MUI CA MAU NATIONAL PARK

BIODIVERSITY AND ECOSYSEM SERVICES

Vulnerability and Climate Change

Initial findings

Regional Workshop

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Please note that this presentation presents initial finding and work that is in progress. It was developed for workshop discussion only.

-The Mui Ca Mau National Park is a part of the Ca Mau peninsular and mudflat, established 14/7/2003.

- Coordinate: 8°32’- 8°49’ N; 104°40’ – 104°55’ E

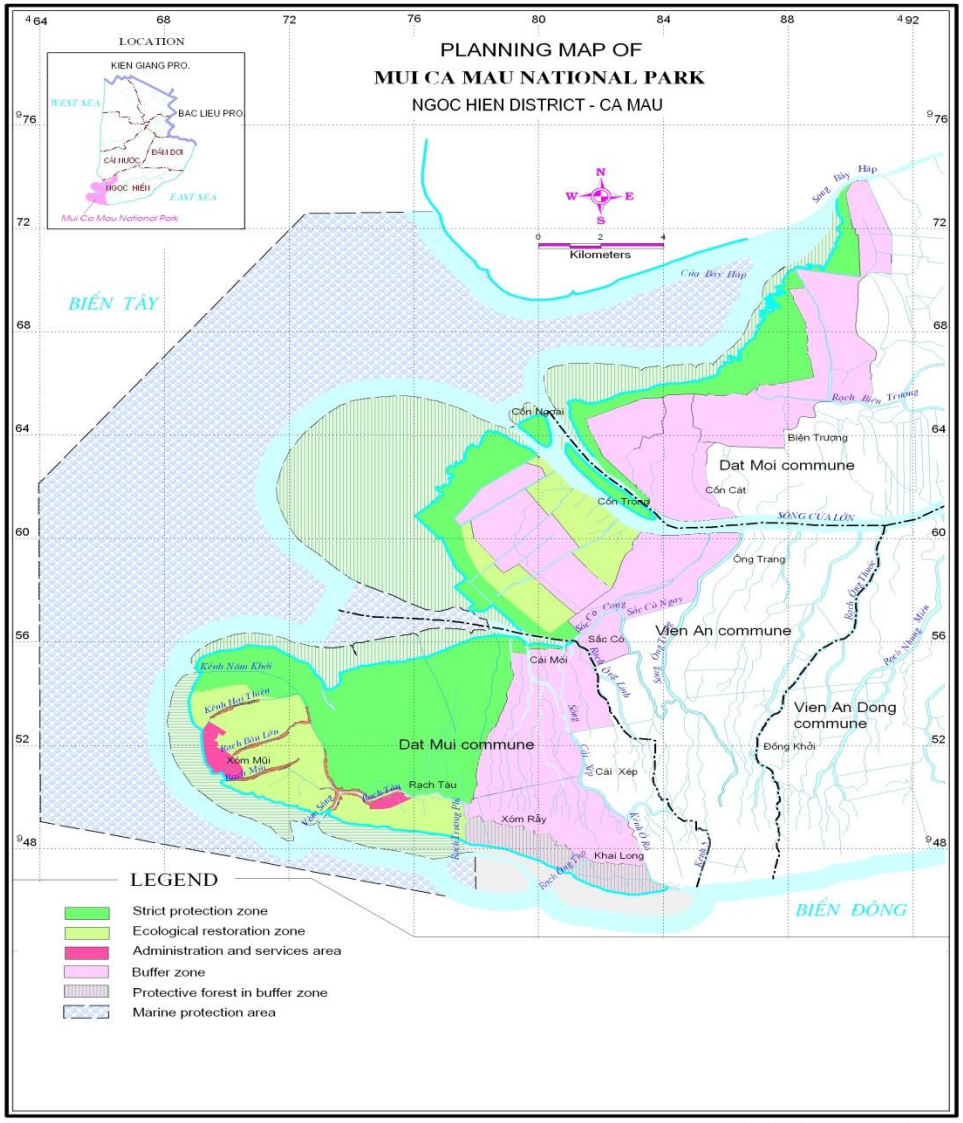
- Total area 41,862 ha. Of those inland territory is 15,262 ha, mudflat and tidal area is 26,600 ha.

-Located within Dat Mui, Vien An - Ngoc Hien and Lam Hai & Dat Moi – Nam Can.

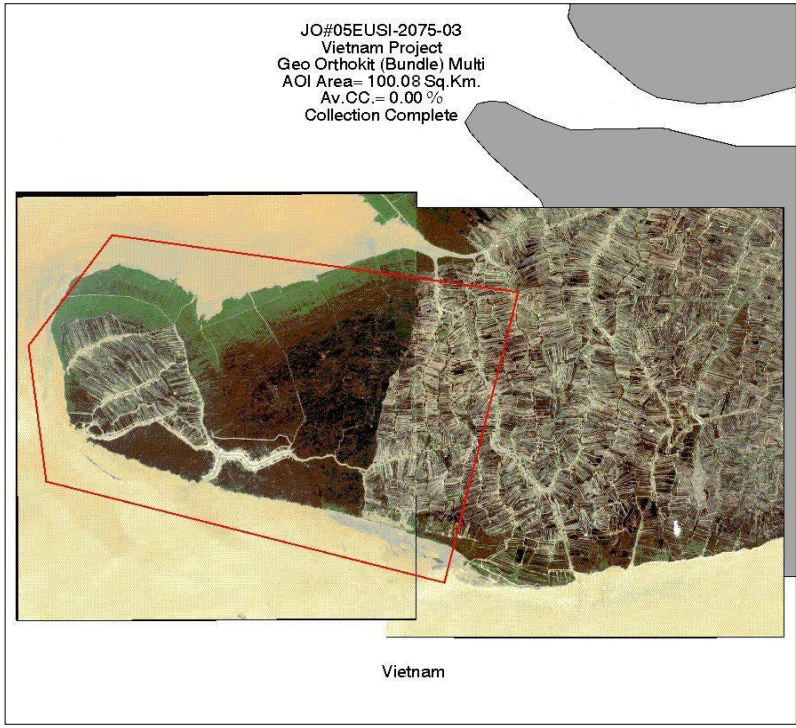
- It is a very important site of ASEAN Wetlands and is one of the international biosphere reserve areas.

