A balanced approach for Urban Flood Management:

a Ho Chi Minh City Case study

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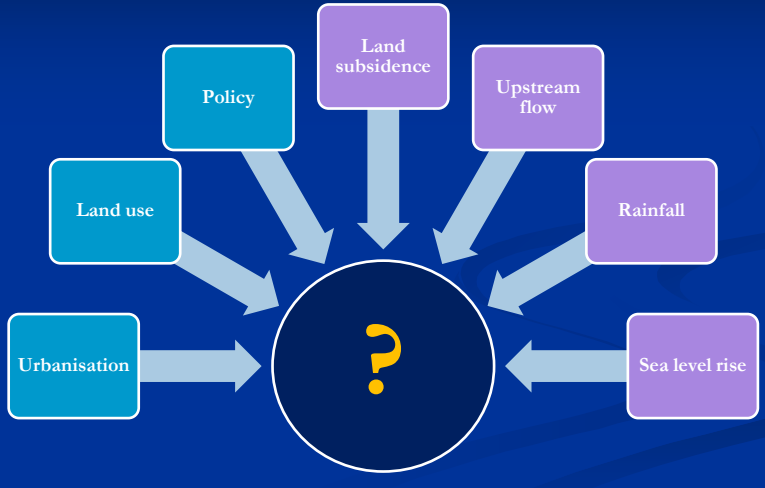
Urban Flood Risk Uncertainties

The Uncertainties



Risk Uncertainty Analysis

Risk is a Hazard-depending Spatio-temporal function:

*Risk = Hazard Probability * Exposure * Vulnerability*

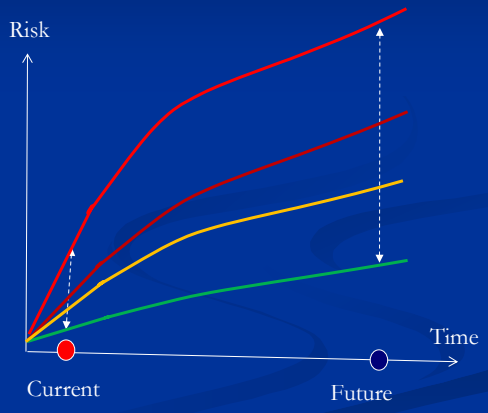
- *Exposure Uncertainty due to Urbanization*
- *Hazard Uncertainty due to both climatic and non-climatic impacts*
- *Vulnerability Uncertainty due to Social policy and economical development*

Risk Uncertainty analysis

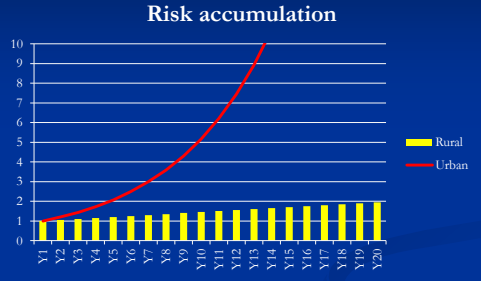
- Hydraulic model ➔ Flood map (at a probability)
- Flood map + cadastral Map ➔ Exposure.
- Exposure map + Damage function ➔ Vulnerability

Risk Uncertainty analysis

- Current risk uncertainty may be just resulted by hydrological variation.
- Future risk may be derived from climate changes, ineffective plans- and policies.



Risk accumulation vs Risk transfer



The higher protection level, the higher Future Risk

- Due to risk accumulation (safe now, risk tomorrow)
- Due to higher exposure by overconfidence and low preparedness.

Large scale intervention:

- Risk transfer to upstream and downstream
- Limited resources in implementation and emergency response
- Hardly and costly reversible or upgradable
- Hardly achieve multi-layered protection.

Remarks

- Urban flood risk control implies high level of Uncertainties resulted by both climatic- and non-climatic factors.
- Conventional approach focusing structural intervention may not be flexible to cope with such variations.
- 3 options of Flood Risk Management: Hazard-, Exposure- and Vulnerability reduction
- A spatially balanced intervention strategy decides the TIMING- and FRACTIONAL HARMONIZING of the H-E-V.

