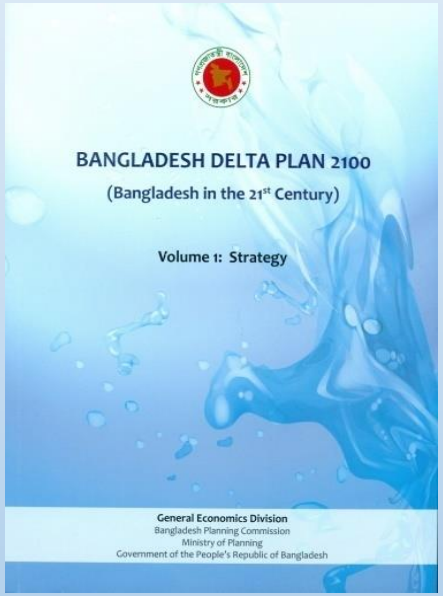
Training on

Defining Hotspots, Delta Vision, Mission, Goals, Policy Options of BDP 2100 and BDP 2100 Strategies/Measures of Water Resources



Presented By

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Bangladesh Delta Plan 2100 and it's Context:

- **6th most vulnerable country** in the world in terms of risks from natural hazards.
- Deltaic formation is still going on
- Frequent tidal surge, salinity, flooding, river erosion, earthquakes and cyclones
- Resulting continuous challenge to food security and livelihood security
- Other challenges include growing urbanization, declining land availability, infrastructure shortages, energy supply constraints and dearth in labour skills
- Climate Change exacerbates all these
- In view of the long term challenges presented by climate change and natural hazards, the Government has formulated a long term **Bangladesh Delta Plan 2100 (BDP 2100).**

Principles and Features of BDP 2100

- **BDP 2100 is a**
  - **long term and visionary plan covering the 21st Century**
  - **Holistic and integrated Plan,** considering many themes and sectors, individual strategies as well as integrated ones for the whole country considering the needs of all water-related sectors have been articulated in a single plan
  - **Techno- economic water centric plan,** which covers both technical and economic issues (GDP growth, Poverty Reduction, Employment, Food Security, Investment, etc.)
  - **Implementable plan** having an investment programme upto year 2030 linked with financial resources

- BDP 2100 has strongly focused on **Climate Change issues and Adaptive Delta Management (ADM)** approach which is a paradigm shift in planning and managing projects.

BDP 2100 Vision & Goals

Vision: Achieving Safe, Climate Resilient and Prosperous Delta

Mission:

Ensure long term water and food security, economic growth and environmental sustainability while effectively reducing vulnerability to natural disasters and building resilience to climate change and other delta challenges through robust, adaptive and integrated strategies, and equitable water governance.

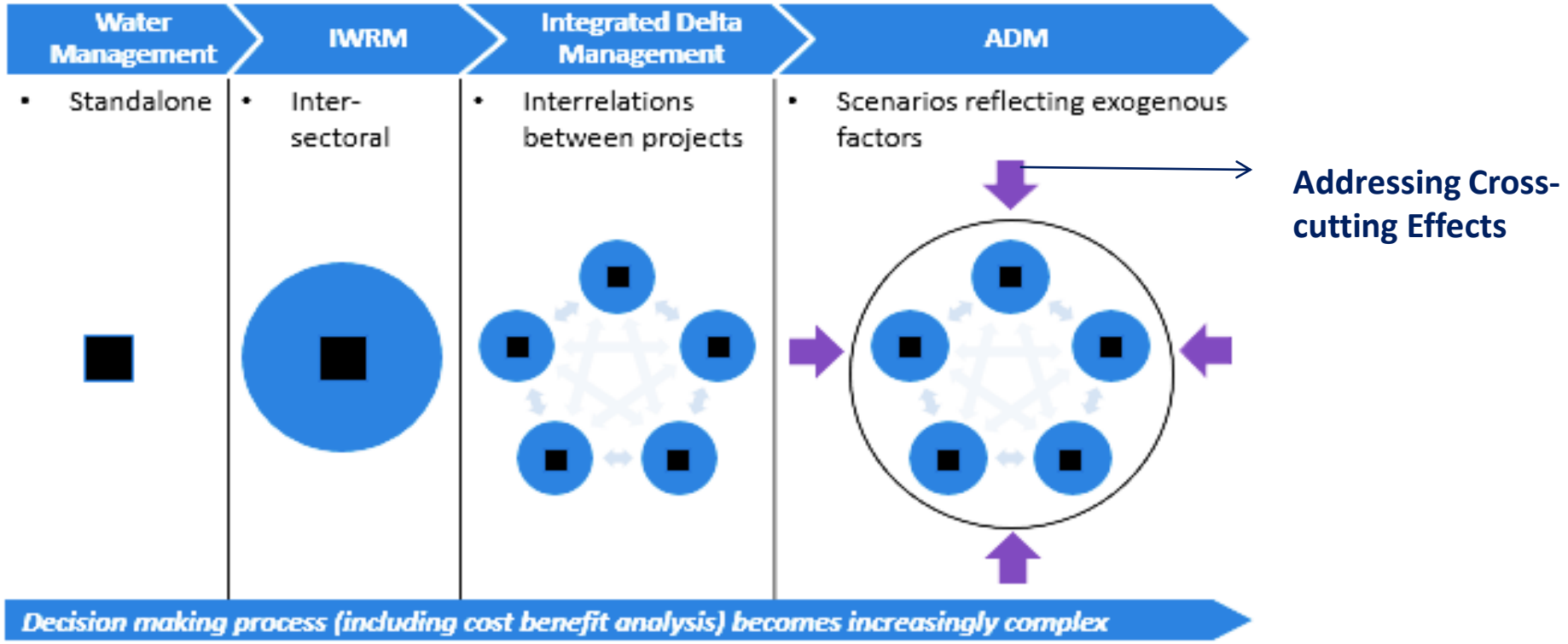
Higher Level Goals

Goal 1: Eliminate extreme poverty by 2030
Goal 2: Achieve Upper Middle Income Country (UMIC) status by 2030
Goal 3: Being a prosperous country beyond 2041

Delta (BDP 2100) Goals

Goal 1: Ensure safety from floods and climate change related disasters
Goal 2: Ensure water security and efficiency of water usages
Goal 3: Ensure sustainable and integrated river systems and estuaries management
Goal 4: Conserve and preserve wetlands and ecosystems and promote their wise use
Goal 5: Develop effective institutions and equitable governance for in country and trans-boundary WR management
Goal 6: Achieve optimal use of land and water resources

Paradigm Shift in Planning to Adaptive Delta Management



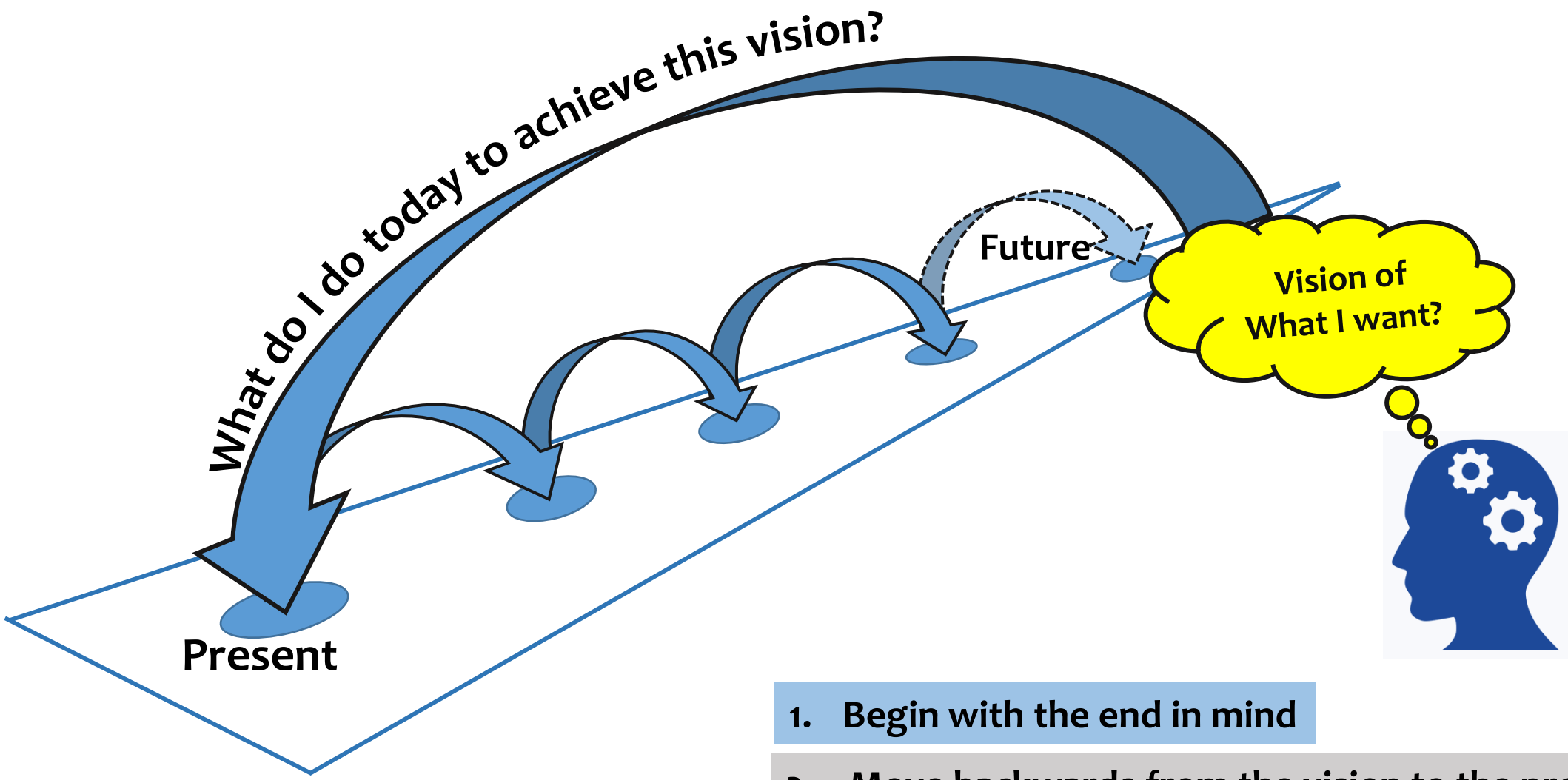
ADM asks:

What could happen in the **future**, and what can we do **now** to achieve our goals, regardless of how the future unfolds? Plan through **Back Casting.**

ADM deals with uncertainties is the key issue:

- ✓ 'what to do and when to do it?'
- ✓ 'not too much, not too little'
- ✓ 'not too early, not too late'

Back Casting



1. Begin with the end in mind
2. Move backwards from the vision to the present
3. Move step by step towards the vision

Framework for Strategy Development

Strategies developed at 3 Levels:

- **National Level Strategies**
  - Flood Risk Management
  - Fresh Water
- **Hotspot Level Strategies**

- **Strategies for Cross-cutting Issues**
  - Sustainable Land Use and Spatial Planning
  - Agriculture, Food Security and Livelihood
  - Trans-boundary Water Resources Management
  - Dynamic Inland Water Transport
  - Blue Economy
  - Renewable Energy

  -Earthquakes

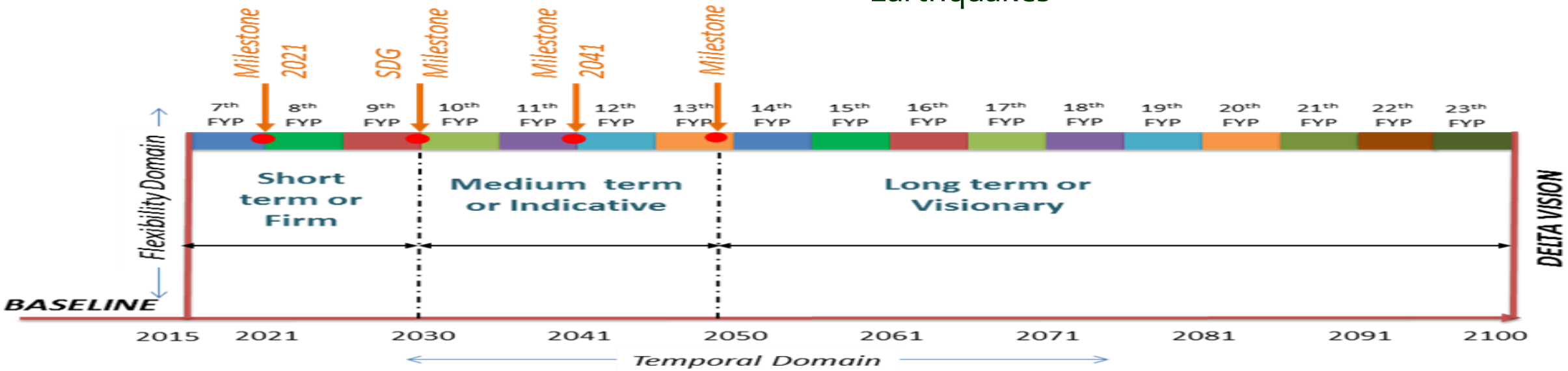


Figure: Time Frame of BDP 2100 Strategy

Hotspots: Planning and Implementation Units of BDP 2100

Hotspot is defined as **"a place of significant activity or danger"**. Hotspots are prototypical areas where similar hydrological and climate change vulnerability characteristics and problems converge also influenced by natural hazards.

