

Coastal & River

MANAGEMENT UNIT (MU)	ISSUE/IMPORTANCE	OBJECTIVE	ACTION/STRATEGY	RESPONSIBLE AGENCIES
MU15	Eroding Cat 2 & 3	<ul style="list-style-type: none"> To track shoreline changes, analyze seasonal impacts, identify flood & erosion risks and support sustainable management. 	<ul style="list-style-type: none"> Frequent observation Preparation for strengthening coastal protection, i.e., add no of groyne & beach nourishment if necessary Maintenance existing structure 	JPS Melaka JPS Daerah
	<ul style="list-style-type: none"> Coastal Protection 			
	<ul style="list-style-type: none"> Setback 	<ul style="list-style-type: none"> Periodically assess the elevation and stability of the bunds to ensure they are functioning as intended To maintain a safe level and making sure that the bunds are in good condition. Ensure the ongoing effectiveness and integrity of coastal bunds by regularly assessing their condition. Quickly address any issues with bunds to maintain their protective function and prevent flooding. Educate stakeholders and the public about the role of coastal bunds and their limitations to promote effective use and maintenance. Ensure that bunds are adequately elevated when mangrove cover is insufficient to provide effective natural flood protection. Implement additional protective measures on bunds when mangrove cover is critically low to ensure continued effectiveness 	<ul style="list-style-type: none"> Develop Comprehensive Setback Guidelines, i.e., Conduct scientific assessments & develop flexible setback guidelines Incorporate Adaptive Setback Practices, i.e., Design setback areas with buffers & Implement zoning regulations. <ul style="list-style-type: none"> Muddy Shoreline <ul style="list-style-type: none"> With existing bunds; <i>Coastal setback follows the alignment of the bund.</i> In already developed areas; <i>Setback is defined by the seaward edge of the development.</i> In undeveloped mangrove areas; <i>Setback is established at the landward boundary of</i> 	

			<p><i>the mangroves.</i></p> <ul style="list-style-type: none"> › Sandy Shoreline <ul style="list-style-type: none"> › Erosion occurs at a slower rate. › In unprotected areas: <i>Setback can be reduced to 30 meters.</i> › Where roads or critical infrastructure exist: <i>Setback may be positioned seaward of existing structures.</i> › In areas with revetments: <i>Setback should align with the revetment line.</i> › Setback lines in this study have been adjusted to allow for existing infrastructures and predicted movement of shorelines. • Integrate Natural Erosion Control Measures, i.e., Restore and protect natural habitats & Plant native vegetation • Enhance Shoreline Monitoring and Management, i.e., Conduct periodic shoreline surveys & Adjust setback requirements • Promote Sustainable Development Practices, i.e., Encourage low-impact development techniques & Limit construction activities • Educate and Engage Stakeholders, i.e., Conduct outreach and education programs & Involve stakeholders in planning and decision-making 	
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	<ul style="list-style-type: none"> • Tidal Gate 	<ul style="list-style-type: none"> • To evaluate tidal gate performance, 	<ul style="list-style-type: none"> • Monitor and maintain tidal gates and channels regularly. 	
	<ul style="list-style-type: none"> • Coastal Bund <ul style="list-style-type: none"> › Insufficient information on the bund levels, for reaches that have coastal bunds. › Mangrove cover fronting the bund is important in preventing bunds from overtopping and damage from wave action. › Mangrove cover of less than 50m means that the bunds is under threat of overtopping protection works on the bund must be carried out. 	<ul style="list-style-type: none"> • Periodically assess the elevation and stability of the bunds to ensure they are functioning as intended • To maintain a safe level and making sure that the bunds are in good condition. • Ensure the ongoing effectiveness and integrity of coastal bunds by regularly assessing their condition. • Quickly address any issues with bunds to maintain their protective function and prevent flooding. • Educate stakeholders and the public about the role of coastal bunds and their limitations to promote effective use and maintenance. • Ensure that bunds are adequately elevated when mangrove cover is insufficient to provide effective natural flood protection. • Implement additional protective measures on bunds when mangrove cover is critically low to ensure continued effectiveness • Prevent damage to bunds caused by heavy vehicle loads to ensure their long-term stability and effectiveness. 	<ul style="list-style-type: none"> • Frequent observation • Installation of coastal protection where areas are inundated 	

Marine Habitats and Biodiversity

The proposed development management strategies for marine habitats and biodiversity at MU15 are as follow.

