



**Asia-Pacific
Economic Cooperation**

2017/SOM3/EPWG/019

Agenda Item: 7.2.3

Proposal for Research and Investment Activities in the Coast and Estuaries (A Case Study in the North Central Coast of Viet Nam)

Purpose: Information
Submitted by: Viet Nam



**12th Emergency Preparedness Working Group
Meeting
Ho Chi Minh City, Viet Nam
21-22 August 2017**



11th Emergency Preparedness Working Group Meeting

PROPOSE RESEARCH AND INVESTMENT ACTIVITIES FOR VIETNAM COAST

Case study on change of coast and estuaries in North Central Coast of Vietnam

Viet Nam Academy for Water Resources





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CONTENT

- Introduction of natural conditions & erosion, sedimentation in the North Central Coast
- Activities have been undertaken to prevent the North Central Coast
 - + Researches and measures have been applied
 - + Current status of erosion, sedimentation management
 - + Technical solutions and measures have been applied
 - + Some limitations of activities.
- Propose cooperation to support research and management of erosion and sedimentation

1. Introduction of natural conditions & erosion, sedimentation

- It has **817 km coastline**, including 8 coastal provinces: **Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien-Hue, Da Nang, Quang Nam**. Population is concentrated in coastal areas.
- Terrain: The West is the Truong Son mountain range, to the East is narrow coastal plain area, with many high coastal sand dunes.
- Separated by many many short and steep rivers directly into the sea. **On average, every 20 to 25 km of coastline has an estuary.**
- Erosion, sedimentation has a serious and direct impacts on people's life and socio-economic because population is concentrated in coastal areas (urban cities locate near coast, tourism...).
- There are little investment on disaster prevention compared to other regions



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1. Introduction of natural conditions & erosion, sedimentation

- During a year, the Northeast monsoon from October to February of the following year; the Southwest monsoon from May to August.
- **Rain fall concentrated in the short time make flood** causes large erosion of rivers bank and estuary.
- Is the region with **Typhoons and tropical cyclones landfall most of Viet Nam**. During the period 1961 - 2016, there were **126 typhoons** (57% of typhoons landfall in Viet Nam), many strong typhoons from level 9 (80 km/h) to level 13 (133 km/h). Typhoons and tropical cyclones cause heavy rain fall and flood, storm surge, high waves make coastal erosion and destroy of coastal constructions.
- **Tide is complex, including diurnal tide and semi-diurnal tide mixed**, amplitude from 0.5 - 2.0 m. Tidal current changes in both direction and magnitude by season and by location.



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1. Introduction of natural conditions & erosion, sedimentation

- The North Central Coast region has **the highest rate** of erosion/sedimentation in estuaries and coastlines in Viet Nam.
- Erosion and sedimentation have worsened due to the **impact of upstream exploitation of river basins and climate change**.
- Statistics erosion/sedimentation of estuaries, coasts:**
 - To 2017, there are **35 sites** of severely eroded coastline, corresponding to **30.5 km**; Some of erosion hotspots such as **Nhat Le, Bao Ninh (Q. Binh), Hoi An (Q.Nam); Quang Cu (T.Hoa), Cua Tung beach (Q.Tri), Quang Cong, Thuan An (T.T.Hue)**.

- Sedimentation: estuaries as **Sot (Ha Tinh), Tung a**

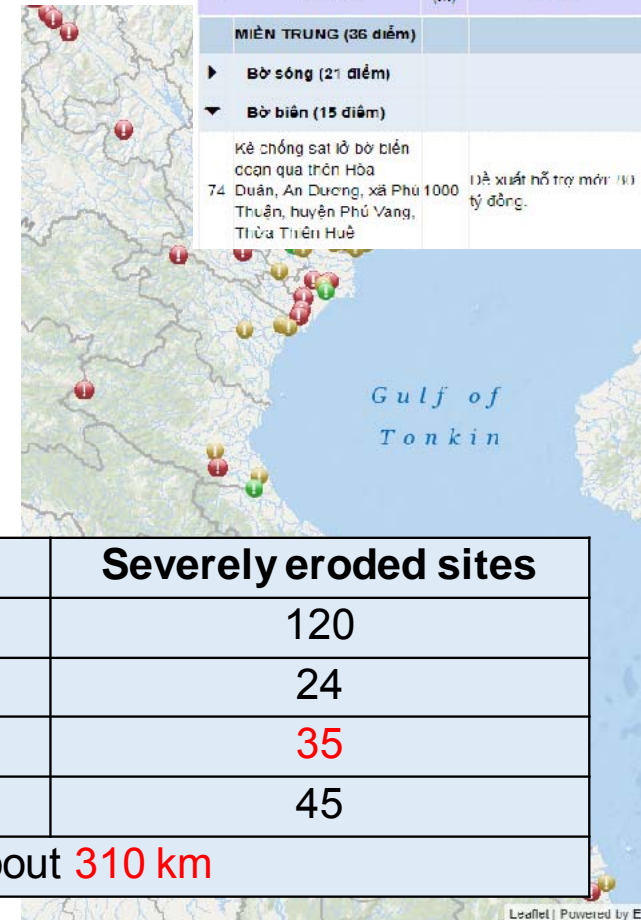
No	Region	Total eroded sites	Severely eroded sites
	Viet Nam	314	120
1	The North region	36	24
2	The Center region	170	35
3	The South region	108	45

