

# CHALLENGES OF INTEGRATED WATER RESOURCES PLANNING & MANAGEMENT IN MEKONG DELTA

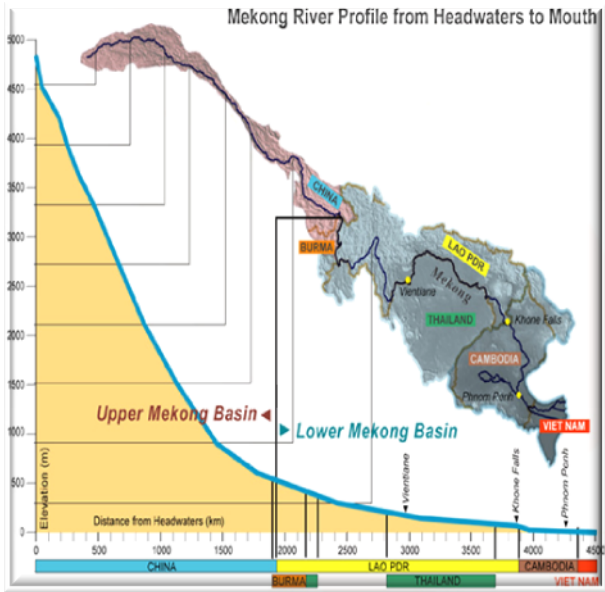


1<sup>st</sup> Rhine-Mekong Symposium

"Climate change and its influence on water and related sectors"

8-9 May 2014, Koblenz, Germany

Nguyen Xuan Hien  
Southern Institute for  
Water Resources Planning



## MEKONG RIVER

- Run through: 6 countries
- Length: 4,200 km
- Catchment area: 795,000km<sup>2</sup>
- One of the longest





# Important Indicators of Mekong Delta in the Vietnamese Economy

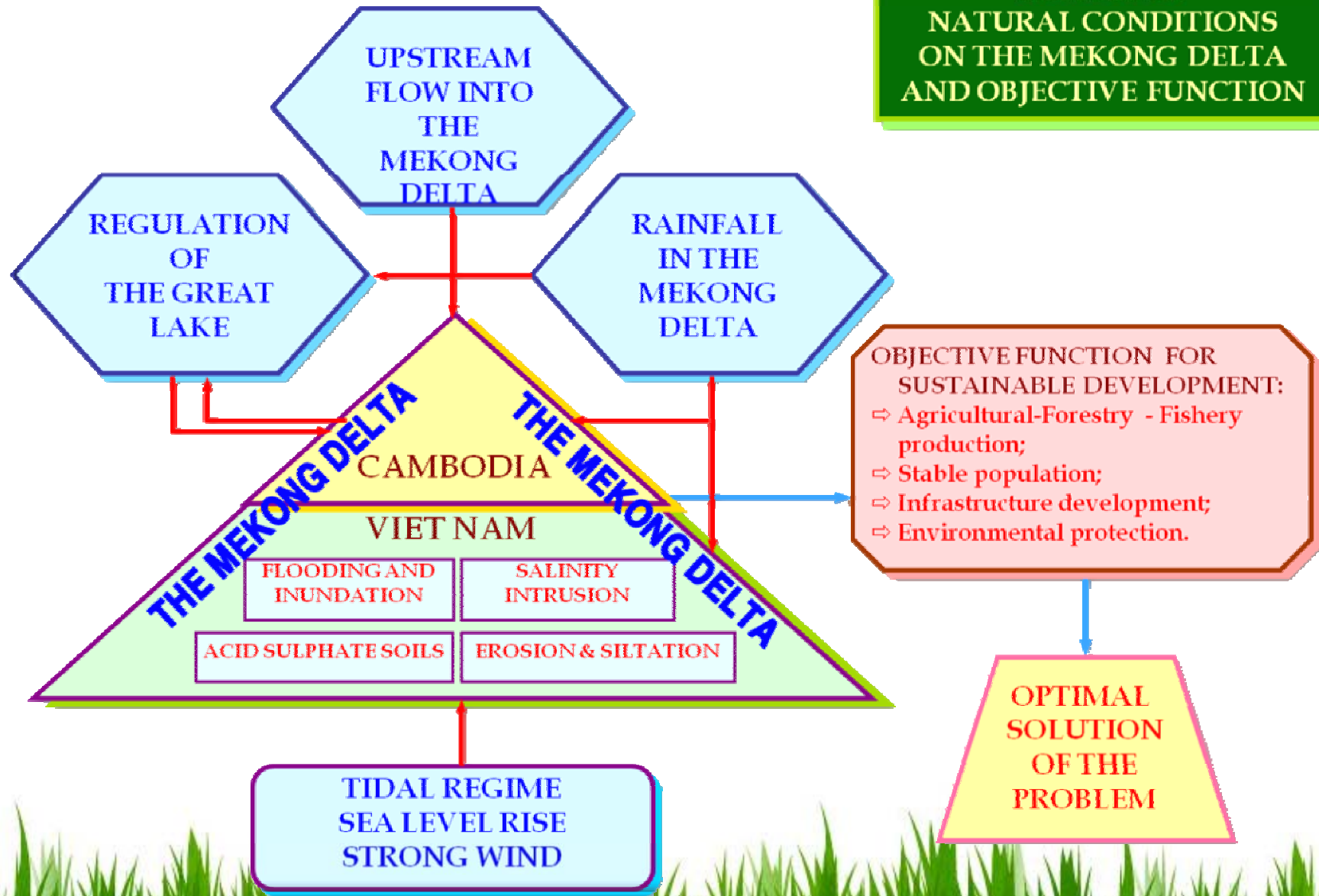
- Viet Nam MK Delta: 3,9 million ha (5% MK basin, 12% area of VN).
- Contribute: 50% rice production, 65% of aquaculture production and 70% of fruits.
- Accounts for 95% of VN rice exports and 60% of fish exports.
- One of the most productive agricultural regions in the world.





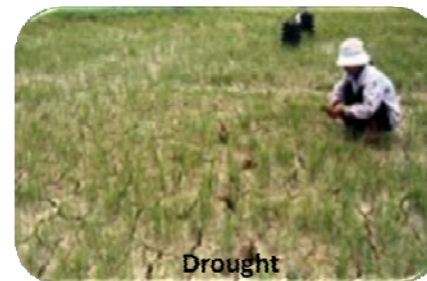
# THE VIETNAM MEKONG DELTA

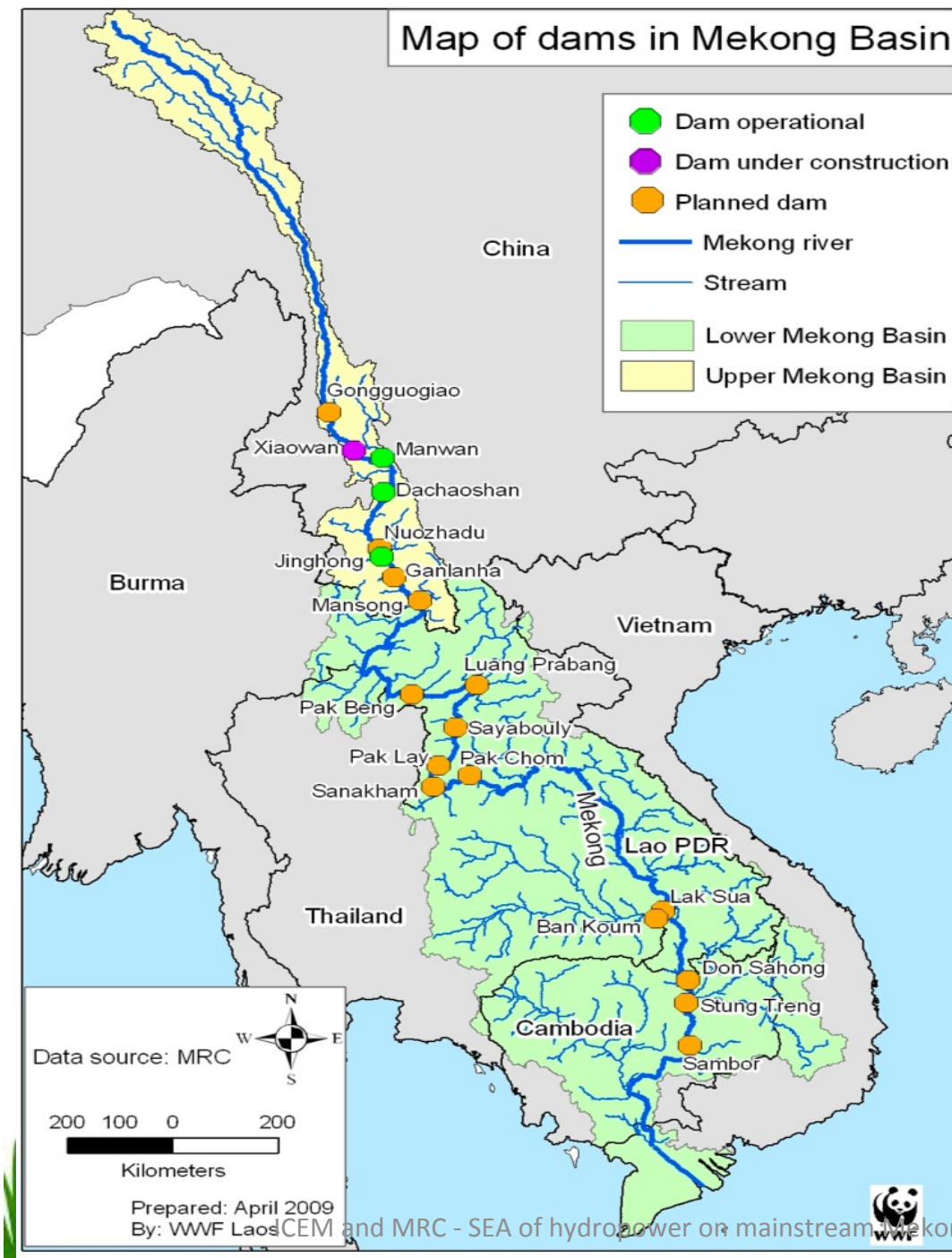
EFFECTS OF  
NATURAL CONDITIONS  
ON THE MEKONG DELTA  
AND OBJECTIVE FUNCTION



# MAJOR IWRM ISSUES IN THE MEKONG DELTA

- Upstream developments
- Flooding & inundation
- Drought & Salinity intrusion
- Acid-sulphate soils
- Water quality deterioration (pollution, aquaculture systems)
- Loss of wetlands and forests
- Erosion & sedimentation
- Land subsidence
- Climate change, SLR