- Mui Ca Mau National Park is one of the important bird areas of Vietnam.

- The park separates the sea into East Sea and West Sea.



Source: Dang Anh Tuan, 2007.



Dang Anh Tuan et al., 2010

Biodiversity

Ecosystem diversity

The National park can be divided into two biomes: inland/ terrestrial area which dominated by mangroves (planted or natural) and the mudflat.

The main/ representative ecosystems in the inland area are:

- Mangroves with:
  - Rhizophora forest
  - Avicennia forest, and
  - Mixed Rhizophora, Avicennia, and Sonneratia
- Aquaculture ponds with mangroves
- Canals and ditches
- Settlement.

Photo: HV Thang & Mui Ca Mau NP

Ecosystem diversity

Estuarine

Mudflat and sandy mudflat

River mouths

Photo: Mui Ca Mau NP

Species richness

Flora

- Seaweed: 27 species

-Vascular plants: 60 species.

-Of those 26 species are mangroves.

Photo: HV Thang & Mui Ca Mau NP

Animals

Class	Total species
Polychaeta	18
Gastropoda	11
Bivalvia	8
Cephalopoda	1
Palaeostraca	1
Crustacea	30
Pices	139
Amphibia	9
Reptilia	43
Aves	93
Mammalia	26
Total	**379**

Genetic

Mui Ca Mau NP contains many rare and endangered species including:

Vietnam Red Data Book:

2 species of plants

13 species of reptiles

7 species of birds, and

6 species of mammals

IUCN Red Data Book

6 species of reptiles

7 species of birds

6 species of mammals

Photo: Mui Ca Mau NP

Many species of high economic values.

Photo: HV Thang

Ecosystem Services

1. Provision
   - Food (fish, shrimp, clam, oyster…)
   - Construction materials (timber, polls, roof…)
   - Firewood
   - Agriculture and aquaculture
   - Medicinal herbs
   - Gene pool.

Photo: Mui Ca Mau NP

Ecosystem services

2. Regulation
   - •Climate regulation and carbon sequestration/ sink.
   - •Flow regulation
   - •Water purification and pollution treatment
   - •Coastline and sea dyke protection
   - •Erosion prevention
   - •Sea wave prevention and natural disaster mitigation.

Photo: HV Thang

Ecosystem services

3. Cultural and spiritual
   - Traditional festivals
   - Recreational and ecotourism
   - Aesthetic and landscape
   - Education and scientific researches

Photo: HV Thang

Ecosystem services

4. Support
   - Habitats for many species including rare and endangered ones
   - Breeding and Spawning areas for many species
   - Nitrogen and SS retention. Mudflat and land formation
   - Nutrient cycling storage, recycle process

Present pressure and climate change pressure on Mui Ca Mau National Park

Present pressure to ecosystems

- Rapid growth in population due to un-planned migration (**Population: 144,679.0; Population density: 120.5 person/km^2)**
- Local people harvest/ cut mangrove trees for charcoal, fuel wood, net polls…
- Hunting of wildlife
- Destructive fishing and exploiting of natural resources
- Too crowded exploitation of aquatic stocks…
- Violation/ against law enforcement.

Photo: Mui Ca Mau NP

Recently Observed Phenomena

- Increased Temperature
- Abnormally prolonged dry, hot season
- Unpredictable, high intensity rain events in the dry season.
- Sea level rises annually.

Impact of climate change on ecosystems

- Coastline erosion, especially in the East Coast
- Decrease in population of a number of bird species due to habitat loss/ decreased feeding area
- Negative impact on aquaculture (impact on poor people, especially to those who have no cultivation land, living heavily depend on forest and sea products).
- Increase in poverty rate.

Extreme events during the last 50 years

- Typhoon No. 5 in 11, 1997: gusted above category number 12 (Vietnam), destroyed huge areas of mangroves.
- Without mangroves, damages could have been greater.

Climatic trend predicted to 2050

Main impacts of climate change:

- Change in temperature
- Change in rainfall
- Sea level rise

Other impacts:

- Reduced sediment load from Mekong River + natural compaction=>Delta sinking =>decreasing elevation relative to sea levels

Projected changes in temperature

- According to SEASTART: average daily temperature of Ca Mau will increase from 0.91-1.05^{0}C btw. 2010-2050.
- The current evaporation is about 1,200mm-1,500mm/annum (Southern Sub-Institute for Water resource planning)
- WeAdapt (2009) predicted average daily temperature will increase 10%; max increase daily is 13%

