ADPC experience and Suggested approaches for Safer Coastal Zone Development

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Outline

1. Introduction to ADPC
2. Importance of the Coastal Zone
3. Issues and Challenges Along the Coasts
   - Coastal Hazards
   - Impacts of Climate Change
   - Sea Level Rise
4. Proposed approaches on Safer Coastal Zone Development

Urban Disaster Risk Reduction: ADPC's Efforts & Experience

Regional Programs & training in different thematic areas of Urban Disaster Risk Management

- Earthquake Vulnerability Reduction for Cities(EVRC)
- Urban Flood Risk management(UFM)
- Climate Change and Climate Risk management in Changing Urban Environment(CCCRM)
- Governance and Disaster Risk Reduction in Urban areas(GDRR)
- GIS for Disaster Risk management
- Urban Disaster Risk Reduction(UDRM)
- Coastal Hazard Resilience

Urban Disaster Risk Management by ADPC

Develop "How-to" resource books that translate increased awareness into action

Conduct Regional Training Programs on different thematic areas of Urban Disaster Risk Management

Countries and Cities

Laos- Vientiane, Lung Praban, Pakse
India- Boroda, Kolkata
Cambodia- Campong Cham, Prey Veng, Kendal
Indonesia- Bandung, Padang, Bankulu, Jakarta
Nepal- Kathmandu, Kirtipur, Bhaktapur, Lalitpur, Banepa
Philippines- Naga, Dagupan, Pasig, Bargulo, St. Carlos, Bagio
Thailand- Hatyal, Patong, Phuket, Udonthani, Sanudsakhon, Chaing Rai
Bangladesh- Dhaka, Chittagong, Sylhet, Jamalpur, Cox's Bazar, Gaibandha, Sirajgang, Mymensing, Tangail, Dinajpur, Tangail, Rangpur, Bogra, Rajshahi, Khagrachari, Bandarban and Rangamati
Sri Lanka- Ratnapura, Nawalapitiya, Kandy, Kalutara, Matara
Iran- Gourgan, Kerman
Myanmar- Mandalay
Vietnam- Hue, Da Nang, Ca Mau
Pakistan- Hyderabad

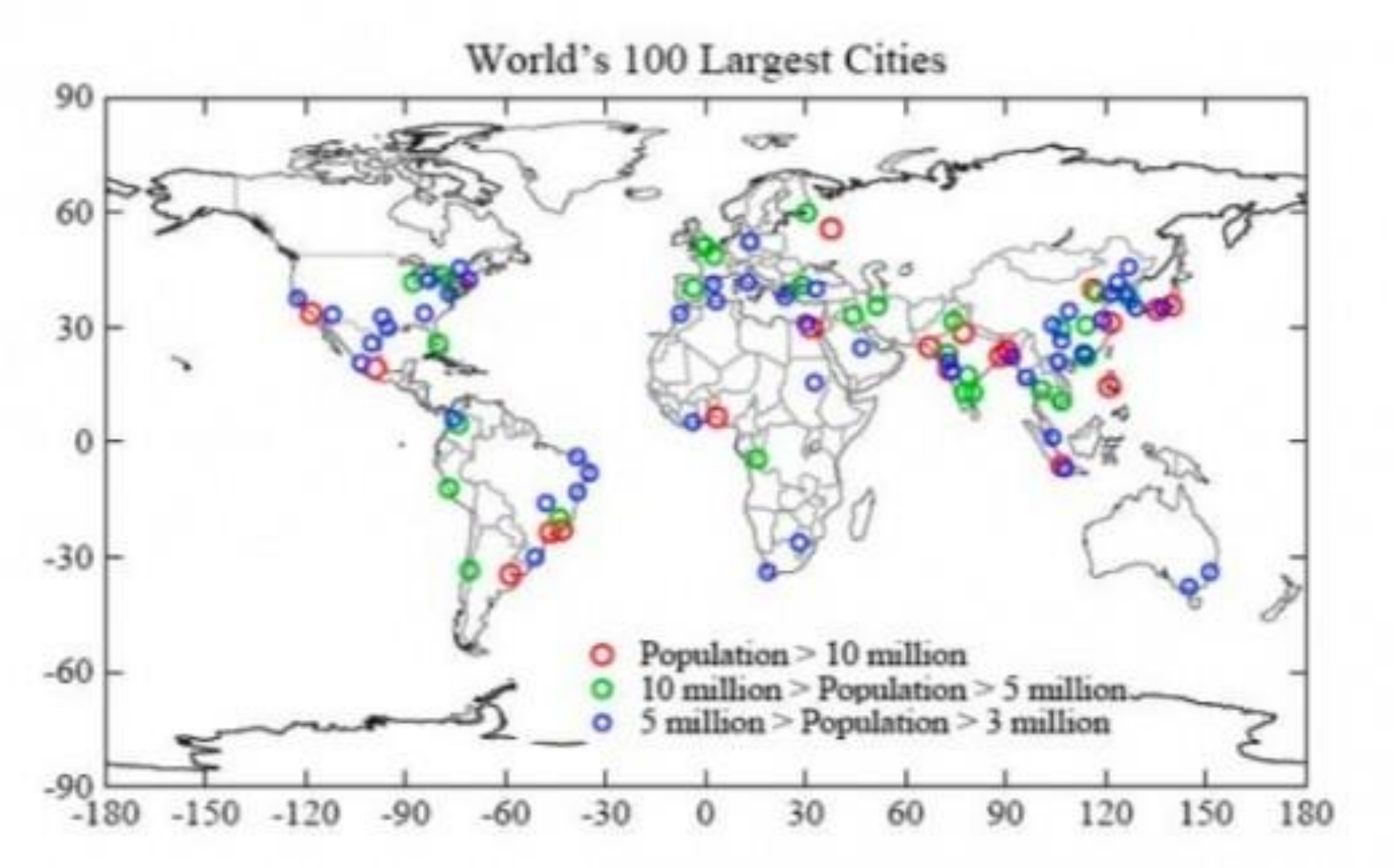
Guidence for building resielent cities through technical advisory services and pilot Programs

Research on Urban disaster-risk reduction and integration of research outcome in capacity building programs

Organize Regional forums on disaster-risk management for sharing experience and sound practices