Total length of the **eroded coastline** about **310 km**

DANH SÁCH CÁC ĐIỂM SẠT LỞ

Nhập tên địa điểm Có 172 điểm tất cả

STT	ĐIỂM DANH	DÀI (m)	GHI CHÚ
MIỀN TRUNG (36 điểm)			
▶ Bờ sông (21 điểm)			
▼ Bờ biển (15 điểm)			
	Kê chống sạt lở bờ biển		
74	Đuân, An Dương, xã Phú 1000 Thuận, huyện Phú Vang, Thừa Thiên Huế		Đã xuất hỗ trợ mới 10 tỷ đồng.

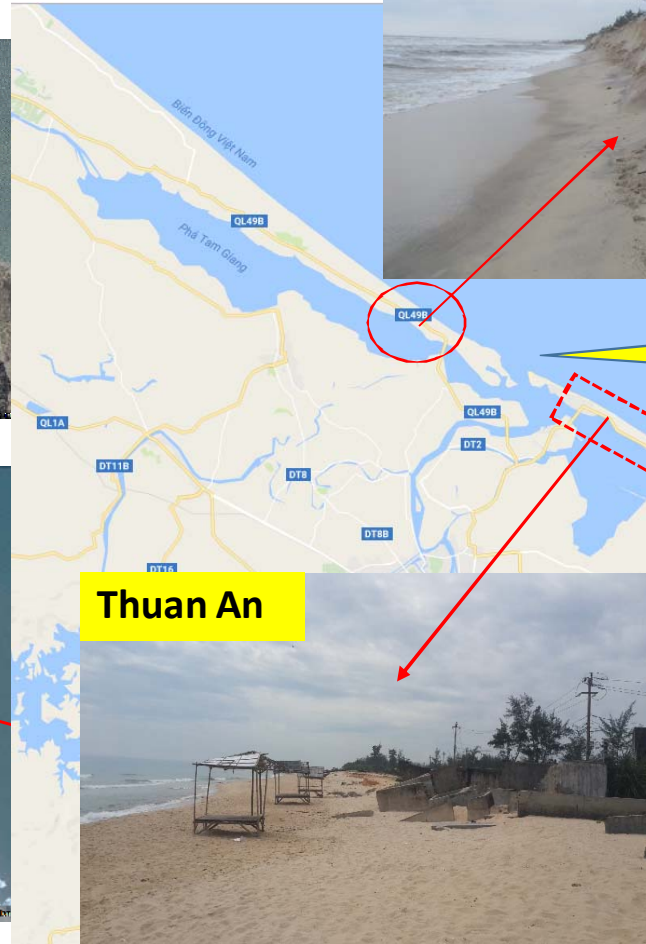


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Some of erosion hotspots



Hoi An (Quang Nam)

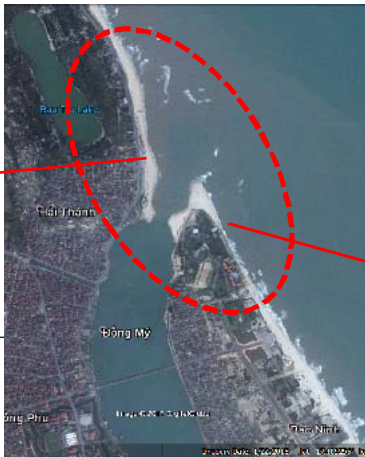


Quang Cong

Eroded continuously each year



North of Nhat Le river mouth
(Quang Binh)



