

KURSUS PEMODELAN HIDRAULIK 1 BAGI PROJEK PEMBANGUNAN DI PANTAI DAN LUAR PANTAI

PEMBANGUNAN PANTAI YANG MEMERLUKAN KAJIAN HIDRAULIK

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PRESENTATION CONTENTS

1) Introducing **Coastal Development That Require Hydraulic Modelling**

2) Learning **The Terminology of Coastal Structure and Development**

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4) Understanding the **Coastal Engineering Problems that Require Hydraulic Knowledge**

5) The **Need for Hydraulic Study**

6) Examples of **Shoreline Geometry that are Affected by Coastal Development**

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8) Understanding the **Dynamic of Shoreline that Must Be Taken Into Account In Hydraulic Study**

1. COASTAL DEVELOPMENT THAT REQUIRE HYDRAULIC STUDY

1) Land Reclamation

2) Coastal Structures (Breakwater/ jetty/ wharfs/ groynes)

3) Dredging and Offshore Disposal Ground

4) Ports

5) Petro-chemical Industries (Offshore/ Coastal Zone)

6) Resort and Recreational Development (Coastal)

2. TERMINOLOGY OF THE COASTAL STRUCTURE AND DEVELOPMENT

A. Breakwater

- i. **SHORE CONNECTED BREAKWATER** is a structure that protects a shore area, harbour, anchorage or basin from waves. Breakwater for navigation purposes are constructed to create calm water in harbour areas, which provides protection for safe mooring, operating and handling of ships, and harbour facilities
- ii. **OFFSHORE BREAKWATER** is a structure that is design to provide protection from wave action to an area or shoreline located on the leeward side of the structure. Offshore breakwater are usually oriented approximately parallel to the shore. They may also provide protection for erodible shorelines. Also serves as a littoral barriers- sediment trap.
- iii. **SEGMENTED BREAKWATER:** A very functional solution for long section of shoreline that requires wave transmission to prevent tombolo formation. Segmented breakwater can be designed to allow the beach in their lee to accrete enough sediment to provide an erodible buffer during storm and still maintain the natural longshore transport rate during normal wave conditions.

B. Jetty

A jetty is a structure that extends into the water to direct and confine river or tidal flow into a channel and prevent or reduce the shoaling of the channel by littoral material

C. Seawall, Bulkheads And Revetments

Are structures placed parallel or near parallel to the shoreline to separate land area from sea area. The primary purpose is to retain land and prevent damage from wave action (only protect land immediately behind and not adjacent areas, upcoast and downcast)

D. Groynes

A shore protection structure designed to trap longshore drift for building a protective beach, retarding erosion of an existing beach or preventing longshore drift from reaching some downdraft point. Groynes are narrow structures of varying lengths and height and are usually constructed perpendicular to the shoreline

E. Dredging

An excavation activity in which materials are recovered from beneath the water surface. The purpose is generally to gather bottom sediment and either dispose of it at a different location or use these sediments in various products.

F. Land Reclamation

Land reclamation is the gain of land from the sea or wetlands, or other water bodies, and restoration of productivity or use to lands that have been degraded by human activities or impaired by natural phenomena.

G. Offshore Disposal Ground

An open water disposal of dredged material. It is normally in deep water many kilometer offshore.

3. LEGAL REQUIREMENT

ENVIRONMENTAL QUALITY (PRESCRIBED ACTIVITIES) (ENVIRONMENTAL IMPACT ASSESSMENT) ORDER 2015

FIRST SCHEDULE

➤ ITEM 7: LAND RECLAMATION

Coastal reclamation or land reclamation along river banks involving an area of less than 50 ha. (the gain of land from the sea or wetland or other bodies and to restore productivity for other types of land use

➤ ITEM 10: PORTS

- a) Expansion of port involving an increase of 50 percent or more in handling capacity per annum.
- b) Expansion of fishing port involving an increase of 50 percent or more in fish landing capacity per annum.

➤ ITEM 12: DEVELOPMENT IN COASTAL AND HILL AREA

- a) Construction of building or facilities with 80 rooms or more in coastal area.

➤ ITEM 15: DREDGING

- a) Capital dredging
- b) Disposal of waste dredged materials

3. LEGAL REQUIREMENT

SECOND SCHEDULE

➤ ITEM 4: FISHERIES

- Land based aquaculture projects accompanied by clearing of mangrove forest , peat swamp forest or fresh water swamp forest covering an area of 50 hectares or more.

➤ ITEM 5: FORESTRY

f) Conversion of an area of:

- i) mangrove forest;
- ii) peat swamp forest; or
- iii) fresh water swamp forest,

for industrial, housing or agricultural use covering an area of 50 hectares or more.

- g) Clearing of mangrove forest, peat swamp forest or fresh water swamp forest on islands adjacent to any national marine park.

➤ ITEM 7: LAND RECLAMATION

- a) Coastal reclamation or land reclamation along river banks involving an area of 50 hectares or more.
- b) Coastal reclamation or land reclamation along river banks within or adjacent or near to environmentally sensitive areas.
- c) Reclamation for man-made island.

CLASSIFICATION OF COASTAL ENGINEERING PROBLEMS

SHORELINE STABILIZATION

SEAWALL

BULKHEAD

REVTMENT

BEACH
NOURISHMENT

DETACHED
BREAKWATERS

GROYNES

SAND BYPASSING AT
INLET

CONSIDERATIONS:

- Hydraulics
- Sedimentation
- Control Structure
- Maintenance
- Legal Requirements
- Environment
- Economics

BACKSHORE PROTECTION

SEAWALL

PROTECTIVE BEACH

REVTMENT

BULKHEAD

CONSIDERATIONS:

- Hydraulics
- Sedimentation
- Control Structure
- Maintenance
- Legal Requirements
- Environment
- Economics

INLET STABILIZATION

DREDGING

JETTIES

NAVIGATION

CONSIDERATIONS:

- Hydraulics
- Sedimentation
- Navigation
- Control Structure
- Maintenance
- Legal Requirements
- Environment
- Economics

BAY CIRCULATION

CONSIDERATIONS:

- Hydraulics
- Sedimentation
- Control Structure
- Legal Requirements
- Environment
- Economics

HARBOUR PROTECTION

JETTIES

SHORE - CONNECTED
BREAKWATER

OFFSHORE
BREAKWATER

CONSIDERATIONS:

- Hydraulics
- Sedimentation
- Navigation
- Control Structure
- Maintenance
- Legal Requirements
- Environment
- Economics

5. THE NEED FOR HYDRAULIC STUDY

Coastal development alters:

1

Wave (Height, direction, and pattern)

2

Current (Speed and direction)

3

Coastal sediment movement (onshore, alongshore and offshore)

4

Sand budget (equal, reduce or increase)

5

Shore geometry & morphology (Shape and form)

6

Water quality (reduce or increase flushing and degradation of water)

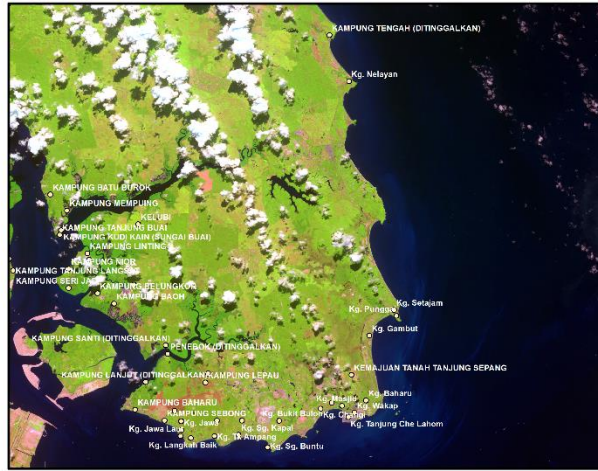
7

Land use (creating new land or structure)

6. EXAMPLE OF SHORELINE GEOMETRY



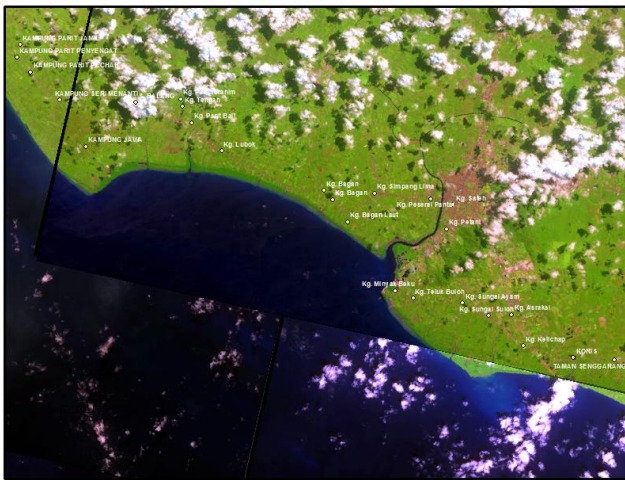
Kelantan Delta



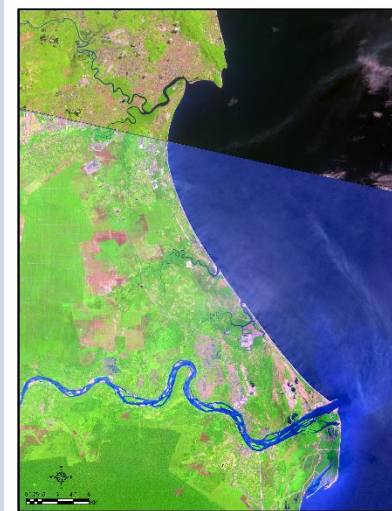
Log Spiral Bay at Mersing



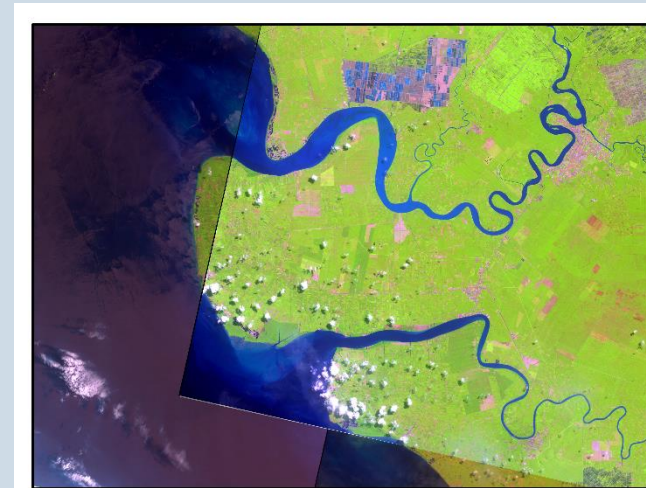
Rectilinear shoreline from Kukup to Pontian