ADPC's Efforts & Experience in Coastal hazard resilience building in urban areas

Global Scenario



Population exposed to coastal flooding in top 20 cities

Rank	Country	Urban Agglomeration	Exposed Population Current	Exposed Population Future
1	INDIA	Kolkata (Calcutta)	1,929,000	14,014,00
2	INDIA	Mumbai (Bombay)	2,787,000	11,418,00
3	BANGLADESH	Dhaka	844,000	11,135,00
4	CHINA	Guangzhou	2,718,000	10,333,00
5	VIETNAM	Ho Chi Minh City	1,931,000	9,216,00
6	CHINA	Shanghai	2,353,000	5,451,00
7	THAILAND	Bangkok	907,000	5,138,00
8	MYANMAR	Rangoon	510,000	4,965,00
9	USA	Miami	2,003,000	4,795,00
10	VIETNAM	Hai Phòng	794,000	4,711,00
11	EGYPT	Alexandria	1,330,000	4,375,00
12	CHINA	Tianjin	956,000	3,790,00
13	BANGLADESH	Khulna	441,000	3,641,00
14	CHINA	Ningbo	299,000	3,305,00
15	NIGERIA	Lagos	357,000	3,229,00
16	CÔTE D'IVOIRE	Abidjan	519,000	3,110,00
17	USA	New York-Newark	1,540,000	2,931,00
18	BANGLADESH	Chittagong	255,000	2,866,00
19	JAPAN	Tokyo	1,110,000	2,521,00
20	INDONESIA	Jakarta	513,000	2,248,00

Table 1: Top 20 cities ranked in terms of population exposed to coastal flooding in the 2070s (including both climate change and socioeconomic change) and showing present-day exposure (Source: Nicholls et al (2007), OECD, Paris)

Importance of the Coastal Zone

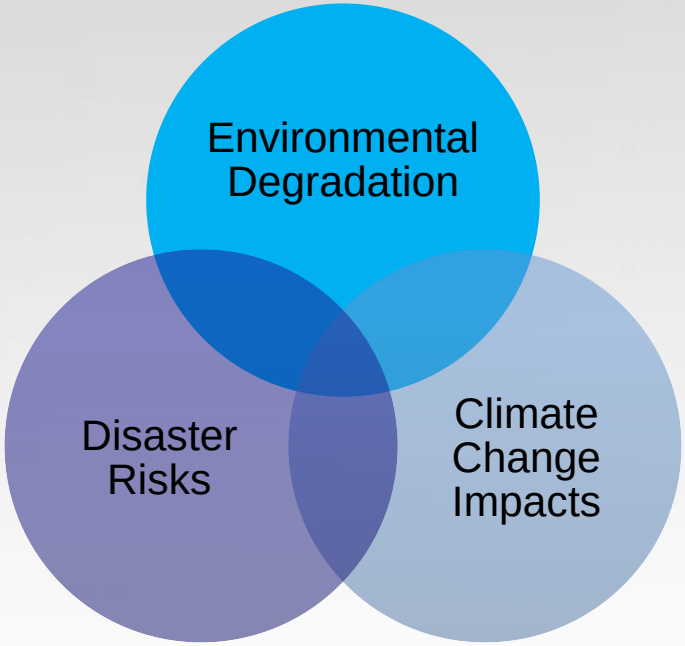
The coastal zone has several important values namely:

1. High level of biodiversity and biological activity
2. High scenic value, for tourism and recreation
3. Rich in biological and natural resources (coral reefs, sea-grass beds)
4. Cheap source of protein (fish, seafood, etc.)
5. Source of livelihoods and important backbone of local economy
6. Transportation, navigation
7. Settlements and housing
8. Rich in Natural resources

Source: World Resources Institute, 2001

Issues and Challenges Along the Coasts

1. Extensive over-development of coastal and marine economy
2. High population density
3. Land-based and sea-based marine pollution
4. Threats to biological diversity (conversion of natural habitat to human uses)
5. The critical depletion of coastal resources and environment
6. Increasing conflicts on coastal development
7. Disaster risks from coastal hazards
8. Impacts of climate change ex. Sea Level Rise



Sources: An, N.T.,Ed., 2003; An, N.T et al, 2006 and Nagothu, 2005

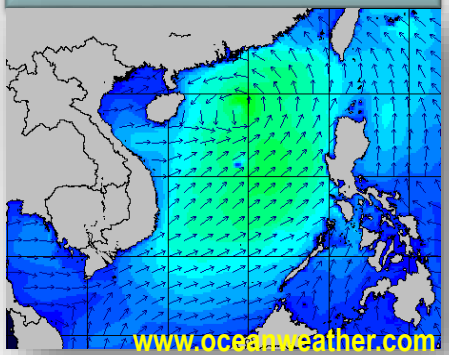
- Coastal Hazards

Coastal hazards are natural and human-made hazards that occur at the interface between the ocean and the shoreline. Coastal hazards are categorized as rapid-onset (fast moving) or slow-onset hazards

Rapid-Onset Hazards
Storms
Flooding
Storm Surge
Tsunamis

Slow-Onset Hazards
Shoreline Erosion
Sea Level Rise
Saltwater Intrusion
Land Subsidence