## UPSTREAM DEVELOPMENT

### Hydropower Dams on mainstream:

**Upper Mekong (China):** 8 existing and planned

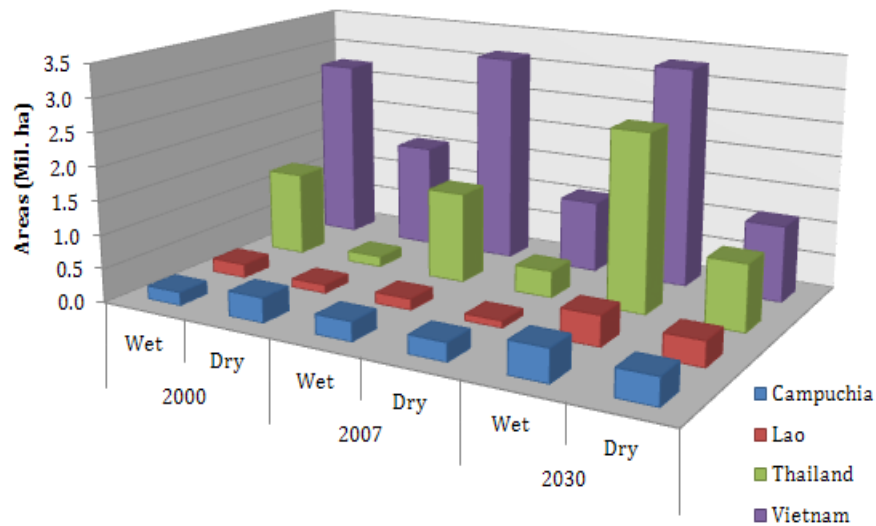
**Lower Mekong (Lao, Thailand, Cambodia):** 11 planned

### Hydropower Dams on Tributaries:

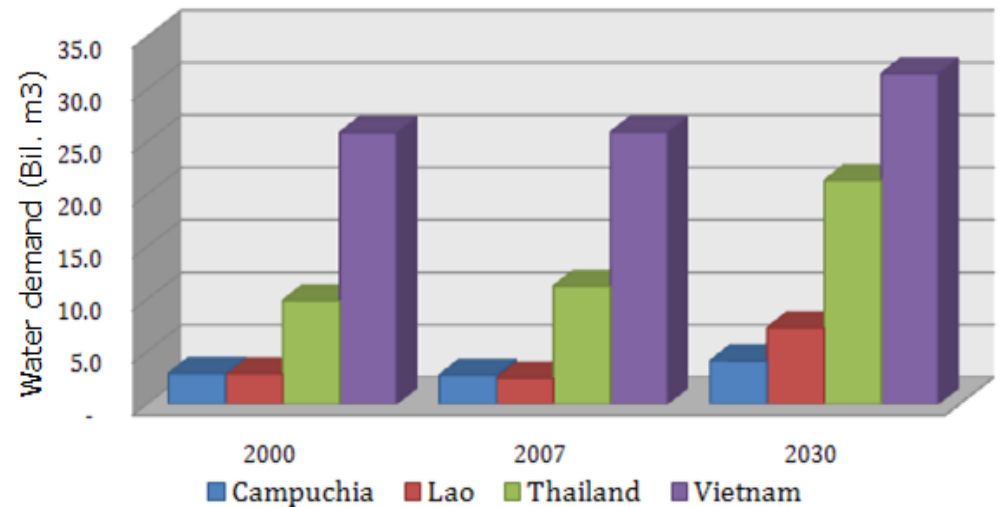
**Existing and planned:** 94 (only hydropower dams – does not include irrigation dams)