Balanced Intervention Approach

12 key principles of IUFR

1. There is no flood management blueprint.
2. Be Able to cope with a changing and uncertain future.
3. Integration of flood risk management into regular urban planning
4. Getting the balance right.
5. Structural measures can transfer risk upstream and downstream.
6. Impossible to entirely eliminate the risk from flooding.
7. Linkages between flood management, urban design, planning and management
8. Social and ecological consequences of flood management
9. Clarity of responsibility
10. Multi-stakeholder cooperation.
11. Raise awareness and reinforce preparedness
12. Recover quickly after flooding

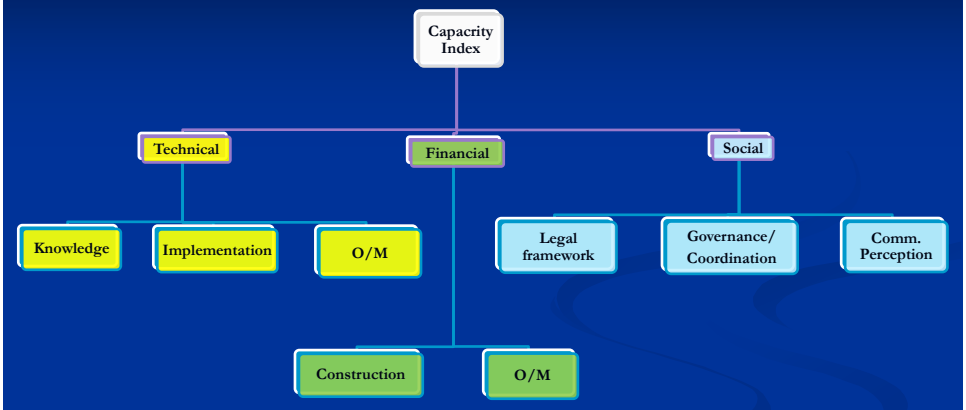
Cities and Flooding (2012). Abhas K Jha et al. World Bank

Need Analysis

Urgency index	Description	Urgency level
0-0.25	Less awared, minor loss	Potential
0.25-0.5	Awared, average loss	Minor intervention required
0.5-0.75	Well awared, heavy loss	Major intervention required
0.75-1	Strongly awared, serious impact	Urgent intervention required

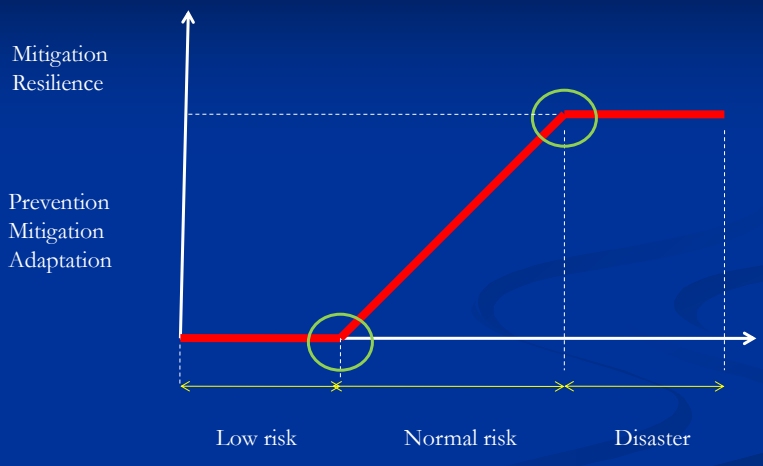
The TIMING of intervention is based on Urgency level of the risk

