

JABATAN PENGAIRAN DAN SALIRAN M A L A Y S I A

Guidelines on Erosion Control for Development in the Coastal Zone An explanatory note By Ir. Arman Bin Mokhtar MIEM, P. Eng. 18 April 2018

Presentation Outline

- Background
- The guidelines explained..with pictures
 - Shorefront development
 - Backshore development
 - Coastal reclamation
 - Offshore sand-mining
- Data requirement
- Conclusion

Background

- National Coastal Erosion Study 1986
 - 29% shoreline eroding
 - Three categories
 - Critical serious erosion where property is immediately threatened
 - 2. Significant serious erosion occurring and property may be threatened in 5 years if no action taken
 - 3. Acceptable areas with serious erosion but of no significant economic value
- Uncontrolled development major contributor to erosion problems

Background

- Following completion of National Coastal Erosion Study 1987 – government implemented twopronged strategy for coastal erosion control
 - Short term strategy is reactive build coastal protection for critical areas
 - Long-term strategy is preventive regulatory measures such as laws, administrative circulars, guidelines to control development
- Long-term strategy implemented for coastal protection
 - Surat Pekeliling Am. Bil. 5 Tahun 1987
 - Garispanduan JPS 1/97
 - Garispanduan Kajian Hidraulik

Background

Purpose

- Ensuring proper planning and implementation of coastal development projects
- Obviate/avoid coastal erosion problems due to human activities
- Ensure sustainable development

Status

 Guidelines approved by Cabinet 29 January 1997





Coastal Erosion Areas



JPS Guidelines 1/97

.....explained..

Garispanduan JPS 1/97

- Types of Coastal Development addressed by Guidelines
 - Shorefront Development
 - Backshore Development
 - Coastal Reclamation
 - Offshore Sand Mining





Typical Beach Profile



- Projects located on the shoreline or foreshore or protruding seawards
 - Jetty
 - Groyne
 - Marina
 - Reclamation
 - Bridge
 - Ports
 - Breakwaters
 - Pipelines/marine cables
 - Outfalls



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THERES



Nearshore Breakwaters

Shore-connected breakwaters

Groyne (groyne field)

- Shorefront projects can interfere with equilibrium of natural processes
- Results in negative impacts erosion, unwanted accretion, sedimentation
- 'Solid structures' interrupt littoral processes
- Developers need to conduct hydraulic studies to determine impacts – both longterm and short term
- Propose mitigative measures

Impact of Rivermouth breakwaters: improves navigation but changes shoreline processes

Source of sediment

Downdrift: local erosion

Updrift: Sediment blocked by breakwater

Net direction of littoral drift







- Open piling system preferred
- Solid barriers (sheet pile wall) interfere with sediment transport





PORT DICKSON: Chalet on stilts (open-pile)

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m

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General guidline:

∀ "vertical faced shoreline structure" not encouraged!



∀ "vertical faced shoreline structure" not encouraged!

Seawall/Vertical Structure





Marine outfalls should be built with

- Minimum 1 meter cover beneath seabed
- outlet should be beyond MLWS (MLLW)



Marine outfalls



- Hotel and condominiums
- Housing
- Industry
- Agriculture
- Tukar Syarat
- Application for government land (permanent or temporary)



Batu Feringghi, Penang: High density backshore development



 Changes to lagoon area due to backshore development affects 'tidal prism'

Results in rivermouth sedimentation

 Hidraulic studies needed to ascertain impact and subsequent mitigative measures

- Reduction of 'sand bank' by removal or usage of beach sand
 - increases chances of erosion or unwanted accretion on adjacent beaches
- General considerations for setback
 - Proposed development must be set-back behind and outside the dynamic zone in order to avoid cyclical erosion and deposition patterns
 - Current erosion classification or stability condition of the shoreline is not the decisive factor
 - Need to recognise (and respect) the unpredictability and dynamics of the coastal zone



Minimum Setback Requirement for Sandy Beaches is 60m from Mean High Water Line

PLAN VIEW OF SETBACK



39



400 meter

Minimum Setback requirement for mud coasts is 400m from seaward edge of mangrove treeline

- Avoid developing on beach/sand dunes: these are sediment banks or reserves that replenish the beach and absorb wave energy
- No development or re-development on sand spits and sand bars: these are often unstable features since they form in the dynamic zone