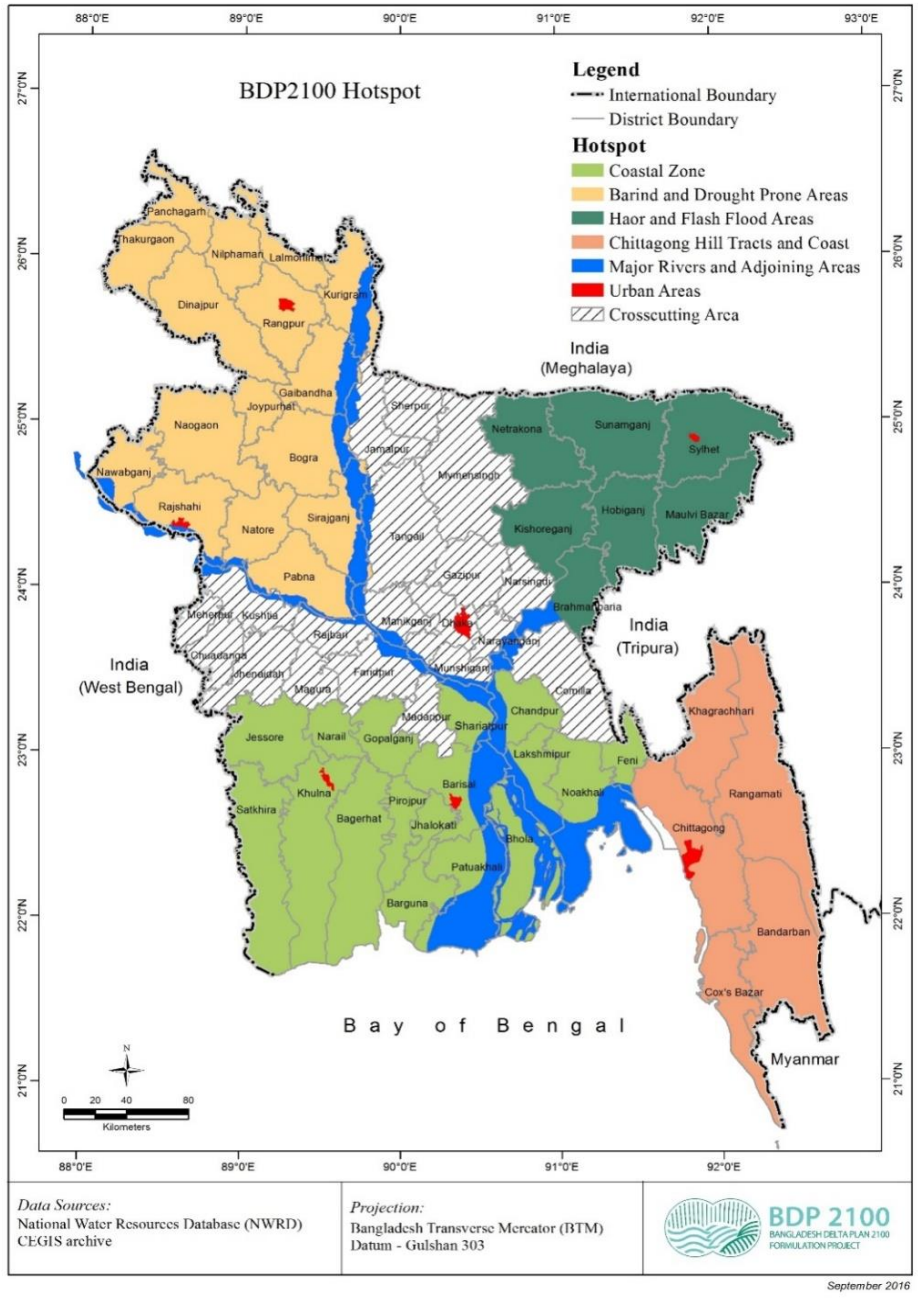
In BDP 2100, Hotspot is a broad grouping of districts and areas facing similar risks evolved by Hydrology, climate change and natural hazards .

The remaining area is identified as **"Cross-cutting"** areas characterized by a combination of issues and challenges e.g. floods, drought, river bank erosion, sedimentation, groundwater depletion, water pollution and water supply and sanitation.

Six Hotspot Areas

Six (6) Hotspot areas have been identified :

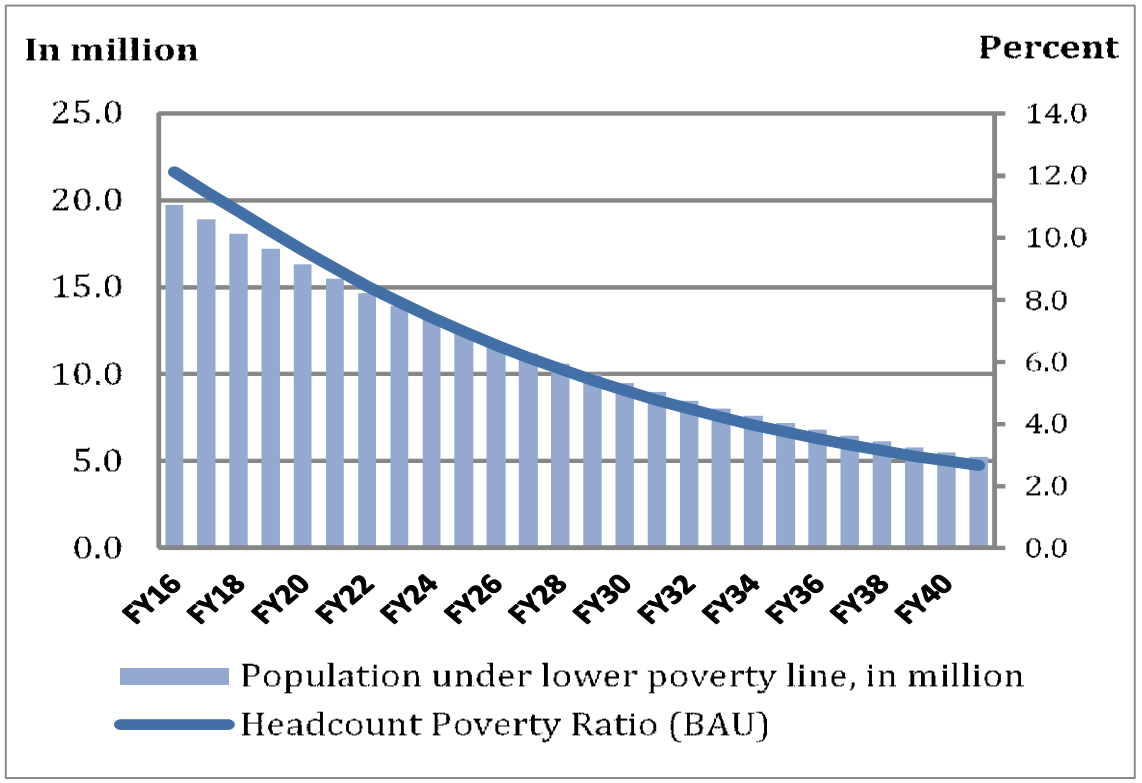
1. Coastal Zone (27,738 sq km);
2. Barind and Drought Prone Areas (22,848 sq km);
3. Haor and Flash Flood Areas (16,574 sq km);
4. Chattogram Hill Tracts (13,295 sq km);
5. River Systems and Estuaries (35,204 Sq km); and
6. Urban Areas (19,823 sq km).



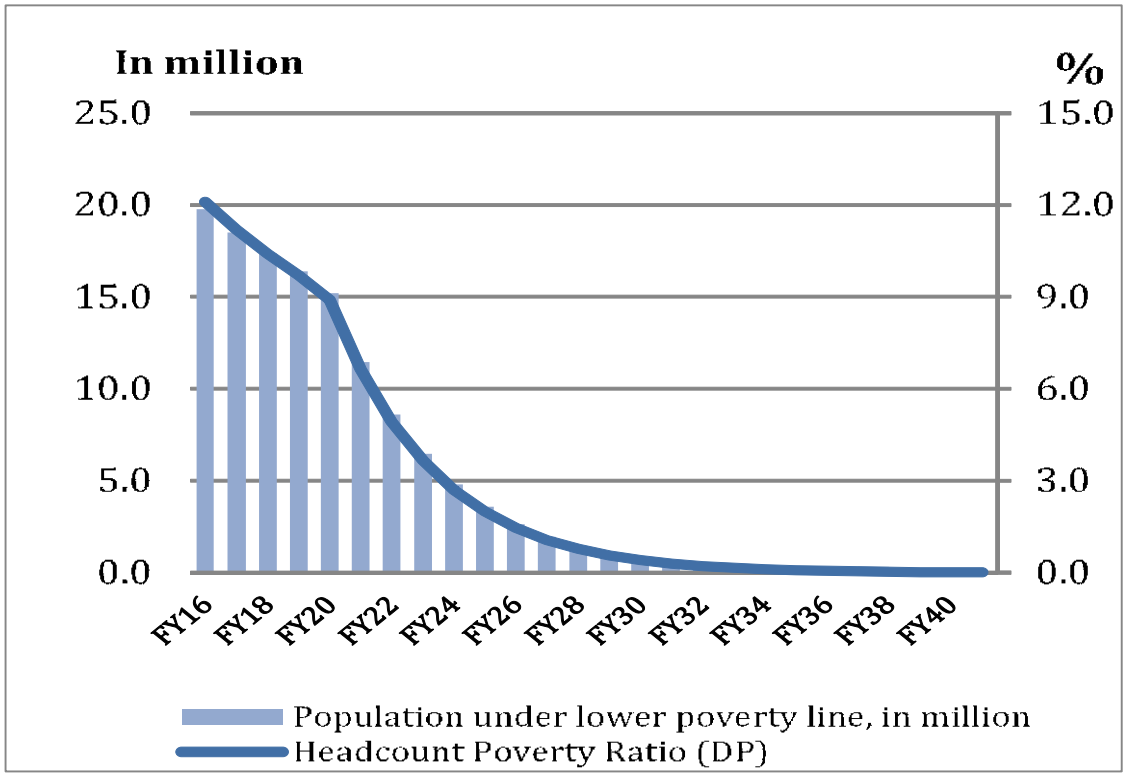
BAU vs BDP2100

Implication of BDP 2100 for Poverty Eradication

Extreme Poverty in BAU Scenario



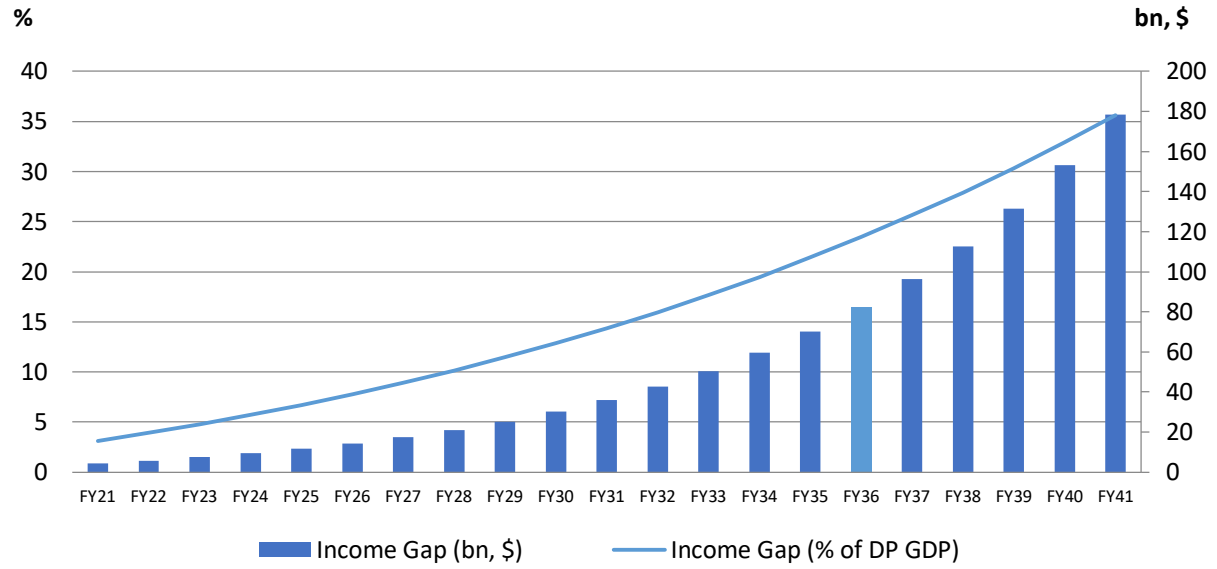
Extreme Poverty in BDP 2100 Scenario



Macroeconomic Analysis done for BDP 2100 reveals that in Business As Usual (BAU) policy option, the extreme poverty will be eradicated around 2041. But, if the country adopt Delta Plan policy option the extreme poverty could be eradicated around 2027.

Implication of BDP 2100 for Poverty Eradication

Income Gap between BAU Scenario and Government's scenario with 9% growth



There is an average loss of real GDP of 1.3% per year in this scenario compared with the government's target of maintaining 9% GDP growth until FY2041. This would add up to an approximate loss USD 741 billion by FY 2041, estimated as the cumulative loss of income by FY2041 between BAU Scenario and the government's 9% growth environment (Figure 5.6 of BDP 2100).