# INCREASED WATER ABSTRACTION

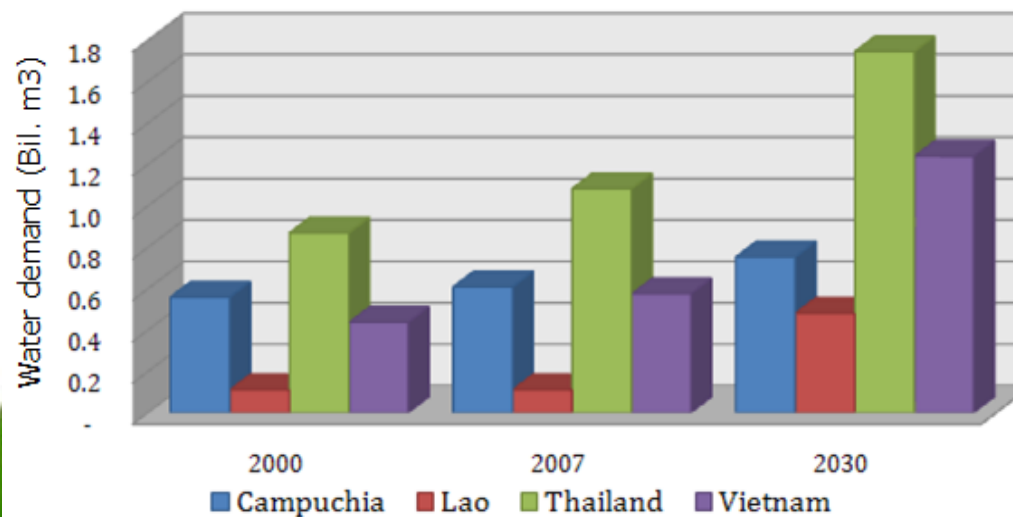
## IRRIGATION AREAS



## IRRIGATION DEMAND

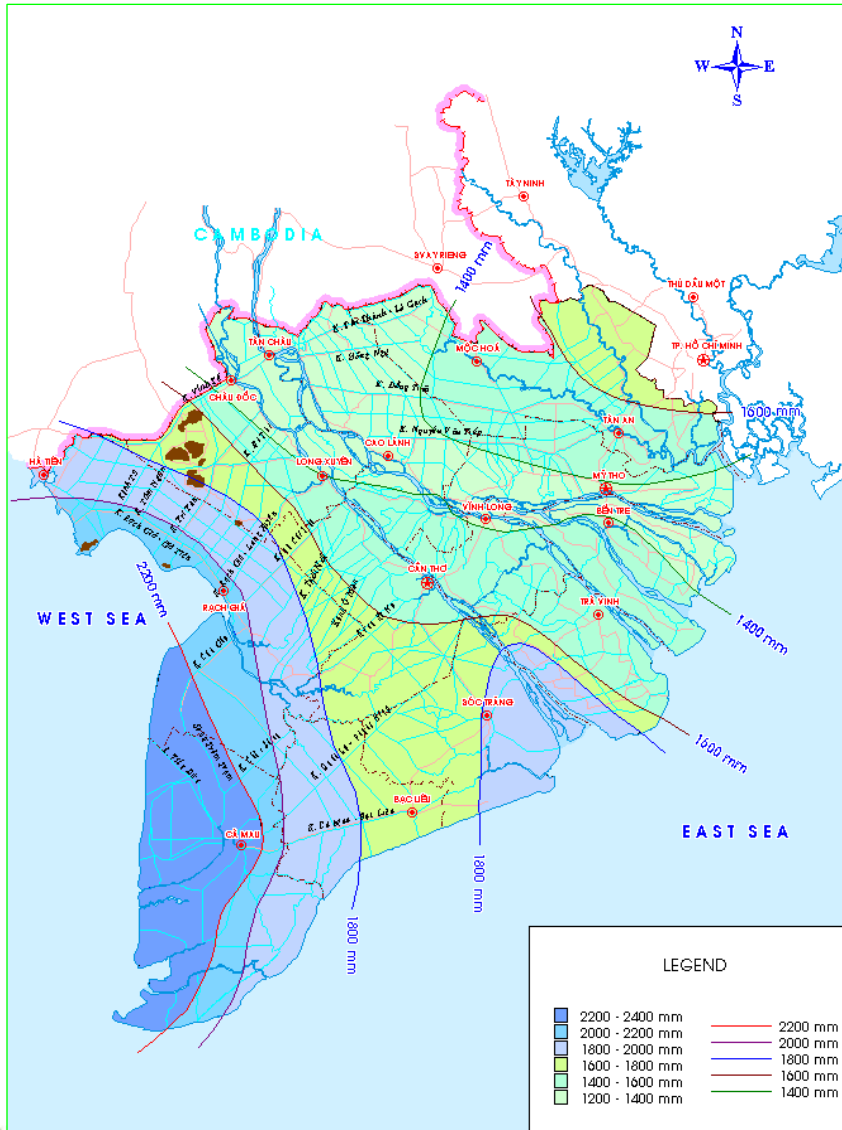


## DOMESTIC DEMAND





# THE NATURAL CONDITIONS

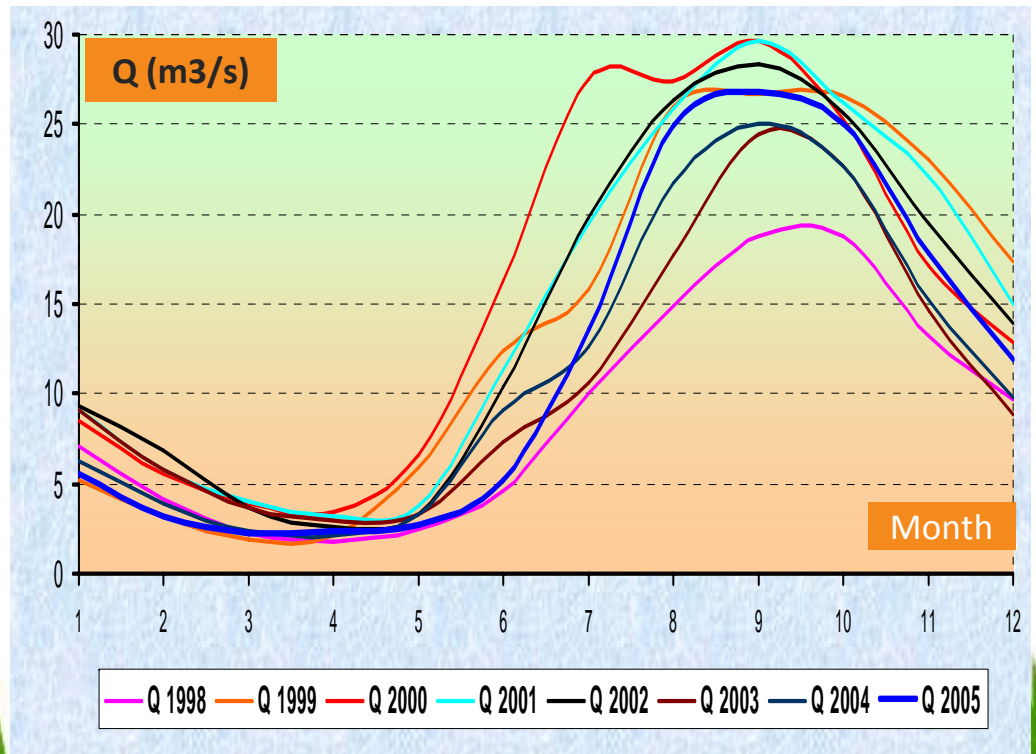


YEARLY RAINFALL ISOLINE IN CUU LONG DELTA

Figure: 12

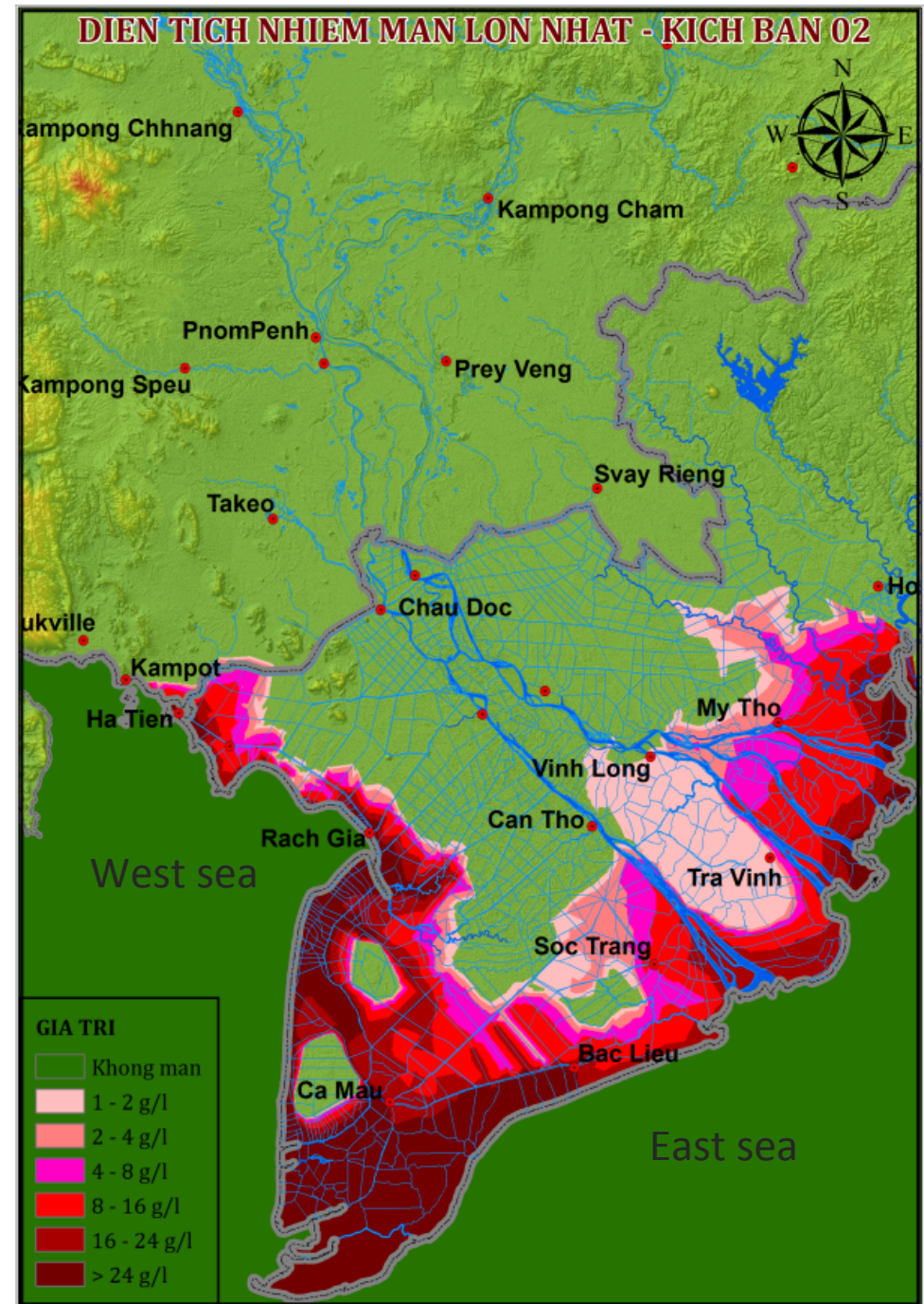
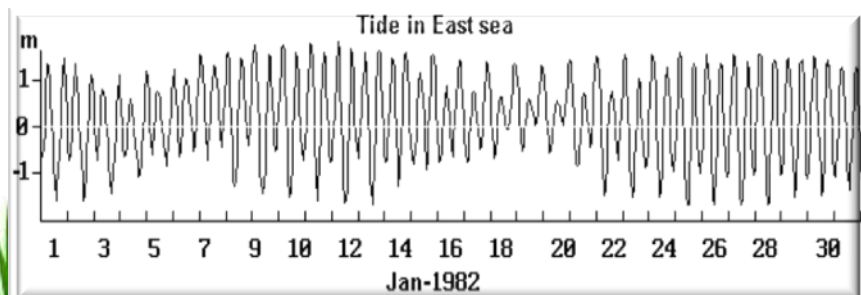
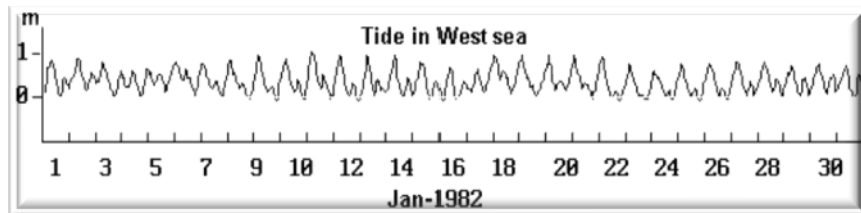
Scale:  
1cm = 17.50 km

- Land elevation: 0.3 – 2.0 m
- Air temperature: 26 – 27°C
- Annual rainfall: 1200–2400 mm
  - Wet season: May-Nov (90%)
  - Dry season: Dec-Apr (10%)



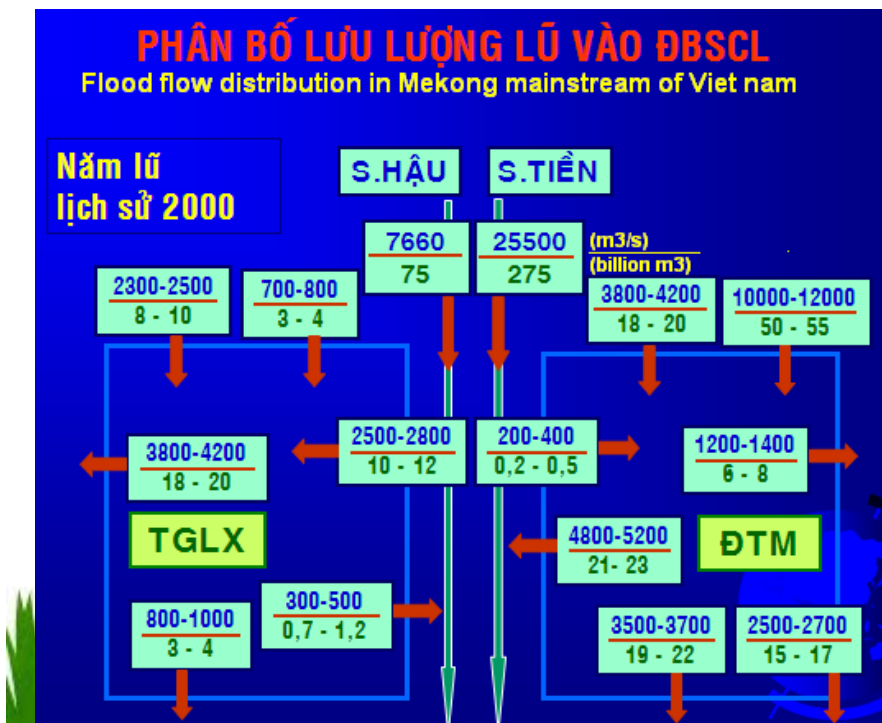
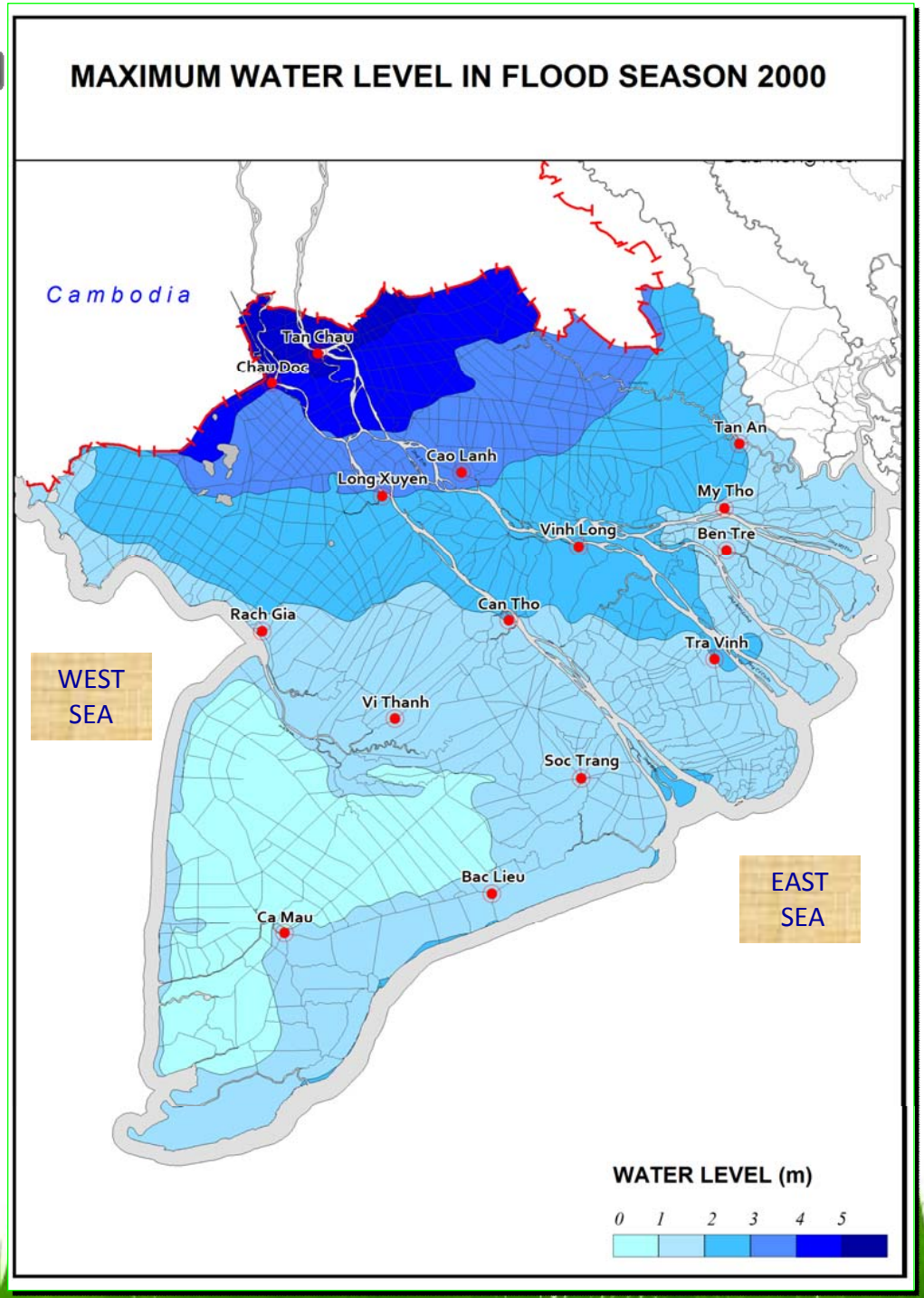
# SALINITY INTRUSION IN THE MEKONG DELTA

- Area: 1.4 - 1.6 million ha
- Length (4 g/l): 40 - 50 km
- Duration: 2-5 months
- High salinity intrusion: 1998, 2005, 2007, 2010, 2013