=>Increase in evaporation; impact on species…

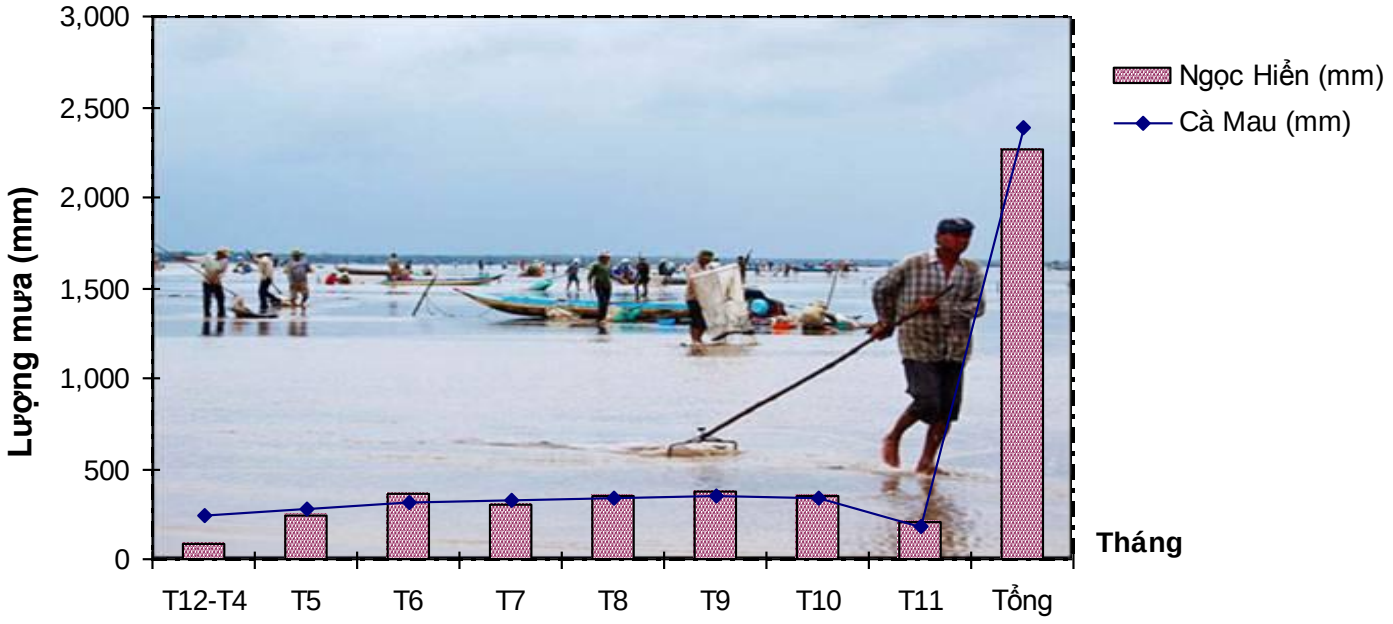
Projected Change in rainfall

- The average annual rainfall is relatively high, over 2,300mm/year and distributed unevenly in terms of time and space.
- SEASTART: average rainfall will reduce from 80-119mm/ annum (scenario A2), 40-79mm (B2) during the period of 2010-2050.
- It is predicted that to 2030, the rainfall of Mũi Cà Mau will decrease more than 35%.
- 3 more droughts/ annum expected.

Rainfall

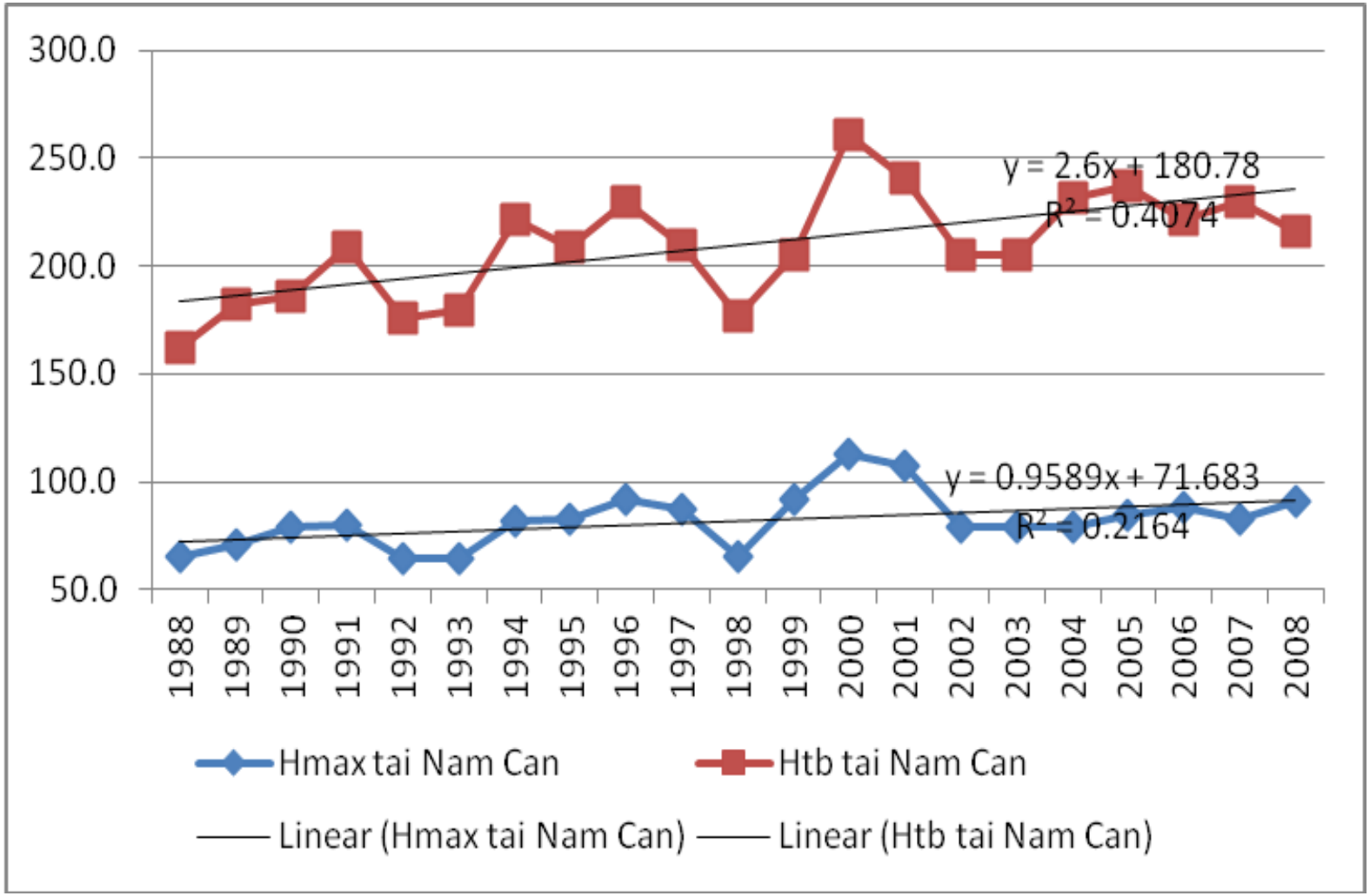
Location	Month								Total
	T12-T4	T5	T6	T7	T8	T9	T10	T11	
Ngọc Hiển (mm)	84	246	364	296	350	370	350	205	2.265
Cà Mau (mm)	237	277	319	331	342	353	338	186	2.383

