terminals, ro-ro terminals, stationary ships dead, construction of fish auctions, & fishery piers• Construction of breakwaters, revetments, groins• Determination of shipping lanes & international shipping routes• Ship trials • Independent tally business, sea transportation business & sea transportation equipment rental services, ship pilotage service business.• Operation of Regional and Local Feeder Ports • Dredging & reclamation in the territorial waters of Regional and Local Feeder Ports• Management (TUKS) within DLKR/DLKP regional feeder ports.• Operation of ferry transport within the province• Flight activities over the archipelagic channel• Loading and unloading activities by foreign ships• Foreign ship berthing activities except in force majeure• War training using ammunition by foreign ships• Construction and operation of special terminals• Marine biota cultivation activities for the benefit of the marine biopharmacology/biotechnology industry • Introduction of genetically modified organisms into the environment• Development of electricity generation,transmission, distribution and sales• Military exercises	• Taking underwater photos/videos • Anchor release • Laying of cables, poles and pipes • Development of Local Port Service (LPS) telecommunications cables • Development of Navigation Assistance Facilities • Construction of container terminals, ship repair sites • Fishing boat repair and maintenance service business • Logistics service business and fishing boat supplies • Jetty construction and operation • Hydrographic research or survey activities by foreign vessels • Salt mining construction • Development of salt industry facilities • Activities for collecting, utilizing, processing, disposing of B3 and non-B3 waste • Ship/floating equipment building activities • Construction of fishing refueling stations • Salt industry intake and output pipes
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Oil and Gas Pipeline	• Educational tourism business, rowing, diving, fishing, surfing, water sports, entertainment and recreation, extreme tourism (high risk), snorkeling, spectacle tourism, swimming, marine tourism services • Taking underwater photos/videos • Protection of biodiversity • Environmental rescue and protection • Conservation research and education activities • Scientific surveys and/or research • Fishing with vessel capacity < 10GT • Use of poles to propel the boat • Fisheries research and development • Diving works within the framework of the maritime industry	• Collection of coral reefs • Fish farming for industrial purposes • Floating aquaculture business • Collection and cultivation of non-fish marine resources • Cultivation of genetically engineered fish • Installation of deep water FADs • Fishing using trawls, payang, cantrang, lampara nets, dogol, gill nets, seine nets, long bag set nets, and Bouke Ami • Activity of testing motorized fishing boats/fishing boats • Exploration, processing & refining of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals • Construction of a coal power plan & oil and gas platform • Placement of tailings under the sea • Construction of LNG Regasification Terminal • Flaring • Destruction of oil and gas explosives • Installation of energy generator turbine facilities • Construction of container terminals, dry & liquid bulk terminals, ro-ro terminals, ship repair sites, and fish auction sites • Construction of breakwaters, revetments, groins • Jetty construction and operation • Dredging and reclamation in the territorial waters of Regional and Local Feeder Ports • War training using ammunition by foreign ships	• Tourist jetty business, domestic & international tourism sea transportation business, tourism travel services, seaside villas (cottages), seaside restaurants, water nature tourism• Planting of mangroves and palm trees• Mangrove cultivation• Collection of non-timber forest products in mangrove forests • Catching fish with a vessel capacity of 10-30 GT and ≥ 30GT• Retrieval of antiquities by motorized boats ≤ 5GT, 5-30 GT, and > 30 GT• Collection of goods other than antiquities by motorized boat ≤ 5GT, 5-30 GT, and > 30 GT• Anchor release• Sea fish cultivation business• Transportation of cultivated and caught fish • Installation of floating net cages and shallow water FADs• Unloading of fish• Fishing using Squid Jigging, Prawe, long line, pole and line, Bubu/Muroami, floating chart• Transportation and exploitation (production operations) of metallic minerals, non-metallic minerals, rocks, coal, radioactive minerals • Development of Floating Production Storage and Offloading• Seabed dredging with capital dredging • Seabed dredging with capital dredging which cuts coral and/or rock material• Construction of Floating Storage

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				• Activities for collecting, utilizing, processing, disposing of B3 and non-B3 waste	Offloading, Mooring• Installation of Ocean Current Power Generation & heat engine facilities • OTEC energy exploration• Construction, transfer and/or demolition of buildings or piping installations in waters• Cable & pipe laying• Construction of Local Port Service telecommunications cables• Planting and or laying of cables or poles and facilities at sea• Development of Navigation Assistance Facilities• Determination of berths & places of transfer between ships• Development of harbor ponds• Placement of dead ships• Determination of shipping lanes to and from fishing ports• Ship trials• Fishing boat repair and maintenance service business• Logistics service business and fishing boat supplies• Construction of a fishing wharf• Business of loading and unloading of goods & independent tally business• Construction and operation of cement grinding plants and cement packing plants• Operation of Regional and Local Feeder Ports• Sea transportation & equipment rental business• Management (TUKS) within DLKR/DLKP regional feeder ports.• Operation of In-Province Ferry Ships• Flight activities over the archipelagic channel• Determination of international shipping routes• Loading and unloading activities by foreign vessels• Hydrographic research or survey activities by foreign vessels• Activities anchoring foreign ships except in force majeure• Ship pilotage service business• Construction and operation of special terminals • Salt mining transportation, sales, construction, construction of Salt Industry Infrastructure Facilities • Shipyard Industry Activities with a Graving Dock system• Industrial development that is integrated with ports• Activities of making, repairing/maintaining ships/floating equipment• Production of main/auxiliary machines• The activity of making other equipment specifically used in ships• Other maritime equipment manufacturing activities• Activities to assist technical work on ships that are afloat but are experiencing a disaster• Cargo and fuel transferring• Towing• Refloating• Marine biotacultivation activities for the benefit of the Biopharmacology / Marine Biotechnology industry• Introduction of genetically modified organisms into the environment• Development of electricitygeneration, transmission, distribution and sales• Construction of fishing refueling stations• Salt industry intake and output pipes
East Java Province	Perda_No 1 Tahun 2018_RZWP3K	Sea Channels	• Entertainment and recreation business activities • Protection of biodiversity • Environmental rescue and protection • Flight activities over the archipelagic channel • Foreign ship berthing activities except in force majeure • Refloating	• Educational tourism business, rowing tourism, diving, fishing, surfing, water sports, jetty tourism, extreme tourism, seaside cottages, snorkeling, viewing tours, swimming, seaside restaurants, water nature tourism, marine tourism • Taking underwater photos/videos • Planting nipa palm, planting and cultivating mangroves • Conservation research and education activities • Collection of coral reefs • Scientific surveys and/or research • Collection of non-timber forest products in mangrove forests • Fishing with vessel capacity < 10GT, 10-30 GT, and ≥ 30GT • Collection of antiquities and other than antiquities by motor boats ≤ 5GT, 5-30 GT, and > 30 GT • Anchor release • Use of poles to propel the boat • Fish farming • Taking and cultivating non-fish marine resources for economic purposes • Transportation of fish cultured & caught by live fish carriers with Indonesian	• Entertainment and recreation business activities • Protection of biodiversity • Environmental rescue and protection • Flight activities over the archipelagic channel • Activities in anchoring foreign ships except in force majeure • Refloating

Area	Law Reference	Zone	Allowed Activities	Not Allowed Activities	Allowed activities with permission
				and foreign flags • Transportation of cultivated fish by small fishing boats • Cultivation of genetically engineered fish • Installation of floating net cages, deep & shallow water FADs • Unloading fish • Fishing using trawls, payang, cantrang, lampara nets, dogol, gill nets, seine nets, long bag set nets, squid jigging, prawe fishing gear, long lines, pole & line, bubu/muroami, bouke ami, floating charts • Fisheries research and development • Activity of testing motorized fishing boats/fishing boats • Exploration and transportation of metal minerals, non-metallic minerals, rocks, coal, radioactive minerals • Development of floating production storage and offloading • Seabed dredging with capital dredging • Seabed dredging with capital dredging which cuts coral and/or rock material • Construction of a coal power plant • Construction of oil and gas platforms, floating storage offloading, mining floating facilities • Exploitation (production operations) and processing & refining of coal, metallic minerals, non-metallic minerals, radioactive minerals • Placement of tailings under the sea • Construction of LNG regasification terminal • Flaring, destruction of oil and gas explosives • Installation of energy generator turbine facilities, installation of ocean current power plants, installation of heat engine facilities • OTEC energy exploration • Construction, transfer/demolition of buildings/installation of piping in waters • Cable embedment diameter 0-20, 20-50, 50-100, and above 100 cm • Development of local port service telecommunications cables • Planting and or laying of cables or poles and facilities at sea • Determination of berthing places, loading and unloading places between ships • Construction of harbor pools, container terminals, dry & liquid bulk terminals, ro-ro terminals, ship repair sites, dead ship placement, construction of fish auction sites • Construction of breakwaters, revetments, groins • Ship trials • Service business for repair & maintenance, logistics services and supplies for fishing vessels • Construction of a fishing wharf • Cargo loading and unloading business, independent tally business • Jetty construction and operation • Dredging and reclamation in regional and local feeder harbor waters • Determination of international shipping routes • Activities of loading and unloading foreign ships, hydrographic research or surveys, & war training using ammunition by foreign ships • Salt mining construction & construction of salt industry facilities • Collection, utilization, processing, disposal and landfilling of B3 & non-B3 waste • Shipyard industry activities with a graving dock system • Ship/floating equipment manufacturing & repair/maintenance activities • Manufacturing activities of main/auxiliary engines & other equipment specifically used in ships • Activities for making maritime tools • Diving works within the framework of the maritime industry • Cargo and fuel transferring • Marine biota cultivation activities for the benefit of the marine biopharmacology/biotechnology industry • Introduction of genetically modified organisms into the environment • Development of electricity generation, transmission, distribution and sales • Construction of fishing refueling stations • Salt industry intake and output pipes • Military exercises	

表 2　陸域空間計画の制限活動

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
Indramayu Regency	Regional Law 1 of 2012	Protected Forest	tourism without changing the natural landscape	other non-forestry development, except open pit mining	Activities that have the potential to reduce the forest and vegetation area
		Coastal Area	- green open space, defense and security, and transportation - customary interests and local wisdom - development of natural structures and artificial structures to prevent abrasion, accretion and seawater intrusion	- recreational activities, marine tourism, and ecotourism without constructing permanent buildings - community plantation forest	- solid waste, liquid waste, gas waste and B3 waste disposal - activities that can reduce the ecological and aesthetic functions of the area by changing and/or damaging the landscape, coastal functions and access to coastal areas
		River Area	- green open space - activities that can strengthen the protection function of river banks	- constructing buildings that support the function of river banks and/or buildings that are part of a network or transmission for the public interest - community plantation forest	activities that hinder the direction and intensity of water flow
		Plantation	- livestock cultivation activities, fisheries, settlements, and tourism activities - settlements for residents who work in the plantation sector - buildings that support plantation activities and regional infrastructure networks - conversion of the designated plantation area into other functions		- planting plantation crops that absorb water - change the type of plantation crops for large plantation areas that are not in accordance with permits
		Aquaculture	- regional infrastructure buildings and buildings that support fishing activities - freshwater aquaculture and floating nets - residential area	- permitted conditional on the use of fishery resources not exceeding the sustainable potential - capture fisheries and aquaculture activities with pay attention to environmental sustainability	- the development of fishery areas burdened with the tourism function undermines the tourism function - activities that cause water pollution and other environmental damage
		Industry	- development of residential area for employee housing - carry out operation/management in accordance with industrial designation areas with pay attention to environmental impacts - development of industrial activities supported by the availability of supporting facilities and infrastructure - construction and development of new industries in industrial areas - industrial activities that do not damage or conversion of protected areas	- industrial activities by having a waste and/or B3 waste treatment system - industrial activities in adjacent locations with integrated waste management - development of industrial designated areas along arterial or collector roads with frontage roads	- activities that have a damaging impact and reduce the quality of the environment
		Residential	- utilize water from surface water - provide education, health, trade and commerce facilities, open space facilities, parks and sports fields - household-scale industrial activities and other socio-economic facilities with environmental service scale	- residential development by providing building and environmental safety features - residential development by determining the type and terms of use of the building - residential development by providing drainage, infiltration wells, and rainwater collection - residential development by providing parking facilities - deep ground water and/or drilled wells utilization	- activities that disrupt the function of settlements and the continuity of social life of the community - developing settlements in river bends and intermittent river in landslides prone areas with a high level of vulnerability
		Defense and Security Area	- determination of the state defense and security area - provide supporting infrastructure for state defense and security areas	cultivation activities around the state defense and security area without disturbing the main function	-
Pemalang Regency	Regional Law 3 of 2011	River Area	- nature tourism as long as it does not disturb water quality - green open space - installation of billboards, counseling and warning boards, security signs, as well as shipping navigation aids - installation of electric cable networks, telephone cables, and drinking water pipes	- construction of buildings to support river management functions and recreational parks	- build a buildings in river area - carry out activities that damage and reduce the quality of the river

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
		Coastal Area	- aquaculture activities and their supporting activities - tourism activities, green open spaces and reforestation - construction of general, special and fishery ports along with supporting facilities - development of natural structures and artificial structures to prevent erosion - development of alternative energy from wind, sun, water/waves and non-fossil energy	-	carry out cultivation activities that damage the sustainability of coastal areas
		River Mouth (Estuary)	- carry out rehabilitation through a reforestation program with plants that have high conservation value and are suitable for the local environment - carry out outreach activities to the communities about the dangers of landuse change from protection function to cultivation activities	-	- cultivation activities extends following the flow of the river, especially around the river banks
		Mangrove Forested Coastal Area	mangrove planting	-	- reducing land conversion for neither cultivation areas nor settlements - Illegal mangrove logging - disposal of industrial waste which can be damaging to the northern coastal area
		Industry Designated Area	- develop supporting activities for industry - space utilization for buffer zones in the form of green belts and green open spaces - developing employee housing, local scale public facilities to support industrial activities	-	pollute water, air and soil beyond the permissible threshold
		Rural Residential Area	- trade in services - trade, creative industry and services with conditions that apply according to the scale of activity - carry out agricultural cultivation activities in yards, fisheries, stockbreeding and small/micro industries that process these cultivated products as long as they do not interfere with the comfort, health, safety, quality of life of the community and do not pollute the environment - development of public and social facilities	-	- damaging infrastructure, facilities and utilities that have been built - cultivation development other than mentioned in the allowed activities
		Urban Residential Area	- trade, creative industry and services with conditions that apply according to the scale of activity - development of public and social facilities	-	- damaging infrastructure, facilities and utilities that have been built - carry out livestock and industrial activities that can interfere the comfort, health, safety, quality of life of the community and pollute the environment
		Aquaculture Designated Area	activities that support fishing activities	-	- all cultivation activities that will disrupt the water quality of rivers and reservoirs for inland fisheries
		Paddy Field	activities that support agriculture	-	- cultivation activities that reduce the area of paddy fields - converting sustainable food agricultural land without a permit according to the conditions required - cultivation activities that reduce or damage land use and soil quality - construction of buildings in the irrigation canal area
		Horticultural Farming	- build detached house on condition that it is in accordance with a detailed spatial plan - space utilization for settlements of farmers	-	-
Pekalongan Regency	Regional Law 3 of 2020	River Area	- green open space	- nature tourism activities without disturbing river water quality - installation of billboards, counseling and warning boards, security signs - installation of electric cable networks, telephone cables, and drinking water pipes	- carry out activities that damage and reduce the quality of the river - carry out soil and rock mining activities

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
				- constructing buildings to support the functions of river management, water utilization, nature tourism, docks, energy facilities and other functions	
		Coastal Area	- carry out activities that able to protect/strengthen coastal areas from erosion, sea water intrusion and sea water infiltration	development of transportation infrastructure and facilities, fish auction market, water control buildings, tourism, energy facilities, shipping navigation aids, safety guard towers and/or other activities that located in beachside	activities that can damage the coastal ecosystem
		Mangrove Ecosystem	activities to protect mangrove ecosystems from destruction, disturbance, threats, pests and diseases	development of integrated mangrove ecosystem areas with education, research and tourism	activities that can damage the mangrove ecosystem
		Cultivation Area	comply with the general provisions of zoning regulations for production forest, agriculture, fishery, mining and energy, industry, tourism, settlement, defense and security areas		
		Industry Designated Area	- space utilization for warehousing, service industry, fueling stations and supporting activities - construction of energy generation facilities - development of infrastructure and supporting facilities for the industry	- developing housing and its supporting facilities - construction of facilities for public interest with considering the impact to industrial activities	- utilizing groundwater for the purposes of industrial activities and supporting activities from water catchment areas - contaminate water, air and soil beyond the required threshold
		Urban Residential Area	development of economic enterprises other than large and medium industries with consideration of environmental impacts	utilization of ground water for domestic use and its supporting activities from water catchment areas	carry out activities that have a significant impact on the health of the settlement environment
		Rural Residential Area	development of economic enterprises other than large and medium industries with consideration of environmental impacts	utilization of ground water for domestic use and its supporting activities from water catchment areas	carry out activities that have a significant impact on the health of the settlement environment
Pekalongan City	Regional Law 30 of 2011	Abrasion Prone Area	development of green open spaces, breakwaters, revetments, polders, retention ponds, pumping stations, embankments, drainage canals, overflow canals	marine business activities including: ports, fish auctions, safety guard towers and/or other activities that located in beachside as long as not damaging and/or polluting the coastal environment	activities and/or developments that threaten damage and/or reduce the quality of environmental sanitation
		Flood and Tidal Flood Prone Area	development of green open spaces, polders, retention ponds, pumping stations, embankments, drainage canals and other urban infrastructure	activities that not damaging the local drainage system and can adapt to flood problems, construction of open spaces that can increase rainwater infiltration into the soil	activities and/or developments that threaten damage and/or reduce the quality of environmental sanitation
		Industry Designated Area	industrial activities that not causing environmental damage and pollution	residential activities, as long as it is supporting industrial activities	-
		Tourism Designated Area	- tourism activities include: natural tourism or cultural tourism or artificial tourism, which is in accordance with the capacity of the environment and not damaging the preservation of nature reserves and cultural heritage - all supporting and supporting facilities including: recreation, sports, shows, lodging, meetings and trade services activities that support the main activities of the zone	residencial, as long as it is part and support of the main activities of the zone	-
		Capture Fisheries Designated Area	capture fisheries, aquaculture, processing and marketing of fishery products	utility network development activities, as long as the utility network is endeavored not to damage the existing fishery area	cultivation activities that reduces or damage the land use and soil quality
		Aquaculture Designated Area			
		Agriculture Designated Area	food crop agriculture, horticulture, and animal husbandry	urban utility/infrastructure network development activities, as long as the urban utility/infrastructure network does not damage the main activities in the area	conversion of land use without the permission from the authority
		Low Density Residential	residencial, religious activities, socio-cultural facilities that support settlements, government services, and others	small-scale service trading activities, small-scale offices, micro-industry, as long as they do not disturb the environment	-

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
		Area			
		Non-green Open Space Designated Area	- for non-green open space in water body: sports, tourism, fish farming, as long as it does not produce waste and garbage which will cause sedimentation in polders / retention ponds - for non-green open space in form of sport facility: sports, parking and the informal sector which will be further regulated by the authority - for non-green open space in form of parking facility: parking and other activities with the permission of the owner as long as it does not reduce the parking capacity	-	-
Rembang Regency	Regional Law 14 of 2011	Coastal Area	- wharf/dock, safety guard tower - activities to protect or strengthen the protection of the coastal border from erosion and infiltration of sea water into the soil - activities that support sea transportation facilities and infrastructure - restoration of damaged coastal protection functions - rehabilitation of degraded mangrove ecosystems - protection of mangrove ecosystems from destruction, disturbance, threats, pests and diseases	-	cultivation that can disrupt coastal functions, damage water quality, physical condition and sea bed
		River Area	- green open space - constructing buildings, except buildings for water management and/or water utilization	-	dumping industrial waste into the river
		Erosion Prone Area	- structural engineering with polder systems, wave breakwaters, sheet piles - non-structural engineering by rehabilitating mangrove forests in coastal areas	-	-
		Flood Prone Area	- preserve protected areas and upstream river areas - construction of infiltration wells in urban and rural urban areas, agricultural areas equipped with reservoirs, weirs, check dams, construction of new dams - create connected drains, and do not combine irrigation functions for drainage - green open space and construction of public facilities with low density	-	-
		Drought Prone Area			
		Nature Park	-	-	-
		Cultural Tourism Designated Area	research, education, and tourism	-	construction of buildings that are not in accordance with the function of the area
		Capture Fisheries Designated Area	-	-	-
		Aquaculture Area	-	-	-
		Residential Designated Area	-	-	-

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
Tuban Regency	Regional Law 17 of 2020	Coastal Area	- activities to protect or strengthen coastline protection from erosion and seawater intrusion, such as planting mangroves and other green open spaces - construction of natural or artificial structures to prevent abrasion such as breakwaters and other structures based on the vulnerability of the area - installation of foundations and spanning of electric cables, foundations of bridges/roads for public, buildings of weirs/dams and waterways, and water discharge controllers	- construction of buildings for recreation activities, which are limited to recreation buildings, guard towers, and sea transportation supporting infrastructure, with the following conditions: low intensity, using environmentally friendly building materials, not change the landscape, non-permanent design, consider physical-ecological conditions, the layout retains the characteristics of the landscape or its primary function - aquaculture activities with the following conditions: having minimum space utilization conflicts potential with the surrounding area, having a waste disposal system, having a feasibility study and/or environmental documents - port activities, marine and fisheries-based industries, construction of jetties with the following conditions: having minimum space utilization conflicts potential with the surrounding area, low intensity and does not have the potential to damage the coastal function, has a waste disposal system, has a feasibility study and/or environmental documents, not contradict the sea spatial plan (RZWP3K)	- construction of new buildings and/or infrastructure that has the potential to reduce area, disrupt protection functions, landscapes, beach preservation, and access to the coast - construction of new residential buildings
		River Area	- activities to protect or strengthen riverbanks, not to slow down the flow of water unless it is intentionally done to slow down the flow of water such as making check dams or cribs or dams or sluice gates or diverting river flow - installation of foundations and spanning of electric cables, foundations of bridges/roads for public, buildings of weirs/dams and waterways, and water discharge controllers - construction of green open spaces or activities that strengthen the protection function of riparian area with control, so not change the future function	- buildings that support river management and/or use of rivers and river nature tourism activities, with the following conditions: building materials that are environmentally friendly and do not change the landscape, non-permanent design and size, considering the physical-ecological conditions, the layout maintains the characteristics of the landscape and does not interfere with its main function - agricultural activities and inland fishery cultivation	construction of new buildings and/or infrastructure facilities that have the potential to reduce the area, disrupt the protection function, landscapes, preserve the function of rivers and impede the direction and intensity of water flow
		Aquaculture	- aquaculture research and development activities - fish breeding and cultivation - development of a market center for aquaculture products	- tourism activities with the following conditions: having an ecotourism concept, not reducing the function of green areas and water catchments, construction of supporting facilities is carried out with an environmentally friendly concept and low intensity - development of small and medium scale aquaculture processing industry with the following conditions: limiting the area, waste handling must be listed in environmental documents and required to have independent waste processing, must use environmentally friendly concepts	utilizing land for functions that negatively impact the ecological balance
		Industry Designated Area	- development of medium and large industrial activities, specifically development of various industries, basic chemical industry, basic metal and electronics machinery industry, and minapolitan industry - development of office for industrial management - warehouse development - green open space - development of bozem/reservoir/pond as a flood control facility, and not used for industrial waste disposal	- construction of housing in industrial areas with the following conditions: limiting the construction of residential houses based on needs, there must be green areas to reduce the negative impact of industry on existing settlements - development of trade and service activities with the following conditions: supporting industrial estates, not having a major environmental impact - supporting activities for environmental services in industrial areas such as health, education, religious activity, social and sports facilities in accordance with applicable technical standards - development of utility installations in the form of fire stations, garbage disposal sites, pump houses, substations, BTS, communal WWTP, with the following conditions: in accordance with	-

Area	Law Reference	Zone	Allowed Activities	Allowed Activities with Conditions	Prohibited Activities
				requirements and development standards as well as security requirements, waste disposal sites are integrated with the dominant waste sources, do not cause conflicts with around and there is a green area - activities that have the potential for high environmental health problems include B3 waste management activities with the following conditions: not causing a conflict with the allotment of space within the industrial area and its surroundings, complying with the provisions on the distance and intensity of the B3 waste management installation - oil and gas mining by complying with technical standards	
		Rural Residential Area	- medium and low density housing developments - green open space both environmental scale or village scale to complement and support the area - the development of blue open space in the form of a boezem/reservoir to maintain the quality of the local environment - protection of conservation of natural resources and preservation of local culture.	- trade and services with the following conditions: must provide loading, unloading areas, and parking lots in the area for local scale services; limited to existing buildings that already have permits, especially along the coastline, and unable to do new development; not causing environmental impacts and traffic disruption - raise, breed, and animal husbandary, with the following conditions: far from settlements, not located on productive land, does not cause waste that can interfere the community - small industry, small industrial centers, and warehouses - household scale industry with the condition - Environmental support activities such as health facilities, education, religion activities, social, and local scale sports, and the environment in accordance with applicable technical standards.	- mining activities
		Urban Residential Area	- high and moderate density housing developments - green open space both environmental scale or village scale to complement and support the area - development of graveyard as a support for housing while still consider the service range standard - the development of blue open space in the form of Boezem/Reservoir/Pond to support water catchment	- development of urban agriculture as tourism - supporting activities such as offices, health facilities, education, religious, social, and sports activities on a regional, local, and environmental service scale in accordance with applicable technical standards - construction of utility installations such as fire stations, garbage disposal sites, electrical substations, BTS, WWTP, pump houses, and other utility installations - trade and local,city, and regional scale service activity - small industrial activities, industrial centers, and warehouses - household scale industry	- mining activities
		Defense and Security Area	- military activities and supporting facilities - development of green open space as a buffer area	-	all activities other than allowed activities

付属資料 6-2

海岸の現況調査

付属資料 6　海岸の現状

6.1　波浪特性

波浪推算結果 ERA5 から、波浪観測地点である各沿岸域沖の 1981-2021 年の 40 年間の波浪データを入手し、それらデータから波浪特性を整理した。図 1 に抽出した波浪推算地点である Indramayu 沖、Pemalang 沖および Rembang 沖の 3 地点の位置を示す。抽出した推算データは以下の諸元である。

- 期間：1981 年 1 月～2021 年 12 月（41 年間）
- 推算時間間隔：1 時間
- 波浪諸元：最高波高、有義波高、平均周期、平均波向

出典：Google Earth をもとに JICA 調査団作成

図 1　波浪推算地点

6.1.1　波浪特性解析

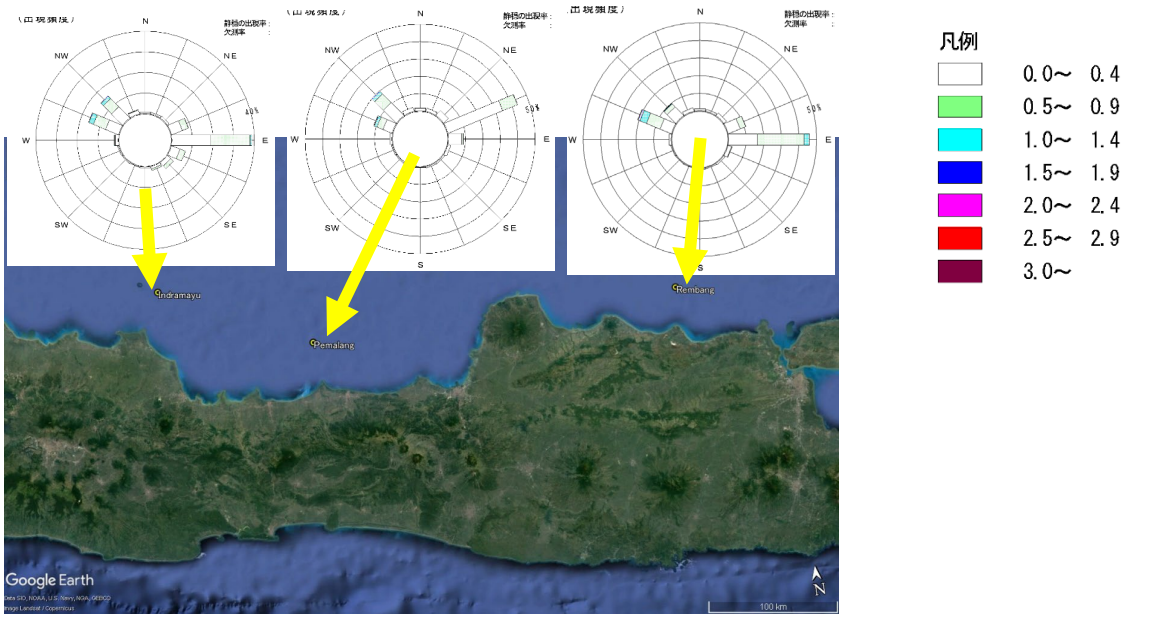
3 地点の波向頻度（図2～図5）から、E、ENE 方向からの波浪と NW、WNW 方向からの波浪と 2 方向からの波浪が存在することがわかる。さらに E、ENE 方向からの波は 5～10 月の乾季に、NW、WNW 方向からの波浪は 11 月から 3 月の雨季に卓越している。これは乾季と雨季で波向を決める風向に対応している。詳細に見ると、中央に位置する Pemalang はやや波向が N 方向にシフトしている。これは、Pemalang は、その東西に突出した地形があることから、東西から来襲する波浪がそれら突出した地形で遮られた影響と考えられる。波高はいずれの地点も 1 m 以下の頻度が高いものの、1 m 以上の頻度ではやや NW、WNW 方向、すなわち雨季の波高のほうが高い傾向が見られる。

3 地点の年最大有義波の平均値（図 6）で見ると、西から Indramayu 沖、Pemalang 沖、 Rembang 沖の順に波高が大きくなる傾向にある。それに伴い、周期も西から東に向けて長くなる傾向が見られる。波向については、先に述べた波向のよる波高の特性、すなわち西方向からの波高が高い傾向が表れており、いずれの地点も最大有義波の波向は W 方向からのものであり、かつ中央の Pemalang 沖ではや

や北寄りの傾向も見られる。3 地点の 40 年間のデータから、年最大有義波高は 1.5 ～ 3 m 程度、その周期は 6 s 程度である。

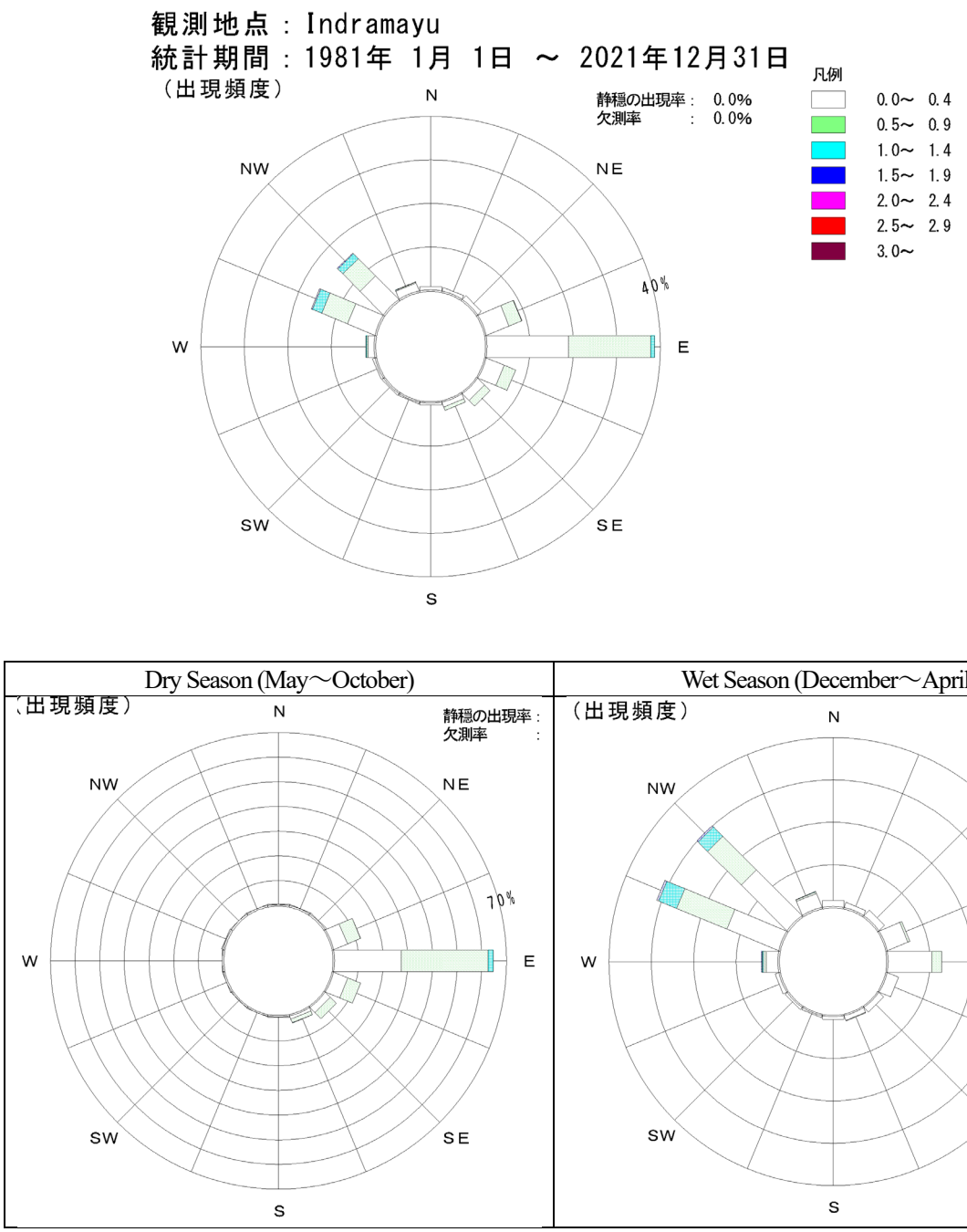
波高と周期の相関関係を図 7 に示す。これによると、3 地点とも波高が大きくなるにつれ、周期も長くなる傾向が見られる。年最大有義波高の経年変化を図 8 に示す。Rembang 沖の波高が大きく、次いで Pemalang 沖、Indramayu 沖の順となる場合が多いものの、順位が逆転している年もある。最大有義波高の地点間の関係を図 9 に示す。これらの関係図からも波高は Rembang、Pemalang、Indramayu の順となっている。年最大有義波の平均周期の年変化を図 10 に示す。周期は 4～7 s の範囲であり、波高と同様、年によって逆転する場合もあるが、概ね周期の長さは Rembang、Pemalang、Indramayu の順となっている。3 地点の平均周期の関係を図 11 に示す。これら関係図からも上記と同様の傾向が見られる。年最大有義波の平均波向の年変化を図 12 に示す。波向は 280° ～320° の範囲にあることから、W～NW 方向から来襲している。3 地点での波向の関係を図 13 に示す。Pemalang 沖の波向は Rembang 沖、Indramayu 沖よりも角度が大きいことから、より N 方向に偏る傾向が見られる。

Indramayu 沖の年間上位 10 波を表 2 に示す。年上位 10 波の平均は、波高 2.2～2.7 m 程度、平均周期 4.5～4.8 s 程度であり、波向は、西方向からの波の他、東方向からの波も見られる。



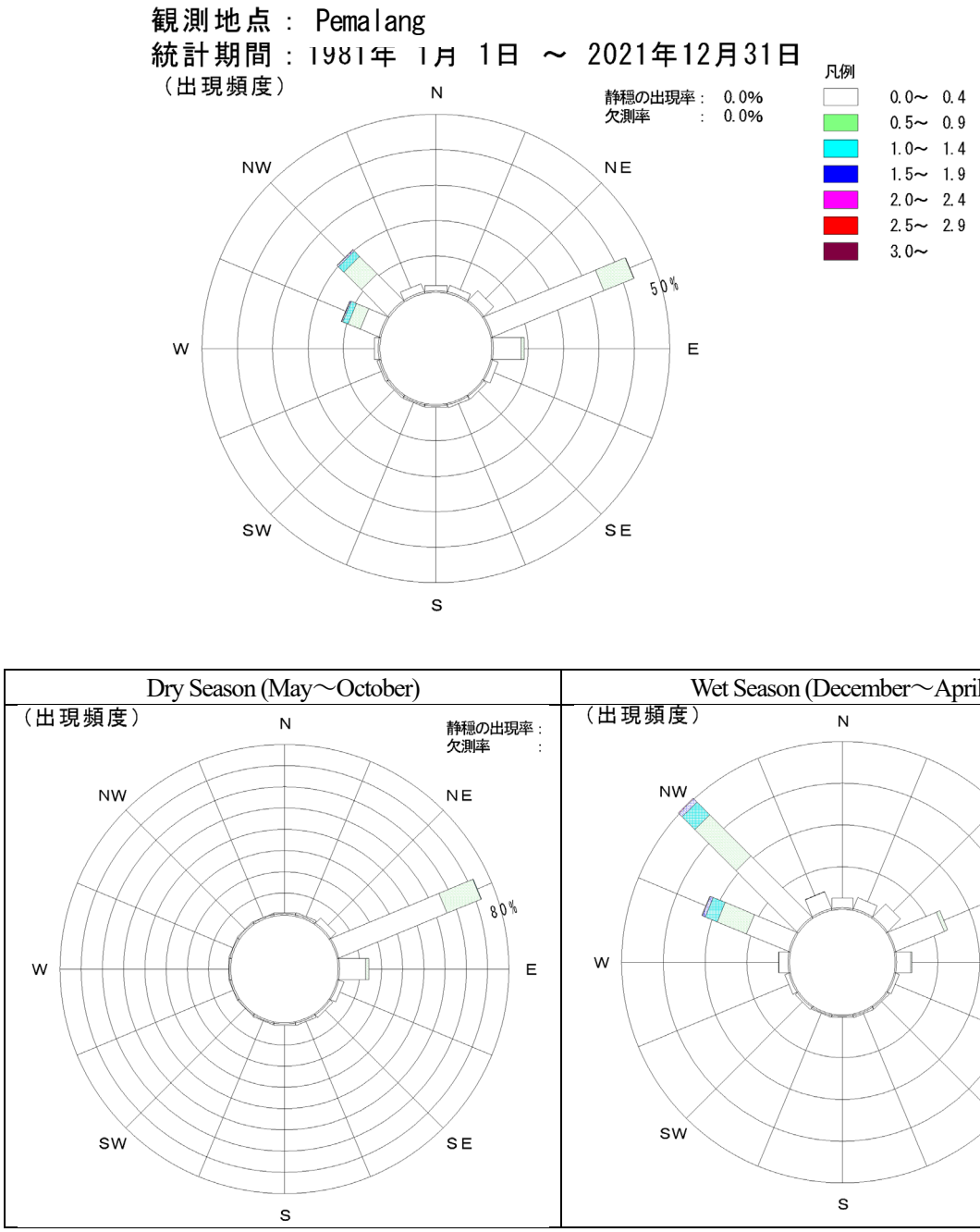
出典：Google Earth をもとに JICA 調査団作成

図 2　波向頻度の比較（左から Indramayu 沖、Pemalang 沖、Rembang 沖）



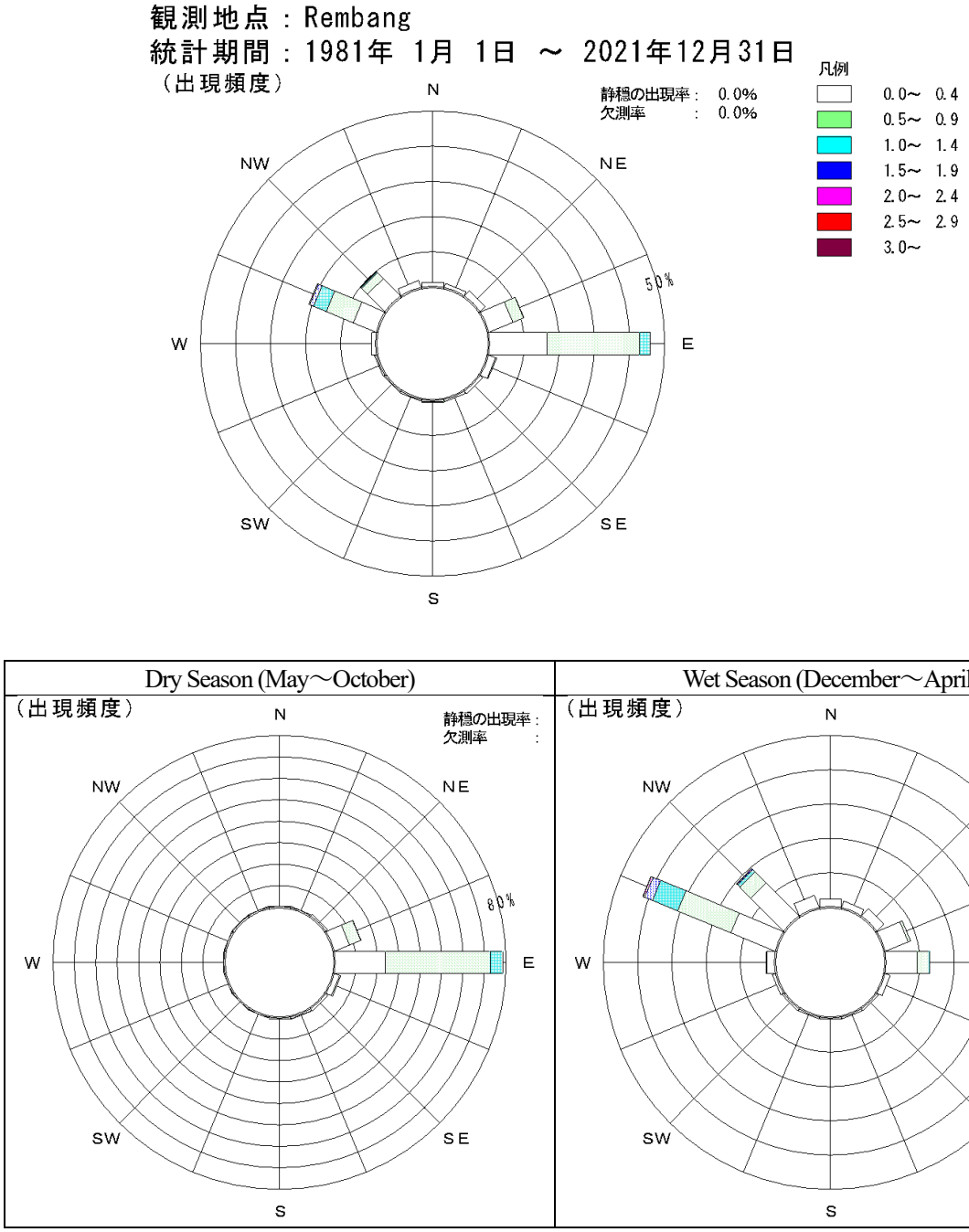
出典：JICA 調査団

図 3　Indramayu 沖の波向別波高頻度分布



出典：JICA 調査団

図 4　Pemalang 沖の波向別波高頻度分布



出典：JICA 調査団

図 5　Rembang 沖の波向別波高頻度分布

表 1　年最高波高一覧（1981～2021 年）

【Indramayu 沖】

year	time	Hmax(m)	Tm(s)	H1/3(m)	WDm(deg)
1981	1981/1/13 9:00	4.19	5.7	2.18	311
1982	1982/1/19 9:00	3.83	5.7	2.00	316
1983	1983/11/27 2:00	3.72	5.2	1.92	286
1984	1984/1/4 8:00	3.42	5.1	1.76	303
1985	1985/2/21 9:00	2.84	4.7	1.47	293
1986	1986/1/17 9:00	3.31	5.2	1.72	306
1987	1987/1/15 9:00	2.96	5.0	1.54	298
1988	1988/12/15 8:00	3.79	5.3	1.96	301
1989	1989/2/5 7:00	3.37	5.2	1.75	309
1990	1990/1/5 12:00	3.81	5.3	1.97	303
1991	1991/2/23 21:00	2.90	4.8	1.51	300
1992	1992/7/9 2:00	2.49	5.1	1.31	85
1993	1993/12/24 8:00	4.24	5.5	2.19	282
1994	1994/8/11 4:00	3.04	5.4	1.59	90
1995	1995/12/8 8:00	3.54	5.3	1.83	298
1996	1996/12/14 4:00	4.21	5.6	2.18	288
1997	1997/2/20 9:00	3.28	5.3	1.71	308
1998	1998/8/18 22:00	2.58	5.5	1.36	87
1999	1999/12/14 21:00	3.81	5.3	1.97	281
2000	2000/2/3 9:00	3.22	5.0	1.66	306
2001	2001/2/11 7:00	4.58	5.8	2.38	306
2002	2002/8/14 16:00	2.79	4.6	1.44	167
2003	2003/1/10 4:00	3.04	5.5	1.60	294
2004	2004/2/11 20:00	2.92	4.8	1.51	311
2005	2005/1/5 12:00	2.79	5.0	1.46	304
2006	2006/12/29 6:00	4.73	5.8	2.45	296
2007	2007/1/1 21:00	4.03	5.2	2.06	288
2008	2008/2/11 9:00	3.41	5.2	1.77	309
2009	2009/2/5 7:00	3.34	4.9	1.72	302
2010	2010/1/14 8:00	3.96	5.5	2.05	308
2011	2011/1/11 9:00	4.29	5.9	2.24	309
2012	2012/1/25 9:00	3.98	5.6	2.07	318
2013	2013/1/9 17:00	3.99	5.3	2.05	280
2014	2014/1/21 15:00	3.49	5.5	1.83	318
2015	2015/12/16 19:00	3.40	5.2	1.77	297
2016	2016/12/22 23:00	3.27	5.2	1.70	278
2017	2017/11/30 21:00	4.09	5.4	2.11	281
2018	2018/1/13 5:00	3.29	5.2	1.71	306
2019	2019/1/22 11:00	3.18	5.3	1.66	313
2020	2020/12/8 22:00	4.04	5.4	2.09	288
2021	2021/1/29 10:00	3.16	5.2	1.65	308
Mean		3.52	5.3	1.83	281

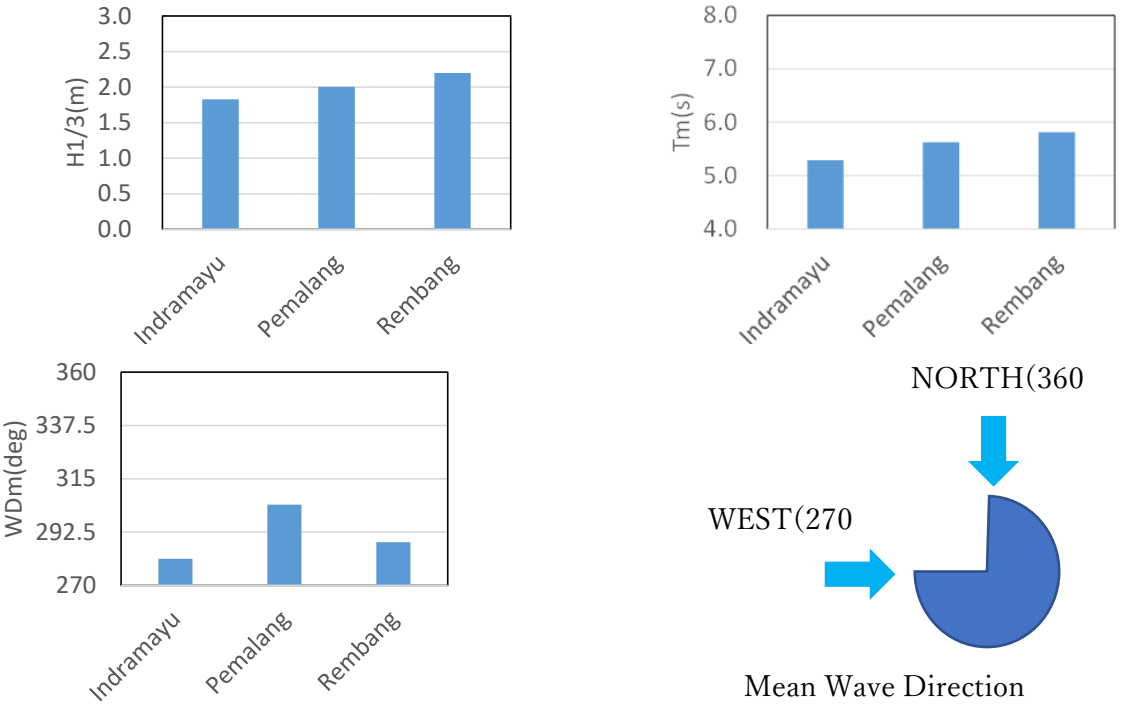
【Pemalang 沖】

year	time	Hmax(m)	Tm(s)	H1/3(m)	WDm(deg)
1981	1981/1/13 9:00	4.98	6.3	2.58	309
1982	1982/1/19 8:00	4.47	6.0	2.32	310
1983	1983/11/27 10:00	4.29	5.8	2.21	301
1984	1984/1/4 10:00	4.03	5.6	2.07	303
1985	1985/2/21 18:00	3.54	5.3	1.82	304
1986	1986/1/19 21:00	4.30	5.7	2.21	303
1987	1987/1/26 10:00	3.84	5.5	1.98	298
1988	1988/12/15 9:00	3.97	5.7	2.05	304
1989	1989/2/5 9:00	3.68	5.5	1.90	308
1990	1990/1/26 7:00	4.54	5.9	2.33	303
1991	1991/2/23 19:00	3.59	5.3	1.85	302
1992	1992/12/2 7:00	2.07	4.5	1.08	299
1993	1993/1/29 21:00	4.09	5.7	2.11	314
1994	1994/1/24 11:00	3.07	5.3	1.60	307
1995	1995/12/8 9:00	3.49	5.7	1.81	303
1996	1996/12/14 4:00	3.47	5.6	1.80	298
1997	1997/2/22 23:00	3.71	5.4	1.91	298
1998	1998/12/30 9:00	2.65	4.9	1.38	300
1999	1999/2/8 7:00	3.90	5.7	2.02	306
2000	2000/2/3 21:00	3.75	5.5	1.93	301
2001	2001/2/11 9:00	5.13	6.4	2.67	305
2002	2002/2/10 4:00	2.78	5.2	1.45	308
2003	2003/2/6 9:00	3.19	5.2	1.64	305
2004	2004/2/12 3:00	2.99	5.2	1.56	305
2005	2005/1/17 4:00	2.58	4.9	1.35	303
2006	2006/12/29 9:00	5.57	6.4	2.88	300
2007	2007/12/28 10:00	4.26	5.8	2.20	307
2008	2008/2/15 8:00	4.09	5.7	2.11	300
2009	2009/2/5 9:00	4.44	5.7	2.27	304
2010	2010/1/14 9:00	4.52	6.1	2.34	310
2011	2011/1/11 21:00	4.59	6.2	2.39	310
2012	2012/1/25 8:00	4.46	6.0	2.31	312
2013	2013/1/9 20:00	4.57	6.0	2.35	294
2014	2014/1/21 18:00	4.08	6.0	2.13	311
2015	2015/12/17 6:00	3.57	5.6	1.86	300
2016	2016/12/21 11:00	2.92	5.1	1.51	301
2017	2017/1/29 12:00	4.12	6.0	2.15	301
2018	2018/1/28 15:00	3.65	5.3	1.88	304
2019	2019/1/27 23:00	3.41	5.4	1.77	312
2020	2020/12/8 22:00	4.51	6.0	2.34	302
2021	2021/1/29 11:00	3.92	5.7	2.02	304
Mean		3.87	5.6	2.00	304

【Rembang 沖】

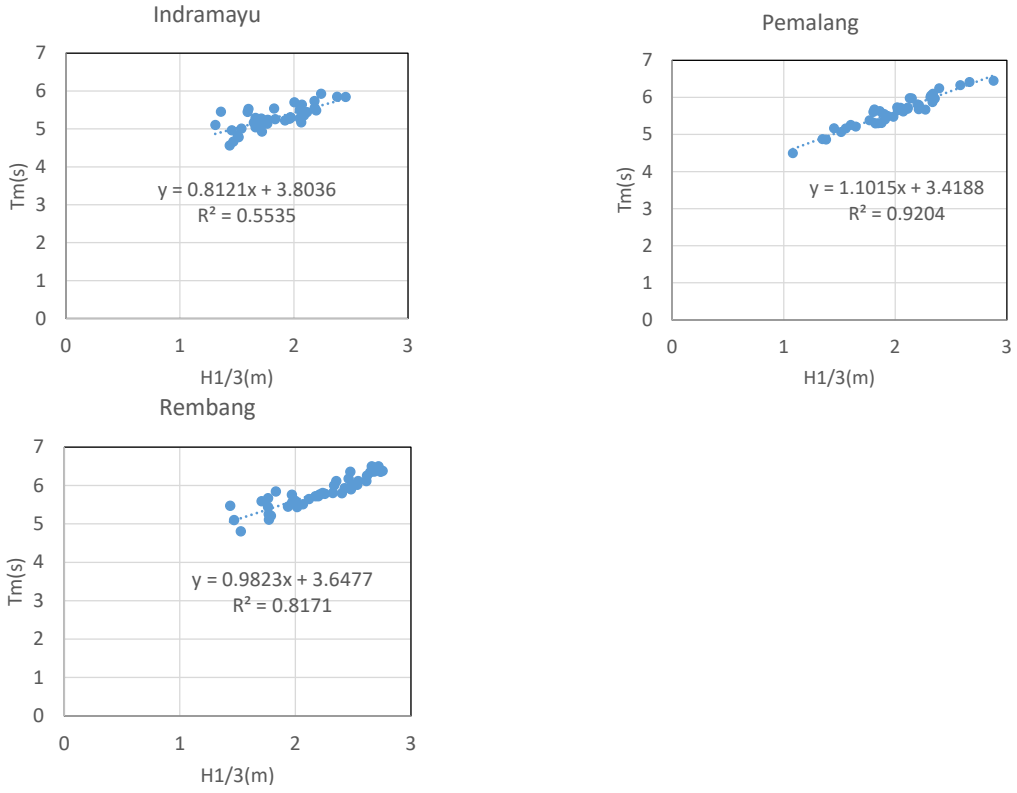
yesr	time	Hmax(m)	Tm(s)	H1/3(m)	WDm(deg)
1981	1981/1/12 7:00	5.29	6.4	2.75	305
1982	1982/1/18 9:00	4.27	5.8	2.21	303
1983	1983/11/28 8:00	4.90	6.1	2.54	297
1984	1984/2/20 19:00	4.02	5.5	2.07	299
1985	1985/2/19 8:00	2.97	4.8	1.53	301
1986	1986/1/19 21:00	5.06	6.1	2.61	297
1987	1987/12/22 9:00	4.25	5.7	2.20	296
1988	1988/12/15 9:00	4.36	5.8	2.25	298
1989	1989/3/10 8:00	3.45	5.1	1.77	296
1990	1990/1/25 6:00	5.04	6.3	2.62	298
1991	1991/2/18 10:00	3.91	5.4	2.01	296
1992	1992/7/8 16:00	2.74	5.5	1.44	84
1993	1993/1/28 7:00	4.67	5.8	2.40	301
1994	1994/1/24 10:00	2.81	5.1	1.47	298
1995	1995/3/2 16:00	4.09	5.6	2.12	287
1996	1996/12/16 12:00	3.78	5.8	1.97	298
1997	1997/2/21 9:00	4.20	5.7	2.17	298
1998	1998/8/18 16:00	3.27	5.6	1.71	88
1999	1999/12/25 8:00	3.79	5.6	1.97	295
2000	2000/1/22 8:00	3.42	5.3	1.77	296
2001	2001/2/11 20:00	5.15	6.4	2.68	297
2002	2002/2/3 10:00	3.47	5.2	1.79	301
2003	2003/1/10 9:00	3.36	5.7	1.76	300
2004	2004/2/12 8:00	3.74	5.4	1.94	294
2005	2005/12/30 10:00	3.39	5.4	1.76	302
2006	2006/12/29 21:00	5.07	6.5	2.66	293
2007	2007/1/2 7:00	5.08	6.3	2.65	297
2008	2008/2/15 7:00	4.81	5.9	2.48	293
2009	2009/2/5 9:00	4.81	6.0	2.49	300
2010	2010/1/14 8:00	5.27	6.4	2.74	302
2011	2011/1/11 22:00	4.73	6.4	2.48	302
2012	2012/3/14 8:00	4.70	5.9	2.43	301
2013	2013/1/10 5:00	5.21	6.5	2.72	297
2014	2014/1/21 22:00	4.72	6.2	2.46	303
2015	2015/12/17 12:00	3.48	5.8	1.83	300
2016	2016/12/21 9:00	3.86	5.6	2.00	300
2017	2017/2/7 1:00	4.92	6.0	2.54	302
2018	2018/1/29 8:00	4.32	5.8	2.24	297
2019	2019/1/22 16:00	4.49	6.0	2.34	300
2020	2020/12/9 3:00	4.53	6.1	2.35	308
2021	2021/1/29 11:00	4.50	5.8	2.32	296
Mean		4.24	5.8	2.20	288

