

HISTORICAL SHORELINE CHANGE OF THAP SAKAE COAST, PRACHUAP KHIRI KAN, THAILAND

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OUTLINE

- Introduction
- Objectives
- Study area
- Material and methods
- Results and discussion
- Conclusion

INTRODUCTION

Coast is a place that land interacts with the sea

Shoreline is the boundary between the land surface and the surface of a water body.

Causes of shoreline change

1. **Nature** : wind, wave, and currents
2. **Human activities:**
 - Construction of structures
 - Dredging of channels and harbors
 - Beach nourishment
 - Other projects in the coast zone

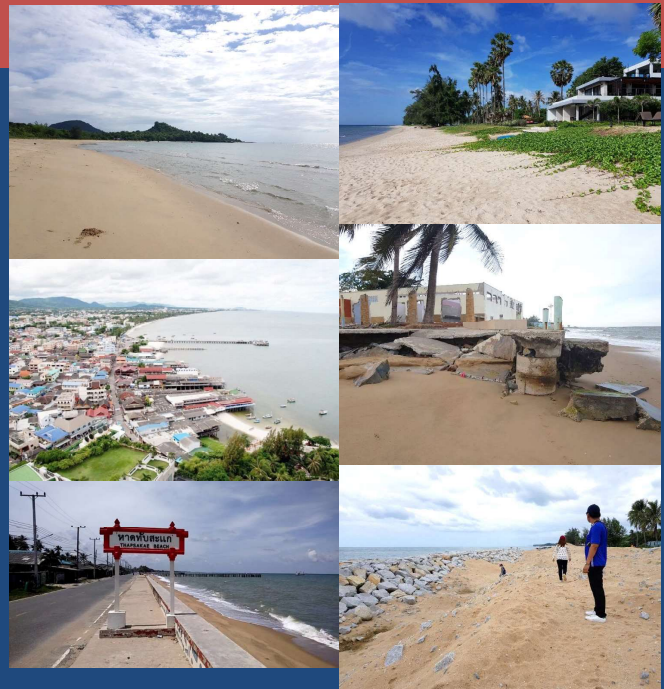


Figure. Coastal areas at Prachuap Khri Kan Province

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OBJECTIVES

To document the historical shoreline changes along the Thap Sakae coastline

- Long-term shoreline change rates
- Short-term shoreline change rates

The current situation of shoreline change along the Thap Sakae coast

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STUDY AREA

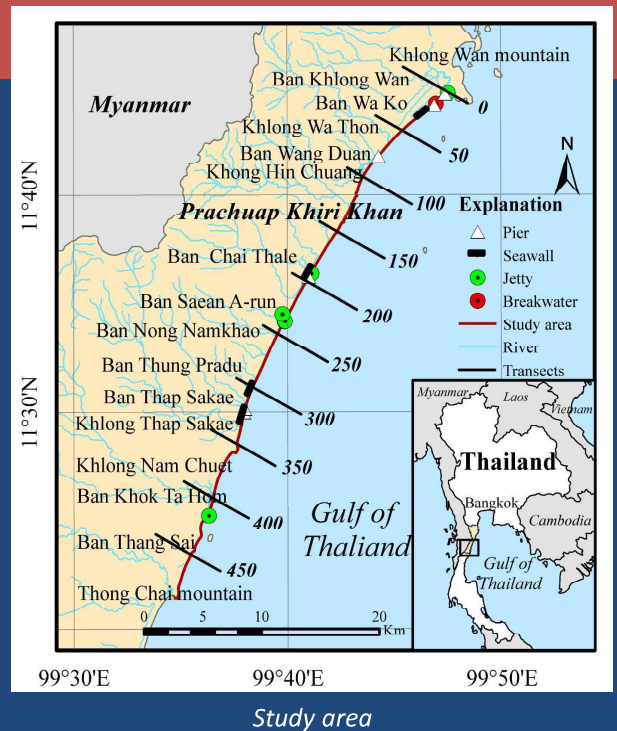
Location : The Thap Sakae coast in Prachuap Khiri Khan Province

From Khlong Wan mountain to Thong Chai mountain

Length of study area : 50 km

Type of beach: Sandy beach

Climate: dominated by the SW monsoon and the NE monsoon



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EXISTING ENGINEERING STRUCTURES