Thuan An



Phu Thuan

Some of sedimentation hotspots



2. Activities have been undertaken to control coastal erosion and sedimentation

2.1 Some case studies and research methods

1. **Research on erosion and countermeasures for Hoi An coast** (2016-2017), sponsored by AFD (France): Understanding the erosion/sedimentation mechanism in Cua Dai estuary; Proposed measures for coastal protection against erosion and **beach restoration**.
2. Other researchs on estuary training (anti-sedimentation, shore stabilization and beach restoration) from 2010 to 2014: **Ma river estuary (Thanh Hoa); Nhat Le estuary (Quang Binh); Ben Hai river mouth (Quang Tri); Huong River estuary (Hue)...**
3. **Planning and Implementation of the Sea Dike Systems** from Quang Ninh to Quang Nam (2012 -2014) with consideration of climate change and combining coastal traffic: Evaluating the erosion status, coastal protection measures, identifying sea dikes (alignment, cross section, elevation...).
4. **The Science and Technology Program for Sea Dike** construction in cooperation with the Netherlands (2009-2012): Determine wave height, cross section for sea dikes; Determine location to build dike in the area of no dike existing and adjust locations of existing dike systems; Management and protection of coastal sand dunes; Issue "Sea Dike Design Guideline"...

2. Activities have been undertaken to control coastal erosion and sedimentation

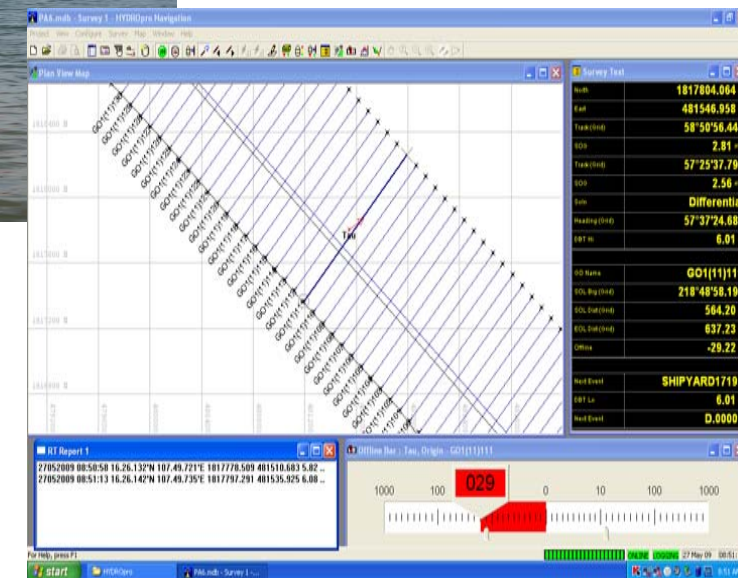
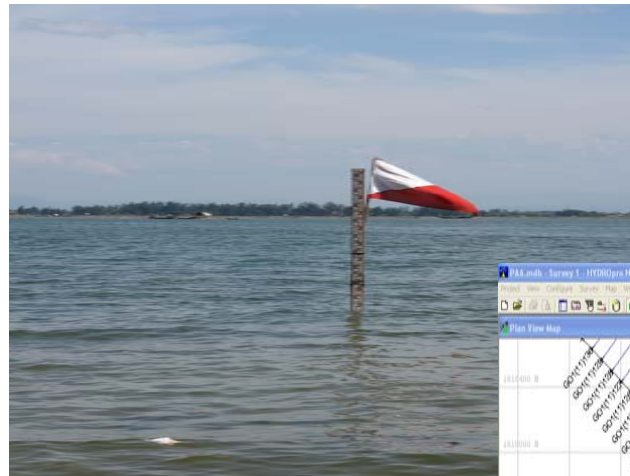
2.1 Some case studies and research methods

❖ Field survey:

- In some years prior to 2007: periodical measurements of topography, meteorological and hydrological factors in some coastal zones, estuaries.

- In the period from 2008 to 2010: surveyed and mapped coastal topography scale 1 : 25000 for the entire coastal zone of Vietnam.