Storms



Floods

Coastal Flooding

Storm Surge

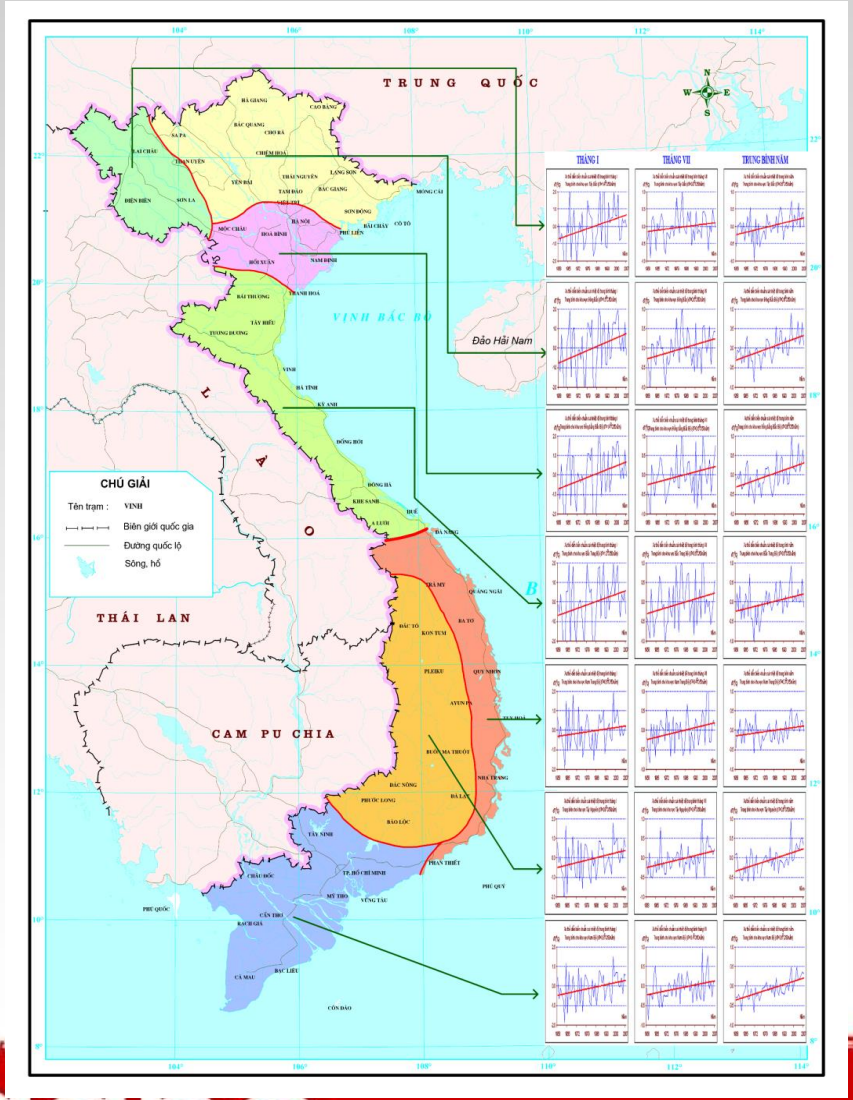
Coastal Erosion

Saltwater Intrusion

Sea Level Rise

Land Subsidence

- Climate Change in Vietnam's Coast

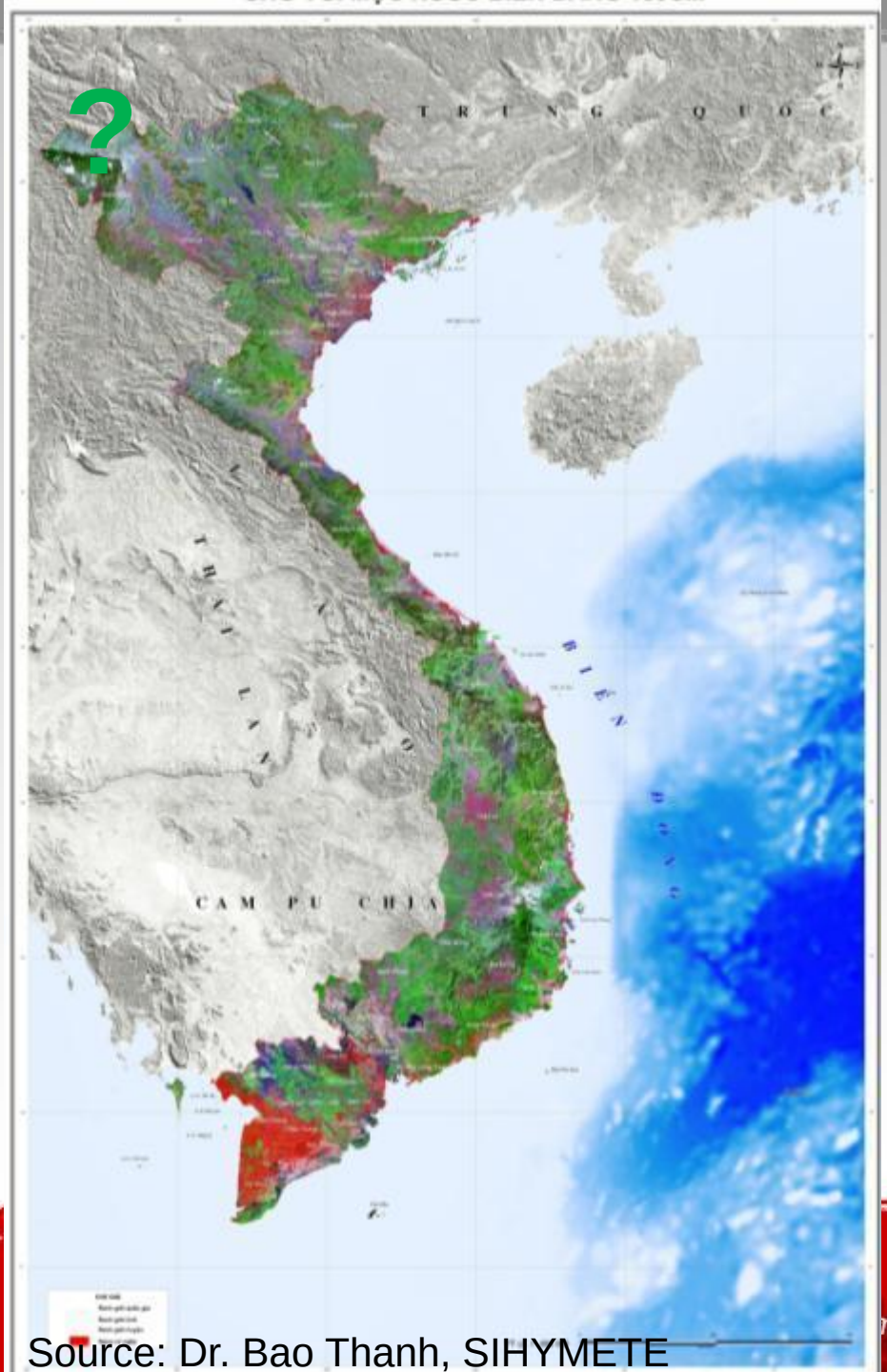


Climate Change is affecting the hydrodynamic regimes in Vietnam's coast:

- Heating up of the East Sea
- Affects tidal circulation, tidal amplitude, and tidal flooding
- Change in storm path and frequency
- Change in wind and air temperature
- **Sea level rise**

Source: Dr. Bao Thanh, SIHYMETE

Inundated Risk Areas in Case of 1m Sea Level Rise



- 39% of Mekong River Delta, more than 10% of Red River Delta, and Quang Ninh Province, more than 2.5% areas of central region, and more than 20 % of Ho Chi Minh city areas will be inundated.
- 35 % of Mekong River Delta population, more than 9% of Red River Delta and Quang Ninh province population, approxiamtely 9% of Central Rgion Province population, and 7% o Ho Chi Minh city population will be directly affected
- 4% of railway system, 9% of highways, and 12% of provincial highways will be affected.

Source: Dr. Bao Thanh, SIHYMETE

NORTHEAST AND RED RIVER REGION

Increasing frequency and intensity of storms, change in storming and cold seasons.

Mangrove forests, rice areas will be reduced that will have bad effects on livelihood of coastal region people.

Increasing of water scarcity in dry season.

Saltwater intrusion threads the salt and aquaculture industry, transportation infrastructures, dikes, and coastal buildings.

Source: Dr. Bao Thanh, SIHYMETE

NORTH CENTRAL AND SOUTH CENTRAL REGION

Highest potential of rising temperature. The sea level rise in the whole coastal line.

Crop structures and calendar must be adjusted

-Affect on coastal industrial zones and transportation structures.