Concave Bay at Batu Pahat



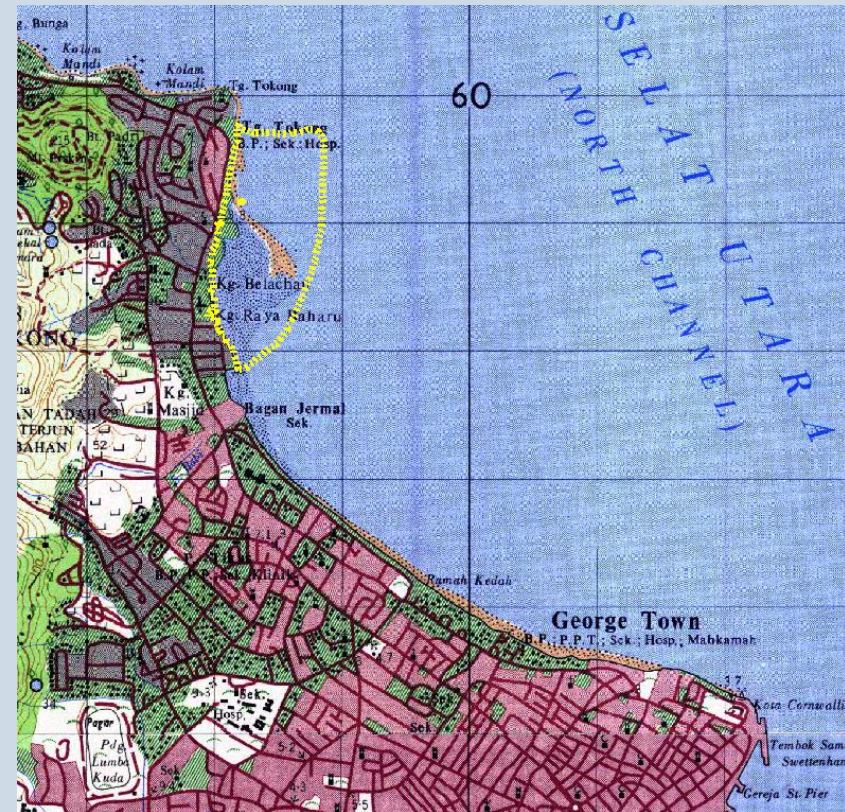
Headland bay at Kuala Pahang



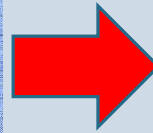
Convex shoreline at Kuala Selangor

7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

A) Land reclamation 1: Sri Tanjung Pinang (STP 1)



Baseline with STP 1 Outline



STP 1

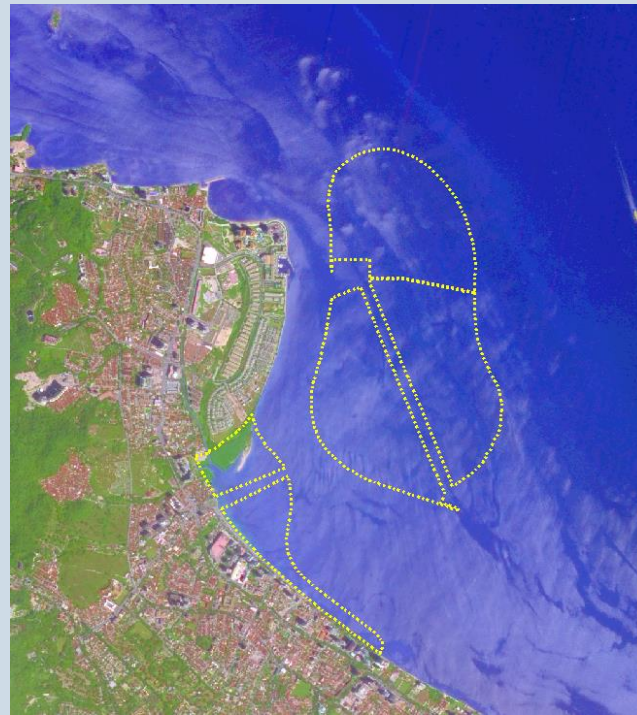


7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

B) Land reclamation 1: Sri Tanjung Pinang (STP 2)



STP 1



STP 1 with STP 2 Layout



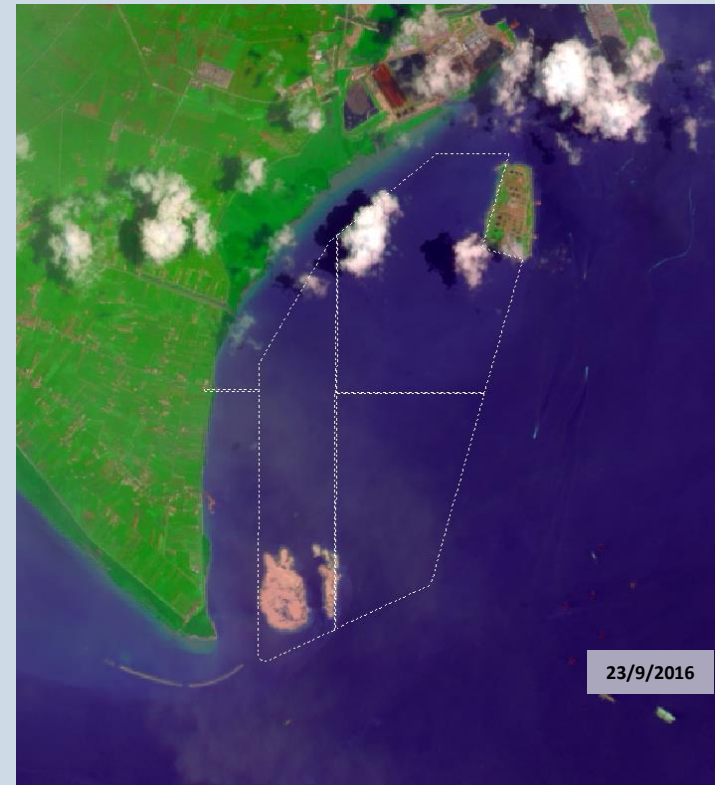
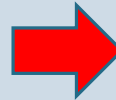
Latest Image: 5/2/2018

7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

C) Tg Piai Maritime and Petroleum Hub



The Project layout northwest of Tg. Piai

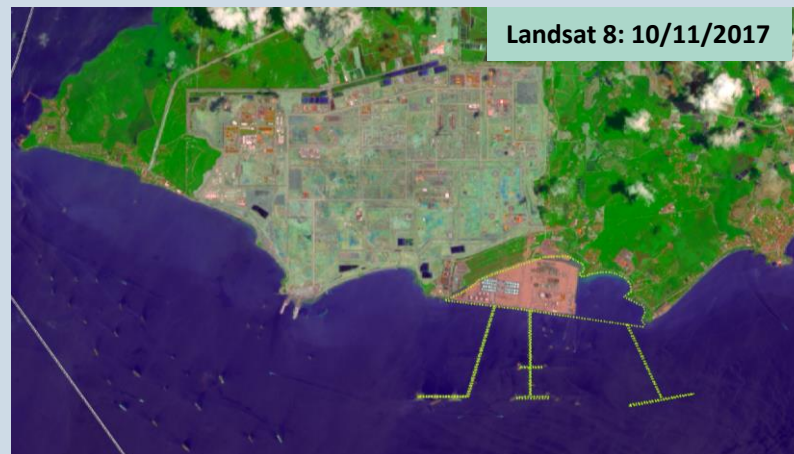


Reclamation Activities

Changing of coastal zone with creation of islands offshore

7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

D) Pengerang Deepwater Terminal (Dialog)

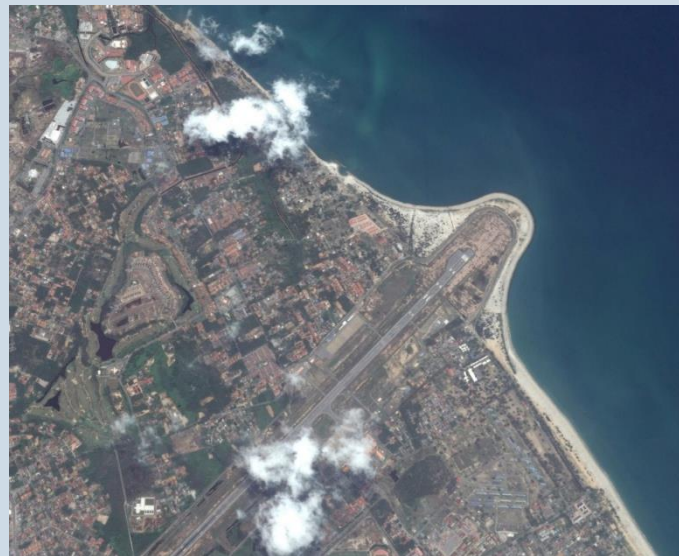


7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

E) Sultan Mahmud Airport, Terengganu:
Changes of shoreline from rectilinear to convex shape to multi structures