出典：JICA 調査団



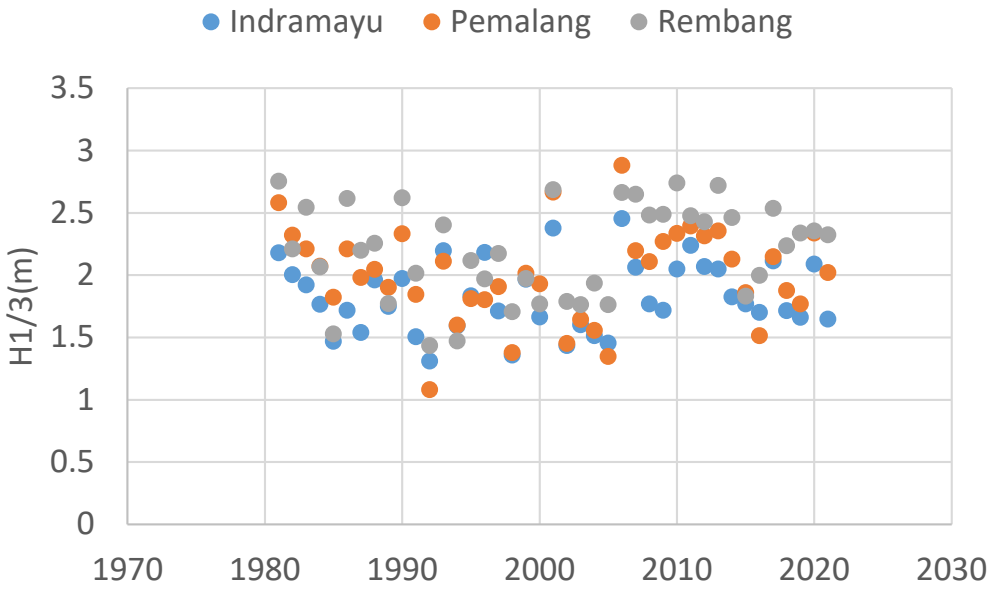
出典：JICA 調査団

図 6　年最大有義波の 1981～2021 年平均値比較



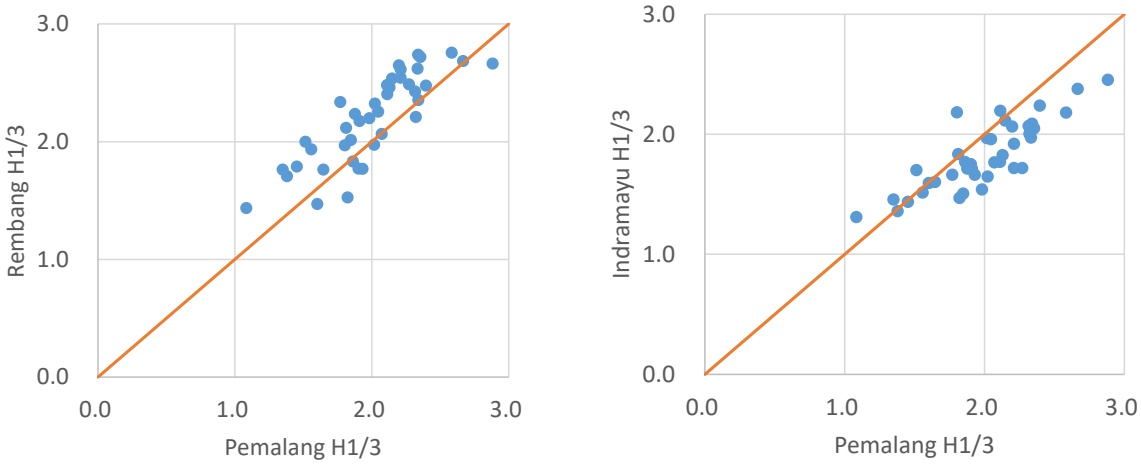
出典：JICA 調査団

図 7　波高と周期の相関関係



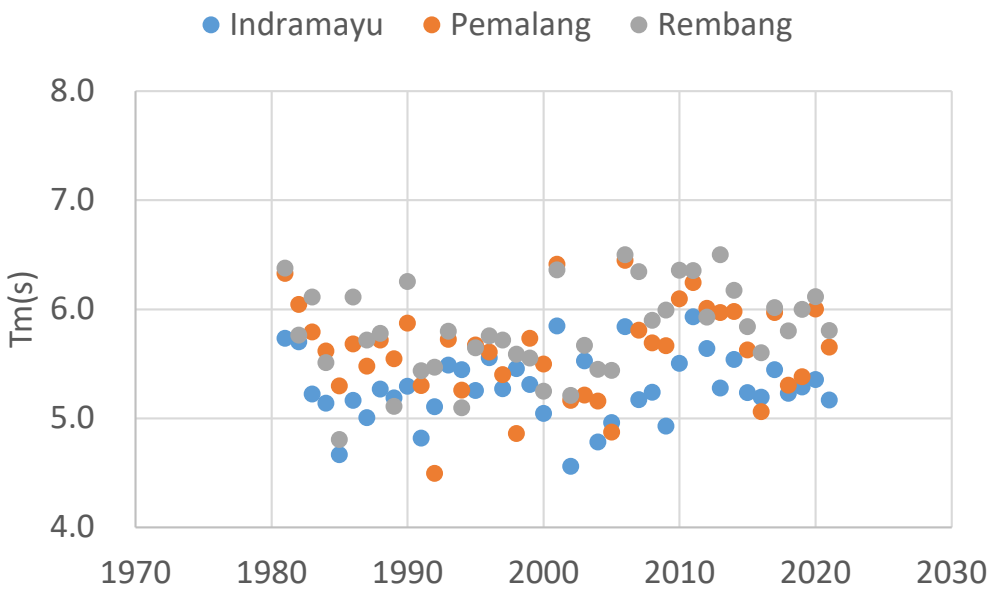
出典：JICA 調査団

図 8　年最大有義波高の変化



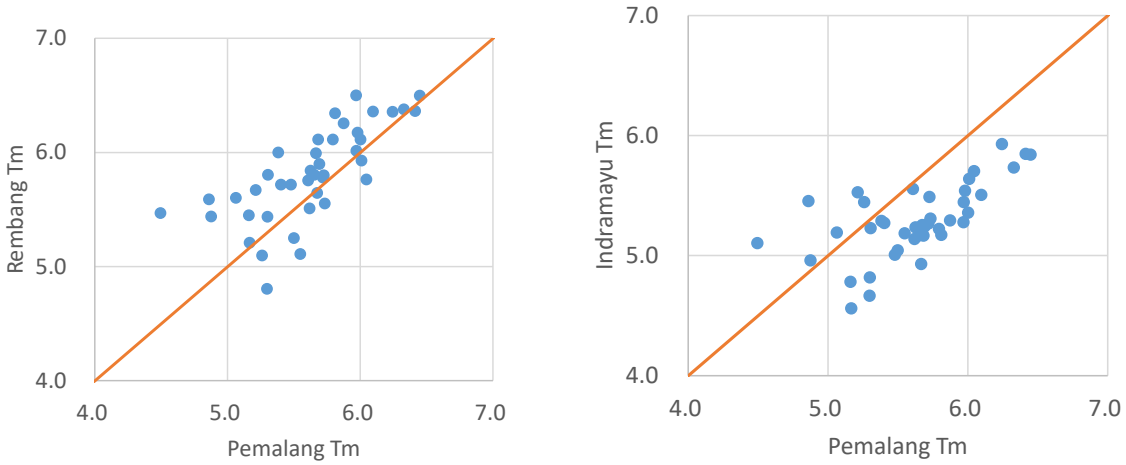
出典：JICA 調査団

図 9　年最大有義波高の地点比較



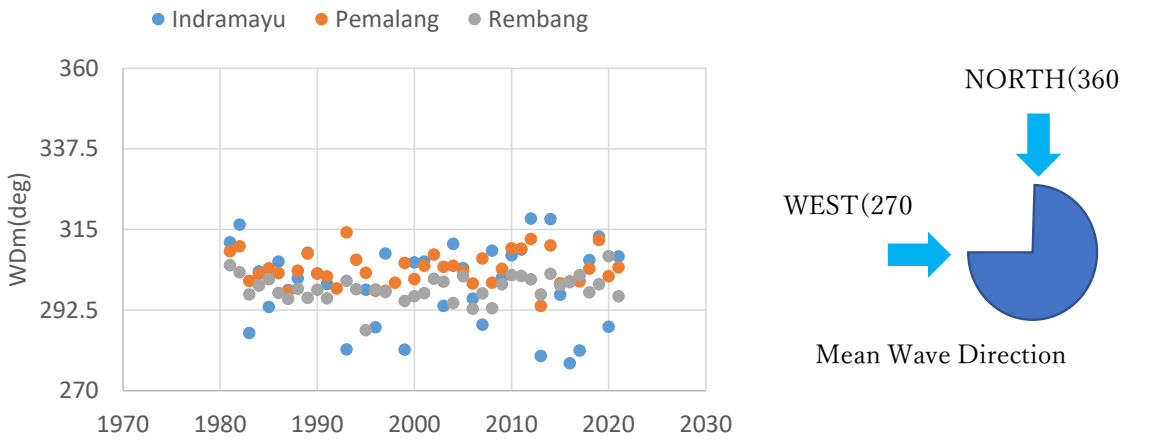
出典：JICA 調査団

図 10　年最大有義波の平均周期の変化



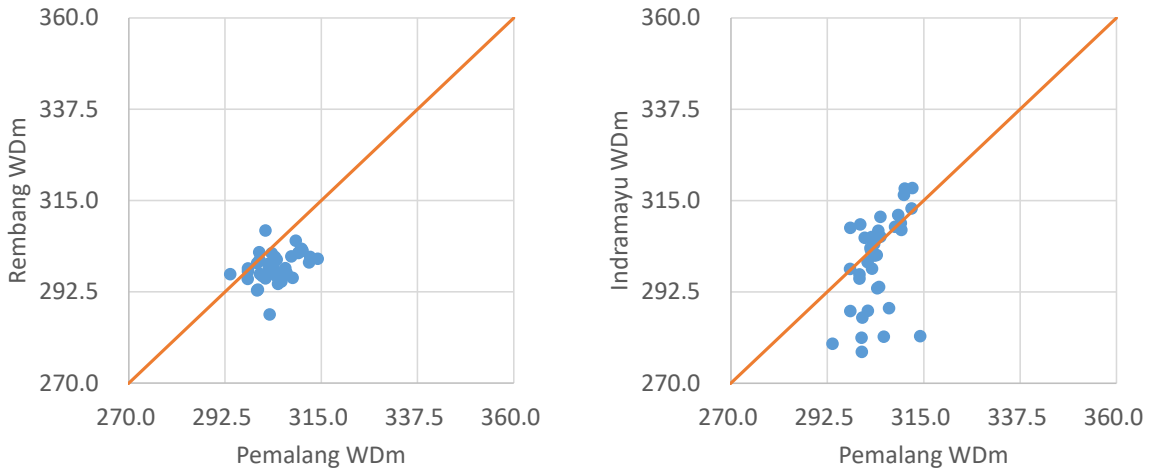
出典：JICA 調査団

図 11　年最大有義波の平均周期の地点比較



出典：JICA 調査団

図 12　年最大有義波の平均波向の変化



出典：JICA 調査団

図 13　年最大有義波の平均波向の地点比較

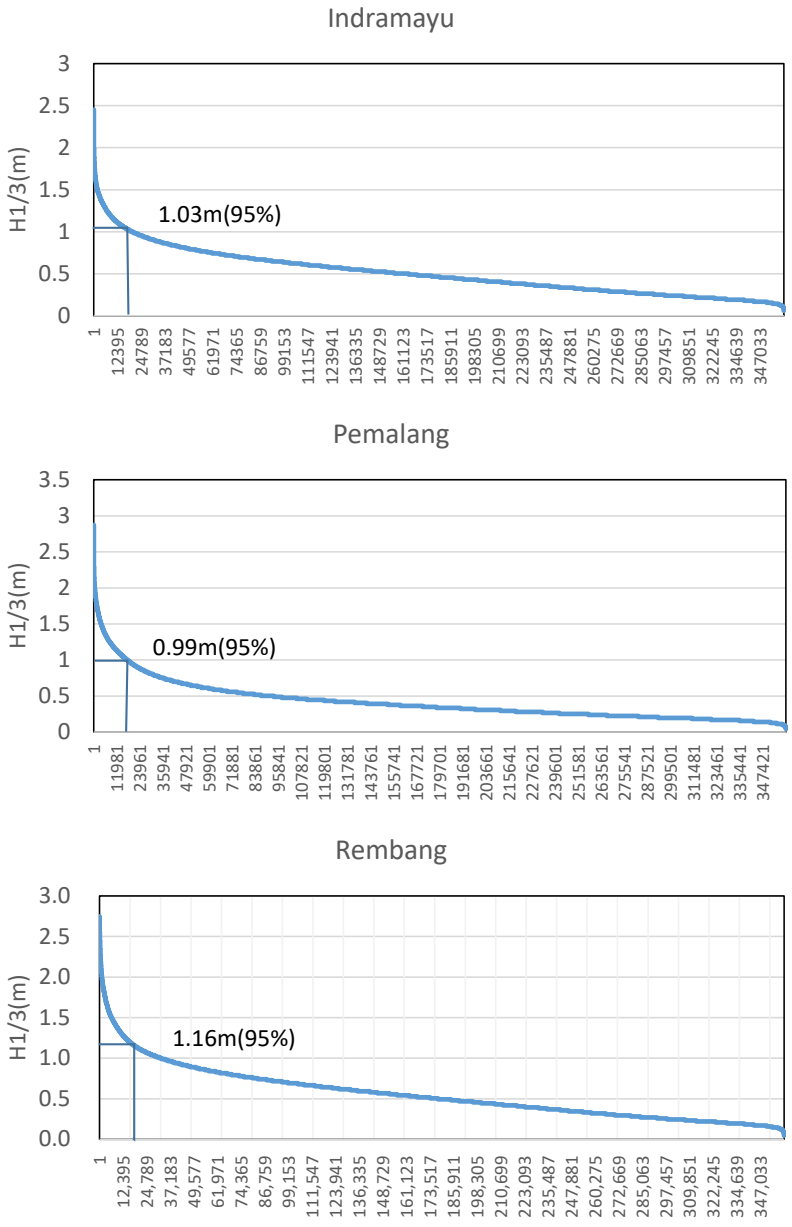
表 2　Indramayu 沖における年間上位波浪

	1981	Hmax(m)	T1/3(s)	H1/3(m)	α(deg)
1	1981/1/13 9:00	4.19	5.7	2.18	311
2	1981/2/3 9:00	3.02	4.8	1.56	296
3	1981/2/8 9:00	3.00	4.9	1.55	299
4	1981/11/16 13:00	2.66	4.5	1.38	283
5	1981/2/26 9:00	2.57	4.5	1.33	294
6	1981/1/27 10:00	2.48	4.6	1.29	309
7	1981/12/3 8:00	2.49	4.3	1.29	294
8	1981/3/1 5:00	2.28	4.5	1.19	311
9	1981/12/18 10:00	2.24	4.3	1.16	305
10	1981/12/24 20:00	2.15	4.5	1.13	311
	上位10波平均	2.71	4.7	1.41	301
	1982	Hmax(m)	T1/3(s)	H1/3(m)	α(deg)
1	1982/1/19 9:00	3.83	5.7	2.00	316
2	1982/2/14 9:00	3.25	5.1	1.68	302
3	1982/2/5 11:00	2.49	4.5	1.29	295
4	1982/1/27 9:00	2.49	4.5	1.29	305
5	1982/7/8 7:00	2.33	5.0	1.23	86
6	1982/6/30 4:00	2.26	4.6	1.18	92
7	1982/8/7 5:00	2.20	4.9	1.16	90
8	1982/7/4 6:00	2.06	5.0	1.09	87
9	1982/8/2 21:00	1.99	4.4	1.04	88
10	1982/7/31 11:00	1.95	4.7	1.03	78
	上位10波平均	2.49	4.8	1.30	174
	1983	Hmax(m)	T1/3(s)	H1/3(m)	α(deg)
1	1983/11/26 4:00	3.49	5.1	1.81	291
2	1983/12/28 6:00	2.33	4.5	1.22	299
3	1983/12/1 6:00	2.32	4.4	1.21	297
4	1983/8/30 9:00	2.11	4.5	1.11	82
5	1983/7/9 18:00	2.15	4.5	1.09	131
6	1983/1/3 10:00	2.08	4.5	1.09	314
7	1983/8/2 9:00	2.05	4.6	1.08	86
8	1983/8/21 22:00	1.96	4.6	1.03	88
9	1983/8/14 17:00	1.96	4.1	1.01	155
10	1983/6/13 4:00	1.89	4.4	0.99	90
	上位10波平均	2.23	4.5	1.16	183
	1984	Hmax(m)	T1/3(s)	H1/3(m)	α(deg)
1	1984/1/4 8:00	3.42	5.1	1.76	303
2	1984/2/20 8:00	2.96	4.8	1.53	299
3	1984/12/11 5:00	2.84	4.6	1.46	283
4	1984/7/1 9:00	2.58	4.8	1.35	91
5	1984/12/28 10:00	2.45	4.5	1.27	291
6	1984/6/12 4:00	2.31	4.7	1.21	82
7	1984/11/27 10:00	2.30	4.5	1.20	290
8	1984/4/30 8:00	2.17	4.5	1.13	93
9	1984/3/5 0:00	2.18	4.2	1.13	291
10	1984/7/6 17:00	2.11	4.7	1.11	83
	上位10波平均	2.39	4.6	1.24	215
	1985	Hmax(m)	T1/3(s)	H1/3(m)	α(deg)
1	1985/2/21 9:00	2.84	4.7	1.47	293
2	1985/4/18 9:00	2.52	4.6	1.31	288
3	1985/12/27 9:00	2.32	4.6	1.21	308
4	1985/12/1 10:00	2.30	4.2	1.19	284
5	1985/3/2 8:00	2.27	4.2	1.17	298
6	1985/3/8 10:00	2.13	4.5	1.11	283
7	1985/7/19 9:00	2.08	4.8	1.10	84
8	1985/1/18 10:00	2.07	4.2	1.08	313
9	1985/8/23 9:00	1.80	4.3	0.95	86
10	1985/8/15 10:00	1.72	4.4	0.91	83
	上位10波平均	2.20	4.5	1.15	232

出典：JICA 調査団

波浪特性として 95%頻度の波浪を以下に示す。収集した 40 年分の推算波浪データを波高の高いほうから順に並べ、その上位 5%に位置する波高を抽出する。すなわち、その波高以下の出現頻度は 95%を占めることとなる。95%頻度の波高は後に示す漂砂の移動高を推定するために用いる。Rembang がやや高いものの、3 地点とも概ね約 1 m 程度である。

- Indramayu: 1.03m
- Pemalang: 0.99m
- Rembang: 1.16m



出典：JICA 調査団

図 14　95%頻度の波高

6.1.2 極値統計解析

入手した41年分のデータから3地点の年最大有義波を抽出して、それらデータを用いて極値統計解析を実施した。先に示したように、当該海域は季節によって東方向と西方向からの波浪が明確に分かれていること、またここで設定する確率波は各地点での設計波になること、地点によっては東西どちらかの方向からの波浪の影響を大きく受けることを考え、東西各々の方向からの波浪に対しての極致統計解析が必要と考えた。解析結果を表 3 および図 15～図 19 に示す。Pemalang については、年最大波は全て西からの波（180°<Wave angle<360°）であったが、他地点は東からの波（Wave angle<180°）が年最大となる場合もあった。確率分布関数としては、Weibull 分布（k = 2.0）が最も適用度が高かった。なお周期については、前述の図 7 に示した波高と周期の相関から求めた。波高については、先に示した傾向と同様、Indramayu から東 Rembang に向かうに従い、確率波高も大きくなる傾向である。ただし、Rembang について 20 年確率波高以上は近似関数から外れてくる傾向が見られる。

表 3　極値統計による確率波

(1) Indramayu

Return Period (year)	Indramayu					
	Wave angle <360		180<Wave angle <360		Wave angle <180	
	Wave Heights H1/3(m)	Wave Period Tm(s)	Wave Heights H1/3(m)	Wave Period Tm(s)	Wave Heights H1/3(m)	Wave Period Tm(s)
1	1.28	4.8	1.26	4.8	0.96	4.5
2	1.79	5.3	1.79	5.3	1.30	5.1
5	2.06	5.5	2.06	5.5	1.48	5.4
10	2.21	5.6	2.22	5.6	1.58	5.5
20	2.35	5.7	2.35	5.7	1.66	5.7
30	2.42	5.8	2.43	5.8	1.71	5.7
50	2.50	5.8	2.51	5.8	1.76	5.8
100	2.60	5.9	2.62	5.9	1.83	5.9

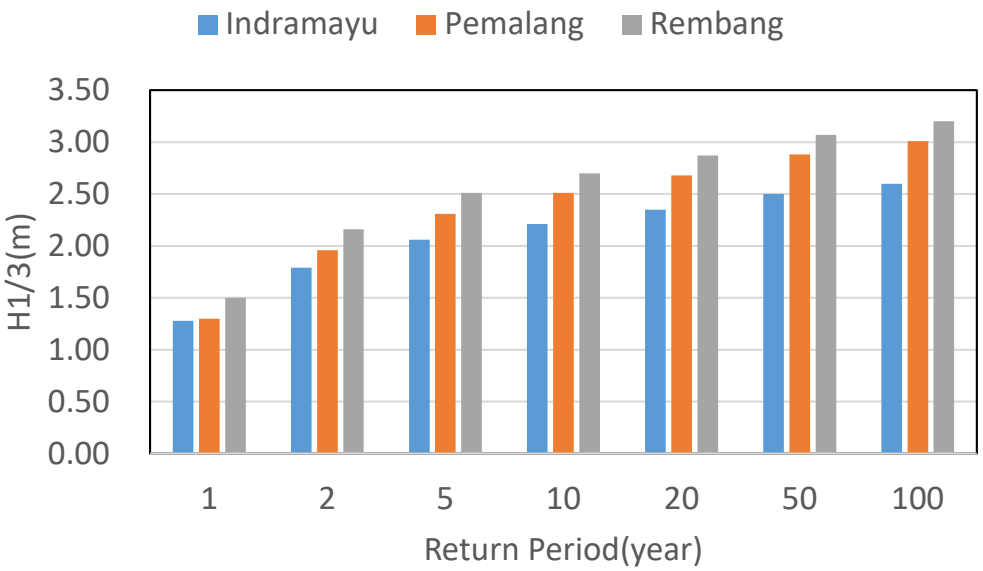
(2) Pemalang

Return Period (year)	Pemalang			
	Wave angle <360		Wave angle <180	
	Wave Heights H1/3(m)	Wave Period Tm(s)	Wave Heights H1/3(m)	Wave Period Tm(s)
1	1.30	4.9	0.75	4.2
2	1.96	5.6	1.06	4.9
5	2.31	6.0	1.23	5.3
10	2.51	6.2	1.33	5.5
20	2.68	6.4	1.41	5.7
30	2.77	6.5	1.45	5.8
50	2.88	6.6	1.50	5.9
100	3.01	6.7	1.57	6.0

(3) Rembang

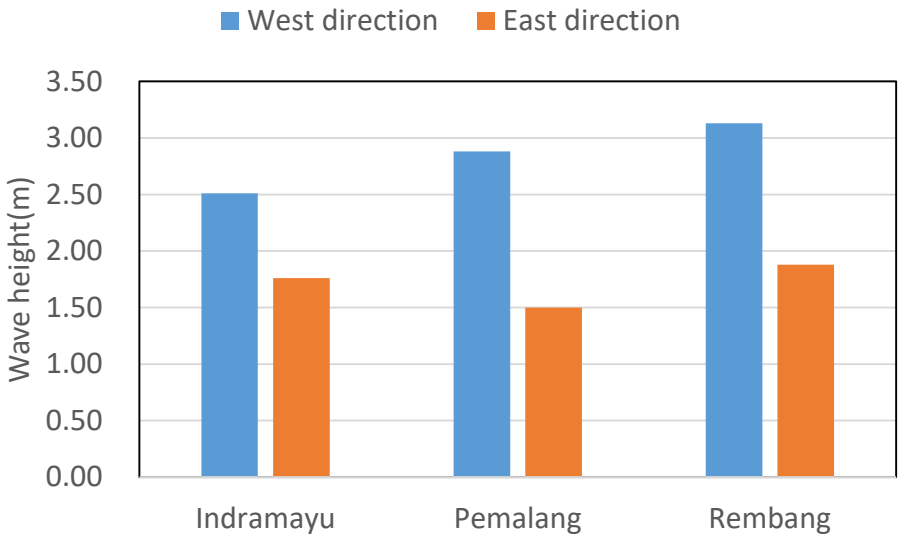
Return Period (year)	Rembang					
	Wave angle <360		180<Wave angle <360		Wave angle <180	
	Wave Heights H1/3(m)	Wave Period Tm(s)	Wave Heights H1/3(m)	Wave Period Tm(s)	Wave Heights H1/3(m)	Wave Period Tm(s)
1	1.50	5.1	1.41	5.0	1.19	4.9
2	2.16	5.8	2.13	5.7	1.39	5.2
5	2.51	6.1	2.51	6.1	1.55	5.5
10	2.70	6.3	2.73	6.3	1.66	5.6
20	2.87	6.5	2.91	6.5	1.76	5.8
30	2.96	6.6	3.01	6.6	1.81	5.9
50	3.07	6.7	3.13	6.7	1.88	6.0
100	3.20	6.8	3.28	6.9	1.96	6.1

出典：JICA 調査団



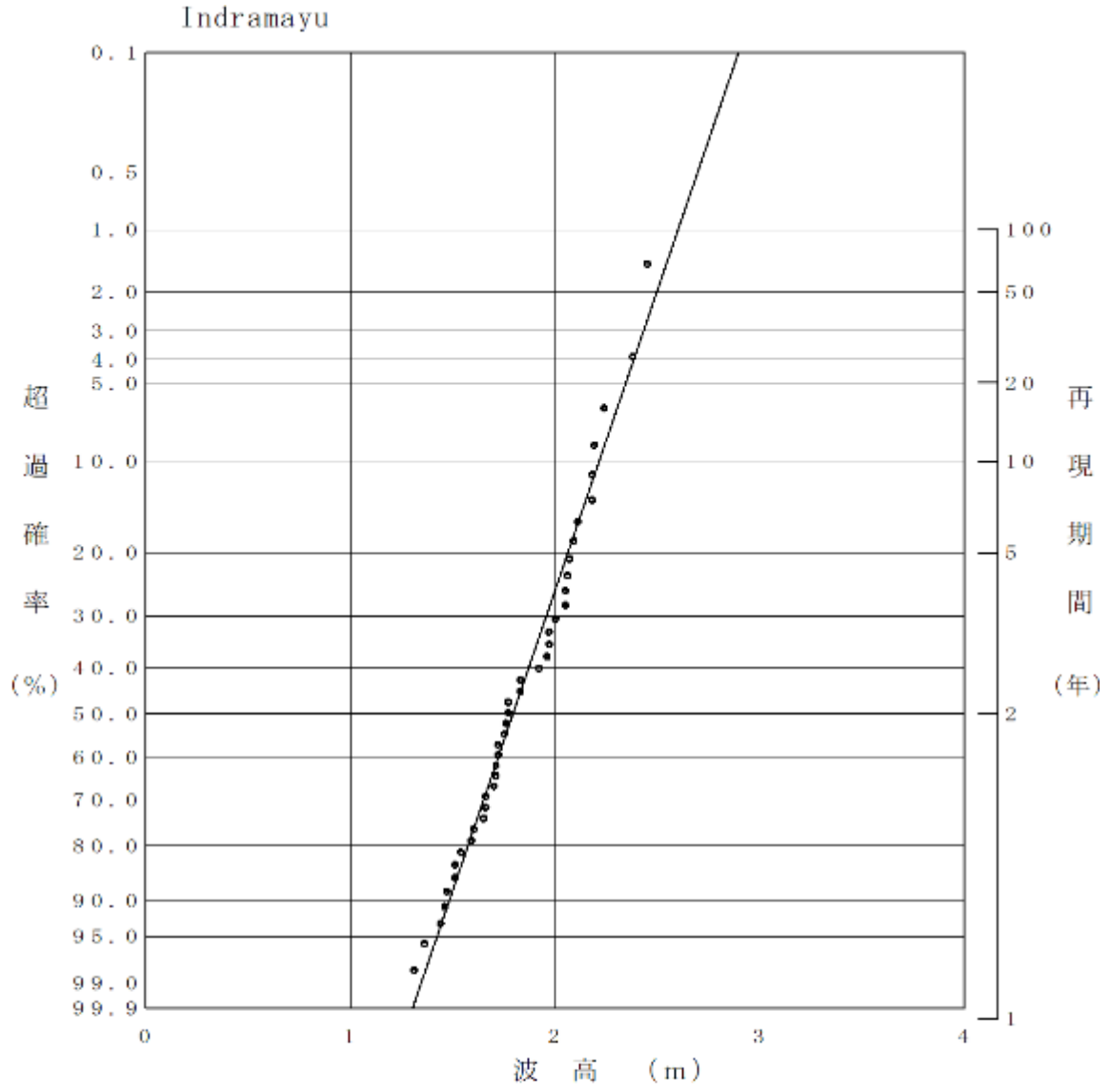
出典：JICA 調査団

図 15　確率波高の地点別比較（全方向）



出典：JICA 調査団

図 16　東西別波向の 50 年確率波高

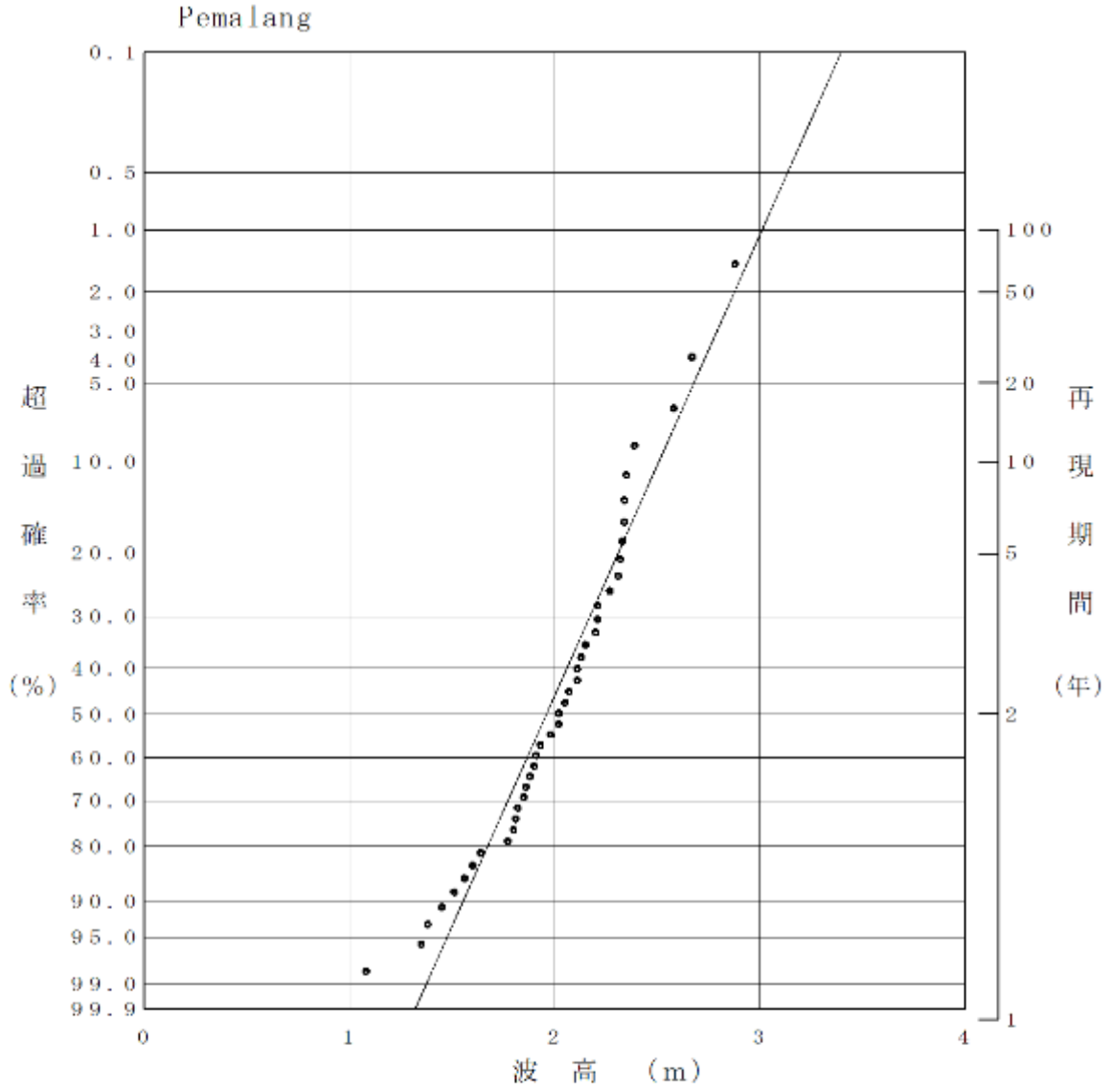


データ数	41（41年）
最適関数	WEIBULL分布（k＝2.00）
相関係数	0.991

確率年	期待値
1	1.28
2	1.79
5	2.06
10	2.21
20	2.35
50	2.50
100	2.60

出典：JICA 調査団

図 17　Indramayu 沖波浪の極致統計解析結果（全波浪対象）

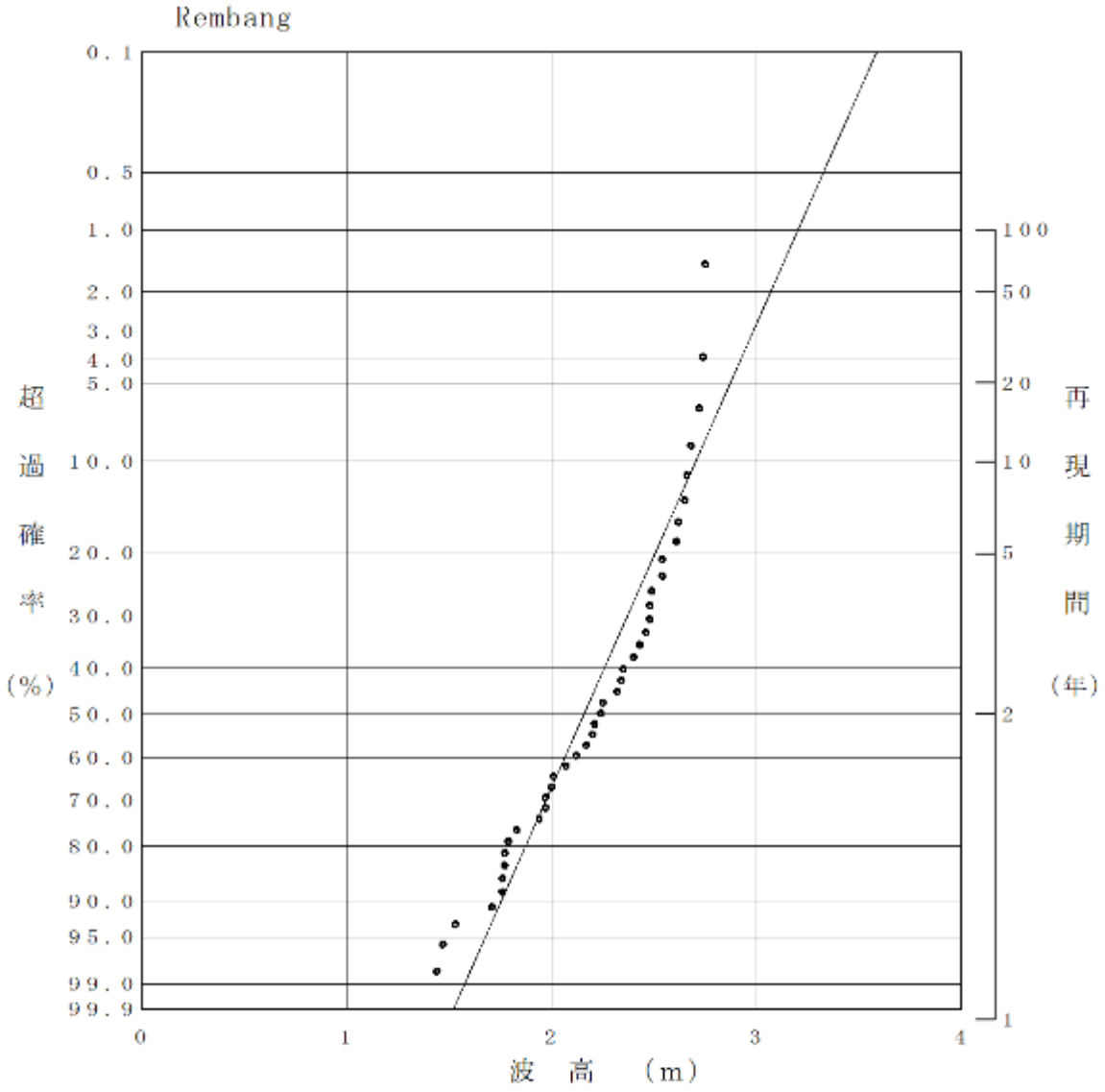


データ数　　41（41年）
最適関数　　WEIBULL分布
　　（k＝2.00）
相関係数　　0.973

確率年	期待値
1	1.30
2	1.96
5	2.31
10	2.51
20	2.68
50	2.88
100	3.01

出典：JICA 調査団

図 18　Pemalang 沖波浪の極致統計解析結果（全波浪対象）



データ数　　41（41年）
最適関数　　WEIBULL分布
　　（k＝2.00）
相関係数　　0.957

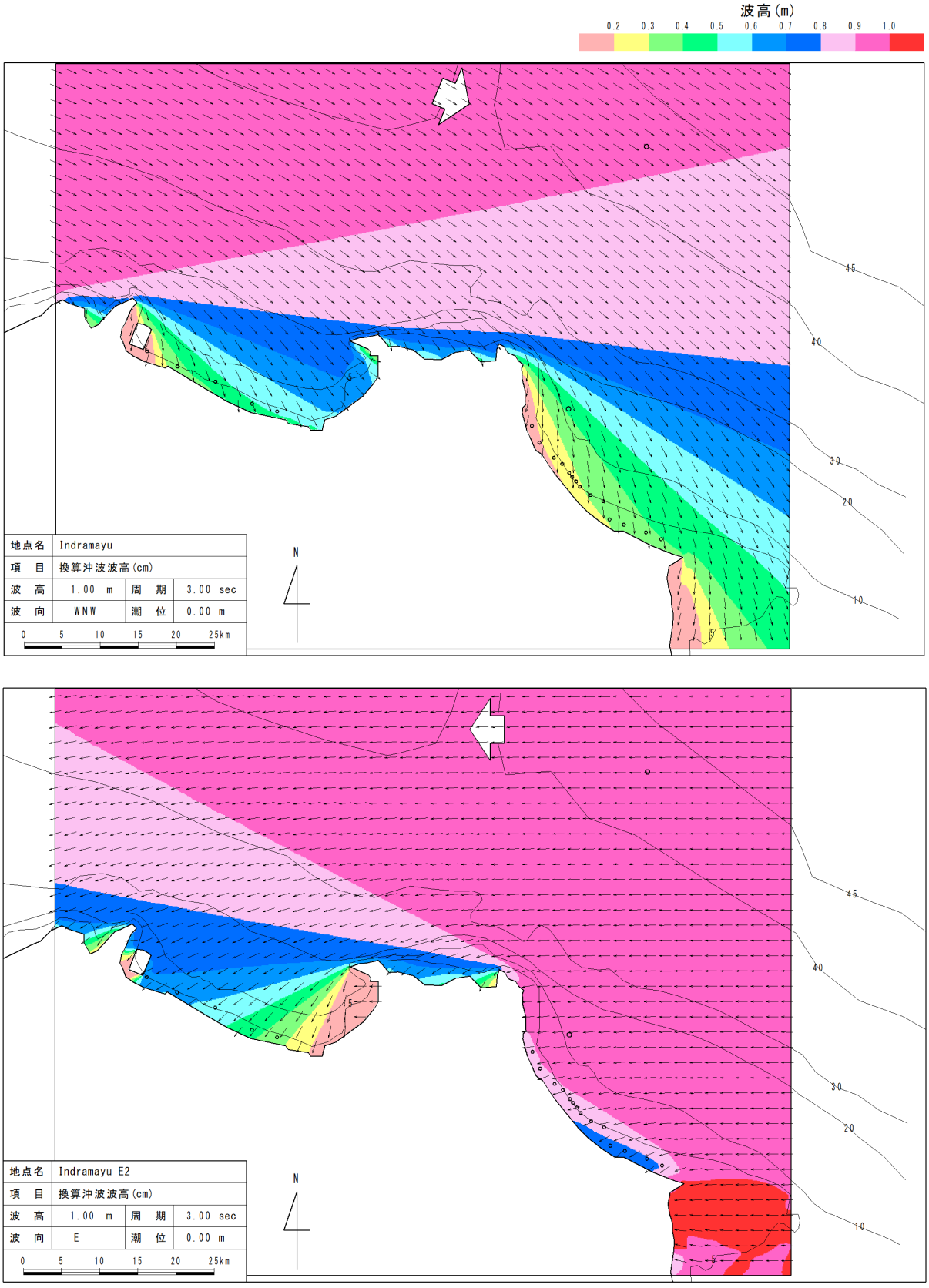
確率年	期待値
1	1.50
2	2.16
5	2.51
10	2.70
20	2.87
50	3.07
100	3.20

出典：JICA 調査団

図 19　Rembang 沖波浪の極致統計解析結果（全波浪対象）

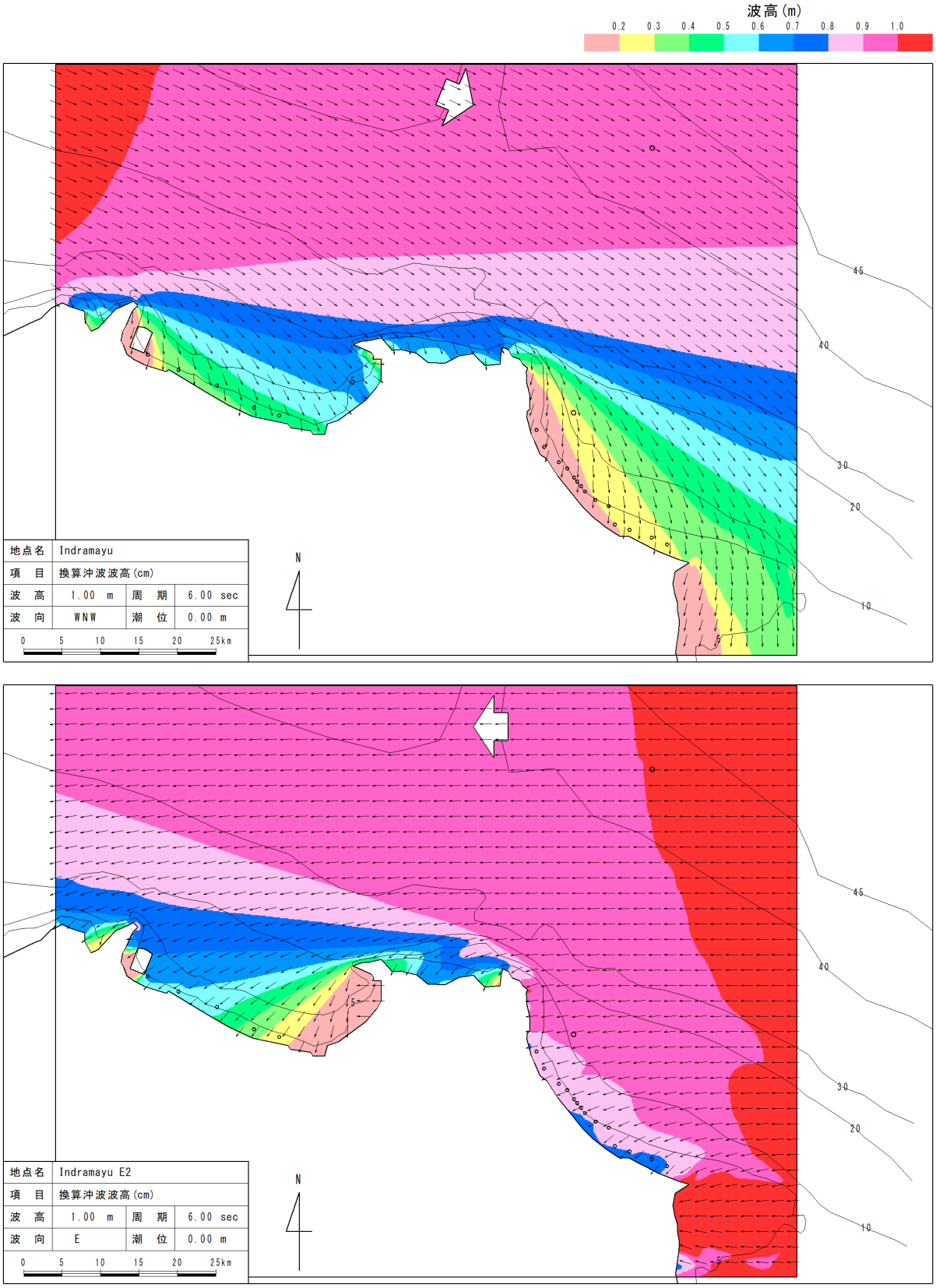
6.1.3 沿岸波浪特性

対象沿岸における波浪特性について、波浪変形計算により解析した。解析方法を以下に示す。波浪変形モデルにはエネルギー平衡方程式を採用した。入射波浪条件は: W～E 方向までを 16 方位別に入射波向を設定、周期は推算結果から、下限値に近い 3 s と上限値に近い 6 s の 2 周期を設定、入射波高は波高比を解析する上で 1.0 m とした。また波の方向分散性を表すパラメータ S_{max} は 25 とした。この条件で計算した波高比分布のうち、各沿岸において卓越する 2 方向からの波向に対する周期 3s および 6s の結果を図 20～図 27 に示す。計算結果から、各沿岸の波高分布を以下に整理した。



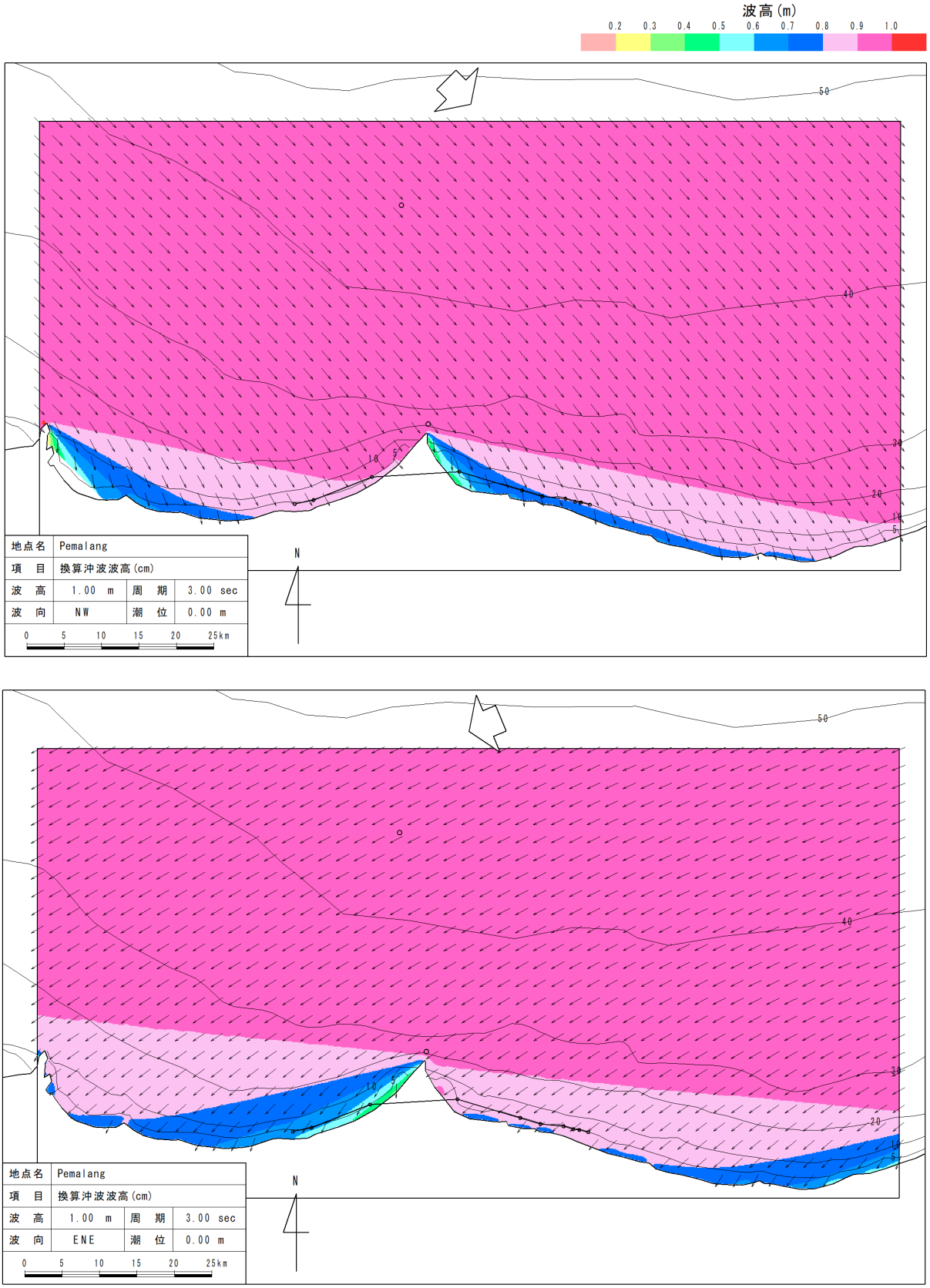
出典：JICA 調査団

図 20　波高分布　Indramayu T=3s (上: 波向 WNW、下: 波向 E)



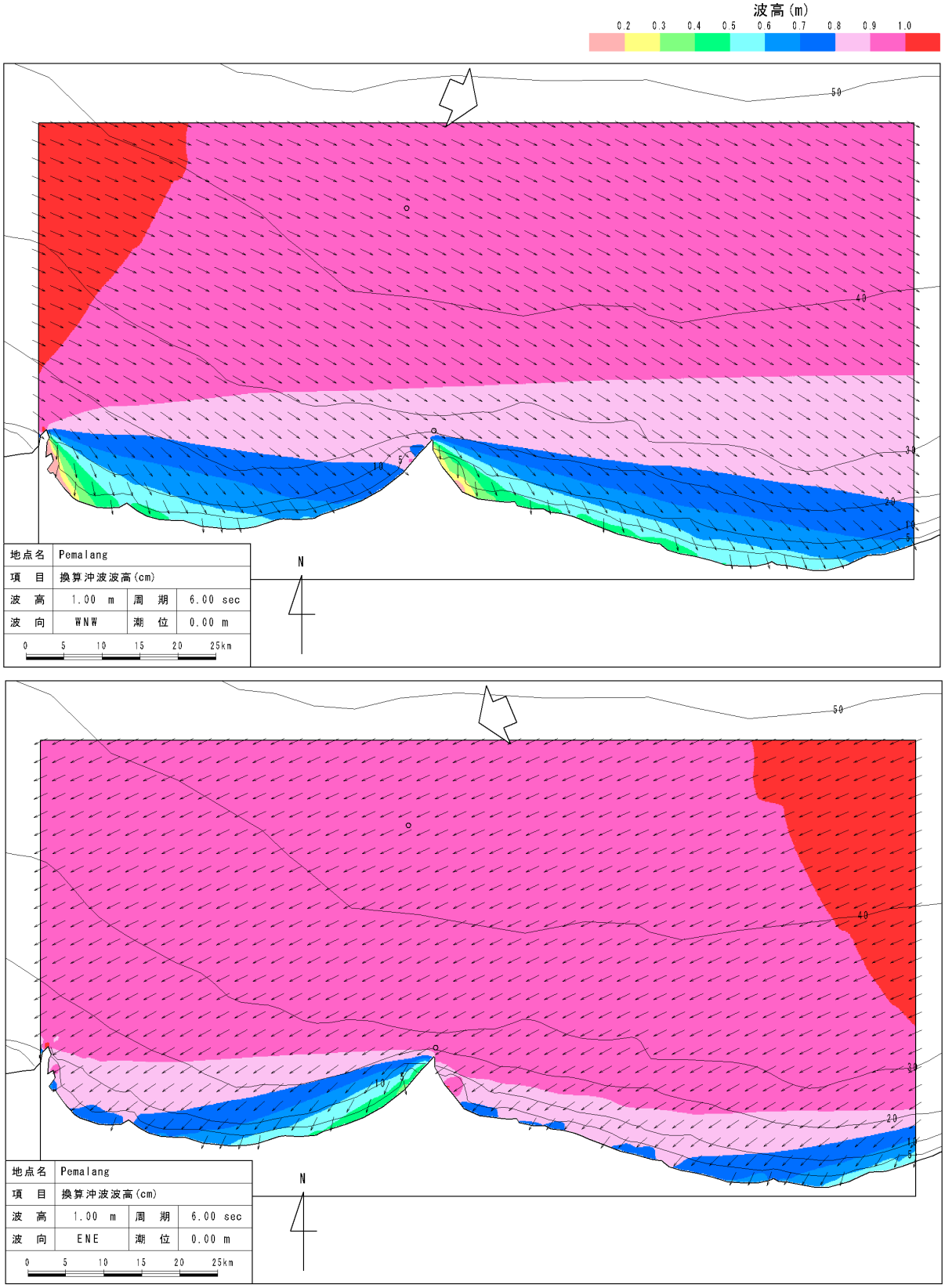
出典：JICA 調査団

図 21　波高分布　Indramayu T=6s (上: 波向 WNW、下: 波向 E)