BIỂU ĐỒ LƯỢNG MƯA



Predicted Change in water level

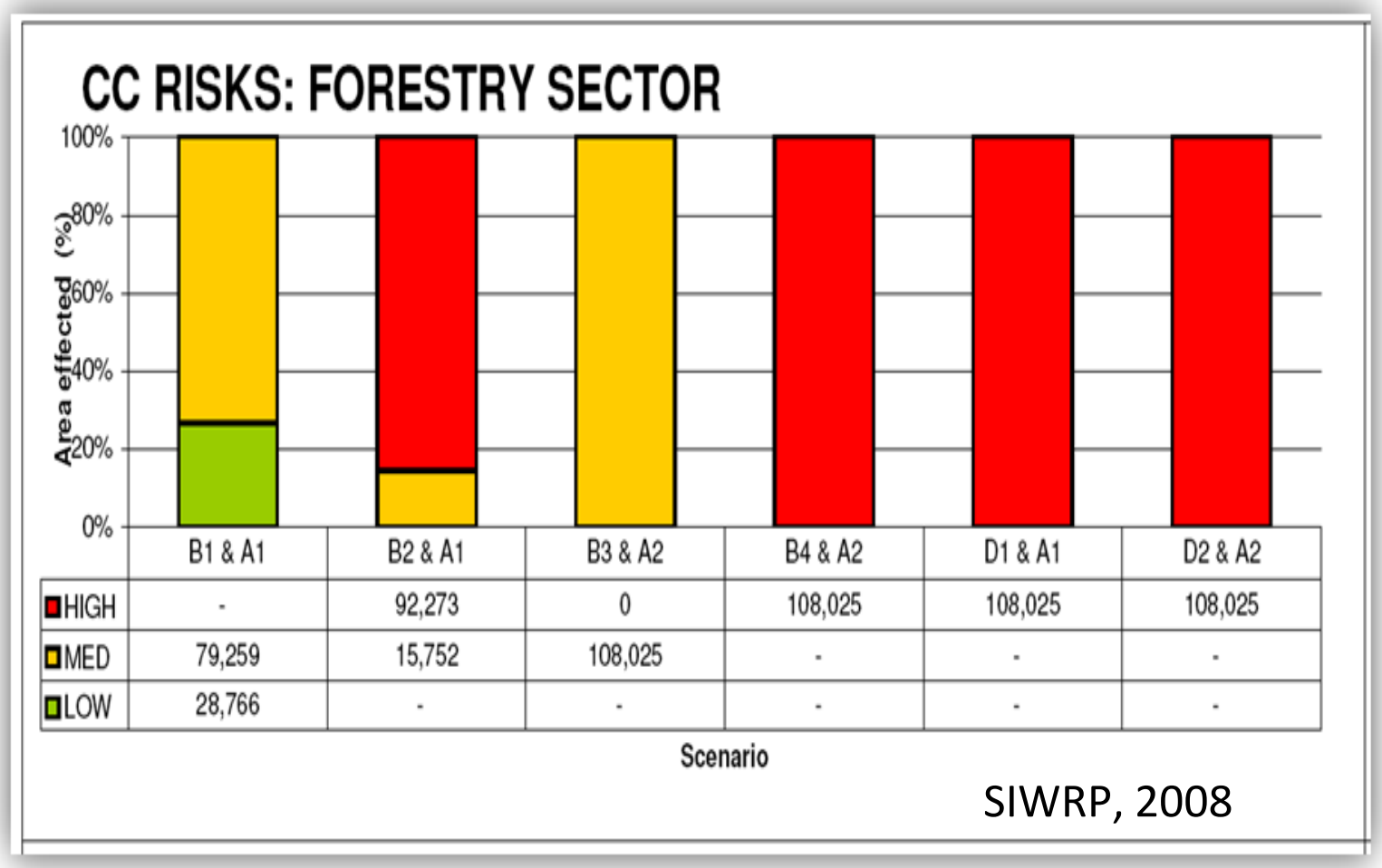
- Water level changed due to mainly tide and partially by rain water
- East Sea tide: 3-3.5m; West Sea: 0.8m
- Drainage of Ca Mau's canals is low. During high tide and heavy rain, prolonged flood can be occurred with the depth of 0.6-1.0m.
- According to Southern Sub-Institute for Water Resource Planning ((2009), when the water level rises 50cm, the water level at Mũi Cà Mau will reach to 1.4-2.0m during both wet and dry seasons. It means that the general water level will increase 0.4m.
- => Flooding large area of the park and its surrounding
- Extreme event like typhoon No. 5 (1997) had caused the water level rise up to 2.0m (especially during the storm season often started in early November).