31/12/2004



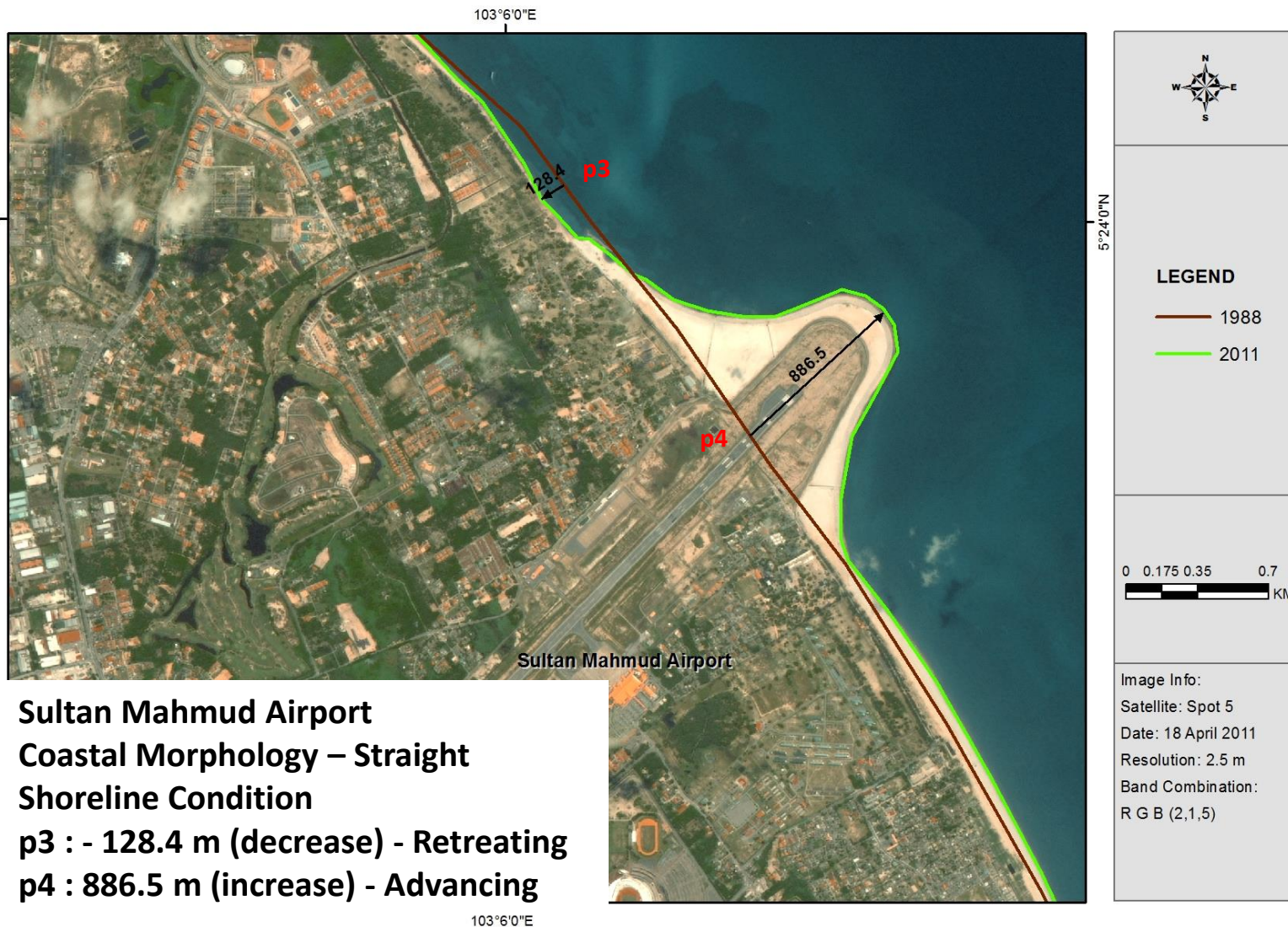
15/9/2014



10/8/2017

7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

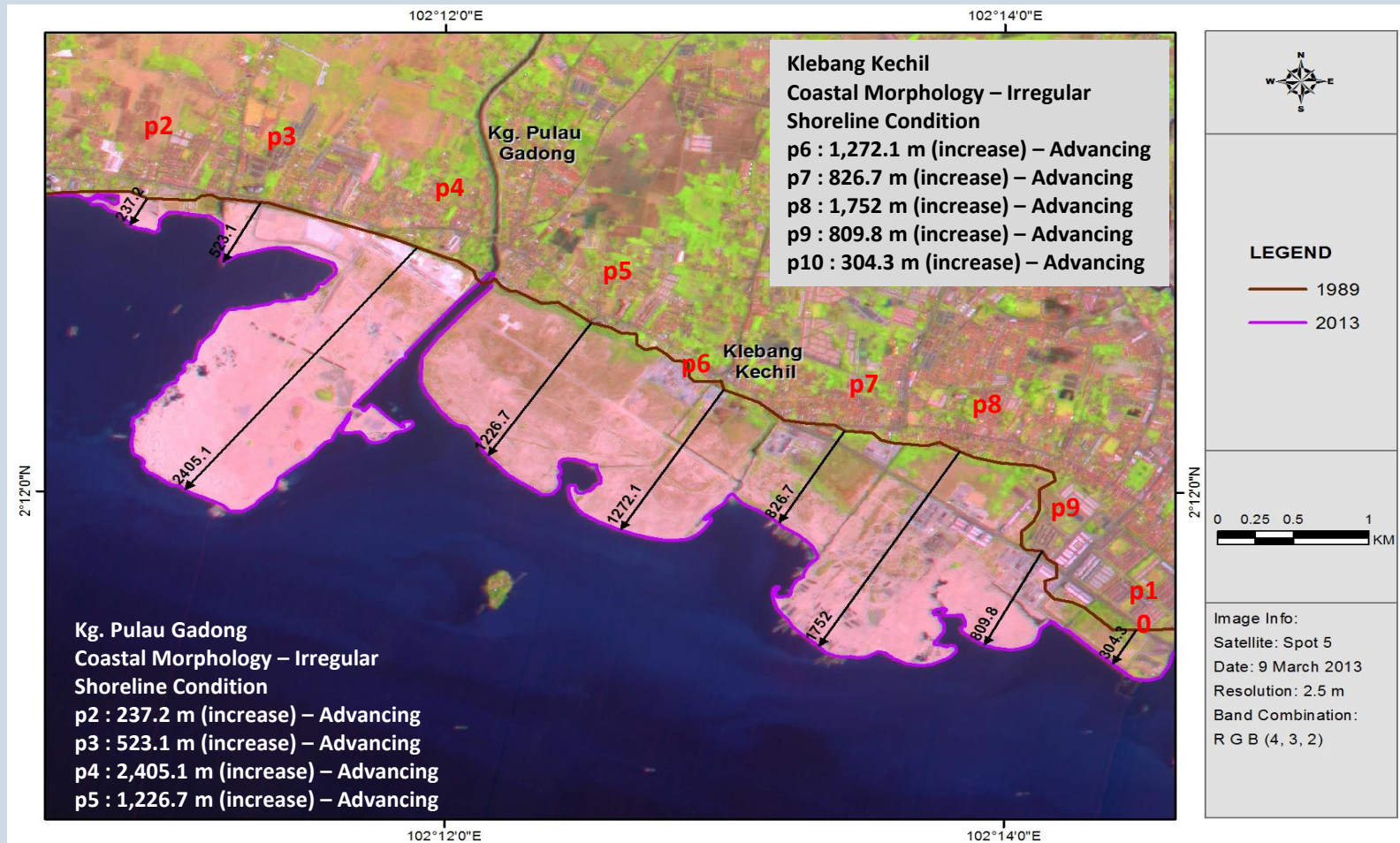
E) Sultan Mahmud airport, Terengganu



Impacts of reclamation: shoreline changes to compensate the newly created convex shape