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MATERIALS AND METHODS



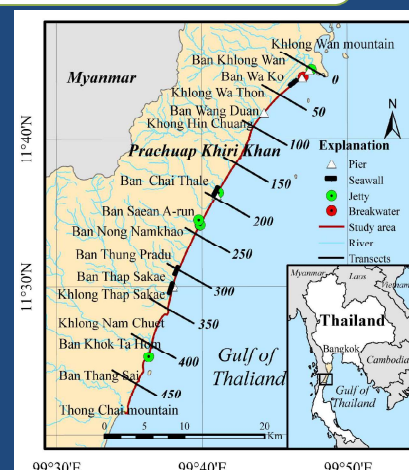
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MATERIALS AND METHODS



Evaluated rate of shoreline change by using DSAS v.4.3

- 482 transects with the spacing of 100 m
- Long-term shoreline change rate between 1966 and 2003
- Short-term shoreline change rate between 2003 and 2017



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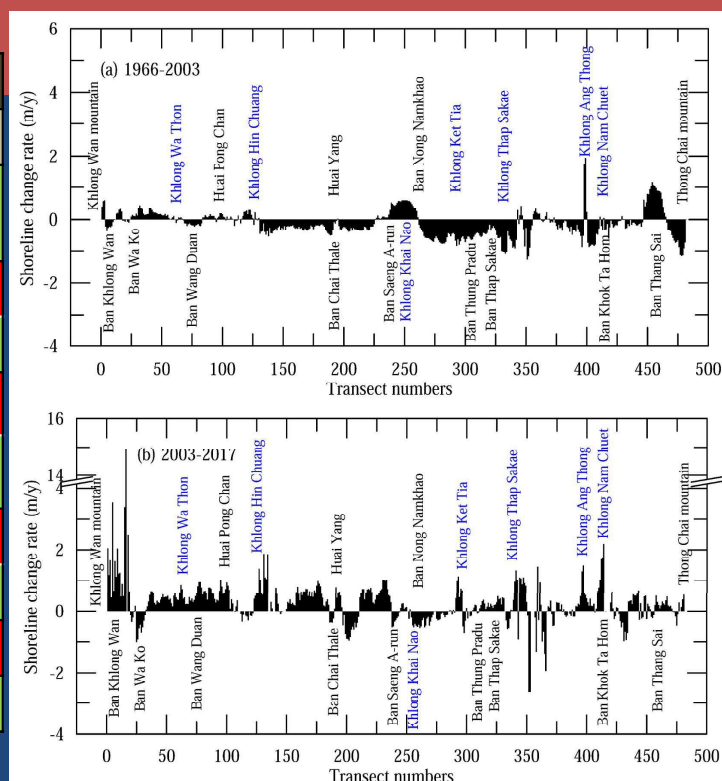
RESULTS AND DISCUSSION

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LONG-/ SHORT-TERM SHORELINE CHANGE