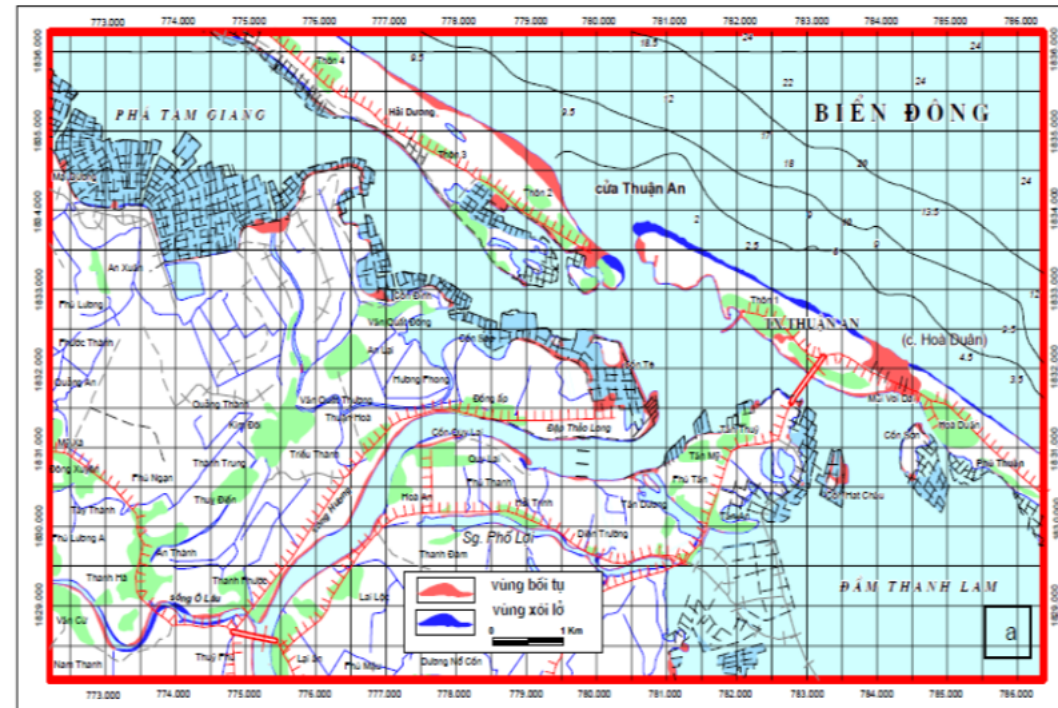
- From 2010: measurements of topography, meteorological and hydrological factors in some coastal zones, estuaries (non-periodic).



2. Activities have been undertaken to control coastal erosion and sedimentation

2.1 Some case studies and research methods

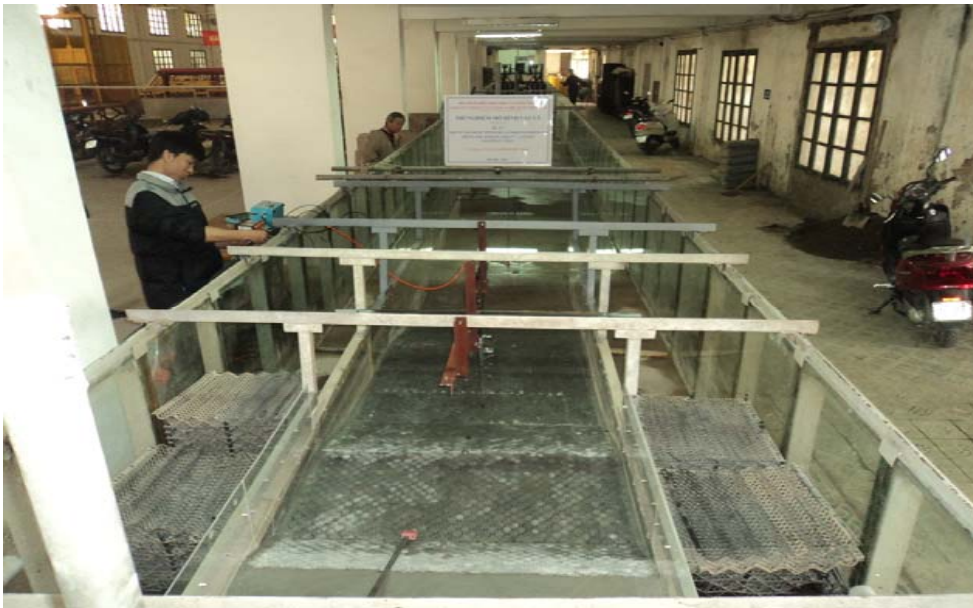
- ❖ Using Remote Sensing Technology in monitoring and evaluation of coastal and estuarine changes.
- ❖ Using numerical models in forecasting:
 - Study of coastal evolution on horizontal platform: MIKE-Denmark: (modules: MIKE21 SW, HD, ST, COUPELE; LITPACK; CEDAS-USA (RCPWVE, STWWAVE, GENESIS, SMS)...
 - Study of coastal evolution on vertical platform: CEDAS - USA (SBEACH), DUROS - Plus – Netherlands...