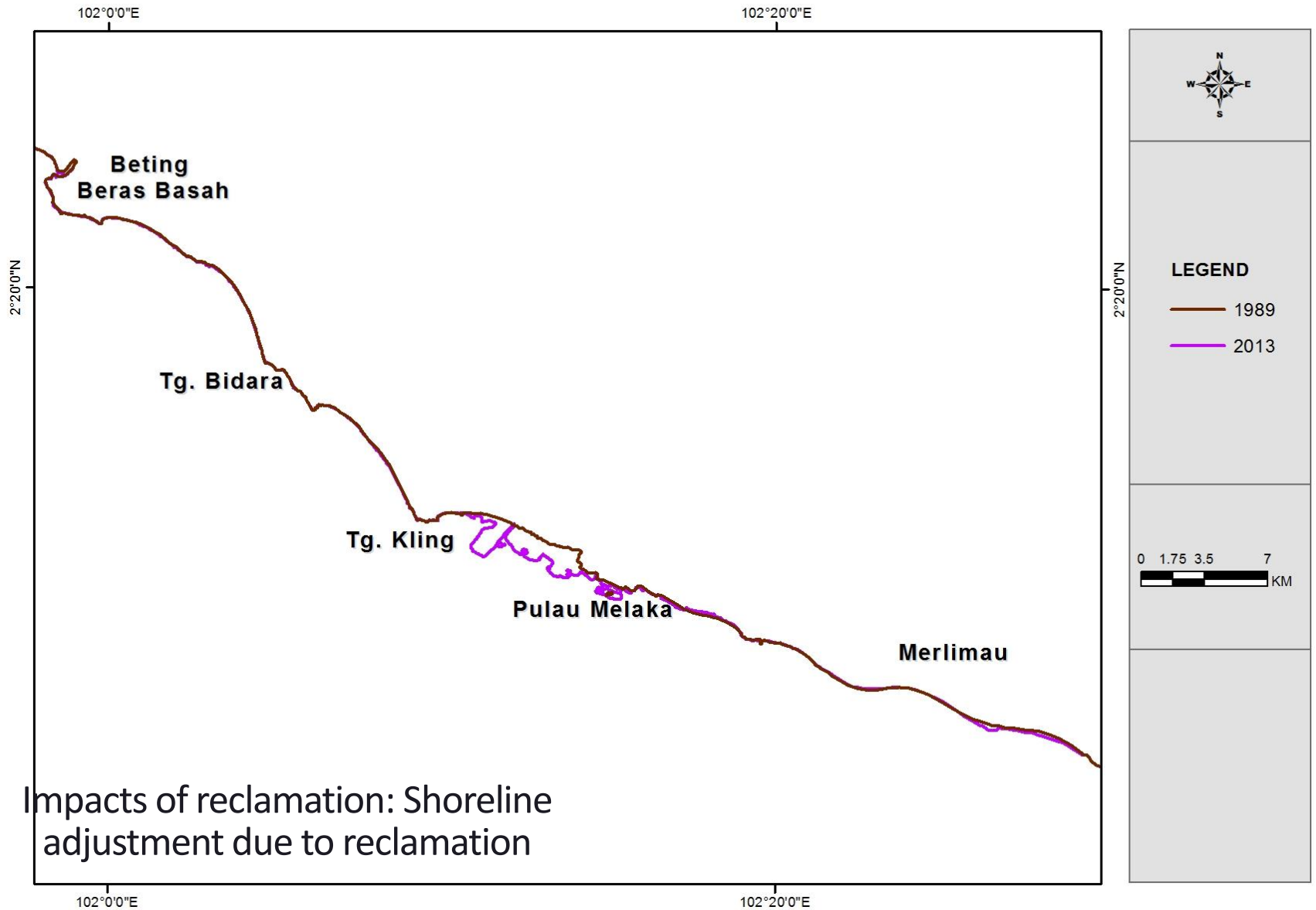
7. EXAMPLES OF COASTAL STRUCTURE AND DEVELOPMENT THAT ARE SUBJECTED TO HYDRAULIC STUDY