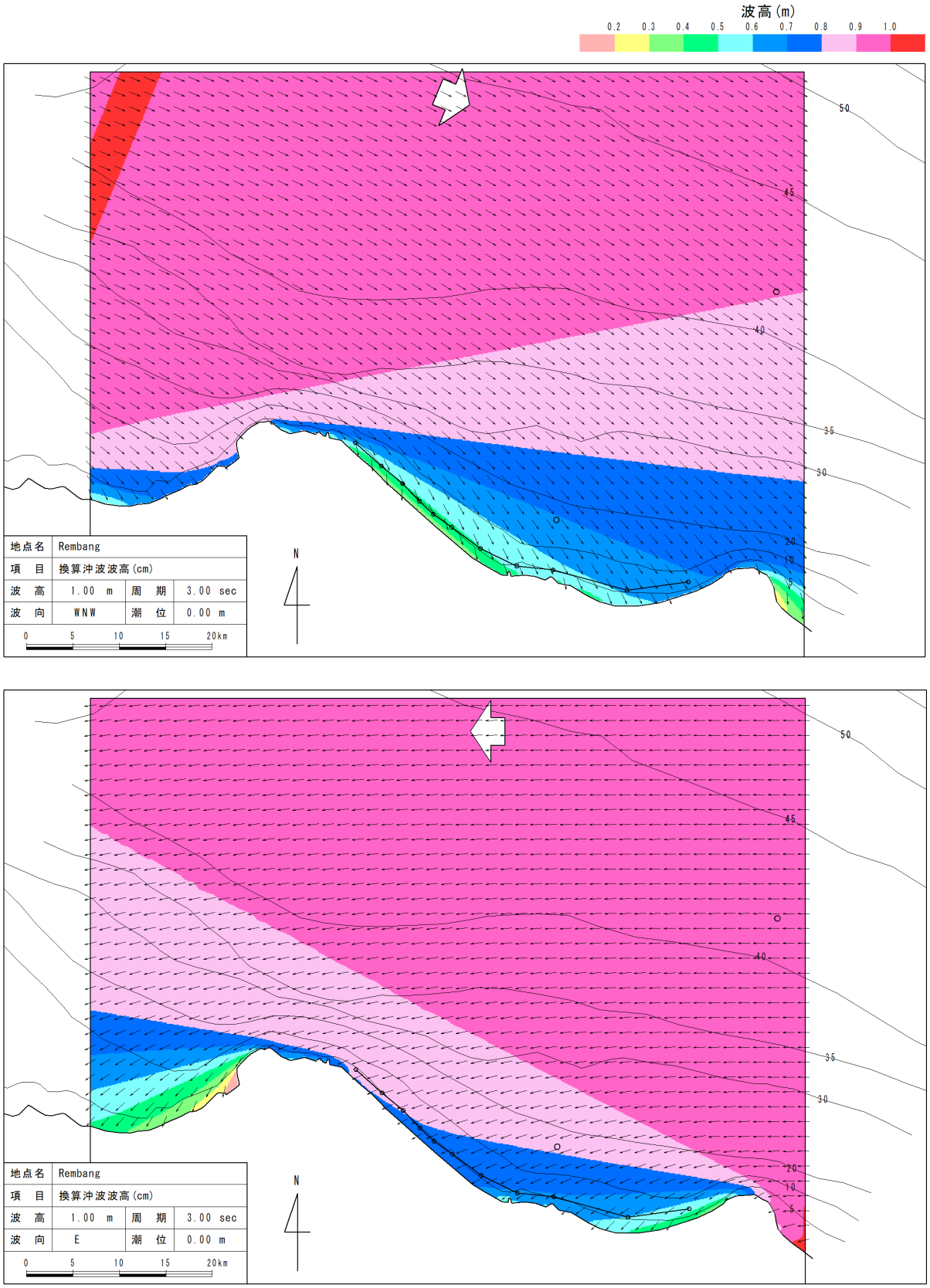
出典：JICA 調査団

図 22　波高分布　Pemalang T=3 s (上: 波向 NW、下: 波向 ENE)



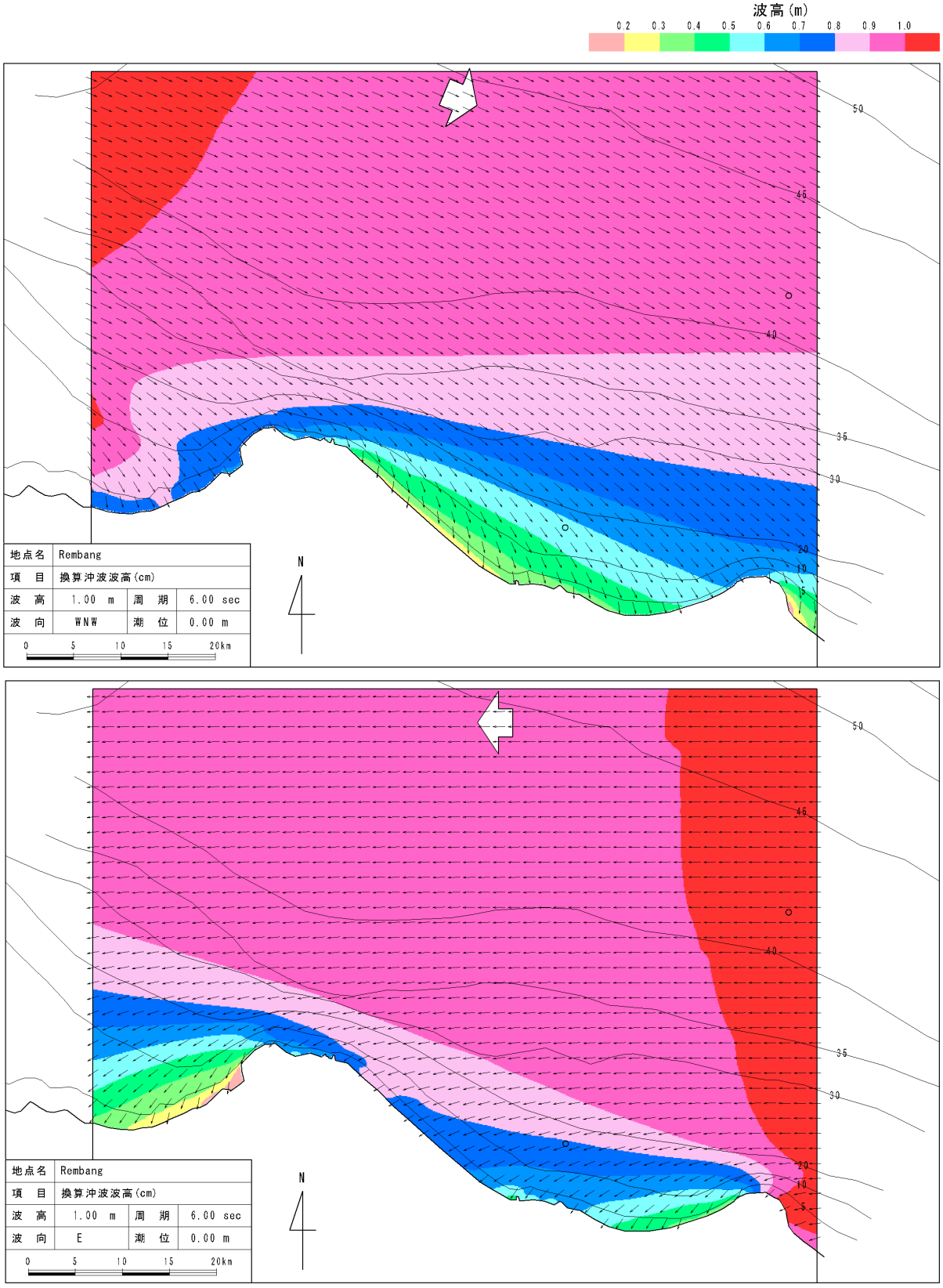
出典：JICA 調査団

図 23　波高分布　Pemalang T=6 s (上: 波向 NW、下: 波向 ENE)



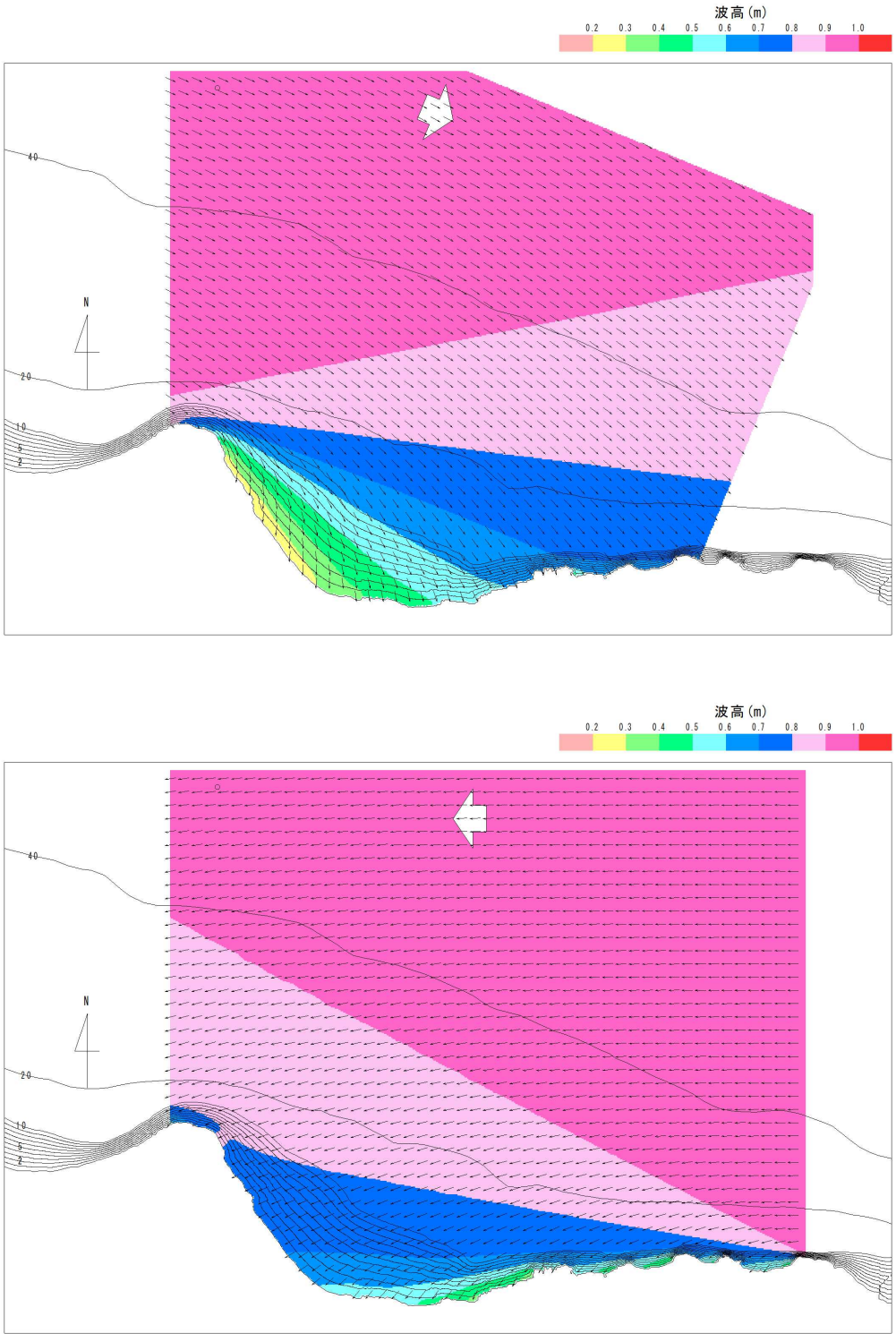
出典：JICA 調査団

図 24　波高分布　Rembang T=3 s (上: 波向 WNW、下: 波向 E)



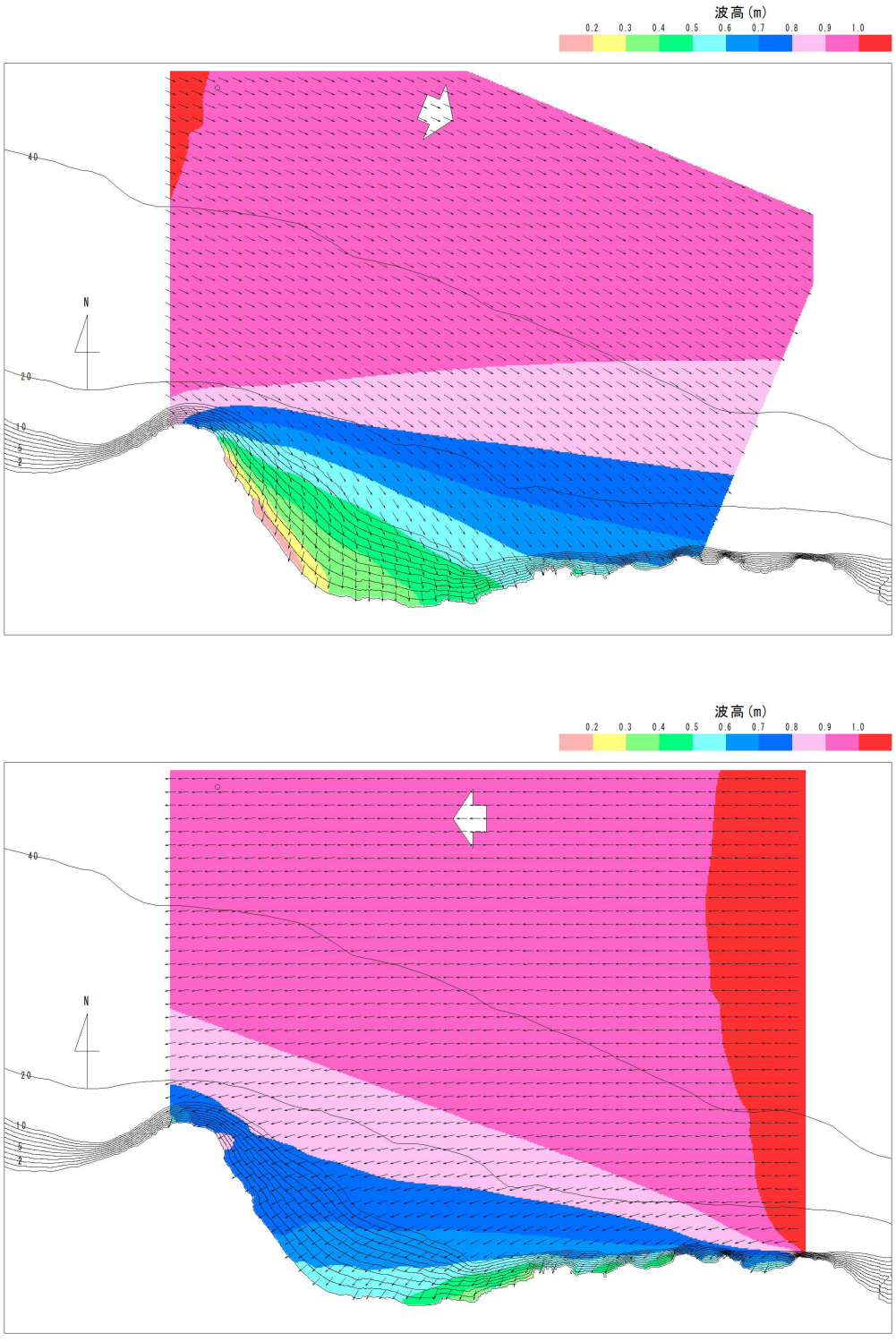
出典：JICA 調査団

図 25　波高分布　Rembang T=6 s (上: 波向 WNW、下: 波向 E)



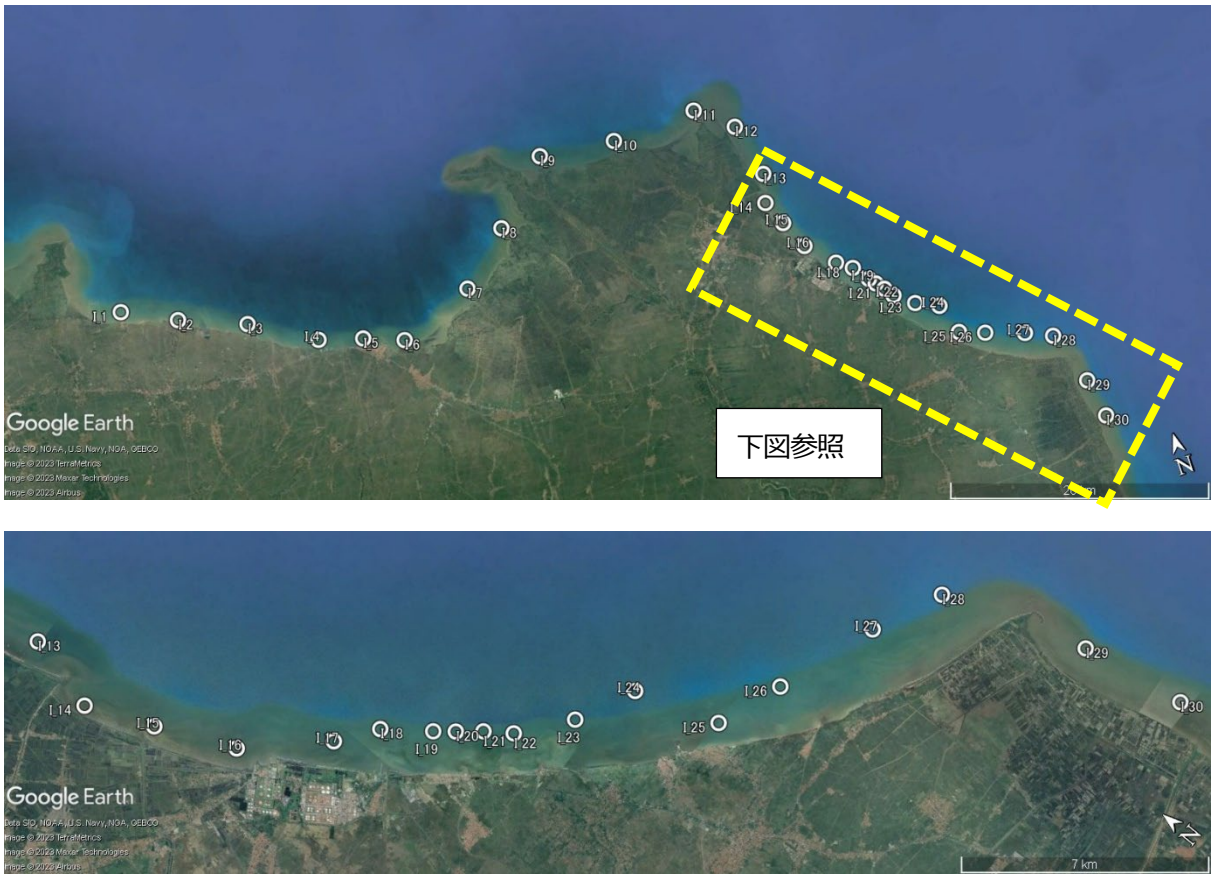
出典：JICA 調査団

図 26　波高分布　Tuban T=3 s (上: 波向 WNW、下: 波向 E)



出典：JICA 調査団

図 27　波高分布　Tuban T=6 s (上: 波向 WNW、下: 波向 E)



出典：Google Earth をもとに JICA 調査団作成

図 28　波高抽出地点　Indramayu

出典：Google Earth をもとに JICA 調査団作成

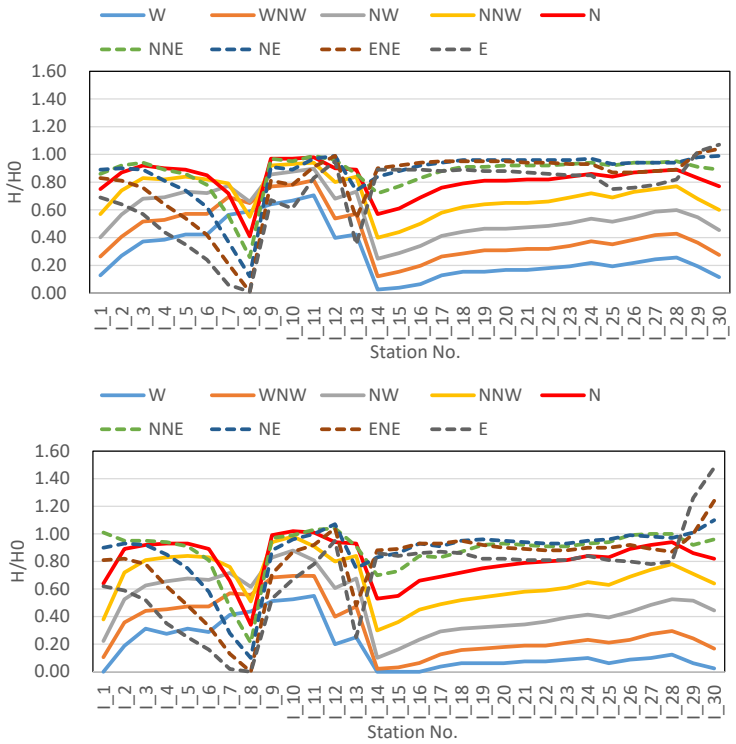
図 29　波高抽出地点　Pemalang-Pekalongan

出典：Google Earth をもとに JICA 調査団作成

図 30　波高抽出地点　Rembang-Tuban

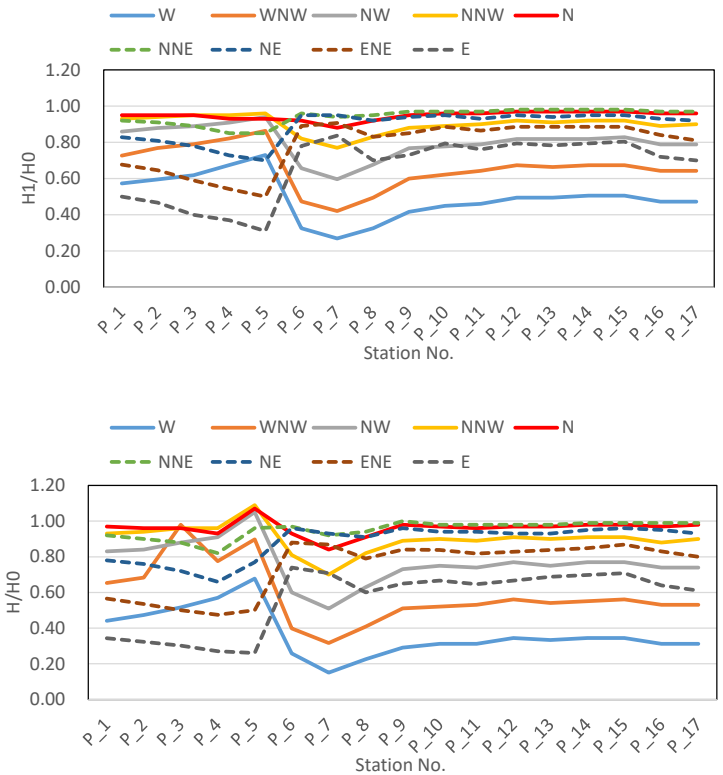
出典：Google Earth をもとに JICA 調査団作成

図 31　波高抽出地点　Tuban



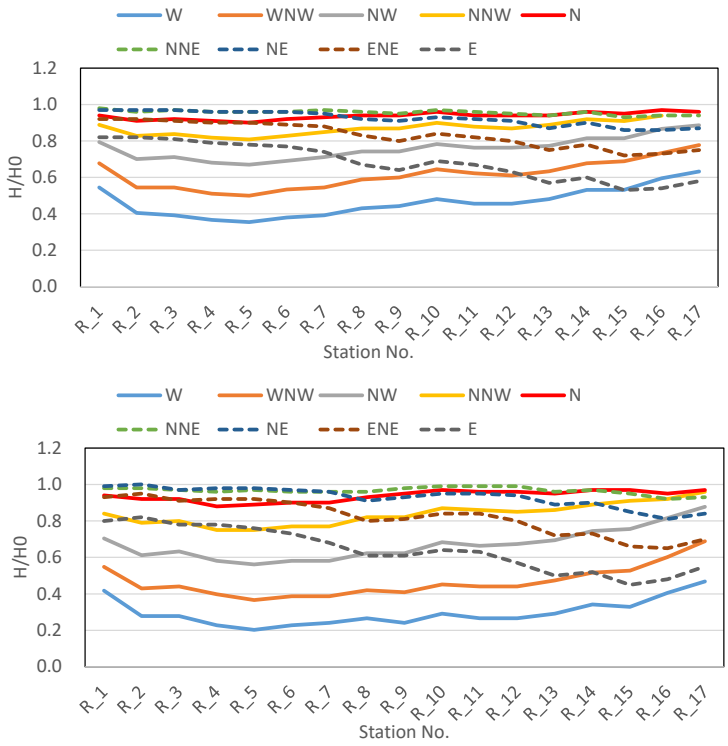
出典：JICA 調査団

図 32　波高の沿岸分布　Indramayu (上: T=3 s、下: T=6 s)



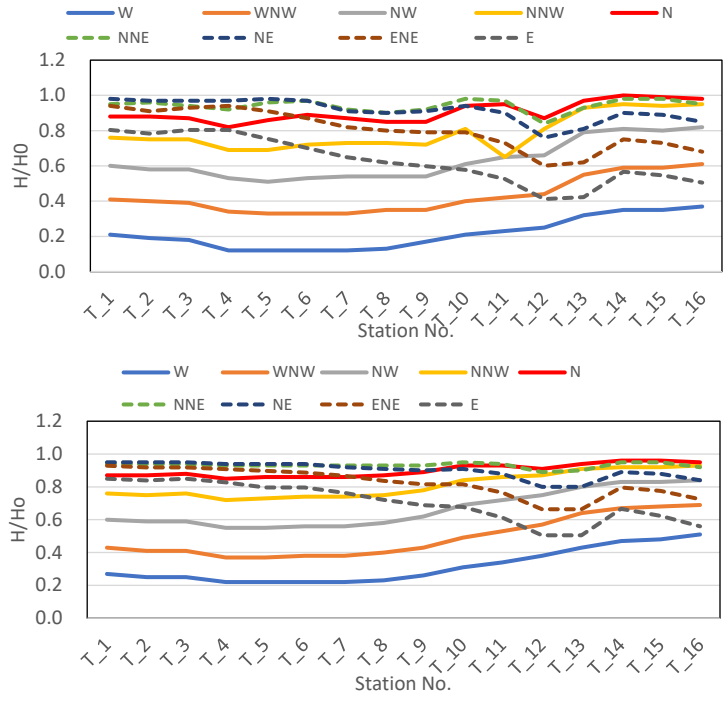
出典：JICA 調査団

図 33　波高の沿岸分布　Pemalang-Pekalongan (上: T=3 s、下: T=6 s)



出典：JICA 調査団

図 34　波高の沿岸分布　Rembang-Tuban (上: T=3 s、下: T=6 s)



出典：JICA 調査団

図 35　波高の沿岸分布　Tuban (上: T=3 s、下: T=6 s)

6.1.4　換算沖波波高

各エリアの沖での推算波浪のもとで解析した極値解析結果と、波浪変形計算のもとで求めた沿岸方向の波高分布から、施設設計で用いる外力としての換算沖波を解析した。対象とした波浪は 50 年確率波とした。各沿岸の代表地点 (Station No については、図 28、図 29、図 30、図 31 を参照) における換算沖波波高を表 4 に整理して示す。なお、周期は年最高波の波高・周期の相関関係（図 7）から求め、それぞれ Indramayu : 5.8 s、Pemalang-Pekalongan : 6.6 s、Rembang-Tuban : 6.7 s、Tuban : 6.7s である。

表 4　沿岸域の換算沖波波高

Area	Staion No.	H0'(m)	H0'_d(m)	T(s)
Indramayu	I_1	1.09	1.1	5.8
	I_2	1.32	1.4	
	I_3	1.57	1.6	
	I_4	1.65	1.7	
	I_5	1.70		
	I_14	1.51	1.6	
	I_15	1.48	1.5	
	I_16	1.51	1.6	
	I_17	1.53		
	I_18	1.51		
	I_19	1.44		
	I_20	1.44		
	I_21	1.43		
	I_22	1.43	1.5	
	I_23	1.43		
	I_24	1.48		
	I_25	1.43		
	I_26	1.41		
	I_27	1.37	1.4	
	I_28	1.41	1.5	
Pemalang–Pekalongan	P_1	2.39	2.4	6.6
	P_2	2.42	2.5	
	P_4	2.62	2.7	
	P_7	1.47	1.5	
	P_10	2.16	2.2	
	P_11	2.13		
	P_12	2.22	2.3	
	P_13	2.16	2.2	
	P_14	2.22	2.3	
	P_15	2.22		

Area	Staion No.	H0'(m)	H0'_d(m)	T(s)
Rembang–Tuban	R_1	2.20	2.2	6.7
	R_2	1.92	2.0	
	R_3	1.98		
	R_4	1.82	1.9	
	R_5	1.76	1.8	
	R_6	1.82	1.9	
	R_7	1.82		
	R_8	1.95	2.0	
	R_10	2.14	2.2	
	R_14	2.33	2.4	
	R_16	2.56	2.6	
Tuban	St.1	1.88	1.9	6.7
	St.2	1.85		
	St.3	1.85		
	St.4	1.72	1.8	
	St.5	1.72		
	St.6	1.75		
	St.7	1.75		
	St.8	1.82	1.9	
	St.9	1.94	2.0	
	St.10	2.16	2.2	
	St.11	2.25	2.3	
	St.12	2.35	2.4	
	St.13	2.50	2.5	
	St.14	2.60	2.6	
	St.15	2.60		
	St.16	2.63	2.7	

注) Ho'_d は Ho'から隣接地点にて、10 cm 単位で切り上げて丸めた値

出典：JICA 調査団

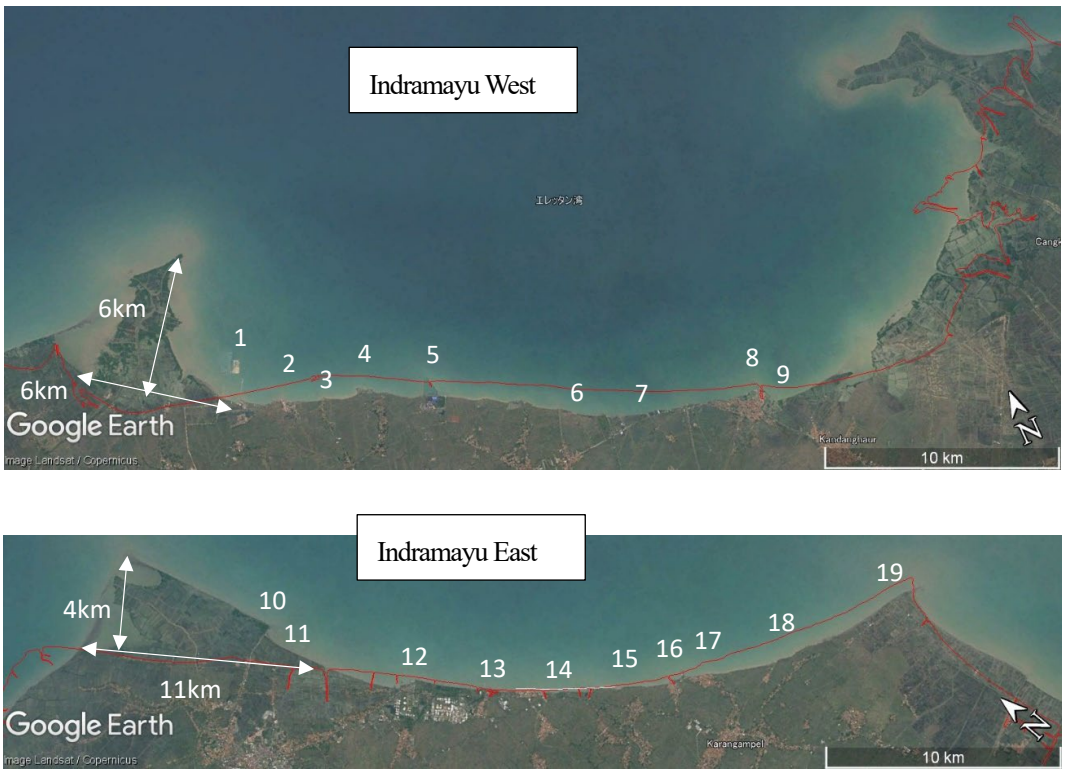
6.2　長期的地形変化

ここでは、1938 年測量の地形図（東北大学ライブラリー　外邦図デジタルアーカイブ）と現在の地形（Google Earth）とを比較し、汀線形状の変化を整理した。

6.2.1　Indramayu

Indramayu の西側と東側の衛星画像に、1938 年当時の汀線と比較したものを図 36 に、さらに東側端部の砂嘴地形から Cirebon に続く範囲について図 37 に示す。突出した地形の先端を境に西側では最大約 1 km もの汀線の後退、一方、東側では最大約 1.5 km の汀線の前進が見られる。ただし、東側においても砂嘴状地形付近では最大約 1 km の汀線の後退が見られる。全体的な地形変化の特徴として、エレッタン湾の西端に 1938 年当時はなかった河口デルタ地形が発達している。この概略の面積は約 1.8×10^7 m^2 程度である。一方、湾の底部に当たるところは一様に汀線が後退しており、その平均値は約 700 m となる。延長約 23 km をかけると侵食面積は約 1.61×10^7 m^2 と、ほぼ河口デルタ面積と一致する。ただし、河口デルタの堆積部分は河口からの流出土砂によるものであると推定されるとこから、侵食部分の土砂が河口デルタ方向に移動したとは考えにくい。

一方、東側についても、その西端部が大きく張り出しており、その面積は約 2.2×10^7 m^2 程度である。一方、その東端部 17～18 (約 5 km) は平均約 580 m、18～19 (約 650m) は約 650 m の汀線後退があり、その侵食面積は約 6×10^6 m^2 である。参考に東端の砂嘴から南に続く Cirebon では約 16 km 区間で平均約 1 km の汀線前進が見られ、その堆積面積は約 1.6×10^7 m^2 である。

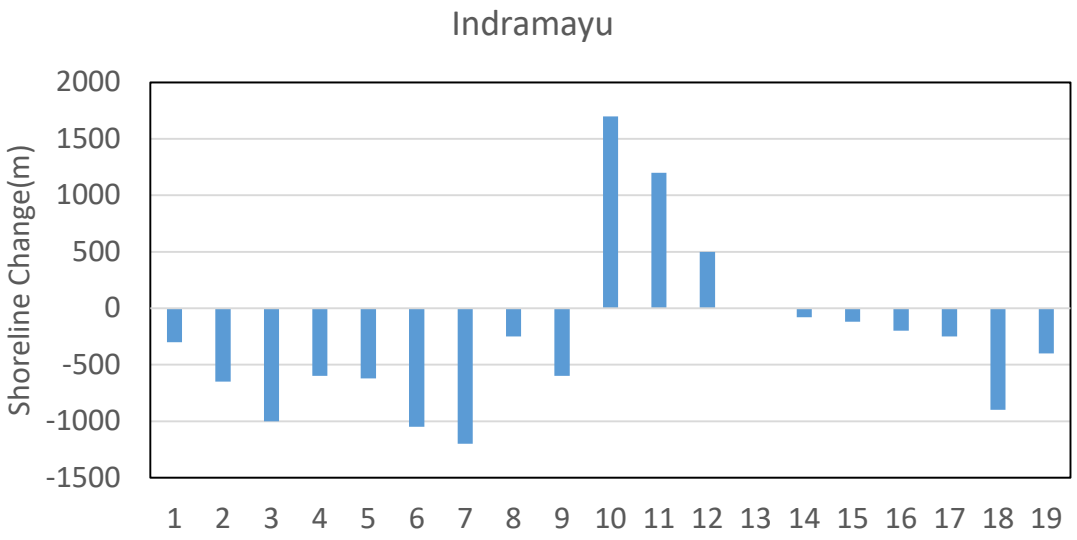


出典：Google Earth をもとに JICA 調査団作成

図 36　Indramayu 沿岸の 1938 年当時の汀線位置（赤色線）

出典：Google Earth をもとに JICA 調査団作成

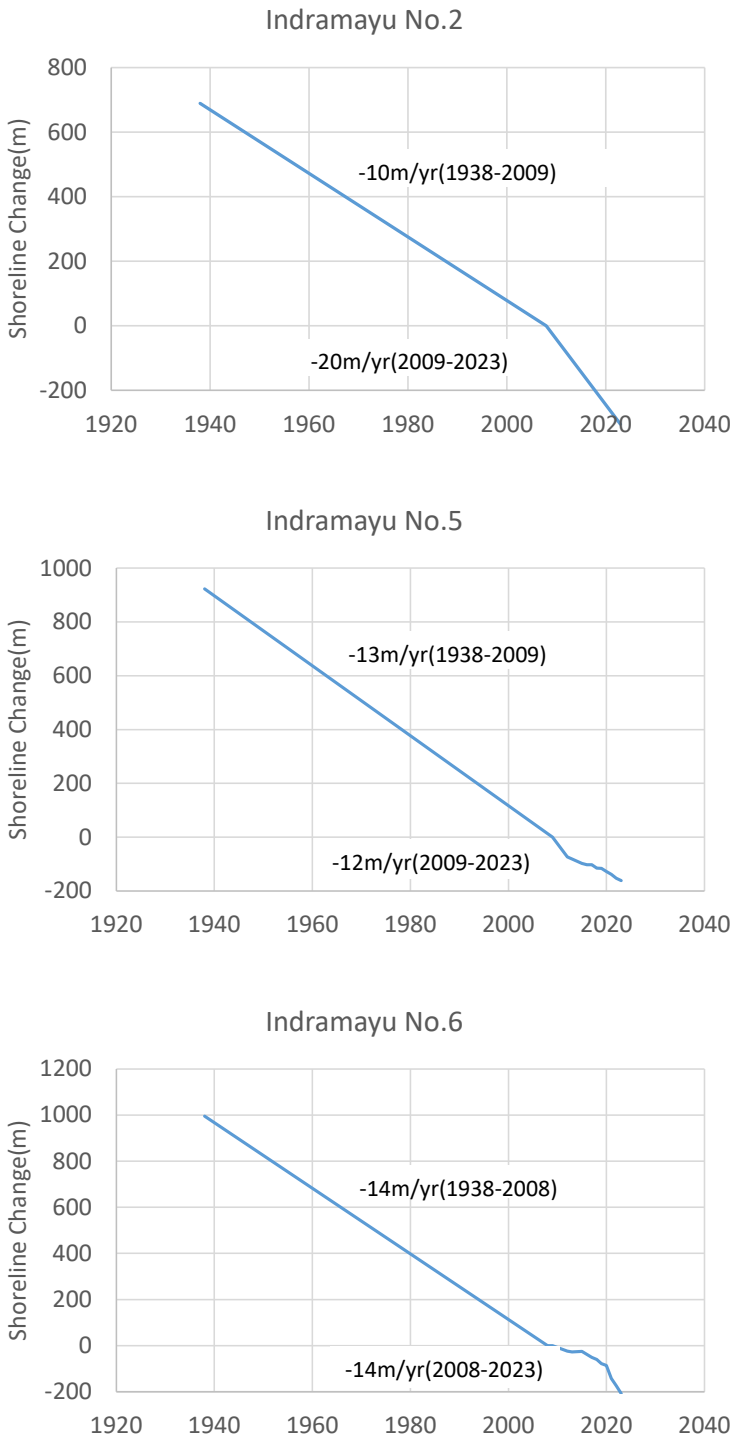
図 37　Cirebon 沿岸の 1938 年当時の汀線位置



出典：JICA 調査団

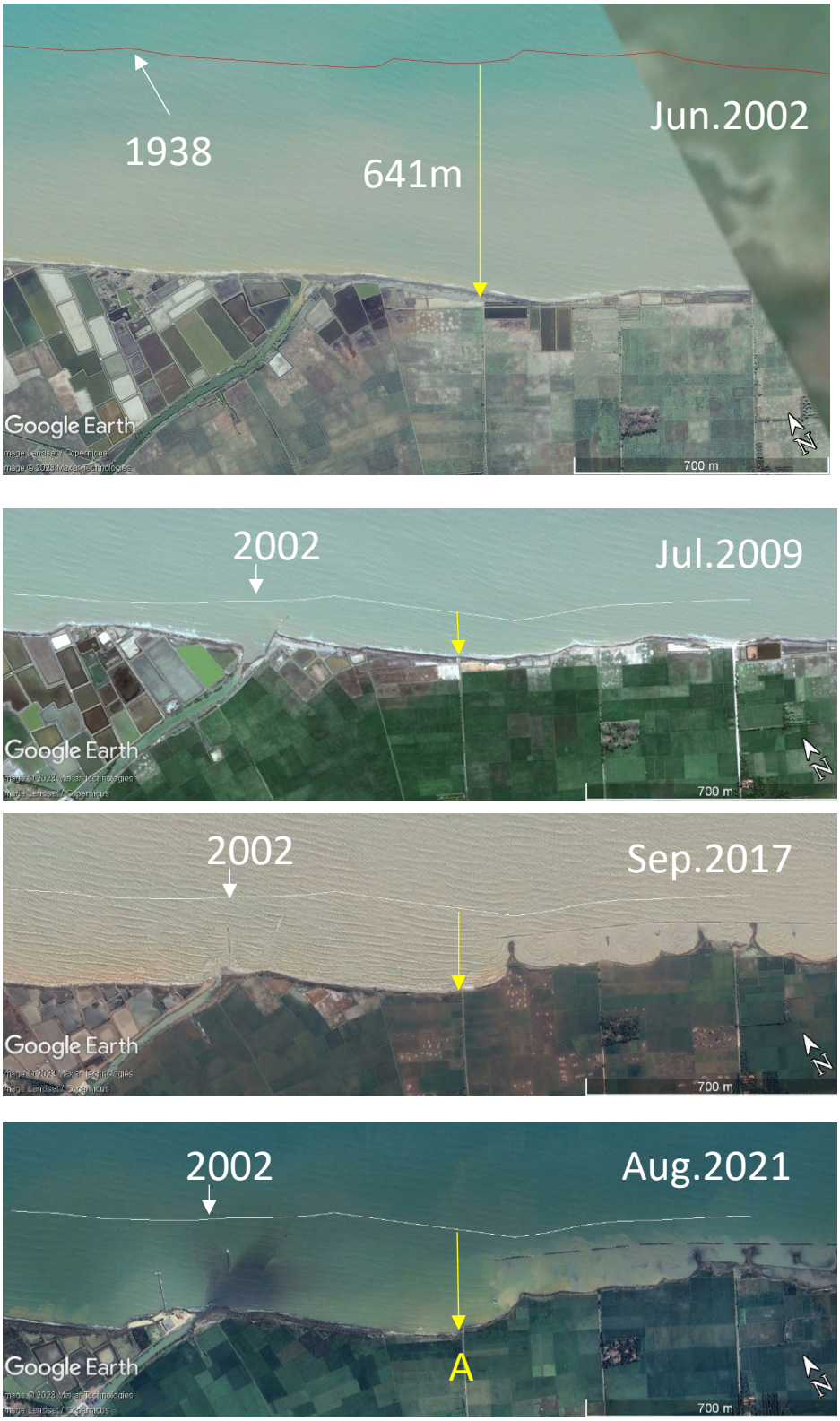
図 38　Indramayu の 1938-2023 年の汀線変化

先に示した侵食の激しい Indramayu West の No.2、 5、 6 地点、および Indramayu East の No.18 地点について、1938～2009 年とそれ以降の汀線変化速度を見ると、1938～2009 年が 10 m～14 m/年程度で後退、それ以降も同程度の速度で後退している。



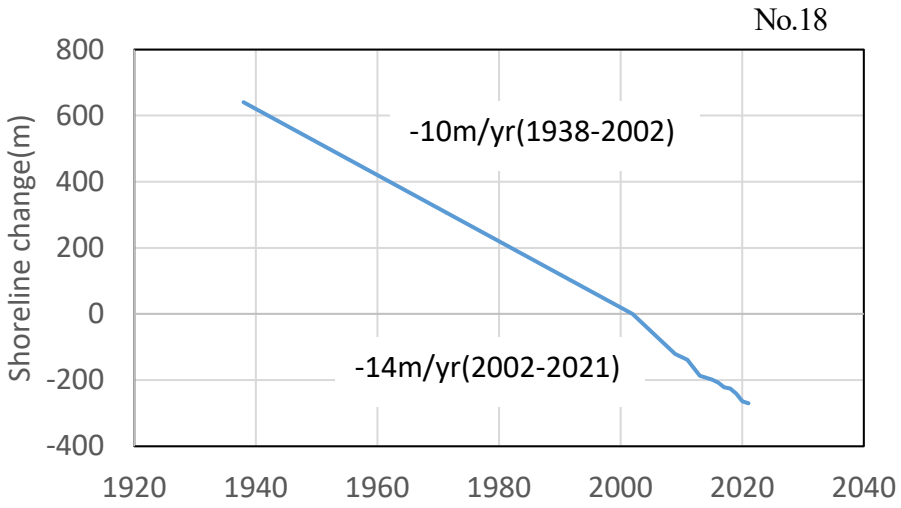
出典：JICA 調査団

図 39　Indramayu West における長期的汀線変化速度



出典：Google Earth をもとに JICA 調査団作成

図 40　Indramayu East 離岸堤周辺の地形変化



出典：JICA 調査団

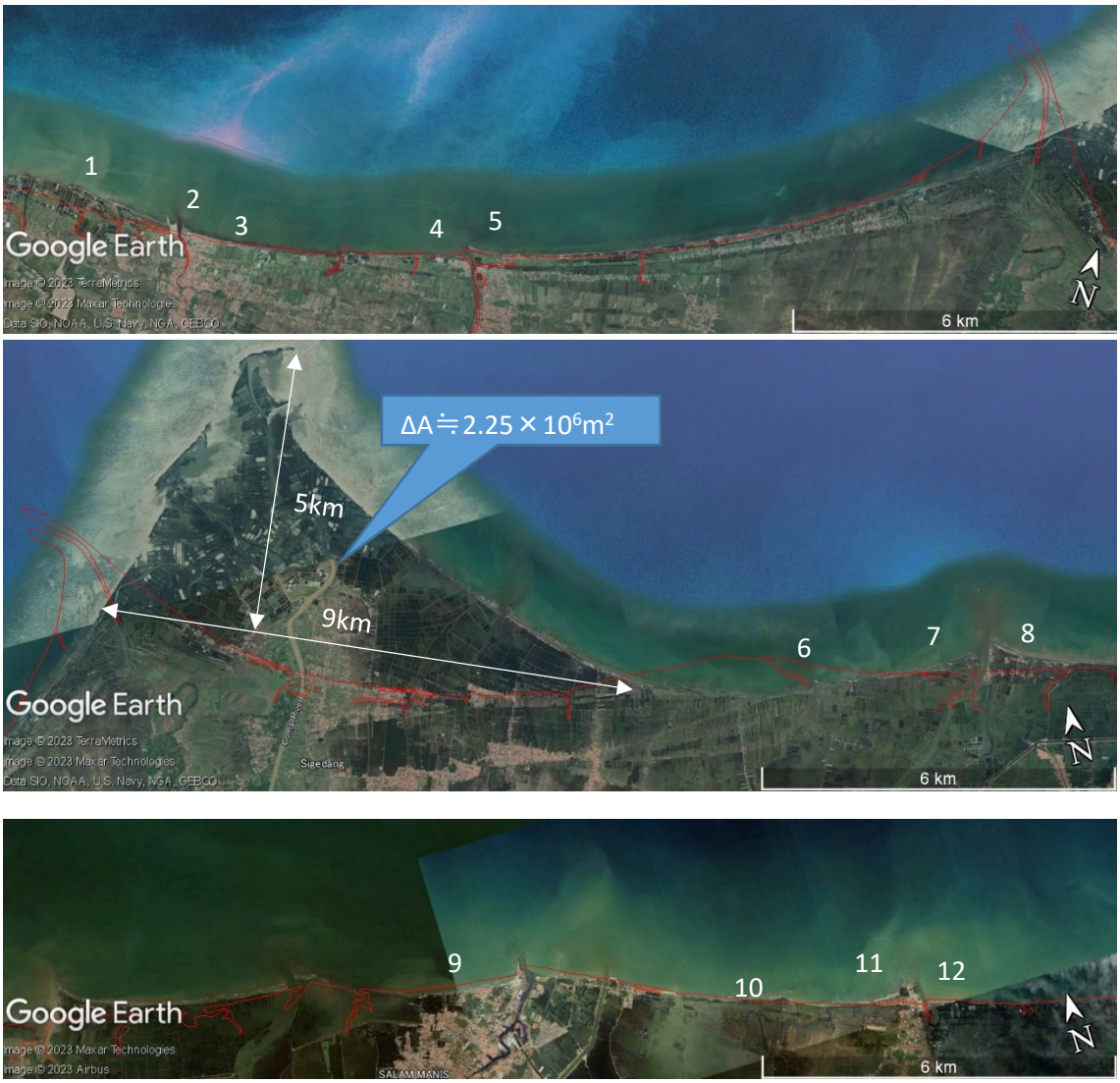
図 41　Indramayu East における長期的汀線変化速度

6.2.2　Pemalang-Pekalongan

Pemalang では、河川からの流出土砂により突出した地形が発達、その先端が 1938 年当時は現在よりも西に位置していた。その後約 85 年かけて、その先端が東に移動するとともに、東側に約 225 万 m^2 の土地が増えている。Pemalang の西側は地点 1 で約 300 m 前進しているものの、Area 対象域はほとんど汀線位置は変化していない。大規模な Jetty のある地点 5 でも Jetty により汀線は約 50 m 程度前進しているものの、沿岸漂砂の下手と推定される地点 4 はほとんど変化していない。

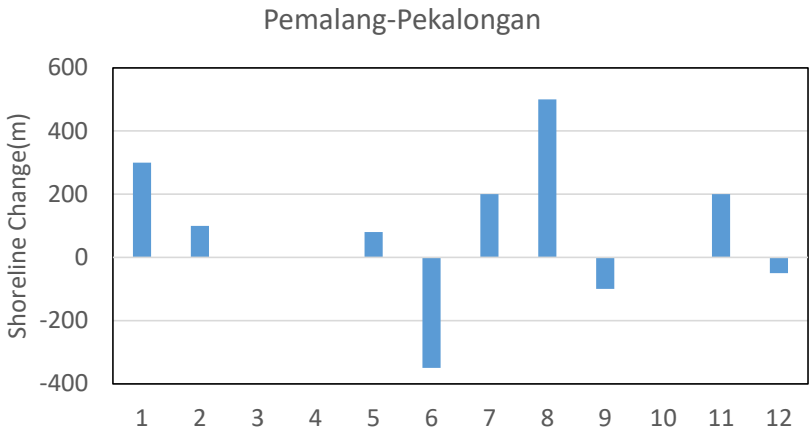
一方、Pemalang の東側は、大きく汀線が前進しているものの、地点 7、8 でほぼ現在の汀線位置と一致している。ただし、Jetty の東側は約 500 m の汀線前進、一方、西側も 200 m 汀線が前進、両者の前進量の差が段差となっている。このような変化はあるものの、大局的には地点 7、8 付近は河川からの流出土砂量によって変化する収束地点（沿岸漂砂がバランスしている）であると推定される。

Pekalongan では背後に市街地が広がる地点 9 では約 100 m 汀線が後退しているものの、さらに東に行くとそれほど大きな汀線変化は生じていない。Area 境界に位置する位置 11 では汀線が約 200 m 前進、その東側の位置 12 では約 50 m 汀線後退となっている。