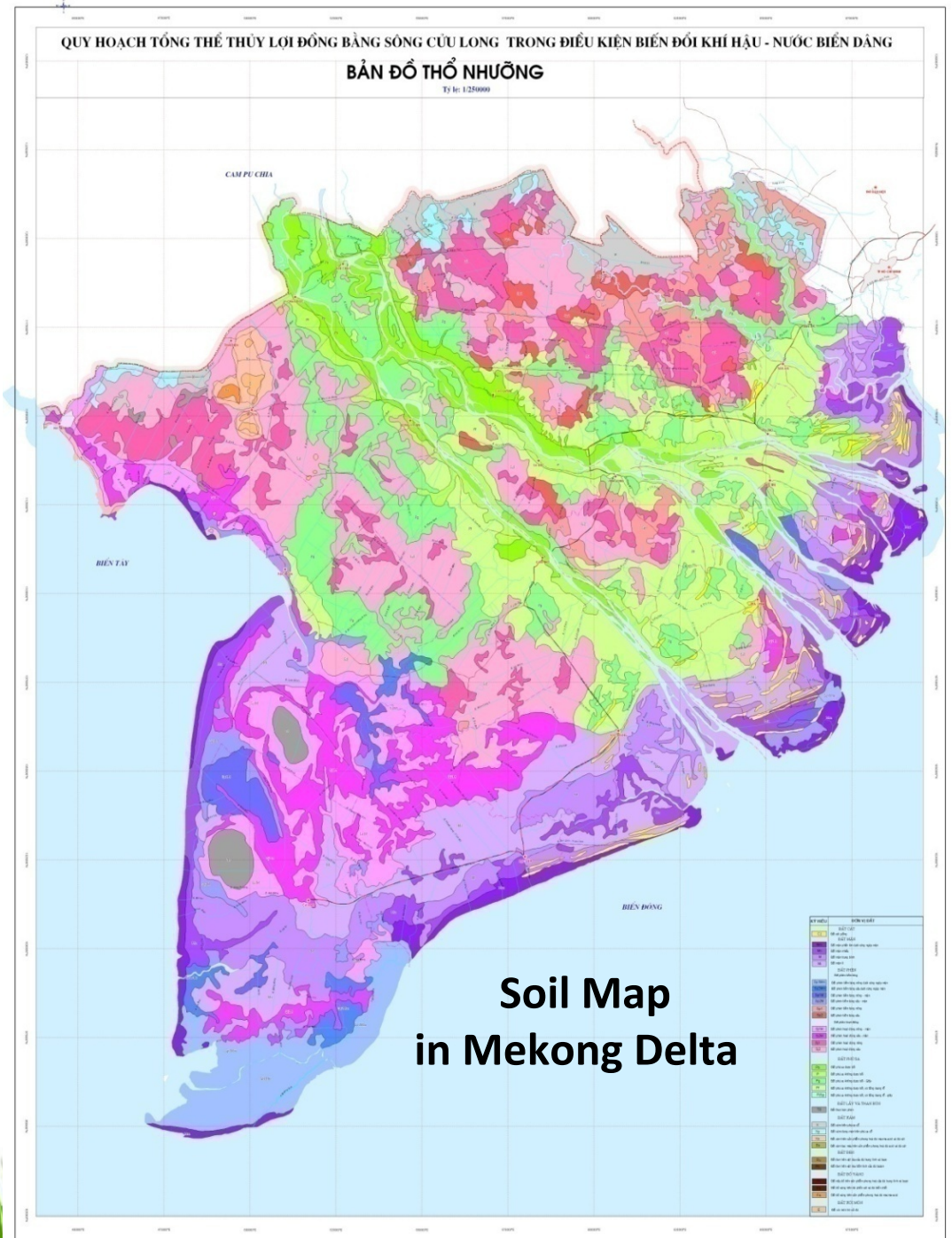
# FLOODING & INUNDATION IN THE MEKONG DELTA

- Area: 1.2 - 1.9 million ha
- Depth: 0.5 - 4.0 m
- Duration: 3 - 5 months
- Recent high flood years: 1996, 2000, 2001, 2002, 2011

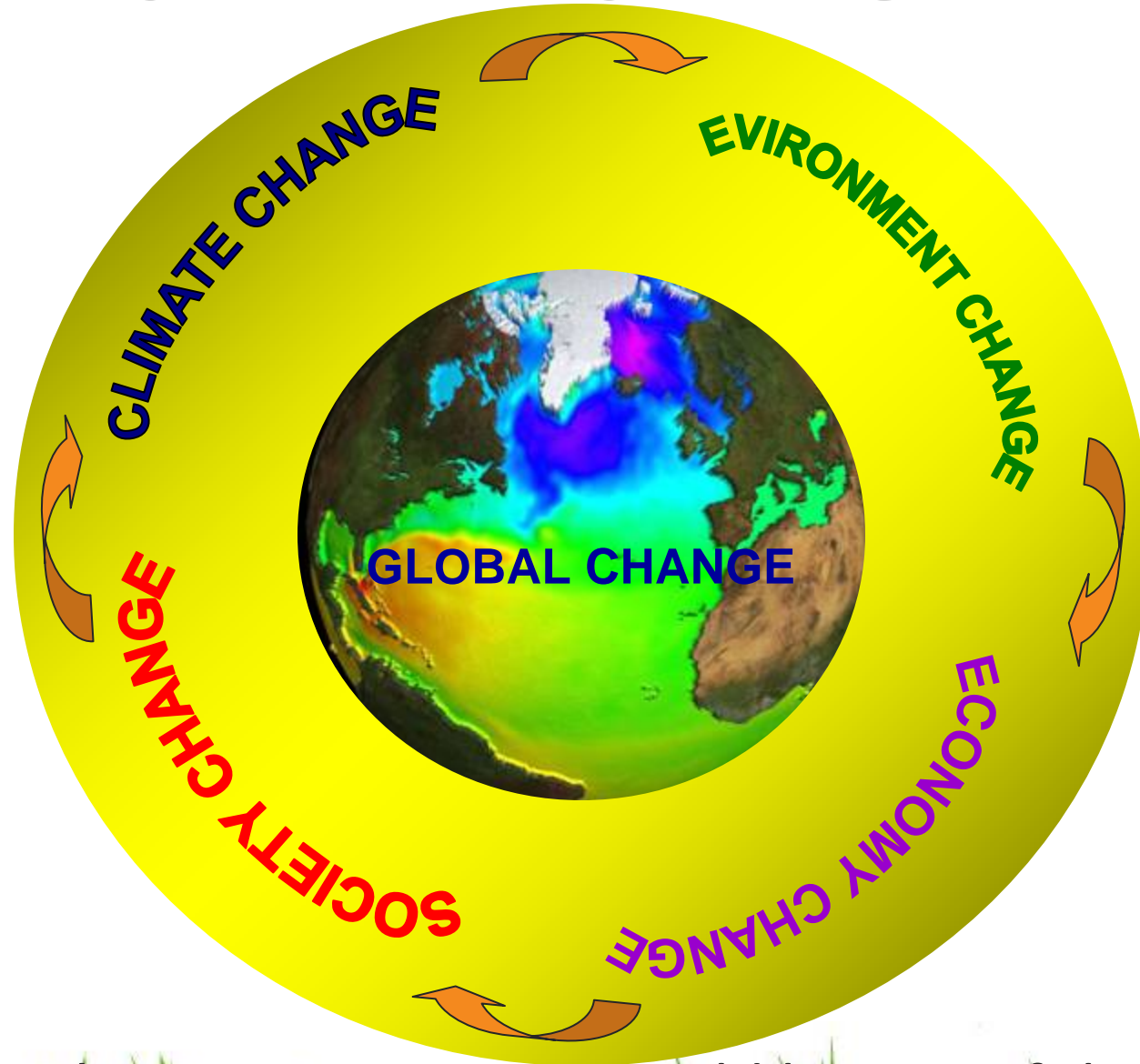


# ACID SULPHATE SOILS ACID SULPHATE SOILS IN THE MEKONG DELTA IN THE MEKONG DELTA

- **Area:**  
1.4 - 1.6 million ha
- **“Problem soils”:**  
0.8 - 0.9 million ha
- **Duration:**  
3 - 6 months (pH=3.5-5)
- **Severe areas:**  
Plain of Reeds,  
Long Xuyen Quadrangle,  
Ca Mau Peninsula