Capacity Analysis

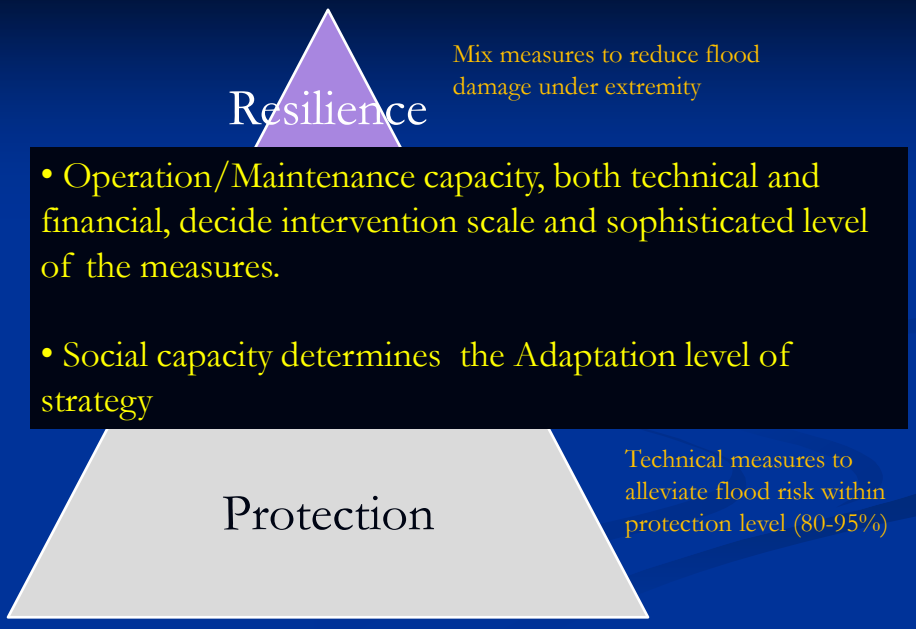


Based Capacity analysis, the 3 adaptation components and intervention level may be determined.

Intervention options



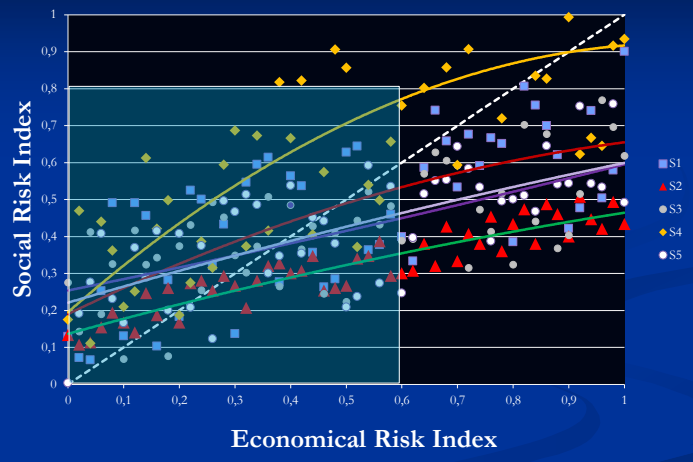
Multi-leveled Integrated strategy



Integrated strategy and Social capacity

- Hazard control: common option for Low to Mid social capacity; requires less governance/coordination; Top-down strategy; highly vulnerable.
- Exposure control: requires higher governance/coordination; Mainstreamed by urban water space policy; Top-down strategy; low vulnerability.
- Vulnerability improvement: requires higher governance/coordination and perception; Mainstreamed by housing policy and Emergency response Plan; Mixed strategy,

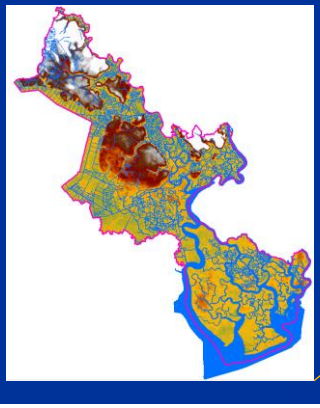
Economical-Social balance

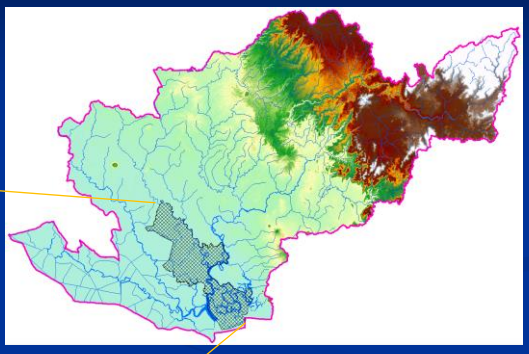


Given Social- and Economical Risk Index, the population of a certain strategy inside the Acceptance range may be a good performance indicator in context of uncertainty.