2. Activities have been undertaken to control coastal erosion and sedimentation

2.1 Some case studies and research methods

- ❖ Researching on wave flume, wave and tide basin for measures



Wave flume, wave and tide basin in Viet Nam Academy for Water Resources

2. Activities have been undertaken to control coastal erosion and sedimentation

2.2 Coastal Disaster Management

* Legal documents:

Disaster Preparedness Law (33/2013/QH13); Dyke Law (79/2006/QH11); National Strategy on Natural Disaster Prevention and Mitigation (172/QĐ-TTg); Regulations on treatment of riverbank and coastline erosion (01/2011/QĐ-TTg).

* Organizational structure, management apparatus:

Fundamentally completed from Government to local levels (Central Steering Committee for Disaster Prevention and Control, General Department of Disaster Prevention, etc.)

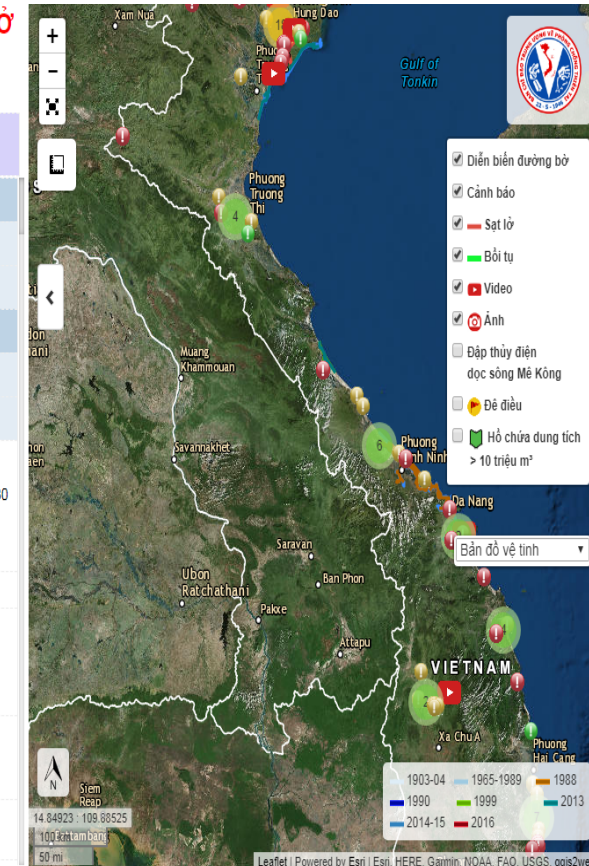
* Database and technology for management:

- Web sites (operating, directing);
- Database of erosion management (using GIS, remote sensing);
- Automatic monitoring system (meteorological factors, coastline ...).

DANH SÁCH CÁC ĐIỂM SẠT LỖ

Nhập tên địa điểm Có 172 điểm tất cả

STT	ĐỊA DANH	DÀI (m)	GHI CHÚ
MIỀN BẮC (52 điểm)			
▶ Bờ sông (52 điểm)			
▶ Bờ biển (0 điểm)			
MIỀN TRUNG (36 điểm)			
▶ Bờ sông (21 điểm)			
▼ Bờ biển (15 điểm)			
74	Kê chống sạt lở bờ biển đoạn qua thôn Hòa Duân, An Dương, xã Phú Thuận, huyện Phú Vang, Thừa Thiên Huế	1000	Đề xuất hỗ trợ mới: 80 tỷ đồng.
75	Ngã Tam Tấn	500	
76	Thôn Tiến Đức, X. Tiến Thành và phường Đức Long, TP. Phan Thiết Bình Thuận	1500	
77	KP 14 TT Liên Hương, huyện Tuy Phong, Bình Thuận	1200	Đề xuất hỗ trợ mới. Tổng kinh phí: 235 tỷ đồng.
78	Xã An Hòa, Tuy An, Phú Yên	1000	



2. Activities have been undertaken to control coastal erosion and sedimentation

2.3 Technical solutions and measures applied

- **Protection works, works against coastline and beach erosion:**

- There are 821 km sea dikes and river mouth dykes built, with over 300 km protected by revetment systems.

- **Solution works:** revetment, sea wall, groin, revetment reduce wave with a variety of textures and materials.

- + Solution on materials: natural materials; Stone; Poured concrete, geotextile.

- + Solution of structural components: Concrete Block; Articulating Concrete Block Revetment System; composite slopes and berms revetment; Cement pipe ...