F) Reclamation at Melaka

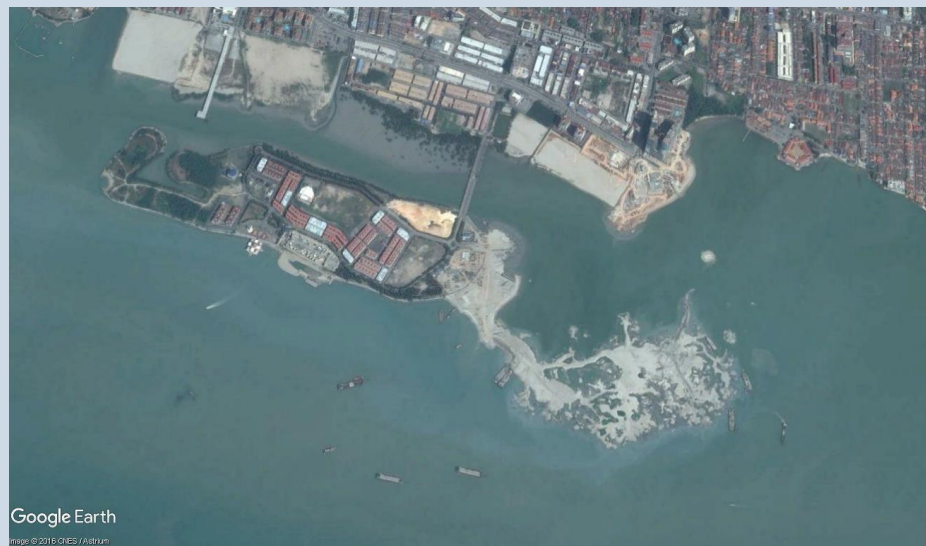


changing shoreline shape from slightly concave shape to convex shape

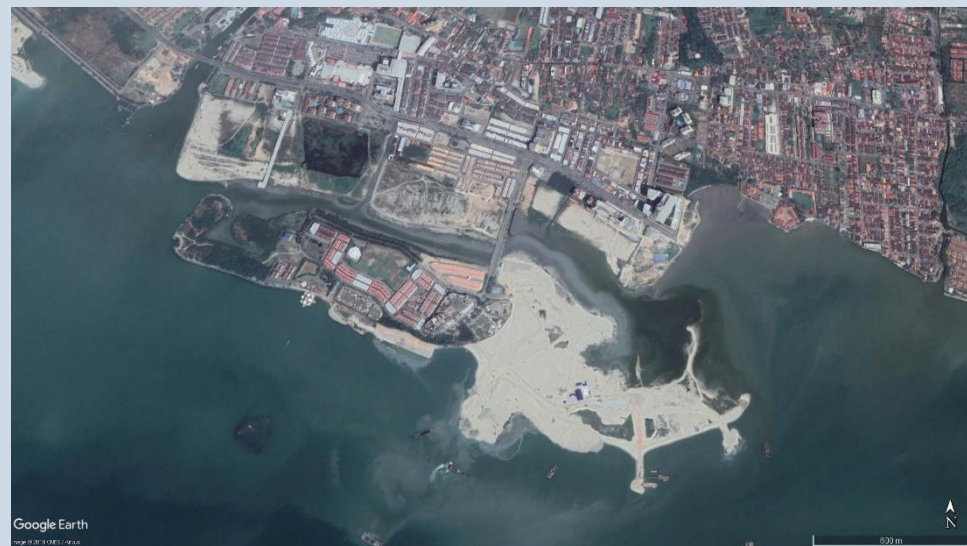
Shoreline Changes – 1989 & 2013



G) Reclamation at Pulau Melaka

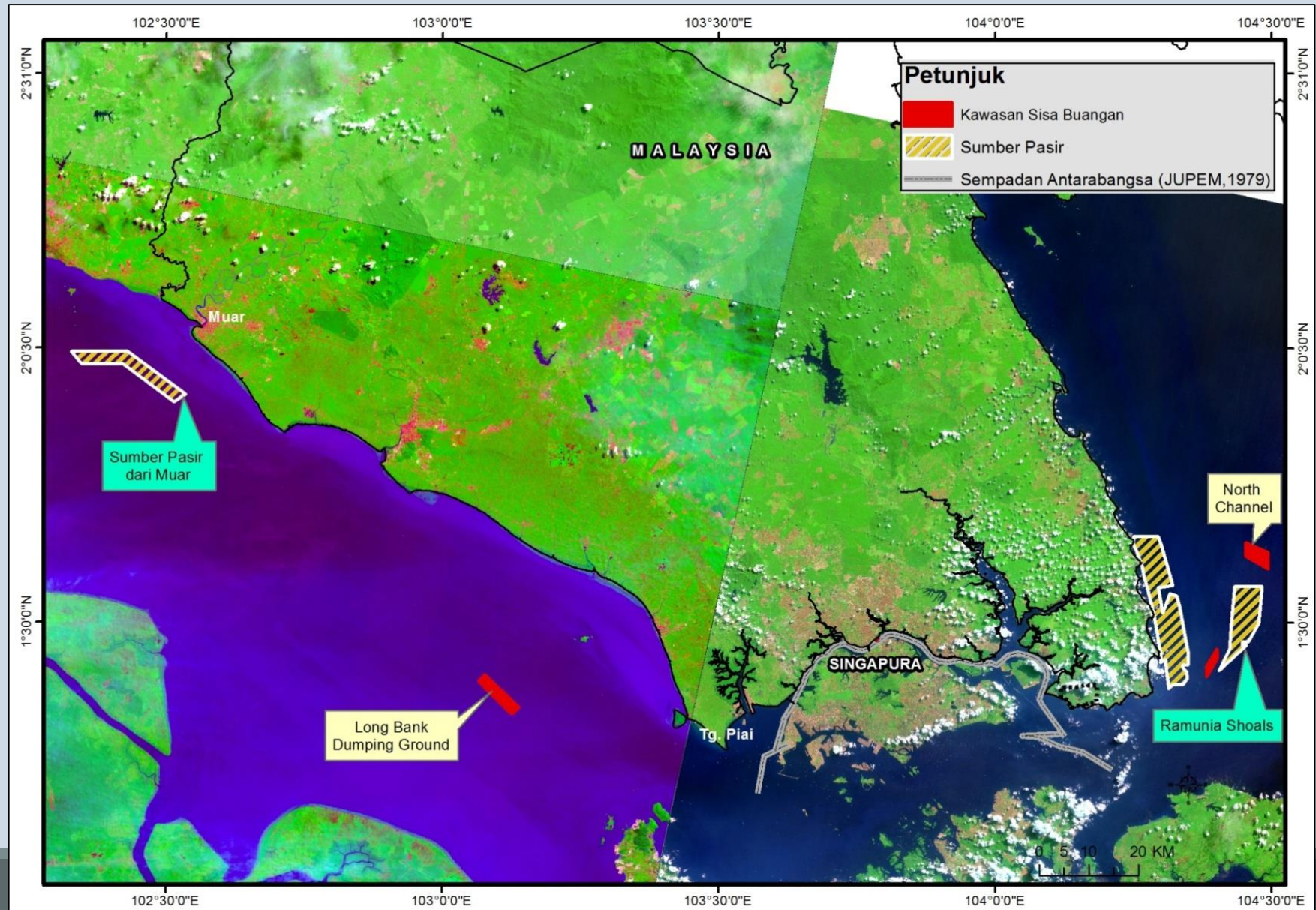


19/1/2015



5/2/2018

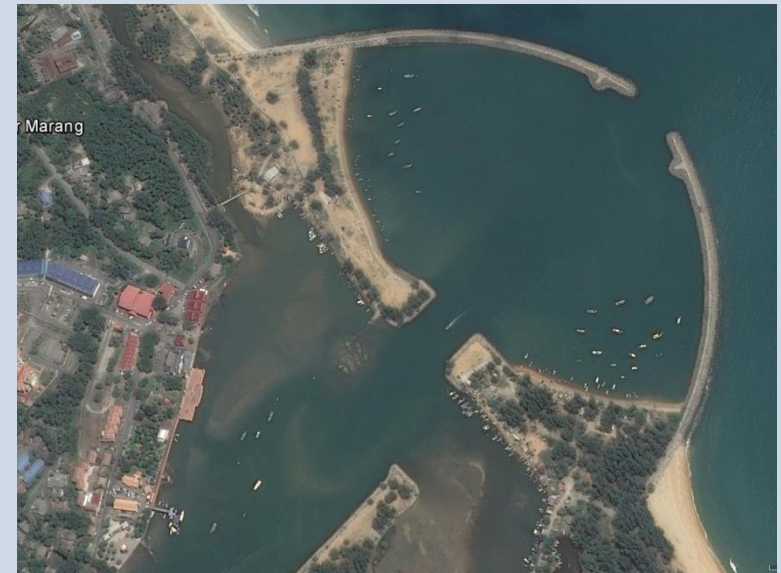
H) Sand Sources and Disposal Ground



I) Breakwaters at Terengganu and Johor



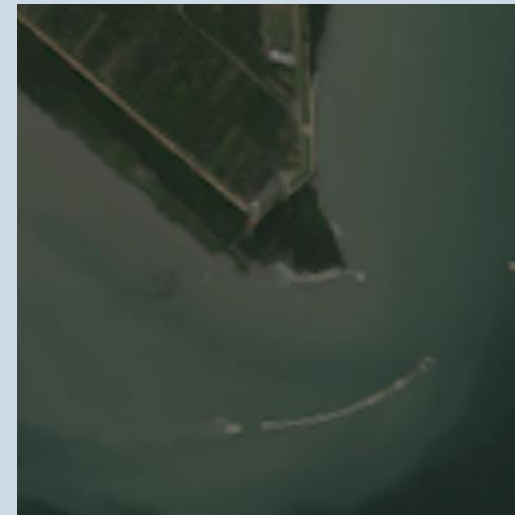
Jetty & offshore Breakwater at Kerteh, Terengganu