出典：Google Earth をもとに JICA 調査団作成

図 42　Pemalang-Pekalongan 沿岸の 1938 年当時の汀線位置（赤色線）



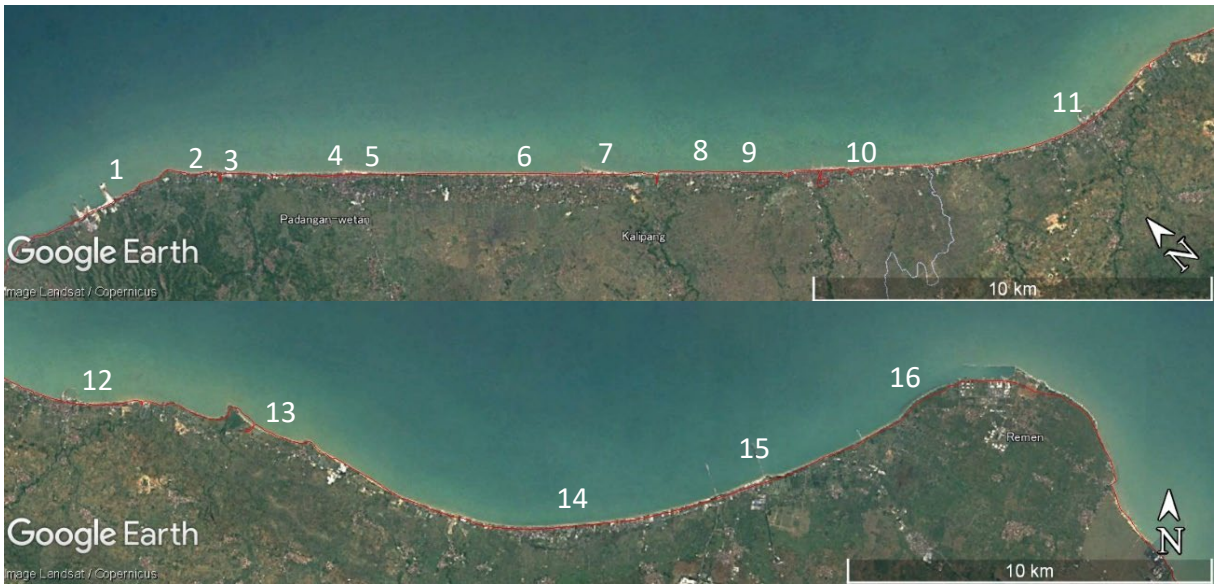
出典： JICA 調査団

図 43　Pemalang-Pekalongan の 1938-2023 年の汀線変化

6.2.3 Rembang-Tuban

Rembang は一部地点を除いてほぼ汀線は 100～150m 前進している。後退している地点 6 は、現在突堤群が設置されている地点である。また地点 8 は離岸堤の西側に当たる地点である。地点 6 はその東側に設置された大規模な突堤（地点 7）の東側の汀線が約 150m 前進していることから、西向きの沿岸漂砂がこの大規模突堤により阻止された影響、さらに地点 8 は離岸堤による西向き沿岸漂砂が補足された影響と推定される。

地点 12 より東側（Tuban）についてはほぼ汀線は前進か変化しておらず、著しい汀線後退は見られない。



出典：Google Earth をもとに JICA 調査団作成

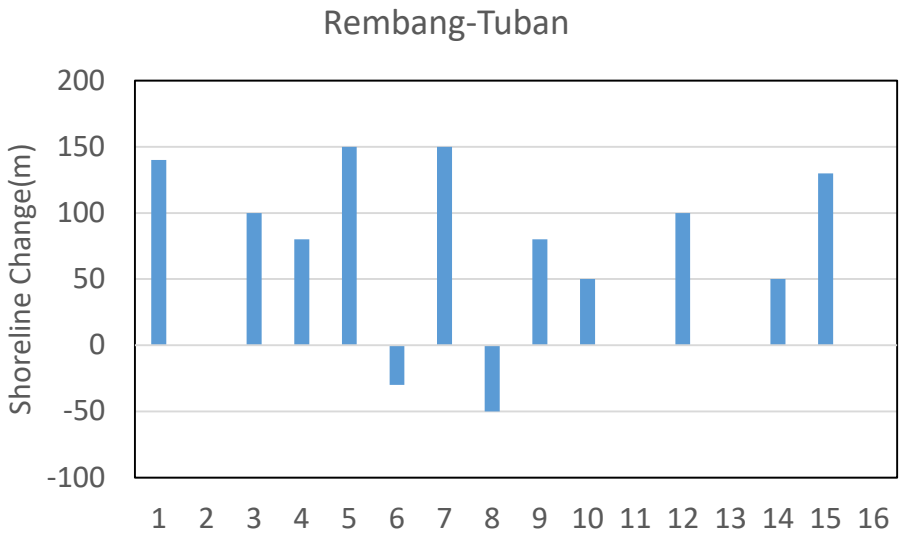
図 44　Rembang-Tuban 沿岸の 1938 年当時の汀線位置（赤色線）

出典：Google Earth をもとに JICA 調査団作成

図 45　Rembang 突堤付近の 1938 年当時の汀線位置（赤色線）

出典：Google Earth をもとに JICA 調査団作成

図 46　Rembang 離岸堤下手侵食域の 1938 年当時の汀線位置（赤色線）



出典：JICA 調査団

図 47　Rembang-Tuban の 1938-2023 年の汀線変化

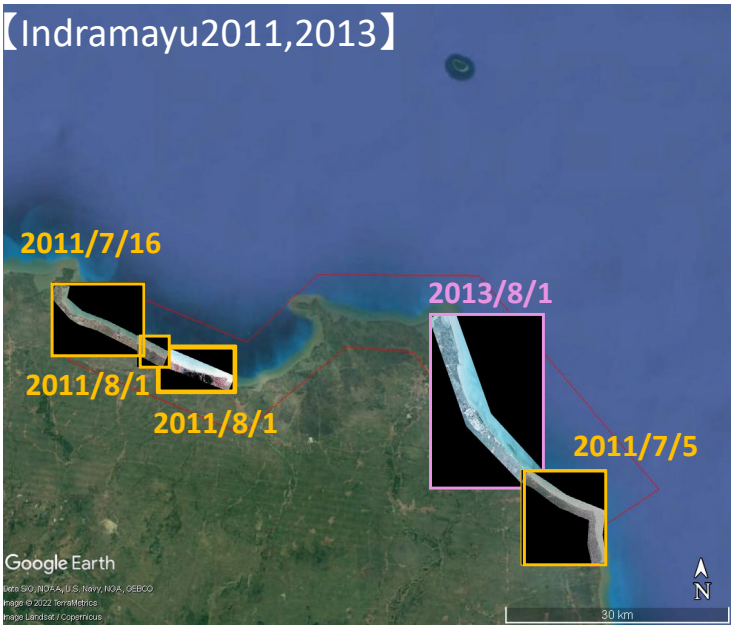
6.3 近年の地形変化

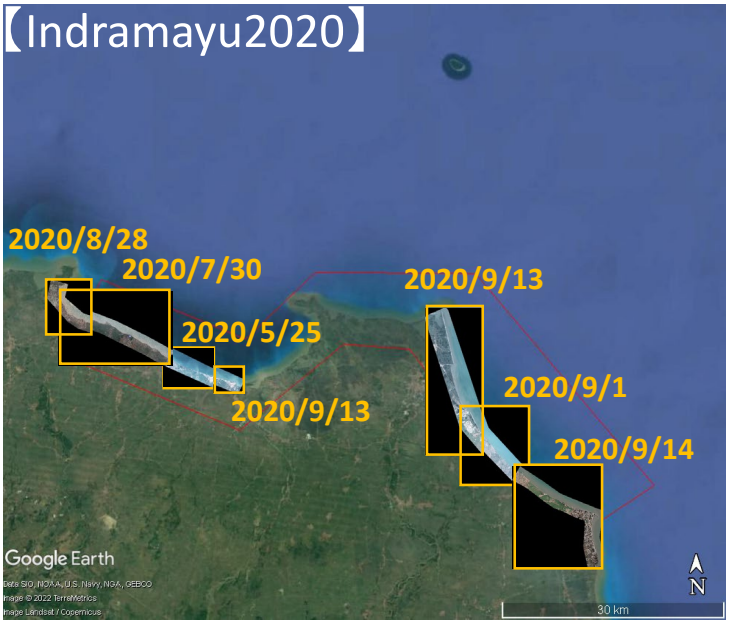
衛星画像から読み取った汀線位置座標により汀線変化を解析した。解析に用いた衛星画像データをおよび図 48～図 50 に示す。収集した衛星画像は過去 20 年に撮影されたものとして、対象域全域がなるべく同時期に撮影されたものとした。古いもので 2002 年前後の画像と、最新の画像で 2022 年前後の画像、さらにその中間時期に当たる 2013 年前後の画像を収集し、汀線位置が確認できない場合は、その前後に撮影されたものを採用した。なお、Indramayu については、2002 年前後の画像が揃わなかったことから、2 時期とした。

表 5 解析に用いた衛星画像データ

撮影時期		Indramayu (2011、2020)	Pemalang-Pekalongan (2002、2013、2022)	Rembang-Tuban (2008、2013、2022)
第 1 時期	2002 年	－	中央 (4 月、9 月.)	－
	2003 年	－	中央 (4 月)、東 (6 月)	－
	2008 年	－	－	中央 (4 月、5 月) 西 (5 月、 7 月)
	2009 年	－	－	中央 (7 月)
第 2 時期	2011 年	西端 (7 月)、西 (8 月)、 東端 (7 月)	－	－
	2013 年	東端 (8 月)	中央 (7 月)、東 (7 月)	中央 (7 月、9 月)、 西 (7 月)
第 3 時期	2020 年	西端 (8 月)、 西 (5 月、9 月) 東 (9 月)、東端(9 月)	－	－
	2022 年	－	中央 (7 月)、 東 (4 月、7 月)	中央 (6 月、8 月)、 西 (6 月)

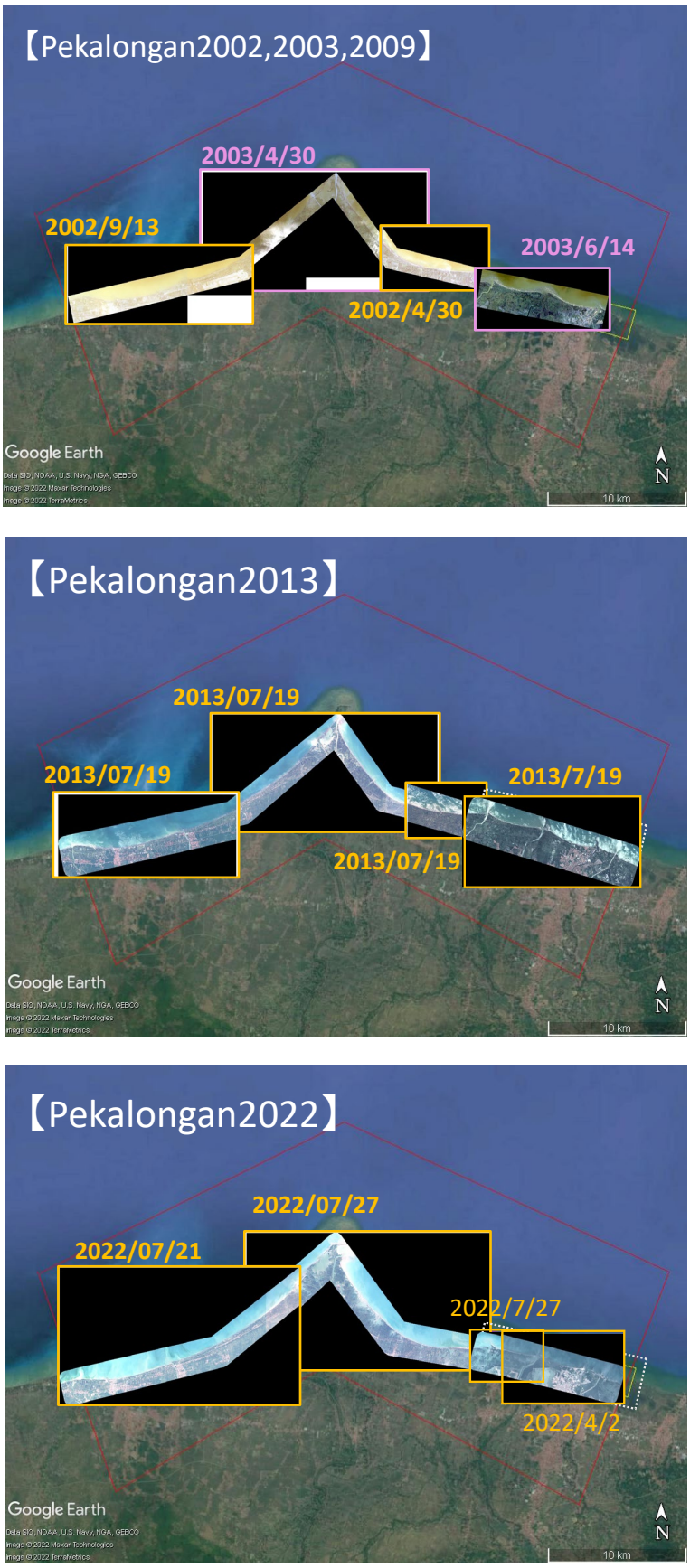
出典：JICA 調査団





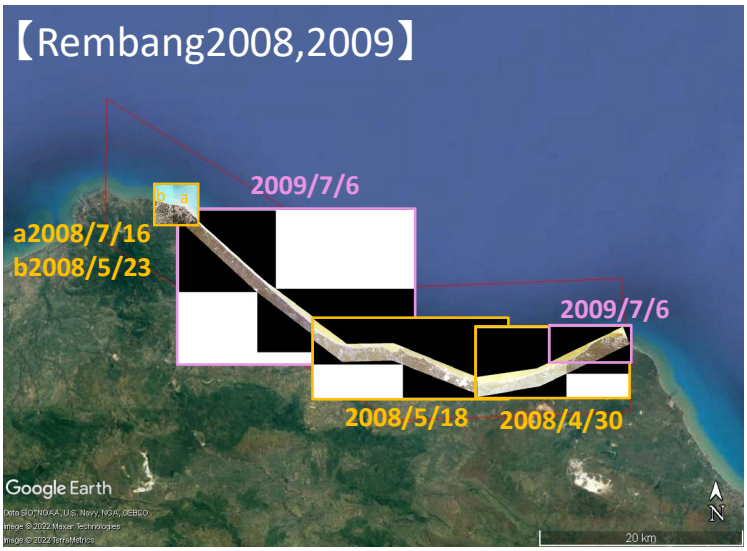
出典：Google Earth をもとに JICA 調査団作成

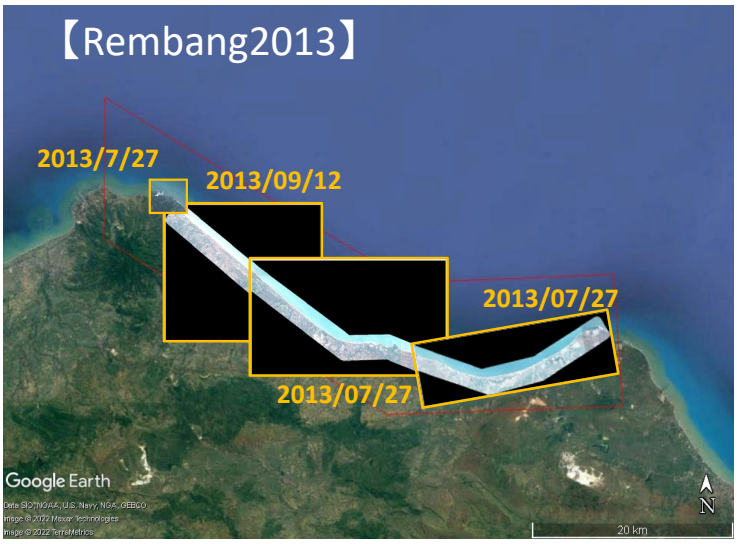
図 48　Indramayu 解析対象域（上：2011 年、2013 年、下：2020 年）

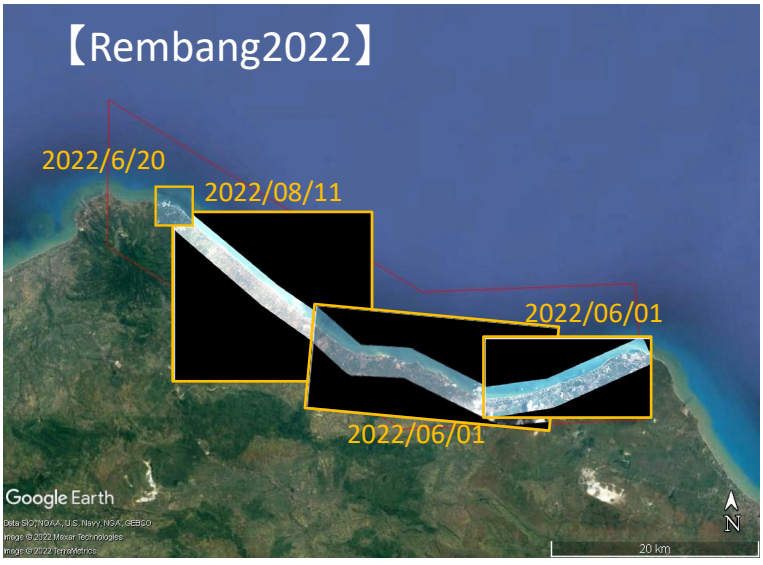


出典：Google Earth をもとに JICA 調査団作成

図 49　Pemalang-Pekalongan 衛星画像解析範囲（上：2002 年、中：2013 年、下：2020 年）





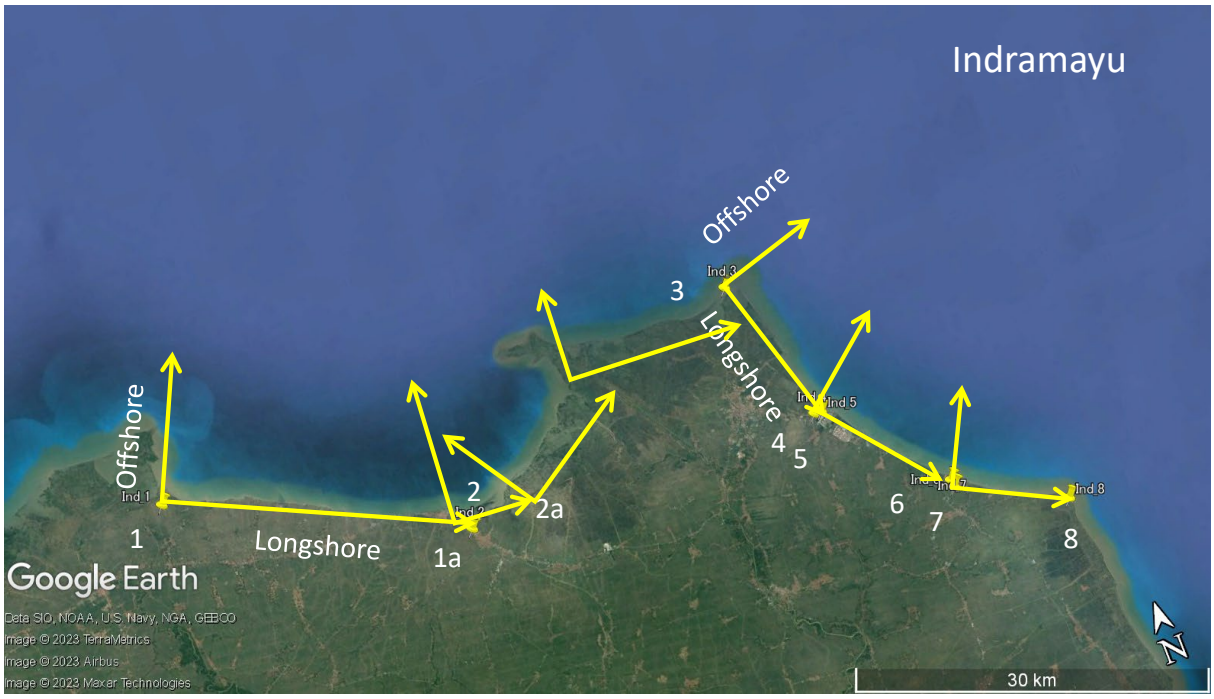


出典：Google Earth をもとに JICA 調査団作成

図 50　Rembang-Tuban 衛星画像解析範囲（上：2008 年、中：2013 年、下：2022 年）

6.3.1　Indramayu 全域

図 6.3.4 に示す基線のもとに 7 区域に分けて汀線変化を整理した。



出典：Google Earth をもとに JICA 調査団作成

図 51　汀線位置読み取り軸位置（Indramayu）

2011～2020 年までの約 10 年間の汀線変化から、地点別に以下の特徴が示される。

■Indramayu 西　西部(図 52)

① Patimban 港近傍で汀線が前進、港の防波堤の遮蔽域への土砂移動が要因と推定

② Fish Pond から西側で顕著な汀線後退、突出した Fish Pond により西向き沿岸漂砂が阻止されたことと、陸域のシルト・粘土質成分が波浪の作用で沖に流出したと推定

③ 広範囲にわたって汀線後退、捨石堤が設置されていない箇所、あるいは捨石堤が沈下・消失している箇所で陸域土砂が沖に流出と推定

④ 護岸が設置され、その前面に砂浜がないことから顕著な汀線変化は見られない

■Indramayu 西　東部(図 53)

① 西端の河口導流堤の右岸側で汀線後退が顕著、東向きの沿岸漂砂によって砂嘴が東方向に発達

② Hybrid Engineering によるマングローブ林が植林された箇所は、施設設置位置まで汀線が前進、それ以外はやや後退

■Indramayu 中央 (図 54)

一部、汀線部決壊により背後に浸水域が生じている箇所があるものの、全体的には汀線は前進

■Indramayu 東　西部 (図 55)

① 河口導流堤の左岸側は汀線後退

② 河口導流堤の右岸側から港湾施設の間は比較的汀線は安定

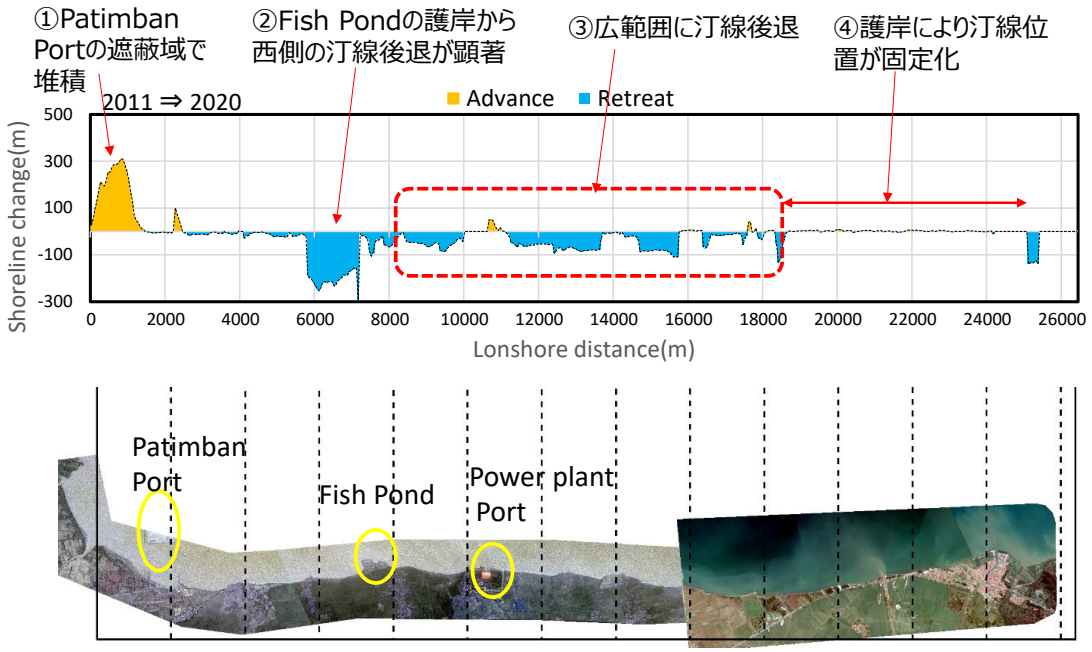
■Indramayu 東　中央部 (図 56)

汀線の変化は小さく、安定

■Indramayu 東　東部 (図 57)

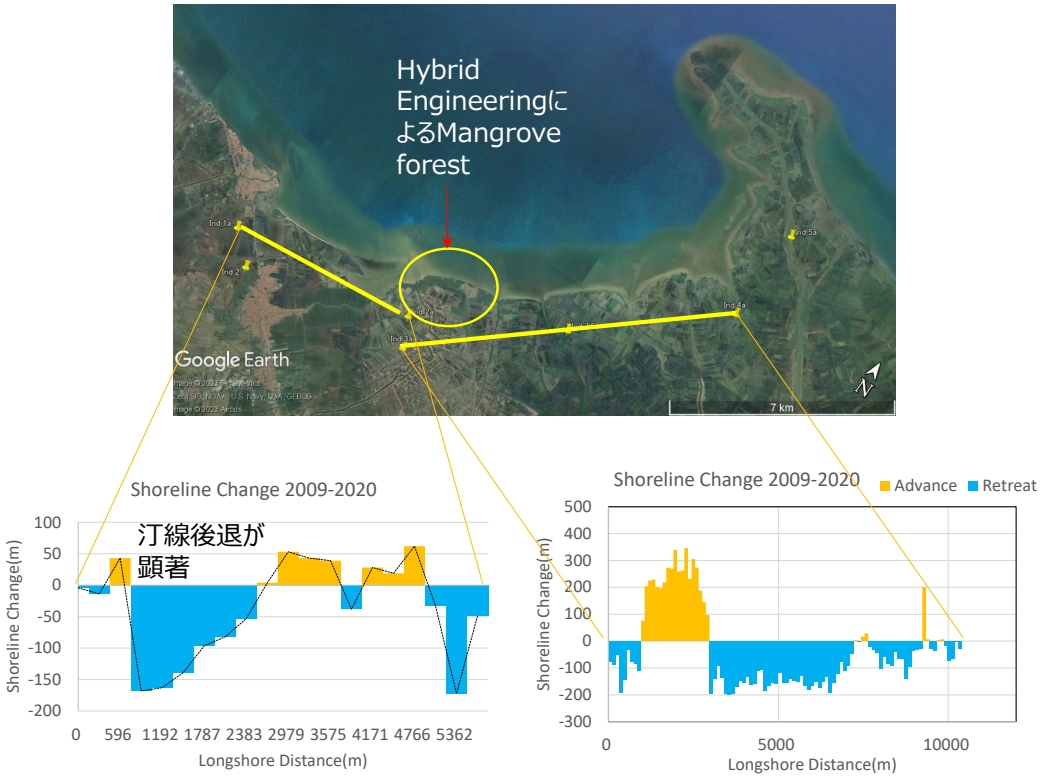
① 西側で顕著な汀線後退

② 東側の砂嘴付近は安定



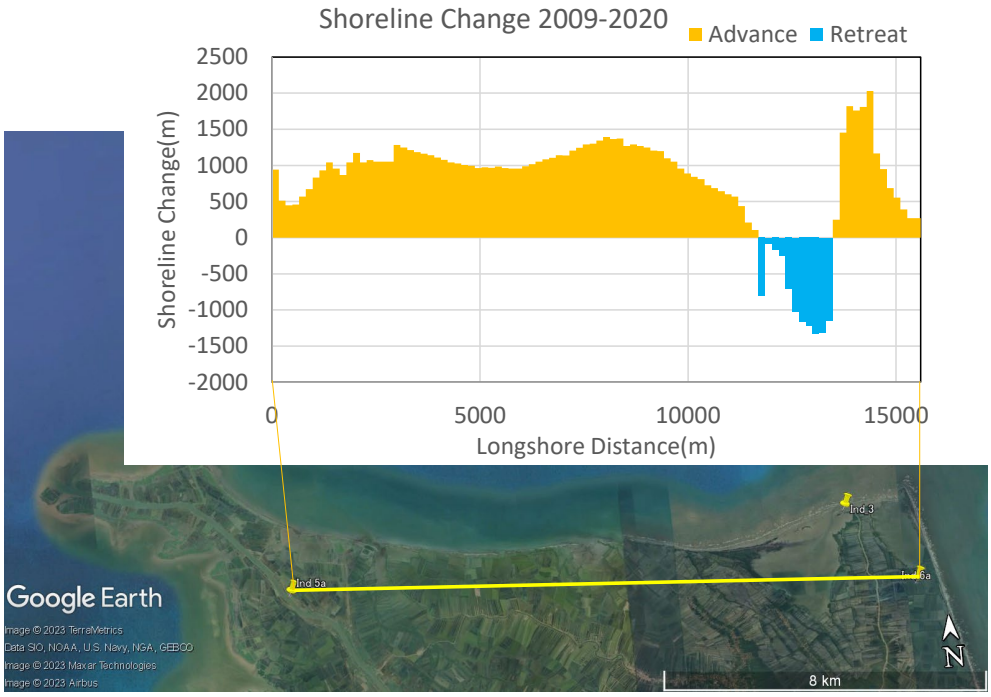
出典：JICA 調査団

図 52　Indramayu 西 西部汀線変化分布（2011–2020 年）



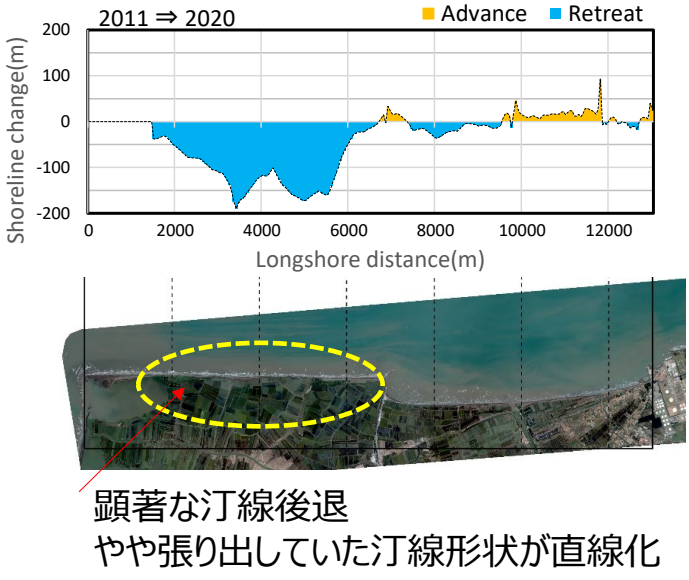
出典：Google Earth をもとに JICA 調査団作成

図 53　Indramayu 西　東部汀線変化分布（2011–2020 年）



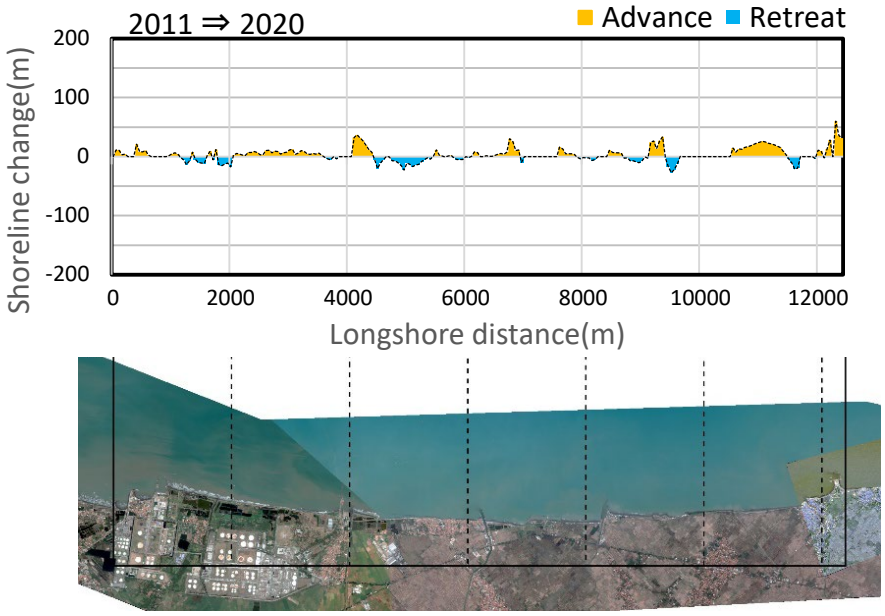
出典：Google Earth をもとに JICA 調査団作成

図 54　Indramayu 中央　汀線変化（2009–2020 年）



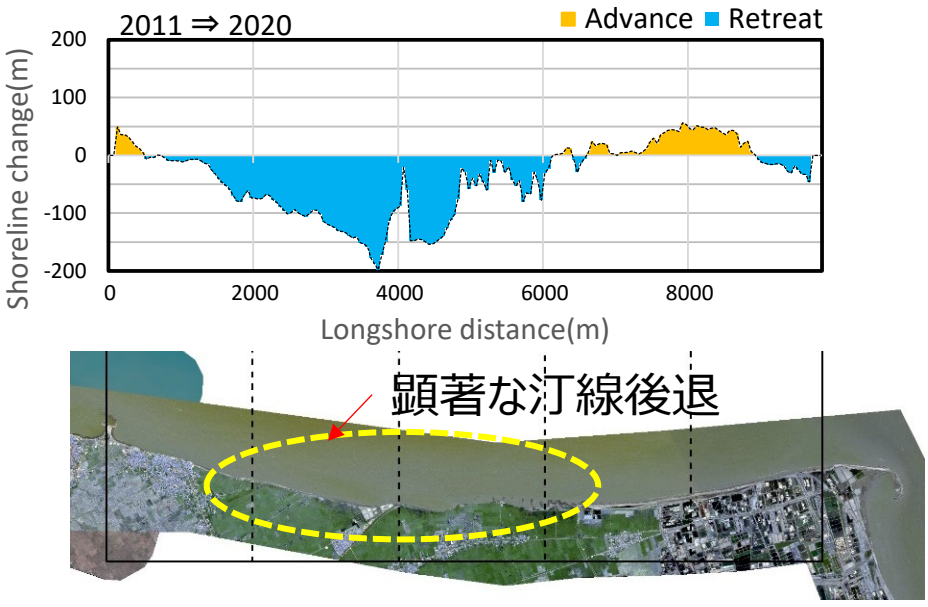
出典：Google Earth をもとに JICA 調査団作成

図 55　Indramayu 東　西部 汀線変化分布（2011–2020 年）



出典：Google Earth をもとに JICA 調査団作成

図 56　Indramayu 東　中央部 汀線変化分布（2011–2020 年）



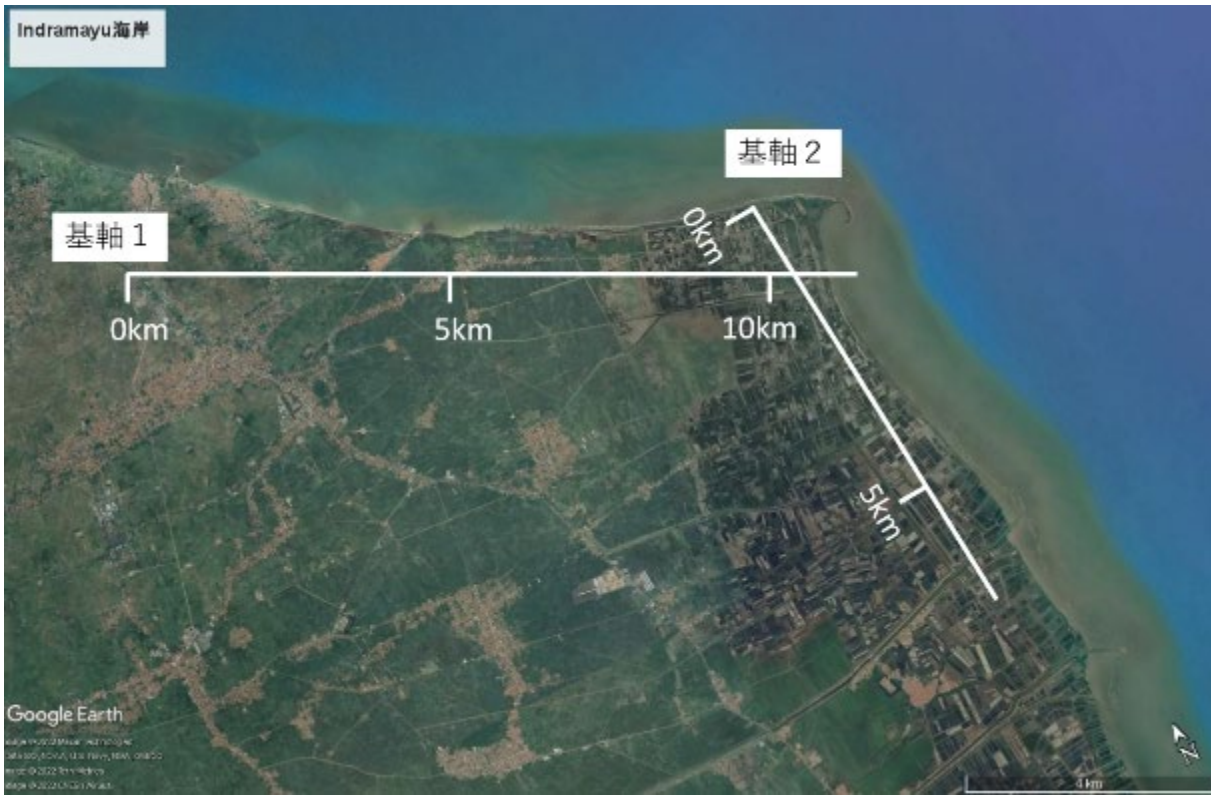
出典：Google Earth をもとに JICA 調査団作成

図 57　Indramayu 東　東部 汀線変化分布（2011–2020 年）

6.3.2 Indramayu 狭域

先に示した中から侵食が激しかった Indramayu 東の東部について、経年的な汀線の後退状況を衛星画像をもとに整理した。図 58 に示す基軸のもとに汀線位置を読み取り、その変化を解析した。対象とした衛星画像の撮影年は以下の 4 年である。

- 2002 年
- 2011 年
- 2015 年
- 2020 年

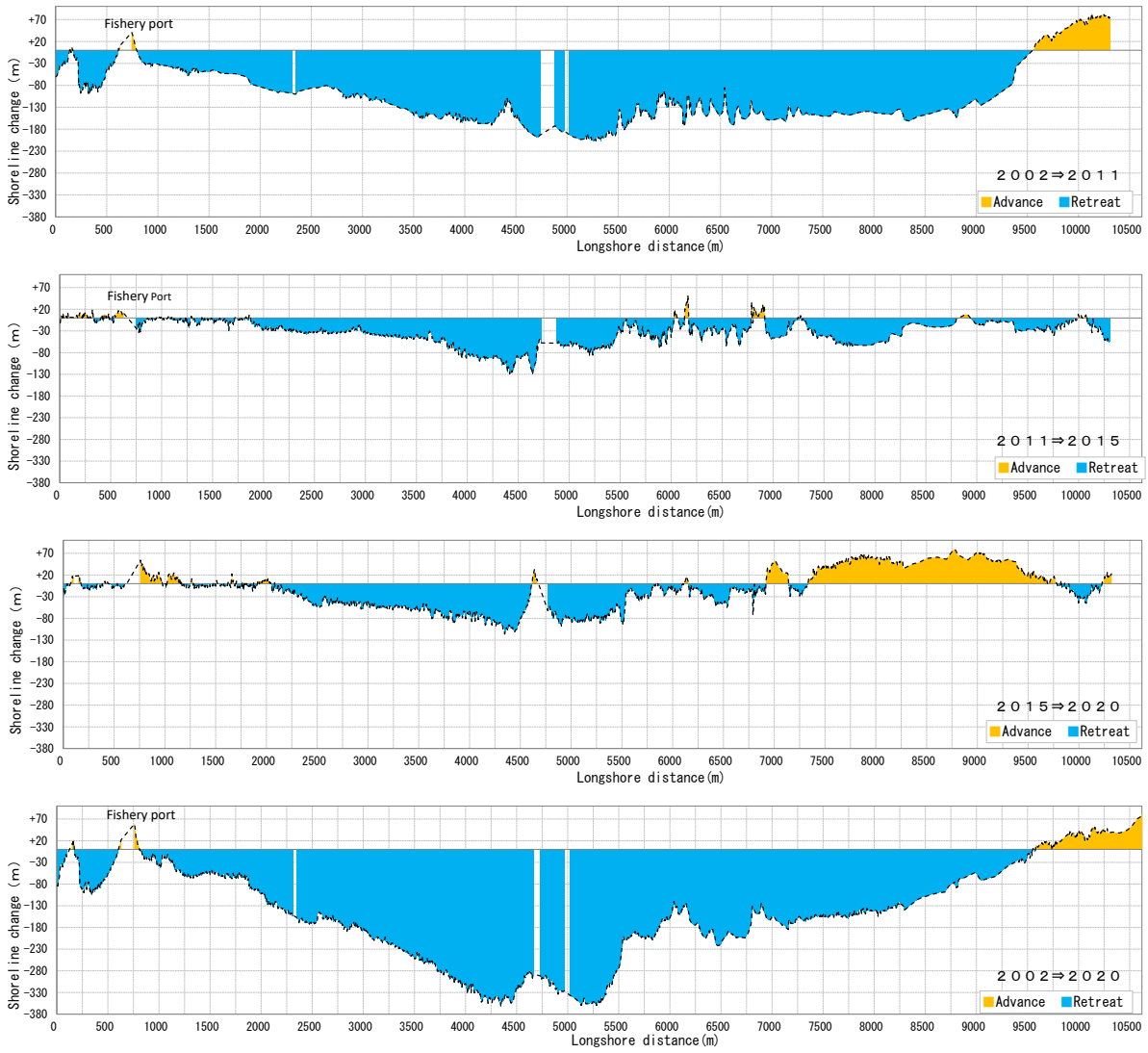


出典：Google Earth をもとに JICA 調査団作成

図 58 汀線位置読み取りの基軸（Indramayu 東部）

①　ワインカップ漁港からその東端の砂嘴に至る汀線変化

基軸 1 に沿った汀線変化の沿岸分布（図 59）から、当該海岸の汀線後退はワインカップ漁港と東端の砂嘴の間のほぼ中央をピークに進行している。その中央での侵食量は近 18 年間で 350 m にも達する。ただし、2011 年以降に設置された離岸堤により、ワインカップ漁港側はほぼ 2002 年当時の汀線位置に戻っている。一方、侵食のピークより東側では堆積が進んでいるものの、2002 年当時の汀線までには回復していない。



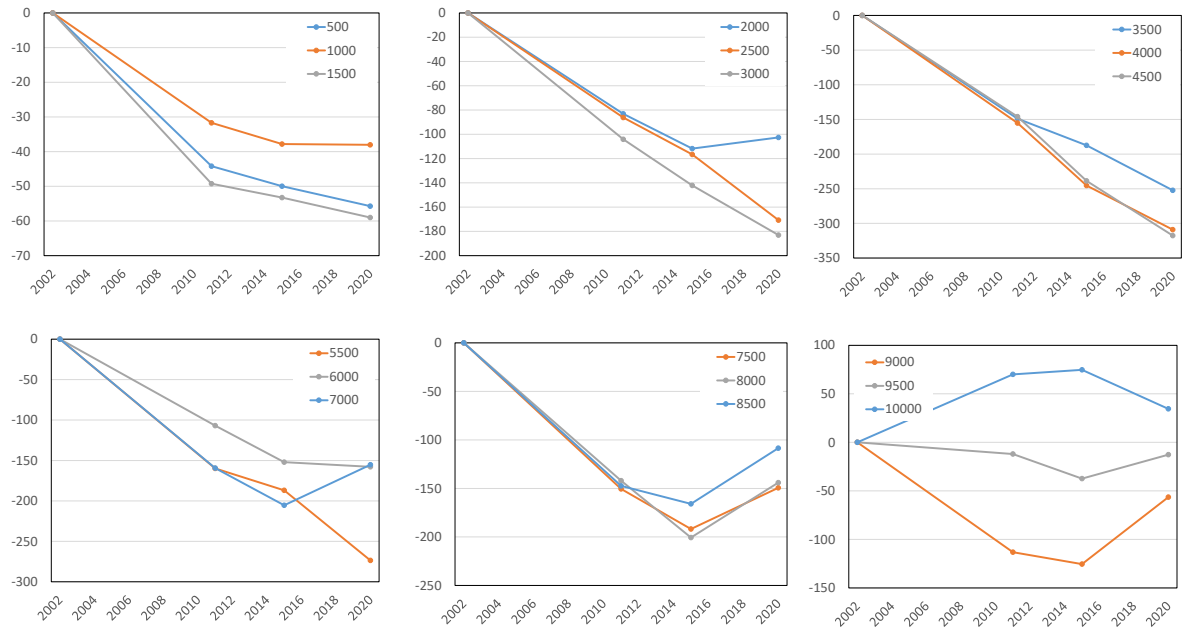
出典：JICA 調査団

図 59　汀線変化量の沿岸分布（図 58 の基軸１）

基軸 1 の 500m ピッチ毎の位置における汀線位置の時間変化（図 60）から、ワインカップ漁港側の x＝2,000 m までの区間は 2015 年以降、汀線の後退は鈍化あるいは止まっている。これは離岸堤および汀線部に投入された捨石の効果と考えられる。一方、x＝2,500～5,500 m 区間の汀線後退はほぼ一定の速度で進行している。この速度は、先の長期的地形変化で示した速度 (前出 図 41) と大きく変化して

いないが、やや近年早くなっている。これは離岸堤によって西向きの沿岸漂砂が阻害されたことによることも原因していると考えられる。またこの区間は離岸堤が未整備の区間に相当する。x=6,000～9,000 m 区間は 2015 年以降汀線後退は止まり、回復しつつある箇所も見られる。これもこの区間沖に設置された離岸堤の効果と考えられる。x=9,500 m より東側は汀線は安定している。

以上から、離岸堤設置により汀線後退は緩和、停止、さらには回復していることから、離岸堤の効果は発現されていると考えられる。



出典：JICA 調査団

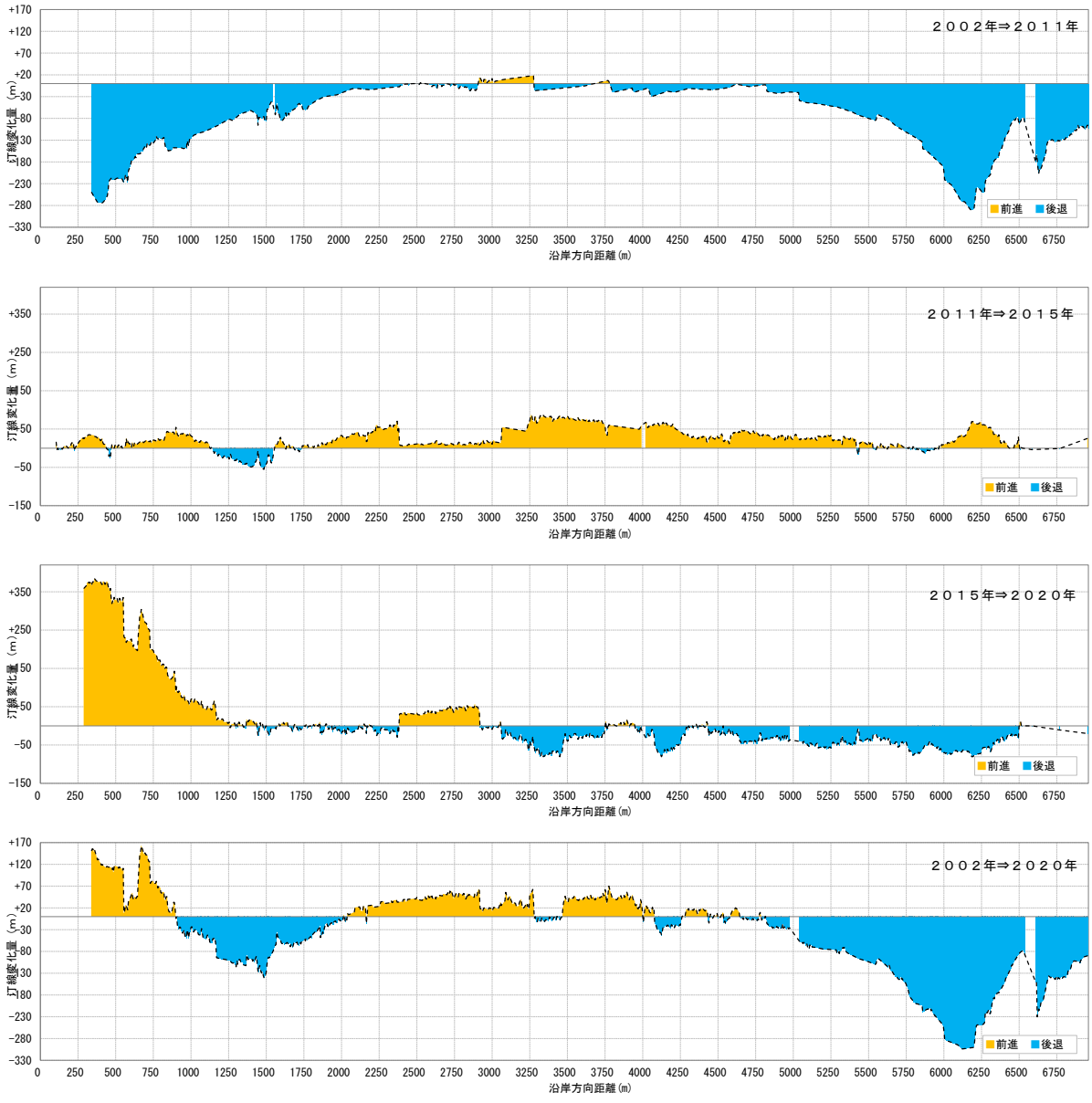
図 60　汀線変化の時間変化（図 58 の基軸 1）

出典：JICA 調査団

図 61　離岸堤と回折波（離岸堤背後にさらにブロックらしき施設あり）

②　砂嘴から Cirebon 方向

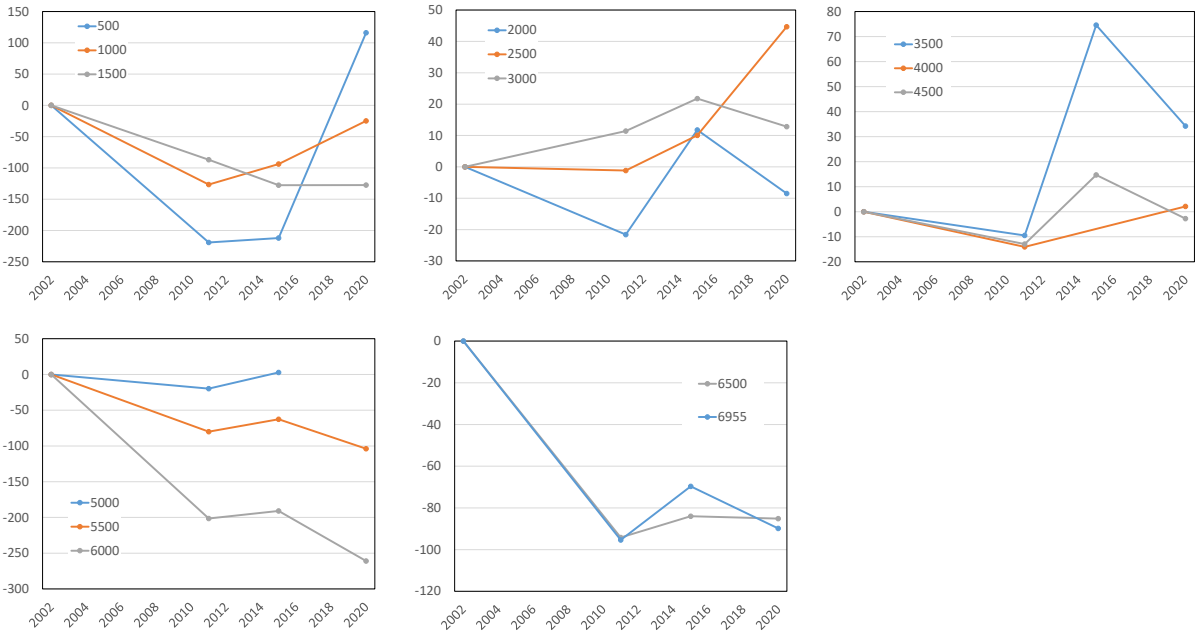
基軸 2 に沿った汀線変化の分布（図 62）から、砂嘴側の x = 0～1,000 m 区間では 2002～2011 年にかけて大きく汀線が後退したものの、その後回復している。中央付近は汀線の前進・後退はあるものの、一方向に大きく変化する汀線変化は見られない。x=5,000 m より東方向は 2002～2015 年にかけて大きく汀線が後退し、その後は回復していない。



出典：JICA 調査団

図 62　汀線変化量の沿岸分布（図 58 の基軸 2）

汀線変化の時間変化（図 63）から、x=500～5,000 m 区間については、汀線変動はあるものの、ほぼ安定しているのに対し、x=5,500 m 以東は汀線が後退しつつある。ただし、x＝6,500 m 以東については 2011 年以降汀線後退は止まっている。



出典：JICA 調査団

図 63　汀線変化の時間変化（図 58 の基軸 2）

6.3.3 Pemalang-Pekalongan

図 64 に示す基線のもとに 3 区域に分けて汀線変化を整理した。

出典：Google Earth をもとに JICA 調査団作成

図 64　汀線位置読み取り軸位置（Pemalang-Pekalongan）

2002～2022 年までの 20 年間の汀線変化から、地点別に以下の特徴が示される。

■Pemalang 西(図 65)

①汀線が前進、この付近の 2 河川からの流出土砂量によるものと推定

②突堤群範囲は西端導流堤基部で汀線後退しているものの全体的には安定している

③導流堤の東基部で汀線前進、下手側の西側で汀線後退、その要因は西向き沿岸漂砂の阻止と推定

④顕著な汀線変化は見られない

■Pemalang 東(図 66)

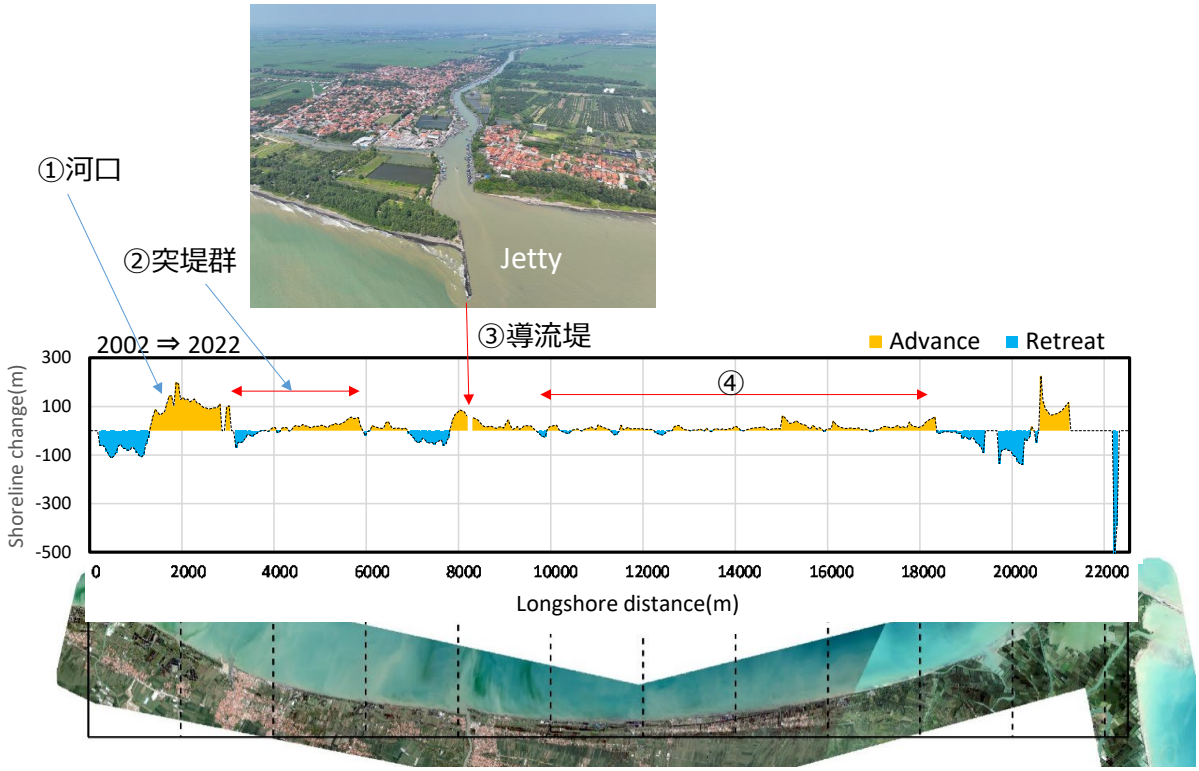
①中央部汀線が決壊し、海水が大きく内陸に侵入、地盤沈下の影響が大きいと推定

■Pekalongan(図 67)