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Some of the solutions have been implemented

Revetment for coastal protection



rip-rap revetment with frame



Stepped concrete block revetment



Articulating Concrete Block System



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Groynes for coastal protection



Tetrapod



Cement-pipe groyne

Toe protection of revetment



Protect revetment's toe by Cement-pipe



Prestressed concrete piles

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Other types of structure



Stabiplage



Groyne with stabiplage techniques



Mangrove planting

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- **Estuary training works:**

- The main task is to prevent sand trapping and reduce waves, to safe for boats and coastal economic activities;
- Measures: groynes with various types of materials and structures.



Thuan An mouth (TT.Hue)



Viet mouth (Quang Tri)



Tung mouth (Quang Tri)

2. Activities have been undertaken to control coastal erosion and sedimentation

2.4 Some limitations of activities

* Limitations on research:

- The data of Coast and estuary has not been centrally managed and updated regularly.
- Field survey equipment for research are incomplete, some are old and outdated that do not meet the requirements.
- Results of the research study has limited scientific basis and not quantified in detail, as quantitative evaluation of key factors to clarify the mechanism, causes of coastal erosion, sedimentation in estuary.
- Advanced technologies (GIS, remote sensing) have not been widely used in the management of the coastal zone of Vietnam as well as the North Central Coast.
- Research on beach restoration and rehabilitation technologies has not seen much progress.
- The research experts in the field of morphology, works are lack and not well organized.

2. Activities have been undertaken to control coastal erosion and sedimentation

2.4 Some limitations

* Limitations on construction

Construction design: not suitable.

- Groins: There still has mistakes in designing of space allocation of groins system, detached breakwater...
- Revetment: Design parameters of revetment has not been suitable for both patterns: berm, slide roof, toe...



Cement pipes at toe of revetment were broken by erosion



rip-rap revetment with frame was broken by wave

2. Activities have been undertaken to control coastal erosion and sedimentation

2.4 Some limitations

* **Limitations on construction:**

• **Construction works**

- Roof reinforcement: Concrete blocks are produced in the construction site so it is difficult to control the quality;
- Toe reinforcement: space between components of revetment's toe is not suitable.

• **Construction maintenance:**

- The monitoring, evaluation, management and maintenance of the works after construction is not proper, small damage untreated will lead to the instability of the whole works.



*construction of revetment
on unstable ground*



*Concrete blocks are produced
with low quality*

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3. Propose cooperation to support erosion, sedimentation research and management

3.1 Propose cooperation to support on research

Research on technical solutions and technology of beach restoration



before



present

Cua Dai beach
(Hoi An - Quang Nam)



Before

Cua Tung beach
(Quang Tri)



present

3.2 Propose cooperation to support a case study

***“Research for Estuary Training of Ben Hai river,
Quang Tri province – the North Central Coast of Viet Nam”***

Current status of Ben Hai river mouth



Eroded beach at the North of river mouth



Deposition in river mouth



Jetty at the South of river mouth



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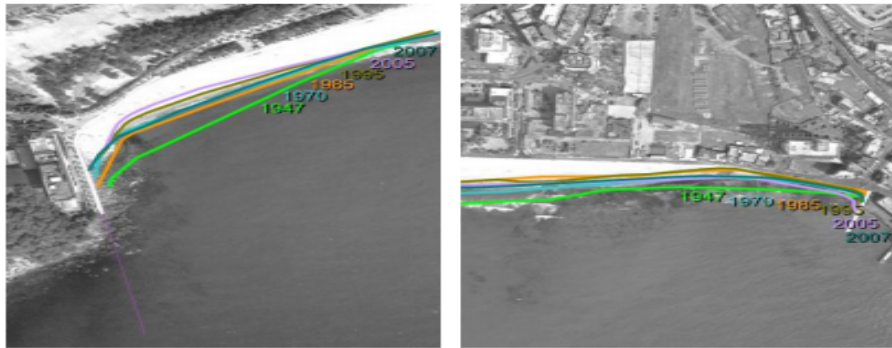


Figure 2. Historical records of shoreline change in Haeundae Beach. (a) Joseon Hotel area (west side). (b) Mipo area (east side).



Figure 3. Seasonal change of shoreline in Haeundae Beach. Joseon Hotel area (west side) in summer (a) and winter (c); Mipo area (east side) in summer (b) and winter (d).



Figure 9. Beach erosion countermeasure plan for Haeundae Beach.



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Thank you for attention!