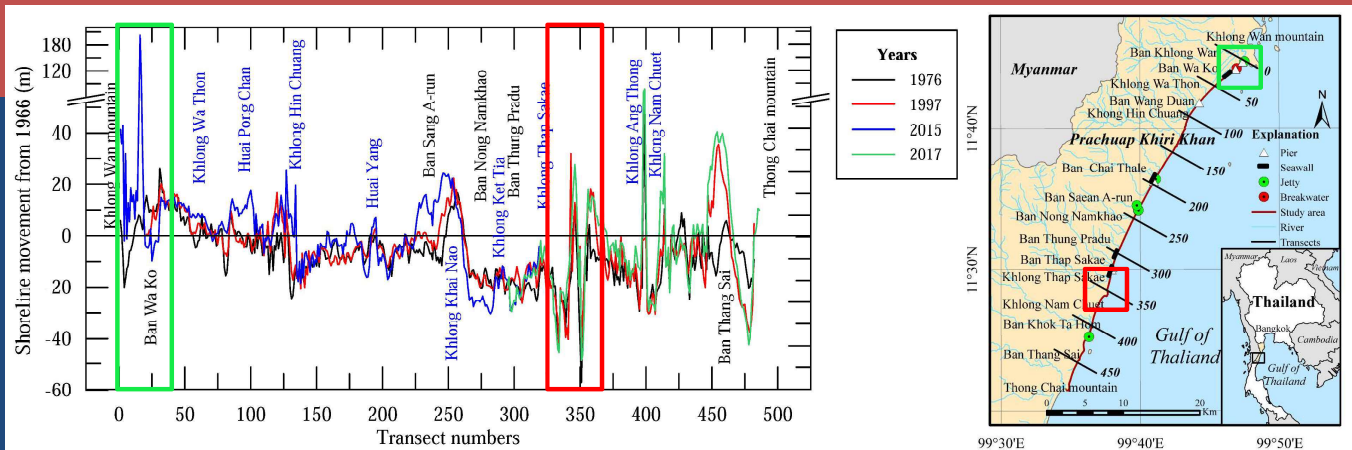
Shoreline change analysis		Long-term	Short-term
Number of transects		482	482
Average net shoreline change rate (m/y)		-0.14	0.28
Percent of shoreline change	erosion	65 %	30 %
	accretion	35 %	70 %
The maximum shoreline change rate (m/y)	erosion	-1.3	-2.62
	accretion	1.94	14.95
Average shoreline change rate (m/y)	erosion	-0.37	-0.38
	accretion	0.28	0.56
Land loss area (km ²)		0.42	0.05
Land growth area (km ²)		0.17	0.24

Uncertainty of shoreline change was ± 1 m/y



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EVOLUTION OF THAP SAKAE COASTLINE



Historical shoreline movement along the Thap Sakae coast during the period 1966-2017

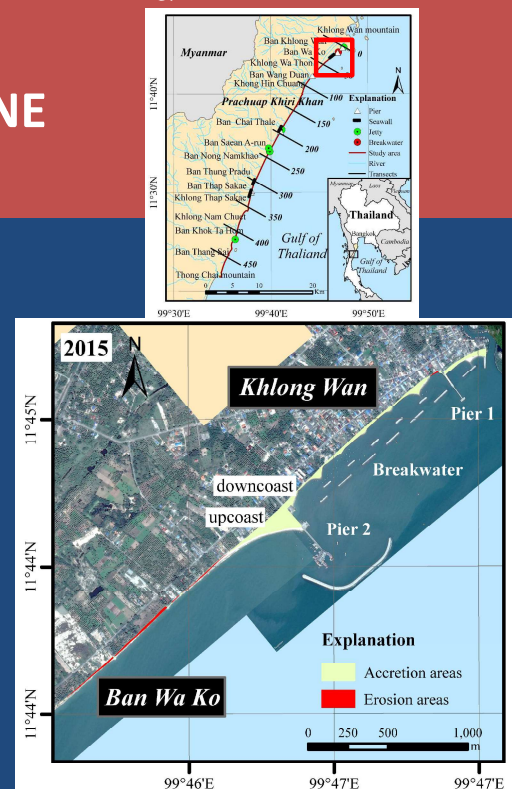
- Using shoreline in 1966 to measure shoreline movements
- The maximum distance of **shoreline accretion was 200 m** at the south of pier at Ban Khlong Wan
- The maximum distance of **shoreline recession was 50 m** at the south of Khlong Thap Sakae
- **Land accretion mainly took place at river mouths**

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EVOLUTION OF THAP SAKAE COASTLINE

Shoreline movement from 1966 between transect 1 and 22

Year	Shoreline movement	
	Khlong Wan	Ban Wa Ko
1976	Retreat (-0.18 m/y)	Accretion (1.38 m/y)
1989	construction Pier 1	
2002	Accretion (0.84 m/y)	Accretion (0.14 m/y)
2005	construction Pier 2 and series of offshore breakwater	
2015	Accretion (2.5 m/y)	Retreat (-0.18 m/y)