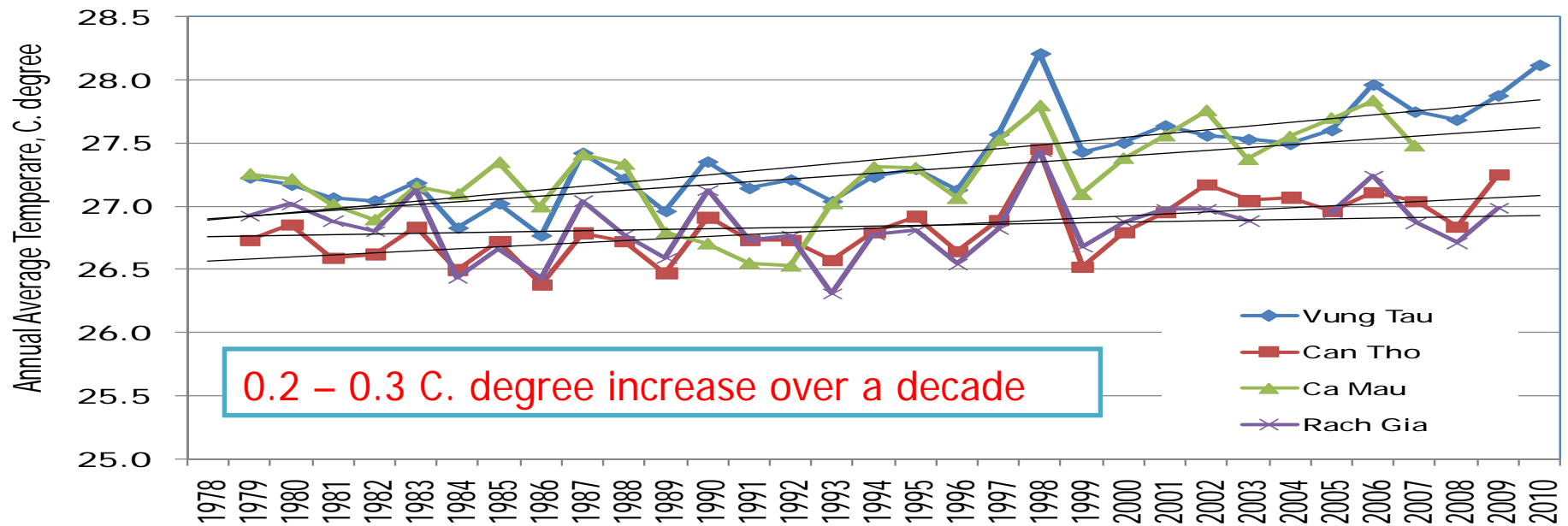


# CLIMATE CHANGE

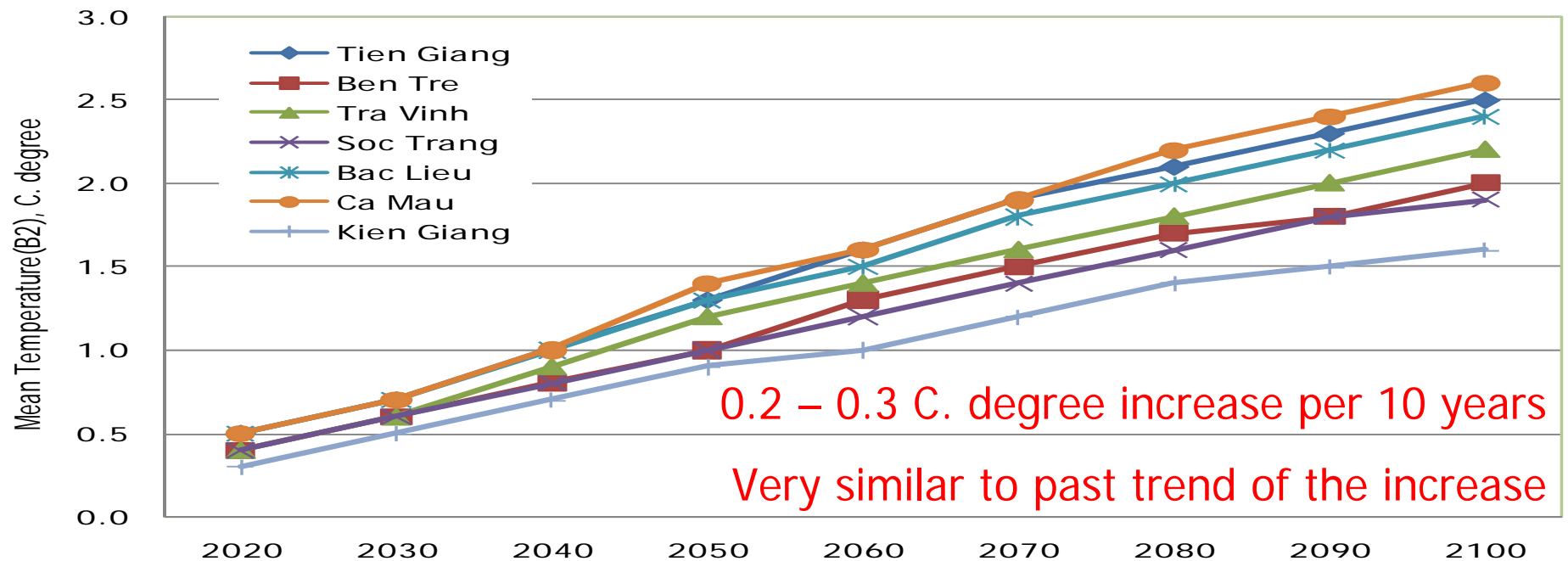


A World Bank report: Vietnam would be one of the most severely affected countries in the world as a result of SLR

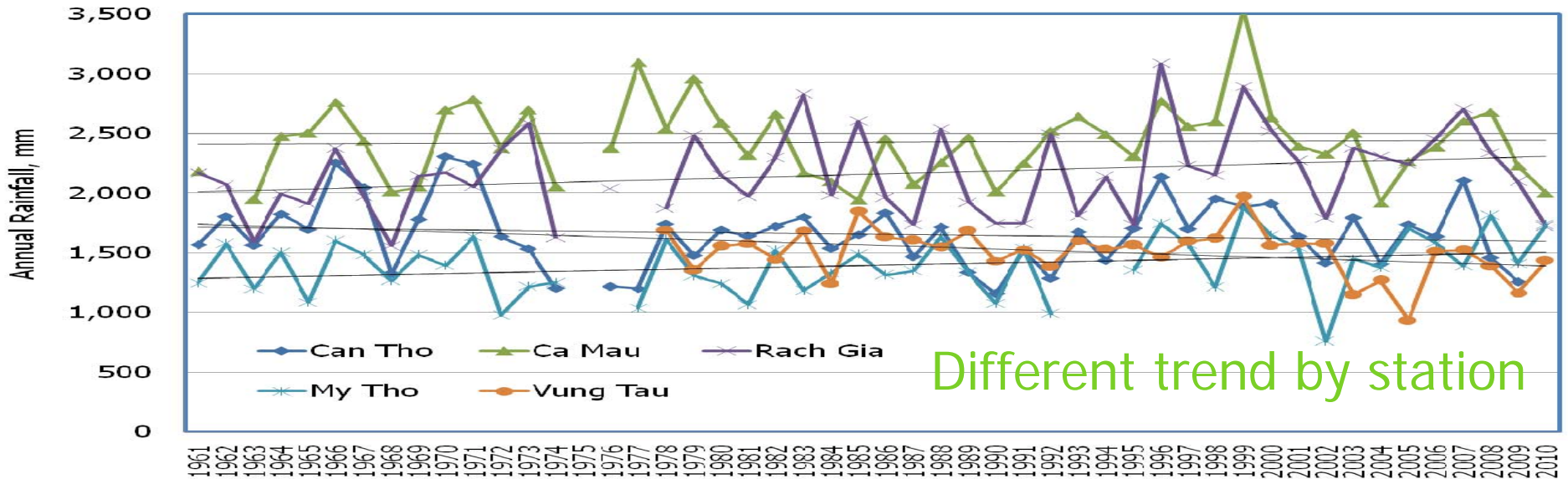
## ANNUAL AVE. TEMP.; PAST TREND



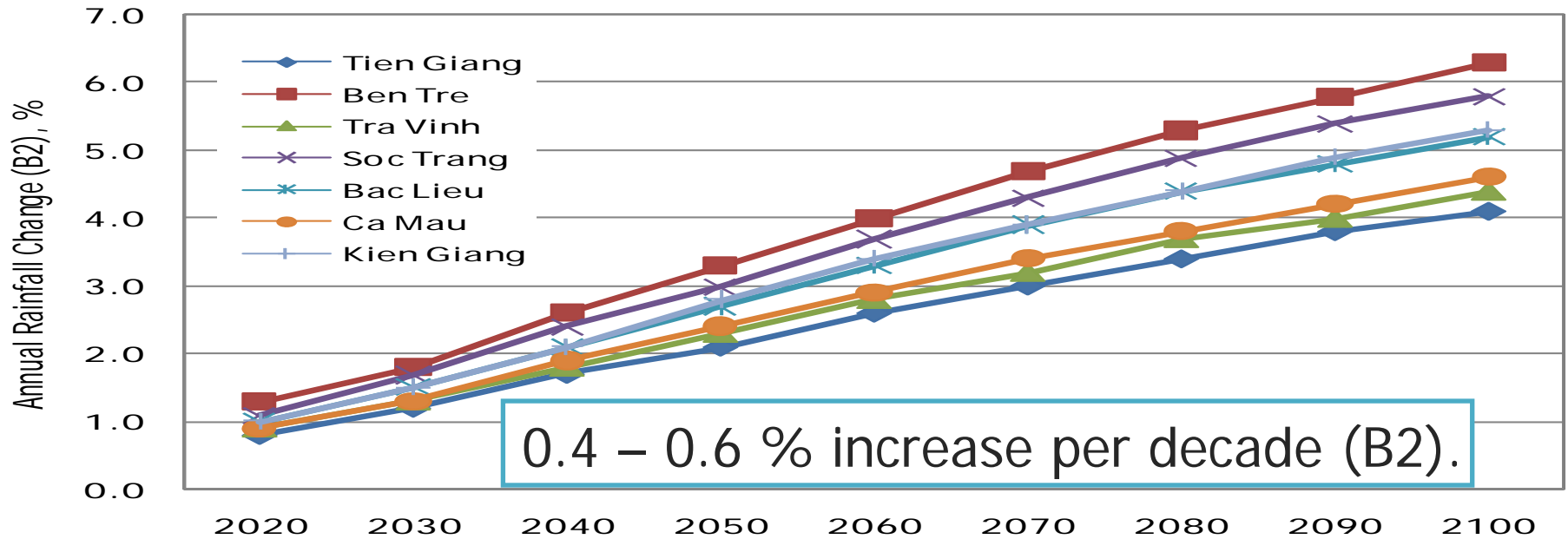
## ANNUAL AVE. TEMP.; PREDICTION



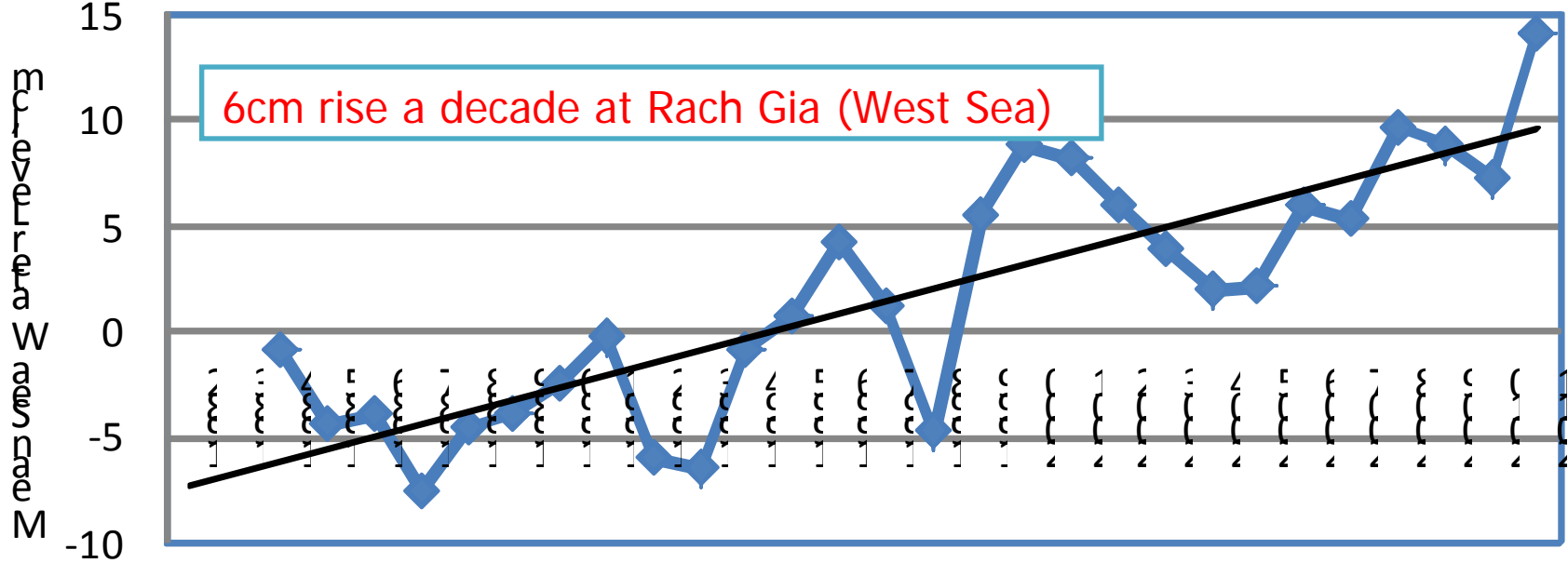
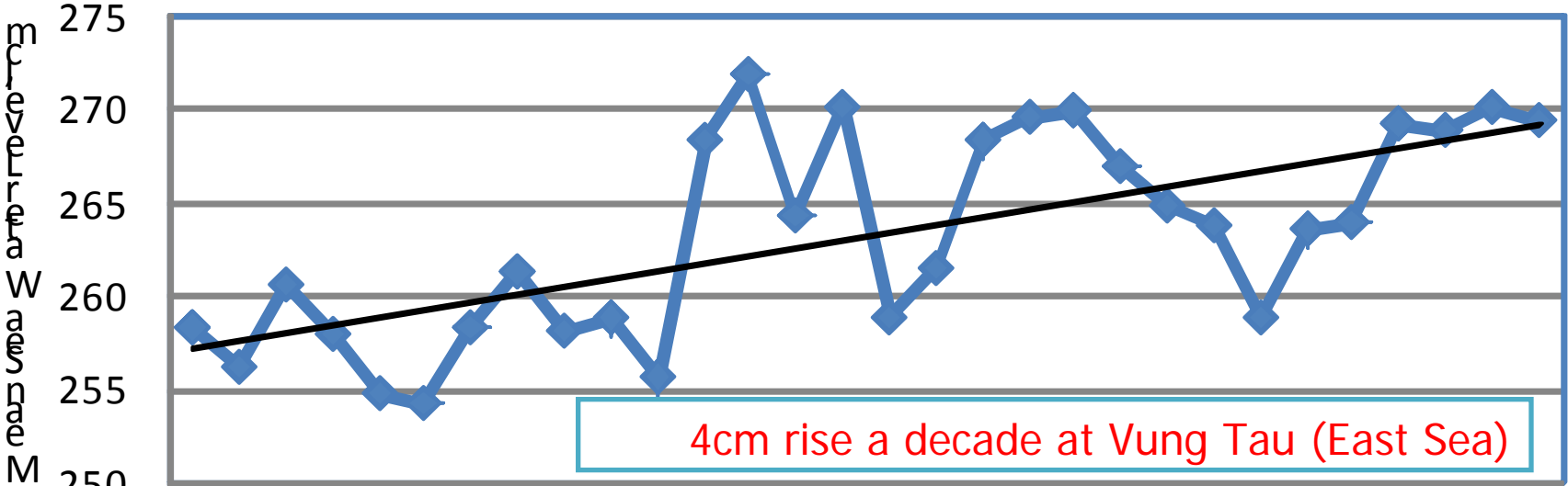
# ANNUAL RAINFALL; PAST TREND