Per Capita Nominal GDP (USD)

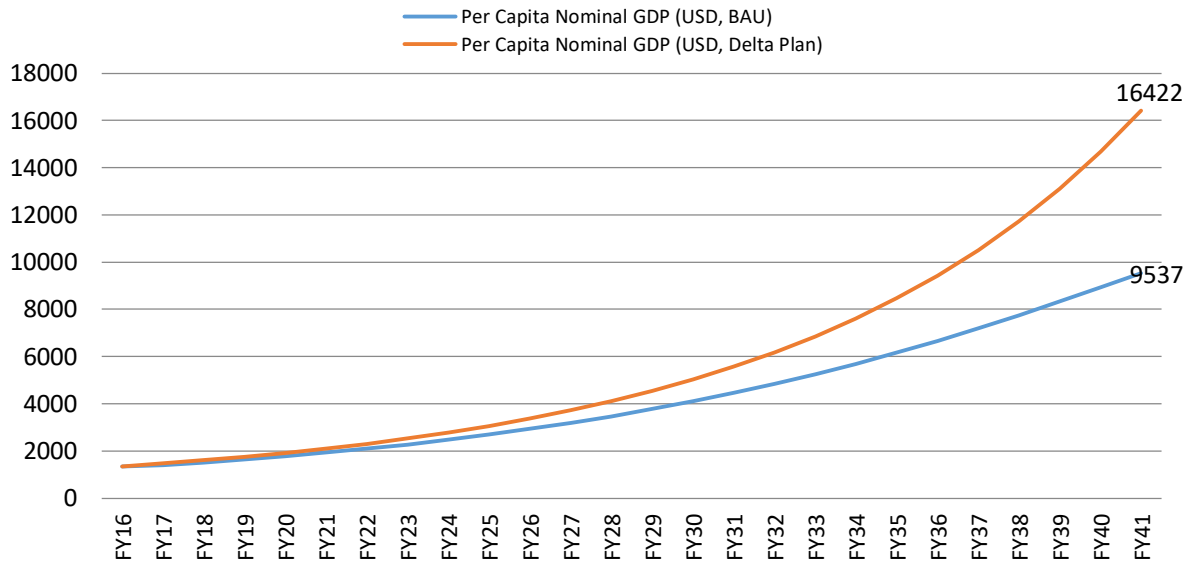


Figure 5.13 of BDP 2100

Bangladesh may fall into the middle income trap in the absence of higher levels of investment on adaptation, requiring much longer time to become a higher middle income country if environmental risks become more severe. It is also conceivable that without the Delta Plan implementation and in the event of the worst case climate change scenario, Bangladesh may not attain UMIC status for a long period of time.

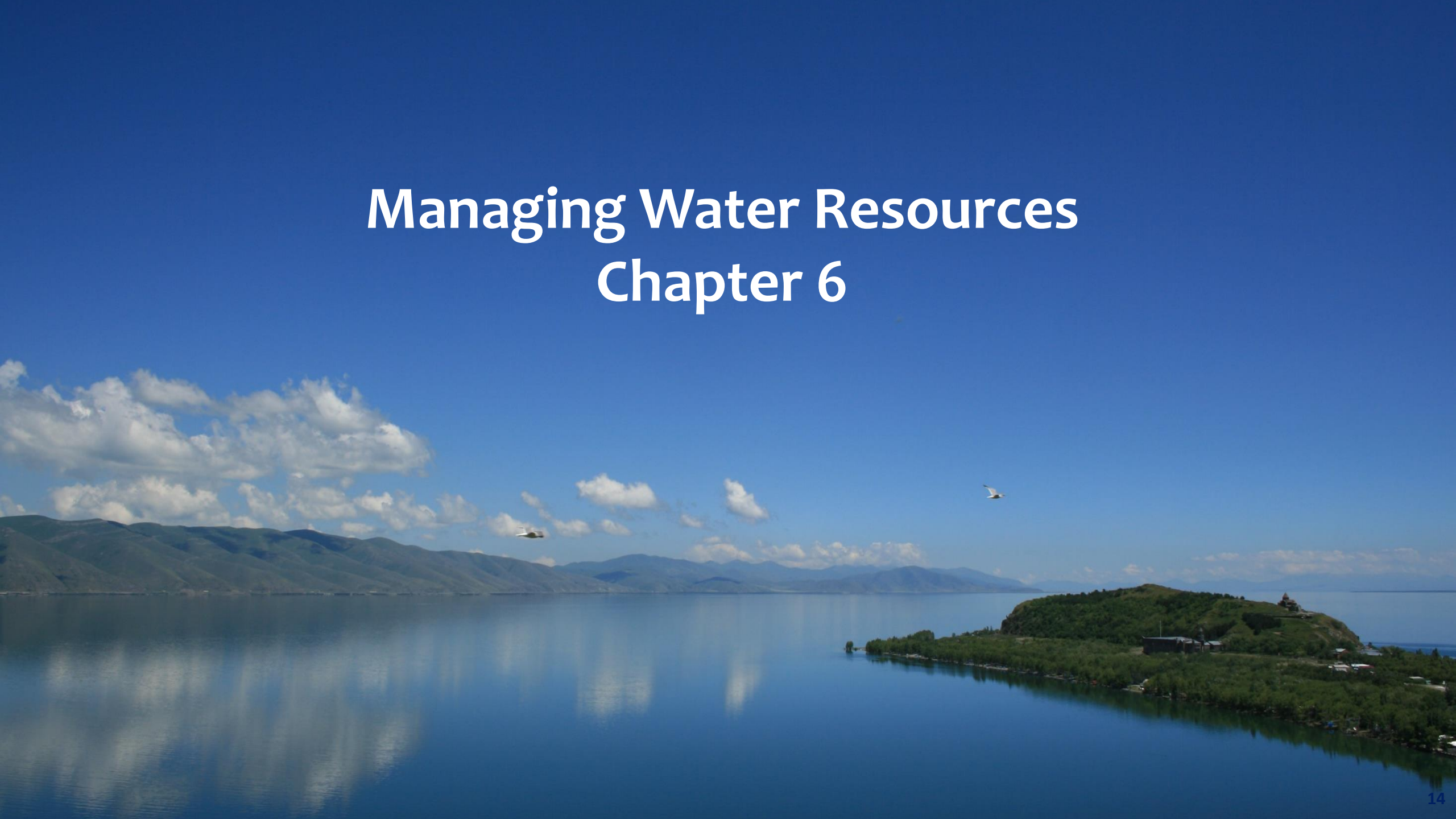
Region wise Migration in BAU Scenario (in million)

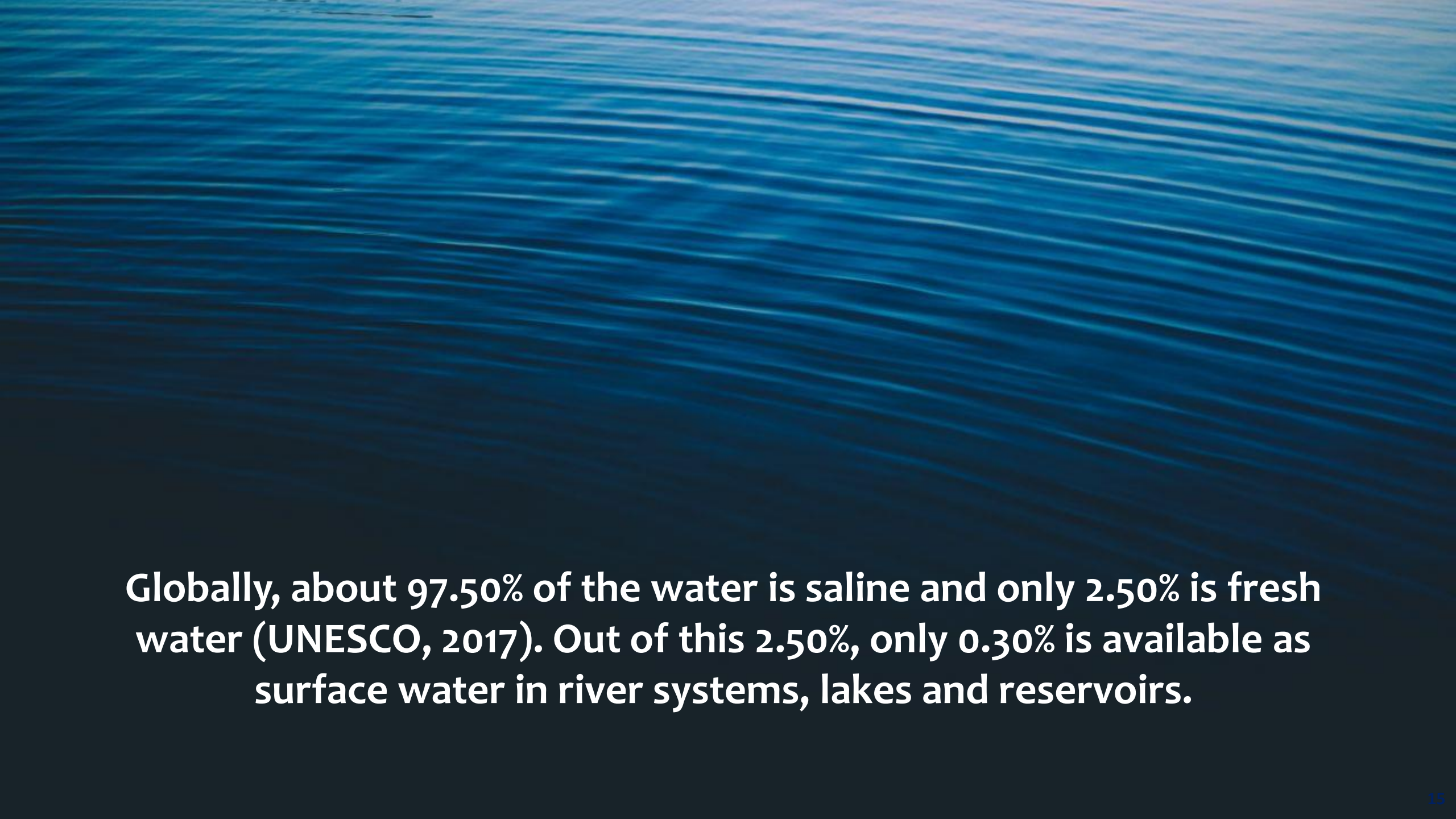
Region	FY16	FY21	FY31	FY41
Haor	0.05	0.11	0.22	0.34
Coastal	-0.50	-2.29	-6.33	-10.72
CTG Hill	0.02	0.04	0.08	0.12
Urban	0.69	3.97	11.38	19.43
Drought Prone	-0.16	-0.73	-2.02	-3.42
Rivers & Estuaries	-0.34	-1.55	-4.30	-7.29
Less Risky Region	0.24	0.46	0.95	1.47

Region wise Migration in DP Scenario (in million)

Region	FY16	FY21	FY31	FY41
Haor	0.05	0.15	0.38	0.62
Coastal	-0.50	-1.41	-3.45	-5.67
CTG Hill	0.02	0.05	0.13	0.22
Urban	0.69	1.94	4.76	7.78
Drought Prone	-0.16	-0.45	-1.10	-1.81
Rivers & Estuaries	-0.34	-0.96	-2.34	-3.86
Less Risky Region	0.24	0.66	1.63	2.66

Managing Water Resources
Chapter 6





Globally, about 97.50% of the water is saline and only 2.50% is fresh water (UNESCO, 2017). Out of this 2.50%, only 0.30% is available as surface water in river systems, lakes and reservoirs.

Renewable Water Resource

Average(1980-2009) availability (bcm/year)

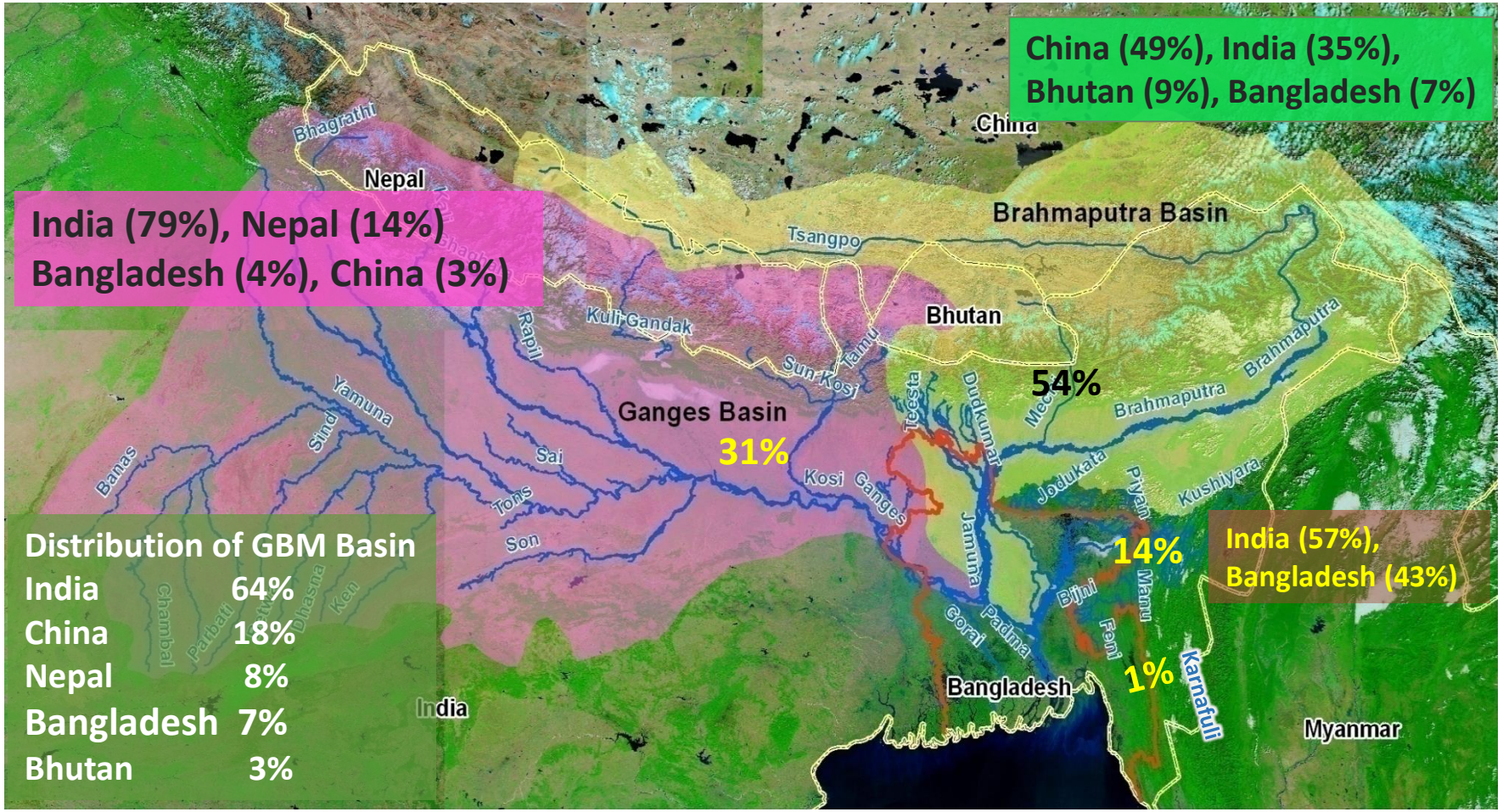
Types		Total	Internal	External
Renewable Water Resource		1,211 /1260	105	1106
Surface Water		1189.5	84	1105.5
Ground Water	**FAO,2011**	21.5	21.02	0.03
	Hodgson et. al., 2014	28		
Combine inflows of Main Rivers		981		
Dry Season inflow		148 (15% of Total Flow)		
Dry Season inflow of Brammaputra		111		
Inflow of Brhamaputra in February		11		
Inflow of Ganges in February		2		
Total Water Demand in 2011		27.78		
Water Demand (avg. 1986-2010) for Agriculture		25 (90% of Total Water Demand, of which 76% is ground Water)		
		33 (2014)		
Water Demand for Domestic (2011)		2.7 (9.71% of Total Water Demand), 4.1 (2030), 5.4 (2050)		
Water Demand for Industrial Sector (2011)		0.08 (0.029% of Total Water Demand) , 0.18(2030), 0.35(2050)		