①河口部の導流堤の西側で大きく汀線が後退、西向きの沿岸漂砂の阻止によると推定

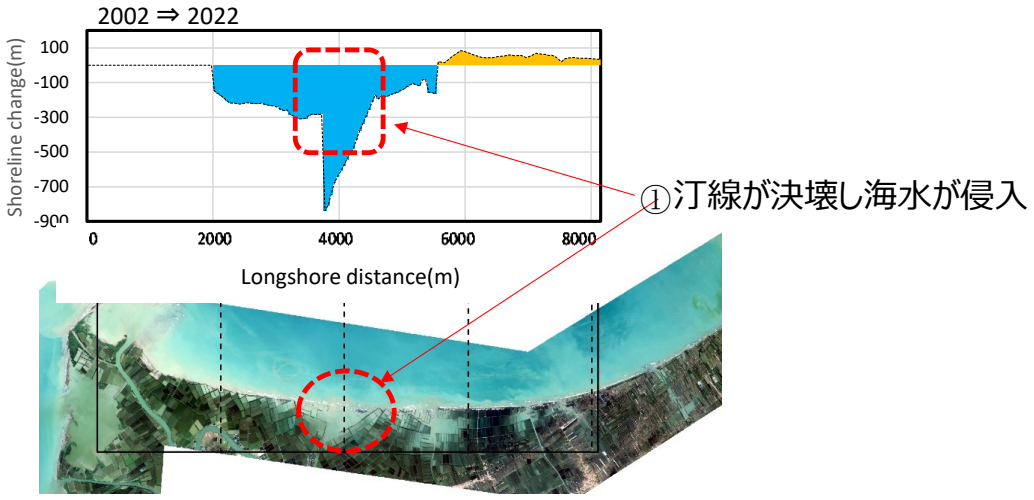
②河口部の導流堤の東西で大きく汀線が後退、西向きの沿岸漂砂の阻止に加え、地盤沈下が要因と推定

③　護岸が設置され、その前面に砂浜がないため、汀線の変化はなし



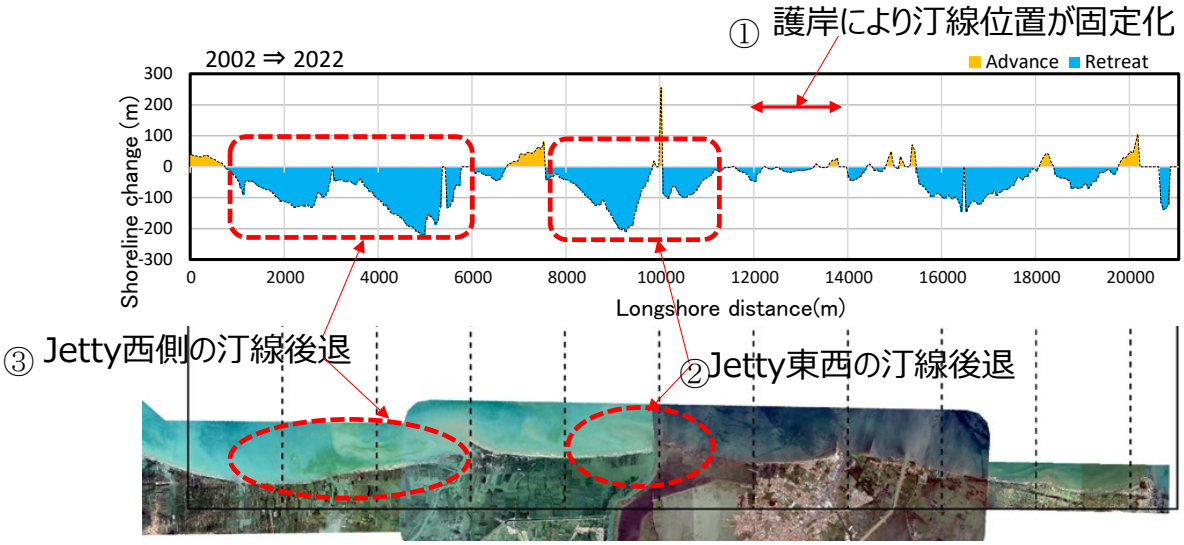
出典：JICA 調査団

図 65　Pemalang 西汀線変化分布（2002–2022 年）



出典：JICA 調査団

図 66　Pemalang 東汀線変化分布（2002–2022 年）



出典：JICA 調査団

図 67　Pekalongan 汀線変化分布（2002–2022 年）

6.3.4 Rembang-Tuban

図 70 には 3 時期毎各々を比較した汀線変化量を示した。これら解析結果による汀線変化の特徴を以下に示す。

■Rembang(West Side)

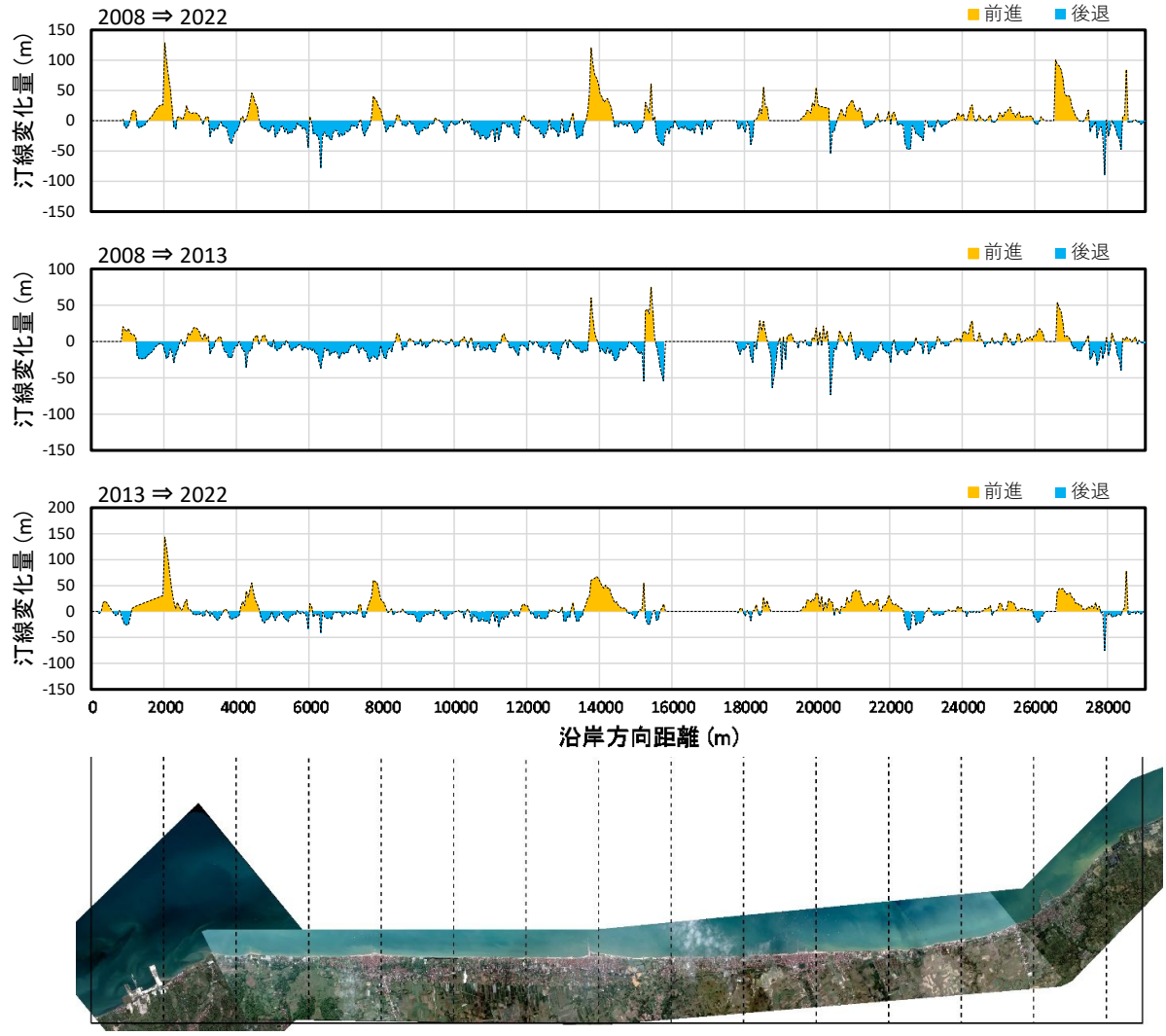
- 2008–2013 年（5 年間）では、全体的に汀線は後退傾向にあり、主な前進している箇所は突堤の設置してある東側に見られる。
- 2013–2022 年（9 年間）では x = 14,000 m より西側は汀線後退量はやや少なくなったものの、突堤の東側を除いてやはり後退傾向が続いている。
- 一方、x = 14,000 m 以東は汀線が前進している区域が多く見られる。
- 2008–2022 年（14 年間）で見た場合、2008 - 2013 年の変化が強く表れている。

■Tuban (East Side)

- 2008–2013 年（5 年間）では、x = 8,000 m より西側が汀線後退、東側が汀線前進傾向となっている。
- 2013–2022 年（9 年間）では全体的に汀線は後退しており、特に x = 8,000～ 9,000 m の区間の後退量は最大 100 m を越えている。
- 2008–2022 年（14 年間）では、West-Side 同様、2008–2013 年の汀線変化傾向が強く表れている。

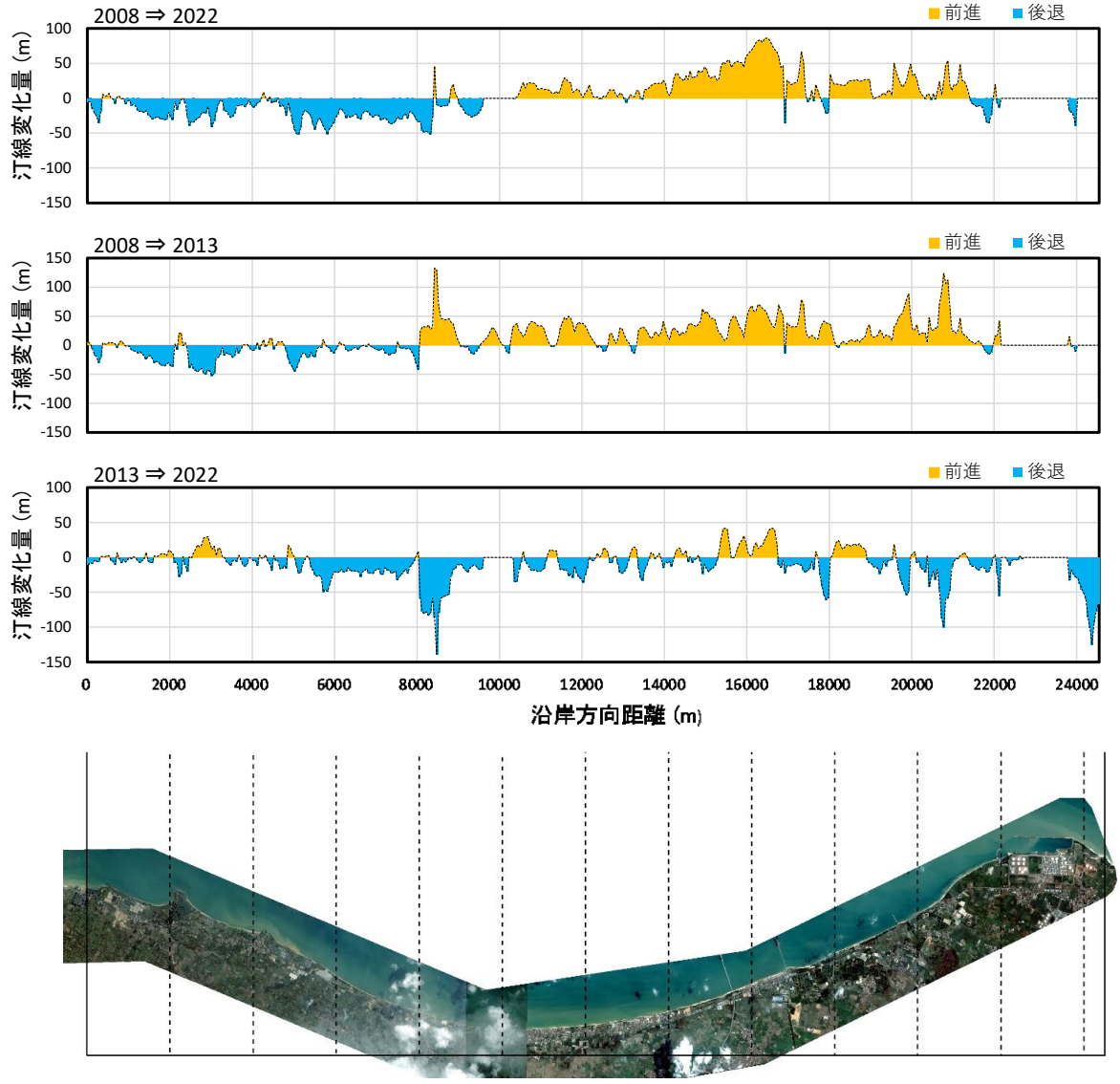
出典：Google Earth をもとに JICA 調査団作成

図 68　汀線位置読み取り軸位置（Rembang-Tuban）



出典：JICA 調査団

図 69　Rembang 汀線変化分布（上：2008–2022 年、中：2008–2013 年、下：2013–2022 年）



出典：JICA 調査団

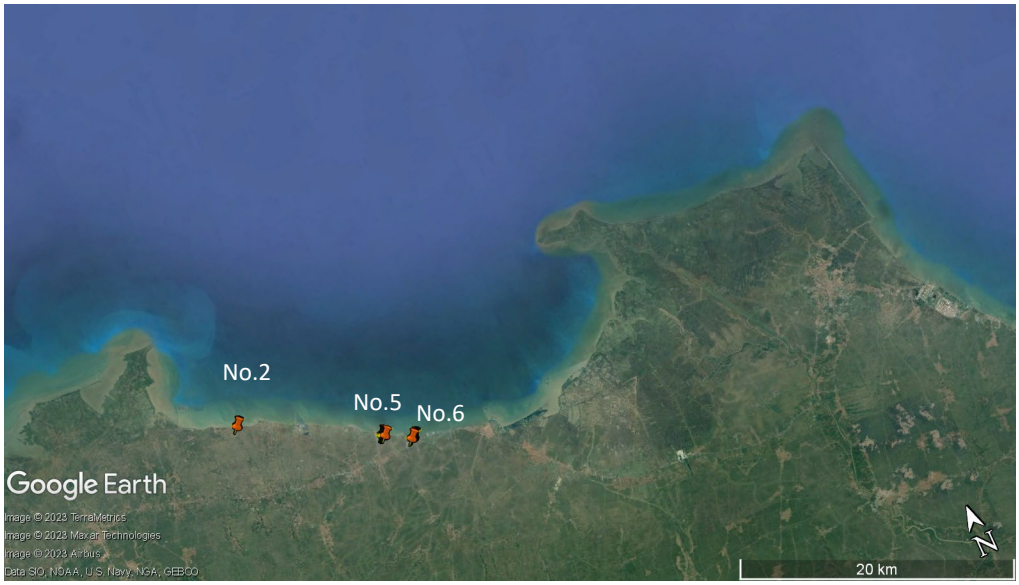
図 70　Tuban 汀線変化分布（上：2008–2022 年、中：2008–2013 年、下：2013–2022 年）

6.4 特徴的地形変化

ここでは、各 Area において、特徴的な地形変化について考察した。

6.4.1 Indramayu に見られる湾曲地形

Indramayu 沿岸で見られる湾曲した地形は、今後の地形変化予測さらには侵食対策に資することと考え、本渡航時において現地において地形を確認した。以下、その中から 3 地点（No.2, No.5, No.6）についての概要を示す。



出典：Google Earth をもとに JICA 調査団作成

図 71 Indramayu の湾曲の地形の調査位置図

①No.2 (図 72、図 73)

当該地点は 2008 年当時は Fish Pond があった地点であるが、急速な侵食によりそれら施設が削られてきている。2023 年現在では 2022 年当時から防波堤が約 50 m 延伸されており、それに伴いその遮蔽域の海浜形状（汀線）が時計回りに回転している。防波堤延伸により、その背後に時計回りの循環流が卓越したことにより、A 地点付近の土砂が B 地点方向に移動した結果と推定される。

②No.5 (図 74、図 75)

捨石消波堤が欠損した背後で汀線が約 12 m/年の速度で後退している。また、両端の消波堤の欠損が拡大し開口幅が拡大するにつれて汀線後退量も増加傾向が見られる。開口幅約 160 m が約 8 年維持されていた時期は後退速度が減少している。しかし、両端の消波堤の沈下とともに開口幅が再び広がり、その影響で再び汀線が後退している。この湾曲部海浜で現地踏査した結果、汀線付近の底質は細砂で構成されていることがわかった。ただし、海浜の西端部では粘土質の土壌が露出しており、もと

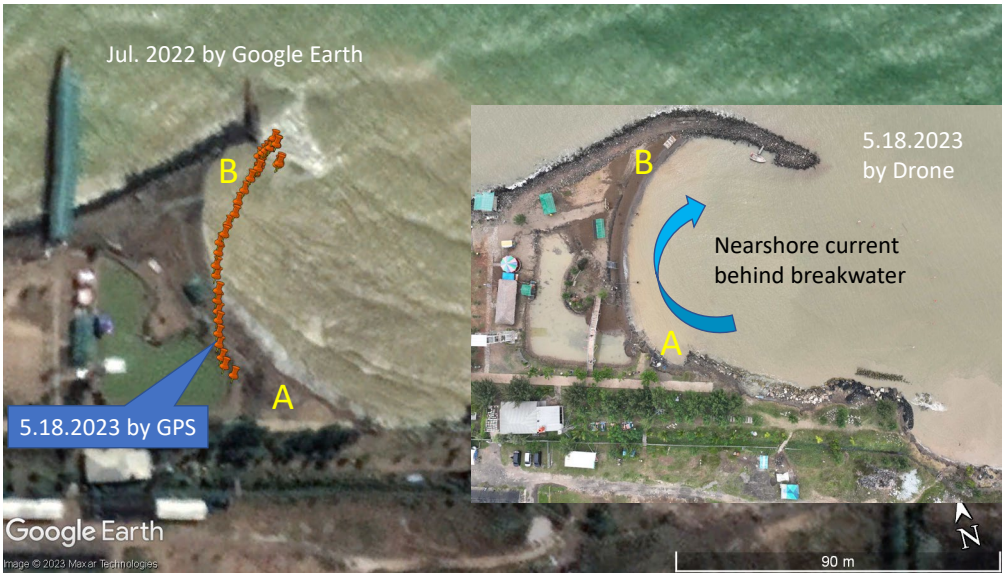
もとはこのような粘土質土壌が侵食により削られ、波浪の作用によってシルト質は沖に流され、砂質分が汀線付近に留まっているものと思われる。

③No.6 (図 76、図 77)

No.5 と同様、消波堤が沈下等で欠損した箇所で侵食が進行し、湾曲した地形が形成されている。消波堤の欠損幅が広がるにつれ、湾曲した中央部の侵食長は徐々に大きくなっている。

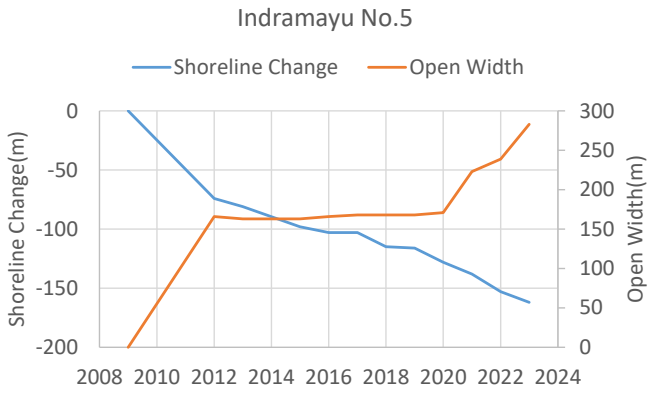
出典：Google Earth をもとに JICA 調査団作成

図 72　Indramayu 湾曲地形地点 No.2 付近の変遷



出典：Google Earth をもとに JICA 調査団作成

図 73　Indramayu の湾曲の地形の調査結果（No.2）



上図：Google Earth をもとに JICA 調査団作成、下図：JICA 調査団

図 74　Indramayu の湾曲の地形（No.5）の変遷

湾曲した海浜の西側(左)と東側(右)海浜

前浜勾配は約1/13,ﾊﾞｰﾑ高約0.8m

汀線から沖へは約1/18勾配

砂浜は細砂（ｼﾙﾄ分はない）

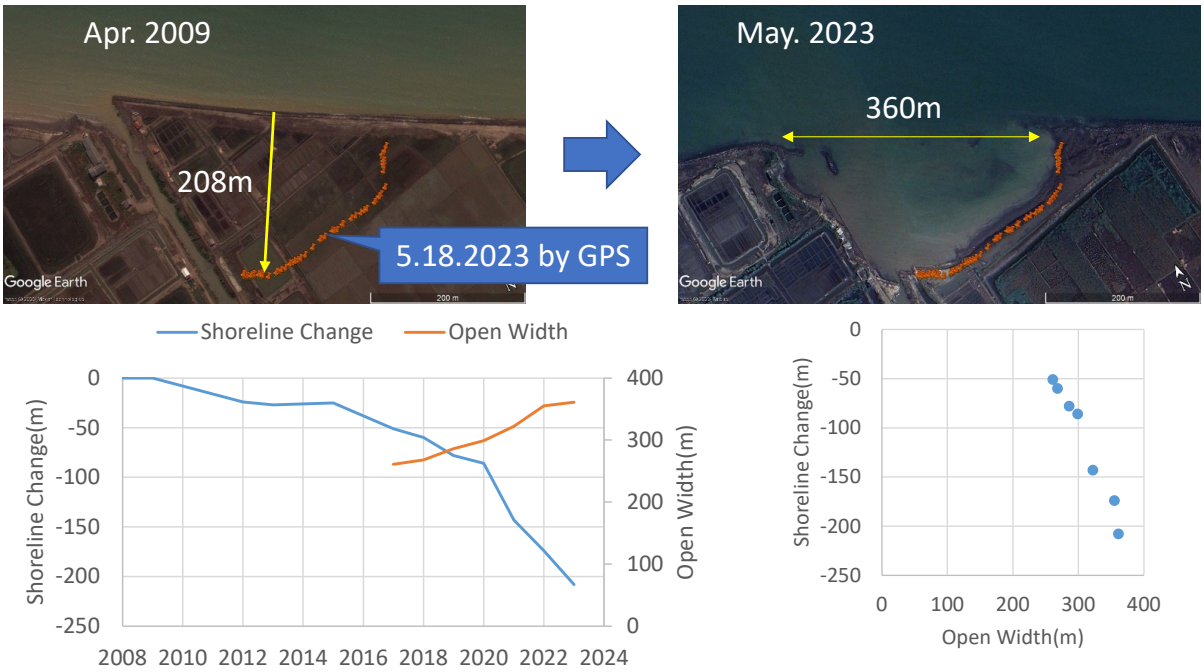
海浜西端部では粘土質の土壌が露出

出典：JICA 調査団

図 75　Indramayu の現地調査結果（No.5）

出典：Google Earth をもとに JICA 調査団作成

図 76　Indramayu の湾曲地形（No.6）の変遷

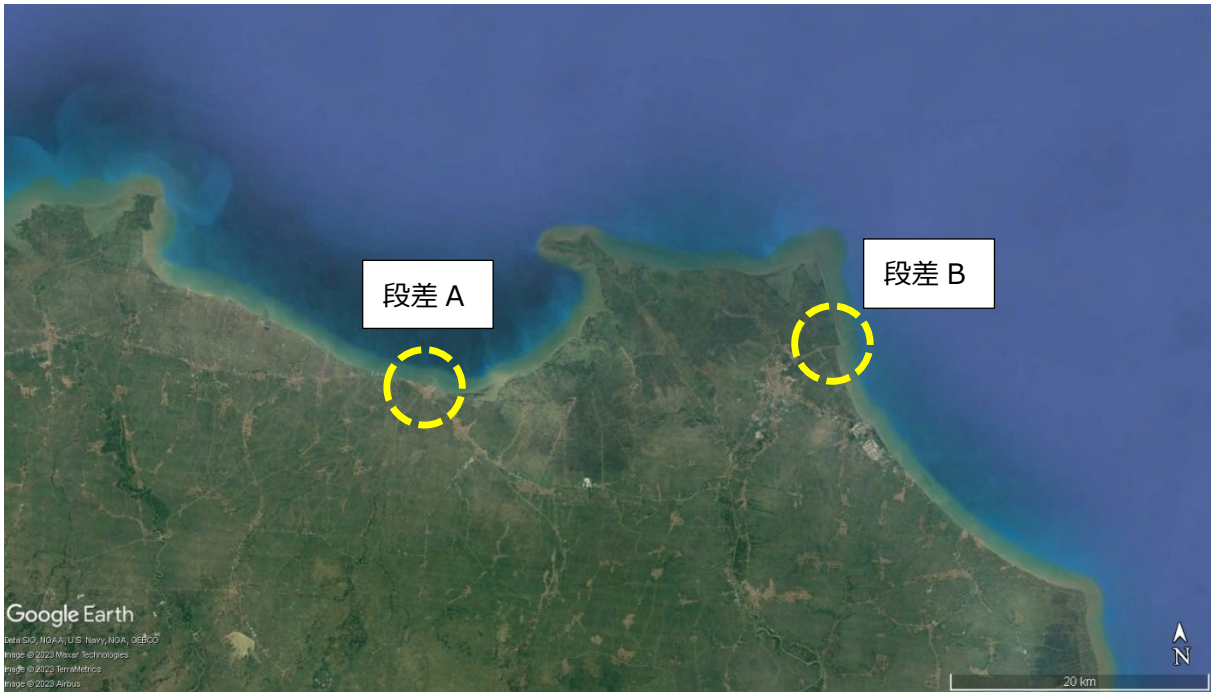


上段、右図および左図：Google Earth をもとに JICA 調査団作成、下段、右図および左図：JICA 調査団

図 77　湾曲地形 No.6 の地形諸元の変化

6.4.2 Indramayu における段差地形

Indramayu において図 78 に示す地点で見られる海岸線に段差が生じている地点についてその要因を考察した。

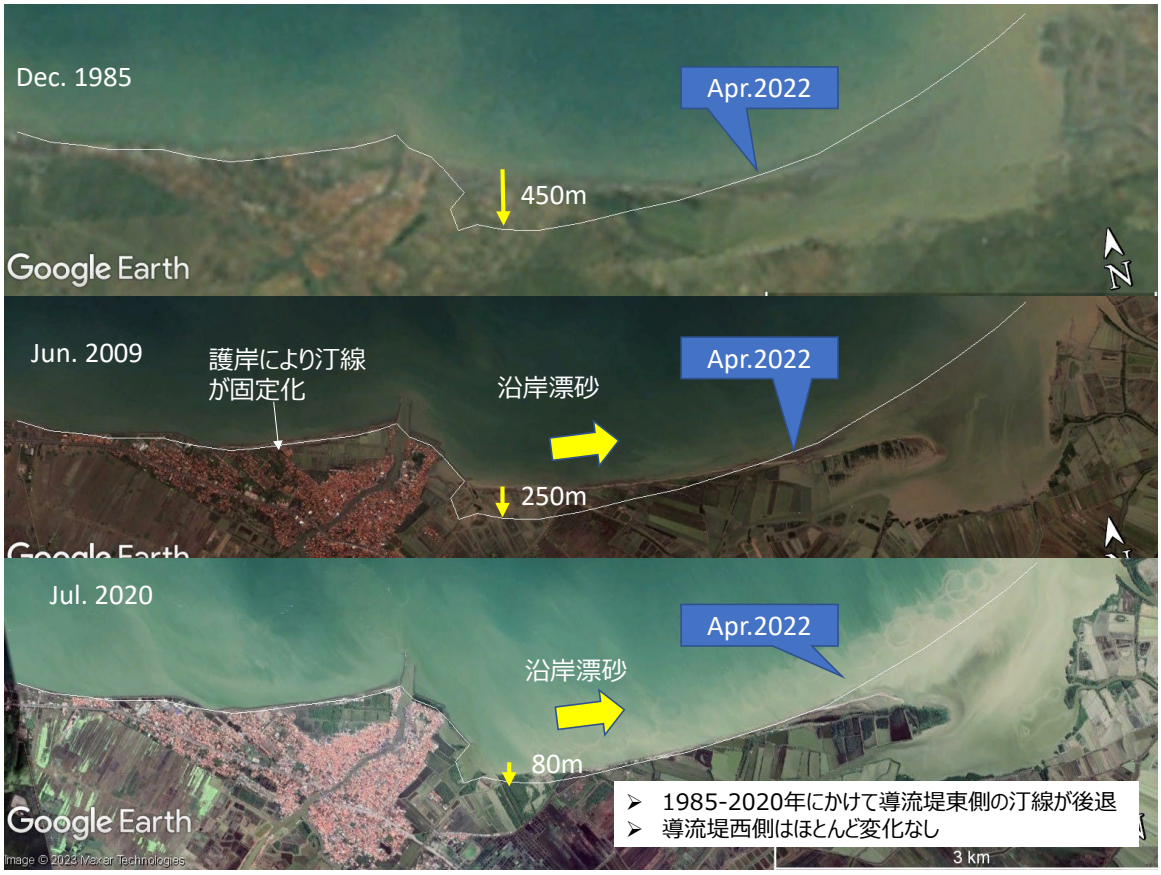


出典：Google Earth をもとに JICA 調査団作成

図 78 Indramayu に見られる段差地形

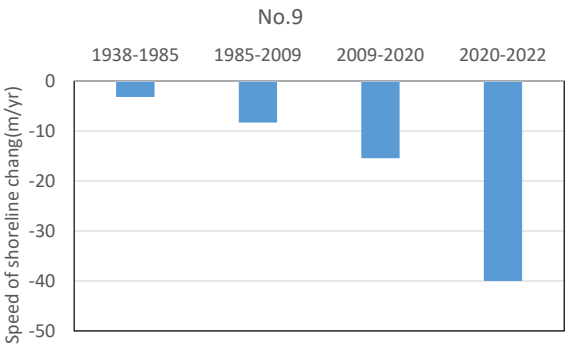
①段差 A

Indramayu West の河口部で生じている段差の形成過程を図 79 に示す。1985 年当時は河口部がやや突出した地形であるものの、左右岸で段差はほとんどない。2009 年には、河口部の左右岸に導流堤が建設されており、また河口の西側は護岸が建設され、その前面には砂浜がない。一方、河口の右岸側(東側)は汀線が後退、1985 年当時よりも 2022 年時点で約 450 m 後退している。それとともに、右岸側には砂嘴が発達し、1985 年当時は海域であった箇所が砂嘴によって閉鎖海域に変化している。



出典：Google Earth をもとに JICA 調査団作成

図 79　Indramayu West 河口導流堤部の段差地形形成過程



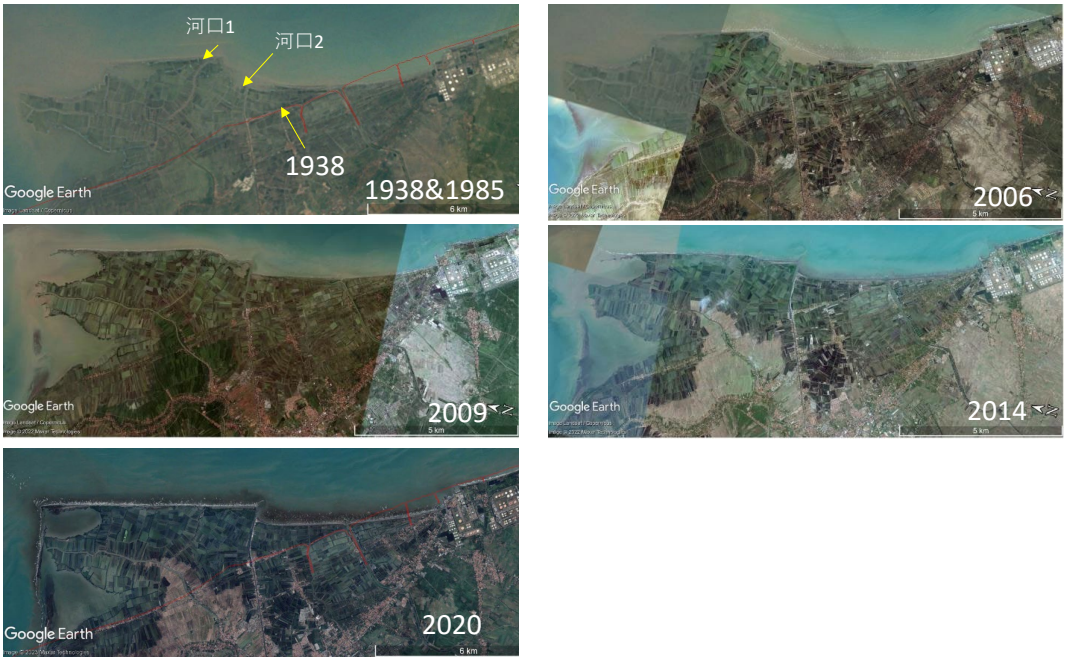
出典： JICA 調査団

図 80　汀線後退速度の変化

②段差 B

Indramayu East の西端部付近では、現在、河口導流堤と港の防波堤により挟まれた箇所の両端で約 450m の段差が生じている。この段差の形成過程を空中写真をもとに整理した。この付近の 1938 年当時は海岸線の向きは異なるものの、ほぼ直線状の海岸であった。1985 年になると、西側に河口が 2 か所存在していることから、この河口からの流出土砂によって突出した地形となっている。一方、東側

には港湾施設が建設されており、その西側の汀線が大きく後退、それによって対象とする海岸線は緩く湾曲した地形に変化している。西端の河口部ではその後、導流堤が建設され、導流堤の左岸側(西側)では土砂の堆積が進行、現在では導流堤先端部にまで汀線が達している。その一方、導流堤の右岸側の汀線位置は大きく変化していないため、導流堤を境に東西で段差が生じている。



出典：Google Earth をもとに JICA 調査団作成

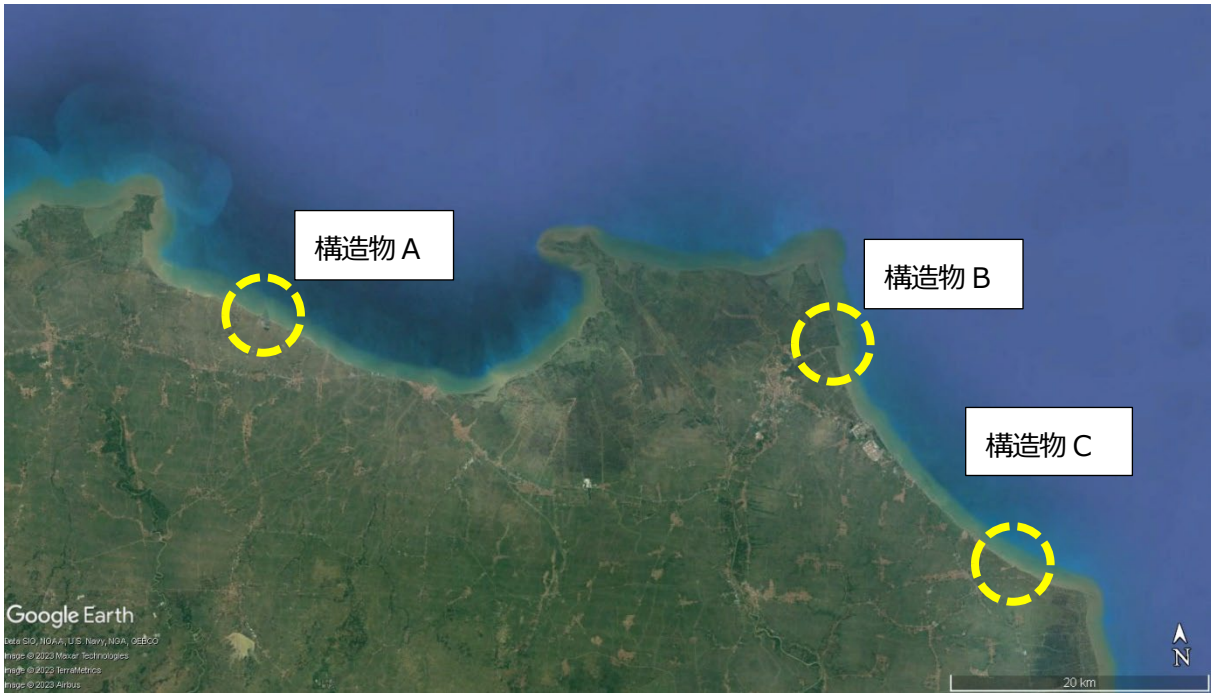
図 81　Indramayu East の段差地形形成の変遷

出典：Google Earth をもとに JICA 調査団作成

図 82　Indramayu East の河口導流堤建設に伴う段差地形形成の変遷

6.4.3　Indramayu における構造物周辺の地形変化

Indramayu において図 83 に示す地点で見られる構造物周辺に見られる地形変化についてその要因を考察した。



出典：Google Earth をもとに JICA 調査団作成

図 83　Indramayu に見られる構造物周辺の地形変化

①構造物 A　火力発電所防波堤

火力発電所防波堤周辺の地形変化を図 84 に示す。防波堤建設により、ややその西側汀線が後退している。

②構造物 B　河口導流堤

先に示した段差地形 A において設置された導流堤周辺での地形変化を図 85 に示す。図中に示すように導流堤によって波浪の遮蔽域が生じたため、その遮蔽域に堆積が進行している様子が見られる。この要因としては遮蔽域に向かう流れが考えられる。

③構造物 C　漁港防波堤

ワインカップ型の漁港防波堤の周辺の地形変化を図 86 に示す。漁港の両側の汀線が前進しているものの、両側の汀線前進量はほぼ同程度である状況からは卓越した沿岸漂砂の存在は見て取れない。

出典：Google Earth をもとに JICA 調査団作成

図 84　構造物 A Indramayu 火力発電所防波堤周辺の地形変化

出典：Google Earth をもとに JICA 調査団作成

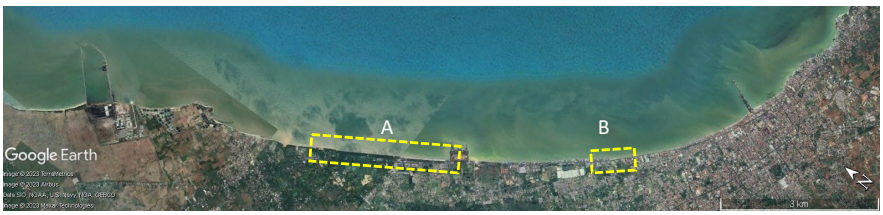
図 85　構造物 B Indramayu East 河口導流堤周辺の地形変化

出典：Google Earth をもとに JICA 調査団作成

図 86　構造物 C Indramayu East 漁港防波堤周辺の地形変化の変遷

6.4.4 Tuban における離岸堤周辺の地形変化

埋立地の北側の海浜(図 87 中 A)では 2000 年頃から離岸堤が南へと建設され、その背後に堆積が生じている(図 88)。一方、埋立地の南側の海浜(図 87 中 B)では 2013 年頃、居住地前面に離岸堤が建設された後、その背後が埋め立てられて陸地が形成されている(図 89)。



出典：Google Earth をもとに JICA 調査団作成

図 87　離岸堤位置

出典：Google Earth をもとに JICA 調査団作成

図 88　埋立地北側海浜での離岸堤周辺の地形変化(地点 A)

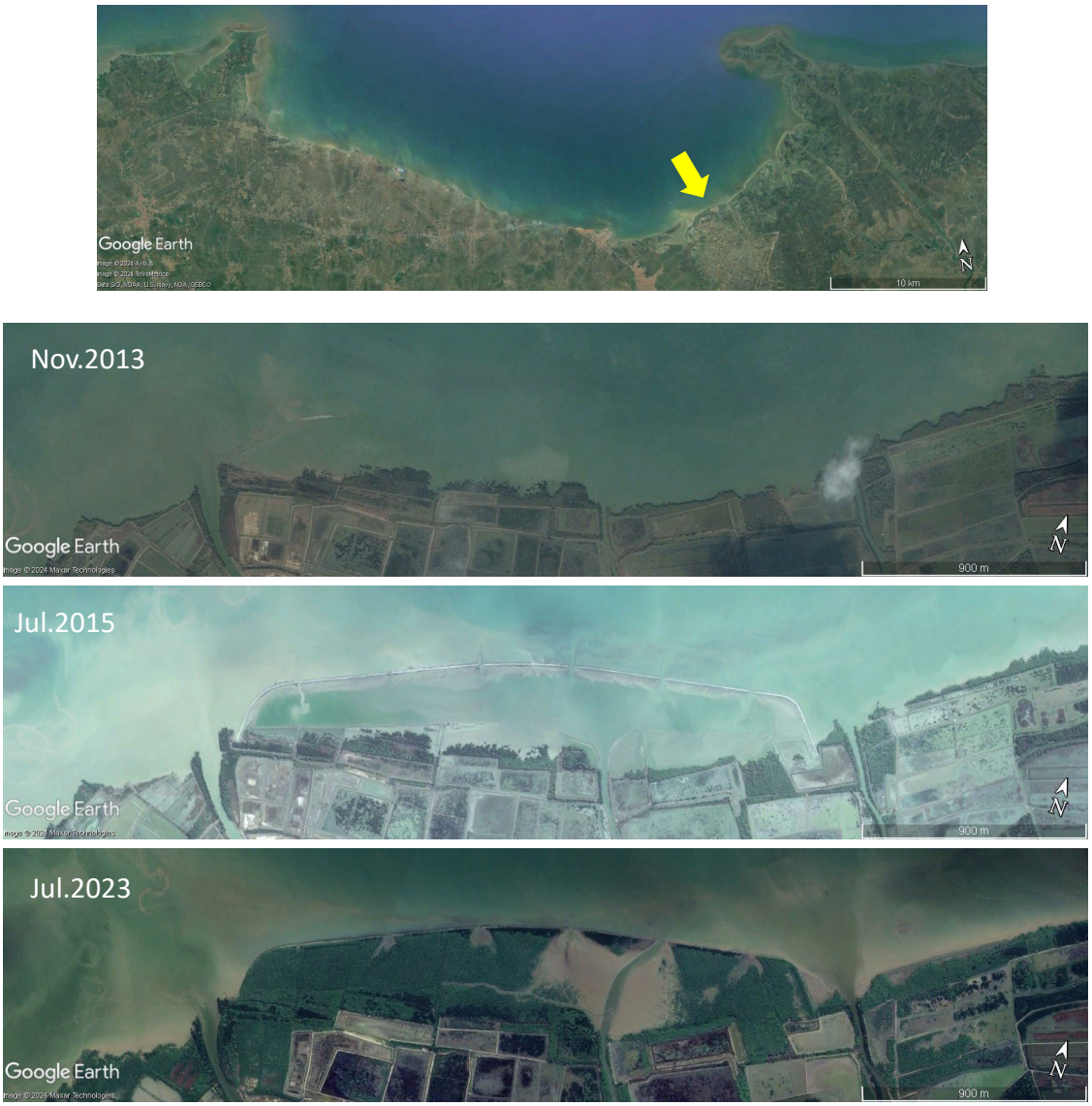
出典：Google Earth をもとに JICA 調査団作成

図 89　埋立地南側海浜での離岸堤周辺の地形変化(地点 B)

6.4.5 グリーン・インフラ施設による地形変化

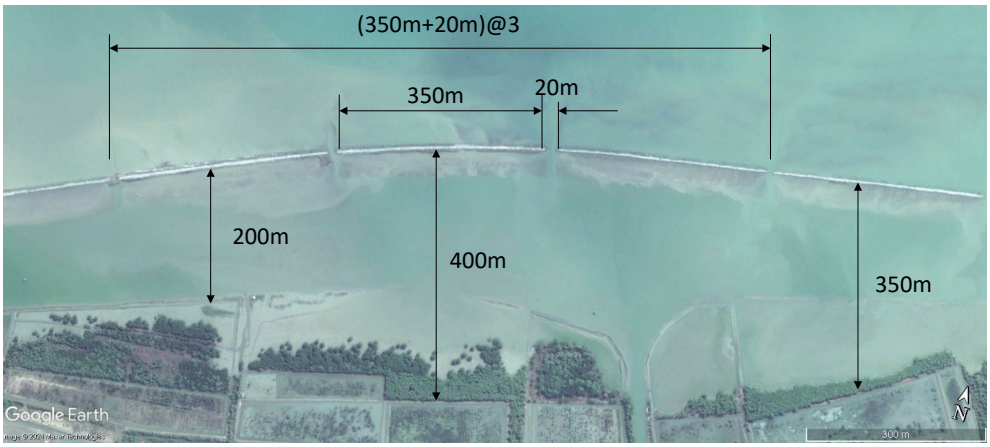
マングローブ植生とその育成のための消波施設設置に伴う地形変化について事例を整理した。Indramayu では石積み堤とその背後にマングローブ植生が実施されている(図 90)。石積み堤を建設後、その背後にマングローブ植林が実施されている。植林されたマングロープは維持され、さらに背後水域全体が浅くなっている様子が伺われる(図 91)。図 92 に石積み堤の平面配置諸元を示す。

一方、優先地点ではないものの、Cirebon や Demak では、沖合消波施設と組み合わせたマングローブ植林が実施されている(図 93～図 95)。ここでも消波施設背後にマングローブ林が成長するとともに背後水域が浅くなっている様子が伺われる。



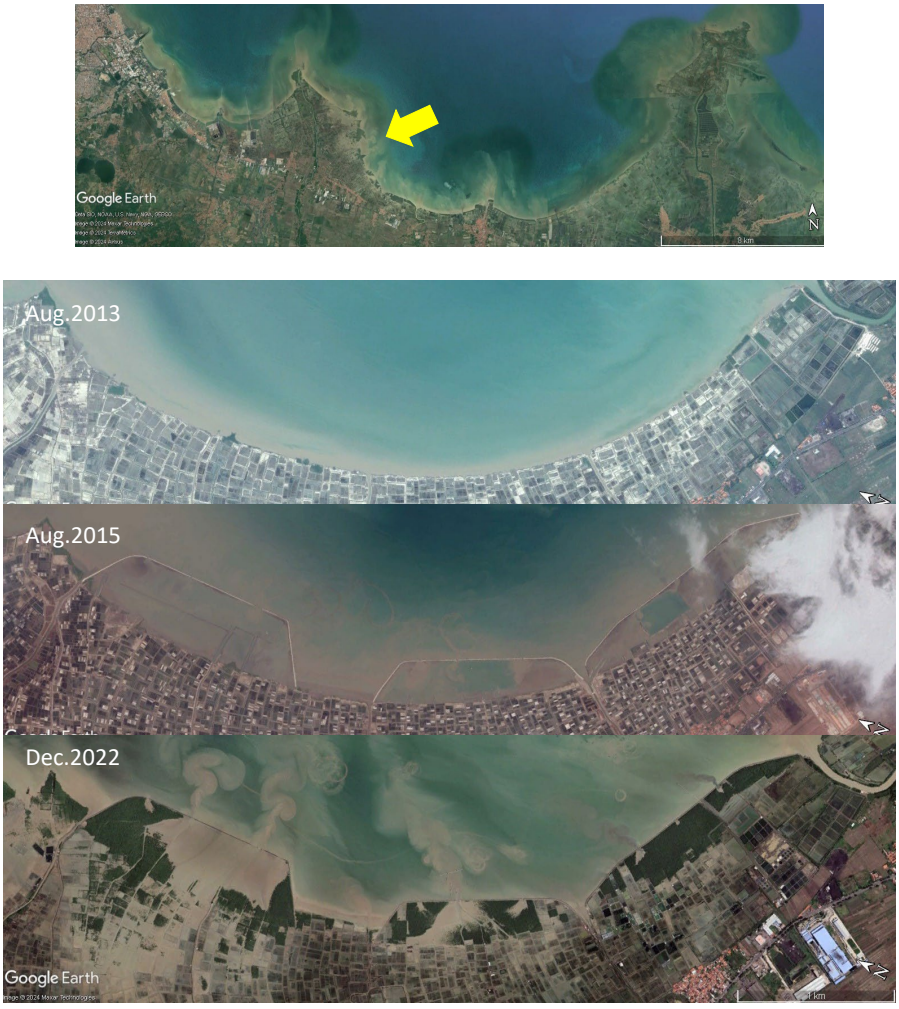
出典：Google Earth をもとに JICA 調査団作成

図 90　グリーン・インフラの整備に伴う地形変化(Indramayu)



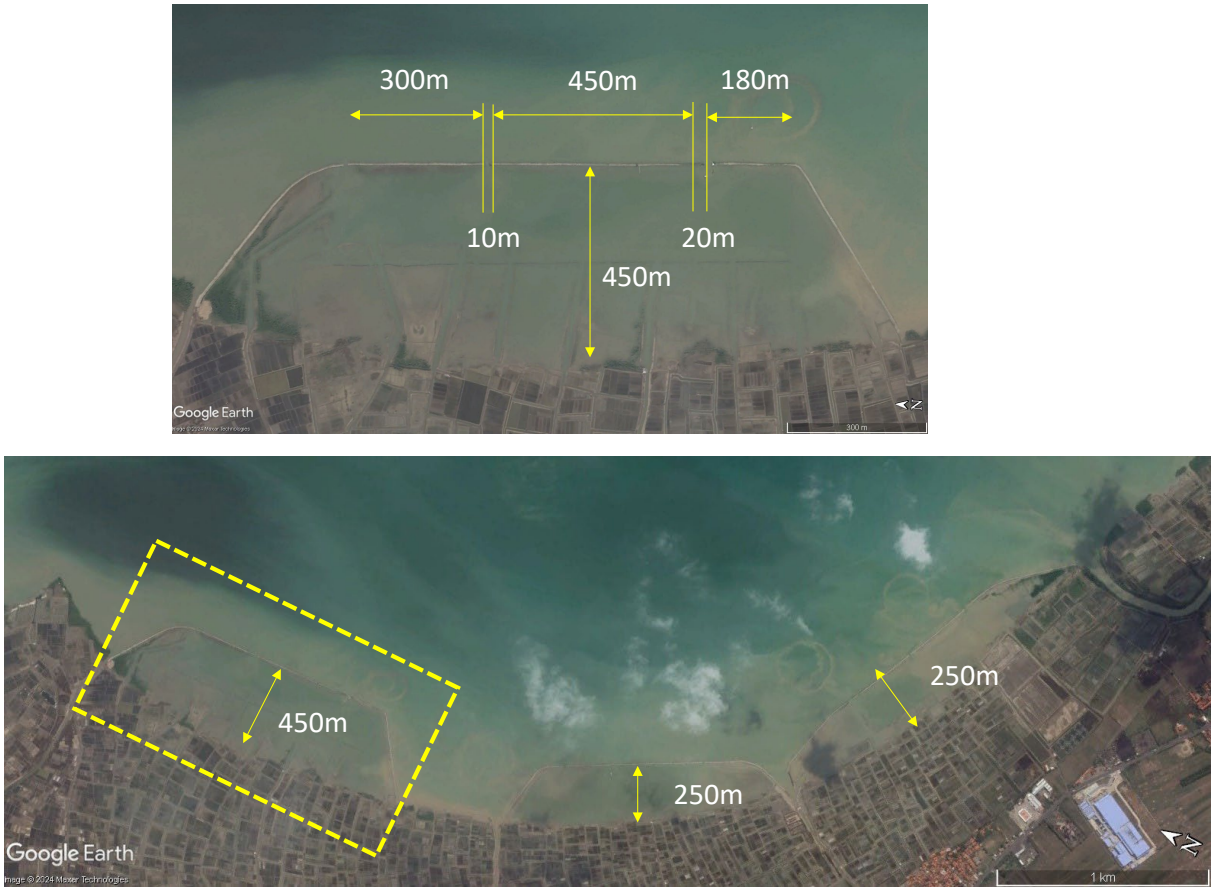
出典：Google Earth をもとに JICA 調査団作成

図 91　沖合消波施設の平面配置例(Indramayu)