# ANNUAL RAINFALL; PREDICTION



# SEA LEVEL RISE; PAST TREND



Source: Southern Regional Hydro-meteorological Centre



# SEA LEVEL RISE; PREDICTION

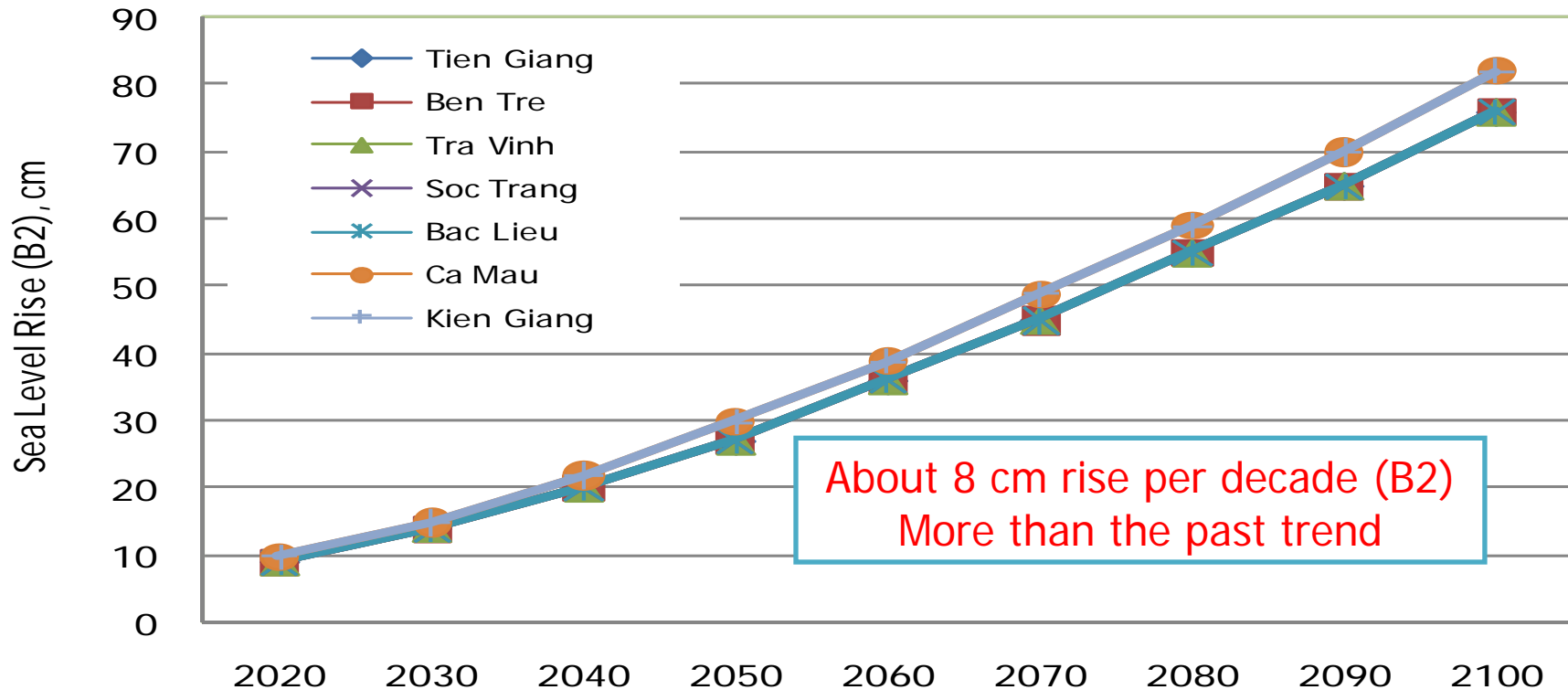
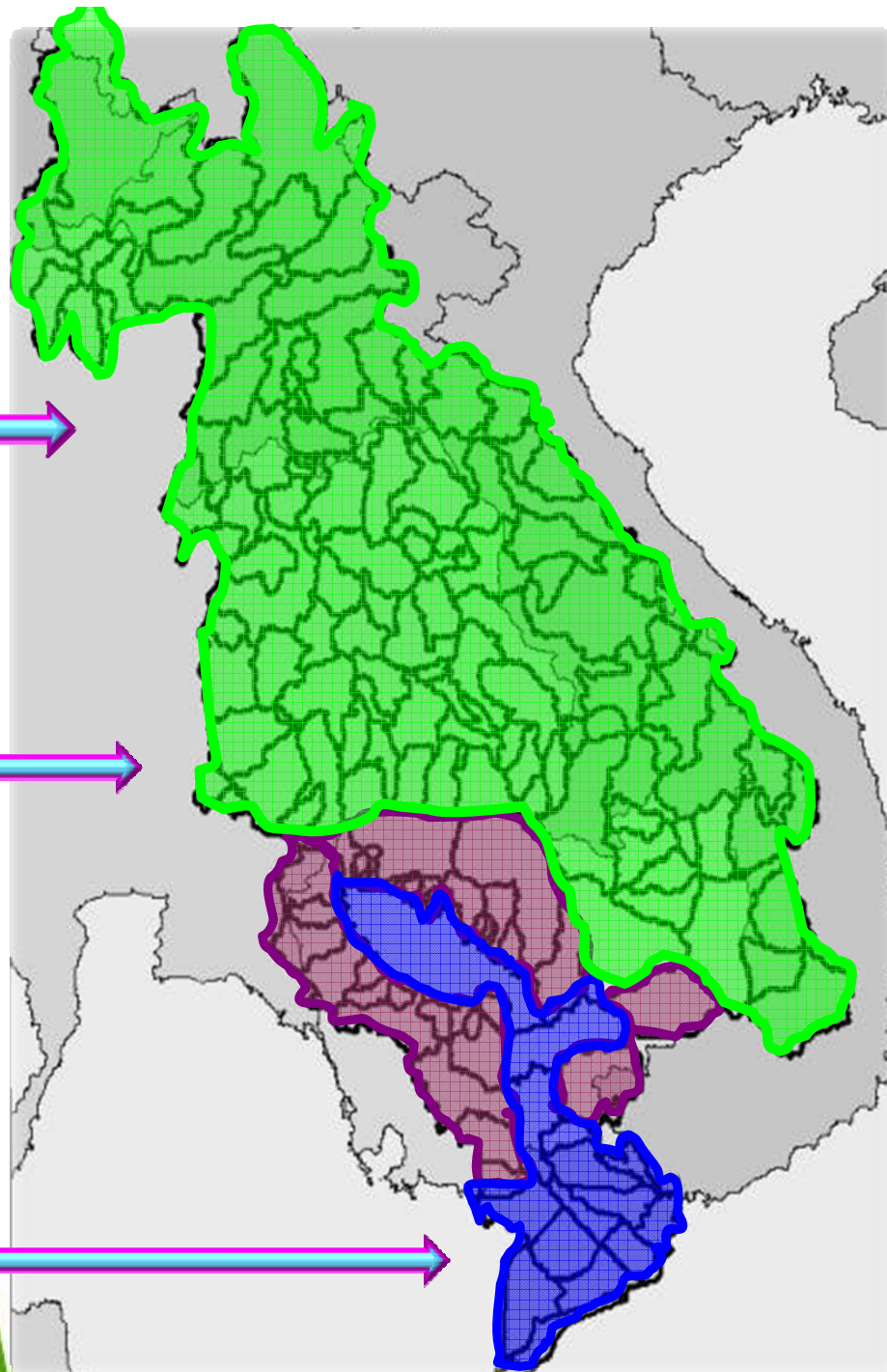
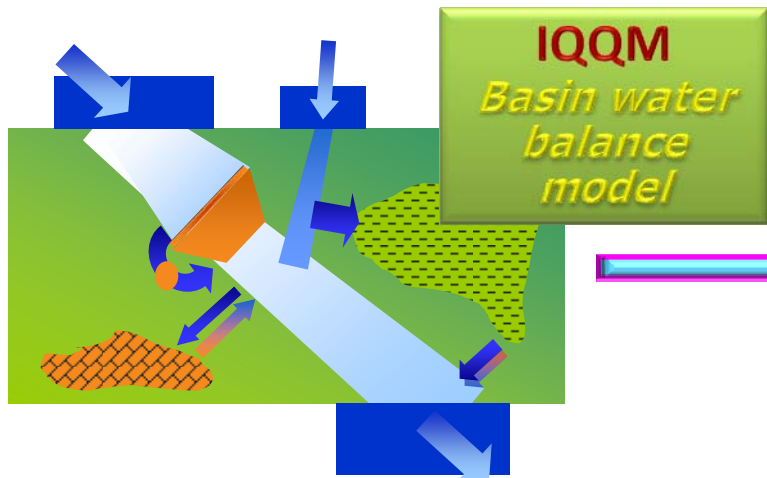