Connected Breakwater at Marang, Terengganu

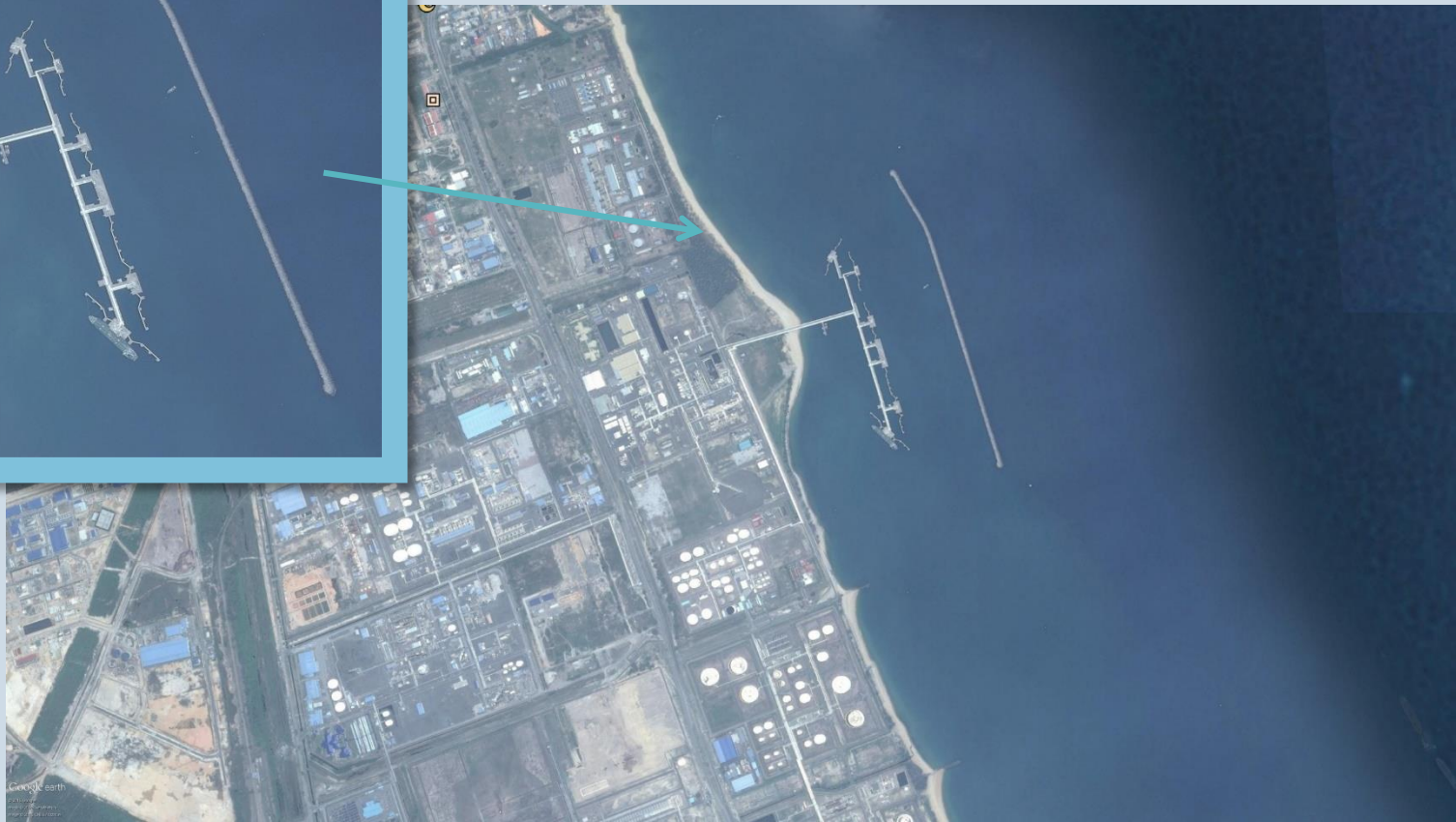


Reclamation & Breakwater at Seberang Takir,
Terengganu

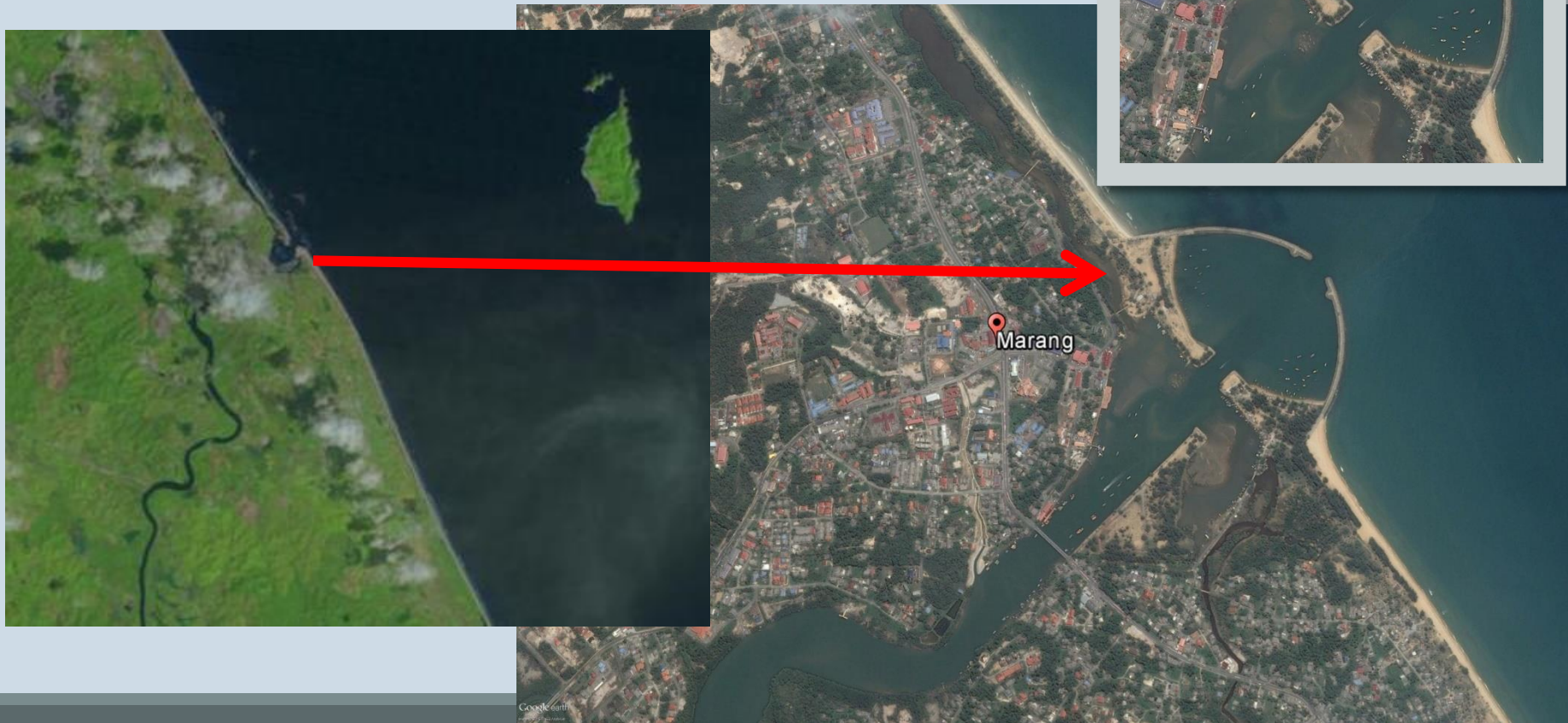


Segmented Breakwater at Tg. Piai, Johor

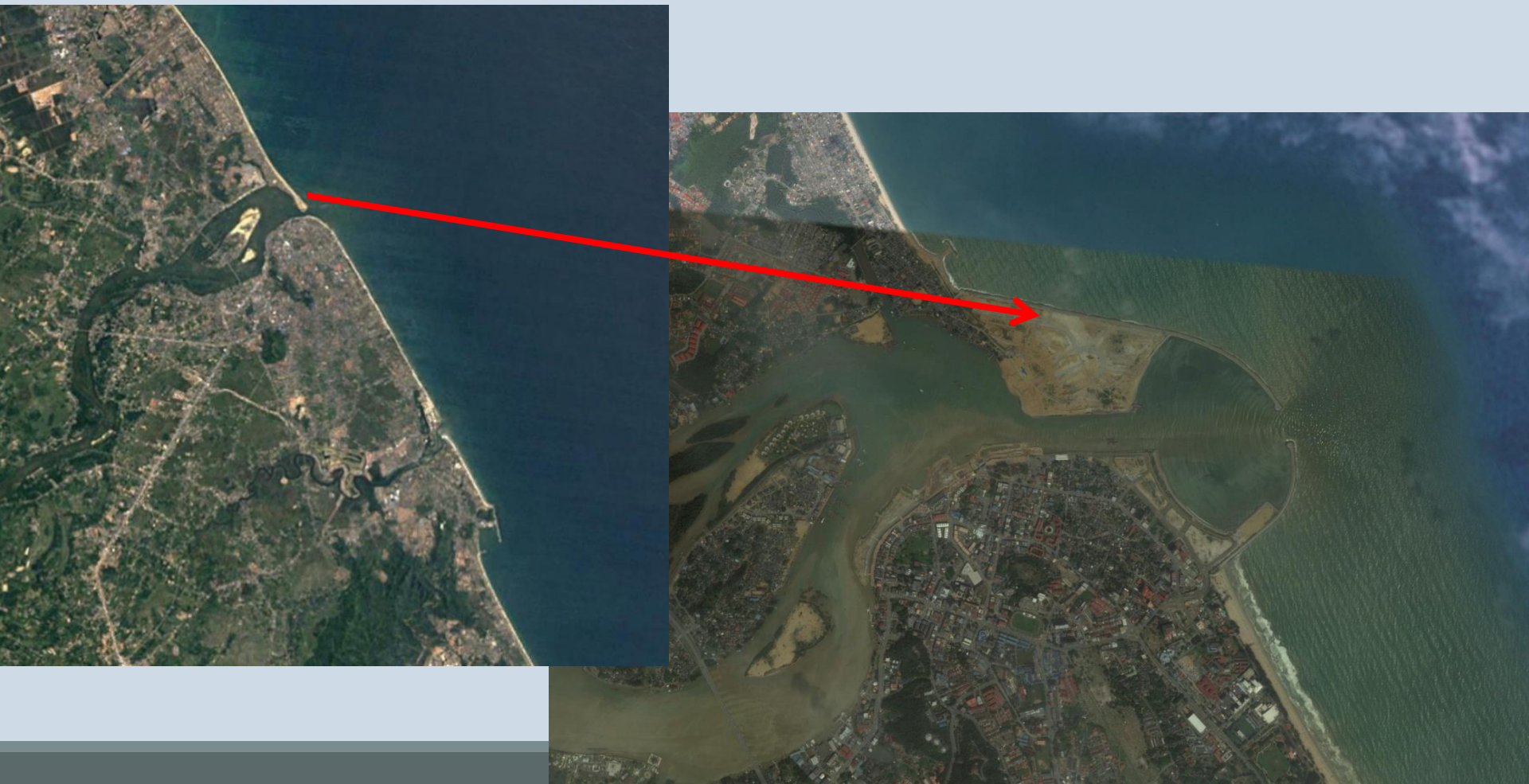
J) Jetty & Offshore Breakwater at Kerteh, Terengganu



K) Connected Breakwater at Marang, Terengganu



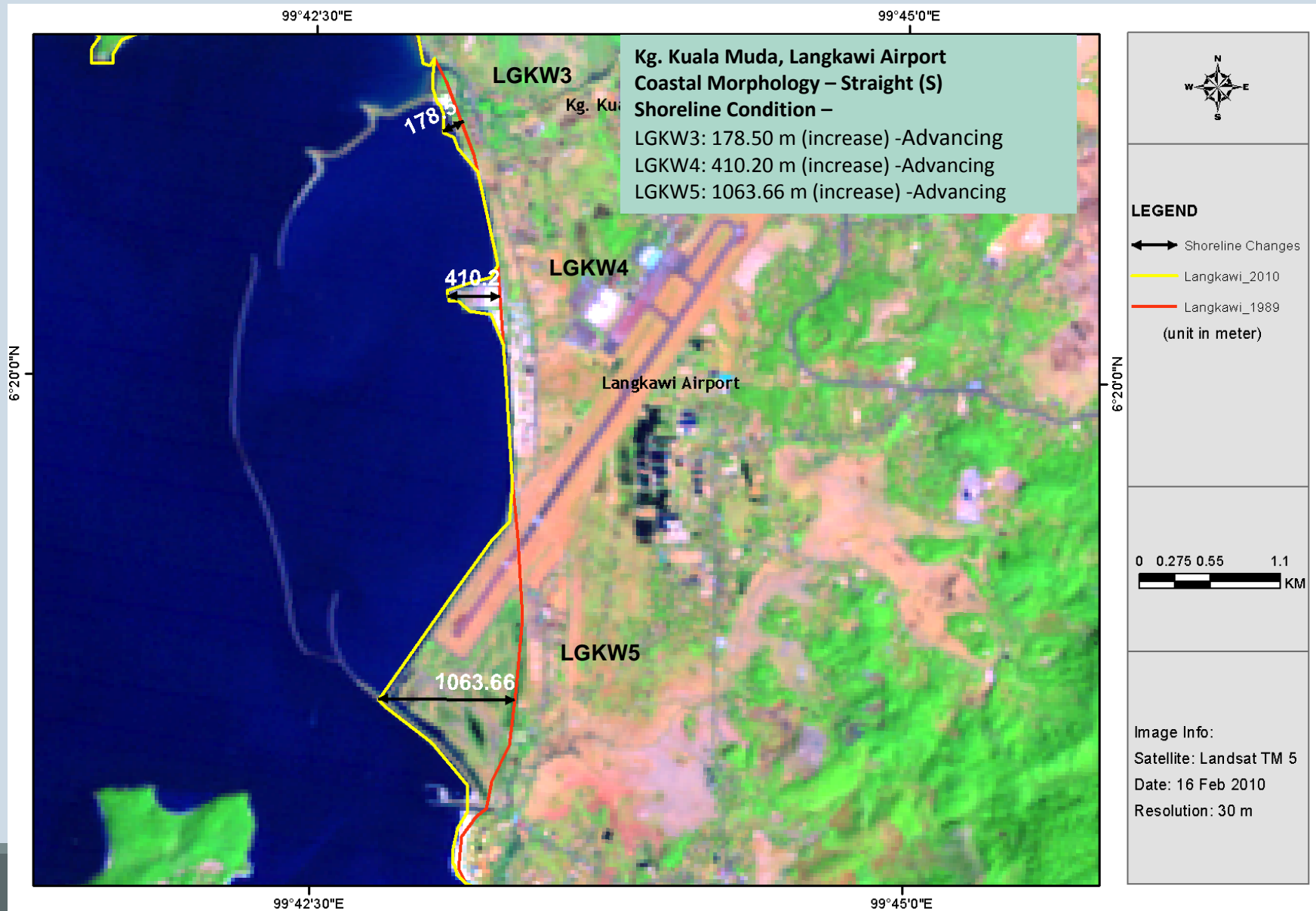
L) Reclamation & Breakwater at Seberang Takir, Terengganu