Shoreline change during 2003-2015 at Ban Khlong Wan

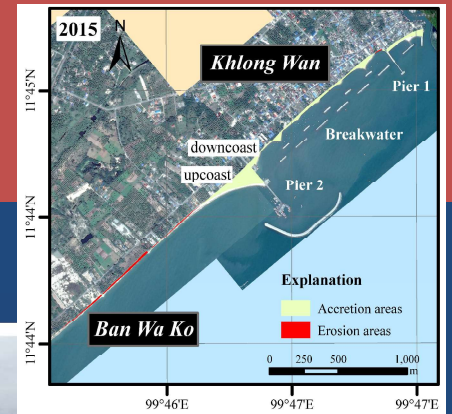
- In year 2015, shoreline at **southern of Pier 2** had distance **about 200 m** from 1966.
- **Ban Wa Ko** located on the south of the Pier 2 has experienced a significant **shoreline retreat response to change in coastal processes**.
- Longshore sediment transport moved northward

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EVOLUTION OF THAP SAKAE COASTLINE

Khlong Wan

Structures collapse behind series of the offshore breakwater



Ban Wa Ko

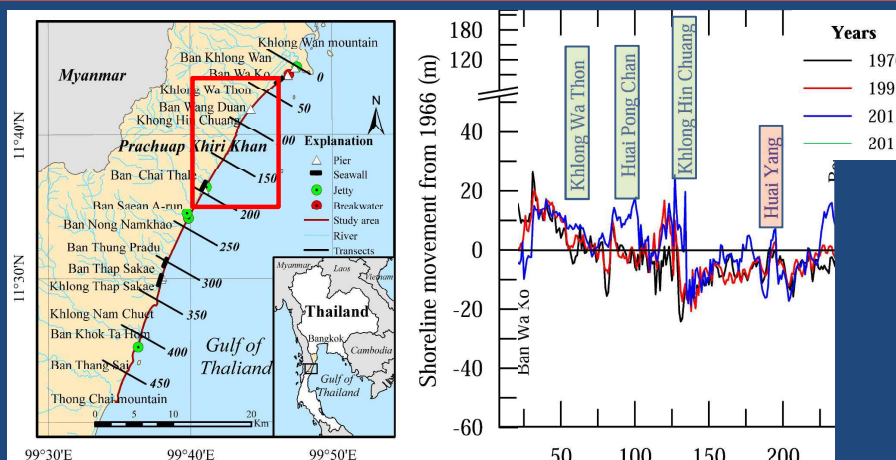
Shoreline erosion along Ban Wa Ko coastline



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EVOLUTION OF THAP SAKAE COASTLINE

Shoreline movement from 1966 between transect 31 and 225



Shoreline change from transect 31 to 225

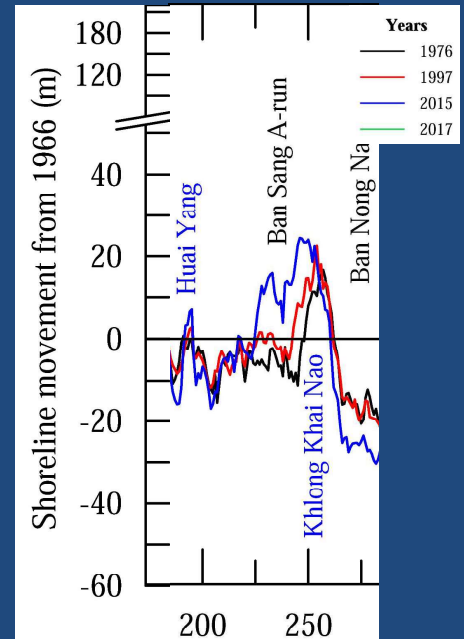
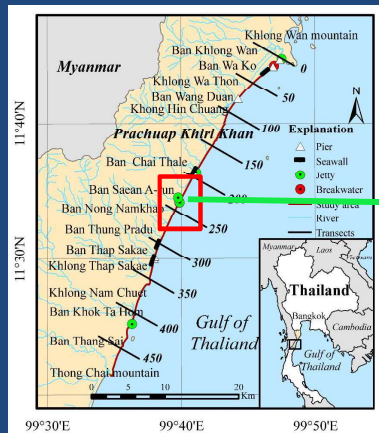
- The pattern of shoreline migration **slightly changed**
- The coastlines adjacent to the river mouths **grew seawards** due to *sediment supply from the rivers*
- At Huai Yang river, shoreline was **retreat**



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EVOLUTION OF THAP SAKAE COASTLINE

Shoreline movement from 1966 between transect 225 and 260



Shoreline change from transect 225 to 260

Ban Sang A-run

- At the inlet of Rong Nong Kok channel has a pair of jetties to prevent sedimentation in the navigation channel