Challenges

Geographical Challenges

Bangladesh ecosystems depend on regional river systems: (Ganges-Brahmaputra/ Jamuna-Meghna)

- Largest dynamic delta of the world
- Around 700 Rivers: 57 Transboundary (54 with India and 3 with Myanmar)
- 93% catchment area lies outside Bangladesh with annual sediment load of 1.0 to 1.4 billion tones
- Abundance of water in wet season but scarcity of water in dry season



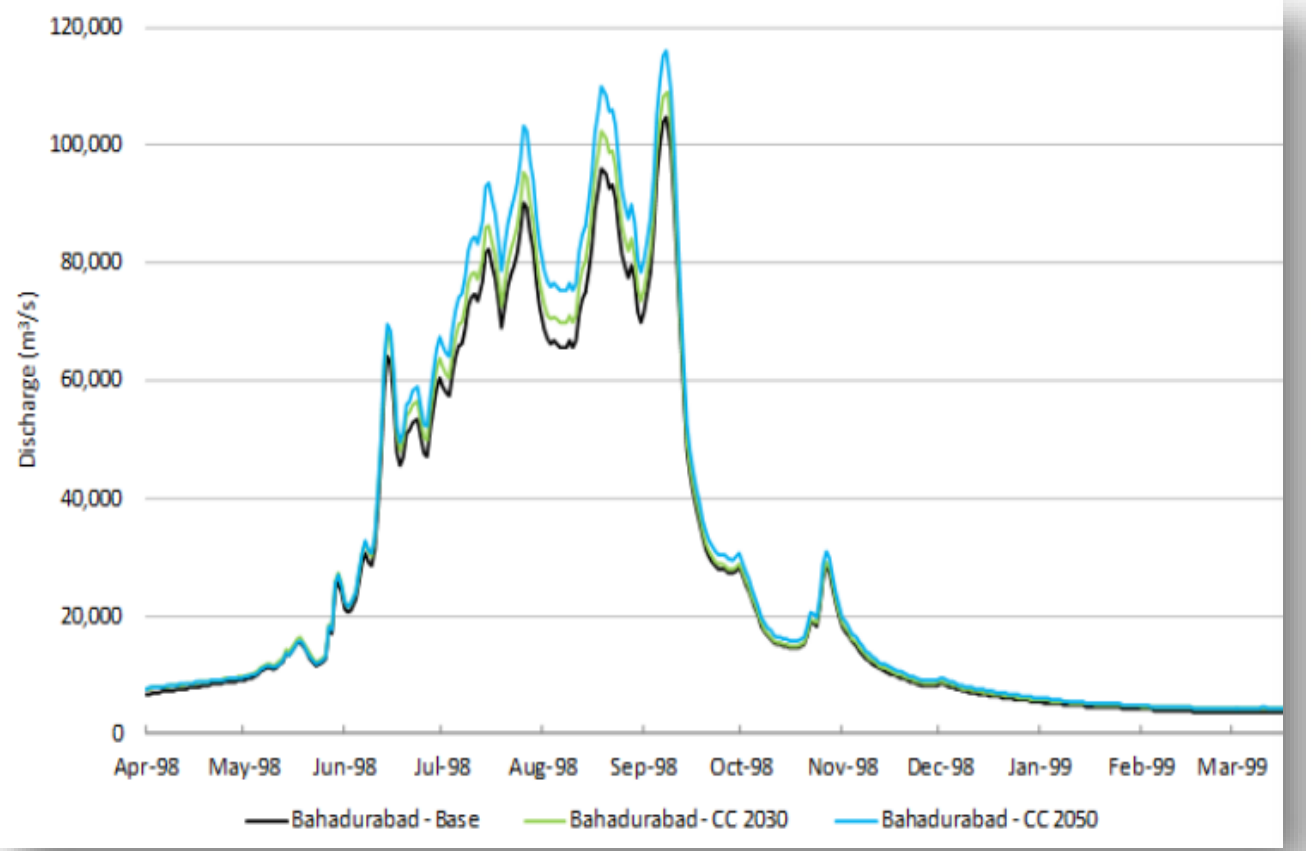


Figure: Climate change impact on flow of the Brahmaputra at Bahadurabad in 2030 and 2050. Source: IWM (2014a).

Max. Discharge

1998: 1,03,000 m^3/sec

2050: 1,16,00 m^3/sec (CSIRO,2014)

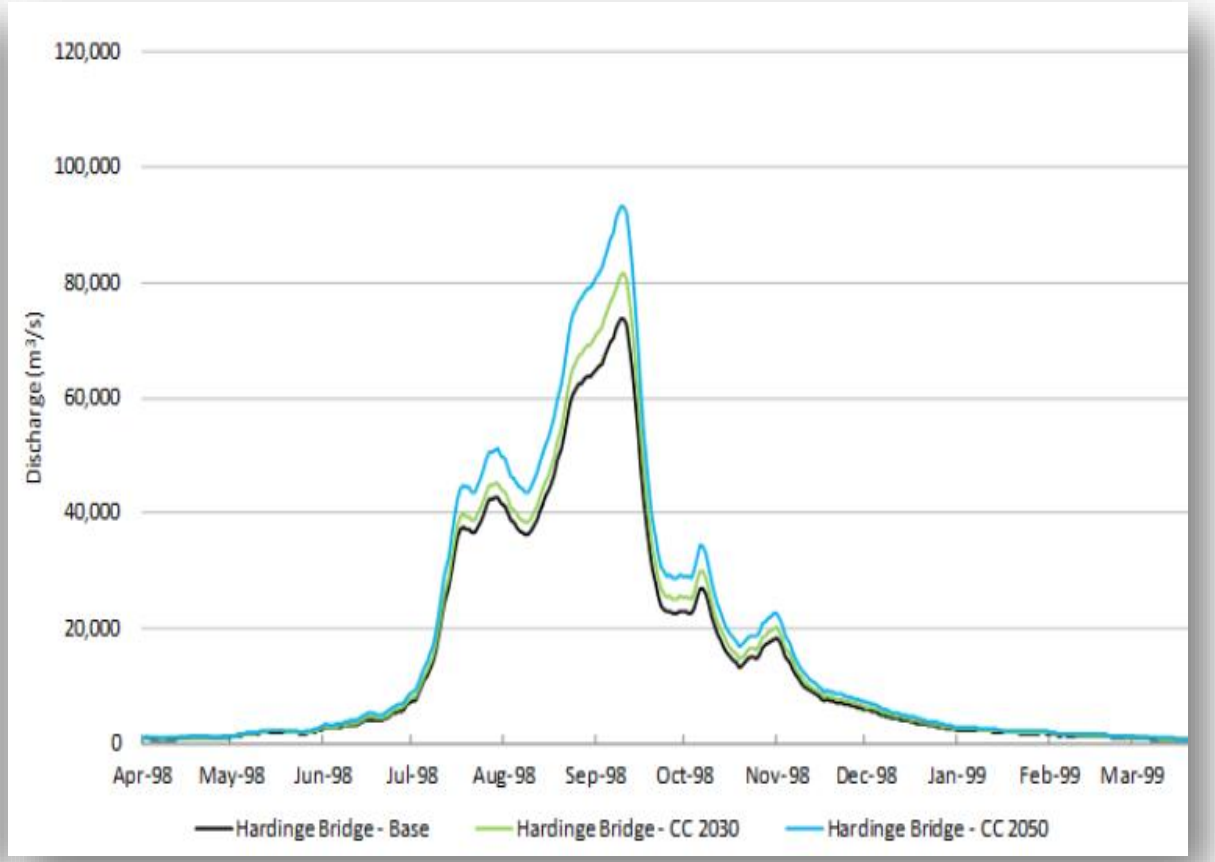


Figure: Climate change impact on flow of the Ganges at Hardinge Bridge in 2030 and 2050. Source: IWM (2014a).

Max. Discharge

1998: 72,000 m^3/sec

2050: 90,000 m^3/sec (CSIRO,2014)

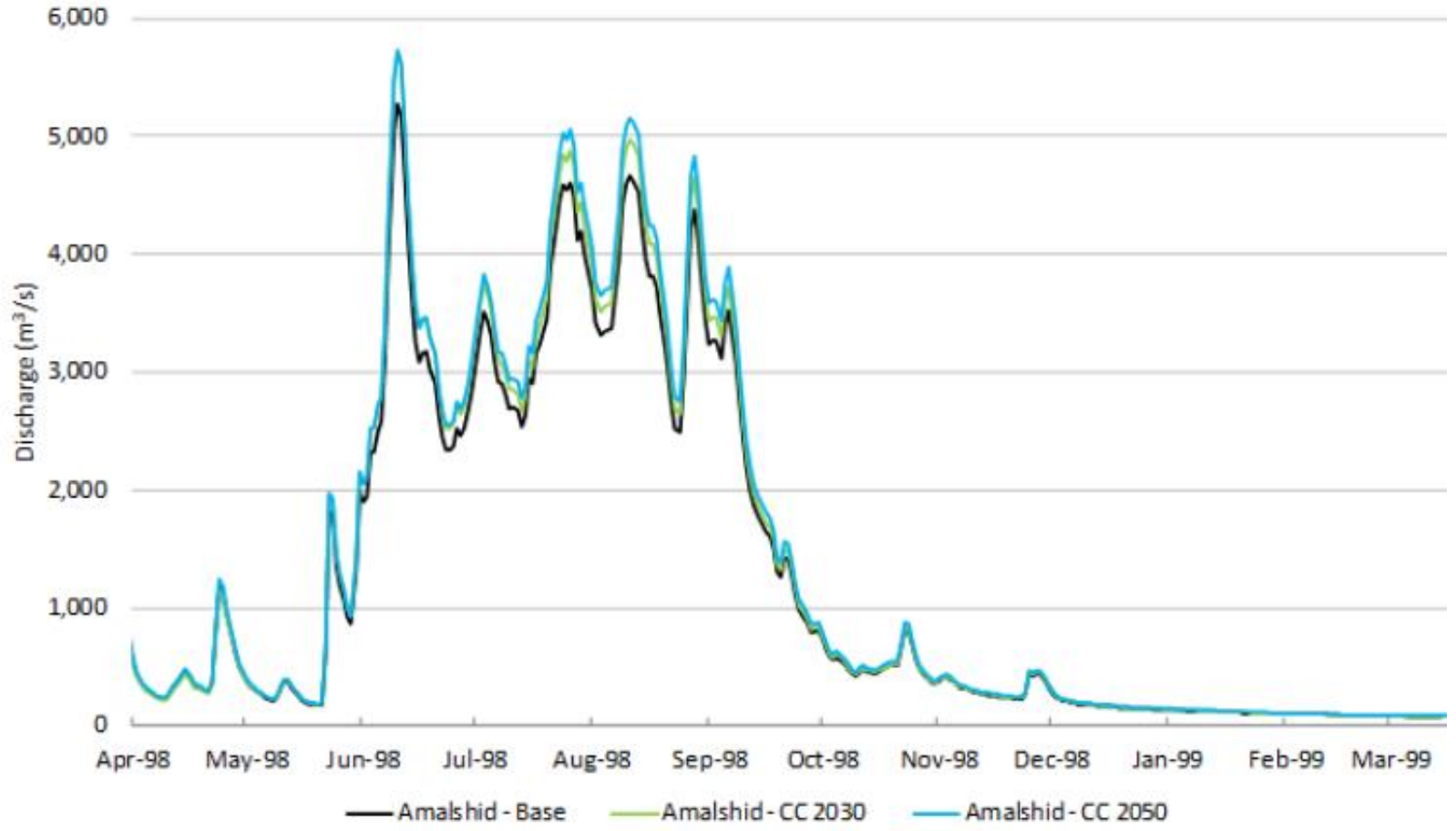


Figure: Climate change impact on flow of the Meghna at Amalshid in 2030 and 2050. Source: IWM (2014a).