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<ul style="list-style-type: none"> MU15 (Merlimau to Sg. Kesang) 	Mangroves <ul style="list-style-type: none"> To protect, conserve and rehabilitate the mangrove areas. To facilitate mangrove regeneration by implementation of appropriate tools and methods. 	<ul style="list-style-type: none"> Gazettement of mangrove areas as Permanent Forest Reserve at state land mangrove forests. 	<ul style="list-style-type: none"> Mangroves serves various ecological importance such as providing protection and habitat for a wide diversity of aquatic species of different taxonomic groups. 	<ul style="list-style-type: none"> Department of Forestry,
<ul style="list-style-type: none"> MU15 (HS Paya Laut Merlimau and HS Paya Laut Merlimau (Tambahan)) 		<ul style="list-style-type: none"> Prohibit land use conversion within permanent forest reserve into other development projects. 	<ul style="list-style-type: none"> Protected mangrove areas (Permanent Forest Reserve) i.e., Hutan Paya Laut Merlimau (11.72 ha) and Hutan Paya Laut Merlimau (Tambahan) (33.62 ha). 	<ul style="list-style-type: none"> Department of Forestry,
<ul style="list-style-type: none"> MU15 (Merlimau, Ayer Tawar and Sebatu) 		<ul style="list-style-type: none"> Rehabilitation, restoration and replanting of suitable mangrove species. No coastal reclamation projects allowed from Merlimau to Sg. Kesang. 	<ul style="list-style-type: none"> Degradation of mangrove areas along the Melaka coastline due to coastal erosion and aquaculture developments 	<ul style="list-style-type: none"> Department of Forestry, Developers.
<ul style="list-style-type: none"> MU15 (off Sebatu) 	Mudflats <ul style="list-style-type: none"> To protect and conserve the mudflat areas. 	<ul style="list-style-type: none"> Protect mudflat areas due to its importance as cockle/ mussel farming areas. No coastal reclamation projects allowed from Merlimau to Sg. Kesang. 	<ul style="list-style-type: none"> Mudflat areas are important for cockle and mussel farming off Sebatu coastline. 	<ul style="list-style-type: none"> Department of Fisheries.
<ul style="list-style-type: none"> MU15 (HS Paya Laut Merlimau and HS Paya Laut Merlimau (Tambahan)) 	Wildlife in Mangrove Forest <ul style="list-style-type: none"> To protect and conserve important wildlife habitats. 	<ul style="list-style-type: none"> Prohibit land use conversion at permanent forest reserves into other development projects. 	<ul style="list-style-type: none"> Mangroves serves various ecological importance such as providing protection and habitat for a wide diversity of terrestrial fauna species of different taxonomic groups. 	<ul style="list-style-type: none"> Department of Forestry.
			<ul style="list-style-type: none"> Mangroves and/or mudflats of Sg. Ayer Tawar and Kuala Sebatu are 	<ul style="list-style-type: none"> Melaka State Government,

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<ul style="list-style-type: none"> MU15 (Ayer Tawar and Kuala Sebatu) 		<ul style="list-style-type: none"> Enhance and promote sustainable ecotourism for birdwatching at Sg. Ayer Tawar and Kuala Sebatu. Propose mangrove areas from Merlimau to Sg. Kesang to be considered as Important Bird and Biodiversity Areas (IBAs). No land reclamation projects allowed at mangroves and mudflats off Merlimau to Sg. Kesang. Promote sustainable coastal development at the mangroves and mudflats off Merlimau to Sg. Kesang. 	<ul style="list-style-type: none"> important avifauna roosting sites for both migrant and resident birds. Development activities along the coastline could affect mangrove habitats thus impact the migratory bird observation activities and eco-tourism at Sg. Ayer Tawar, and Kuala Sebatu. 	<ul style="list-style-type: none"> PERHILITAN, Department of Forestry, Majlis Bandaraya Melaka Bersejarah (MBMB), NGOs.
<ul style="list-style-type: none"> MU15 (Sebatu and Sg. Kesang) 	<ul style="list-style-type: none"> To ensure the safety of public beaches from wildlife attacks (e.g. crocodile). 	<ul style="list-style-type: none"> Promote awareness, education and safety programme about crocodile behaviour and habitats. Installation of warning signboard (e.g. crocodile habitats) at respective beaches/ river. 	<ul style="list-style-type: none"> The presence of crocodiles in coastal areas, especially recreational beaches pose a significant risk to tourism and public safety. 	<ul style="list-style-type: none"> PERHILITAN, Majlis Bandaraya Melaka Bersejarah (MBMB), NGOs.
<ul style="list-style-type: none"> MU15 (Merlimau to Sg. kesang) 	<ul style="list-style-type: none"> To reduce impact on human-wildlife conflicts. 	<ul style="list-style-type: none"> Promote sustainable coastal development at mangroves area. Development of human-wildlife conflict management plan. 	<ul style="list-style-type: none"> Presence of wildlife (small mammals & avifauna) in mangroves. Presence of crocodiles in coastal areas especially at recreational beaches pose a significant risk to tourism and public safety. Development activities could affect mangrove habitats and thus can cause potential human-wildlife conflicts. Human-wildlife conflict can result in the decline and potential loss of species due to habitat degradation, 	<ul style="list-style-type: none"> PERHILITAN, Majlis Bandaraya Melaka Bersejarah (MBMB), Department of Town and Planning, Developers. NGOs.