Water level at Nam Can station

Source: SRHMC, 2009

Climate Change risk on forestry sector



	B1 & A1	B2 & A1	B3 & A2	B4 & A2	D1 & A1	D2 & A2
HIGH	-	92,273	0	108,025	108,025	108,025
MED	79,259	15,752	108,025	-	-	-
LOW	28,766	-	-	-	-	-

SIWRP, 2008

Mekong hydropower dampens: decrease sediment/ silt

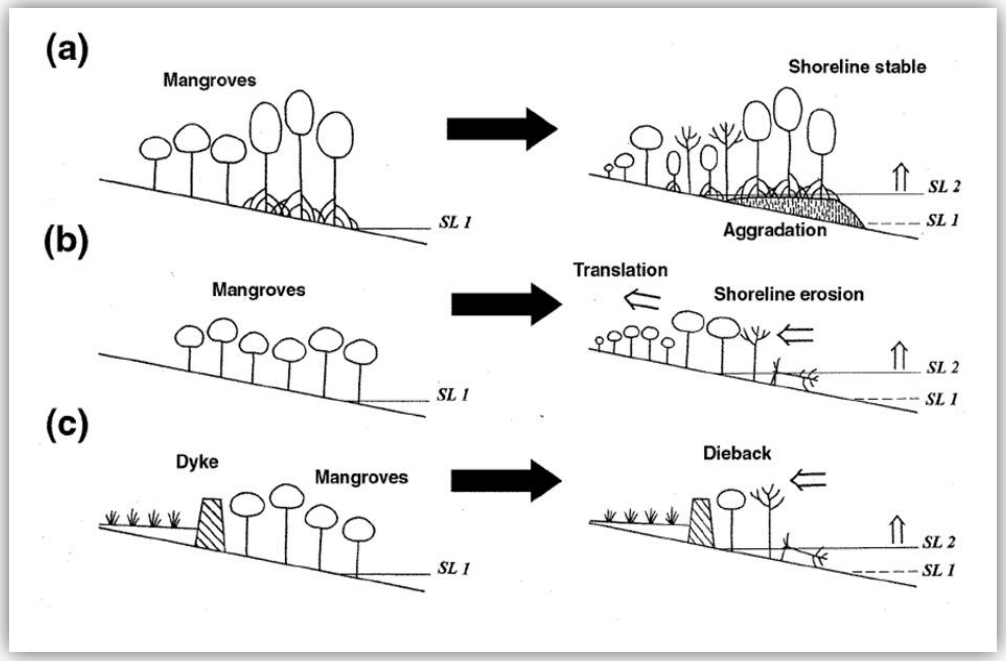
- According to MRC's SEA reports for 11 hydropower damps along Mekong river, the silt or sediment will decrease up to **75%**.
- It will block or stop the delta's formation/ building.
- Stopping sedimentation/ siltation.
- Shortage of silt/ sediment to compensate the natural sinking of the delta leading to lower land elevation.
- Decrease in fishery products.

Summary table of key climate change impacts on wetland natural components

Wetland natural system components	IF?..... (Climate condition)	Then.....(Impact of climate change (1 to 3 key examples for each)
1. Species	High Mekong flood	Nutrient supply increased => Increased in fishery productivity
		but too deep to catch for waterbirds
	Sea level rise	Mangrove migration or die out
		Negative impact on sea grass or seaweed
	Increased temperature	Hotter water surface + more stratified water column impacts on primary productivity
		Change in behavior, species composition
2. Habitats	High water level	Reduce feeding area for waterbird
		Push the magrove backward in land
	Low flood	Reduce sedimentation/ siltation
	Increased temperature	Increase salinity intrusionand salinity
		Increased evaporation
3. Geomorphology (landscape and sediment)	Off-season rains	Reduce salinity
	Sea level rise	Coastal erosion; large flooded area
	Low flood	Reduce sedimentation/ delta building
	Extreme event	Storm surcharge

Possible mangrove response

With the rise in sea level mangrove systems will migrate further inland, as they attempt to maintain their position relative to the rising water surface (b).
If the rate of sea level rise is comparable or slower to future rates of sedimentation, it is likely that the mangroves will be able to maintain their habitat through substrate aggradation (a).
At the moment, there is no high sea dykes along the coastline of Mui Ca Mau NP area.
Nevertheless, if the road is heighten, the dyke is built, then these structures may potentially impede the migration of mangroves experiencing sea level rise, causing them to die out (c).