Ho Chi Minh City case study

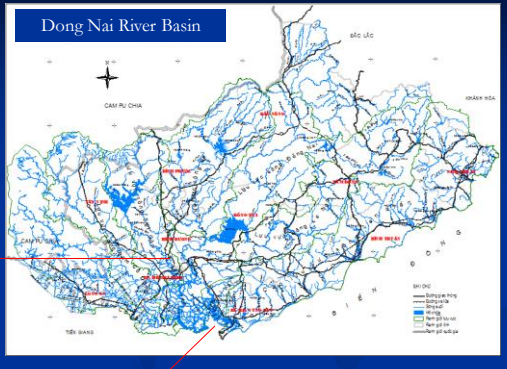
Ho Chi Minh City and the basin

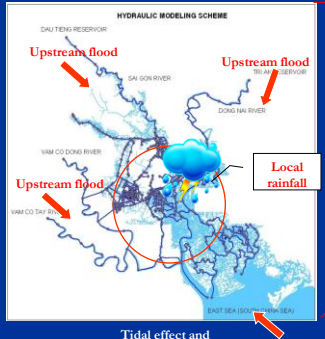




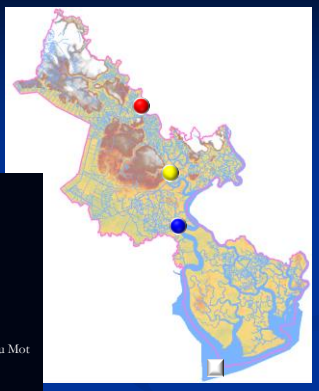
- HCMC is impacted directly by the sea and an upstream basin of 40,000 sqkm.

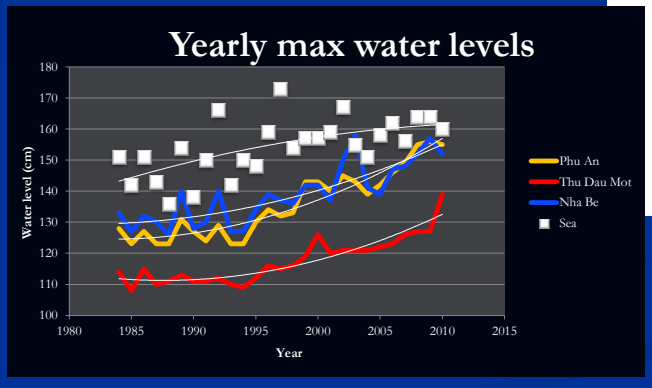
Hydrological impacts





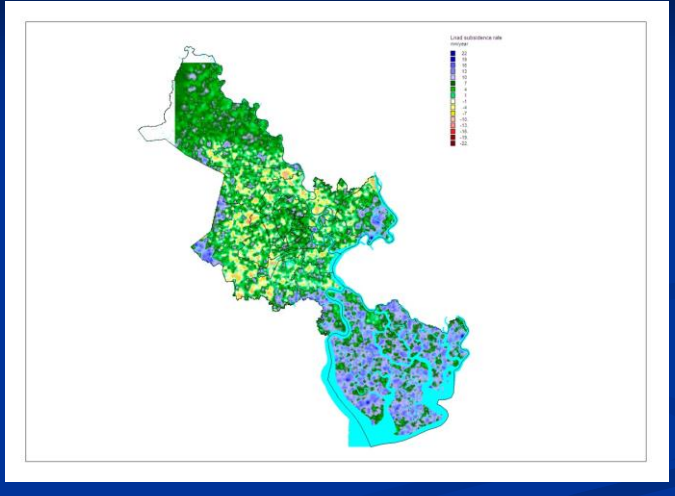
Hydrological anomaly





Hydrological anomalies have occurred since mid 1990s at all stations around Ho Chi Minh City