-Tropical cyclone directly affects South Central Region with higher frequency and stronger intensity.

-Sea level rise will reduce the mangrove areas, facilitate of increasing coastal erosion, reduce the living areas local people.

Source: Dr. Bao Thanh, SIHYMETE

REGIONAL IMPACTS OF CLIMATE CHANGE

MEKONG REGION

Under strong effects of sea level rise

Severe drought in Winter- Spring cropping

Low flow -> affect on hydro power (East), agriculture (West)

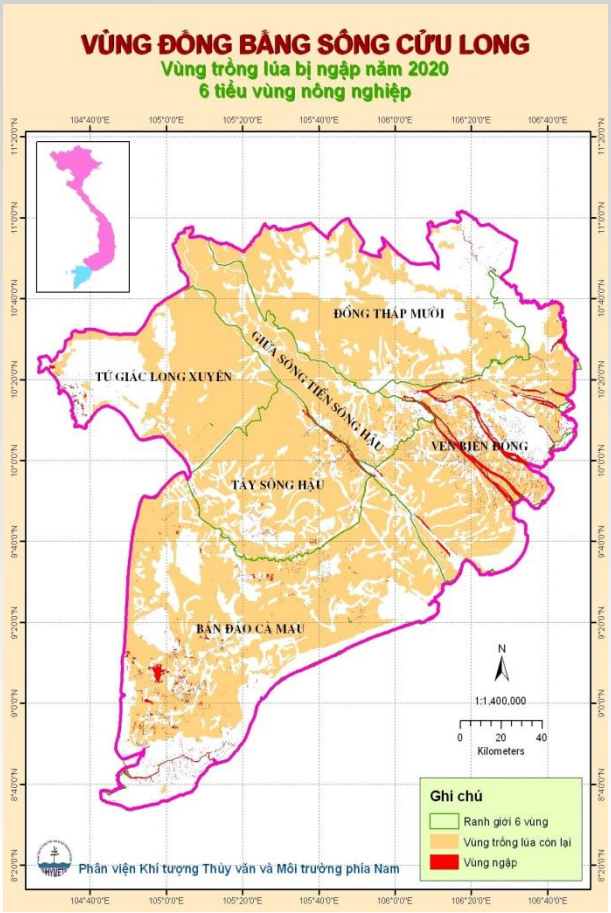
Sea level rise reduce the land areas

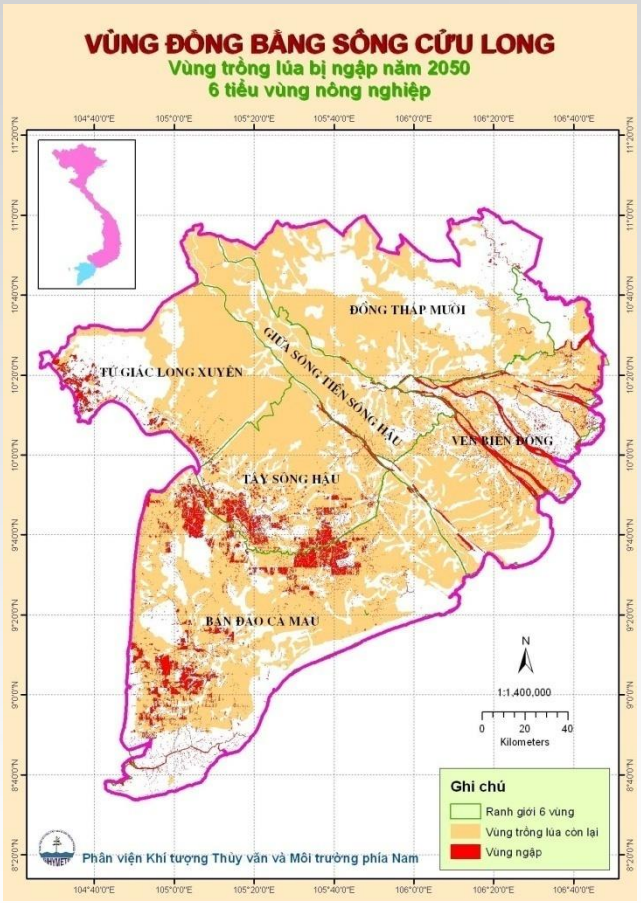
Increasing of seawater intrusion and high tide -> affect on agricultural production, infrastructure, transportation.