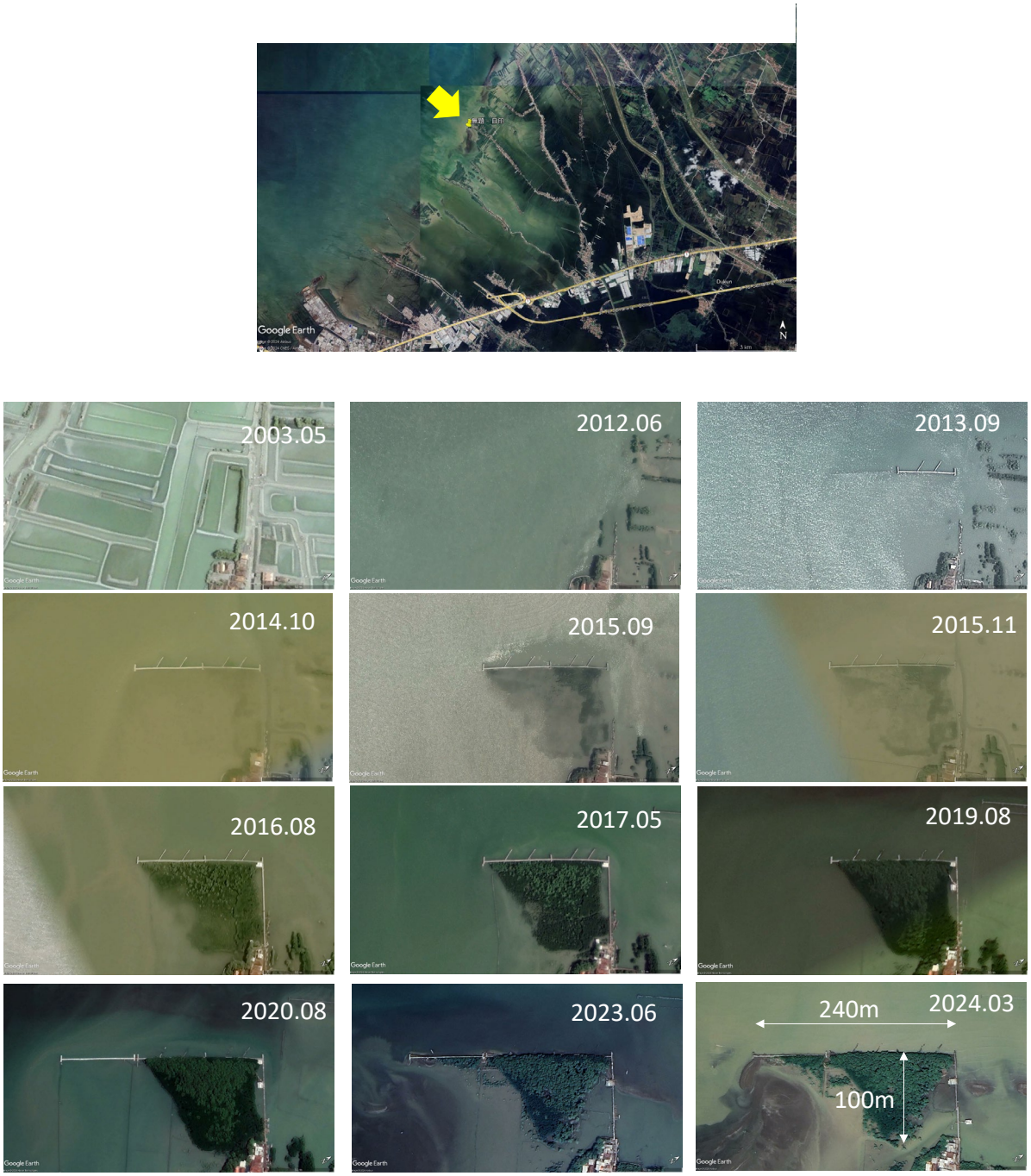
出典：Google Earth をもとに JICA 調査団作成

図 92　グリーン・インフラの整備に伴う地形変化(Cirebon)



出典：Google Earth をもとに JICA 調査団作成

図 93　沖合消波施設の平面配置例(Cirebon)



出典：Google Earth をもとに JICA 調査団作成

図 94　グリーフ・インフラの整備に伴う地形変化(Demak)

6.5 漂砂供給源

6.5.1 Indramayu

Indramayu 海岸に流出する河川を表 6 に整理した。この中で、領域の西端に流出する CIPUNAGARA 川と、中央に流出する CIMANUK 川が流域面積として圧倒的に大きい。特に CIMANUK 川はその流域が約半分を占める。この河川は河口部で二股に東西に分流し、当該海岸の東西各々の海岸に向けて土砂を供給している。また、CIMANUK および CIPUNAGARA 流域にはいくつかのダムが建設されている（図 96、図 97）。

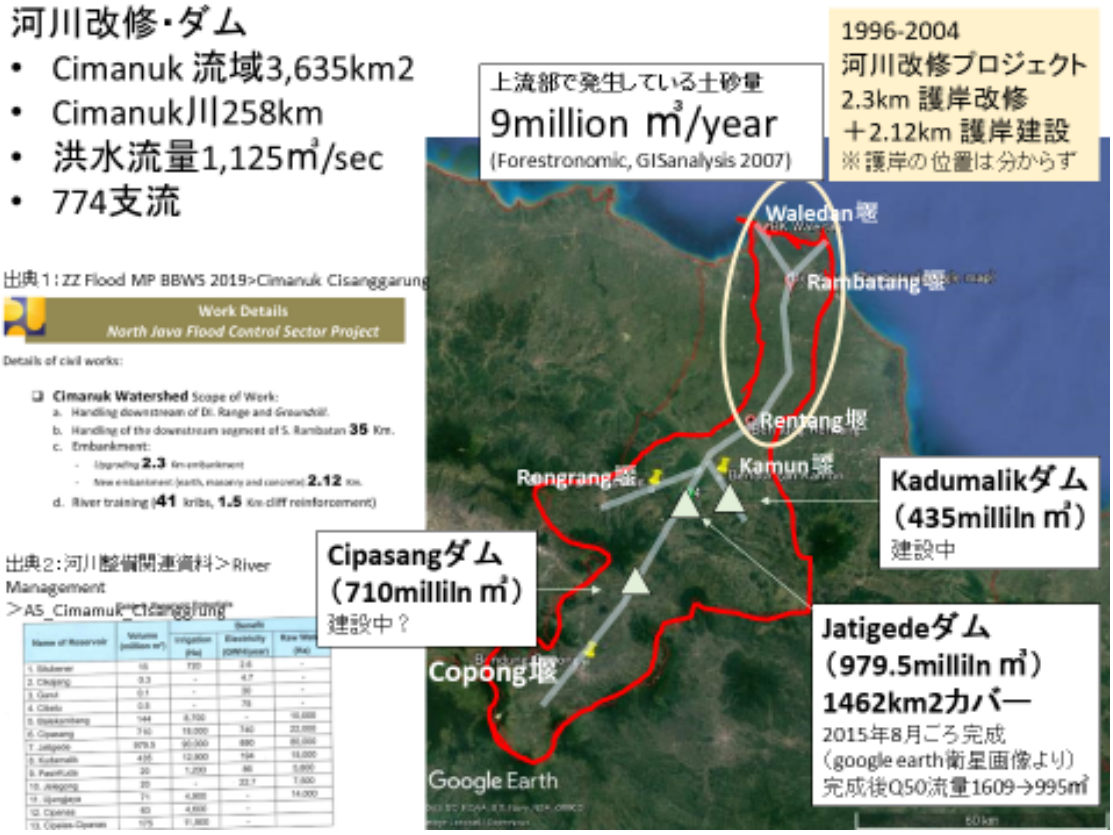
表 6　Indramayu 域に流出する主要河川一覧

No.	Name	Area (km2)	ratio of Area	River Name
1	CIPUNAGARA	1,359.81	20.0%	Sungai Cipunagara
2	K. SEWO	97.12	1.4%	Kali Sewo
3	No name	29.30	0.4%	-
4	No name	23.40	0.3%	Kali Mangsetan
5	No name	37.11	0.5%	K. Ujungwaru
6	No name	22.89	0.3%	Kali Bugel
7	No name	10.91	0.2%	-
8	CILANGAN	206.14	3.0%	Kali Menir/Ci Pancuh
9	CILANANG	326.17	4.8%	Kali Perawan/Ci Lalanang
10	No name	23.98	0.4%	-
11	CIPANAS	391.21	5.8%	Kali Cilet/Kali Cipanas
12	No name	61.99	0.9%	Kali Anyar
13	CIPANAS	343.96	5.1%	Kali Pangkalan
14	CIMANUK	3,635.68	53.6%	Kali Cimanuk/Kali Rambatan
15	No name	88.10	1.3%	Kali Prawirakepolo
16	No name	58.99	0.9%	Kali Gebangsawit, Kali Gabus, Kali Genggong
17	No name	23.23	0.3%	Kali Dutamati
18	No name	44.94	0.7%	Ci Gedang
Total		6,784.91		

出典：JICA 調査団

出典：JICA 調査団

図 95　Indramayu 域に流入する主要河川の流域



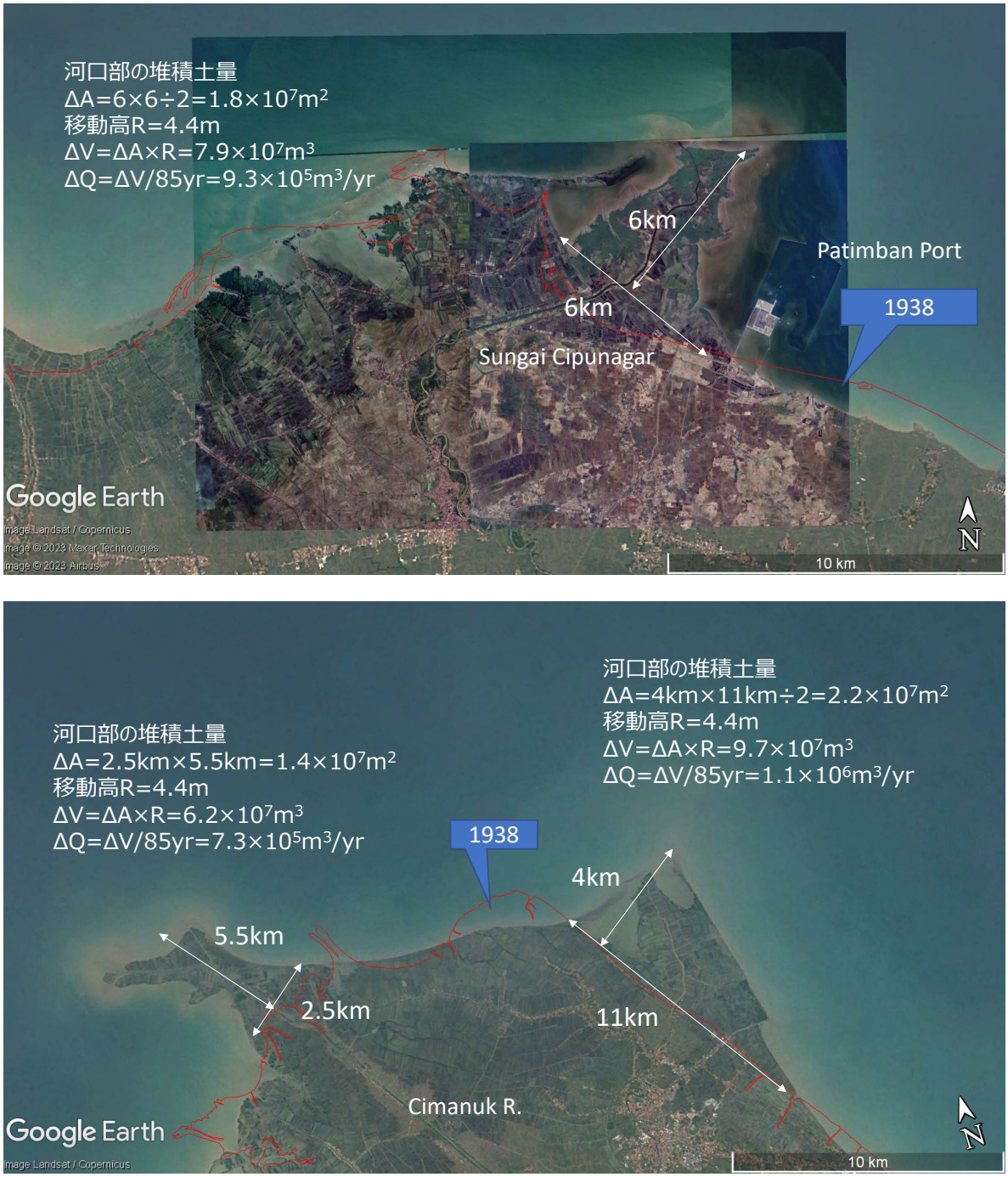
左図：BBWS Cimanul Cisanggarung、右図：JICA 調査団

図 96　Cimanuk 流域のダムの状況

左図：Citarum (SDA), 2019、右図：JICA 調査団

図 97　Cipunagara 流域のダムの状況

Sugai Cipunagar 川河口部および Cimanuk 川では 1938 年～現在に至る約 85 年間で、河口デルタ地形として各々約 7,900 万 m^3、9,700 万+6,700 万=16,400 万 m^3 の土砂が堆積していると推定される。その土砂量から推定すると Sugai Cipunagar 川から約 93 万 m^3/年、Cimanuk 川からは約 190 万 m^3/年の土砂が海域に供給されていたと推定される。



出典：Google Earth をもとに JICA 調査団作成

図 98　河川からの流出土砂量の推定 (上: Sungai Cipunagr 川、下: Cimanuk 川)

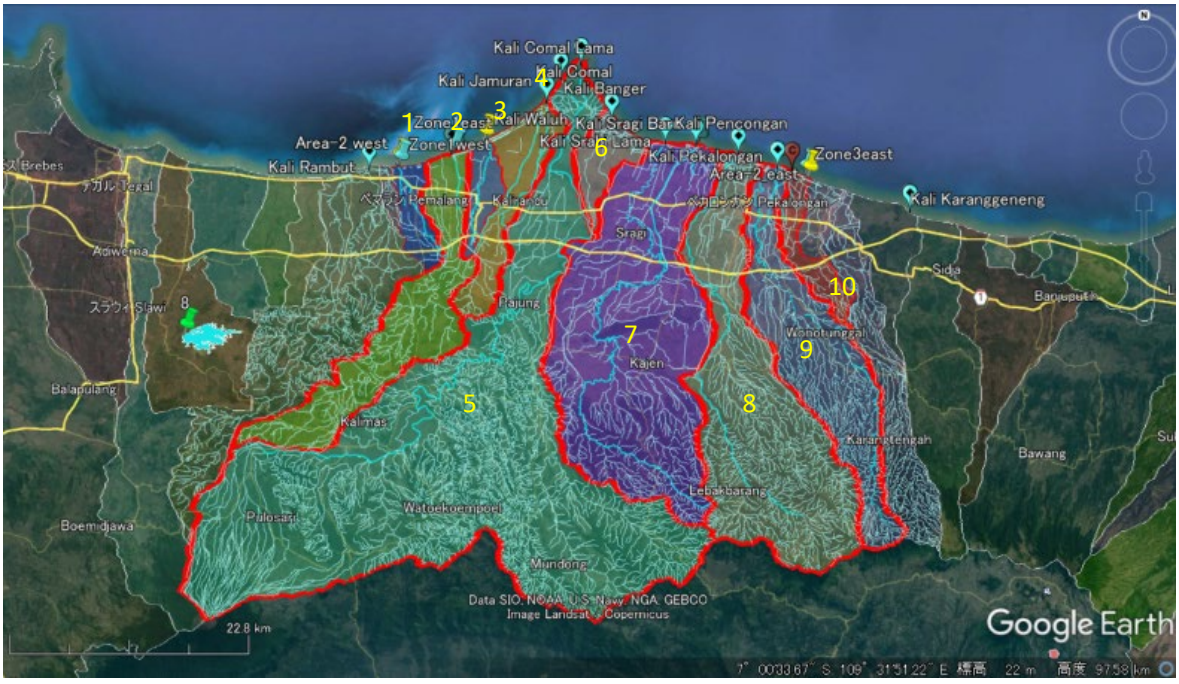
6.5.2 Pemalang-Pekalongan

Pemalang-Pekalongan海岸に流出する河川を表7に整理した。この中で、領域の中央に流出するComar川が流域面積として最も大きく流域全体の約4割を占める。また、そこから東領域のPekalonganに流出するSragi川およびSengkarang川も流域面積で約15～20％占めており、Pekalongan沿岸域への土砂供給源となっている。

表7 Pemalng-Pekalongan域に流出する主要河川一覧

No.	River Basin Name	Area (km2)	Ratio of Area	River Name
1	GENTONGAN	27.76	1.3%	Kali Wirasa/Kali Srengsreng
2	WALUH	157.18	7.6%	Kali Elon
3	UNTER	25.90	1.3%	Kali Waluh
4	RANDU	69.55	3.4%	Kali Jamuran/Kali Randu
5	COMAL	821.40	39.7%	Kali Comal/Kali Comal Lama
6	BANGER	37.17	1.8%	Kali Banger
7	SRAGI	401.59	19.4%	Kali Srabi Lama/Kali Sragi Baru
8	SENGKARANG	306.31	14.8%	Kali Pencongan/Kali Sengkarang
9	KUPANG	180.22	8.7%	Kali Pekalongan/Kali Kupang/ Kali Banger
10	SUSUKAN	33.71	1.6%	Kali Susukan
	Total	2,067.79		

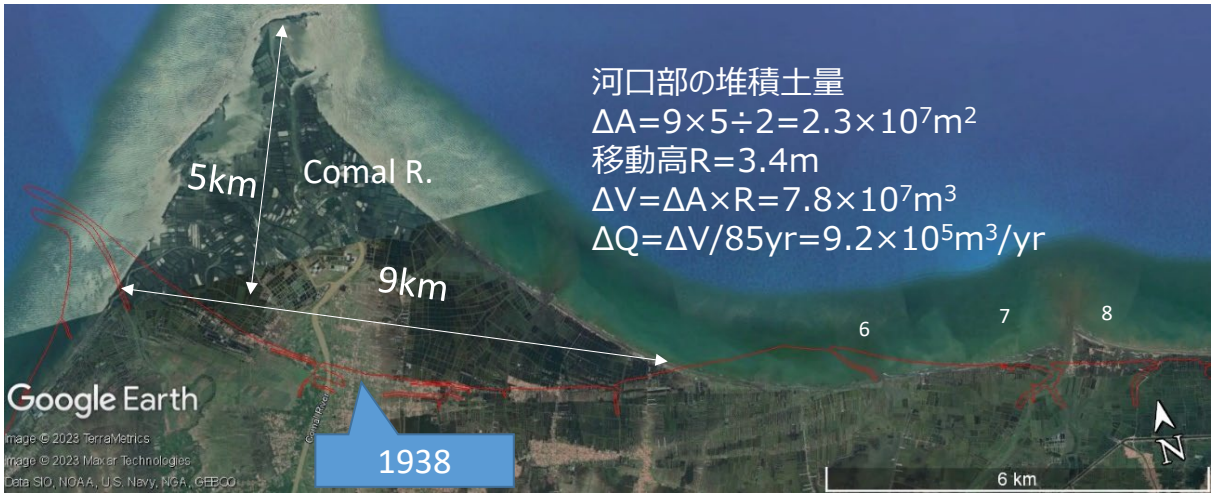
出典：JICA調査団



出典：Google Earthをもとに JICA調査団作成

図99 Pemalang-Pekalongan域に流入する主要河川の流域

Comal 川河口部では 1938 年～現在に至る約 85 年間で、河口デルタ地形として各々約 7,800 万 m^3 の土砂が堆積していると推定される。その土砂量から推定すると Comal 川から約 92 万 m^3/年の土砂が海域に供給されていたと推定される。



出典：Google Earth をもとに JICA 調査団作成

図 100　Comal 川からの流出土砂量の推定

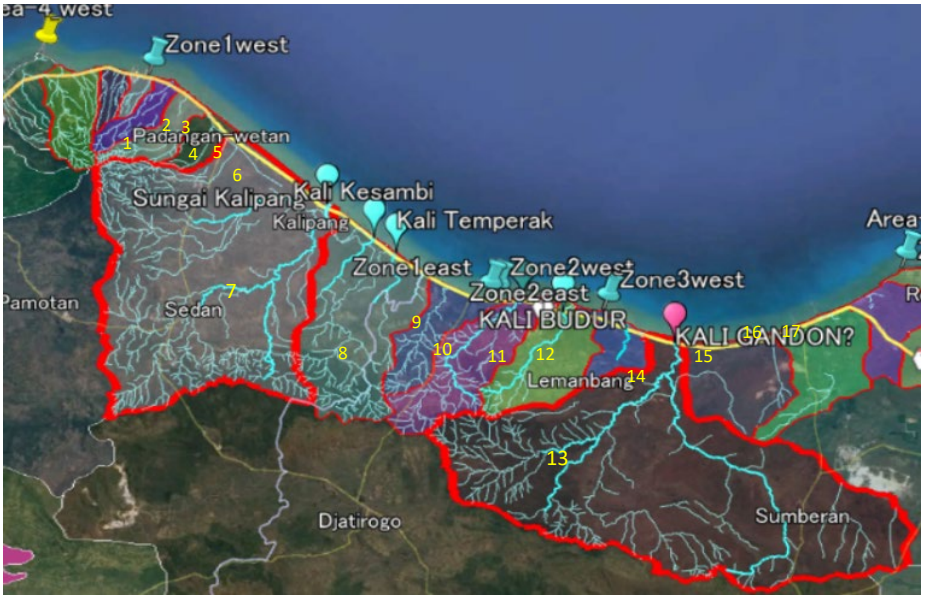
6.5.3 Rembang-Tuban

当該海岸に流出する河川を表 8 に整理した。この中で、領域西側の Rembang に流出する Kesambi 川が流域全体の約 25 %を、また、領域東側の Tuban に流出する Purumpung Klero 川が約 30 %を占めており、両沿岸域への土砂供給源となっている。

表 8　Rembang-Tuban 域に流出する主要河川一覧

No.	River Basin Name	Area (km2)	Ratio of Area	River Name
1	KLADEN	17.16	2.4%	Kali Banu, Kali Dalananyar
2	SRANDUK	5.18	0.7%	Kali Sanduk,Kali Grasak
3	RANDUALAS	3.19	0.4%	Kali Randualas
4	KEPEL	8.84	1.2%	No name
5	KRESAK	11.79	1.6%	Kali Nggempol
6	ANYAR	8.21	1.1%	Kali Glonggong
7	KESAMBI	180.71	24.8%	Kali Kesambi
8	TEMPERAK	63.63	8.7%	Kali Temperak
9	LATSARI	18.84	2.6%	No name
10	BONCONG	33.54	4.6%	Kkali Boncong
11	BUDUR	28.51	3.9%	Kali Budur
12	BANCAR	11.35	1.6%	No name
13	PRUMPUNG KLERO	223.19	30.7%	Kali Gandon
14	DASIN	31.02	4.3%	No name
15	SOCOREJO	28.99	4.0%	No name
16	PURWOREJO	16.95	2.3%	No name
17	MENTOSO	23.57	3.2%	No name
Total		727.88		

出典：JICA 調査団



出典：Google Earth をもとに JICA 調査団作成

図 101　Rembang-Tuban 域に流入する主要河川の流域

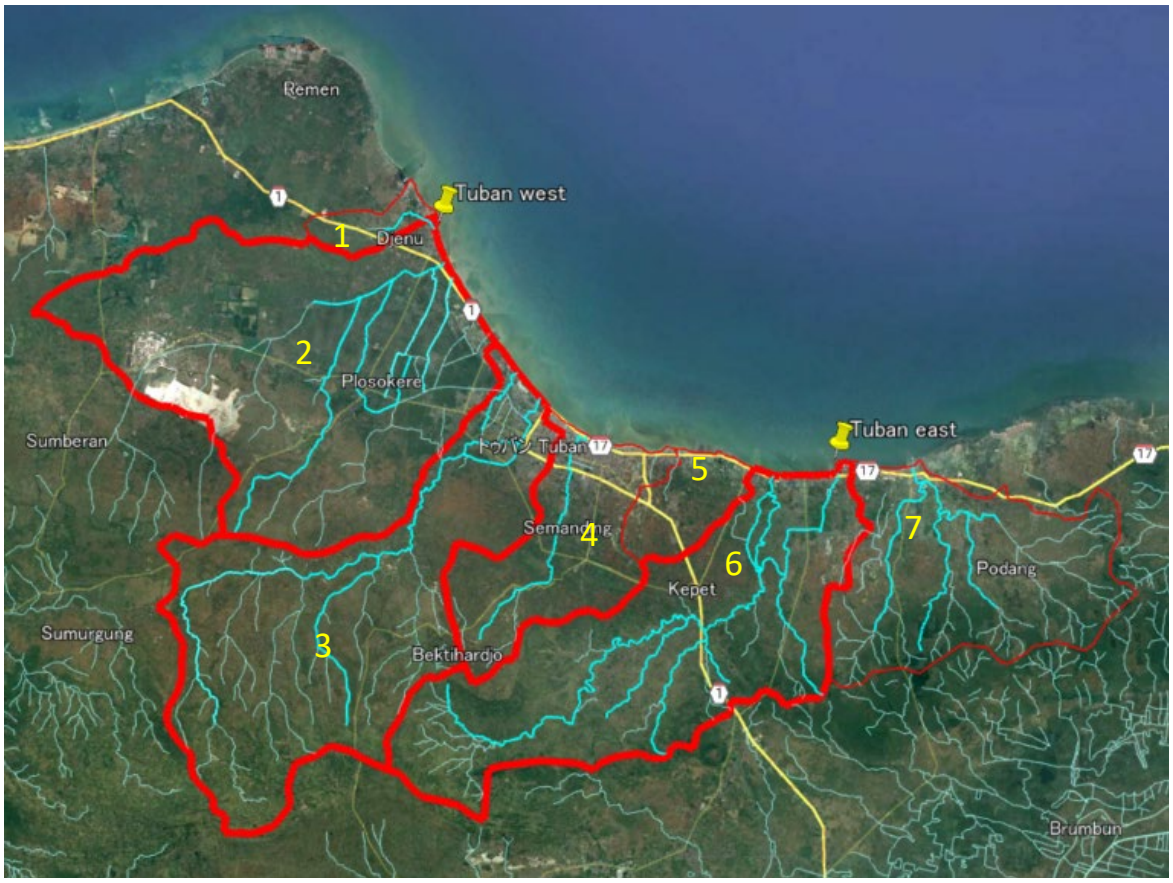
6.5.4 Tuban

当該海岸に流出する河川を表 9 に整理した。この中で、流域面積が 100km^{2}超える流域が 3 流域あるものの、河口部には突出した地形が形成されていないことから、顕著な土砂流出はないものと推定される。なお、いずれの流域にもダムは建設されていない。

表 9　Tuban 域に流出する主要河川一覧

No.	River Basin Name	Area (km2)	River Name	Remark
1	KALIUNTU	5.99	KALI KALIUNTU	BPDAS SOLO
2	LAORSEMUT	125.96	KALI LAORSEMUT,KALI MENENGAN	BPDAS SOLO
3	LENGKONG	108.50	KALI LENGKONG, KALI KELOR	BPDAS SOLO
4	KARANG	38.02	SUNGAI BETO / KALI KARANG	BPDAS SOLO
5	TASIKMADU	12.50	No name	BPDAS SOLO
6	KLERO	102.13	KALI KLERO / KALI KLAREK	BPDAS SOLO
7	LOHGUNG	63.87	KALI WANGUN,KALI CAPER	BPDAS SOLO

出典：JICA 調査団



出典：Google Earth をもとに JICA 調査団作成

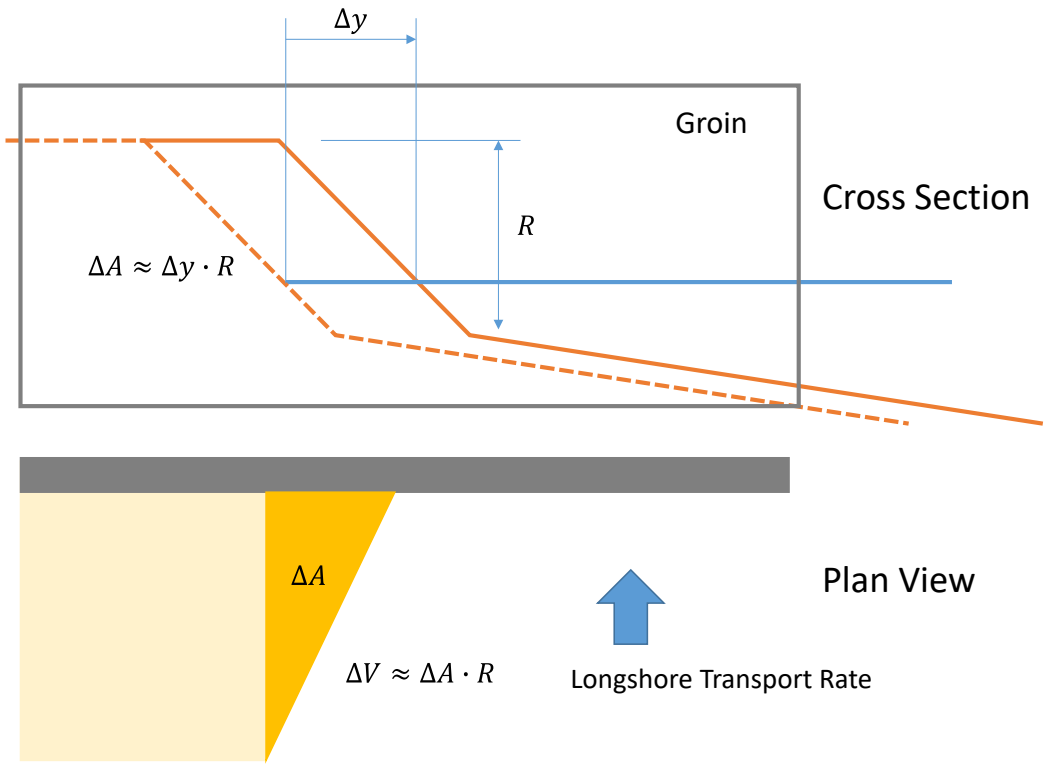
図 102　Tuban 域に流入する主要河川の流域

6.6 構造物周辺の地形変化から見た沿岸漂砂特性

先に整理した汀線変化状況から沿岸漂砂の卓越方向と沿岸漂砂量を推定した。

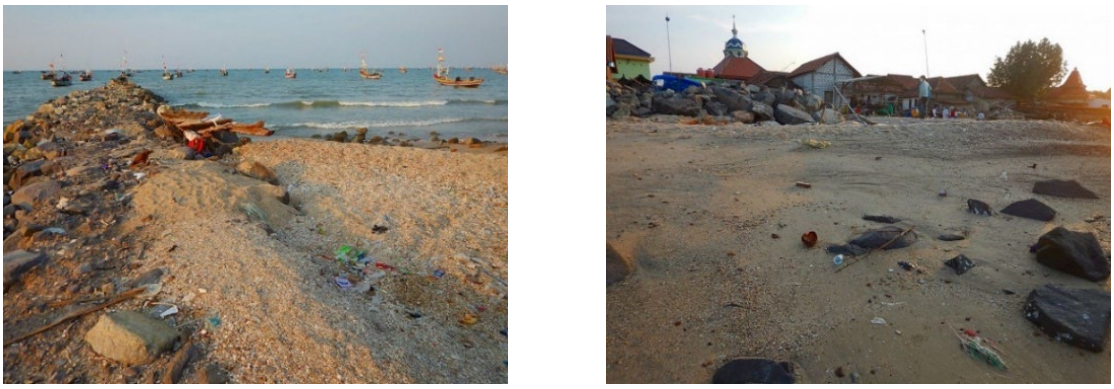
6.6.1 Rembang

当沿岸域には多数の突堤が設置されており、その周辺の汀線変化は東側が汀線の前進、西側が汀線の後退が顕著であることがわかる。したがって、当該海岸の沿岸漂砂の卓越方向は東から西方向と推定される。この沿岸漂砂量の一部は突堤により捕捉されることから、突堤の沿岸漂砂の上手側では堆積が生じ、その結果汀線が前進する。その前進量から突堤に捕捉された土砂量を推定した。推定方法を図 103 に示す。突堤の上手側で汀線が前進したことで増加した面積を求め、その面積に前浜部の高さをかける。前浜部の高さ R は、水面上はバーム高、水面下は干潮時の汀線付近と仮定すると、対象とした突堤周辺のバーム高は+ 2.0 m 程度（図 104 右からほぼ目線位置がバーム頂部）、干潮時は – 0.5 m 程度（Rembang の干満差約 1.0 m）であることから、R= 2.5 m とした。通常は移動高 (Rembang では 3.5 m 程度と推定) を用いるが、0.5 m より沖については海底勾配が 1/80 程度と緩いこと、また突堤先端水深も−2 m 程度と浅いことから、この部分の堆積土量は無視した。



出典：JICA 調査団

図 103　突堤による沿岸漂砂の捕捉量の推定方法



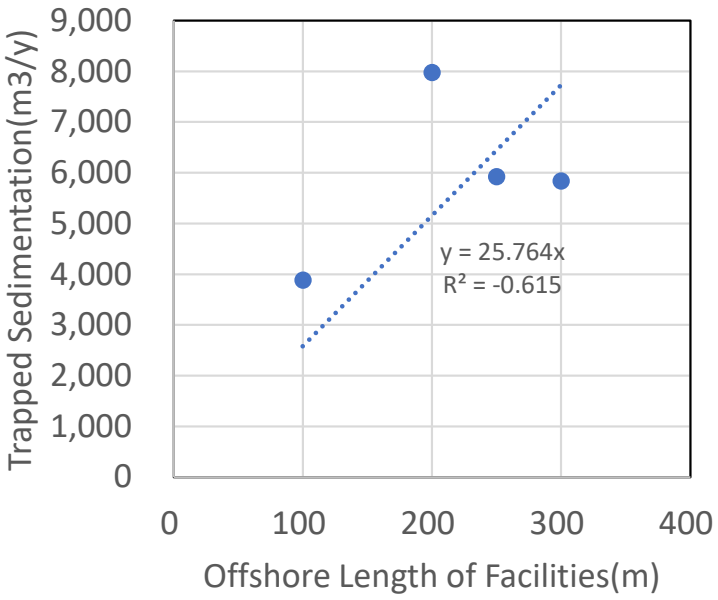
出典：JICA 調査団

図 104　Rembang 突堤基部の砂浜の状況
（左：突堤基部から沖、右：突堤基部汀線から前浜（2022 年 10 月））

表 10　突堤に阻止されて堆積した土砂量

Facilities.	範囲	初期年	比較年	始点	終点	施設長(m)	汀線前進量(m)	変化面積(m2)	平均汀線前進量(m)	堆積厚(m)	変化堆積量(m3)	期間(年)	年間阻止土砂量(m3/y)
Groin_1	西	2013	2022	2,000	2,700	200	140	28,723	41	2.5	71,808	9	7,979
Groin_2	西	2013	2022	7,750	8,100	100	60	13,988	40	2.5	34,970	9	3,886
Groin_3	西	2008	2022	13,750	14,350	250	120	33,181	55	2.5	82,951	14	5,925
Breakwater	西	2008	2022	26,550	27,150	300	100	32,698	54	2.5	81,744	14	5,839

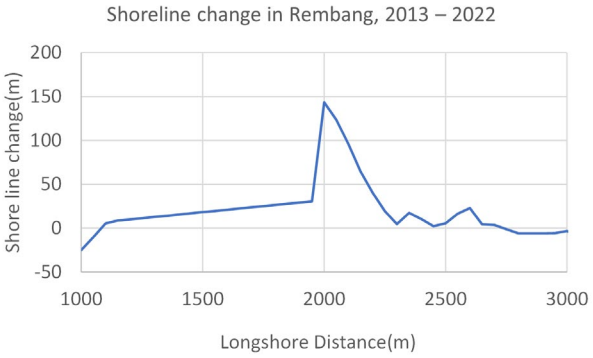
出典：JICA 調査団

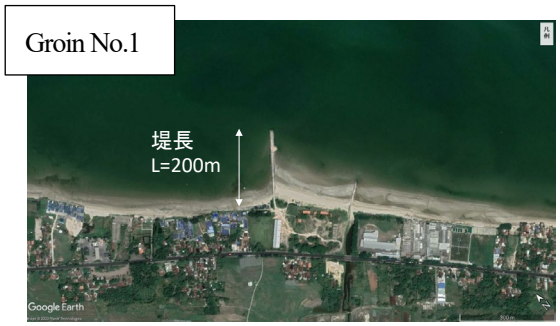


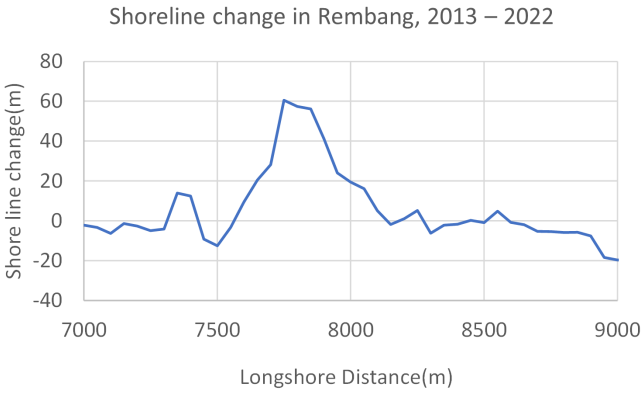
出典：JICA 調査団

図 105　施設延長と捕捉された土砂量の関係

これより、沖方向の堤長 200 ～ 300 m 程度の施設では約 6～8 千 m^3/年程度の土砂量が捕捉されたと推定される。この土砂量は沿岸漂砂量の一部であることから、少なくてもこの土砂量以上の沿岸漂砂量が存在することが推定される。

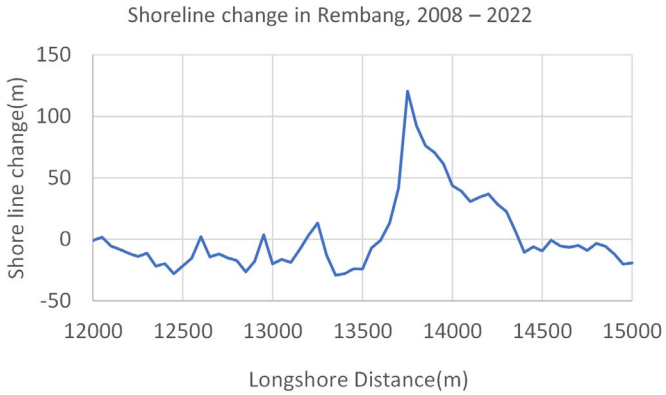


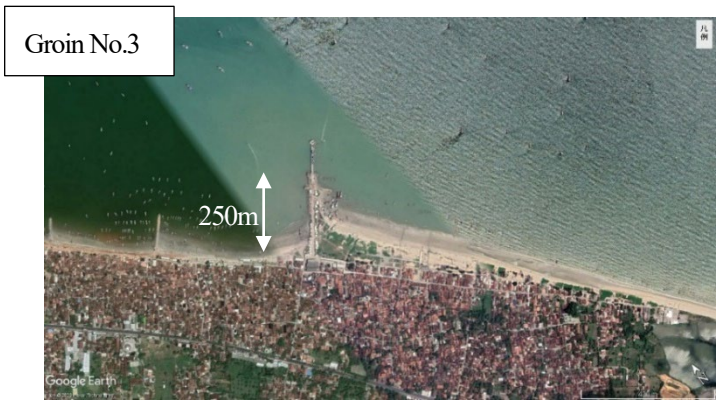


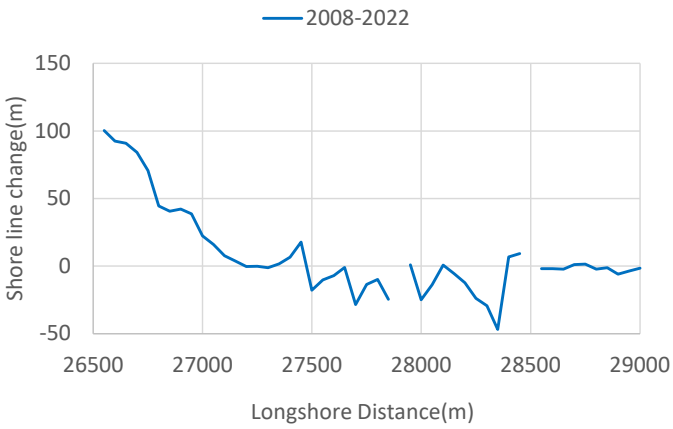


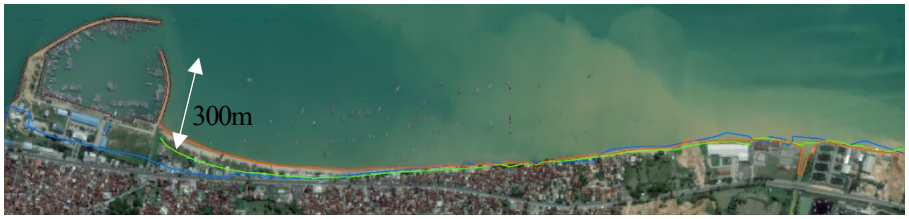
1 段目および 3 段目図：JICA 調査団、2 段目および 4 段目図：Google Earth をもとに JICA 調査団作成

図 106　海岸施設によって捕捉されて生じた汀線変化 (Rembang) (1)







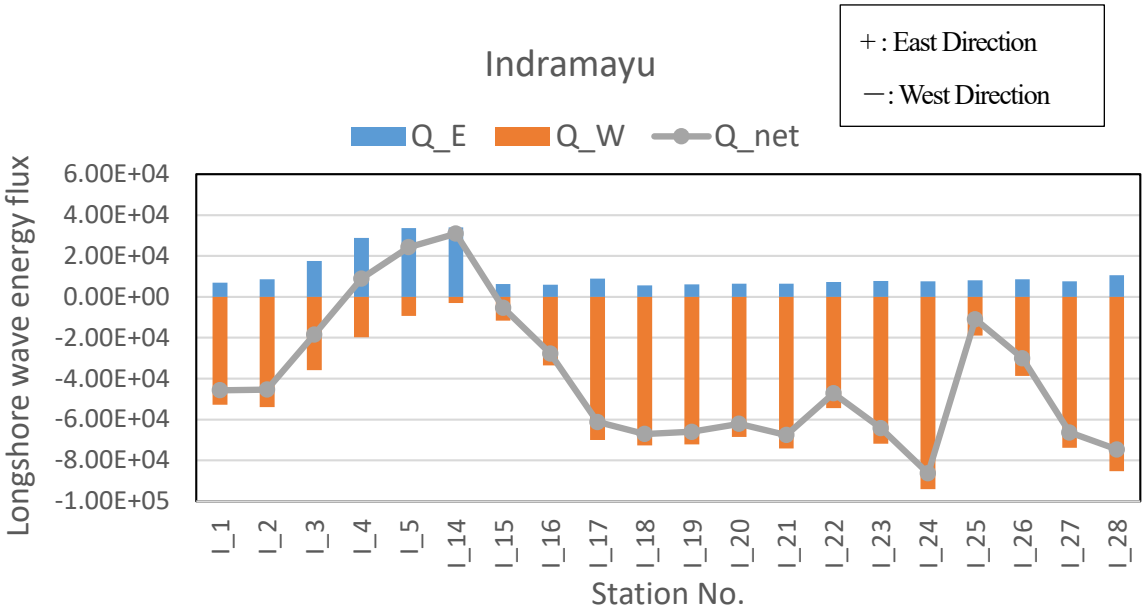


1 段目および 3 段目図：JICA 調査団、2 段目および 4 段目図：Google Earth をもとに JICA 調査団作成

図 107　海岸施設によって捕捉されて生じた汀線変化 (Rembang) (2)

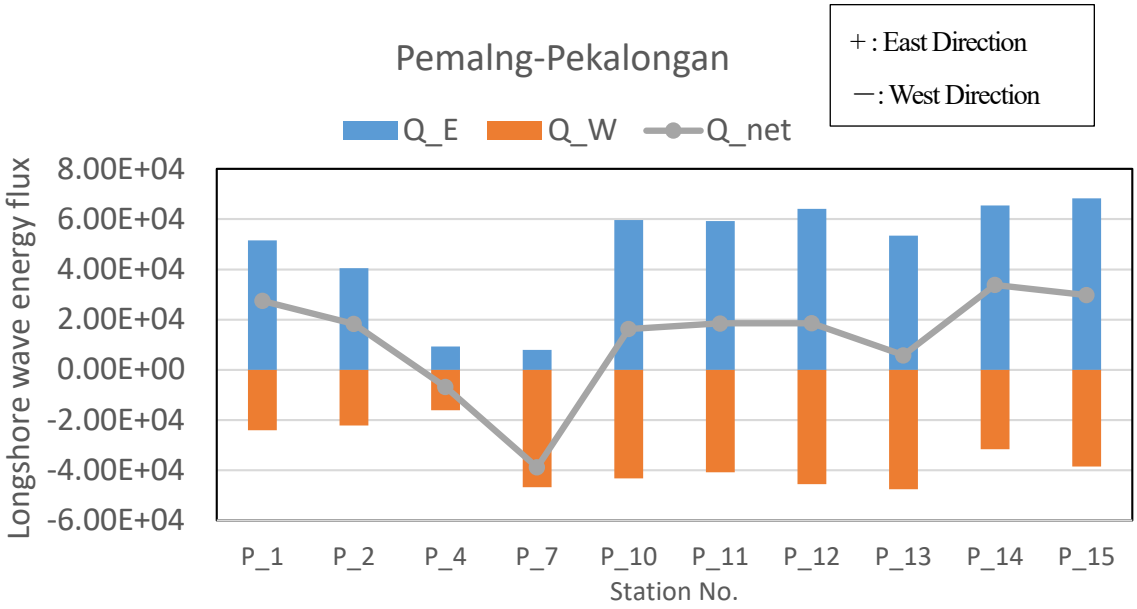
6.7 波浪特性から見た沿岸漂砂卓越方向

ERA5 の推算波浪データとエネルギー平衡方程式での波浪変形計算から、各沿岸域での沿岸漂砂の卓越方向を推定した。Indramayu、Pemalang-Pekalongan、Rembang-Tuban および Tuban 沿岸の沿岸漂砂量分布を図 108、図 109、図 110 および図 111 に各々示す。計算では、東向き (Q_E) と西向き (Q_W) の両方向の沿岸漂砂を求め、両者を合成したものを (Q_net) として示している。



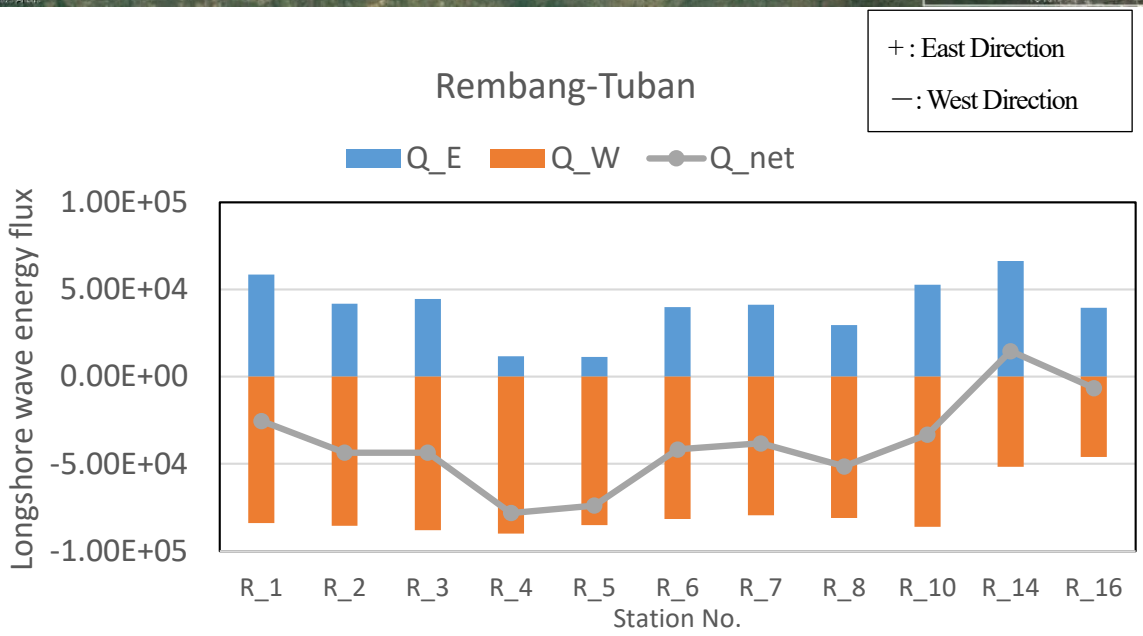
上図：Google Earth をもとに JICA 調査団作成、下図：JICA 調査団

図 108 Indramayu における沿岸漂砂特性



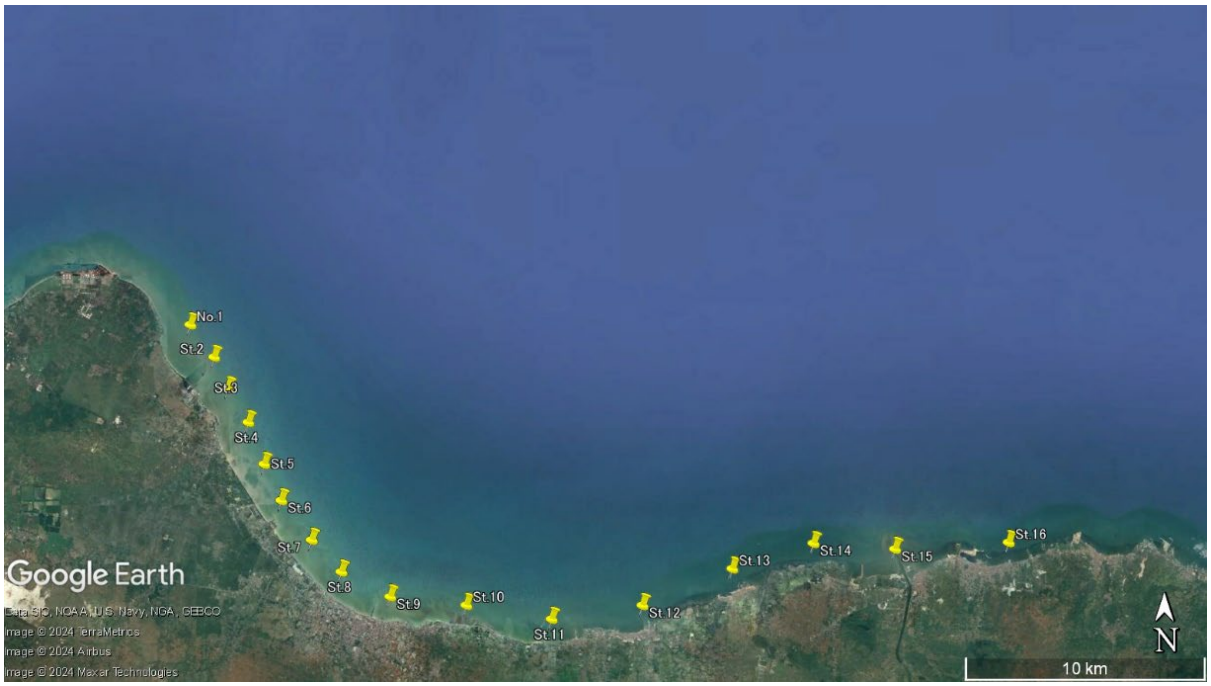
上図：Google Earth をもとに JICA 調査団作成、下図：JICA 調査団

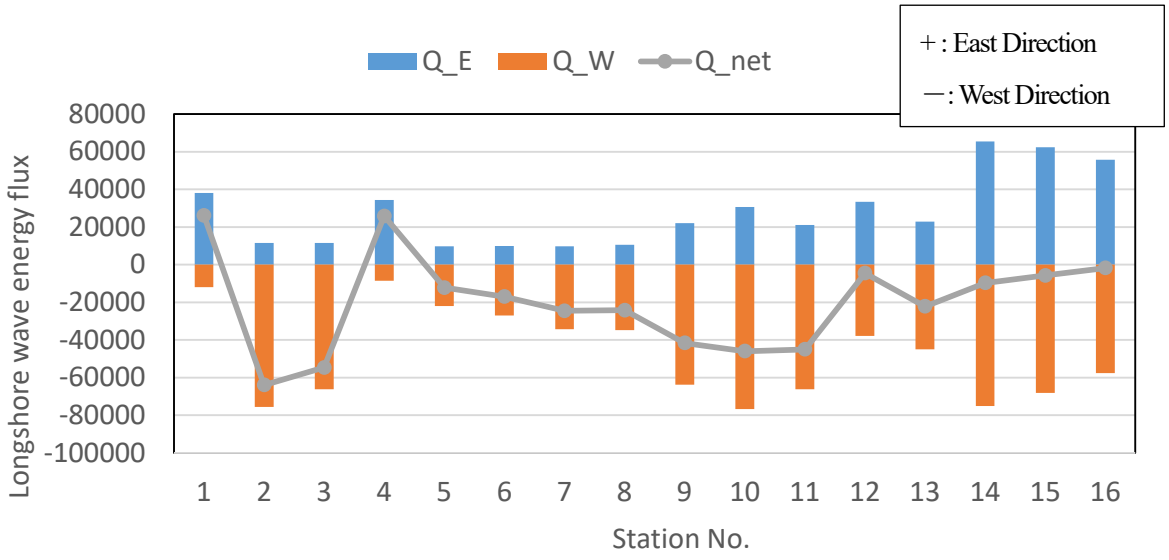
図 109　Pemalang-Pekalongan における沿岸漂砂特性



上図：Google Earth をもとに JICA 調査団作成、下図：JICA 調査団

図 110　Rembang-Tuban における沿岸漂砂特性





上図：Google Earth をもとに JICA 調査団作成、下図：JICA 調査団

図 111　Tuban における沿岸漂砂特性

6.8 浸水特性

対象沿岸域の浸水リスクを評価するため、地盤標高と設定した水位条件のもと、背後域の浸水域を把握した。なお、ここで示す浸水域は②計算方法で示すように、海域の海水が内陸に浸水していく過程を追跡して浸水域を求めるものでなく、あくまでも設定した水位よりも内陸の地盤標高が低い地域を浸水するリスクの高い範囲として計算したものである。

6.8.1 浸水要因

実現象は、高潮等で海面水位が上昇しさらにそこに高波が来襲した場合に想定され、以下の２現象が個々に、あるいは同時に生起して生じる現象である。

A) 海面水位が上昇し陸域に浸水

B) 高波による越波により陸域が浸水

海面水位が上昇する要因としては、以下が想定される。

① 天文潮による高潮位（年最大潮位）

② 低気圧による気圧差、風の吹き寄せ等による水位上昇

③ 波浪による水位上昇（Wave Set-up）

④ 気候変動による海面上昇

⑤ 地盤沈下による相対的な海面上昇

ここでは、A) に対して②を除く要因による海面上昇に対して、評価することとする。

6.8.2 浸水計算方法

設定した海面水位のもと、背後地の地盤標高との比較から浸水域を設定する「レベル湛水法」を用いて、以下の条件で算定する。

- 浸水経路

海岸付近の標高が高くても、その背後が設定した水位よりも低い場合は、浸水リスクがあるものとして評価する。特に侵食域においては、侵食により高い標高部分が欠損するリスクがあり、標高に低い背後地への浸水リスクは高まると想定される。