Khlong Khai Nao

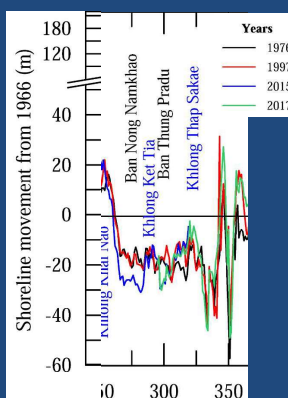
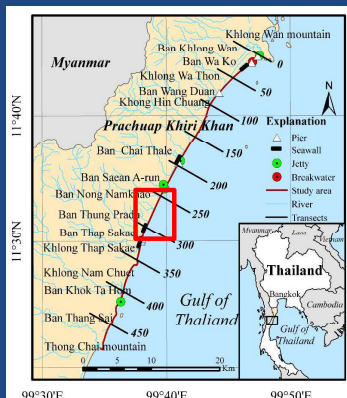
- The shoreline has migrated seaward about 20 m.
- The net sediment transport has moved northward

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EVOLUTION OF THAP SAKAE COASTLINE

Shoreline movement from 1966 between transect 261 and 310

Timeline of shoreline change during 1966 to 2017



Shoreline change from transect 261 to 310

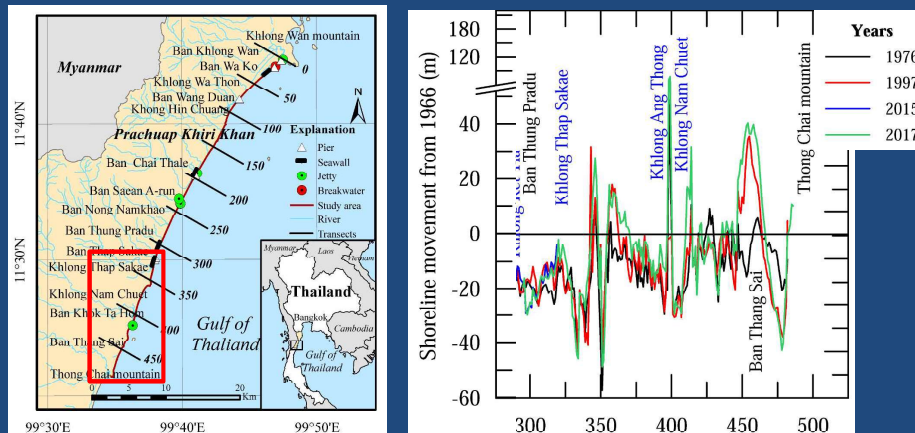


Property damages along the Ban Thung Pradu and under construction of seawall

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EVOLUTION OF THAP SAKAE COASTLINE

Shoreline movement from 1966 between transect 311 and 455



Shoreline change from transect 311 to 455

- Between 1966 and 1976, most coastal areas had experienced shoreline erosion probably related to three tropical depressions in 1975.
- The coast was severely eroded more than 40 m during 1966-1997
- Concrete seawall with 500 m long was built to stabilize the eroding shoreline in 1996 along the Khlong Thap Sakae coast

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BEACH EROSION AND PROPERTY DAMAGES



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CONCLUSION

Long-term (1966-2003)

- **65 %** of the Thap Sakae coastline has experienced coastal erosion
- The average of shoreline retreat and accretion was **-0.37 m/y** and **0.28 m/y**, respectively.
- Shoreline accretion was found in several places near the river mouths

Short-term (2003-2017)

- **30 %** of the Thap Sakae coastline has experienced coastal erosion
- The average of shoreline retreat and accretion was **-0.38 m/y** and **0.56 m/y**, respectively.
- The erosional trend has shifted to accretion trend because of *many coastal developments and coastal stabilization projects*

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CONCLUSION

- The rates of shoreline change along Thap Sakae coast **seem to be not critical** compared to other areas in Thailand.
- However, based on field observation, **severe damages of the local and private properties were found in many locations.**
- As the Thap Sakae coastline is characterized by **narrow sandy beaches**, *such a low rate of shoreline change can cause significant effects on coastal development in this area.*

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THANK YOU