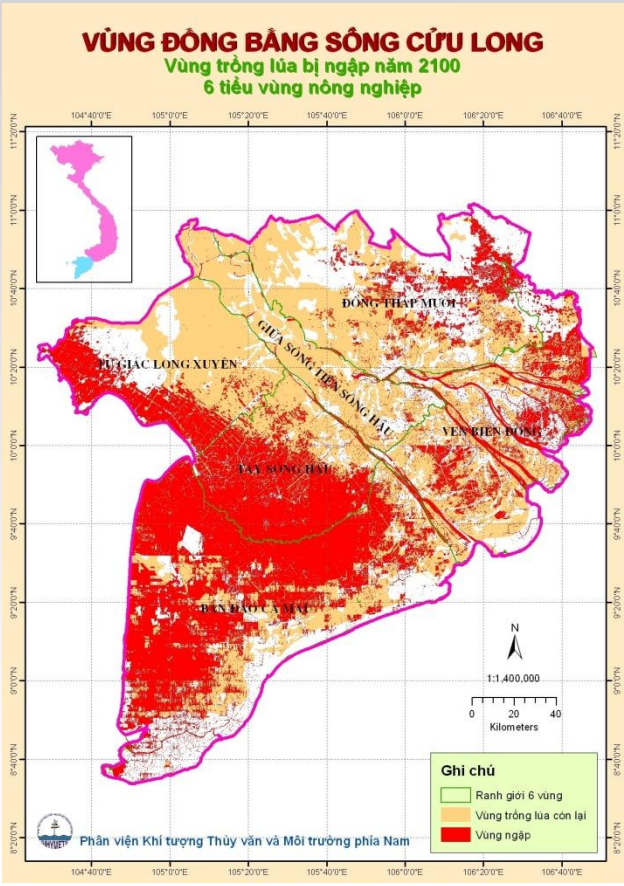
Source: Dr. Bao Thanh, SIHYMETE

Map of Predicted Inundated areas 2020, 2050 and 2100

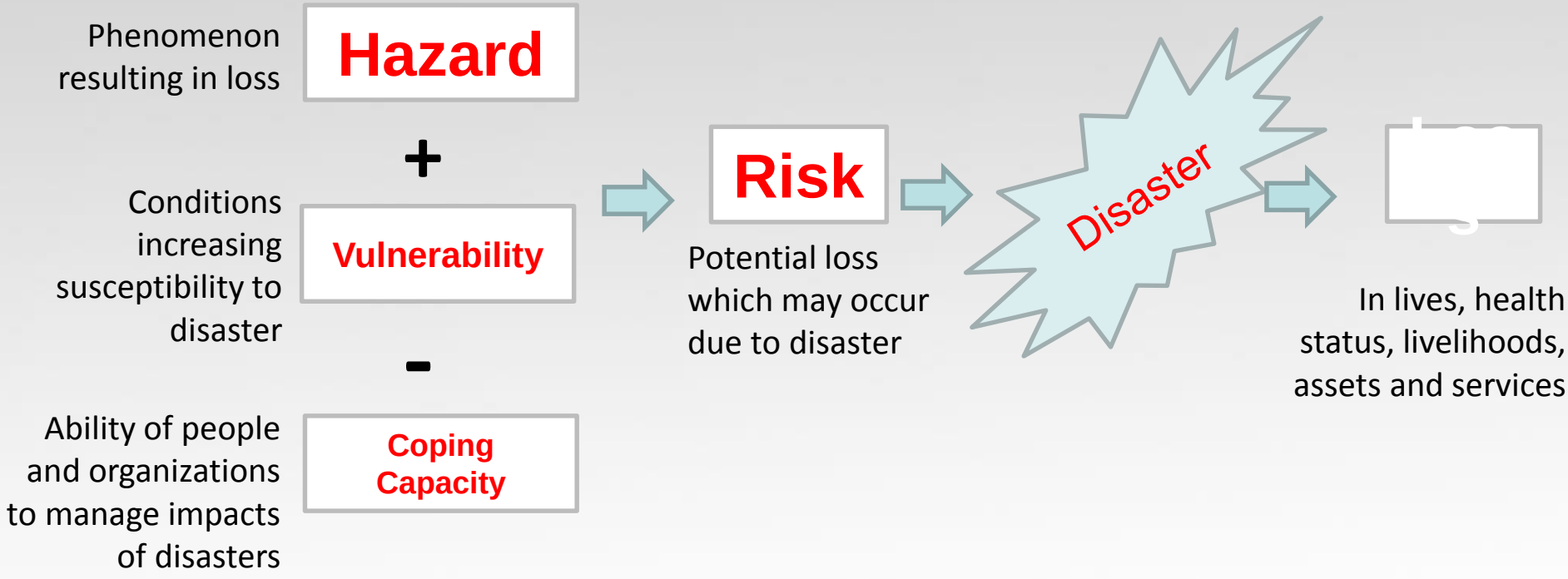
Source: Dr. Bao Thanh, SIHYMETE







Understanding the occurrence of a Disaster:



Global scenario

Unprecedented population growth and Economic development causing degradation of coasts and its resources



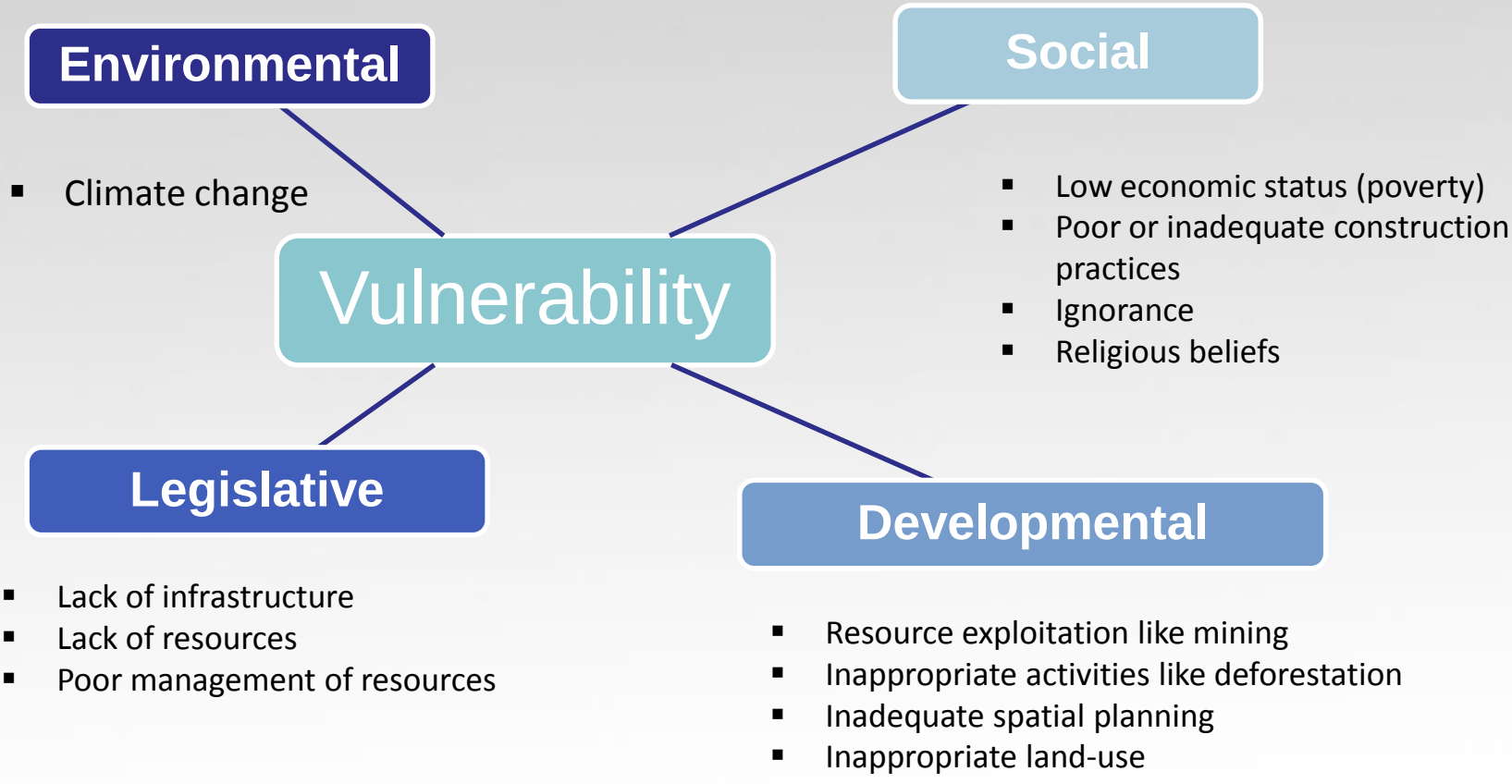



Global scenario

- **Environmental impact -** rise in sea-level will lead to migration of eco-system landwards
- **Economic impact -** loss of property, rebuilding of infrastructure, resettlement costs etc
- **Social impact -** affected coastal communities

Vulnerability

Factors increasing the vulnerability of an area:



- Climate change

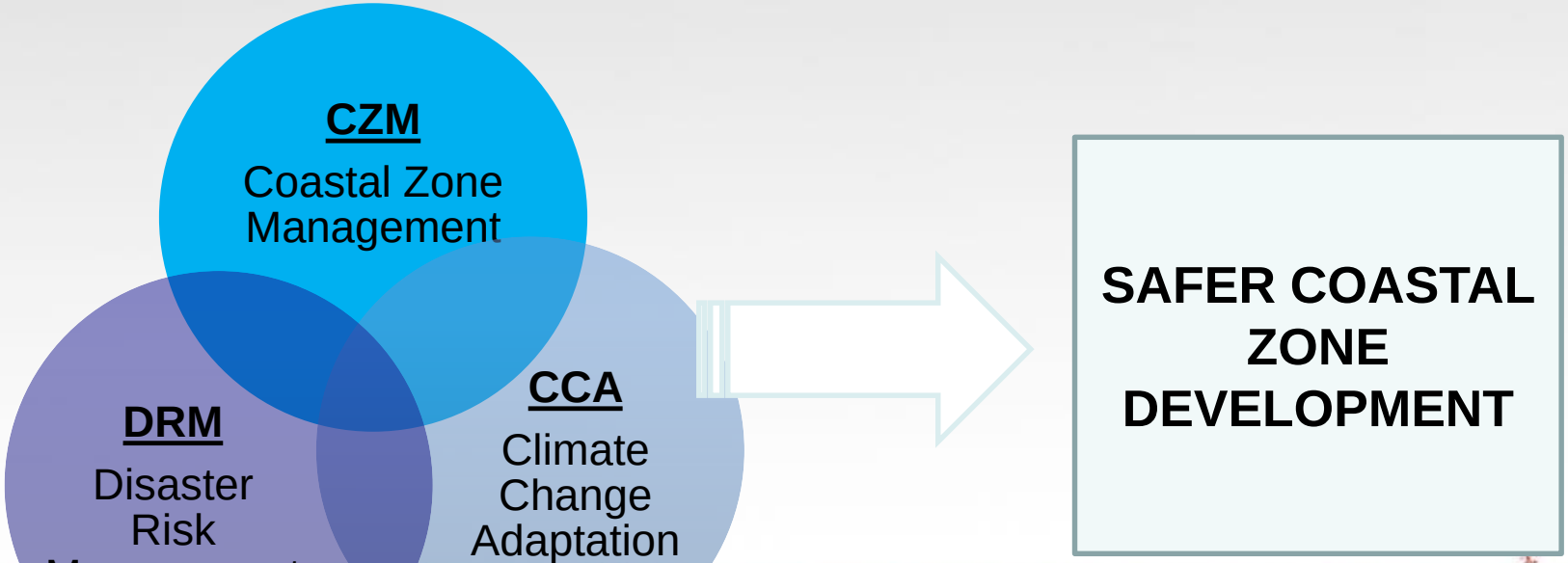
- Low economic status (poverty)
- Poor or inadequate construction practices
- Ignorance
- Religious beliefs

- Lack of infrastructure
- Lack of resources
- Poor management of resources

- Resource exploitation like mining
- Inappropriate activities like deforestation
- Inadequate spatial planning
- Inappropriate land-use

Need for a sound approach for Safer Coastal Zone Development is to:

- Support local communities and institutions in managing their coast.
- Enhance the resilience of coastal areas in facing the threats of coastal hazards and impacts of climate change.
- Recommend key steps to improve the existing coastal management process by integrating Coastal Zone Management, Disaster Risk Management and Climate Change Adaptation (CZM-DRM-CCA).



Country level strategy

Four key factors which can be suggested in stimulating safer coastal management as example Vietnam:-

1. Global Environmental change – Brought awareness and realization that changing environmental conditions associated with the various projections required different approaches to coastal management systems

2. Sustainable development - Sustainable development essentially means enhancing the community's resources so that ecological processes, are maintained, and the total quality of life, now and in the future, can be increased'.

3. Integrated resource management - horizontal and vertical integration and coordination

4. Community based movements and participation - the people who live and work in coastal areas and depend on these resources are enabled to take an active and responsible role (Hildebrand 1997)

Safer coastal zone development framework

Country level – Criteria for coastal boundaries

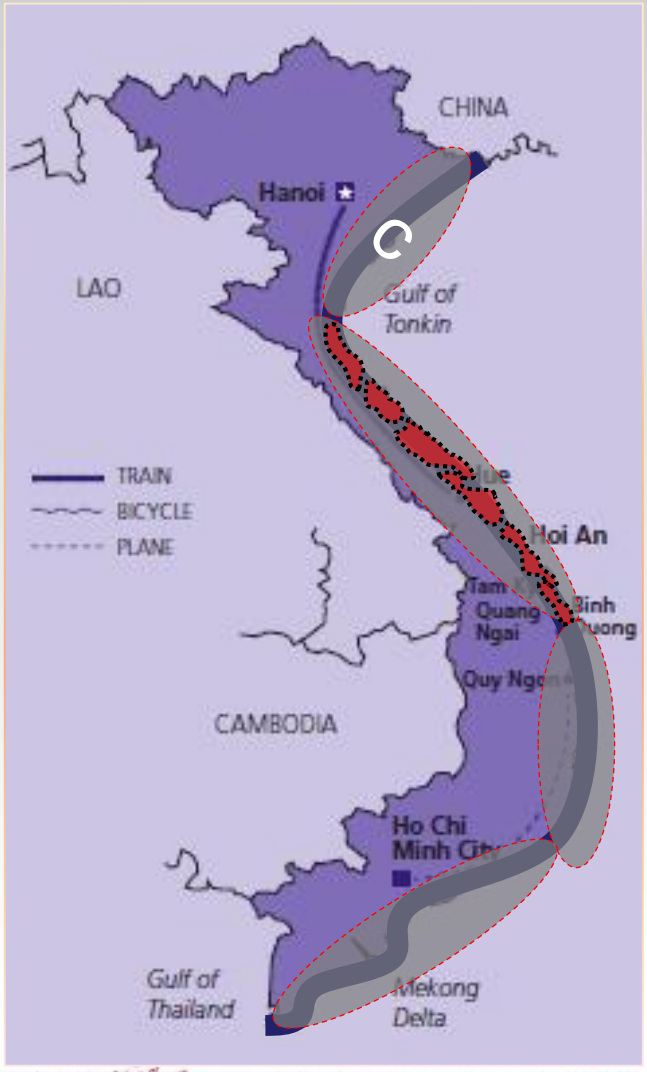
Regional level-Formation of coastal regions