Hashimoto, 2001

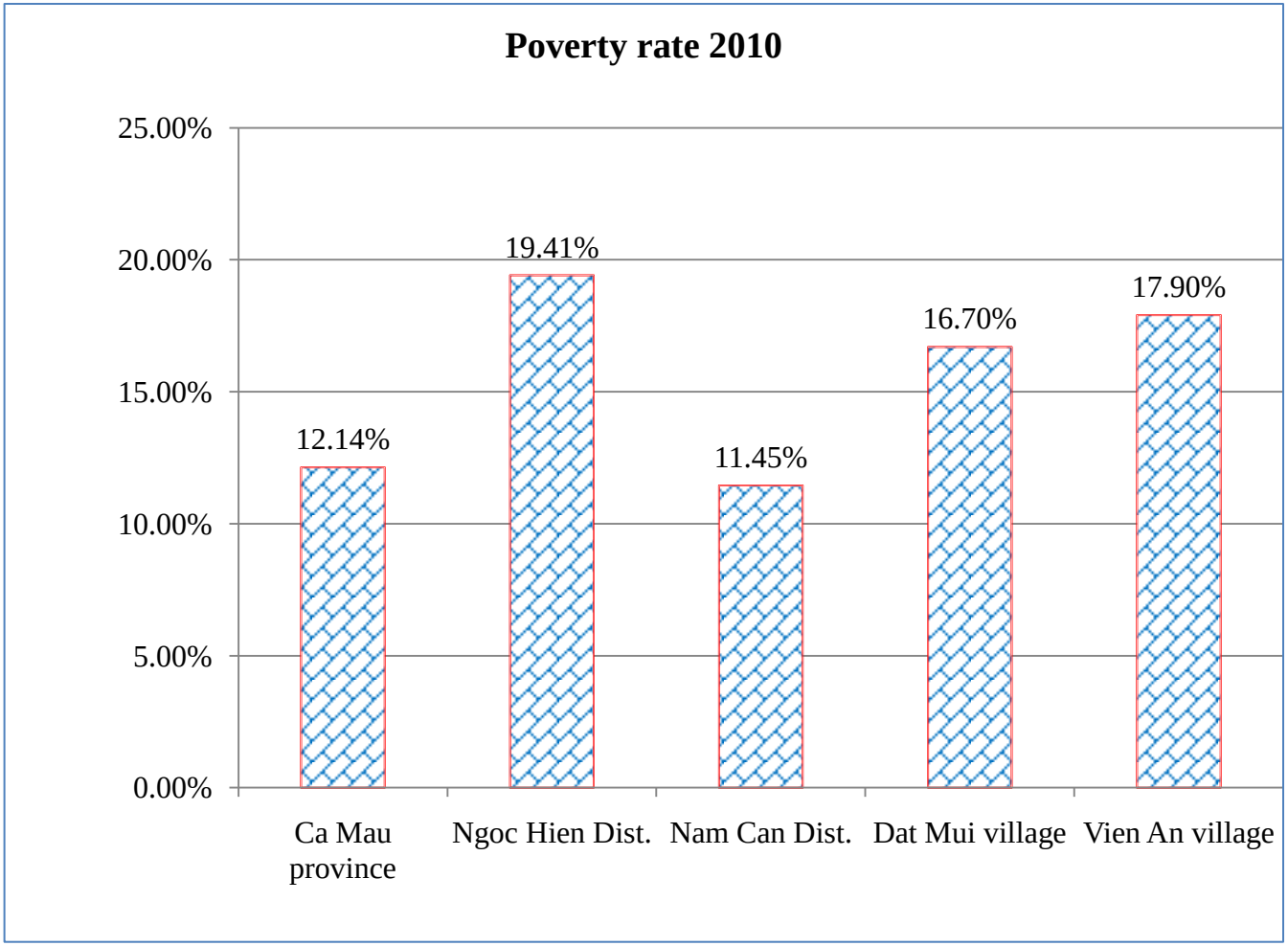
Socio-econmic

Socio-economic situation of Mui Ca Mau National Park

Table: Socio-economic conditions of two districts in Mui Ca Mau National Park

Content	Unit	Region	Ca Mau province
		2010	2010
Area	km^2	1,230.60	5294.87
Population	person	144,679.0	1,212,089.0
Population density	person/km^2	120.5	229
Number of household	household	36,182.0	286,813.0
Male	%	51.53	50.27
Female	%	48.47	49.73
Urban	%	20.53	21.49
Rural	%	79.47	78.51
Population growth rate	%	0.06	0.41

Source: Ca Mau Statistical Yearbook 2010



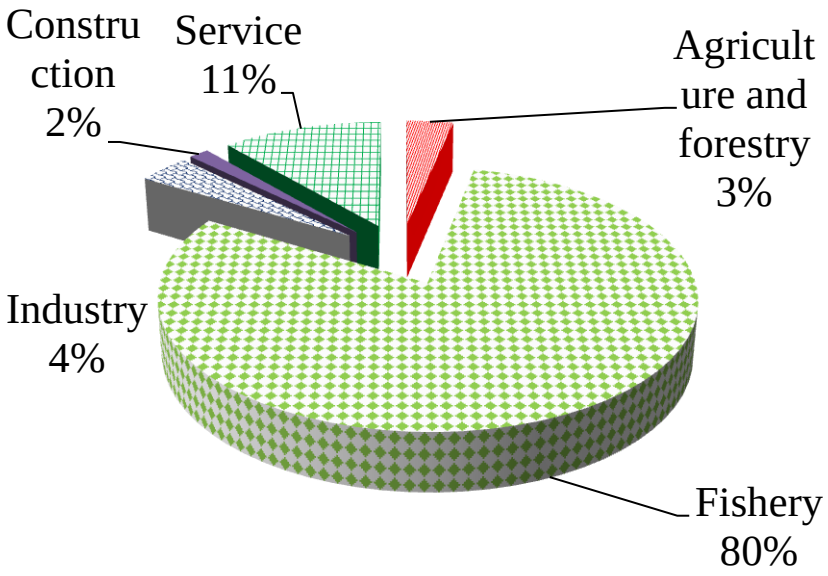
Source: Ca Mau Statistical Yearbook 2010; *Dat Mui PPC, 2011*