History of Mega Floods

1954

- Inundation 28%

1987

- Inundation 35%
- Estimated damage US$ 1.0 billion
- Death toll 2,055

1988

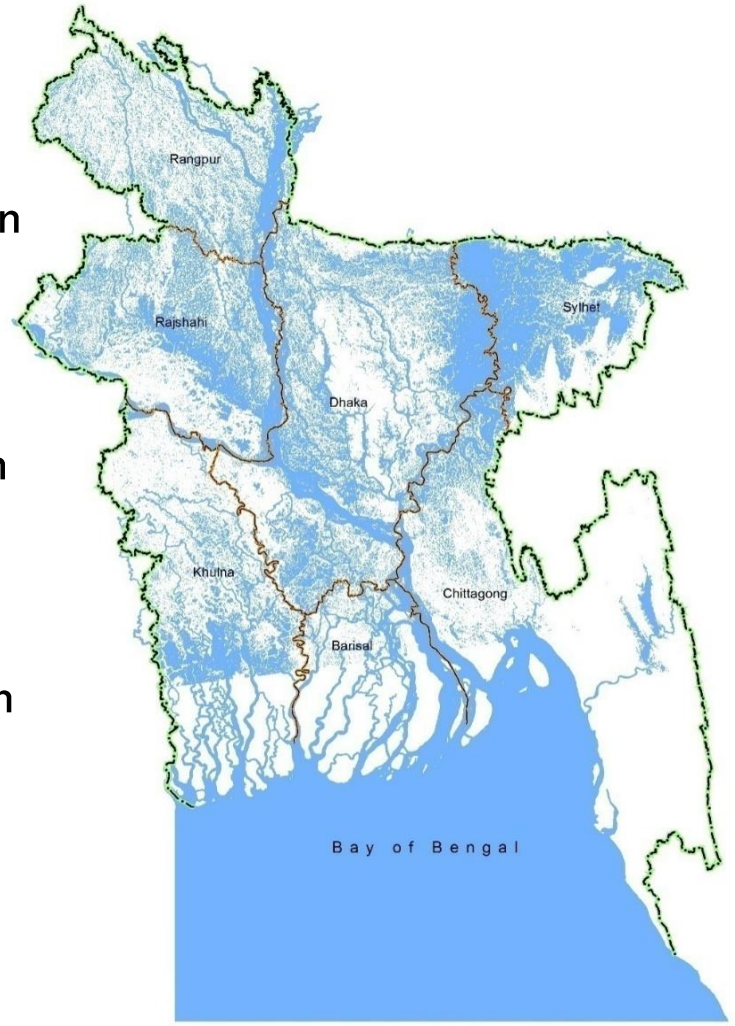
- Inundation 61%
- Estimated damage US$ 1.2 billion
- Death toll 6,500

1998

- Inundation 69%
- Estimated damage US$ 2.8 billion
- Death toll 1,100

2004

- Inundation 38%
- Estimated damage US$2.0 billion
- Death toll 700



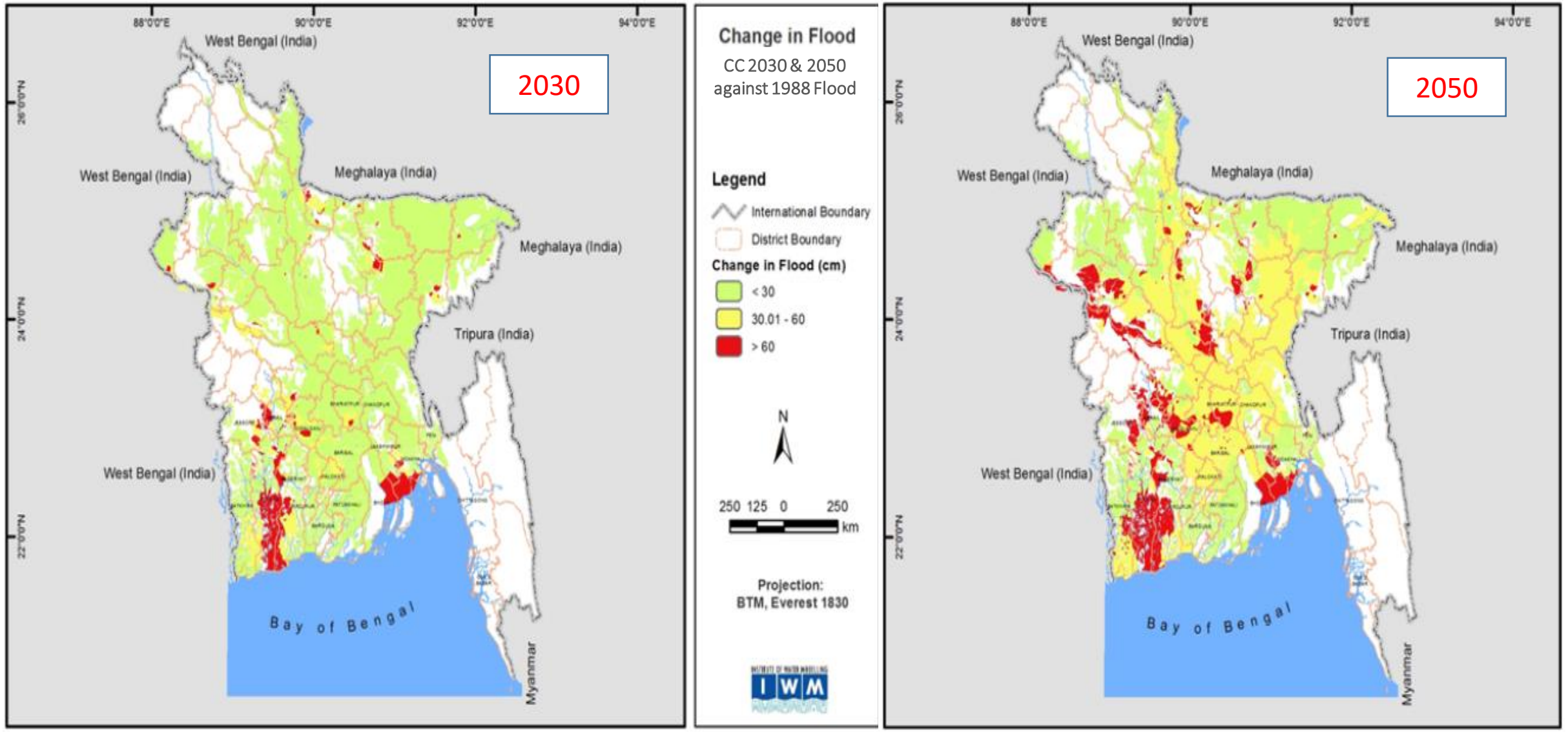


Figure: Increase in depth of flooding for the 1988 flood due to the additional impacts of projected 2030 & 2050 climate change.

River Bank Erosion & Consequences

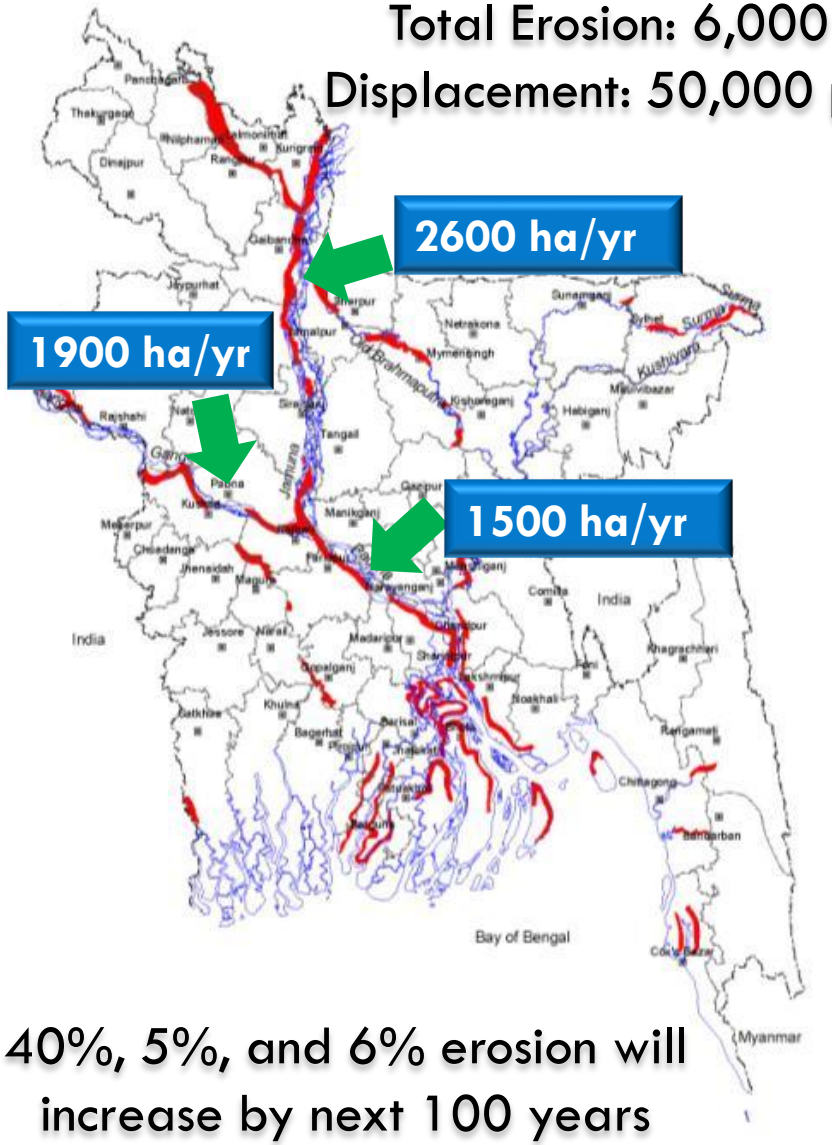
Land Loss

Infrastructural Damage

Loss of Assets

Total Erosion: 6,000 ha/ yr

Displacement: 50,000 person/yr



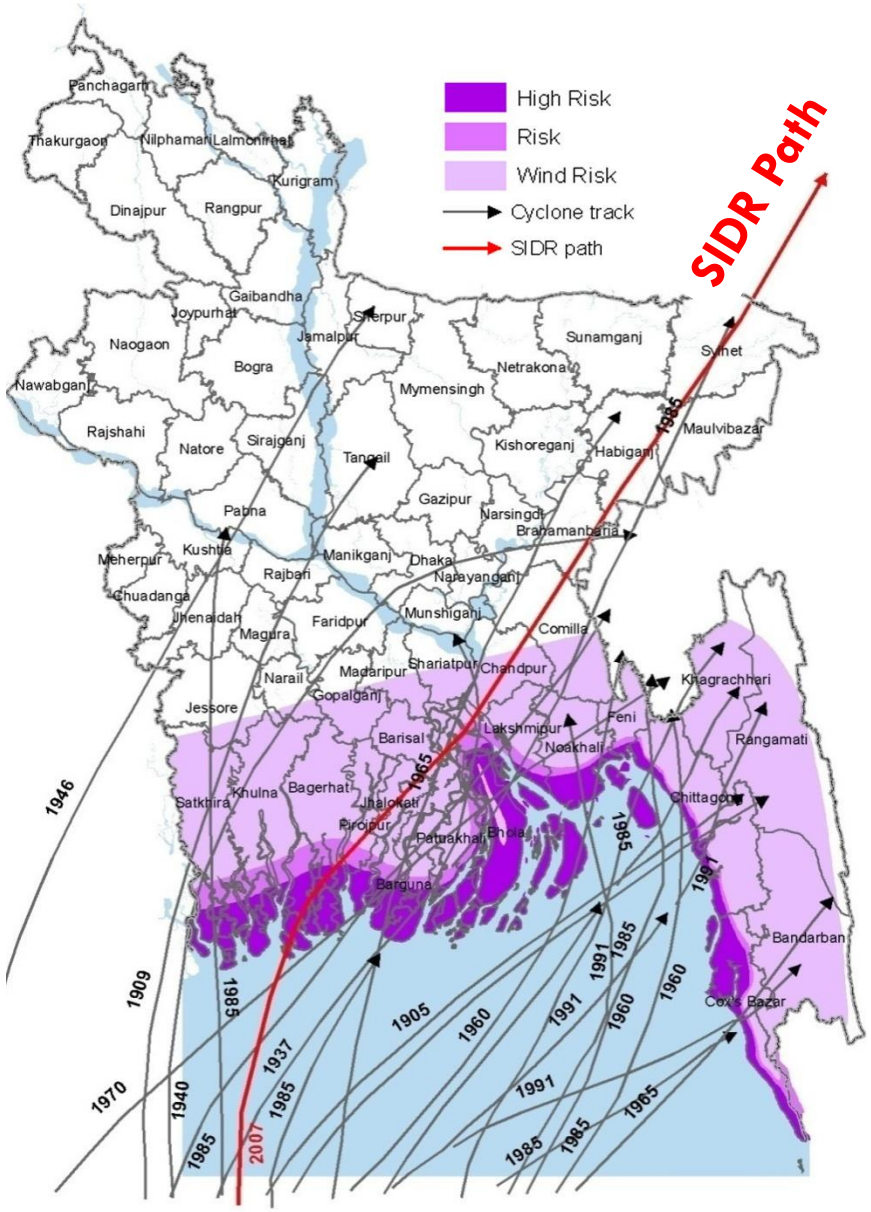
40%, 5%, and 6% erosion will increase by next 100 years