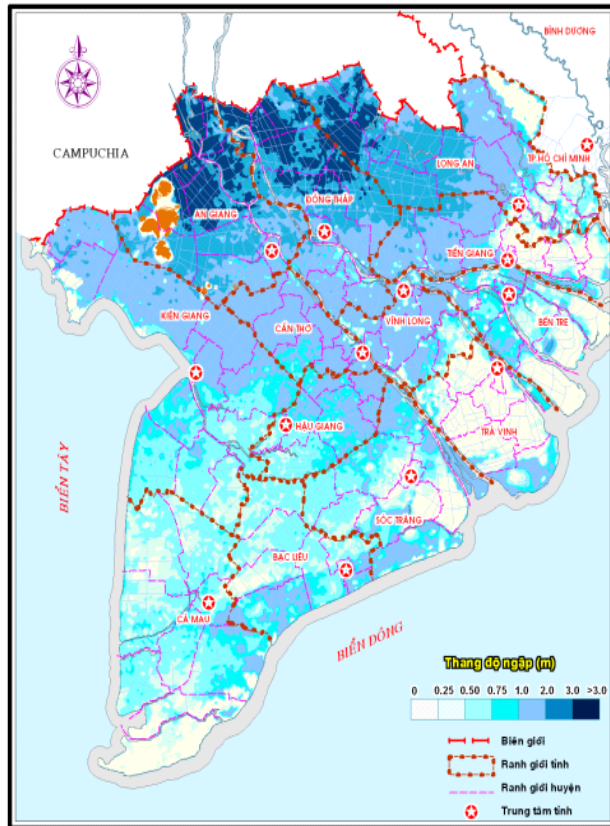
Table 7. Sea Level Rise (cm) relative to period of 1980 - 1999

Scenarios	Decades in the 21 Century								
	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low emission scenario (B1)	11	17	23	<b>28</b>	35	42	50	57	<b>65</b>
Medium emission scenario (B2)	12	17	23	<b>30</b>	37	46	54	64	<b>75</b>
High emission scenario (A1FI)	12	17	24	<b>33</b>	44	57	71	86	<b>100</b>

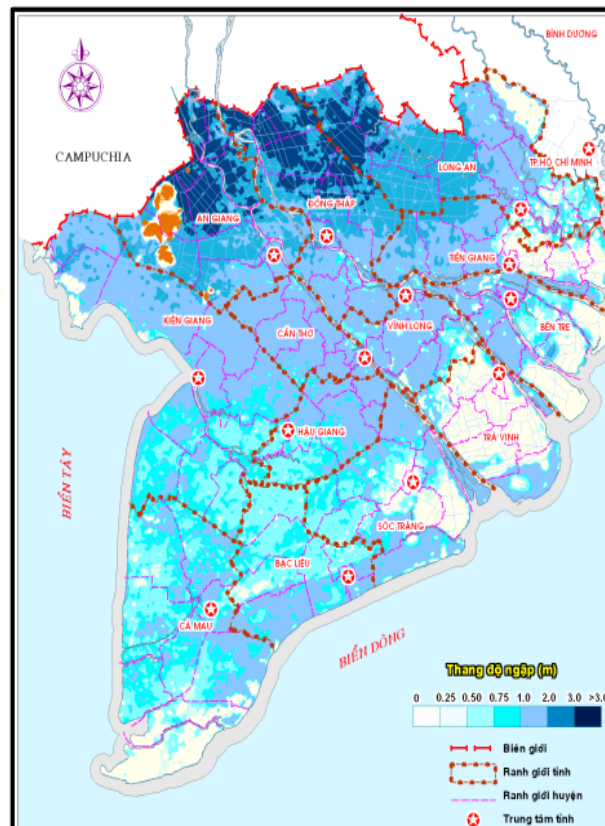
# MODEL APPLICATION



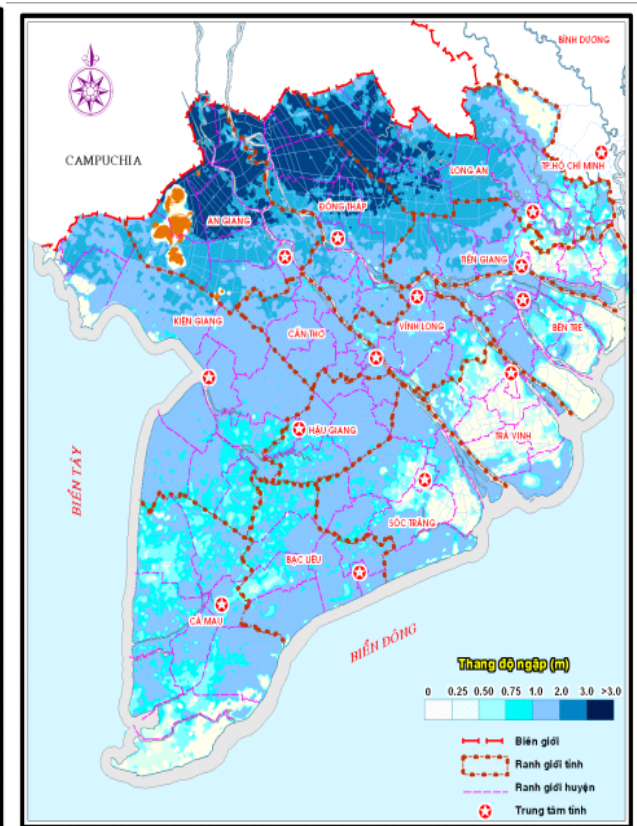
# IMPACTS OF CC & SLR ON FLOODING IN THE MEKONG DELTA



Maximum inundation depth  
(existing)



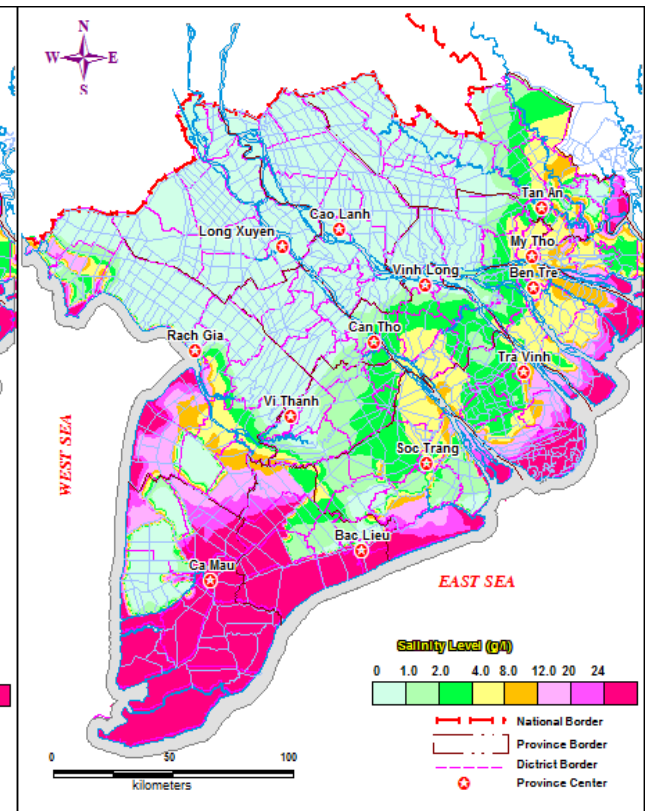
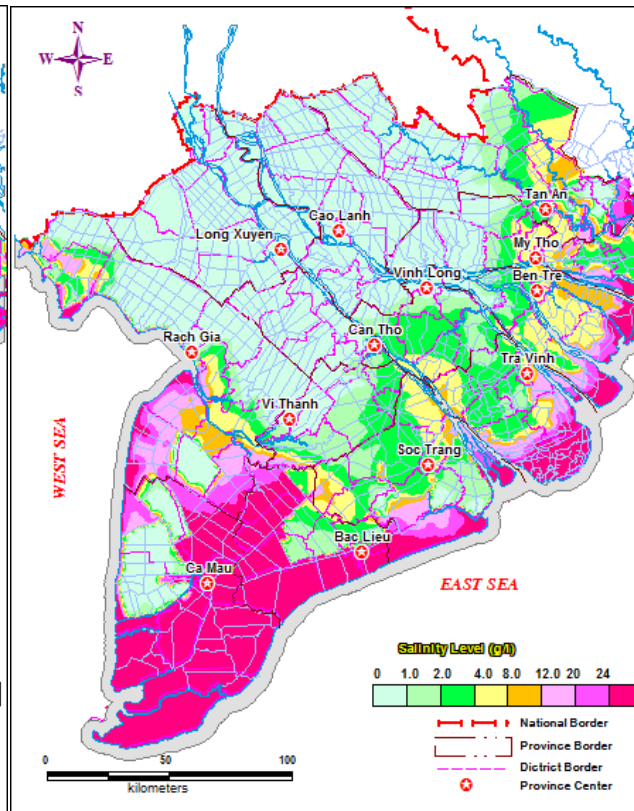
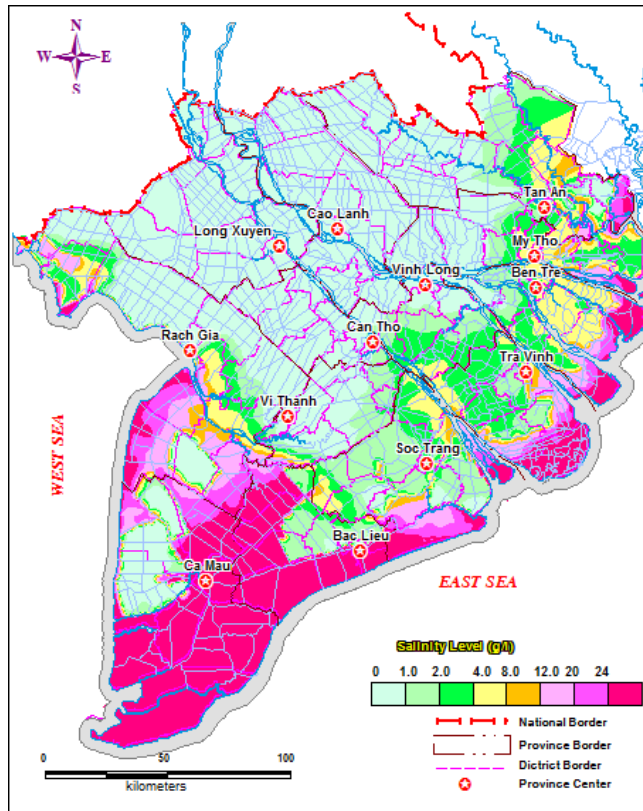
Maximum inundation depth  
(SLR 17cm)



Maximum inundation depth  
(SLR 30cm)



# IMPACTS OF CC & SLR ON SALINITY INTRUSION IN THE MEKONG DELTA



Maximum salinity intrusion  
(existing)

Maximum salinity intrusion  
(SLR 17cm)

Maximum salinity intrusion  
(SLR 30cm)

## IMPACTS OF BASIN DEVELOPMENT & CLIMATE CHANGE

- Saline intrusion is deeper in main rivers to threaten fresh water intake points and leads to the failure of “fresh water” projects.
- Fresh water shortage is more seriously, especially in the dry season.
- The dyke systems become ineffective to protect the intrusion of water from river or sea when the high tide.
- The drainage capacity of sluices could become less effective because the sluices were designed for outdated water levels.
- The flooding periods are seriously lengthened in Agriculture areas and in cities...
- Many infrastructure such as roads and urban drainage will not be suitable.
- However, there are some advantages such as increasing land area with gravitational irrigation, reducing acidity.