M) Segmented Breakwater at Tg. Piai to Protect Shoreline

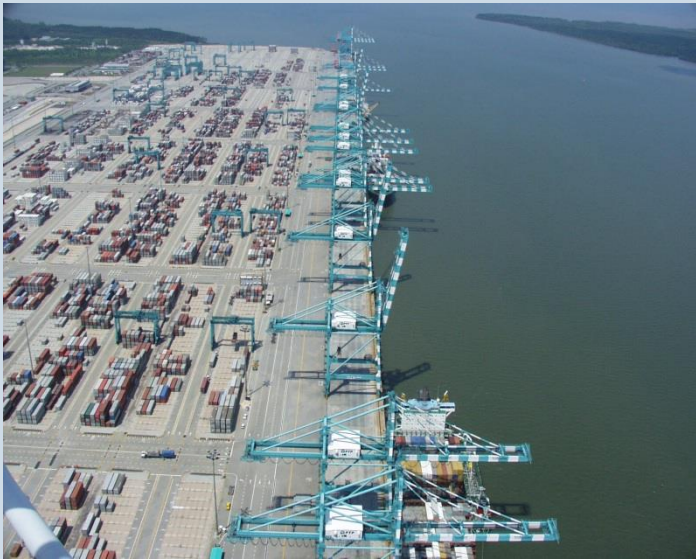


N) Breakwater at Langkawi to Protect the Shoreline and Airport



O) Wharfs

Port of Tg. Pelepas, Johor



Penang Port



P) Groynes Field at Kerteh, Terengganu



Q) Changing of Shorelines from Rectilinear to Headland Bay

Groyne at Kertih Port (October 2008)



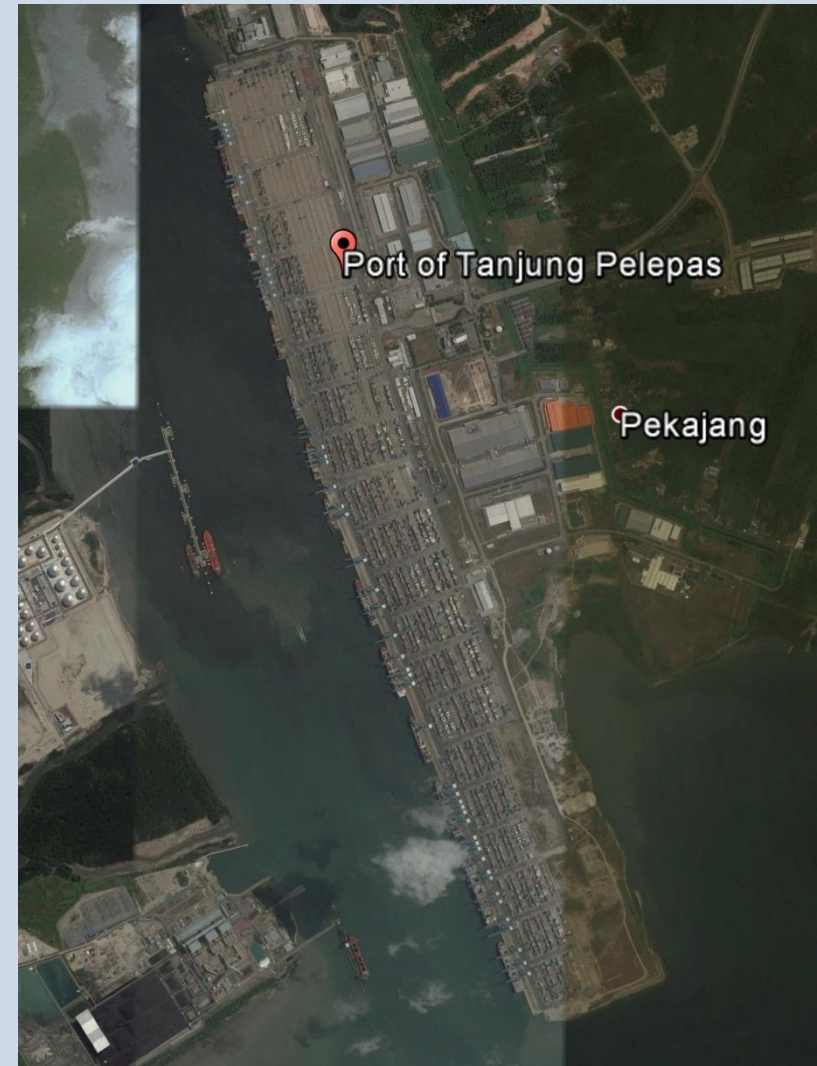
Groynes at Kertih Port (October 2008)



R) Changing Of Shorelines From Rectilinear To Headland Bay



Port of Tg. Langsat, Johor



Port of Tg. Pelepas, Johor

S) Changing of shoreline rectilinear to complex shape Ports



Port of Kuantan



Port of Tg. Pelepas (PTP)

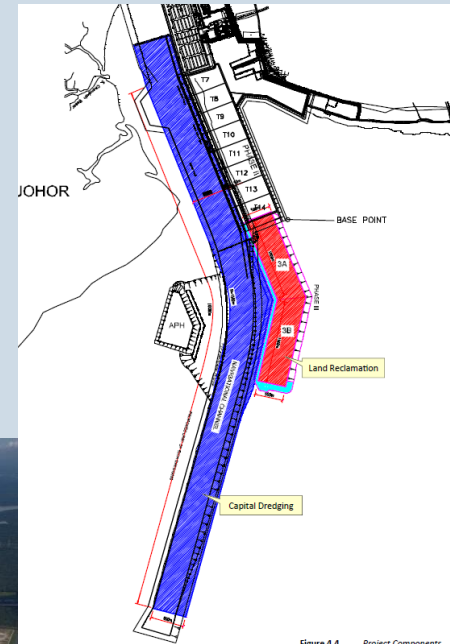


Figure 2.1 Project Components



Port of Kuantan

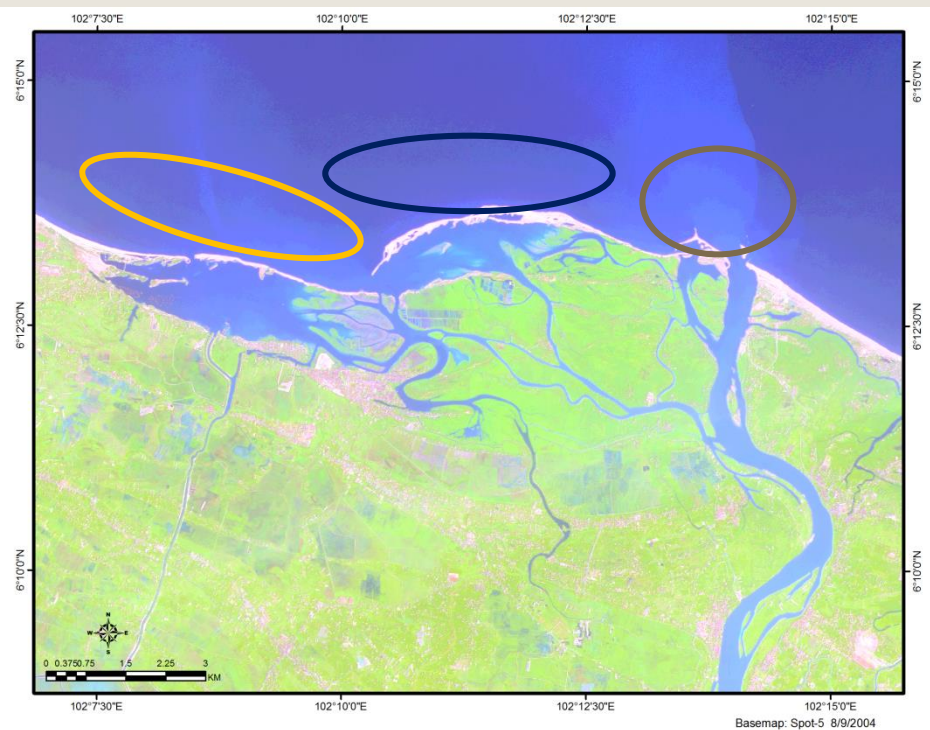


Source: <http://www.kuantanport.com.my>

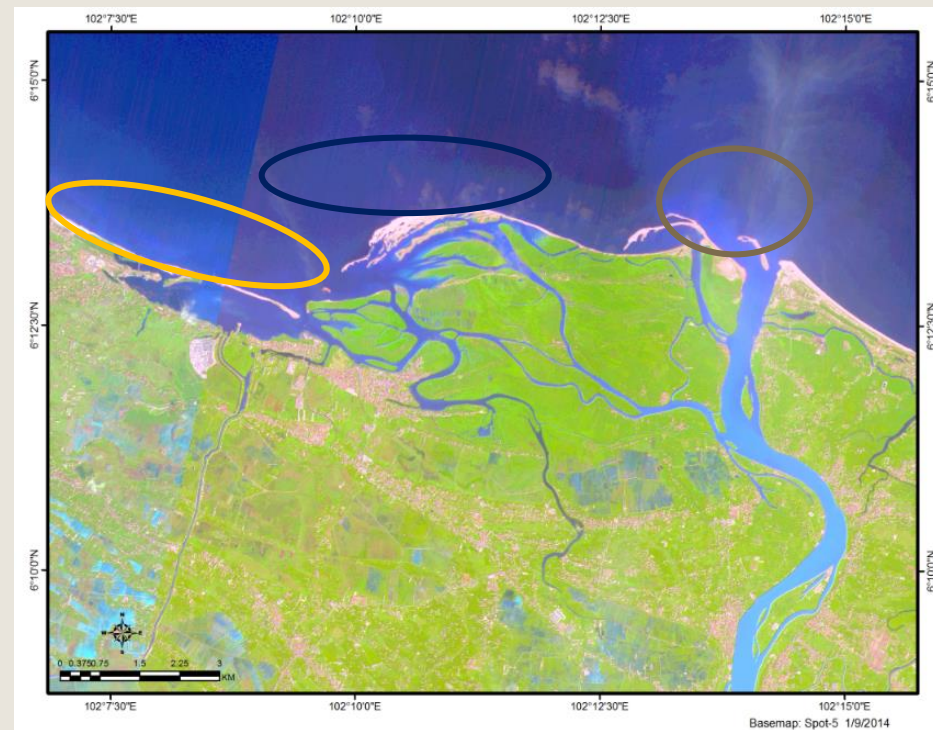
8. Understanding the Dynamic of Shoreline That Must Be Taken Into Account In Hydraulic Study