Local communities are highly dependent on wetland resources of the park

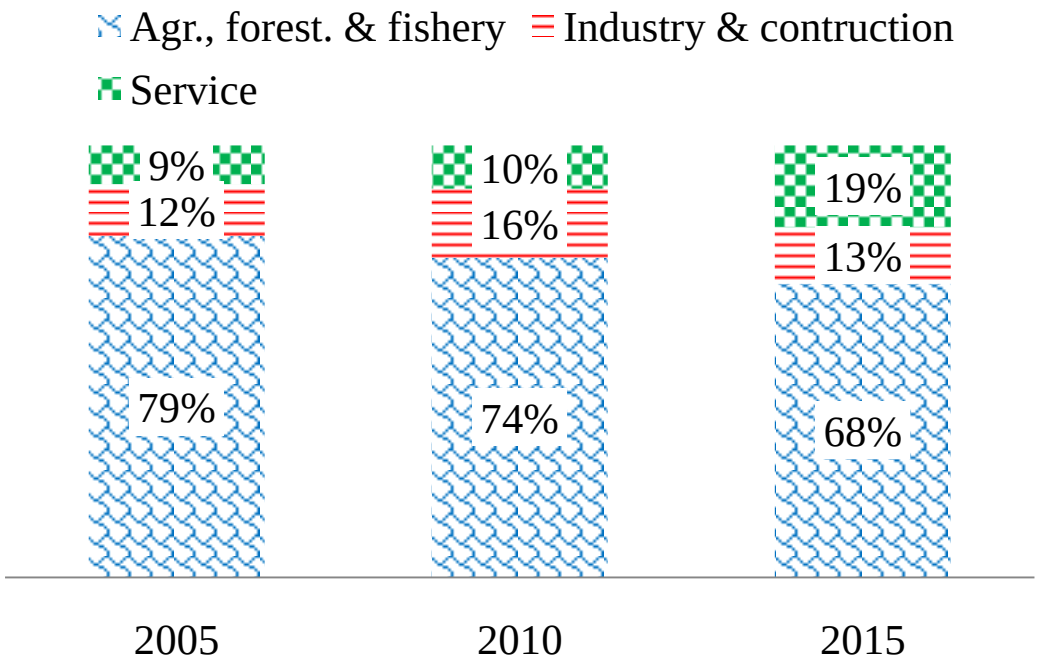
Photo: Ho Cong Hoa

Local communities are highly dependent on wetland resources of the park

Labor structure of Ngoc Hien dist. 2010



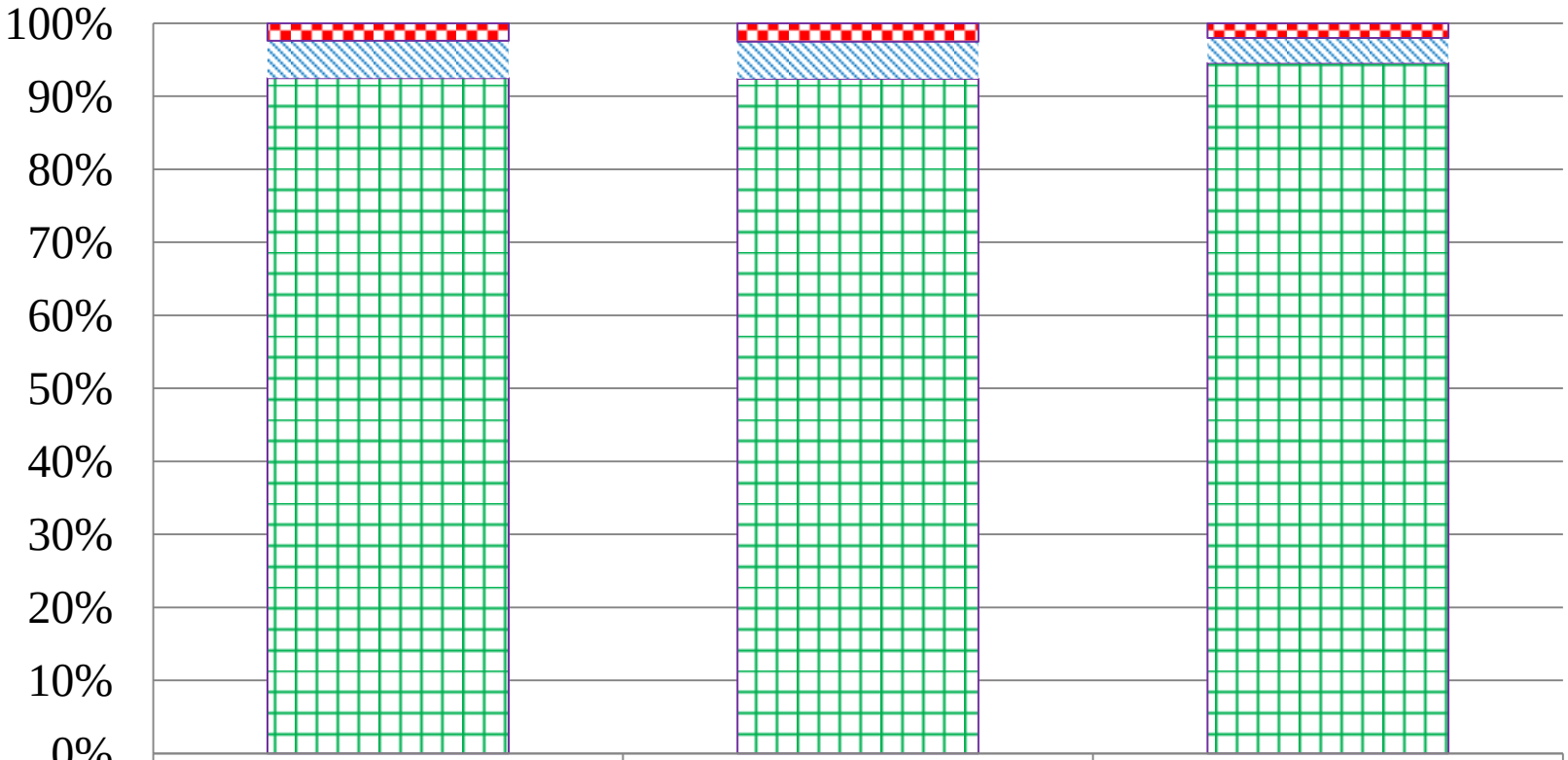
Structure of output value of Ngoc Hien dist. (current prices)