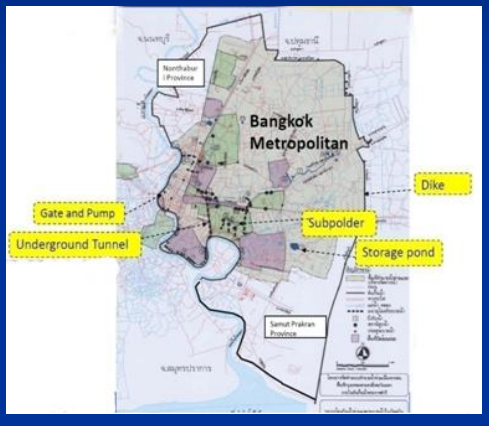
Land subsidence (1996 – 2010)



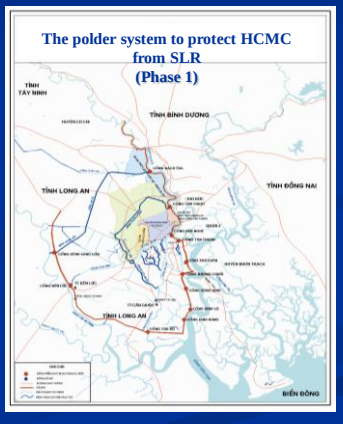
Land subsidence has occurred in large scale with highest rate of about 1 cm/year

Protection plan
Bangkok vs HCM City

97% protection level

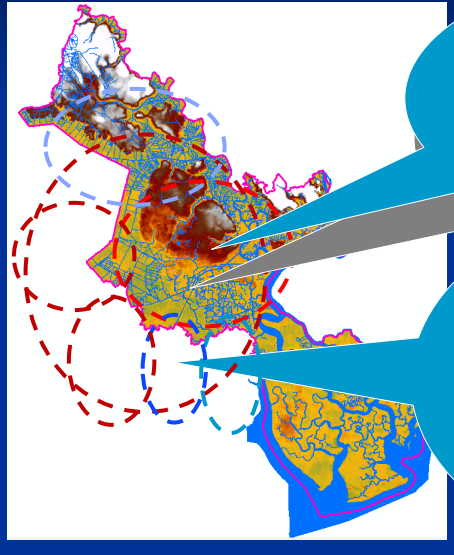


95% protection level



HCMC MARD's plan is almost a BKK's replicated.
The mindset of prevention-biased is still dominant.

Revised plan for more balance



- For planned Urban area
- Less resources for better priority
- Encourage adaptation in to reduce exposure.
- Smaller scope for better floodproof policy
- [illegible] sewer system

- For Lowland rural area
- Lower protection level
- Discouraging urbanization
- Subpolder [illegible] safety
- Stepwise scheme for limited resources
- Medium-scale to fit with M/O capacity

High vulnerability
Resources exhausting
Less flexibility
Overkilled intervention

Remarks

- Prevention-biased mindset, originated from agricultural water management, is still dominant in developing countries.
- Changing the perspectives of Flood management from just hazard reduction to all 3 components will provide more balanced strategies.
- Operation/Maintenance capacity decides intervention scale and sophisticated level of the strategy.
- Balance level of strategy is usually limited by Social capacity.
- Risk accumulation and transfer should be taken into account in CBA.

Conclusions

- For cities, probability of diaster beyond prevention capacity is 100%.
- Bigger is not usually better. If possible, multi-layered protection should be prefered.
- To cope with uncertainty, Earlier is not necessarily better. Stepwise intervention for uncertainty and limited resources.

Do you know where?

Newyork City (Sandy, 2012)

Do you know where?

Groningen- the Netherlands (Jan, 2013)

What is the difference?

Dordrecht – the Netherlands (2012)