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			while communities can suffer from financial losses (ecotourism) and threats to public safety, livelihoods and property.	

Fisheries and Aquaculture

The proposed development management strategies for marine capture fisheries and recreational fisheries at MU15 are as follow.

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<ul style="list-style-type: none"> MU15 (Merlimau and Sebatu) 	Marine Capture Fisheries <ul style="list-style-type: none"> To ensure high standards of fish quality, enhanced food safety and nutritional value through provision of better fisheries infrastructures and facilities. 	<ul style="list-style-type: none"> Upgrade the fisheries infrastructures at Merlimau and Sebatu fish landing points. 	<ul style="list-style-type: none"> Lack of fisheries infrastructures at Merlimau and Sebatu fish landing points. 	<ul style="list-style-type: none"> Department of Fisheries. LKIM. Melaka State Government.
	<ul style="list-style-type: none"> To improve the navigation of fishing vessels at Merlimau and Sebatu. 	<ul style="list-style-type: none"> Undertake maintenance dredging at Merlimau and Sebatu. 	<ul style="list-style-type: none"> Siltation issues prevented safe passage for fishing vessel during low tides. 	<ul style="list-style-type: none"> Department of Drainage and Irrigation.
	<ul style="list-style-type: none"> To ensure food security and safety. 	<ul style="list-style-type: none"> Gazettement of mangroves areas as Permanent Forest Reserve at state land mangrove forests. Prohibit land use conversion at permanent forest reserves into other development projects. Rehabilitation, restoration and replanting of suitable mangrove species at the affected mangrove areas. Deployment of artificial reefs and Fish Aggregating Devices (FADs). Promote sustainable coastal development through enhancement of fisheries habitat (eco-engineering structures). No coastal reclamation projects allowed off Merlimau to Sg. Kesang. 	<ul style="list-style-type: none"> Coastal development such as reclamation can cause negative impacts on fisheries resources and fishermen income. 	<ul style="list-style-type: none"> Department of Forestry, Department of Fisheries, Developers.

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<ul style="list-style-type: none"> MU15 (Merlimau and Sebatu) 	<ul style="list-style-type: none"> To promote sustainable fishing methods and practices. 	<ul style="list-style-type: none"> Strengthen the surveillance and enforcement. 	<ul style="list-style-type: none"> Utilization of unsustainable fishing gear as a common fishing method practice. 	<ul style="list-style-type: none"> Department of Fisheries.
<ul style="list-style-type: none"> MU15 (Merlimau and Sg. Kesang) 	Aquaculture <ul style="list-style-type: none"> To minimize the potential of water quality degradation to aquaculture activities. To promote sustainable aquaculture practices. 	<ul style="list-style-type: none"> Provision of water treatment facilities, sewage treatment plants (STPs) or other appropriate structures at the aquaculture farms to reduce discharge of untreated water directly into the river. Regular maintenance of treatment ponds. Encourage culturists to obtain MyGAP certification. Retain the status of Aquaculture Industrial Zone (ZIA) at Sebatu. 	<ul style="list-style-type: none"> Degradation of water quality due to the untreated wastewater discharge from brackishwater pond culture. 	<ul style="list-style-type: none"> Department of Fisheries, Department of Environment.
<ul style="list-style-type: none"> MU15 (Air Tawar to Sebatu) 	<ul style="list-style-type: none"> To ensure food security and safety 	<ul style="list-style-type: none"> Promote sustainable coastal development. 	<ul style="list-style-type: none"> Harmful Algae Blooms (HAB) can affect mussel and cockle farming activities undertaken off Air Tawar to Sebatu. 	<ul style="list-style-type: none"> Department of Fisheries, Department of Environment, Melaka State Government.
<ul style="list-style-type: none"> MU15 (Kelong off Sebatu) 	<ul style="list-style-type: none"> Recreational Fisheries To improve recreational fisheries infrastructures and facilities. 	<ul style="list-style-type: none"> Upgrade the recreational fisheries infrastructures. Upgrade/Provision of septic tanks/toilets. 	<ul style="list-style-type: none"> Limited recreational fisheries infrastructures and facilities. 	<ul style="list-style-type: none"> Melaka State Government MOTAC Melaka Majlis Bandaraya Melaka Bersejarah (MBMB).