Zonal level – Delineation of coastal zones

Coastal zones in each region

City/community level

- Provide guidelines for Permissible and non-permissible activities



Defining the coastal stretch

C

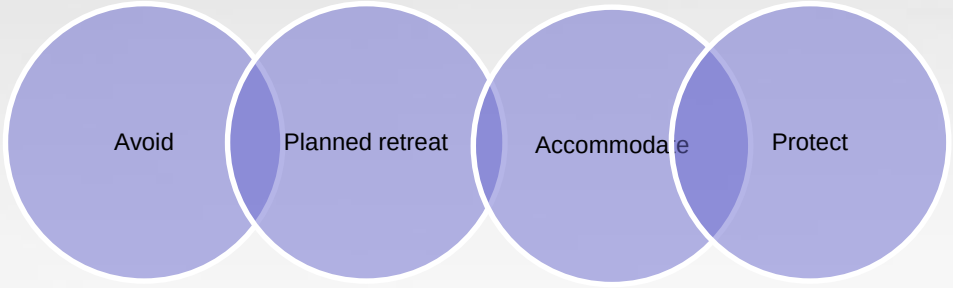
Broad state level coastal regions

Delineation coastal zones

Regional level strategy

Define and declare the coastal zone and have provisions for the coastal zone protection

- Land use planning -
  - Existing urban settlements on the coast should remain compact and physically separated through the identification and maintenance of non-urban areas.
  - The provision of new infrastructure should promote consolidation and separation of urban areas on the coast.
- Coastal hazards –
  - Coastal hazard areas must be mapped before determining new areas for urban land uses on the coast, to understand impact of physical coastal processes, including potential sea level rise
  - Planning for the coast must address the potential impacts of coastal hazards through the following hierarchy of approaches:



3. Provision for coastal-dependent land uses –
   - Where there is competition for available land, preference should be given to coastal-dependent land uses ahead of other urban land uses
   - Planning for the location and design of new coastal-dependent land uses outside of existing coastal townships
4. Areas of high ecological significance

Zonal level strategy

Each zone must be equipped with its set of regulations. The region may be differentiated into various such zones

- Coastal hazard prone zone - high risk of being affected by coastal hazards . Development in such areas need to address:
  - vulnerability to sea level rise and storm tide inundation
  - proposed access to and protection of evacuation routes

- Erosion prone area – must remain undeveloped apart from acceptable temporary or re locatable structures for safety and recreational purposes. Strategy of retreat from erosion prone areas is the preferred option.

- Nature conservation - Biodiversity on the coast is to be safeguarded through conserving and appropriately managing the diverse range of habitats including coral reefs, seagrass, soft bottom (benthic) communities, dune systems, salt flats, coastal wetlands and riparian vegetation

- Areas of high ecological significance - Development and development infrastructure is to be located outside of, and not have a significant impact on, an area of high ecological significance. Specific purpose allowable development are:-

  - urban or rural residential purposes within an urban area
  - development for tourism purposes
  - any purpose within a maritime development area or aquaculture development area
  - development associated with a port or airport
  - extraction purposes within a key resource area.

Local/Community level strategy

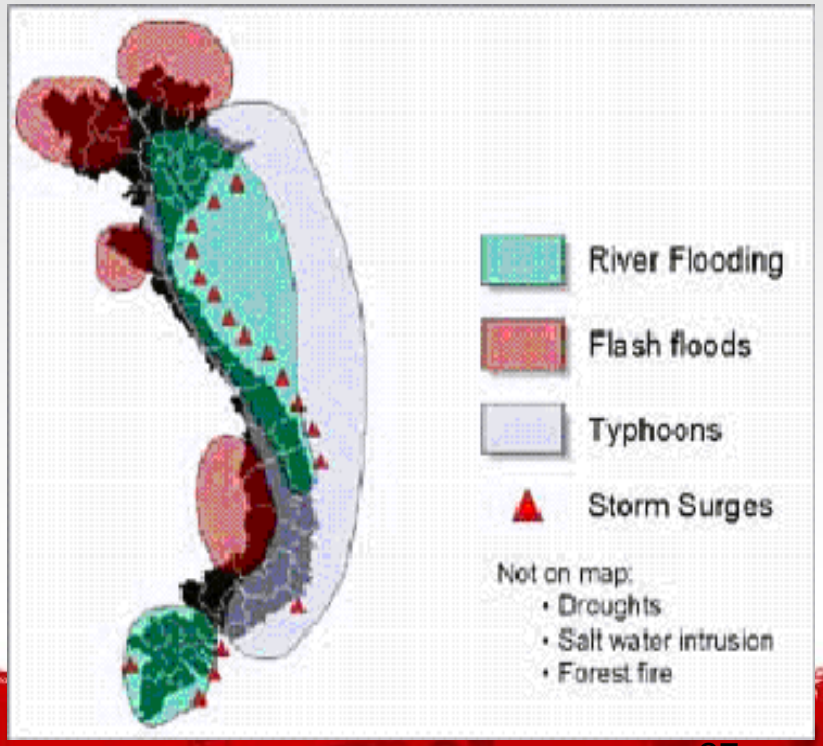
Planning tools

1. Objectives and policies - The setting of objectives and policies to manage development must be available to local governments. It can be termed as community plan/comprehensive plan. Typical objectives include
    - accommodating future development by identifying land suitable for such purposes,
    - protecting residents by avoiding development or managing risk on land subject to hazards,
    - protecting environmentally sensitive areas.

2. Coastal hazard mapping - Coastal hazard mapping must identify coastal flood and erosion hazard(s) and to provide the technical basis for land use planning and development floodplain bylaws.

3. Risk management –
    - ❑ Identification, assessment, measurement, and prioritization of risks from SLR
    - ❑ Responding to risks by selecting the most appropriate adaption tools

4. Emergency planning and preparedness – Advance and post disaster planning



Local/Community level strategy

Regulatory tools

- Subdivision regulation - Establish conditions for the subdivision of land at risk from coastal hazards associated with SLR. Subdivision refers to establishing a separate title of land. This can include a fee simple property, bare land strata lot etc.

- Building regulation - This tool refers to the ability of the appointed local government representative to ensure that a building can be safely used for its intended purpose.

- Regulation of land use - Regulated through appropriate zoning within areas subject to coastal hazards. It may include:-
  - Land use, density, siting of buildings and servicing standards
  - Designation of land as a floodplain
  - Minimum building elevations & setbacks for land in floodplain

4. Development permit - It combines policy objectives and guidelines with site specific regulation. The ones applicable o SLR are:-
   - protection of the natural environment, its ecosystems and biological diversity
   - protection of development from hazardous conditions.