Source: Department of Statistics of Ngoc Hien district

Local communities are highly dependent on wetland resources of the park

Structure of output value of Agr. Forst. & Fishery in Ngoc Hien & Nam Can dist. *(current prices)*



	2008	2009	2010
Forestry	2%	3%	2%
Agriculture	5%	5%	3%
Fishing	93%	92%	95%

Source: Ca Mau Statistical Yearbook 2010

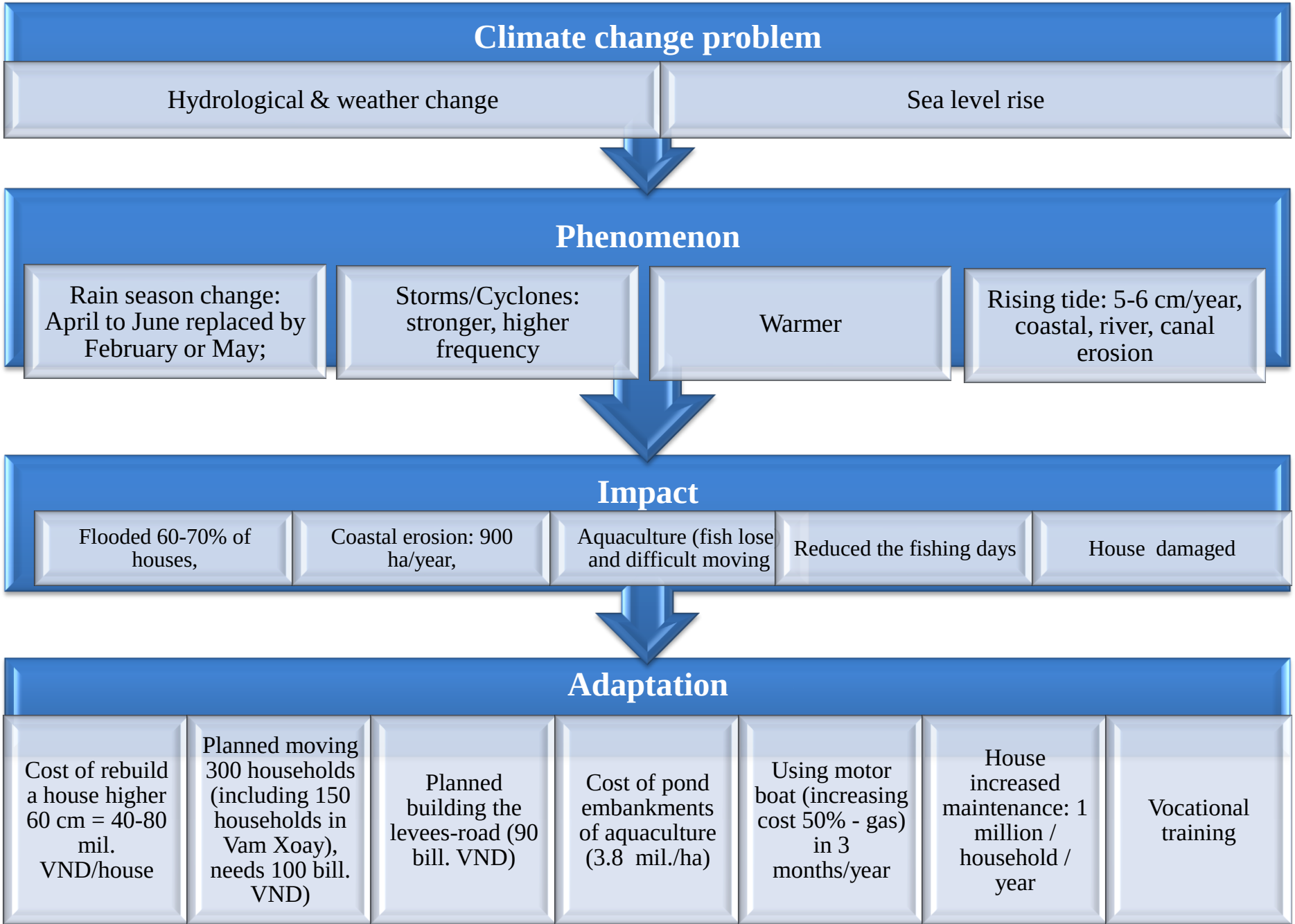
Local communities are highly dependent on wetland resources of the park

Household groups	Income percentage of natural dependence
Landless – fishing, hired labor	83%
Landless – fishing facilities	100%
Land for aquaculture	100%
Land for aquaculture & service activities	65%
Average	86%

Big gap between rich and poor households income

Household groups	Unit	Percentage of household	Income per household	Income per person	Income per worker
Landless – fishing, hired labor	Mill./month	42%	2.67	0.48	0.73
Landless – fishing facilities	Mill./month	18%	3.00	0.50	1.50
Land for aquaculture	Mill./month	20%	6.00	0.72	2.13
Land for aquaculture & service activities	Mill./month	20%	3.67	0.85	1.50
Average	Mill./month		3.59	0.60	1.30

Climate change and adaptation of the local communities




THANK YOU!
Photo: HV Thang