Water Quality

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MU15	<p>Conservation of the Forest Reserve</p> <ul style="list-style-type: none"> Avoid encroachment and illegal trees felling within the forest reserve <p>Waste Control</p> <ul style="list-style-type: none"> Solid waste and Scheduled Waste Control <p>Erosion and Sediment Control</p> <ul style="list-style-type: none"> Control the sedimentation <p>Sewage Discharge</p> <ul style="list-style-type: none"> Control of sewage discharge 	<ul style="list-style-type: none"> Promote the use of environmentally friendly and biodegradable fertilizers and pesticides. Enhance the implementation of biological control for pest control. New activities that fall under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 must submit the EIA report to the Department of Environment for approval. New activities that do not fall under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 shall submit their development proposal to the Local Authority and conditions on discharge should be imposed on the operators. Provision of Erosion and Sediment Control (ESCP) for land clearing activities Submission of the ESCP plan to the Department of Irrigation and Drainage (DID) for approval prior to start of land clearing and earthwork activities Provision of septic tanks in remote areas Upgrading of existing sanitary facilities Compliance to Malaysian Marine Water Quality Standard Compliance to Standard Kebangsaan Kualiti Air Rekreasi Semulajadi dan Garispanduan bagi Pemantauan Air Rekreasi Semulajadi Compliance with Environmental Quality (Sewage) Regulations 2009 Environmental Quality (Scheduled Waste) Regulations 2005 	<ul style="list-style-type: none"> MU15 extends from the estuary of Sungai Kesang to Kuala Merlimau. It is the only area in the study that includes a Forest Reserve, known as Hutan Simpan Paya Laut Merlimau. Water quality index within this MU is Moderate. 	<ul style="list-style-type: none"> Department of Forestry Department of Environment Local Council and Authorities Indah Water Konsortium (IWK) National Water Services Commission (Suruhanjaya Perkhidmatan Air Negara, SPAN)

Land Use

MANAGEMENT UNIT (MU) (LOCATION)	MANAGEMENT OBJECTIVES	MANAGEMENT STRATEGIES	ISSUE/IMPORTANCE/REASON	RESPECTIVE/ RESPONSIBLE AGENCIES
Human Settlement				
MU15	<ul style="list-style-type: none"> To manage and control any land use changes along the coast 	<ul style="list-style-type: none"> Define coastal zoning categories (including residential, commercial, conservation, and mixed-use areas). Establish zoning regulations Control the allowable density type for any development along the coast. Limit land conversion and approval for TOL permit 	<ul style="list-style-type: none"> Increase of population along the coastline may impact the existing infrastructure (including road, utilities, and traffic) 	<ul style="list-style-type: none"> MPJ PTD Jasin PTG Melaka JKR JPS IWK SAMB TNB
	<ul style="list-style-type: none"> To prevent and control erosion. To ensure compliance with environmental regulations regarding hydraulic impact assessments and erosion control. 	<ul style="list-style-type: none"> Construct proper erosion control structures such as retaining walls and sediment control barriers. Conduct regular hydrological studies to identify high-risk erosion zones. Enforce guidelines for land development near water bodies to minimize erosion risks. 	<ul style="list-style-type: none"> Impact from the hydraulic can cause erosion to the settlement 	<ul style="list-style-type: none"> JPS
	<ul style="list-style-type: none"> To reduce environmental impact caused by the construction activities on the site 	<ul style="list-style-type: none"> Prepare an Environmental Impact Assessment (EIA) for any major projects along the coast (based on the DOE requirements). Manage thorough evaluations of EIA before approving construction projects. Adhere to the Environmental Managing Plan (EMP) recommendations as part of the mitigation major. Conduct periodical inspection during and after construction. 	<ul style="list-style-type: none"> Any changes to land use due to construction may affect the environment. 	<ul style="list-style-type: none"> MPJ DOE
	<ul style="list-style-type: none"> To monitor coastal development 	<ul style="list-style-type: none"> Conduct periodical inspection. Regulate the law related to any developments along the coast. 	<ul style="list-style-type: none"> Coastal development within Melaka coastline possesses adverse impacts towards 	<ul style="list-style-type: none"> MPJ PTD Jasin PTG Melaka