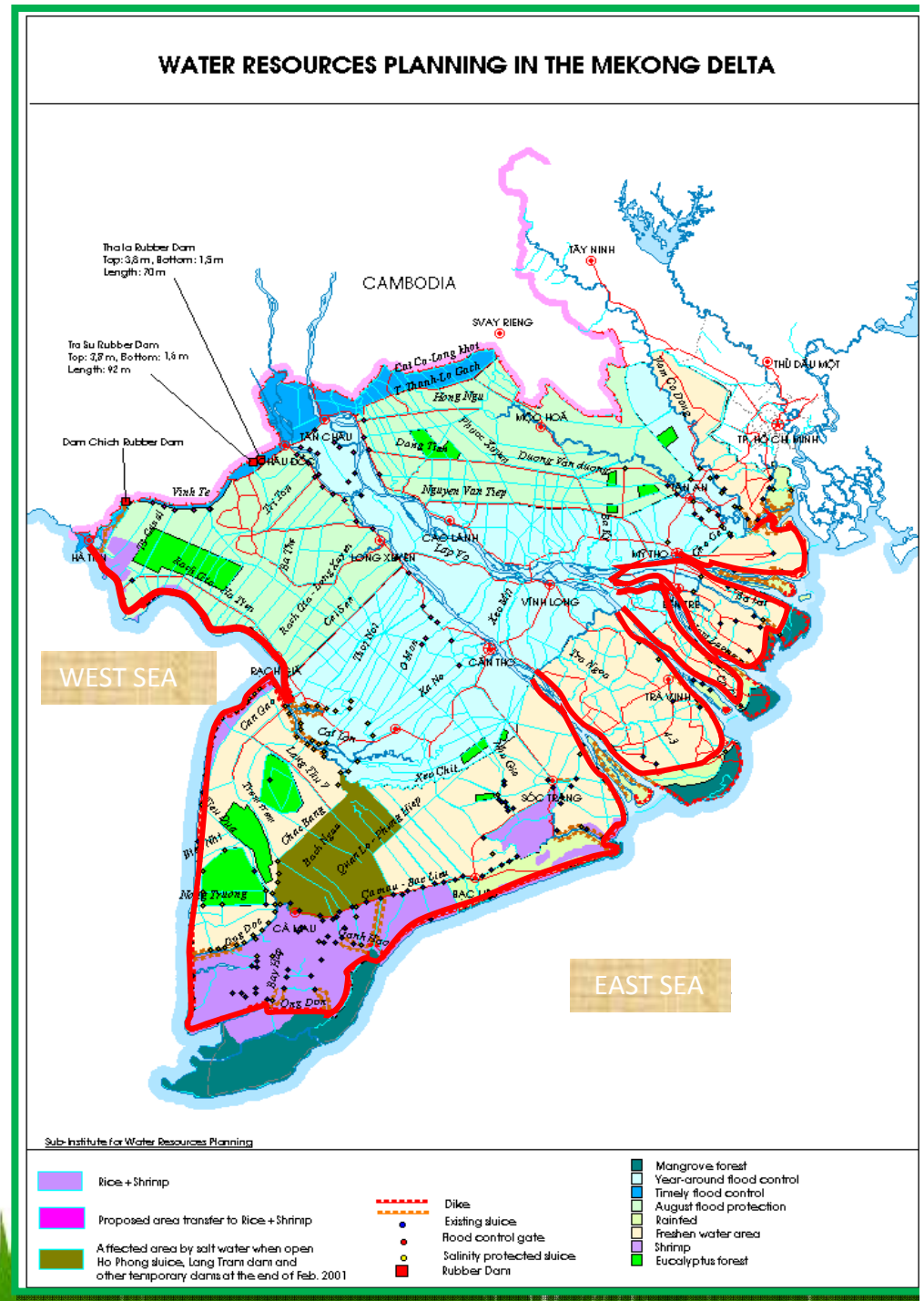
## ADAPTATION INITIATIVES

- To understand in sound way of the impacts from upstream development and climate change-sea level rise.
- In order to mitigate against and adapt to basin development and climate change, we need to apply a combination of structural and non-structural measures.
- A good combination of structural measures and non-structural measures will increase benefits and decrease investment cost.



## STRUCTURAL MEASURES

- Make use of existing structures, which were heavily invested, without creating any conflicts with long-term solution for the future.
- To ensure sustainable development, proposed solutions should also maintain and develop the diverse ecosystem of Mekong Delta.
- For flooding: floods have both positive and negative impacts. The strategy for flood management and mitigation is “Adapt living with flood”
- For salinity intrusion: build a system of the coastal dikes connecting with the embankment systems of the Mekong river and Bassac river to form closed areas.
- Invest to build resettlement areas infrastructures, roads, etc... to be suitable with the impacts.



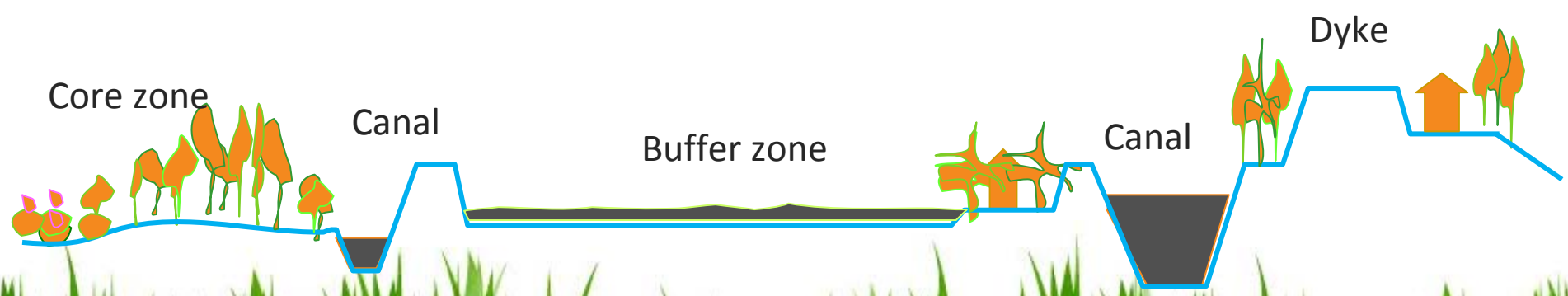
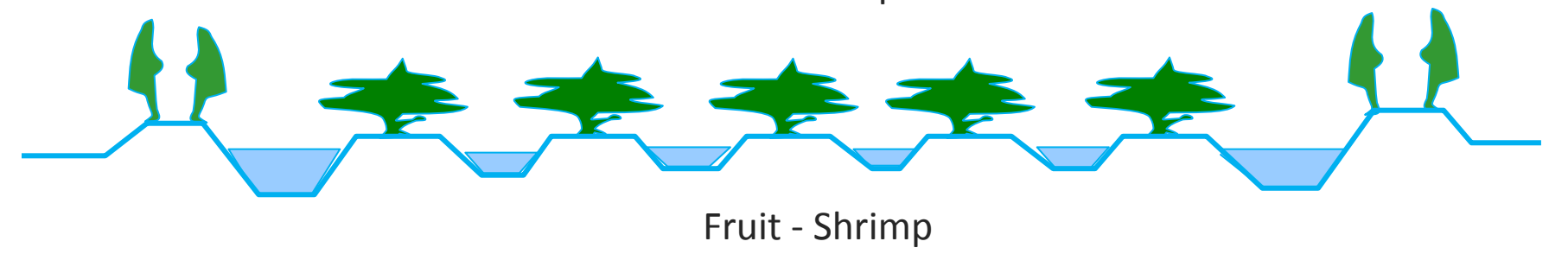
## NON-STRUCTURAL MEASURES

- ❖ Protect and develop coastal mangrove forests, especially protected forests to reduce the impacts and protect the environment.
- ❖ Select cropping calendars, cropping patterns, crop varieties, and crop diversification etc... which take into account likely climate change impacts.
- ❖ Using irrigation water more efficiently, increase searching for more measures to create and exploit additional sources of water in dry season.
- ❖ Develop a highly adaptable and strategic master plan for Mekong Delta in short-term and long-term.
- ❖ Developing and improving legal system on water resources management and prevention of damage caused by water, etc...
- ❖ All stakeholders should incorporate their contributions to the adaptation and mitigation initiatives





# ADAPTATION INITIATIVES

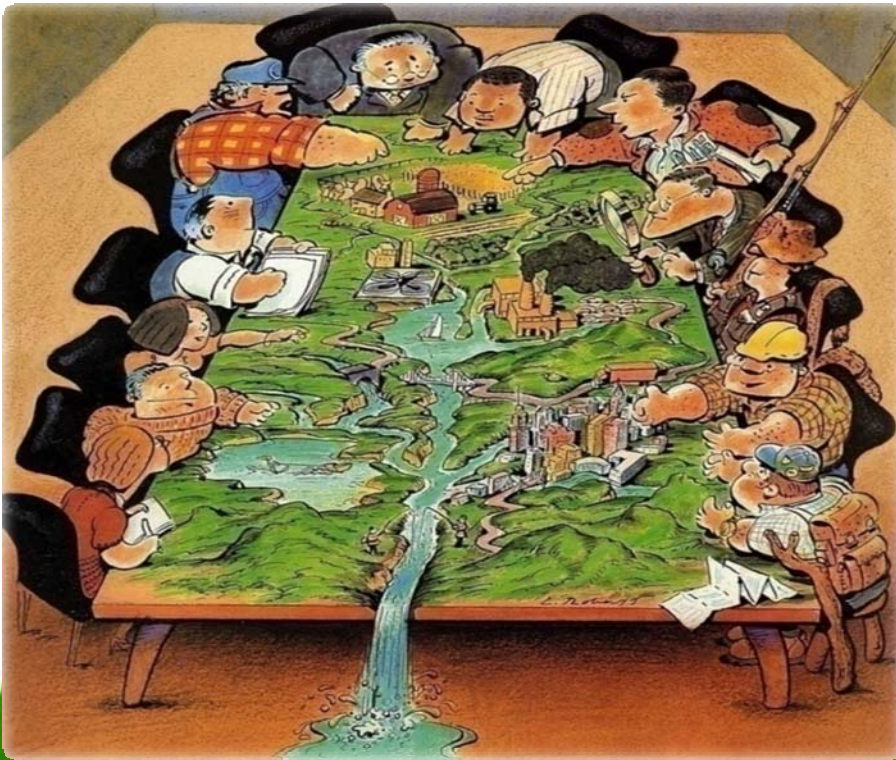


**COMBINATION OF STRUCTURAL AND NON-STRUCTURAL MEASURES**



## **INTERNATIONAL COOPERATION AND SUPPORT**

**With a close cooperation between all riparian countries and international assistance. We will be able to meet the sustainable development of the Mekong River Basin for the benefit of all the Mekong people.**



**THANK YOU  
FOR YOUR ATTENTION**