Local/Community level strategy

Structural Tools (Flood Protection Works)

- Scour protection - Scour protection consists of riprap or structural elements designed to withstand wave action and the force of moving water and is used to protect shoreline structures or building foundations from being eroded

SCOUR PROTECTION

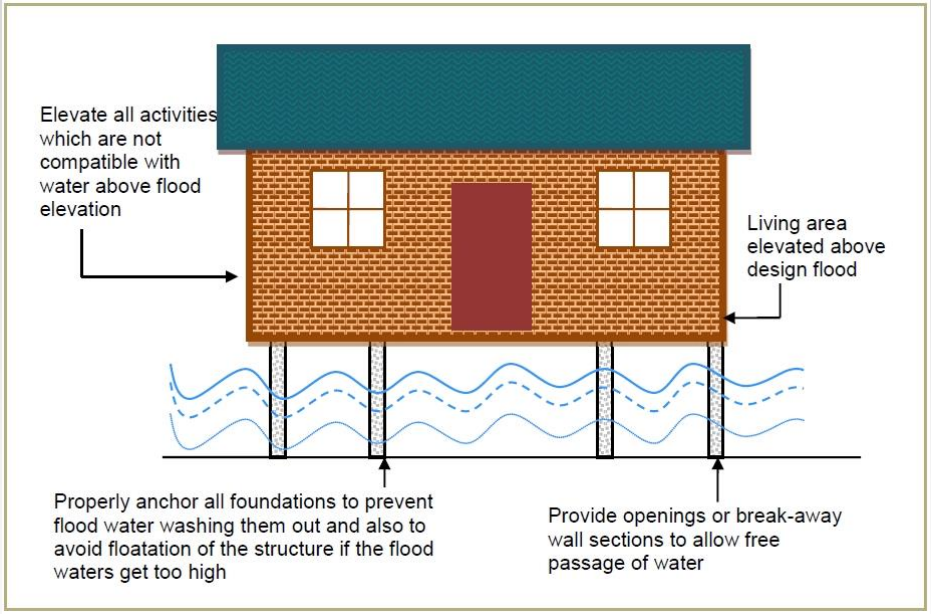
STRUCTURE ABOVE GROUND LEVEL

2. Structural elevation - raising the ground level below a building with the placement of fill; raising the habitable areas within a building; or raising the entire building by using stilts, foundation walls or similar elevating structures.

Local/Community level strategy

Structural Tools (Flood Protection Works)

3. Dikes - Dikes are a linear protection tool, and typically form the key defense element in a protect strategy.



4. Wet flood proofing - Wet flood proofing consists of providing protective measures below the Flood Construction Level of a building which allows water to enter and exit a structure with minimal damage.

Local/Community level strategy

Structural Tools (Flood Protection Works)

5. Other Hard Protection - There are several types of other hard protection structures commonly used within a coastal context.
   - Off-site structural works to protect shorelines from flooding
   - Includes seawall, groyne, revetment and storm surge barrier
   - Secondary protection including roads and back-up dikes

Local/Community level strategy

Non-structural

- Coastal wetland creation or restoration - Wetland creation can be part of an avoid strategy or provide a transitional land use as part of a long-term strategy of retreat. It helps create of a buffer to reduce wave energy.

Local/Community level strategy

Non-structural

1. Dune building – It refers to the restoration of natural or artificial dunes in order to gain the greatest coastal protection. Both natural and artificial dunes can be stabilized through vegetation planting; vegetation roots help stabilize the dune.


REBUILDING OF SAND DUNES


BEACH NOURISHMENT

2. Beach nourishment – It refers to the addition of sand or other similar beach sediment material to satisfy the erosion forces of natural wave action and prevent shoreline erosion.

Disaster Risk Reduction Measures - Structural

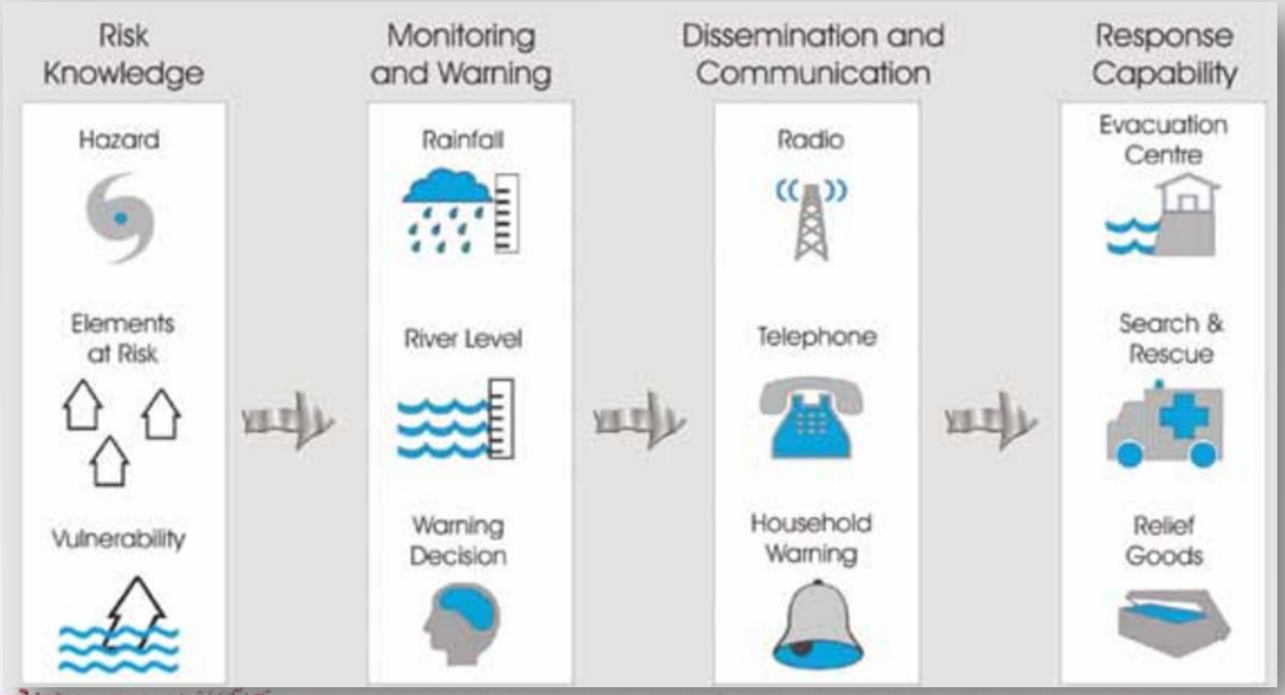
Ecosystem Based

- Bio Shields
- Mangroves
- Sand Dunes
- Coral Reefs

DRR - Non structural measures

Measures to reduce the physical exposure of coastal areas to impacts of hazards:

- Early Warning Systems
- Training and capacity building
- Regulations such as Coastal Setbacks
- Public Awareness
- Others



Thank You