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		<ul style="list-style-type: none"> Implement sustainable zoning regulations to prevent excessive land reclamation. 	adjacent mudflat areas.	
Forest and Mangroves				
MU15	<ul style="list-style-type: none"> To protect the coastal of the state. To protect, conserve and rehabilitate the mangrove areas. 	<ul style="list-style-type: none"> Gazettement of mangroves areas as Permanent Forest Reserve at state land mangrove forests. 	<ul style="list-style-type: none"> Mangrove serves various ecological importance such as providing protection and habitat for a wide diversity of aquatic species of different taxonomic groups. 	<ul style="list-style-type: none"> FDPM
		<ul style="list-style-type: none"> Prohibit land use conversion within mangrove areas into other development projects 	<ul style="list-style-type: none"> Extensive protected mangroves area, including the area between Umbai to Sungai Rambai 	<ul style="list-style-type: none"> FDPM
		<ul style="list-style-type: none"> Prohibition of new development plans to facilitate the regeneration of mangrove within respective areas. 	<ul style="list-style-type: none"> Regeneration and re-establishment of mangroves. 	<ul style="list-style-type: none"> FDPM
		<ul style="list-style-type: none"> Rehabilitation, restoration and replanting of suitable mangrove species at the affected areas. Facilitate mangrove regeneration by implementation of appropriate tools and methods. 	<ul style="list-style-type: none"> Degradation of mangroves area at some part within Melaka coastline due to the coastal erosion. 	<ul style="list-style-type: none"> FDPM
		<ul style="list-style-type: none"> Promote programs related to the restoration and replanting of suitable mangrove species. Provision of buffer zone between mangrove and development areas. Restoration of abandoned farms as an alternative to minimize the development of new aquaculture farms. 	<ul style="list-style-type: none"> Potential mangrove forest degradation due to coastal and aquaculture developments. 	<ul style="list-style-type: none"> FDPM
	<ul style="list-style-type: none"> To regulate human activities in order to minimize environmental impact 	<ul style="list-style-type: none"> Establish guidelines for tourism, aquaculture, and infrastructure development. Enforce regulations to control pollution, illegal 	<ul style="list-style-type: none"> Existence of the human activities within the mangrove forest, and requires proper 	<ul style="list-style-type: none"> FDPM MPJ

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		logging, and encroachment.	management	
Paddy-Field				
MU15	<ul style="list-style-type: none"> To provide incentives for sustainable and high-yield rice farming. 	<ul style="list-style-type: none"> Provide training programs on modern farming techniques and sustainable practices. Ensure access to financial aid, subsidies, and agricultural insurance for small-scale farmers. 	<ul style="list-style-type: none"> Paddy field is highly importance due being one of the key food security areas for the country High involvement of the local people within these economic activities particularly in Jasin District 	<ul style="list-style-type: none"> Jabatan Pertanian Negeri Pejabat Pertanian Daerah
	<ul style="list-style-type: none"> To encourage the use of multi functions infrastructures in order to manage the non-renewable water for agriculture. To protect from non-point source of pollution as to manage non-revenue water. 	<ul style="list-style-type: none"> Establish efficient drainage systems to flush out excess salt from the soil. Introduce and cultivate salt-tolerant rice strains that can withstand higher salinity levels. 	<ul style="list-style-type: none"> Paddy field which facing the sea needs extra measures in order to prevent excessive salt water access the crops 	<ul style="list-style-type: none"> Jabatan Pertanian Negeri Pejabat Pertanian Daerah
Aquaculture				
MU15	<ul style="list-style-type: none"> To implement water management and pollution control. 	<ul style="list-style-type: none"> Encourage and promote the application myGAPs as a basis of the framework by the operators. Promote water-saving techniques, such as rainwater harvesting and efficient irrigation methods. Develop proper waste collection, treatment, and disposal systems to prevent contamination. Encourage integrated aquaculture systems, such as combining fish farming with hydroponics (aquaponics), to naturally recycle nutrients. 	<ul style="list-style-type: none"> Issues of water usage and waste disposal from the aquaculture farming which may affect the environment. 	<ul style="list-style-type: none"> Jabatan Perikanan Pejabat Perikanan Negeri Melaka