Low Production

Household Loss

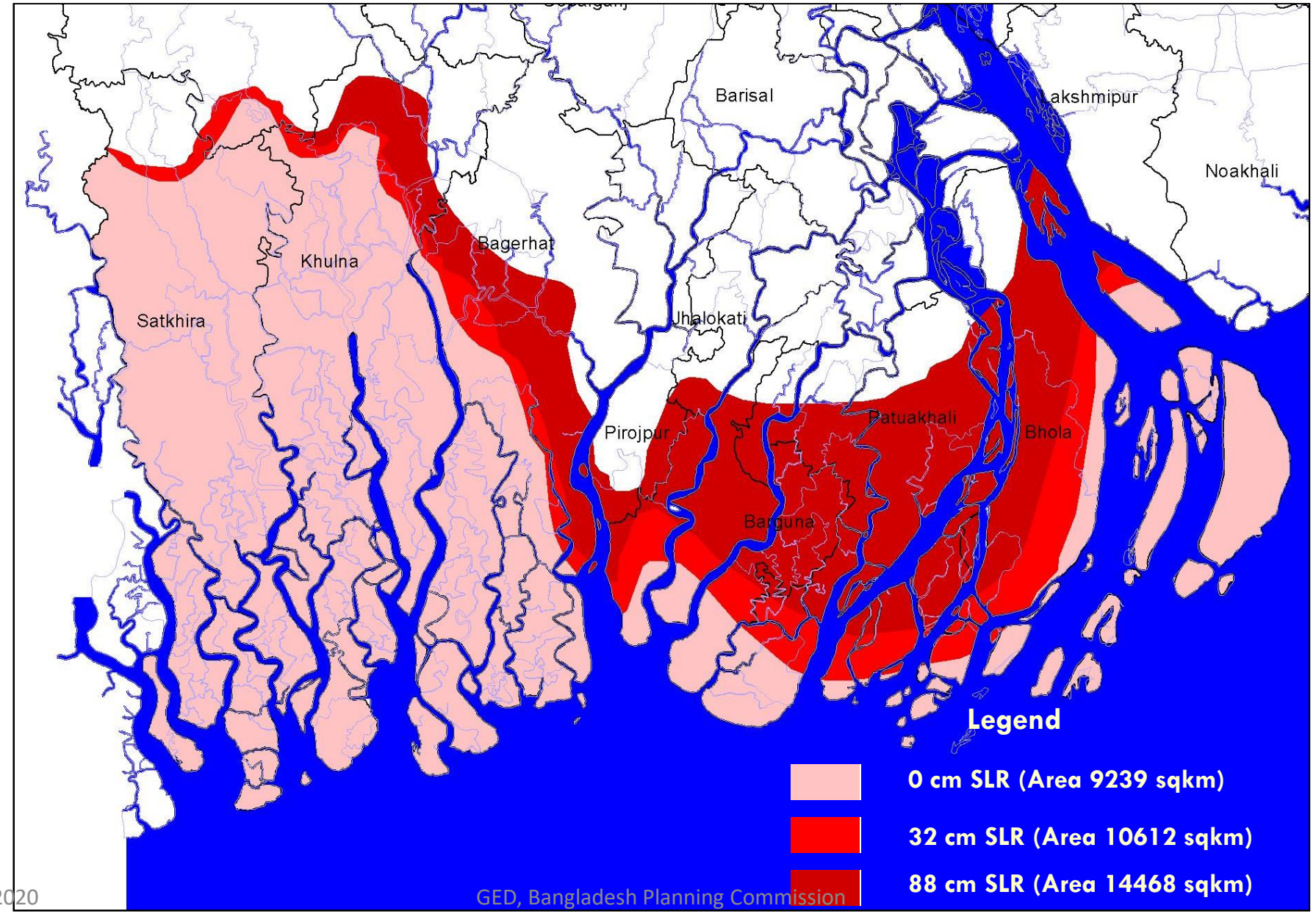
Displacement

CC Impact on Cyclone and Storm Surge



- Increasing intensity of Cyclones due to Climate Change (10 cyclones in last 30 yrs; 11 Cyclones in 100 yrs from 1876-1977)
- Areas vulnerable to inundation more than 1m and 3m, would be 14% and 69%
- 10-year-return period cyclone will be more intense covering 43% of the vulnerable area, 17% more than current coverage
- Coastal embankments, afforestation, evacuation through 10000+ volunteers, warning dissemination etc. are using for cyclone and storm surge management

Increasing Salinity with Sea Level Rise



Other Challenges

- Ground Water Depletion
- Arsenic Contamination
- Industrial Effluent
- Flood Plain Connectivity and Degradation of Wetland Ecosystem

Water Management Strategies

Two Types of Strategies for Water Resources Management:

- **National Strategies**
  - i) The Flood Risk Management Strategy;
  - ii) The Fresh Water Strategy
- **Hotspot Wise Strategies**

Flood Risk Management Strategy

❑ Principles For Flood Risk (FR) Management

- ➢ Supporting the economic development, without endangering the environment;
- ➢ Creating a climate-proof Bangladesh, making optimal use if its natural conditions; and
- ➢ Leaving no one behind, building on resilience.

❑ Strategies For Flood Risk (FR) Management

FR1: Protecting Economic Strongholds and Critical Infrastructure

FR2: Equipping the FCD Schemes for the Future

FR 3: Safeguarding Livelihoods of Vulnerable Communities

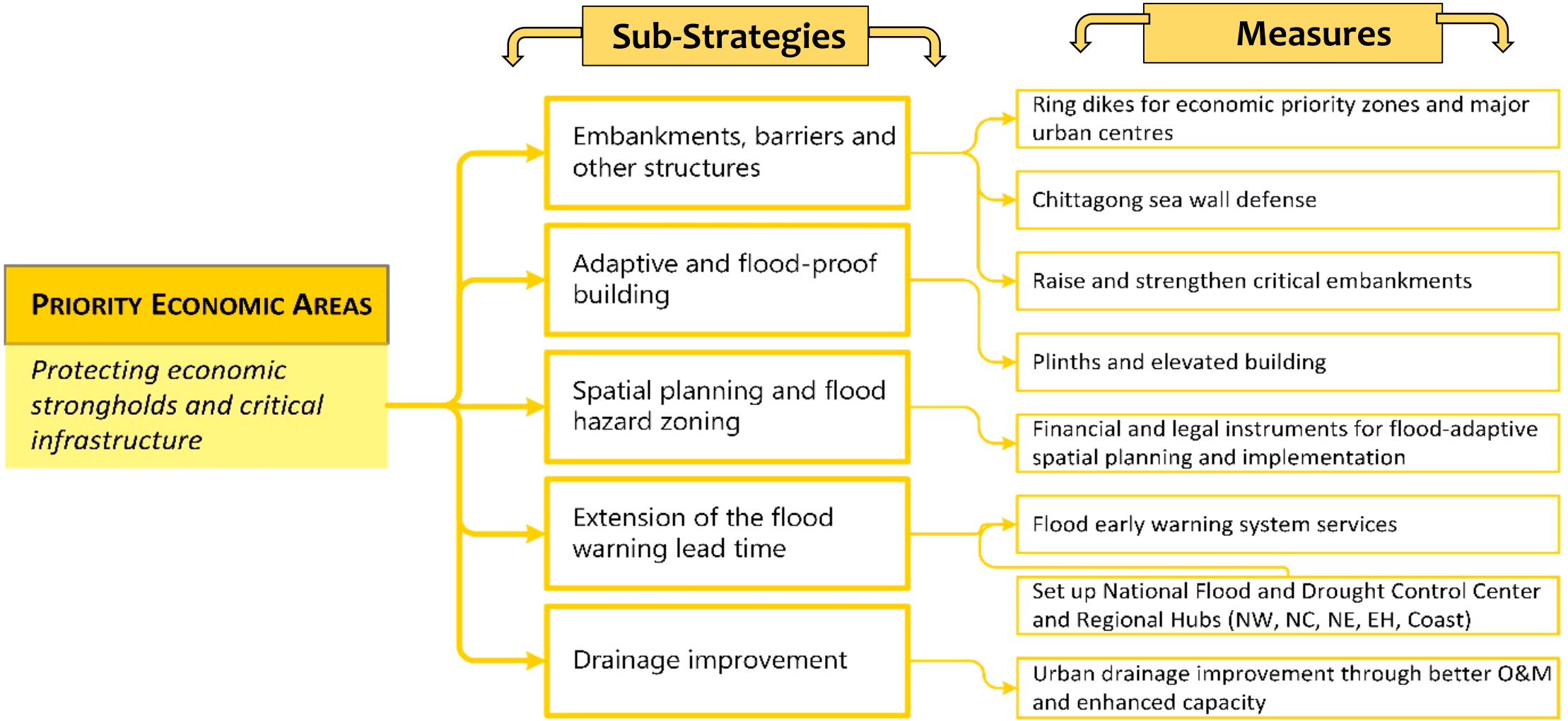
Flood Risk Management Strategy

FR1: Protecting Economic Strongholds and Critical Infrastructure

- ✓ Indicative Flood Protection Levels :
  - ➢ 1/100 and 1/250 up to 2030;
  - ➢ 1/250 - 1/1000 up to 2050, and
  - ➢ 1/1000 - 1/2500 by 2100;

- ❑ **Sub-Strategies**
  - *i. Develop and improve embankments, barriers and water control structures*
  - *ii. Construct adaptive and flood-storm-surge proof building*
  - *iii. Adopt spatial planning and flood hazard zoning*
  - *iv. Extension of the flood warning lead time.*
  - *v. Improvement of Drainage*

Flood Risk Management Strategy



Strategy FR 1: Protecting Economic Strongholds and Critical Infrastructure

Flood Risk Management Strategy

FR2: Equipping FCD Schemes for the Future

- ✓ **Diversified FCD schemes**, with high value infrastructure, industry and high value agriculture:
  - 1/100 up to 2030,
  - 1/250 up to 2050; and
  - 1/1000 by 2100
- ✓ **Agriculture based FCD schemes:**
  - Current 1/10 and 1/25

❑ Sub-Strategies

i. Drainage improvement

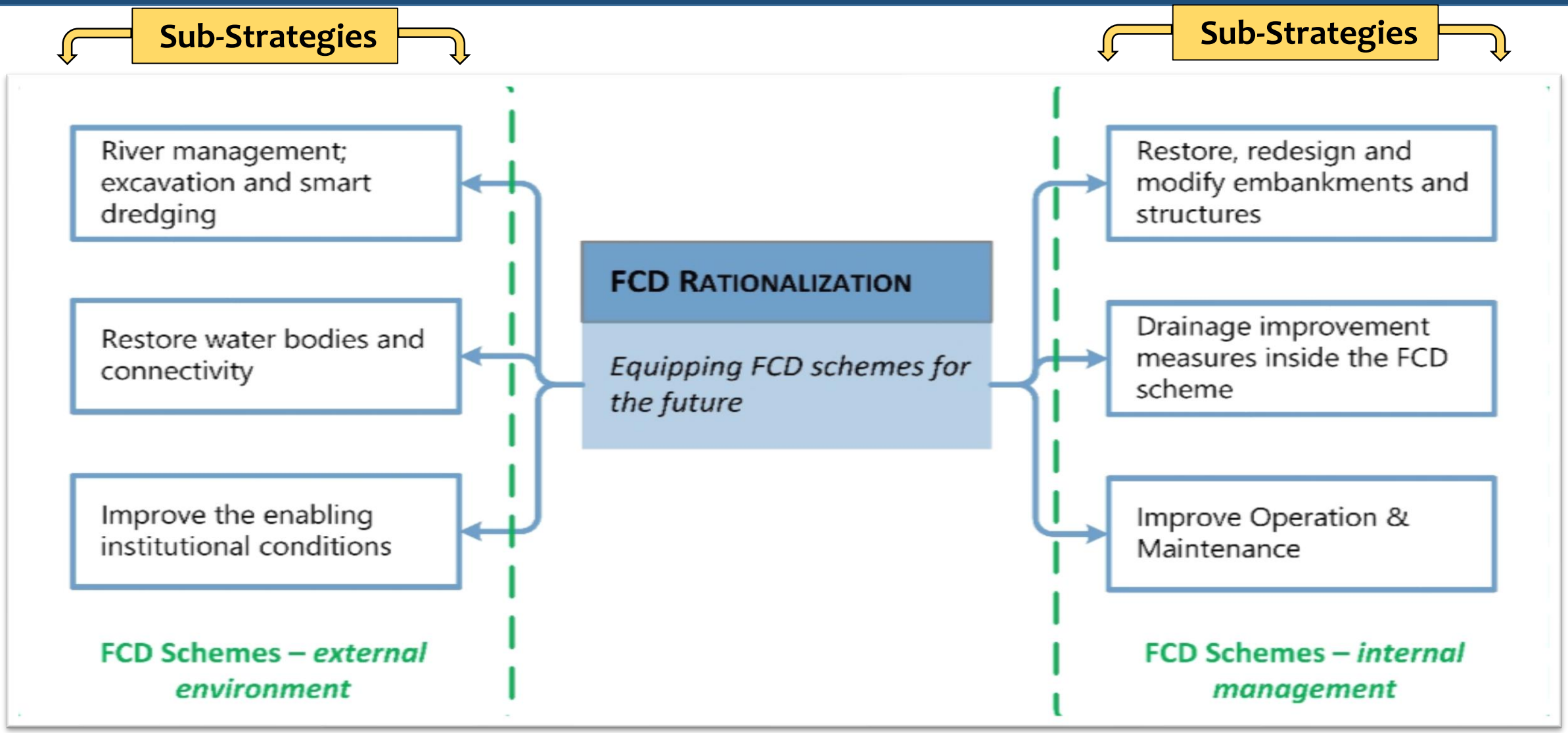
ii. Restoration, redesign and modification of embankments and structures