Sand Dune - reserve of sand

- No development or re-development on sand spits and sand bars
 - these are unstable features since they are very dynamic
 - Sand spits are prone to shift and change during storms and floods
 - Sand bars change considerably under storm conditions and can disappear entirely





Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- If proposed development is within 1 km of a well-developed area with high-value permanent buildings located at distances less than the general setback distance
- Erosion is not occurring
- Setback cannot be any less than the minimum existing setback





Exceptions: cases where setback distances can be reconsidered/ reviewed:-

• Proposed development is behind a JKR road or coastal bund where these structures must be protected





Exceptions: cases where setback distances can be reconsidered/ reviewed:-

 Developer undertakes to do coastal erosion control (design still has to be approved by JPS*)

* cannot be applied for mangrove forests and/or public beaches with tourism potential



Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- Development is on erosion resistant headlands
- Developed area is 5 m above MSL
- Turtle nesting facilites (turtles need sand)

- Types of reclamation
 - Island concept
 - Preserves mangroves
 - Drainage patterns maintained
 - Separation channel needs maintenance
 - Peninsular concept
 - Extension of original coastline
 - New sea frontage
 - Loss of beaches



Island concept: Tanjung Tokong Land Reclamation Project, Penang (980 ha)

Reclamation in Langkawi: peninsular concept

Peninsular concept: Reclamation For Airport Runway - Kota Kinabalu, Sabah



Net Longshore Sediment Transport







Reclamation effects: rivermouth sedimentation

Impacts

- Loss of sea-frontage and recreational beach
- Interference with coastal processes
 - Erosion of adjacent beach
 - Siltation of drainage channels
- Interference of natural drainage channels
- Destruction of mangrove, other ecosystems and habitats
- Pollution of coastal waters
- Loss of aquaculture or fish landing sites

Data Requirement

• What needs to be included in proposal

- Key plan 1:50000,
 - landuse, flora & fauna
- Location plan
 - lots within 1 km of site
 - Layout of existing infrastructure eg roads, coastal structures, bunds, drains
 - Aquaculture, fisheries, habitat
- Site plan 1:500
 - Buildings and structures
 - High water mark
 - Drainage system; erosion control structures
- Design calculation
- Photos
- Info specific to proposed development

- Impacts...contd.
 - Silting-up of existing tidal gates
 - 'Backwater' effect in upstream areas lead to flooding

Scope of Impact Evaluation Study

- Key, location and site plan
- Topographic, hydrographic, physical conditions of site and adjacent areas including socio-economics
- Historical shoreline change
- Prediction/measurement of sediment, littoral transport and sediment budget for pre and post project scenarios
- Project affect on neighboring shoreline
- Project impact on environment and economic activities
- Identify and map mitigative measures to overcome adverse effects

- Subject to impact evaluation studies including hydraulic studies
 - identify impacts of various reclamation scenarios
 - Propose mitigation measures

 Multiple reclamation projects along same coastline may need macro EIA to determine overall impact

Offshore Sand Mining













Drawdown effect due to dredged pit too close to shore
Offshore Sand-mining

Impacts

- Drawdown
- Interference to sediment transport
- Loss of offshore sandbars that are sediment 'banks'
- Destruction of aquatic life
 - Benthic organisms on seabed
 - Turbidity due to dredging activity
 - Sedimentation over sensitive habitats (corals)

Affect of sand mining too close to shore



Dredged pit created near shoreline

Over the pit, current velocity reduces, sediment settles in

Reduced sediment supply to downdrift beach

Affect of sand mining too close to shore



Suspended sediments endanger aquatic life



Offshore Sand-mining

- Jurisdiction
 - State Governments: from low water mark up to 3 nautical miles
 - Federal Government: from 3 nautical mile limit up to continental shelf



Guidelines for Offshore Sand-mining



Offshore Sand-mining

- Exceptions if not possible to fulfil distance requirement of guidelines then,
 - Proponent must prove that dredging of sand source does not create adverse environment impact
 - Must conduct hydraulic study with numerical modelling
 - Must propose mitigative measures

Conclusion

- Guidelines designed as a preventive measure against coastal erosion/sedimentation and other environmental problems
- Explains the necessary scope of impact study for coastal development project
- To be used by all project proponents government/private sector/individual