A) Kelantan Delta

2004



2014



Laporan NCES, 2015

B) Pantai Sabak, Kelantan

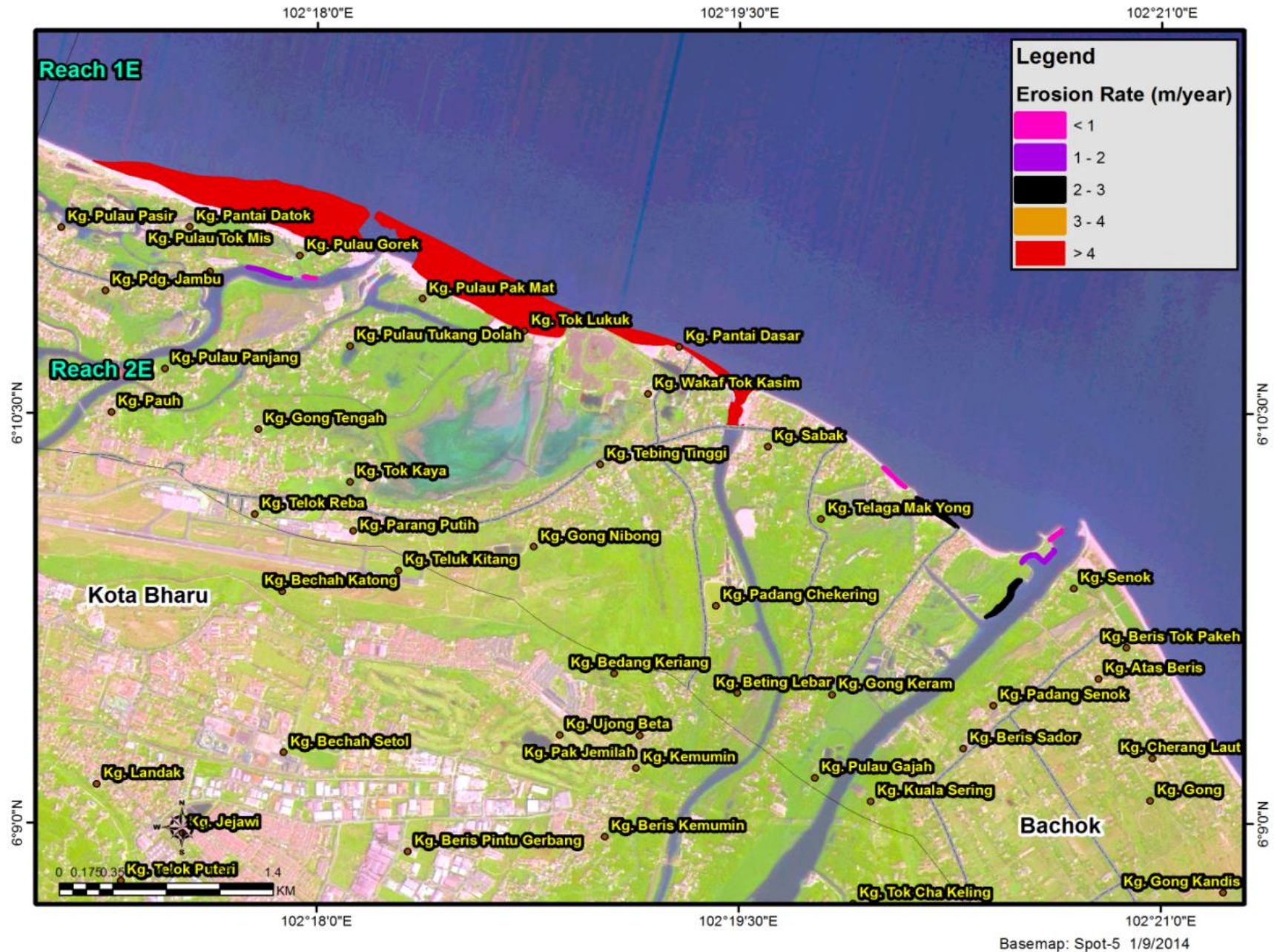


B) Pantai Sabak, Kelantan



29.92m

B) Pantai Sabak, Kelantan



B) Pantai Sabak, Kelantan



Uprooted Trees & High Wave Activity (Feb 2004)



Fallen Trees & Damaged Houses (Jan 2005)



Large Scarp Formation (Jan 2005)



Makeshift Plank Wall Used as Wave Protection (March 2005)

B) Pantai Sabak, Kelantan



Sand bags placed in front of house at Kg. Pantai Dasar (Jan. 2005)



House being destroyed by waves (March 2005)



House partially destroyed (March 2005)



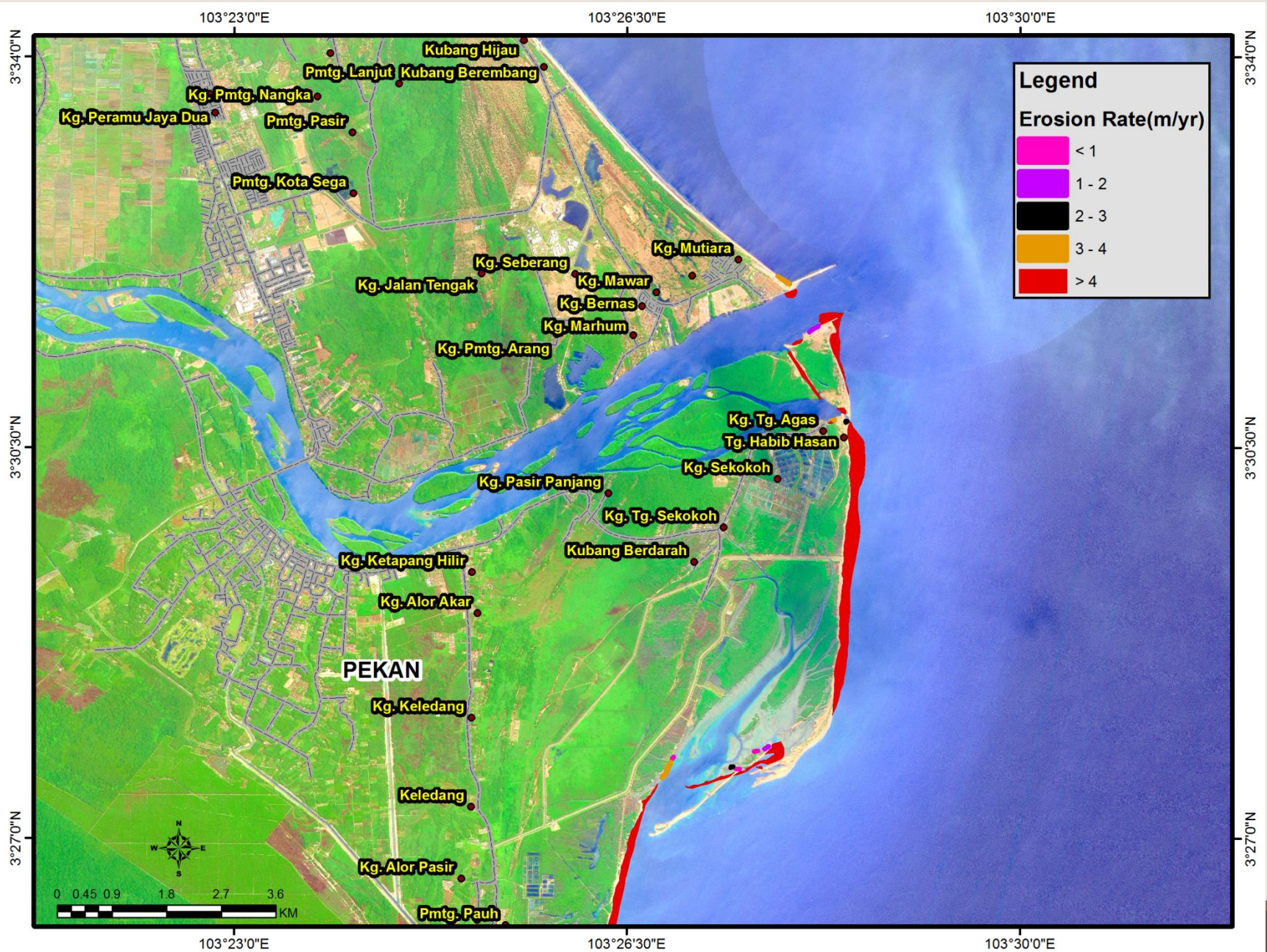
House abandoned (June 2005)

C) Serious Erosion And Shoreline Adjustment Due To Training Wall At Kuala Pahang



Laporan NCES,2015

C) Serious Erosion At Kuala Pahang, Pahang



THANK YOU