- 評価対象の背後の範囲

汀線から背後 1 km までの範囲で評価する。

- 浸水面積の算定

設定した基線に対して沿岸方向 50 m 単位で、その背後域の浸水面積を求めることで、沿岸方向の浸水範囲の分布を把握した。

6.8.3 水位上昇要因の設定方法

①天文潮による高潮位

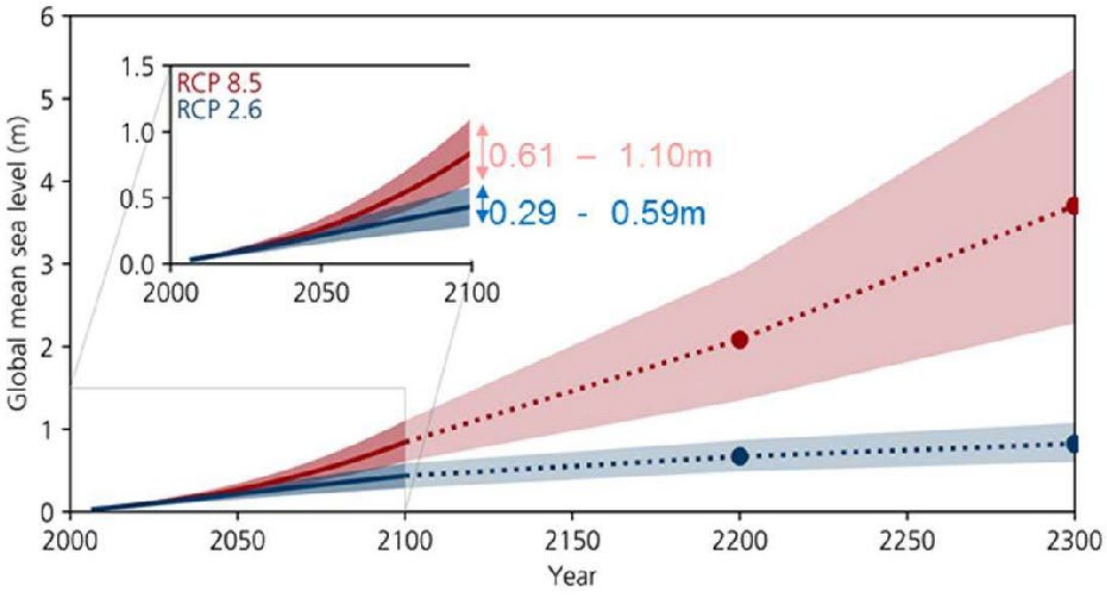
当該地域の年最大潮位条件とする。

②波浪による水位上昇（Wave Set-up）

合田の方法[1]による。波高は 50 年確率波に対する各地点の換算沖波波高を採用する。海底勾配は、高潮位時の砕波点から陸側の海浜勾配とすると、波高が 1～1.5 m 程度であることから、現在の汀線付近で砕波すると想定されることから 1/10 とする。

③気候変動による海面上昇

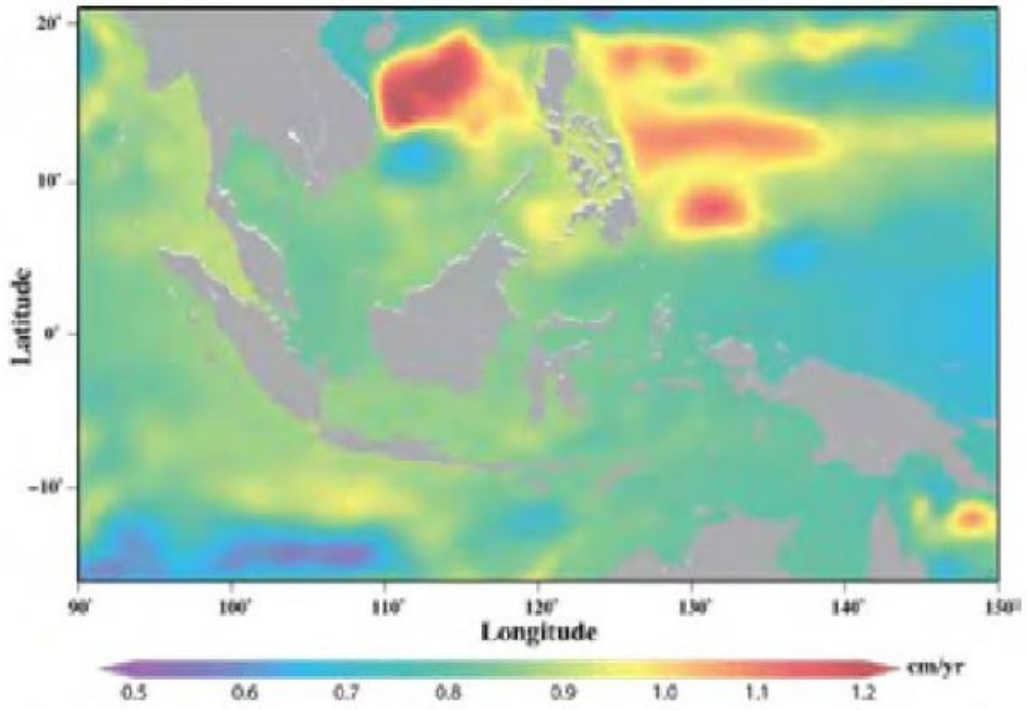
IPCC から出された海洋・雪氷圏特別報告書 (SROCC,2019) では図 112 に示す海面上昇量が予測されている。それらから、RCP2.6 のシナリオでの 21 世紀末の世界平均の海面上昇量である 0.29～0.59 m≒0.4 m とする。なお、Third National Communication (2017) によると RCP4.5 に基づくジャワ海周辺海域の海面上昇率は 0.8～0.9cm/年と予測されている (図 113) 。この速度での 21 世紀末の海面上昇量は約 0.8 m と、RCP2.6 の約 2 倍となる。



出典：IPCC SROCC（2019）

図 112 IPCC SROCC による海面上昇

[1] 合田（2008）、耐波工学―港湾・海岸構造物の耐波設計、鹿島出版会



出典：Third National Communication (2017)

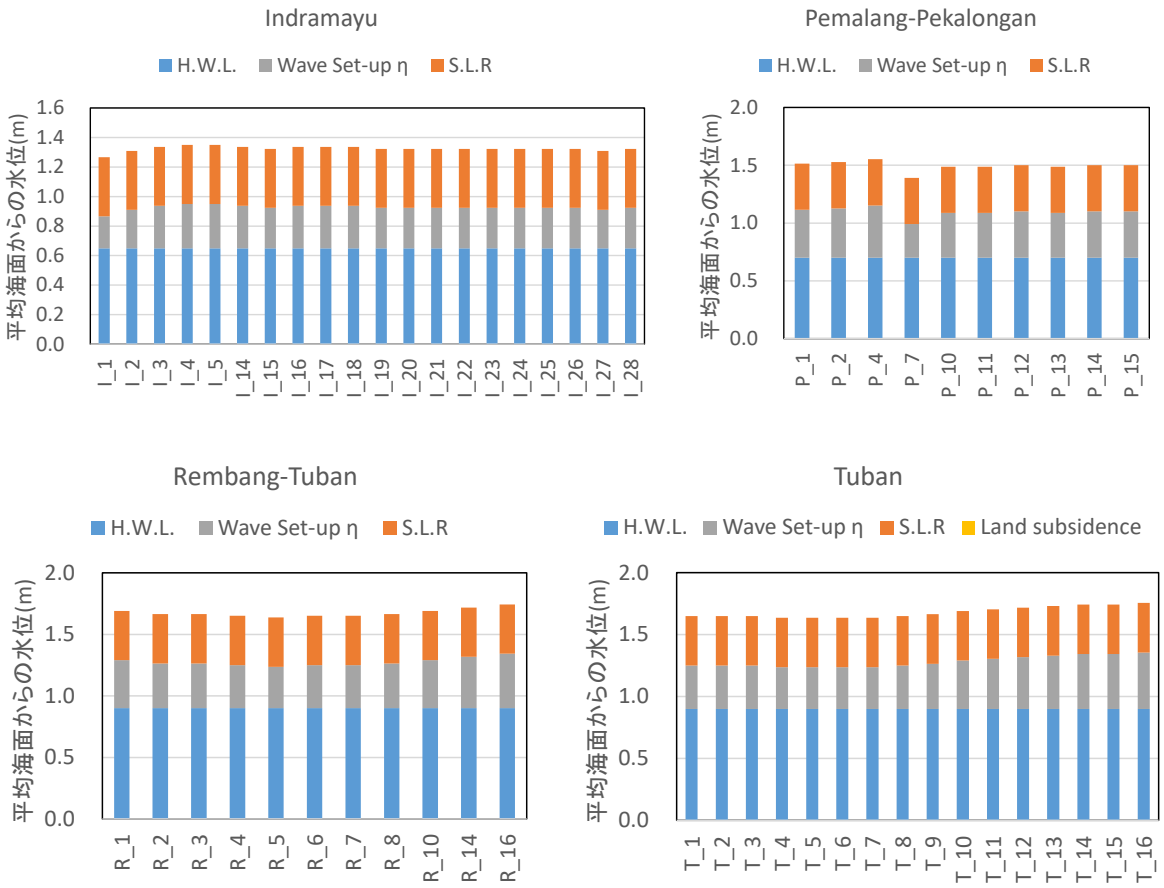
図 113　RCP4.5 に基づく 2006～2040 年の海面上昇率

④地盤沈下による相対的な海面上昇

各沿岸で現在生じている地盤沈下速度から 50 年後の沈下量とする。既往資料より、対象沿岸で地盤沈下を考慮すべき海岸は Pemalang-Pekalongan のうち Pekalongan のみとし、その速度は 7 cm/年とする。ただし、この値を用いると 50 年後には 3.5 m となり過大ともとられる。

6.8.4 水位上昇量

先に示した水位上昇の要因のうち、地盤沈下は地域性の高いものであること、また今後の地盤沈下速度に不確定な要素が多いことなどから、ここでは地盤沈下を除いた要因 (H.W.L:年最大潮位、Wave Set-up η:波による水位上昇量、S.L.R:気候変動による海面上昇量) で水位を算定した。図 115 に各沿岸域の平均海面からの水位を示す。なお、沿岸方向の Station No.は波浪特性で示した前出図 28～図 30 と同じである。



出典：JICA 調査団

図 114 水位条件

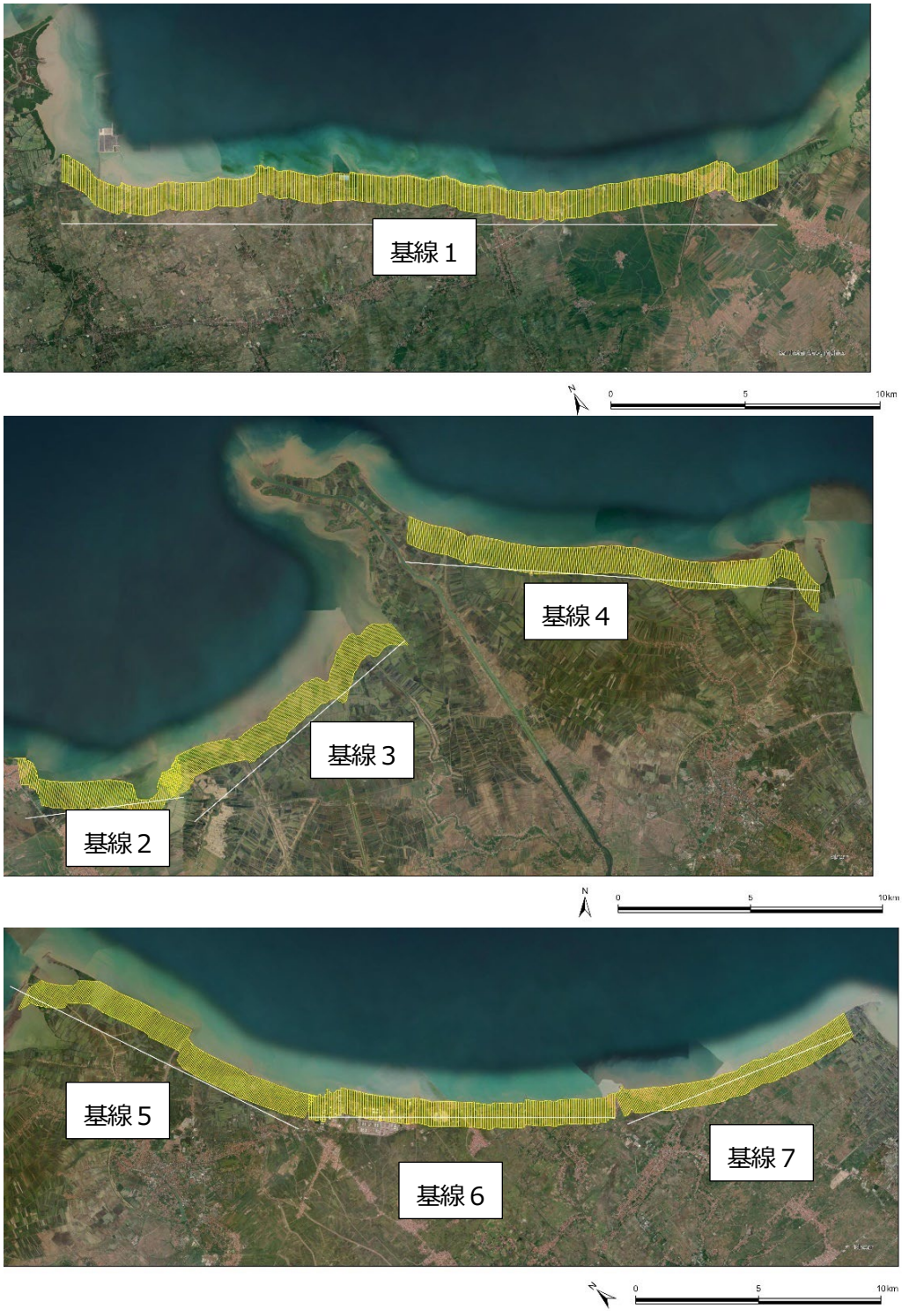
表 11　水位条件整理結果

Coast	Staion.No.	H.W.L.	S.L.R	$H_{1/3}$_50	Tm_50	H'0/L0	Tan θ	η /H0	Wave Set-up η	Land subsidence		D.W.L			浸水計算時
		(m)	(m)	(m)	(s)				(m)	m/yr※	m/50yr	with L.S	without L.S.	without L.S.and SLR	潮位
Indramayu	I_1	0.65	0.40	1.10	5.80	0.0210	0.10	0.197	0.22	0.00	0.00	1.27	1.27	0.87	1.00
	I_2	0.65	0.40	1.40	5.80	0.0267	0.10	0.185	0.26	0.00	0.00	1.31	1.31	0.91	
	I_3	0.65	0.40	1.60	5.80	0.0305	0.10	0.179	0.29	0.00	0.00	1.34	1.34	0.94	
	I_4	0.65	0.40	1.70	5.80	0.0324	0.10	0.177	0.30	0.00	0.00	1.35	1.35	0.95	
	I_5	0.65	0.40	1.70	5.80	0.0324	0.10	0.177	0.30	0.00	0.00	1.35	1.35	0.95	
	I_14	0.65	0.40	1.60	5.80	0.0305	0.10	0.179	0.29	0.00	0.00	1.34	1.34	0.94	
	I_15	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_16	0.65	0.40	1.60	5.80	0.0305	0.10	0.179	0.29	0.00	0.00	1.34	1.34	0.94	
	I_17	0.65	0.40	1.60	5.80	0.0305	0.10	0.179	0.29	0.00	0.00	1.34	1.34	0.94	
	I_18	0.65	0.40	1.60	5.80	0.0305	0.10	0.179	0.29	0.00	0.00	1.34	1.34	0.94	
	I_19	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_20	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_21	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_22	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_23	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_24	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_25	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_26	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
	I_27	0.65	0.40	1.40	5.80	0.0267	0.10	0.185	0.26	0.00	0.00	1.31	1.31	0.91	
	I_28	0.65	0.40	1.50	5.80	0.0286	0.10	0.182	0.27	0.00	0.00	1.32	1.32	0.92	
Pemalan-Pekalongan	P_1	0.70	0.40	2.40	6.60	0.0353	0.10	0.173	0.41	0.00	0.00	1.51	1.51	1.11	1.20
	P_2	0.70	0.40	2.50	6.60	0.0368	0.10	0.171	0.43	0.00	0.00	1.53	1.53	1.13	
	P_4	0.70	0.40	2.70	6.60	0.0397	0.10	0.168	0.45	0.00	0.00	1.55	1.55	1.15	
	P_7	0.70	0.40	1.50	6.60	0.0221	0.10	0.195	0.29	0.00	0.00	1.39	1.39	0.99	
	P_10	0.70	0.40	2.20	6.60	0.0324	0.10	0.177	0.39	0.07	3.50	4.99	1.49	1.09	
	P_11	0.70	0.40	2.20	6.60	0.0324	0.10	0.177	0.39	0.07	3.50	4.99	1.49	1.09	
	P_12	0.70	0.40	2.30	6.60	0.0338	0.10	0.175	0.40	0.07	3.50	5.00	1.50	1.10	
	P_13	0.70	0.40	2.20	6.60	0.0324	0.10	0.177	0.39	0.07	3.50	4.99	1.49	1.09	
	P_14	0.70	0.40	2.30	6.60	0.0338	0.10	0.175	0.40	0.07	3.50	5.00	1.50	1.10	
	P_15	0.70	0.40	2.30	6.60	0.0338	0.10	0.175	0.40	0.07	3.50	5.00	1.50	1.10	
Rembang-Tuban	R_1	0.90	0.40	2.20	6.70	0.0314	0.10	0.178	0.39	0.00	0.00	1.69	1.69	1.29	1.30
	R_2	0.90	0.40	2.00	6.70	0.0286	0.10	0.182	0.36	0.00	0.00	1.66	1.66	1.26	
	R_3	0.90	0.40	2.00	6.70	0.0286	0.10	0.182	0.36	0.00	0.00	1.66	1.66	1.26	
	R_4	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	R_5	0.90	0.40	1.80	6.70	0.0257	0.10	0.187	0.34	0.00	0.00	1.64	1.64	1.24	
	R_6	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	R_7	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	R_8	0.90	0.40	2.00	6.70	0.0286	0.10	0.182	0.36	0.00	0.00	1.66	1.66	1.26	
	R_10	0.90	0.40	2.20	6.70	0.0314	0.10	0.178	0.39	0.00	0.00	1.69	1.69	1.29	
	R_14	0.90	0.40	2.40	6.70	0.0343	0.10	0.174	0.42	0.00	0.00	1.72	1.72	1.32	1.40
	R_16	0.90	0.40	2.60	6.70	0.0371	0.10	0.170	0.44	0.00	0.00	1.74	1.74	1.34	
Tuban	T_1	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	1.30
	T_2	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	T_3	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	T_4	0.90	0.40	1.80	6.70	0.0257	0.10	0.187	0.34	0.00	0.00	1.64	1.64	1.24	
	T_5	0.90	0.40	1.80	6.70	0.0257	0.10	0.187	0.34	0.00	0.00	1.64	1.64	1.24	
	T_6	0.90	0.40	1.80	6.70	0.0257	0.10	0.187	0.34	0.00	0.00	1.64	1.64	1.24	
	T_7	0.90	0.40	1.80	6.70	0.0257	0.10	0.187	0.34	0.00	0.00	1.64	1.64	1.24	
	T_8	0.90	0.40	1.90	6.70	0.0271	0.10	0.185	0.35	0.00	0.00	1.65	1.65	1.25	
	T_9	0.90	0.40	2.00	6.70	0.0286	0.10	0.182	0.36	0.00	0.00	1.66	1.66	1.26	
	T_10	0.90	0.40	2.20	6.70	0.0314	0.10	0.178	0.39	0.00	0.00	1.69	1.69	1.29	
	T_11	0.90	0.40	2.30	6.70	0.0328	0.10	0.176	0.40	0.00	0.00	1.70	1.70	1.30	
	T_12	0.90	0.40	2.40	6.70	0.0343	0.10	0.174	0.42	0.00	0.00	1.72	1.72	1.32	1.40
	T_13	0.90	0.40	2.50	6.70	0.0357	0.10	0.172	0.43	0.00	0.00	1.73	1.73	1.33	
	T_14	0.90	0.40	2.60	6.70	0.0371	0.10	0.170	0.44	0.00	0.00	1.74	1.74	1.34	
	T_15	0.90	0.40	2.60	6.70	0.0371	0.10	0.170	0.44	0.00	0.00	1.74	1.74	1.34	
	T_16	0.90	0.40	2.70	6.70	0.0386	0.10	0.169	0.46	0.00	0.00	1.76	1.76	1.36	

出典：JICA 調査団

6.8.5　浸水域対象範囲

浸水面積を算定する範囲を、汀線変化解析において設定した基軸をもとに、現海岸線から内陸 1 km の範囲とした。その範囲を図 115～図 118 に示す。



出典：Google Earth をもとに JICA 調査団作成

図 115　浸水面積算定範囲　Indramayu

出典：Google Earth をもとに JICA 調査団作成

図 116　浸水面積算定範囲　Pemalang-Pekalongan

出典：Google Earth をもとに JICA 調査団作成

図 117　浸水面積算定範囲　Rembang-Tuban

出典：Google Earth をもとに JICA 調査団作成

図 118　浸水面積算定範囲　Tuban

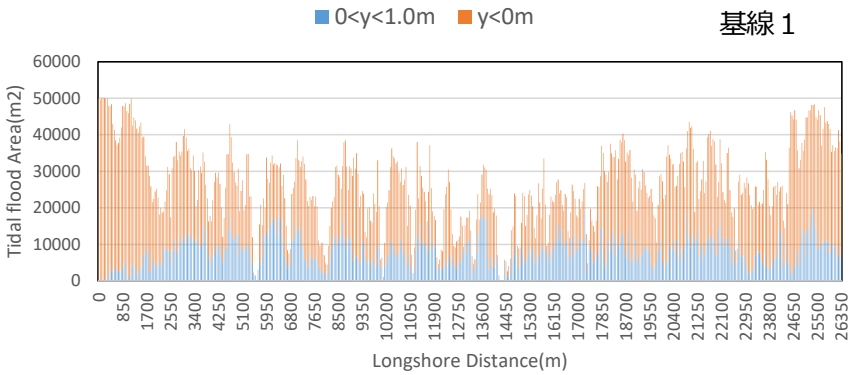
6.8.6 浸水面積

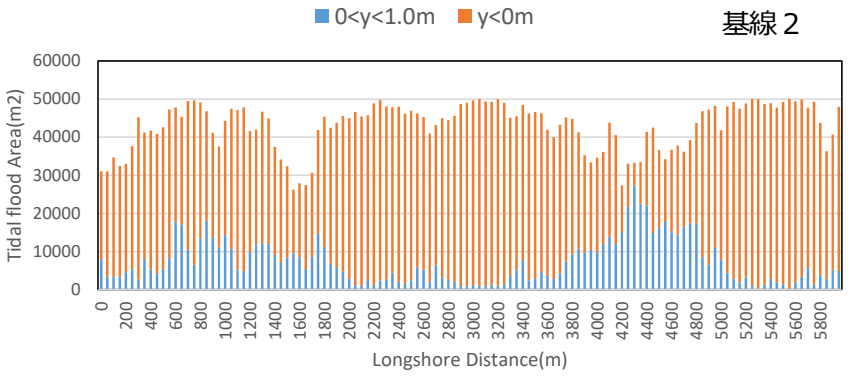
浸水計算は設定した水位のもとで、汀線からその背後 1 km 内での浸水面積を求めた。設定した水位条件は先に検討した水位上昇量から、気候変動による海面上昇量を除いた各沿岸域で沿岸方向の分布から以下の条件を設定した。

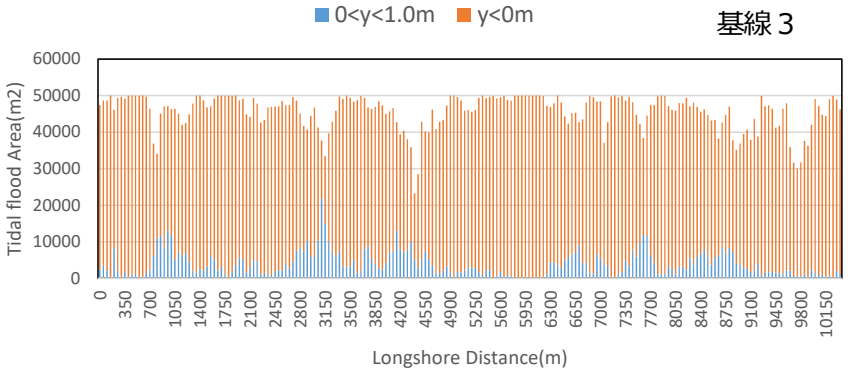
- Indramayu 全基線 ： 1.0 m
- Pemalang-Pekalongan 基線 1 ： 1.2 m、基線 2 ： 1.1 m、基線 3 ： 1.1 m
- Rembang-Tuban 基線 1 ： 1.3 m、基線 2 ： 1.4 m
- Tuban 基線 1 ： 1.3 m、基線 2 ： 1.3 m

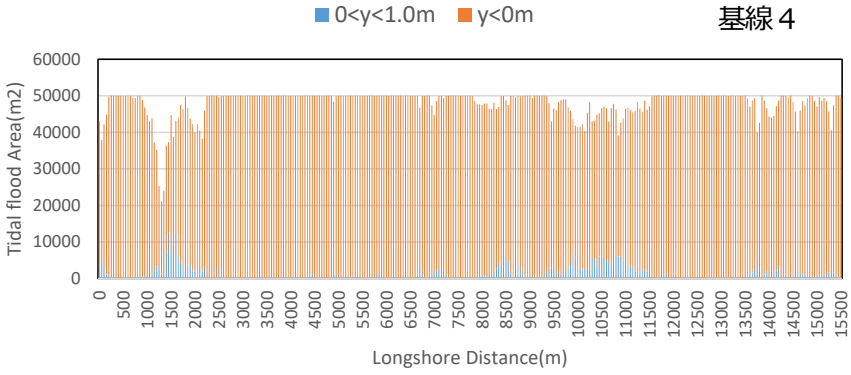
上記の水位条件のもとで求めた浸水面積を各沿岸域、基線毎に図 119～図 123 に示す。背後地盤は 0 m 以下の箇所もあることから、図中には、0 m 以下の面積と 0 m 以上、設定水位以下の面積とを区分して算出している。

Indramayu は基線 1～5 は地盤高 0 m 以下の所が多いことがわかる。Pemalang-Pekalongan も基線 2 では地盤高 0 m 以下が多くを占める。その一方、Rembang-Tuban および Tuban は地盤標高が比較的高いことから 0 m 以下が少なく、また設定した水位以下の面積も他沿岸よりも少ない。



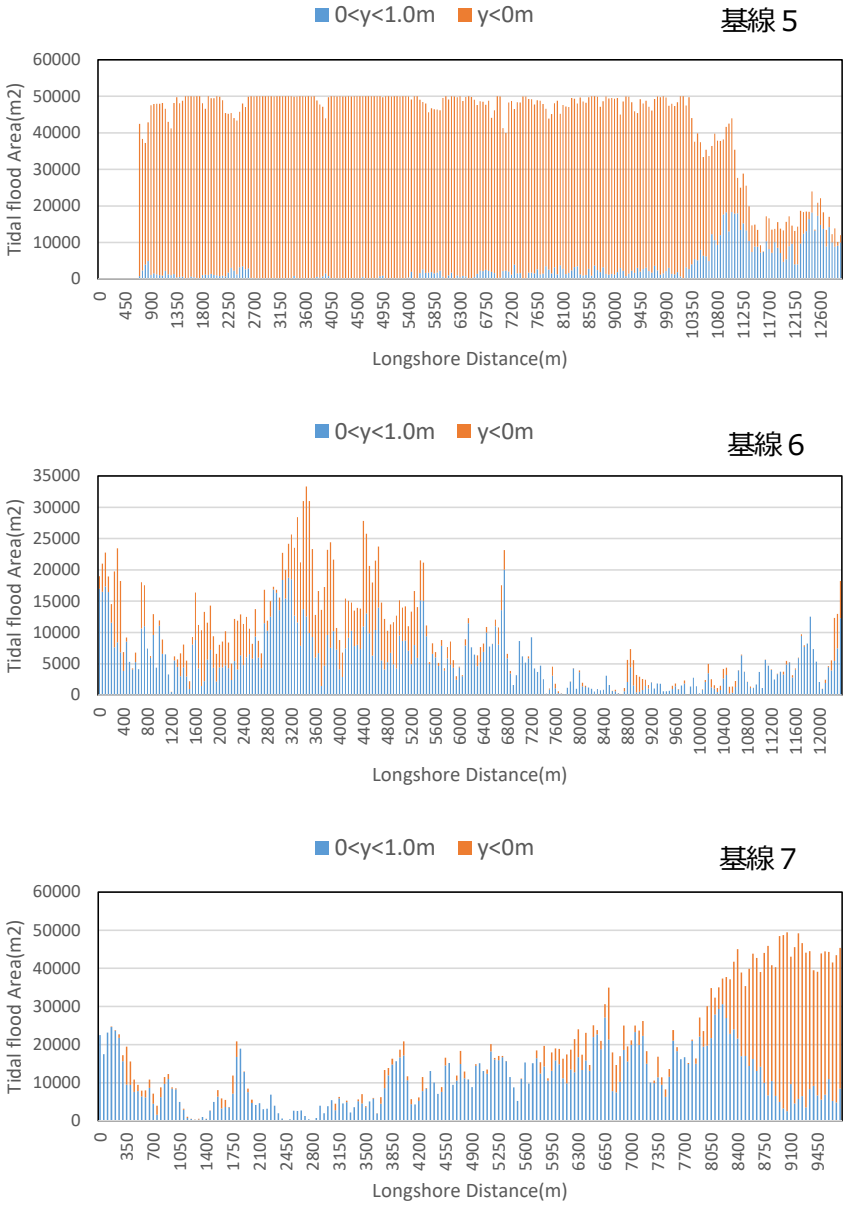






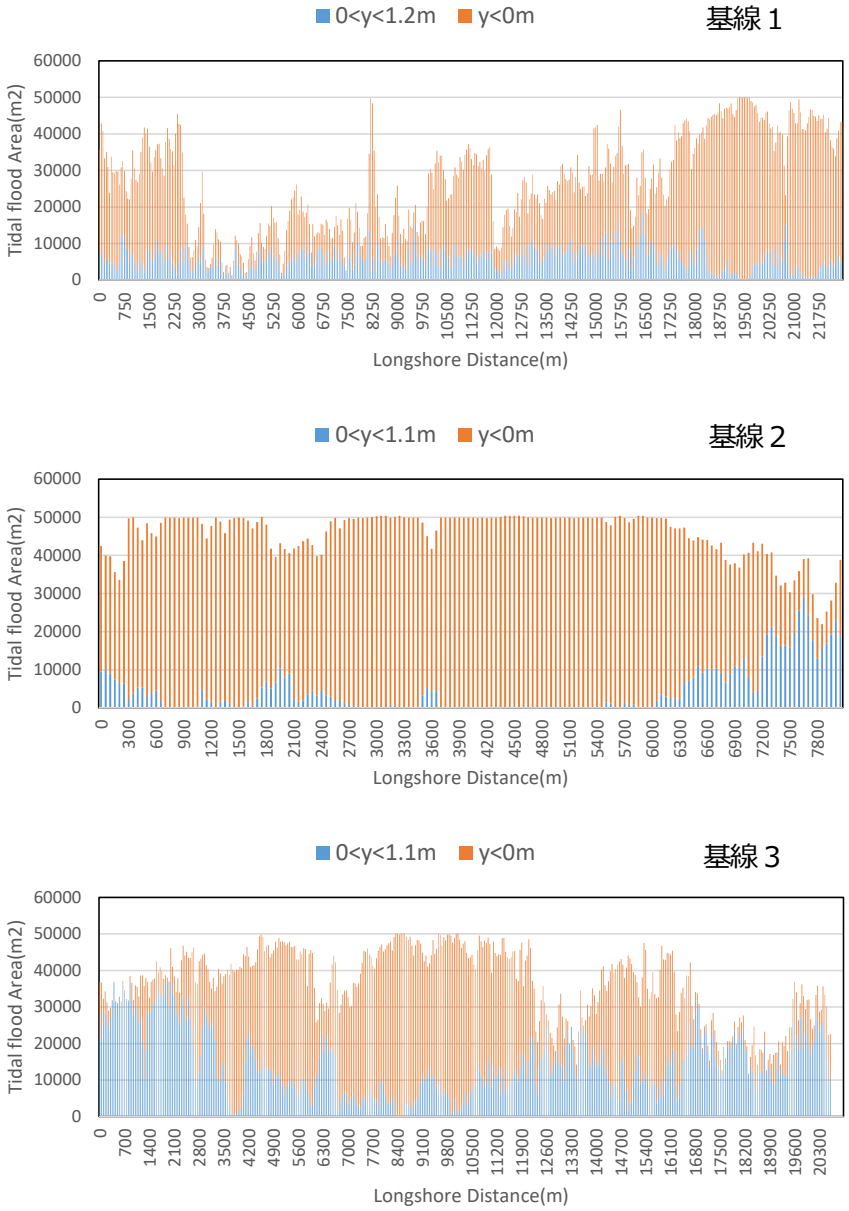
出典：JICA 調査団

図 119　浸水面積　Indramayu (1)



出典：JICA 調査団

図 120　浸水面積　Indramayu (2)



出典：JICA 調査団

図 121　浸水面積　Pemalang-Pekalongan

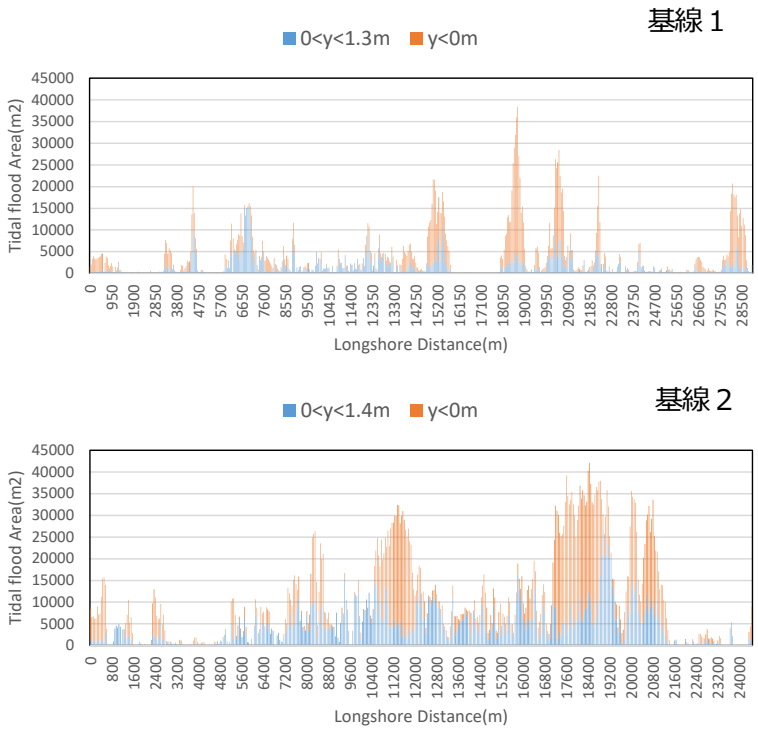
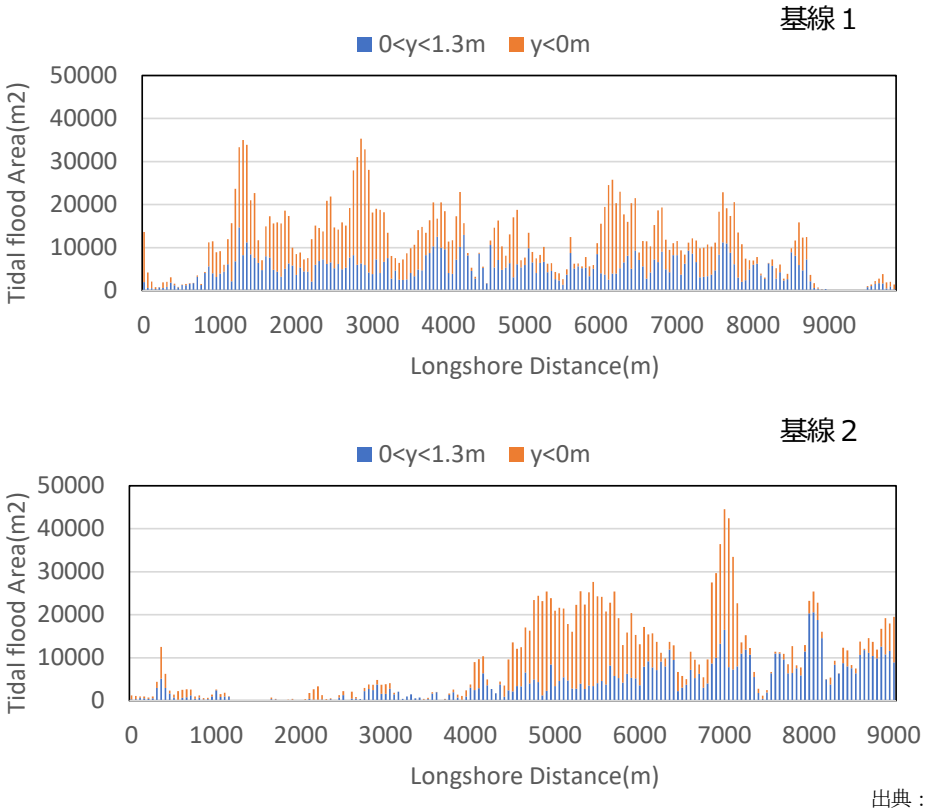


図 122　浸水面積　Rembang-Tuban

出典：JICA 調査団



出典：JICA 調査団

図 123　浸水面積　Tuban

付属資料８
セクション評価図

海岸保全基本方針（案）

海岸保全基本方針の目的

- 「イ」国の人命、資産、国土を保護、保全するため、沿岸開発が今後も進む中で「防護」「利用」「環境」の調和を図りながら、海岸侵食、Tidal Flood、越波、気候変動に伴う海面上昇等の海岸脆弱性に対する海岸管理及び整備の基本方針を定める。
- 対象海岸域は、「イ」国の主要 5 島（Sulawesi, Kalimantan, Java, Papua, Sumatra）＋2 つの主要群島（Maluku Islands and Nusa Tenggara）の海岸域とする。
- 「イ」国における海岸管理ガイドラインとして、海岸整備の実施する主要 3 省庁（PUPR, KKP, KLHK）の大臣が発行する海岸管理基本計画の、基本的な要求事項およびその手順を明確にする。

海岸保全基本計画の位置づけ、用語の定義

(1) 海岸保全区域の定義

- 海岸保全基本計画の対象となる海岸保全区域については、下記のとおり定める。
    a. 海岸保全区域は、基本的には LWL 時の海岸線から 50 m 沖から HWL 時の海岸線から 100 m 陸側までのエリアとして定義される。最終的な海岸保全区域は、海浜の状況、海底勾配やその他を考慮して拡張されることもありうる。

    b. 海岸災害に対する“バッファーゾーン”は 、Presidential Decree (No. 51, 2016) の下で、公共財産として定義される。本海岸保全区域の陸上側では、その範囲と公的地位の整合性を保つことが推奨される。

    c. 州管轄区域として定義される沖合 12 海里の境界は、海岸保全区域としては沖合に遠すぎるため本海岸保全基本計画内では考慮されていない。

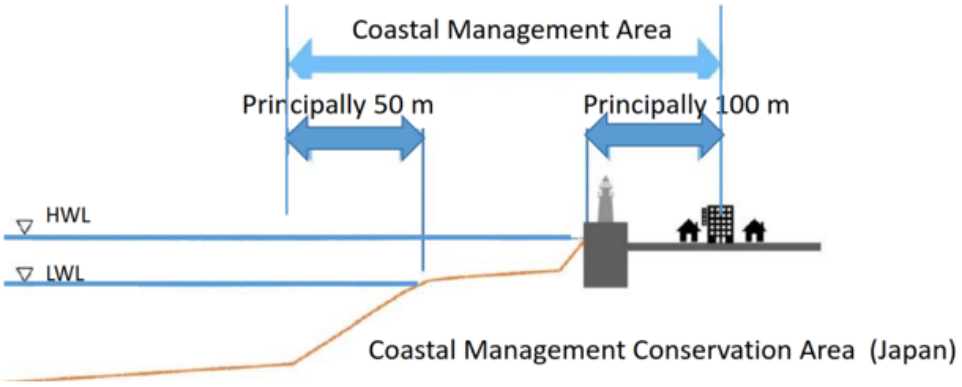


図 1　海岸保全区域の定義

(2) 海岸保全基本計画の位置づけ

- 空間計画 (Rencana Tata Ruang Wilayah, RTRW) と海岸保全基本計画の位置づけおよび目的における違いを明確にするため、下記に記述する。
    a. 空間計画は、既存計画および将来開発計画– 海岸・海洋利用および活動のゾーニングを明確化するものである。
    b. 海岸保全基本計画は、海岸状況、その過程、社会・文化状況、海岸域における将来のインフラの開発の影響を考慮しながら、海岸保全における中長期の目標および海岸域の計画を明確化するものである。

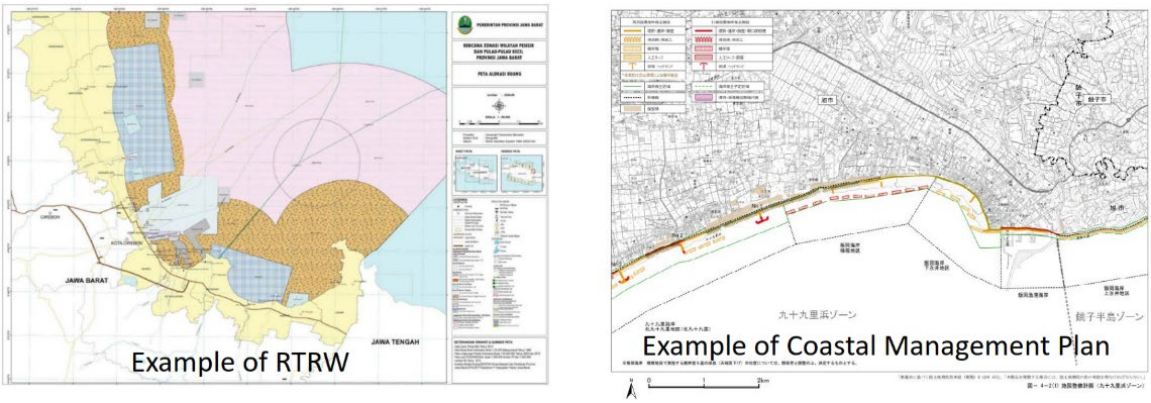


Figure 2.　　海岸保全基本計画と空間計画の違い

(3) 海岸保全施設の定義

- 海岸保全施設は多岐にわたるため、ハード対策（Hard measure）、ソフト対策（Soft measure）、グリーンインフラ（green infrastructure）、グレーインフラ（grey infrastructure）、について、下記に例示する。
    a. ハード/グレー対策として、突堤、護岸、離岸堤、ヘッドランド、消波堤等
    b. ソフト対策として、養浜、サンドリサイクル（サンドバックパス）、サンドバイパス等
    c. グリーン対策として、マングローブ、その他の植林、サンゴ移植等
    d. 上記対策の組み合わせ
    e. 海岸利用を促進するための遊歩道、駐車場、休息所等のその他の公共施設等

(4) 海岸保全基本計画の作成、及び制定に関する関連機関

- 海岸保全基本方針に従って海岸保全基本計画を策定する関係機関を、下記に定めた。
    f. 地方政府の Dinas PU と BAPPEDA が主体となり、PUPR、KPK、および KLHK 等の中央政府の関係機関との連携のもとで、海岸保全基本計画を策定する。
    g. 海岸保全基本計画の策定にあたって、臨時協議会（Ad-Hoc Council）を組織することが推奨される。委員会の構成は、中央省庁から PUPR、KKP、および KLHK 等の主要省庁、地方政府から Dinas PU、BAPPEDA とその他の関連機関、および海岸工学や海岸管理の専門家等とすることを推奨する。
    h. 空間計画と同様に、各州の知事は海岸保全基本計画を発行し、情報の統合のため中央政府（ATR によって管理される）に提出することが求められる。

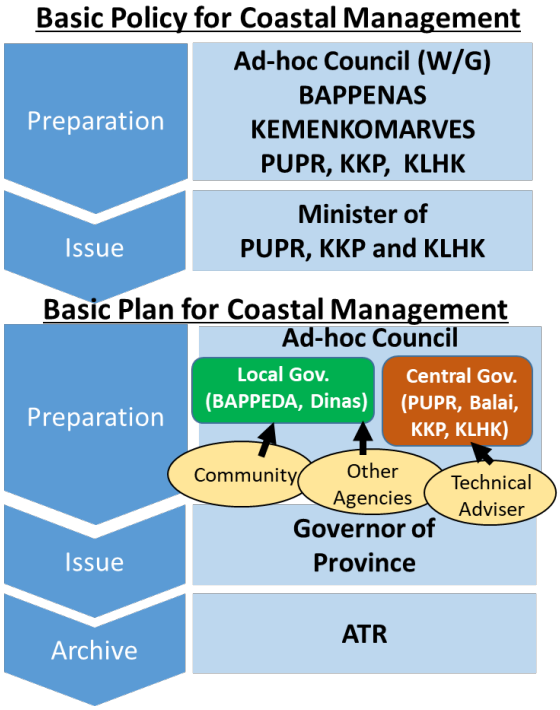


Figure 1 海岸保全基本方針、海岸保全基本計画の策定フロー

第 1 節　　海岸の保全に関する基本的な指針

1. 海岸保全に関する基本理念

“「イ」国の海岸特性とそれを踏まえた海岸保全の基本理念”

- 世界第 2 位の広大な海岸線を持つ「イ」国では島毎、エリア毎に異なる海岸特性・海岸災害・海岸利用を有する。
- 国民共有の財産として、「利用と環境に調和した海岸防護と海岸保全」を次世代に継承していくことを基本理念とする。

“基本理念達成のための目指すべき海岸保全の姿“

- 中長期的視点及び広域的視点での総合的な海岸整備、保全、管理を推進する。
- 地域の統制を活かした海岸作りを目指す。

2. 海岸保全の方向性

“海岸整備・保全の方向性”

- 防護・環境・利用の 3 つの観点からの海岸整備・保全を図る。
- 防護については、高波・越波、海岸侵食、河口部の地形変化と堆積、地盤沈下、気候変動影響、等を踏まえた適切な防護水準の確保、およびハード・ソフト対策を含めた総合的な対策を推進する。
- 環境については、自然海浜、サンゴ礁、マングローブ林の保全と維持、サンゴや魚介類等の海岸・海洋生態系の保全を図る。
- 利用については、観光、地域社会による海岸利用を促進する。

2.1 海岸の防護の方向性

“対象とする海岸災害の分類”

- 防護については、高波・越波、Tidal Flood、海岸侵食、堆積、河口部の地形変化、地盤沈下、気候変動影響、等を踏まえた適切な防護目標の確保をする。
- 「イ」国の海岸は地域ごとに自然状況および背後の社会経済状況が大きく異なる。それゆえ、自然条件、災害の発生状況、背後地の人口および資産、利用状況等を勘案して、各海岸の防護対象となる海岸災害および防護目標を設定する。

“海岸災害ごとの防護目標の記載”

- 高波・越波、Tidal Flood からの防護が求められる海岸では、背後域の状況を踏まえ適宜設定する。
- 海岸侵食からの防護が求められる海岸では、現状の汀線を保全することを基本的な目標とし、海岸利用等を考慮し、必要に応じて更なる汀線の回復を図る。
- 地盤沈下からの防護が求められる海岸では、10～100 年のオーダーの地盤沈下に対応することを目標とする。
- 津波からの防護が求められる海岸では、過去の浸水や関連データを基に、数十年～数百年に一度程度発生する津波からの防護を目標とする。

- 高潮（Storm Surge）からの防護が求められる海岸では、過去の台風等の記録による既往最高潮位又は記録や将来予測に基づき適切に推算された潮位＋波浪からの防護を目標とする。

“防護面の対策方針”

- 海岸保全施設の整備は、背後域の利用状況を踏まえ、海水の侵入又は海水による侵食を防止するとともに、海水が越流した場合にも背後地の被害が軽減される。また、単一の構造物による防護のみならず、バッファーゾーンの確保や複数の対策の組み合わせ等の面的防護を推進する。
- 現存する砂浜、サンゴ礁、マングローブ林等、自然の防護機能の維持・保全に努める。
- 津波・高潮対策はハード・ソフトの総合的な対策を行うように努める。
- 侵食対策は、順応的管理や、土砂収支の状況を踏まえた広域的な視点に立った対応を行う。
- 河口部は、波浪変化に応じた地形変化や河口からの土砂流入による堆積が顕著となるため、これらの変化を踏まえた中長期的かつ広域的な視点での対応に努める。特に堆積域においては総合的土砂管理の視点に立った対応、土地管理を行う。

2.2 海岸環境の整備及び保全に関する基本的な事項

“環境面にて海岸の有する機能”

- 海岸は、生物にとって多様な生息・生育環境を提供する。
- 海岸は、優れた自然景観を形成する。

“環境面の対策方針”

- 自然と共生する海岸環境の保全と整備を図る。
- 優れた景観や、学術的に価値のあるもの、多様な生物の生態系保全に努める。
- 海岸環境保全のための規制を設ける。
- 良好な海岸環境を作るために必要に応じて海岸施設を整備する。
- 油流出事故等の突発的に生じる環境への影響等に適切に対処する。
- 豊かな生物環境の維持・保全を図るために、マングローブ林とサンゴ礁を保全する。
- 関係者間での保全されるべき海岸に対する共通認識を確保するように努める。

2.3 海岸における公衆の適正な利用に関する基本的な事項

“利用面にて海岸の有する機能”

- 海岸は地域文化を形成、保全する。
- レジャー、スポーツ、教育活動、憩いの場等の多様な利用を促す。

“利用面の対策方針”

- 海岸の利用の増進に資する施設の整備等を推進する。
- 景観や利便性を著しく損なう施設の汚損、放置艇等に適切に対処する。
- 公衆による海辺へのアクセスを確保する。
- 海とのふれあいの場の確保を図るとともに、利用者マナーの啓発活動を推進する。

3. 海岸保全施設の整備に関する基本的な事項

3.1 海岸保全施設の新設又は改良に関する基本的な事項

1) 安全な海岸の整備

“防護目標を達成するために推進される施策“

- 海岸保全施設の整備にあたり面的防護方針を推進.する。また、構造物のみによるハード対策だけでなく、養浜（堆積域からのサンドバイパス等含む）等のソフト対策、マングローブ植林等のグリーンインフラによる対策、およびこれらの組み合わせ等、多様な対策を推進する。またそれを可能とするように、変化する海岸域における適切な土地管理を推進する。
- 津波・高潮による甚大かつ広域的な被害を防ぐための複合的かつ効果的に施設を組み合わせた対策を推進する。
- 広域的な漂砂の動きを考慮した、養浜などのソフト対策も含めた適切な土砂管理を推進する。
- 地盤沈下については、推定される沈下量を踏まえた規制強化等の非構造物対策も含めた総合的な沈下対策を推進する。
- Tidal Flood、高波・越波に対しては、広域的な海岸土砂の動きを踏まえた周辺海岸や当該地点への負の影響面を生じさせない対策を推進する。

2) 自然豊かな海岸の維持

“多様な生態系および美しい景観を保全するために推進されるべき施策（取り組み）”

- 自然特性に応じた海岸保全施設の整備を推進する。
- 砂浜、サンゴ礁、マングローブ林の保全と回復の整備を推進する。
- 海岸保全施設整備時の自然環境の保全に配慮する。

3) 親しまれる海岸の整備

“利用者の利便性や地域社会の生活環境の維持・向上に寄与するために推進されるべき施策（取り組み）”

- 利用者の利便性や地域社会の生活環境の維持・向上に寄与するための施設を推進する。
- 海岸へのアクセスの確保のため、必要に応じて階段の設置、階段護岸、緩傾斜護岸の整備を推進する。
- 砂浜は観光利用、地域住民のレクレーション、地域文化の継承等の重要な場であり、その保全、整備を推進する。
- 施設のバリアフリー化を推奨する。

3.2 海岸保全施設の維持又は修繕に関する基本的な事項

“維持管理の必要性”

- 施設老朽化の中での費用軽減と所要機能の確保を両立する。

“推進されるべき施策（取り組み）”

- 海岸保全施設の適切な時期の点検、検査を実施する。
- 海岸保全施設の計画的な維持又は修繕を推進する。
- 海岸保全施設の点検又は修繕に関する記録の作成及び保存を実施する。

4. 海岸保全に関するその他の重要事項

4.1 広域的・総合的な視点からの取組の推進

“広域的・総合的な視点からの取り組みが推進されるべき項目”

- 気候変動の平均海水面の上昇について、社会全体で共有する。
- 関係機関との協力のもと、地域一体的・計画的な防災・減災対策を推進する。
- 海岸侵食に対して、流砂系における総合的な土砂管理対策との連携等の、関係機関との連携のもとの総合的な施策を推進する。
- 海岸利用について、海岸及びその周辺の施策との連携を促進する。

4.2 地域との連携の促進と海岸愛護の啓発

“地域との連携や海岸愛護の思想の推進が求められる項目”

- 災害に強い地域づくりのため、地域住民の防災意識向上に努める。
- 海岸の美化について地域住民やボランティア等の参加参加を促進する。
- 海岸環境保全のためのモラル向上のための啓発活動を推進する。
- 適正な利用のための海岸利用のルール作りを推進する。
- 海岸愛護の思想の普及および地域における人材育成を推奨する。
- 地域連携による海岸管理を充実する。
- 海岸保全における民間セクターの関与を促すため、CSR 活動としての海岸保全プログラムを推奨する。

4.3 調査、研究、モニタリングの推進

“調査・研究、モニタリングの推進が図られるべき項目”

- 海岸に関する基礎的な情報収集を実施する。
- 民間セクターを含めた多様な関係者への情報の共有および国際的な技術交流を図る。
- 気候変動による潮位、波浪変動のための継続したモニタリングの実施およびデータを蓄積する。
- 地盤沈下の影響、グレー・グリーンインフラの効果や周辺影響についての継続したモニタリングおよびデータの蓄積を実施する。

第 2 節　　海岸保全基本計画を策定する海岸

- 「イ」国の主要 5 島（Sulawesi, Kalimantan, Java, Papua, Sumatra）＋2 つの主要群島（Maluku Islands and Nusa Tenggara）の沿岸を対象とする。
- 海岸保全基本計画を策定すべき一体の海岸区分は、地形、海象面の類似性、沿岸漂砂の連続性及び行政区域を考慮して、50 km～100km 程度を一体の海岸の目安として定める。

第 3 節　　海岸保全基本計画の作成に関する基本的な事項

1. 海岸保全基本計画の作成に関する基本的な事項

1.1 海岸保全に関する基本的な事項

1) 海岸の現況及び管理の方向に関する事項

- 自然的特性、社会的特性を踏まえ、沿岸の長期の在り方を定める。

2) 海岸の防護に関する事項

- 防護すべき地域、海岸防護の目標、および達成するための施策を定める。

3) 海岸環境の整備及び保全に関する事項

- 海岸環境の保全（必要に応じて、整備）のための施策を定める。

4) 海岸における公衆の適正な利用に関する事項

- 公衆の適切な海岸利用を促進するための施策を定める。

1.2　海岸保全施設の整備に関する基本的な事項

1) 海岸保全施設の新設又は改良に関する事項

a. 海岸保全施設の新設又は改良する区域を定める。
b. (a)で定められた海岸保全施設に関して、種類、規模、配置を定める。
c. 海岸保全施設の新設又は改良による受益地域を示す。

2) 海岸保全施設の維持又は修繕に関する事項

a. 既存の海岸保全施設を維持又は修繕する必要のある区域を定める。
b. (a)で定められた海岸保全施設に関して、種類、規模、配置を定める。
c. (b)で定められた海岸保全施設について、維持又は修繕方法を定める。

2. 留意すべき重要事項

2.1 関連計画との整合性の確保

- 国土の利用開発、環境保全に関する関連計画との整合性を確保する。

2.2 関係行政機関との連携調整

- 海岸に関係する関係機関との十分な連携調整を図る。
- 気候変動、地盤沈下等の地域リスクについて、街づくり関係機関と共有する。

2.3 地域住民の参画と情報公開

- 地域住民の参画を促す。

- 事業の透明性向上のため、海岸に関する情報を広く公開する。

2.4 計画の見直し

- 海岸保全基本計画は基本的に 5 年程度ごとに再作成の必要性を検討し、必要性に応じて再作成を実施する。
- 地域状況の変化、社会経済状況、気候変動影響に応じて、計画および整備内容を見直す。

Basic Policy for Coastal Management

Purpose of enforcing Basic Policy for Coastal Management

- In order to protect and preserve human lives, assets and territorial land under the continues coastal development, the purpose of enforcing the Basic Policy for Coastal Management is to establish the fundamental principles on coastal management and development to address coastal vulnerability such as coastal erosion, tidal flood, wave overtopping, sea level rise associate with climate change, while ensuring the harmonization of "protection,' utilization," and "environment."
- The designated coastal areas, in which the Basic Coastal Management Plan is required to be prepared, are coastal areas of the five main islands, that is Sulawesi, Kalimantan, Java, Papua, and Sumatra, and the two main islands group, that is Maluku Islands and Nusa Tenggara.
- The purpose of the Basic Policy for Coastal Management is to clearly define the fundamental requirements and procedures for the Basic Coastal Management Plan which will be issued by the ministers of primary ministry – PUPR, KKP, and KLHK, as the guideline for coastal management in Indonesia

Definition of Basic Terms on Coastal Management

(1) Definition of Area on Coastal Management

- The area for coastal management, in which the Basic Coastal Management Plan shall be prepared, is defined as follows:

    a. Area which defined as coastal area are at least 50 meters from the lowest water level (LWL) offshore and 100 meters from the highest water level (HWS) onshore principally. The final area for each coastline should take account of shore condition, seabed slope and other considerations that may widens the area for specific site.

    b. The "Buffer zone" against coastal disaster is defined on Presidential Decree 51/2016 as public property. It is recommended to keep consistency of both its range and its public status at onshore side.

    c. Boundary of 12 nautical mile defined as provincial jurisdiction area for offshore side is deemed too far for coastal management, thus it is not considered on this plan.