iii. Restoration of water bodies and connectivity

iv. Improve operation & maintenance

v. River management, excavation and smart dredging

Flood Risk Management Strategy



Strategy FR 2: Equipping FCD Schemes for the Future

FR3: Safeguarding Livelihoods of Vulnerable Communities

- **Sub-Strategies**

  i. Extension of early warning services into the communities

  ii. Extension and improvement of cyclone shelters

  iii. Flood and storm surge proofing of housing and critical services

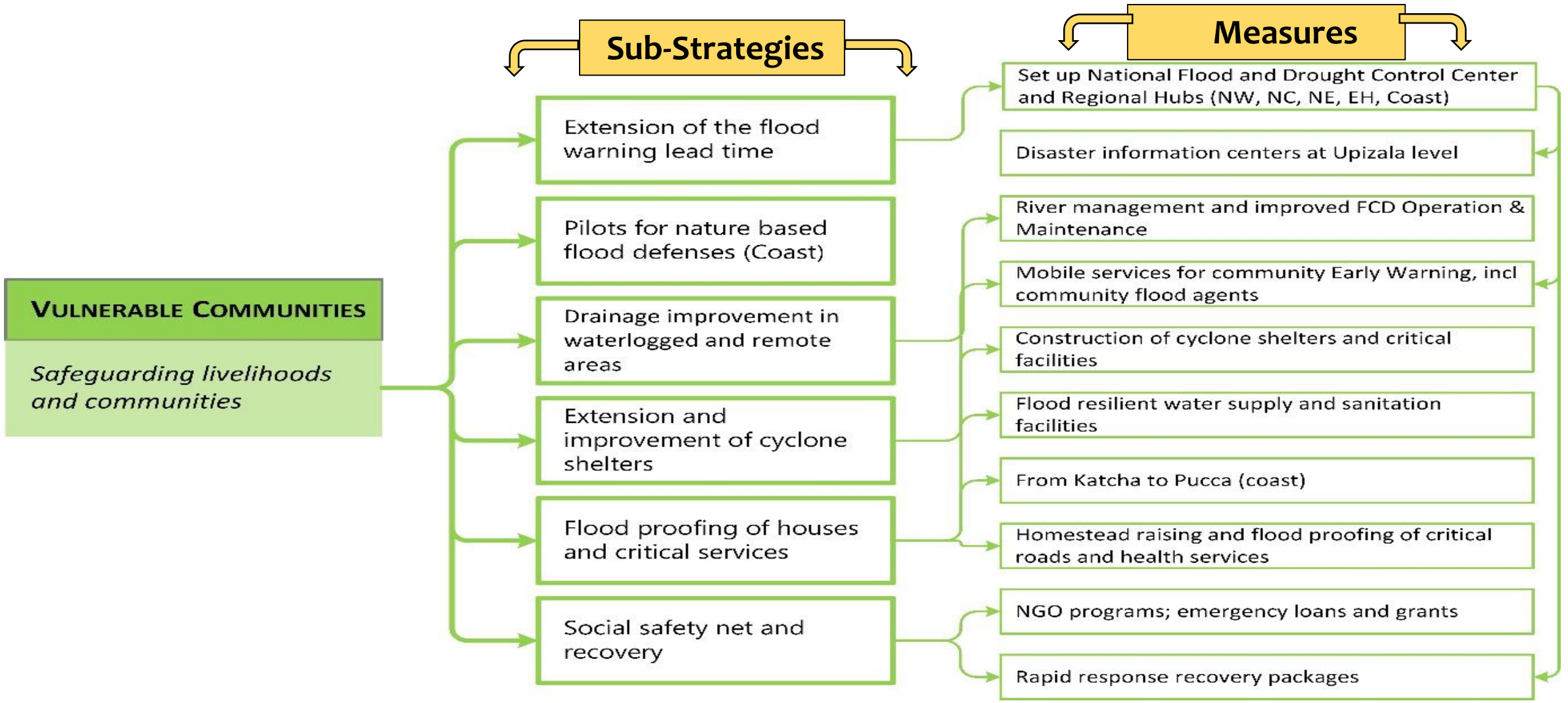
  iv. Social safety net and recovery

  v. Pilots for nature based flood defenses

  vi. Improving drainage

  vii. Protection of Chars and its population along with alternative livelihoods

Flood Risk Management Strategy



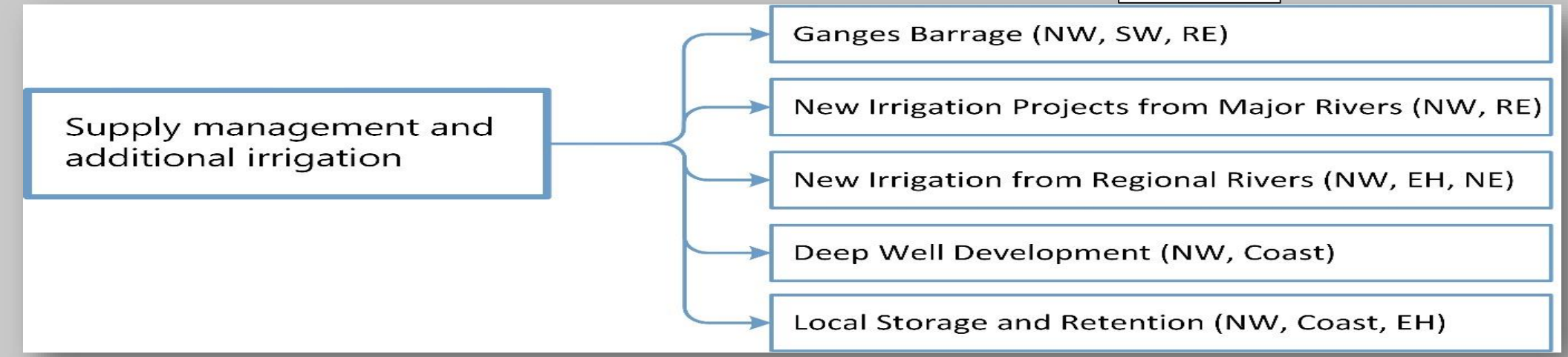
Strategy FR 3: Safeguarding Livelihoods of Vulnerable Communities

The Fresh Water Strategy

- **Strategy FW 1:** Ensure Water Availability by Balancing Supply and Demand for Sustainable and Inclusive Growth
- **Strategy FW 2:** Maintaining Water Quality for Health, Livelihoods and Ecosystems

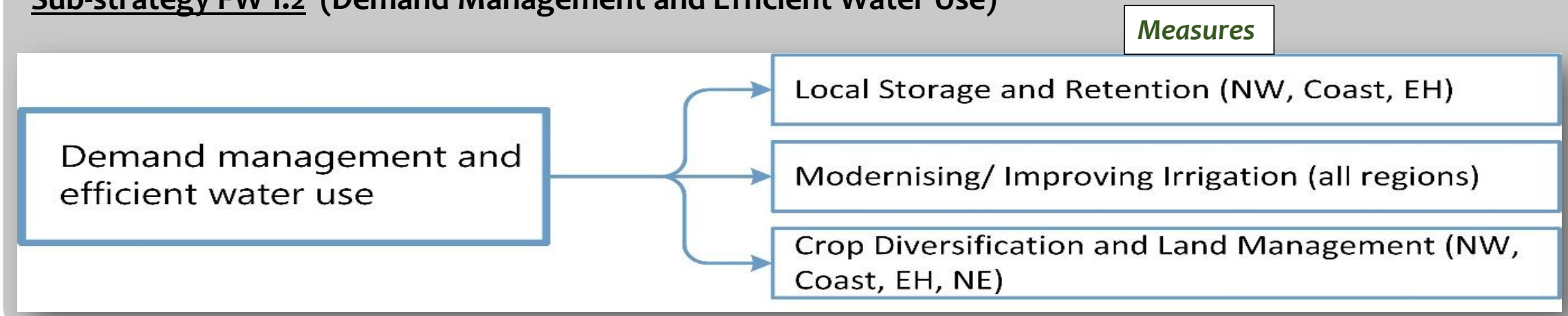
Sub-Strategies

Sub-strategy FW 1.1 (Supply Management and Additional Irrigation)

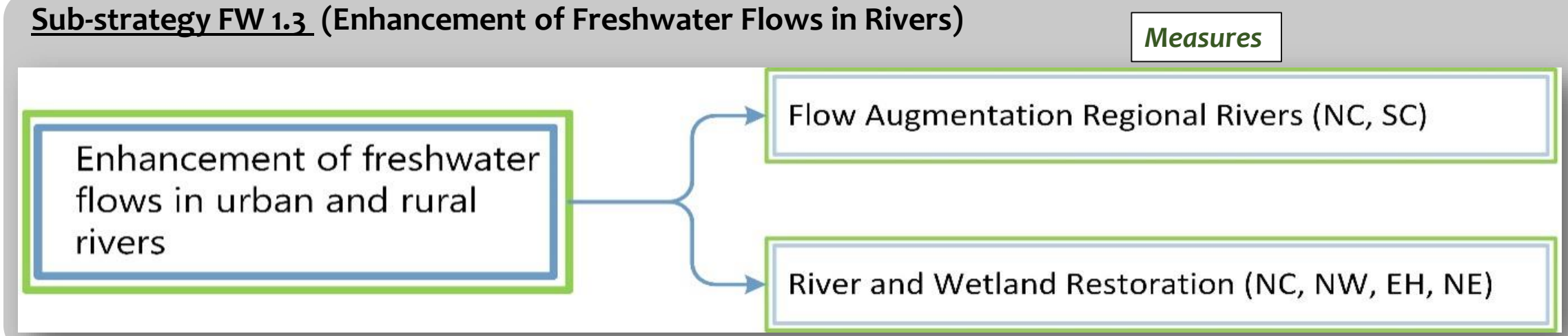


The Fresh Water Strategy (Sub-Strategies of FW 1)

Sub-strategy FW 1.2 (Demand Management and Efficient Water Use)

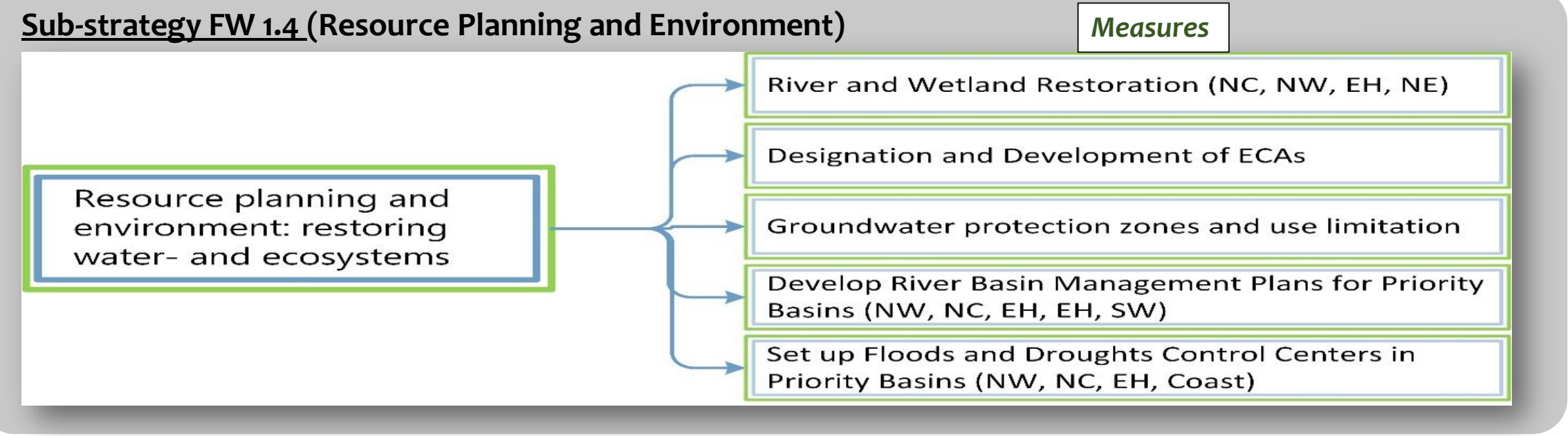


Sub-strategy FW 1.3 (Enhancement of Freshwater Flows in Rivers)



The Fresh Water Strategy (Sub-Strategies of FW 1)

Sub-strategy FW 1.4 (Resource Planning and Environment)