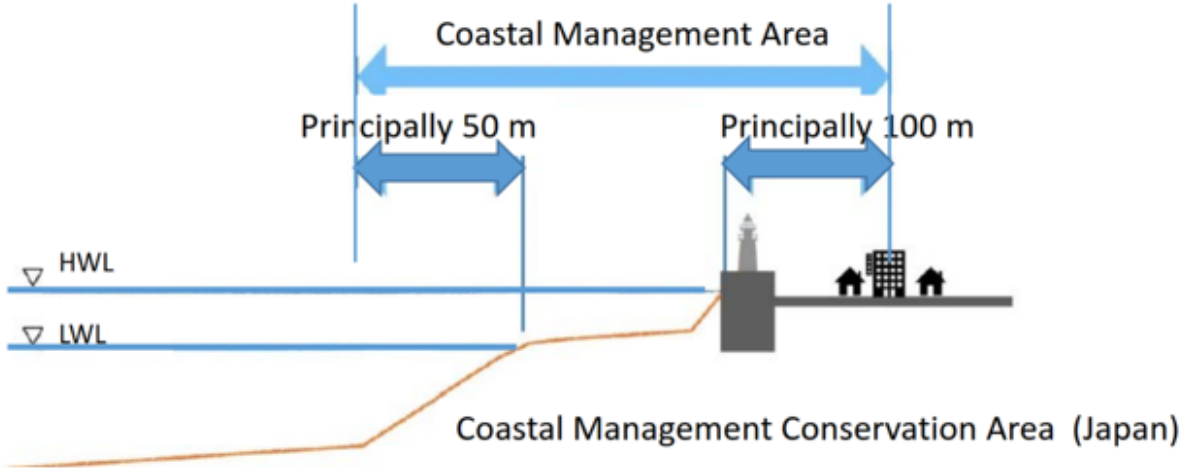


Figure 1. Definition of Coastal Management Area

(2) Position of Basic Coastal Management Plan

- To make it clear that objective and position of coastal management plan and spatial plan (known as Rencana Tata Ruang Wilayah, RTRW) difference, both are defined on this section.
    a. The O
    b. objective of RTRW is to clarify the zoning to show the area for existing – and future development – coastal and marine utilization and activities.
    c. On the other hand, the "Basic Coastal Management Plan" is to clarify the middle and long-term goals on coastal management and its plan at the coastal area, considering the coastal condition and its process, and socio-cultural condition as well as impact of future development of infrastructures at coastal area.

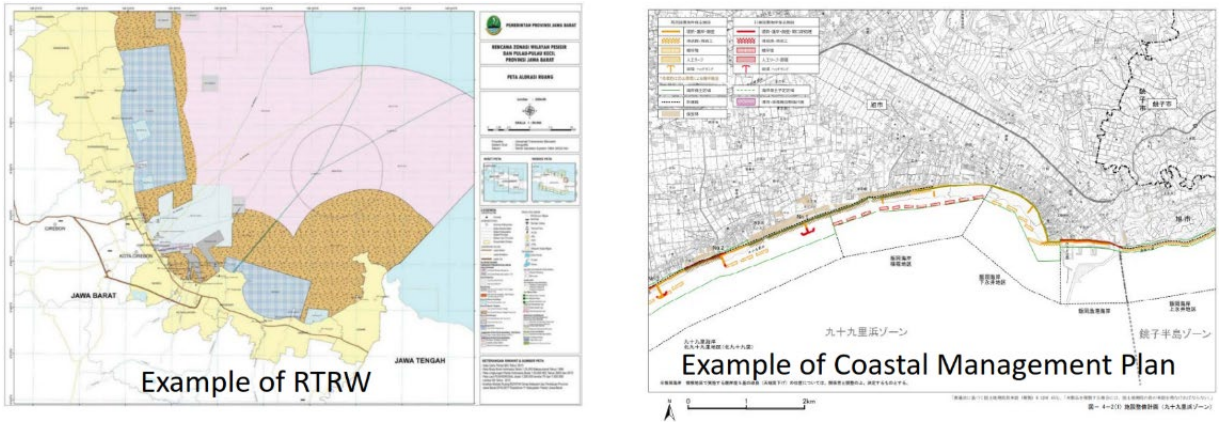


Figure 2. Difference between RTRW and Coastal Management Plan

(3) Definition of Coastal Facility

- Coastal facilities have a variety of types. Examples of coastal facilities such as both "hard" and "soft" or "gray" and "green" facility (measures) are defined as follows:

    a. Groin, revetment, breakwater, detached break water, artificial headland, etc., as hard and gray facilities/measures

    b. Beach nourishment, sand back-pass, sand bypassing, etc. as "soft" measures

    c. Mangrove and other vegetation plantation, coral transplantation, etc. as "green" facilities/measures

    d. Combination of above facilities

    e. Other public facilities to enhance beach utilization such as walkway, parking, rest house, etc.

(4) Agencies who mainly take initiative for preparation and issuing of the Basic Coastal Management Plan;

- Agencies involved in preparation of the Basic Coastal Management Plan are defined as follows:

    a. The Local Governments, mainly DINAS PU and BAPPEDA, prepare the Basic Coastal Management Plan as the leading agencies in cooperation with relevant agencies from the central governments, such as PUPR, KLHK, and KKP.

    b. For the preparation of the Basic Coastal Management Plan in each area, it is recommended to establish the "Ad-Hoc Council" which consists of at least PUPR, KKP, and KLHK from Central Government; and Dinas PU, BAPPEDA and other corresponding agencies from the Local Governments as required; communities, technical adviser of coastal engineering and management, etc.

    c. The Governor in each province shall issue the Coastal Management Plan and submit it to the Central Government (under ATR) to archive and integrate, as same system as that for the Spatial Plan.

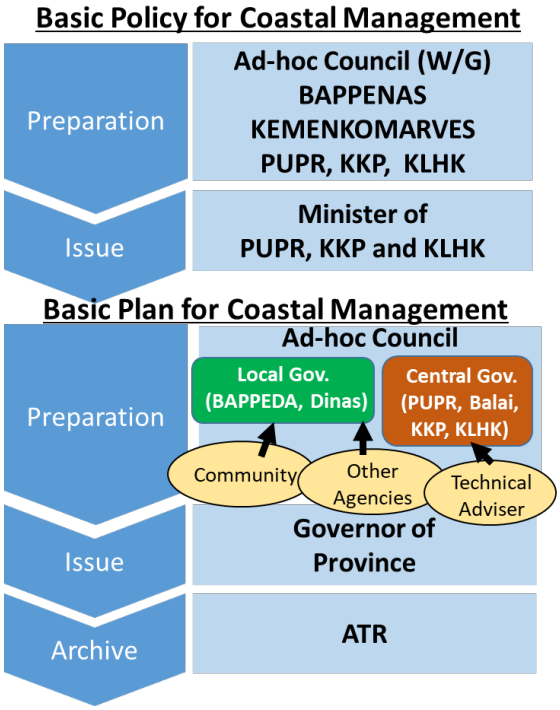


Figure 1 Flowchart on Coastal Management Plan Sequencing

Clause 1 Basic Guidelines for Coastal Management

1. Basic philosophy of coastal management

"Basic philosophy of coastal management based on overview of coastal conditions in Indonesia"

- In Indonesia, which has the second-longest coastal length in the world, each island and area possesses distinct coastal characteristics, coastal hazards, and coastal utilization.
- The basic philosophy is to pass on the coast with "coastal protection and coastal protection in harmony with utilization and environment" to future generation as a shared national asset.

"Ideal situation for coastal management to achieve above mentioned basic philosophy "

- Comprehensive and integrated coastal facility development, conservation, and management from mid-to long-term and wide-area viewpoints are promoted.
- Coastal facility development with the local governance is promoted.

2. Direction on Coastal Management

"Direction on coastal facility development and conservation"

- Coastal facility development and coastal conservation from the three perspectives of protection, environment, utilization is promoted.
- In the context of coastal protection, it shall be promoted to ensure appropriate protection levels considering high waves, wave overtopping, coastal erosion, topographical change and sedimentation surrounding river mouth, land subsidence, climate change, etc., and take integrate measures incorporating both hard and soft measurers.
- In the context of coastal environment, the conservation and maintenance of natural sandy beaches, coral reefs, mangrove forests, as well as conservation of coastal and marine ecosystems including coral and fish and other marine species, shall be promoted.
- In the context of coastal utilization, coastal utilization by tourism and the local society shall be well-considered and enhanced.

2.1 Direction on Coastal Protection

"Classification of targeted coastal disasters"

- In the context of coastal protection, ensuring appropriate protection levels, considering high waves, wave overtopping, coastal erosion, sedimentation, topographical change at river mouth, land subsidence, climate change, etc., shall be clarified.
- Indonesian's coasts vary significantly from one region to another, with distinct natural condition and socio-economic condition of hinterland. Thus, it is required to determine targeted coastal disasters and appropriate protection levels against the disaster, taking into account natural conditions, occurrence of coastal disasters, and population and assets of hinterland, and coastal utilization.

"Setting appropriate protection levels against coastal disasters."

- For coasts targeted to protect against high wavs, overtopping, and tidal flood, the target protection levels are set considering the status of hinterland.

- For coasts targeted to protect against coastal erosion, the basic target of protection level is to maintain the current shoreline, and the further target protection level is to restore the shoreline to a greater extent taking into account coastal utilization, as required.
- For coasts targeted to protect against land subsidence, the protection level is to secure the safety against land suboscine with a timescale ranging from 10 years to 100 years.
- For coasts targeted to protect against Tsunami, the target protection level is set is to protect against relatively frequent tsunamis that occurs once a few decades to a hundred and few decades years, based on records of past inundation and other relevant data.
- For coasts targeted to protect against storm Surge, the target protection level is set to protect against either the highest high tides based on records of past storm surges caused by typhoons, etc., or the tides appropriately estimated based on records or future projections, in addition to the effects of waves appropriately estimated based on records or future projections.

"Direction of measures for coastal protection"

- For developing coastal facilities, considering the status of the hinterland, the goal is to set to prevent seawater intrusion or erosion, and if the sea water overflows the levees, to mitigate the damage to hinterland. Moreover, integrated coastal measures, that is the protection not only by the single structure, but also by the combination of multiples coastal measures including the establishment of buffer zone.
- Conservation and maintenance of natural protection functions such as existing sandy beach, coral reefs, mangrove forests, etc. is promoted.
- Regarding tsunami and storm surge countermeasures, in addition to the development of coastal facilities, comprehensive measures should be implemented that combine hard and soft measures.
- For the countermeasures against coastal erosion, it is promoted to implement measures through adaptive management of beach and from a wide-area perspective taking into account the entire cell of littoral drift.
- Since river mouths experience significant topographic changes in response to wave dynamics and sedimentation due to sediment inflow from the river, measures are promoted from both mid- to long-term and wide-area perspectives. Particularly in sedimentation areas, comprehensive sediment management in the sediment transport system and land management are carried out.

2.2 Direction on Development and Conservation of Coastal Environment

"Functions of coastal environment"

- The coast provides a diverse habitat and growth environment for organisms.
- The coast forms a part of outstanding natural landscapes.

"Direction of measures for coastal environment"

- Conservation and maintenance of coastal environment that coexists harmoniously with nature is promoted.
- Preservation of outstanding landscapes, academically valuable assets, and diverse ecosystems is promoted.
- Regulations for coastal environmental conservation is established.
- In order to create favorable coastal environment, coastal facilities are developed as necessary.
- Environmental impacts resulting from sudden incidents such as oil spills is appropriately managed.
- In order to maintain and conserve the rich biodiversity, conservation of mangrove forests and coral reefs are promoted.
- It is promoted to secure that all parties concerned can share a common understanding of the coastal environment that need to be conserved.

2.3 Direction on Proper Coastal Utilization by Public

"Functions of coastal utilization"

- The coast forms and preserves regional culture of local community.
- The coast encourages diverse coastal utilizations such as leisure, sports, education activities, and recreational spaces.

"Direction for measures of coastal use"

- Coastal facilities that contribute to the enhancement of coastal utilization is promoted to be developed.
- Actions are necessary to deal with the degradation of coastal facilities and abandoned vessels that significantly impair the scenery and convenience of the coast.
- Ensuring public access to the seashore is promoted.
- Awareness rising activities for users of the coast is promoted so as to improve their etiquette and behavior in their coastal utilization is promoted.

3. Direction of Implementation on Coastal Facilities

3.1 Direction on New Implementation or Repair of Coastal Facilities

1) Promotion of development of safer coast

"Measures promoted to achieve target protection level "

- In development of coastal facilities, integrated coastal measures are promoted, including, not only hard structure, but also soft measures such as beach nourishment (including sand bypass from sedimentation area, etc.) as well as green infrastructure such as mangrove plantation, and various measures such as combining these structures are fostered. To enable this, furthermore, the appropriate land management in evolving coastal areas is promoted.
- To prevent widespread and catastrophic damages by Tsunami and storm surges, it is promoted to take measures that efficiently and comprehensively combines multiple coastal facilities.
- The appropriate management of sediment is required, including non-structural measures such as sand nourishment from sedimentation areas to erosion areas on a series of beaches, taking into consideration the movement of sand transport over a wide area.
- To address land subsidence, integrated measures are promoted including non-structural measures such as establishment and enforcement of regulations considering the estimated subsidence amount.
- For protection against Tidal Flood, high waves, and wave overtopping, it is promoted to take measures to prevent negative impacts to surrounding coasts taking into account the continuity of sand transport.

2) Promotion of measures for the conservation of nature-rich coast, and their creation as required.

"Measures to be promoted for the conservation of divers ecosystems and beautiful landscapes."

- Development of coastal facilities in accordance with the natural characteristics.
- Conservations and restoration of sandy beaches, coral reefs, and mangrove forests is promoted.
- Development of coastal facilities in consideration of the natural environment is promoted.

3) Promotion of measures for the beloved coast

"Measures to be promoted for the maintenance and improvement of user convenience and local community's living environment."

- Coastal facilities for enhancing user convenience and maintaining the living environment of the local community area promoted.
- In order to secure the continues access to the seashore, coastal facilities such as stairs, staircase- revetment, and gently sloping revetment, etc. are promoted.
- Conservation and development of sandy beaches is promoted as sandy beaches are an important space for tourism, recreational activities for local residents, and the preservation of local culture.
- Facilitating handicapped accessibility is encouraged.

3.2 Promotion of Implementation of Planned and Effective Maintenance and Repair of Coastal Facilities

"Necessity of maintenance"

- As existing coastal facilities continue to degrade, it is necessary to satisfy the required functions while reducing and equalizing costs.

"Measures to be promoted."

- Patrols or inspections of coastal facilities at appropriate times shall be conducted.
- Systematic and effective maintenance and repair of coastal facilities are promoted.
- The records related to inspections and repairs as well as new construction or repair of coastal facilities are properly prepared and stored.

4. Other Considerations on Coastal Management

4.1 Promotion of Initiatives from Broad and Comprehensive Perspective

"Initiatives that should be promoted from a broad and comprehensive perspective."

- Regarding sea level rise due to climate change, the common understanding about the target sea level is shared within a society.
- Integrated and systematic disaster prevention and mitigation measures is promoted in cooperation with related organizations.
- Against coastal erosion, it is promoted to take wide-area and comprehensive measures in cooperation with various relevant organizations, such as comprehensive sediment management measures in the entire sediment system from upstream to the coast.
- Further cooperation with various measures implemented in and around the coast is encouraged so as to promote coastal utilization.

4.2 Promotion of Cooperation with Local Communities and Raising Awareness of Coastal Management

"Items which cooperation with local communities and raising awareness of coastal management."

- In order to archive the creation of a disaster-resistant community, enhancing local communities' awareness is promoted.
- Beautification of coasts is promoted with cooperation of participants from local residents, volunteers, etc.
- Awareness-raising activities to improve users' morale in coastal environmental conservation are recommended.
- It is encouraged to create rules for safe and proper coastal utilization.
- Promotion of coastal conservation philosophy and capacity building in local communities are encouraged.
- Coastal management in cooperation with local community is promoted.
- In order to encourage private sector involvement in coastal conservation, coastal conservation programs as part of CSR (Corporate Social Responsibility) initiatives is recommended.

4.3 Promotion of Research, Studies, and Monitoring

"Items that require the promotion of research, studies, and monitoring."

- Collecting basic information on the coasts is promoted.
- It is encouraged to collaborate and share information across a wide range of sectors, including the private sector, and to facilitate international technological exchanges.
- To address the climate change impact, tidal levels and waves is monitored continuously, and the data shall be store and accumulated.
- Continuous monitoring and data accumulation for implemented coastal facilities for both gray and green measures is promoted to be conducted in order to clarify the effectiveness of facilities and impact to surrounding coastal area.

Clause 2 Area for Preparation of Basic Coastal Management Plan

- Five main islands (Sulawesi, Kalimantan, Java, Papua, Sumatra) and two islands group (Maluku Islands and Nusa Tenggara) is designated to prepare the Basic Coastal Management Plan.
- Division of one coastal area, in which one coastal management plan is prepared, shall be determined based on the similarity of topographical and oceanographical condition, the continuity of littoral drift as broadly as possible, and administrative boundary by setting an approximately 50 to 100 kilometers as the extent of a one of unified coastal area.

Clause 3 Basic Items for the Preparation of the Basic Coastal Management Plan

1. Basic Items to be included in the Basic Coastal Management Plan

1.1 Basic items concerning Coastal Management

1) Current status of the coast and the direction of coastal conservation

- The long-term vision of the coast shall be determined based on natural and social characteristics and other factors.

2) Items related to coastal protection.

- It is required to determine the area to be protected, the goals of coastal protection such as the protection level against coastal disasters, and the details of the measures to be implemented to achieve these goals.

3) Items related to the management, maintenance and conservation of the coastal environment.

- It is required to determine the detail of the measures that are to be implemented for the conservation of the coastal environment, and, if necessary, development of the coastal environment.

4) Items related to proper public utilization of the coast.

- It is required to determine the details of the measures that are to be implemented to promote proper coastal utilization by public.

1.2 Basic items concerning the development of Coastal Facilities

1) Items related to new development or improvement of coastal facilities.

a. The area in which coastal facilities are to be newly constructed or improved shall be determined.
b. The type, size, and layout of coastal facilities in each area determined in (a) shall be determined.
c. It is required to show the beneficiary areas through the new construction or improvement of coastal facilities.

2) Items concerning the maintenance or repair of coastal facilities.

a. The area in which existing coastal facilities are subject to maintenance or repair shall be determined.
b. The type, size, and layout of existing coastal facilities in each area determined in (a) shall be determined.
c. The method of maintenance or repair of each type of coastal facilities that identified in (b) shall be determined.

2. Important items to be considered in the Basic Coastal Management Plan

2. 1 Ensuring consistency with relevant development plans

- Basic Coastal Management Plan shall be in line with the relevant plans such as national land use plan, plans on environmental conservation, etc.

2.2 Cooperation and coordination with relevant administrative agencies

- Adequate cooperation and close coordination with relevant administrative agencies related to the coast shall be conducted.
- Local risks, including climate changes, land subsidence, etc. shall be shared with hose involved in community development.

2.3 Participation of residents and information disclosure

- Participation of local residents shall be facilitated.
- Disclosure of information related to the coast shall be carried out in order to enhance the transparency of the project,

2.4 Review of plan and revision properly

- Basic Coastal Management Plan is basically reviewed approximately every five years to assess the need for updates, and it is revised as necessary.
- Basic Coastal Management Plan and the development plan of coastal facilities stated in the Basic Coastal Management Plan shall be revised in response to changes in local condition, socio-economic condition, and the effect of climate change.

Kebijakan Dasar Pengelolaan Pantai

Tujuan Penerapan Kebijakan Dasar Pengelolaan Pantai

- Berlandaskan kepentingan untuk melindungi dan melestarikan kehidupan manusia, aset, dan wilayah teritorial sebagai pengembangan kawasan pantai yang berkelanjutan, tujuan penerapan Kebijakan Dasar Pengelolaan Pantai adalah menjadi prinsip-prinsip dasar pengembangan dan manajemen pantai untuk menjawab ancaman seperti erosi pantai, banjir pantai (rob), limpasan gelombang, kenaikan muka air laut akibat perubahan iklim, dengan memastikan harmonisasi antara "proteksi", "utilitas", dan "lingkungan".
- Wilayah pantai yang perlu dipersiapkan dokumen Rencana Dasar Pengelolaan Pantai adalah wilayah pantai dari lima pulau utama: Sulawesi, Kalimantan, Jawa, Papua, dan Sumatera, serta dua gugus kepulauan besar, yaitu gugus pulau Maluku dan gugus pulau Nusa Tenggara.
- Tujuan dari Kebijakan Dasar Pengelolaan Pantai adalah untuk mendefinisikan dengan jelas persyaratan dan prosedur fundamental untuk Rencana Dasar Pengelolaan Pantai yang akan diterbitkan oleh kementerian utama yang terkait – Kementerian Pekerjaan Umum dan Perumahan Rakyat (PUPR), Kementerian Kelautan dan Perikanan (KKP), dan Kementerian Lingkungan Hidup dan Kehutanan (KLHK), sebagai panduan untuk pengelolaan pantai di Indonesia.

Definisi Istilah yang Digunakan dalam Dokumen Pengelolaan Pantai

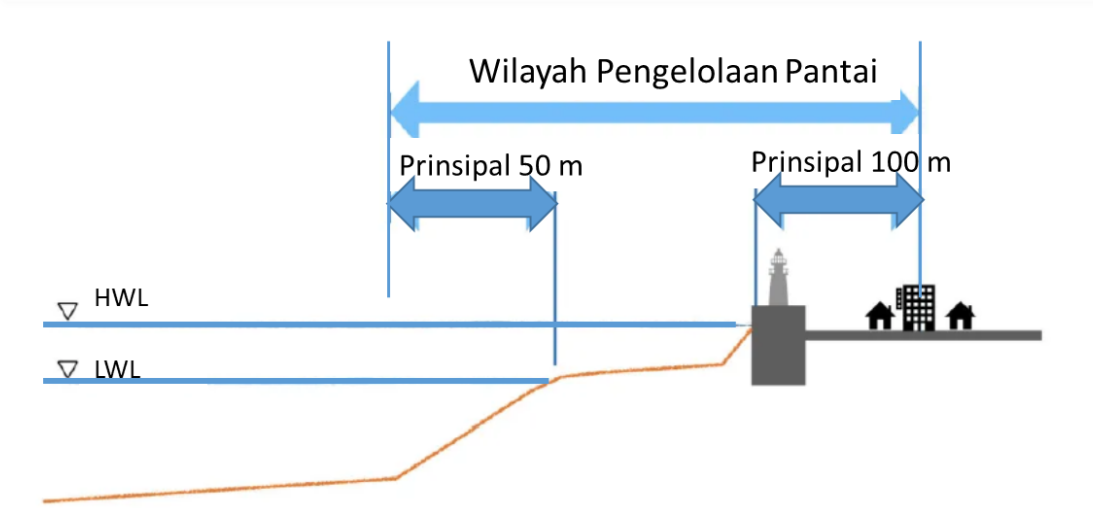
Definisi Wilayah Pengelolaan Pantai

- Wilayah pantai yang didefinisikan dalam penyusunan dokumen Rencana Dasar Pengelolaan Pantai adalah sebagai berikut:

    a. Wilayah yang didefinisikan sebagai area pantai adalah sekurangnya 50 meter dari muka air surut terendah (*Lowest Water Level*, LWL) ke arah laut dan 100 meter dari muka air pasang tertinggi (*Highest Water Level*, HWL) ke arah darat. Wilayah akhir yang ditentukan untuk tiap garis pantai harus mempertimbangkan kondisi pantai, kemiringan pantai, dan pertimbangan lain yang dapat mempengaruhi lebar wilayah di lokasi spesifik.

    b. Berdasarkan Peraturan Presiden Nomor 51 Tahun 2016 tentang Batas Sempadan Pantai, sempadan pantai memiliki lebar minimal 100 (seratus) meter dari titik pasang tertinggi ke arah darat. Sempadan pantai memiliki fungsi sebagai daerah penyangga untuk menghadapi bencana pesisir, pelestarian fungsi ekosistem, alokasi ruang, dan merupakan area publik. Direkomendasikan untuk menjaga konsistensi dan status publik lahan di sisi darat.

    c. Jarak 12 (dua belas) mil laut yang didefinisikan sebagai batas wewenang provinsi untuk arah laut dinilai terlalu jauh untuk keperluan dokumen manajemen pantai sehingga tidak dipertimbangkan dalam dokumen perencanaan manajemen pantai ini.



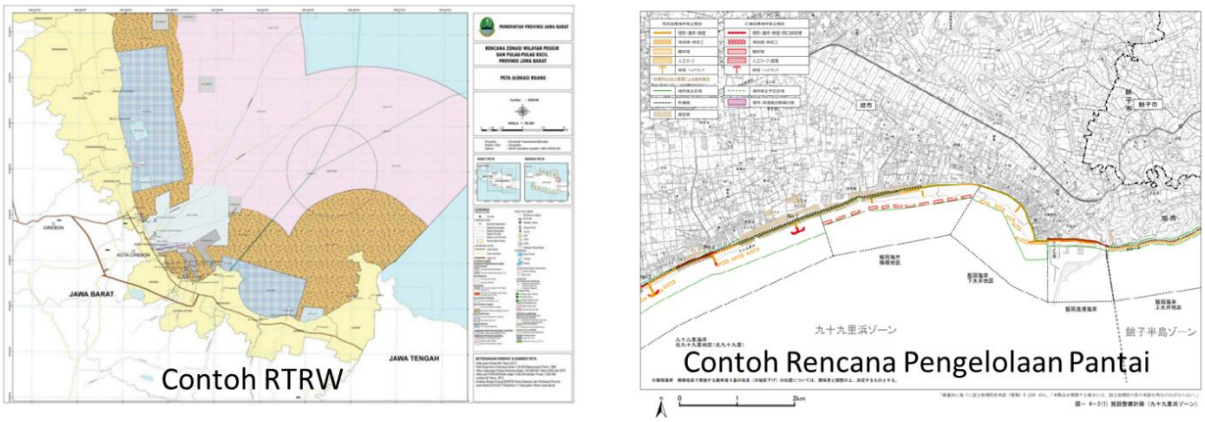
Gambar 1 Definisi Wilayah Pengelolaan Pantai

Posisi Dokumen Rencana Dasar Pengelolaan Pesisir

- Untuk memperjelas perbedaan tujuan dan posisi antara Rencana Pengelolaan Pantai (RPP) dan Rencana Tata Ruang Wilayah (RTRW), penjelasan mengenai keduanya dijelaskan pada bagian ini.

    a. Tujuan RTRW adalah memperjelas pembagian wilayah untuk menunjukkan pemanfaatan aktivitas pantai dan laut, baik eksisting maupun rencana pengembangan di masa mendatang.

    b. Di sisi lain, RPP bertujuan untuk memperjelas tujuan jangka menengah dan jangka panjang dari pengelolaan pantai dan perencanaan wilayah pantai terkait, dengan mempertimbangkan kondisi pantai dan proses pantai di lokasi yang dimaksud, kondisi sosial kultural serta dampak rencana pengembangan infrastruktur kawasan pantai di masa mendatang.



Gambar 2 Perbedaan antara RTRW dan RPP

Definisi Fasilitas Pantai

- Terdapat berbagai jenis fasilitas pantai. Secara umum, fasilitas pantai dapat dikategorikan meniadi “keras” dan “lunak”, atau “abu-abu” dan “hijau”. Contoh dari fasilitas pantai yang dimaksud di antaranya:

a. Groin, revetment, pemecah gelombang (*breakwater*), pemecah gelombang lepas pantai (*detached breakwater*), tanjung buatan, dan sebagainya sebagai fasilitas/tindakan "keras" dan "abu-abu". Kategori ini umumnya berupa infrastruktur keras yang melibatkan pekerjaan sipil dengan memanfaatkan struktur beton dan/atau batuan keras, pembentukan daratan buatan dengan manipulasi topografi pesisir, dan sebagainya;

b. *Beach nourishment, sand back-pass, sand bypassing*, sebagai tindakan "lunak";

c. Penanaman mangrove vegetasi lainnya, transplantasi terumbu karang, dst sebagai fasilitas/tindakan "hijau";

d. Kombinasi fasilitas/tindakan di atas;

e. Fasilitas publik lainnya yang bertujuan untuk meningkatkan utilitas pantai seperti jalan setapak, area parkir, pendopo, dst.

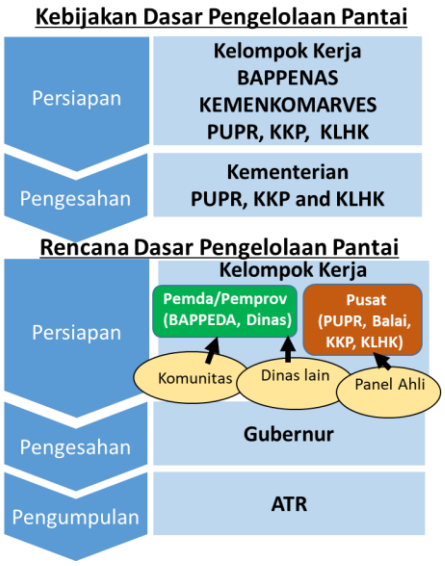
Kementerian yang Bertanggungjawab dalam Menginisiasi Persiapan dan Melaksanakan Rencana Dasar Pengelolaan Pantai;

- Kementerian yang terlibat dalam persiapan Rencana Dasar Pengelolaan Pantai didefinisikan sebagai berikut:

a. Pemerintah Daerah, terutama Dinas PU dan BAPPEDA, memppersiapkan Rencana Dasar Pengelolaan Pantai sebagai lembaga utama (*leading agency*) dengan bantuan dan kerjasama dengan institusi terkait dari Pemerintah Pusat seperti PUPR, KLHK, dan KKP.

b. Untuk persiapan dokumen Rencana Dasar Pengelolaan Pantai di tiap lokasi, direkomendasikan untuk membentuk Kelompok Kerja (*Ad-Hoc Council*) yang terdiri dari perwakilan pusat (sekurangnya PUPR, KKP, dan KLHK), perwakilan daerah (BAPPEDA, Dinas PU, dan dinas terkait dari Pemerintah Daerah/Provinsi), komunitas lokal, panel ahli untuk rekayasa dan pengelolaan pantai, dan sejenisnya.

c. Gubernur dari tiap provinsi lalu akan merilis Rencana Manajemen Pantai dalam bentuk Peraturan Gubernur dan direkap di Kementerian Agraria dan Tata Ruang (ATR) untuk integrasi dengan RPP provinsi lain – sistem yang sama dengan RTRW.



Gambar 3 Bagan alir tahapan RPP

Pasal 1. Panduan Dasar Pengelolaan Pantai

1.1 Filosofi Dasar Pengelolaan Pantai

"Filosofi Dasar Pengelolaan Pantai berdasarkan kondisi pantai di Indonesia"

- Indonesia memiliki garis pantai kedua terpanjang di dunia. Setiap pulau dan wilayah pantainya memiliki karakteristik, ancaman, dan pemanfaatan yang unik untuk lokasi yang terkait.
- Filosofi dasar dalam pengelolaan pantai adalah untuk mewariskan pantai ke generasi mendatang sebagai aset nasional bersama
- Oleh karena itu, diperlukan cara berpikir yang menyelaraskan usaha perlindungan pantai dengan pemanfaatan dan konservasi lingkungan sekitarnya.

"Pengelolaan pantai yang bertujuan untuk mencapai filosofi dasar"

- Direkomendasikan untuk mempromosikan pengembangan, konservasi, dan pengelolaan pantai yang komprehensif dalam jangka menengah dan panjang untuk cakupan wilayah yang luas.
- Pengembangan pantai difokuskan untuk bertumpu pada Pemerintah Daerah.

1.2 Arahan Pengelolaan Pantai

"Arah pengembangan fasilitas dan konservasi pantai"

- Penggalakkan pengembangan dan konservasi pantai yang didasarkan pada tiga (3) perspektif: perlindungan, penjagaan lingkungan, dan utilitas pantai.
- Dalam konteks perlindungan pantai, direkomendasikan untuk menjamin tercapainya tingkat perlindungan yang memadai dengan mempertimbangkan gelombang tinggi, limpasan gelombang/ombak, erosi pantai, perubahan topografi dan sedimentasi di sekitar muara sungai, penurunan muka tanah, perubahan iklim, dan sebagainya, dan melakukan integrasi pendekatan tindakan "keras" dan "lunak".
- Dalam konteks penjagaan lingkungan pantai, digalakkan konservasi dan perawatan pantai alami, terumbu karang, hutan bakau (*mangrove*), konservasi ekosistem pantai dan laut termasuk karang, ikan, dan spesies laut lainnya.
- Dalam konteks utilitas pantai, pengembangan utilitas dilakukan berdasarkan masukan dari komunitas lokal dan manfaat untuk menunjang kemudahan akses kepariwisataan.

1.2.1 Arahan Perlindungan Pantai

"Klasifikasi bencana pantai yang dipertimbangkan"

- Dalam konteks perlindungan pantai, direkomendasikan untuk memastikan tingkat perlindungan yang memadai terpenuhi. Pertimbangkan kondisi gelombang tinggi, limpasan gelombang/ombak, erosi pantai, sedimentasi, perubahan topografi muara sungai, penurunan muka tanah, perubahan iklim, dan sebagainya.
- Pantai Indonesia memiliki variasi yang signifikan untuk tiap daerah, dengan kondisi alami dan sosial ekonomi beragam tergantung kondisi daratan (hinterland) sekitarnya. Oleh karena itu, diperlukan penentuan target bencana pantai serta tingkat perlindungan yang memadai untuk menjawab ancaman tersebut, dengan mempertimbangkan kondisi alami, kejadian bencana pantai, populasi dan aset daratan di belakang pantai tinjauan, dan utilitas pantai.

"Mendesain perlindungan yang memadai menghadapi ancaman bencana pantai."

- Untuk pantai dengan sistem perlindungan yang didesain untuk menghadapi gelombang tinggi, limpasan gelombang, dan banjir laut, tingkat perlindungan didesain dengan mempertimbangkan status penggunaan lahan di belakang pantainya.
- Untuk pantai dengan sistem perlindungan yang didesain untuk menghadapi erosi pantai, tingkat perlindungan dasar didesain untuk mempertahankan garis pantai saat ini, dan target perlindungan lanjutannya adalah untuk mengembalikan garis pantai hingga titik tertentu dengan mempertimbangkan pemanfaatan pantai jika diperlukan.
- Untuk pantai dengan sistem perlindungan yang didesain untuk menghadapi penurunan muka tanah, tingkat perlindungan didesain untuk mengamankan wilayah dengan rentang waktu sepuluh (10) hingga seratus (100) tahun.
- Untuk pantai dengan sistem perlindungan yang didesain untuk menghadapi tsunami, tingkat perlindungan didesain untuk menghadapi tsunami dengan kriteria tertentu yang didasarkan pada studi kejadian terdahulu dan informasi lain yang dinilai relevan.
- Untuk pantai dengan sistem perlindungan yang didesain untuk menghadapi gelombang badai (*storm surge*), tingkat perlindungan didesain untuk menghadapi pasang tertinggi berdasarkan rekam historis badai sebelumnya yang disebabkan oleh angin topan dan sejenisnya, atau berdasarkan estimasi elevasi muka air di masa mendatang berdasarkan proyeksi masa depan, dengan mempertimbangkan kondisi gelombang tinggi pada saat prediksi mendatang tersebut pula.

"Arahan terhadap tindakan perlindungan pantai"

- Tujuan pengembangan fasilitas pantai, mempertimbangkan status penggunaan lahan di belakang pantai tersebut, adalah untuk mencegah masuknya air laut, erosi pantai. Jika air laut melimpas ke dalam tanggul, maka tujuan dari tindakan pantai adalah untuk mencegah kerusakan pada lahan yang dilindungi. Integrasi tindakan pantai berupa kombinasi dari beberapa tindakan dan struktur pelindung, termasuk pembentukan area sempadan pantai sebagai area penyangga.
- Direkomendasikan penggalakkan konservasi dan pemeliharaan perlindungan alami pantai seperti keberadaan pantai berpasir, terumbu karang, hutan bakau, dan sebagainya.
- Terkait tindakan penanggulangan menghadapi tsunami dan gelombang badai, selain pengembangan fasilitas pantai, diperlukan pula implementasi komprehensif yang mengombinasikan tindakan "keras" dan "lunak".
- Terkait tindakan penanggulangan menghadapi erosi pantai, direkomendasikan untuk mengimplementasikan tindakan dengan melakukan tindakan adaptif pengelolaan pantai dengan mempertimbangkan seluruh sel *littoral drift*.
- Mengingat muara sungai mengalami perubahan topografis yang signifikan sebagai respon dinamika gelombang dan suplai sedimen dari hulu, setiap tindakan di wilayah muara sungai perlu memperhatikan dampak jangka menengah dan panjang serta melingkupi area yang cukup luas untuk mengakomodasi keseimbangan suplai sedimen di sel wilayah tersebut. Pengelolaan sedimen yang komprehensif pada sistem transportasi sedimen dan pengelolaan lahan penting untuk ditekankan, terutama di daerah yang mengalami sedimentasi.

1.2.2 Arahan Pengembangan dan Konservasi Lingkungan Pantai

"Fungsi lingkungan pantai"

- Pantai menyediakan ekosistem untuk habitat yang beragam dan tempat tumbuh kembangnya organisme
- Pantai membentuk sebagian dari pemandangan alam yang luar biasa.

"Arahan tindakan untuk lingkungan pantai"

- Konservasi dan pemeliharaan lingkungan pantai harus hidup berdampingan dengan alam secara harmonis.
- Digalakkan pelestarian bentang alam, aset bernilai akademis, dan ekosistem beragam
- Bentuk peraturan dan regulasi konservasi lingkungan pantai.
- Untuk menciptakan lingkungan pantai yang memadai, pengembangan fasilitas pantai dilakukan sesuai kebutuhan
- Dampak lingkungan yang diakibatkan oleh kejadian insidental seperti tumpahan minyak harus ditangani dengan tepat
- Konservasi hutan bakau dan terumbu karang digalakkan untuk menjaga dan melestarikan kekayaan keanekaragaman hayati.
- Direkomendasikan untuk memastikan bahwa semua pihak yang terlibat dapat berbagi pemahaman bahwa lingkungan pantai harus dilestarikan.

1.2.3 Arahan Pemanfaatan Pantai oleh Masyarakat

"Pemanfaatan fungsi pantai"

- Pantai membentuk dan menjaga budaya regional komunitas lokal
- Pantai mendorong ragam pemanfaatan pantai seperti wisata, olahraga, aktivitas pendidikan, dan memberi ruang rekreasi.

"Arahan tindakan pemanfaatan pantai"

- Fasilitas pantai yang berkontribusi dalam peningkatan pemanfaatan pantai direkomendasikan untuk dikembangkan
- Diperlukan tindakan yang menjawab masalah penurunan kapasitas fasilitas pantai dan kapal karam dan/atau ditinggalkan yang secara signifikan mengganggu pemandangan dan kenyamanan pantai.
- Pastikan kelayakan dan keterjaminan akses masyarakat ke pantai
- Galakkan aktivitas yang meningkatkan kesadaran pengguna pantai untuk meningkatkan etika dan perilaku dalam memanfaatkan pantai.

1.3 Arahan Implementasi Fasilitas Pantai

1.3.1 Arahan Implementasi Fasilitas Baru atau Perbaikan Fasilitas Pantai

1.3.1.1 Penggalakkan pengembangan pantai yang lebih aman

"Tindakan yang dilakukan untuk mencapai target perlindungan yang diharapkan "

- Dalam pengembangan fasilitas pantai, direkomendasikan untuk melakukan integrasi berbagai tindakan di pantai termasuk namun tidak terbatas pada struktur "keras", melainkan pula memanfaatkan tindakan "lunak" seperti suplai pasir pantai (termasuk *sand bypassing* dari daerah tersedimentasi, dst). Pemanfaatan infrastruktur "hijau" seperti penanaman bakau dan mengombinasikan metode-metode di atas sangat dianjutkan. Untuk mendukung hal tersebut, manajemen penggunaan lahan yang mampu beradaptasi dengan perubahan kondisi wilayah pantai harus dikedepankan.
- Untuk mencegah kerusakan yang massif dan fatal akibat tsunami dan gelombang badai, direkomendasikan untuk dilakukan berbagai tindakan yang mengombinasikan beberapa fasilitas pantai secara komprehensif dengan efektif dan efisien.

- Pengelolaan sedimen pantai yang memadai harus dilakukan, termasuk dengan melakukan pendekan non structural seperti pengisian pasir (*sand nourishment*) dari daerah yang mengalami sedimentasi ke daerah yang mengalami erosi pada satu kesatuan garis pantai, dengan mempertimbangkan pergerakan pasir di wilayah tersebut.
- Untuk menjawab permasalahan penurunan muka tanah, integrasi pendekatan harus dilakukan, termasuk tindakan non struktural seperti penguatan peraturan, dengan mempertimbangkan perkiraan laju penurunan tanah dan perkiraan penyebab fenomena tersebut.
- Untuk perlindungan terhadap banjir pantai, gelombang tinggi, dan limpasan gelombang, direkomendasikan tindakan pencegahan dampak negatif akibat fasilitas pelindung tersebut ke pantai sekitarnya dengan mempertimbangkan kesetimbangan dinamika pantai di cakupan wilayah tersebut.

1.3.1.2 Penggalakkan tindakan konservasi pantai yang kaya akan alam, dan pembentukan pantai tersebut jika diperlukan

"Tindakan yang direkomendasikan untuk konservasi ekosistem penyelaman dan keindahan bentang alam."

- Pengembangan fasilitas pantai harus memperhatikan karakteristik alami pantai tersebut
- Konservasi dan restorasi pantai berpasir, terumbu karang, dan hutan bakau harus dikedepankan
- Pengembangan fasilitas pantai harus memperhatikan lingkungan alami sekitar pantai tersebut

1.3.1.3 Promosi tindakan untuk pantai yang berharga

"Tindakan yang direkomendasikan untuk memelihara dan meningkatkan kenyamanan pengunjung pantai dan lingkungan hidup komunitas lokal."

- Peningkatan kenyamanan pengunjung pantai dan pemeliharaan lingkungan hidup komunitas lokal harus diprioritaskan
- Dalam rangka mengamankan akses ke pantai, direkomendasikan penggunaan fasilitas seperti tangga, revetment berundak, dan revetment landai.
- Pelestarian dan pengembangan pantai berpasir direkomendasikan mengingat pantai berpasir merupakan ruang penting untuk pariwisata, aktivitas rekreasi penduduk setempat, dan pelestarian budaya lokal.
- Sangat dianjurkan untuk memfasilitasi aksesibilitas terhadap penyandang disabilitas.

1.3.2 Implementasi pemeliharaan dan perbaikan fasilitas pantai yang terencana dan efektif

"Perlunya pemeliharaan"

- Seiring penurunan fungsional fasilitas pantai, perlu dilakukan pemeliharaan untuk menjaga fungsi fasilitas tersebut dengan memperhatikan keseimbangan biaya perawatan dan manfaat yang diterima.

"Tindakan yang dianjurkan"

- Patrolia tau inspeksi fasilitas pantai yang berkala harus disiplin dilakukan
- Perawatan yang sistematis dan efektif serta perbaikan fasilitas pantai yang mengalami kerusakan harus dilakukan
- Catatan dan rekam historis hasil inspeksi, perbaikan, dan/atau penambahan konstruksi baru fasilitas pantai harus disimpan dan diarsipkan dengan baik.

1.4 Pertimbangan Lain dalam Pengelolaan Pantai

1.4.1 Inisiatif dari perspektif yang luas dan komprehensif

"Inisiatif tindakan harus didasarkan pada pandangan yang luas dan komprehensif."

- Terkait kenaikan muka air laut akibat perubahan iklim, pemahaman umum mengenai besaran elevasi muka air laut harus dimiliki masyarakat.
- Upaya-upaya pencegahan dan mitigasi bencana yang terpadu dan sistematis dilakukan melalui kerjasama dengan lembaga-lembaga terkait.
- Direkomendasikan untuk meninjau secara komprehensif dan dengan cakupan wilayah yang luas dalam menghadapi erosi pantai. Lakukan kerjasama dengan berbagai lembaga terkait. Tindakan sedimentasi dilakukan dengan mempertimbangkan seluruh sistem sedimen dari hulu sungai hingga sistem pesisir.
- Pemaduan berbagai tindakan yang diimplementasikan di dan sekitar lokasi pantai direkomendasikan untuk mengedepankan pemanfaatan pantai secara terpadu.

1.4.2 Kerjasama dengan Komunitas Lokal dan Meningkatkan Kesadaran Terkait Pengelolaan Pantai

"Hal-hal yang dilakukan bersama komunitas lokal untuk meningkatkan pemahaman dan kesadaran pengelolaan pantai"

- Dalam rangka menciptakan komunitas tahan bencana, peningkatan kesadaran dan pemahaman komunitas lokal terhadap ancaman bahaya di pantai penting untuk dilakukan
- Keindahan pantai ditingkatkan dengan melibatkan kerjasama dengan penduduk setempat, sukarelawan, dst.
- Sosialisasi peningkatan kesadaran pelestarian lingkungan pantai harus dilakukan untuk meningkatkan kepedulian public
- Direkomendasikan untuk menciptakan peraturan dan regulasi pemanfaatan pantai yang aman dan patut.
- Promosi filosofi pelestarian pantai dan *capacity building* di komunitas lokal
- Pelibatan komunitas lokal dalam pengelolaan pantai
- Untuk mendorong keterlibatan sektor privat pada konservasi pantai, canangkan program konservasi pantai dalam skema inisiasi CSR (*Corporate Social Responsibility*)

1.4.3 Mendorong Riset, Studi, dan Pemantauan

"Hal-hal yang perlu didorong oleh riset, studi, dan pemantauan."

- Mengumpulkan informasi dasar mengenai pantai
- Direkomendasikan untuk berkolaborasi dan saling berbagi informasi lintas berbagai sektor, termasuk sektor privat, dan memfasilitasi pertukaran teknologi internasional sebagai ajang pembelajaran
- Pemantauan elevasi muka air laut dan gelombang secara menerus untuk memantau dampak perubahan iklim. Akumulasi hasil pemantauan harus dapat disimpan dan diarsipkan secara cermat dan rapi.
- Pemantauan menerus dan akumulasi data terhadap implementasi fasilitas pantai untuk tindakan "abu-abu" dan "hijau" direkomendasikan untuk dilakukan untuk mengevaluasi efektivitas fasilitas tersebut dan dampaknya terhadap lingkungan pantai sekitar.

Pasal 2. Lokasi Persiapan Rencana Dasar Pengelolaan Pantai

- Lima pulau utama (Sulawesi, Kalimantan, Java, Papua, Sumatra) dan dua gugus kepulauan (Maluku dan Nusa Tenggara) ditunjuk untuk mempersiapkan dokumen Rencana Dasar Pengelolaan Pantai.
- Penentuan pembagian satu wilayah pantai, yang mana satu rencana pengelolaan pantai tersebut disiapkan, dilakukan berdasarkan kesamaan kondisi topografi dan oseanografi, keberlanjutan *littoral drift*, dan batas

administratif wilayah dengan rekomendasi pembagian sekitar 50-100 km per satuan wilayah rencana pengelolaan pantai.

Pasal 3. Pokok-pokok Penyusunan Rencana Dasar Pengelolaan Pantai

3.1 Hal-hal Mendasar yang Perlu Dicantumkan pada Rencana Dasar Pengelolaan Pantai

3.1.1 Hal-hal Mendasar Mengenai Pengelolaan Pantai

3.1.1.1 Status pantai saat ini dan arah konservasi pantai

- Visi jangka panjang pantai ditentukan berdasarkan karakteristik natural, sosial, dan faktor lainnya.

3.1.1.2 Hal-hal terkait perlindungan pantai

- Perlu ditentukan wilayah yang akan dilindungi. Tujuan dari perlindungan pantai adalah perlindungan terhadap bencana pantai, dan detail dari tindakan yang akan diimplementasikan untuk mencapai tujuan tersebut

3.1.1.3 Hal-hal terkait pengelolaan, pemeliharaan, dan konservasi lingkungan pantai

- Perlu ditentukan detail tindakan yang akan diimplementasikan untuk pelestarian lingkungan pantai, dan jika diperlukan pengembangan lingkungan pantai

3.1.1.4 Hal-hal terkait pemanfaatan pantai yang layak oleh publik

- Perlu ditentukan detail tindakan yang akan diimplementasikan untuk meningkatkan pemanfaatan dan utilitas pantai oleh publik.

3.1.2 Hal-hal Mendasar Mengenai Fasilitas Pantai

1) Hal-hal terkait peningkatan atau pengembangan baru fasilitas pantai

a. Lokasi konstruksi fasilitas pantai, baik baru maupun peningkatan yang sudah ada, harus ditentukan
b. Jenis, ukuran, dan denah fasilitas pantai di tiap lokasi yang didefinisikan pada poin (a) harus ditentukan
c. Tunjukkan area penerima manfaat konstruksi fasilitas pantai tersebut.

2) Hal-hal terkait pemeliharaan atau perbaikan fasilitas pantai

a. Lokasi fasilitas pantai yang akan dilakukan pemeliharaan atau perbaikan harus ditentukan
b. Jenis, ukuran, dan denah fasilitas pantai eksisting yang akan dilakukan pemeliharaan atau perbaikan di tiap lokasi yang didefinisikan pada poin (a) harus ditentukan
c. Metode pemeliharaan atau perbaikan tiap jenis fasilitas pantai yang diidentifikadi pada poin (b) harus ditentukan.

3.2 Hal-hal Penting yang Harus Diperhatikan terkait Rencana Dasar Pengelolaan Pantai

3.2.1 Memastikan Konsistensi dengan Rencana Pengembangan Terkait Lainnya

- Rencana Dasar Pengelolaan Pantai harus sejalan dengan rencana-rencana yang relevan seperti Rencana Tata Ruang Wilayah Nasional, rencana konservasi lingkungan, dan sebagainya.

3.2.2 Kerjasama dan Koordinasi dengan Lembaga Administratif Terkait

- Kerjasama yang memadai dan koordinasi yang intensif dengan lembaga administratif terkait pengelolaan pantai harus dilaksanakan secara efektif dan efisien
- Risiko lokal, termasuk sensitivitas terhadap perubahan iklim, penurunan muka tanah, dan sebagainya, harus diinformasikan kepada semua pihak yang terlibat dalam pengembangan komunitas

3.2.3 Partisipasi Penduduk dan Keterbukaan Informasi

- Partisipasi penduduk setempat harus difasilitasi
- Keterbukaan informasi terkait pantai harus dilaksanakan untuk meningkatkan transparansi proyek

3.2.4 Peninjauan Kembali Dokumen Perencanaan

- Dokumen Rencana Dasar Pengelolaan Pantai pada dasarnya ditinjau kembali setiap lima (5) tahun untuk menilai keperluan pembaruan, dan akan direvisi sesuai keperluan
- Dokumen Rencana Dasar Pengelolaan Pantai dan rencana pengembangan fasilitas pantai yang dinyatakan dalam dokumen tersebut akan disesuaikan sebagai respon perubahan kondisi lokal, sosial ekonomi Masyarakat setempat, dan efek perubahan iklim.