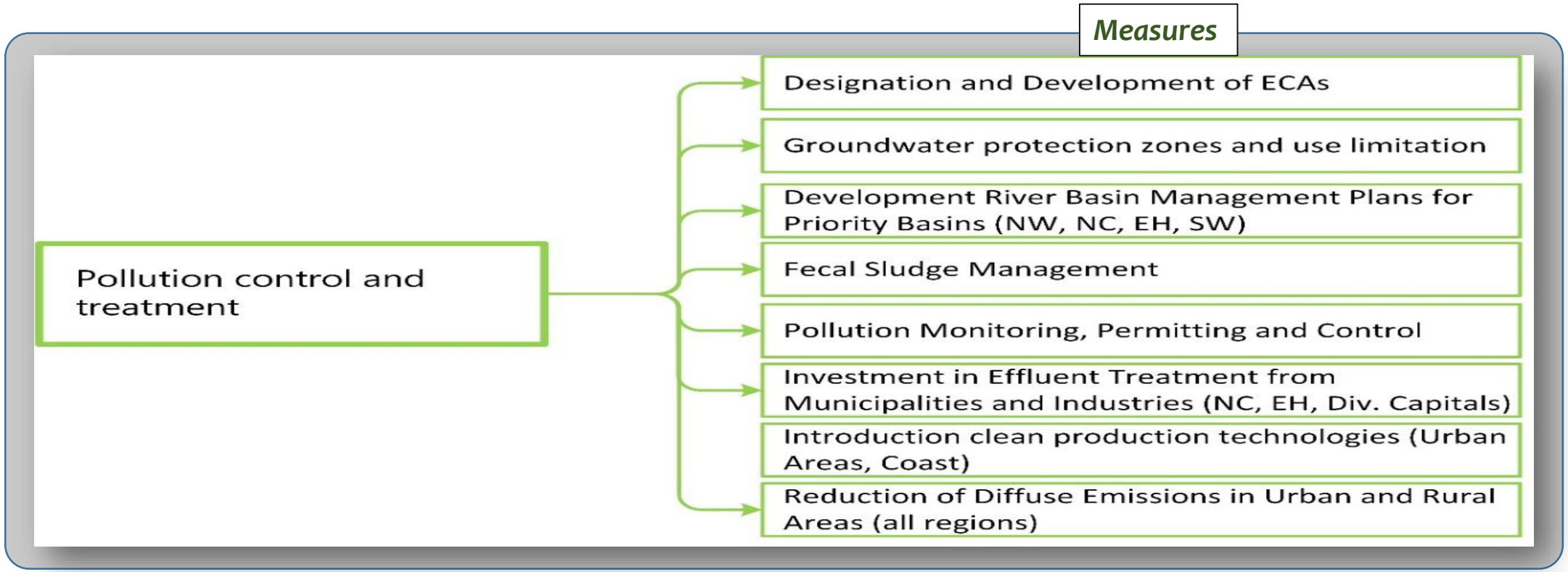


Sub-strategy FW 1.5 (Ensuring Safe water to sustainable drinking water and sanitation)

- Encourage rain water harvesting wherever possible
- Promote increasing storage in existing water retention bodies

The Fresh Water Strategy (Sub-Strategies of FW 2)

- **Sub-Strategies for FW2:**
  i. Pollution control and treatment



Here,

ECAs: Ecologically Critical Areas

Sub-strategy FW 2.1 (Pollution Control and Treatment)

Hotspot Wise Strategies

- **Six Hotspot Areas:**
  - ✓ Coastal Zone (27,738 sq. km);
  - ✓ Barind and Drought Prone Areas (22,848 sq. Km);
  - ✓ Haor- and Flash Flood Areas (16,574 sq. km);
  - ✓ Chattogram Hill Tracts (13,295 sq. km);
  - ✓ River System and Estuaries (35,204 sq. km); and
  - ✓ Urban Areas (19,823 sq. km).

Coastal Zone
(27,738 sq. km)

Key Vulnerabilities of the Coastal Zone Hotspots

Table 1.10: Key vulnerabilities of the Coastal Zone Hotspots

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Tidal fluctuation	ranges from approximately 1.5 m in the west to over 4 m in the east and up to 8 m at spring tide near Sandwip	Tidal height expected to increase with ASLR	Will affect at least 50% of coastal zone and increased salinity and destruction of polder embankments.
2.Accelerated Sea Level Rise (ASLR)	2.0 mm/year sea level rise.	1 m or more by 2100; likely to cause significant changes in river salinity in the southwest coastal zone of Bangladesh during the dry season (October to May) by 2050	Inundation of between 17-21% of total area; significant shortages of drinking water in the coastal urban areas, scarcity of water for irrigation for dry-season agriculture and significant changes in the coastal aquatic ecosystems; loss of farmland; loss of livelihoods; out-migration; destruction of infrastructure; change in mangrove pattern; will affect fish habitat and productive freshwater fisheries.

(to be continued)

Key Vulnerabilities of the Coastal Zone Hotspots

(continued)

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
3. Salinity intrusion with sea level rise	Out of 2.86 million ha of coastal and offshore lands about 1.0 million ha (SRDI 2000) of arable lands are affected by varying degrees of salinity.	salinity intrusion increase with SLR of 52 cm in 2050	7,000-8,400 km^2 likely to be affected; Loss of freshwater zones in Bagerhat, Barguna, Barishal, Bhola; salinity will affect 2.9 to 5.2 million people
4. Cyclones	Number of cyclones decreasing but intensity increasing	Increased intensity of cyclones with high wind speeds up to and over 250 km per hour	Devastating effects on homesteads, crops, livestock; salt water intrusion; water logging.
5. Storm surge	Current storm surge heights are topping over polder embankments (Sidr and Aila cyclones); estimated cost of damage of Sidr alone was at US$ 1.7 billion (World Bank, 2010).	Future storm surge heights will increase due to higher wind speeds.	All current polders will be flooded with prolonged water logging; damages to infrastructure, agriculture and aquaculture.

Note: BAU Scenario (i.e. no concerted adaptation or mitigation investments)

Source: BDP 2100 Technical Team Analysis, GED, 2015

Coastal Zone Strategy

Strategy CZ 1: Increase drainage capacity and reduce flood risk at coastal zone.

Strategy CZ 2: Balancing water supply and demand for sustainable growth

Strategy CZ 3: Reclaim New Land in the Coastal Zone

Sub-Strategies

- **Strategy CZ 1: Increase Drainage Capacity and Reduce Flood Risk at Coastal Zone.**
  - **Sub-Strategies**
    i. Diminish Drainage Congestion
    ii. Flood Risk Protection
    iii. Flood Risk Prevention
    iv. Flood Risk Preparedness

Coastal Zone Strategy

➢ Strategy CZ 2: Balancing Water Supply and Demand for Sustainable Growth

❑ Sub-Strategies

i. Supply management and additional irrigation

ii. Demand management and efficient water use

iii. Resource planning, protection of environment;

iv. Safe and reliable waterway transport

v. Restoration of rivers for fresh water supply including river basin management for cross boundary rivers

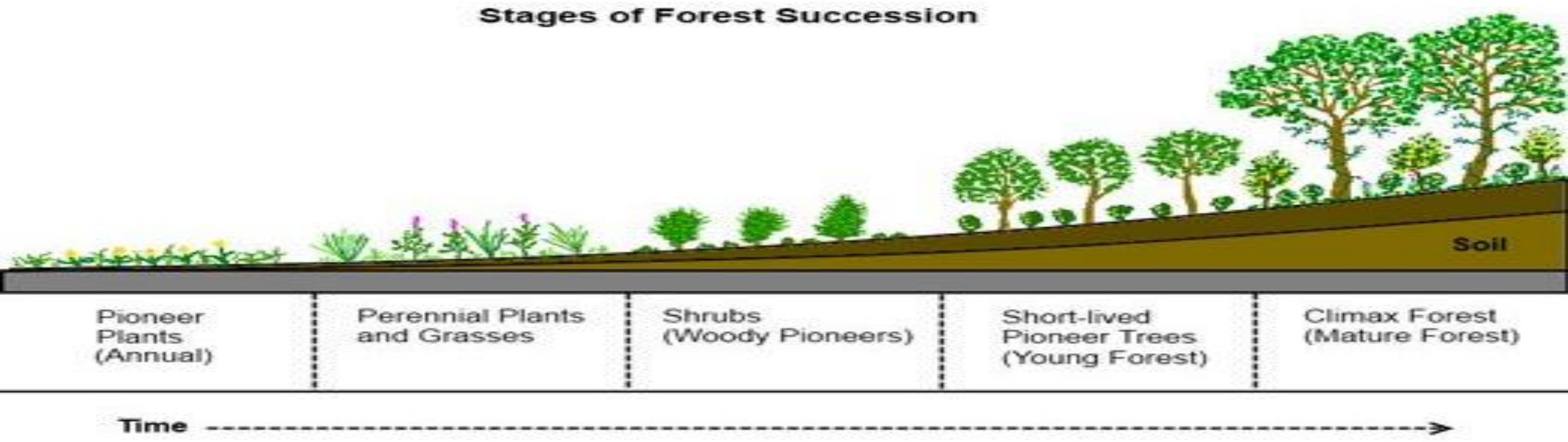
➢ Strategy CZ 3: Reclaim New Land in the Coastal Zone

❑ Sub-Strategies

i. Conduct research on morphological behavior of the Meghna estuary to assess the effect and potential of land reclamation

ii. Accelerate land reclamation process in the Meghna Estuary

Strategy for the Sundarbans



➢ Strategies for the Sundarbans

Strategy 1: Planting in All The Layers of a Forest at The Same Time

Strategy 2: Not Being Competitive Against Nature Rather Being Collaborative

Strategy 3: Maintenance of Perennial Tidal Flow

Barind and Drought Prone Areas (22,848 sq. Km)

Key Vulnerabilities of the Barind and Drought Prone Areas Hotspot

Table 1.11: Key Vulnerabilities of the Barind and Drought Prone Areas Hotspot

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Temperatures	Increase in minimum temperatures by 0.85 °C between 1948 – 2011; maximum temperatures increased by 0.5 °C	Increases in temperatures of up to 2.0 °C or more	Reduced crops and livestockproduction; increase in disease and pest infestation; extinction of some flora and fauna.
2. Dry periods / drought	Long period of consecutive dry days	Increase in number of dry days and drought	Further reduction in groundwater table; water scarcity for irrigation and household consumption; up to 39 million people could be affected; land use pattern, plant species composition in the Barind ecosystem may change and also increase in top soil erosion

(to be continued)

Key Vulnerabilities of the Barind and Drought Prone Areas Hotspot

(continued)

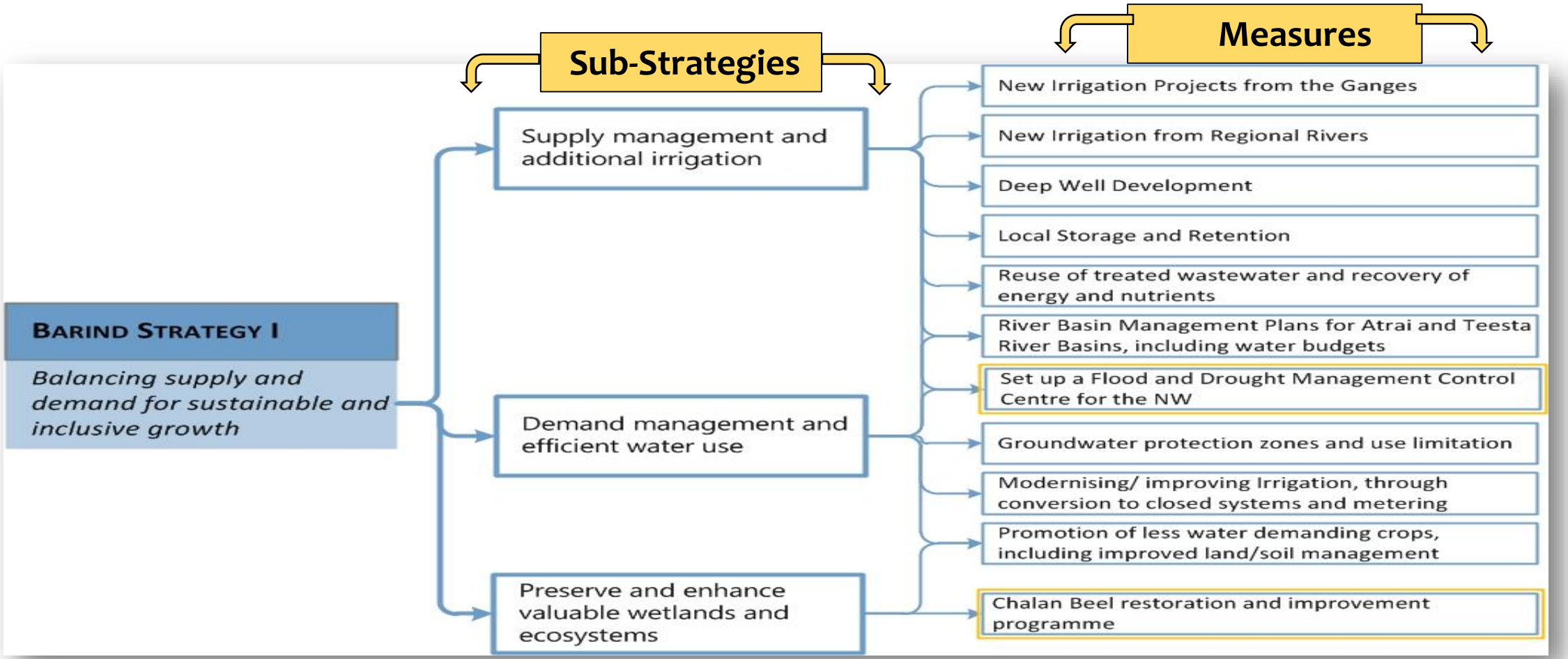
Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
3. Reduced groundwater levels	Uncontrolled abstraction of groundwater for irrigation and consumption	Falling groundwater tables; poor re-charging of groundwater due to prolonged dry spells and drought	Crop failures, reduced agricultural output; water scarcity; increase in water, sanitation and hygiene problems and related diseases
4. Reduced wetlands	Number of water bodies, their area and water holding capacity reducing	Low water holding capacity, reduction in ecosystem goods and services	Reduce water availability for domestic and irrigation purpose, rise in temperature due to low evapo-transpiration, affect food security and nutrition, disease and pests outbreak, land degradation and loss of biodiversity.

Source: BDP 2100 Technical Team Analysis, GED, 2015

Barind and Drought Prone Areas Strategy

Barind and Drought Prone (DP) Areas Hotspot strategy consists of the following Four related but independent strategies:

- **Strategy Barind (DP) 1:** Balancing Supply and Demand for Sustainable and Inclusive Growth



Strategy Barind (DP) 1 : Balancing Supply and Demand for Sustainable and Inclusive Growth

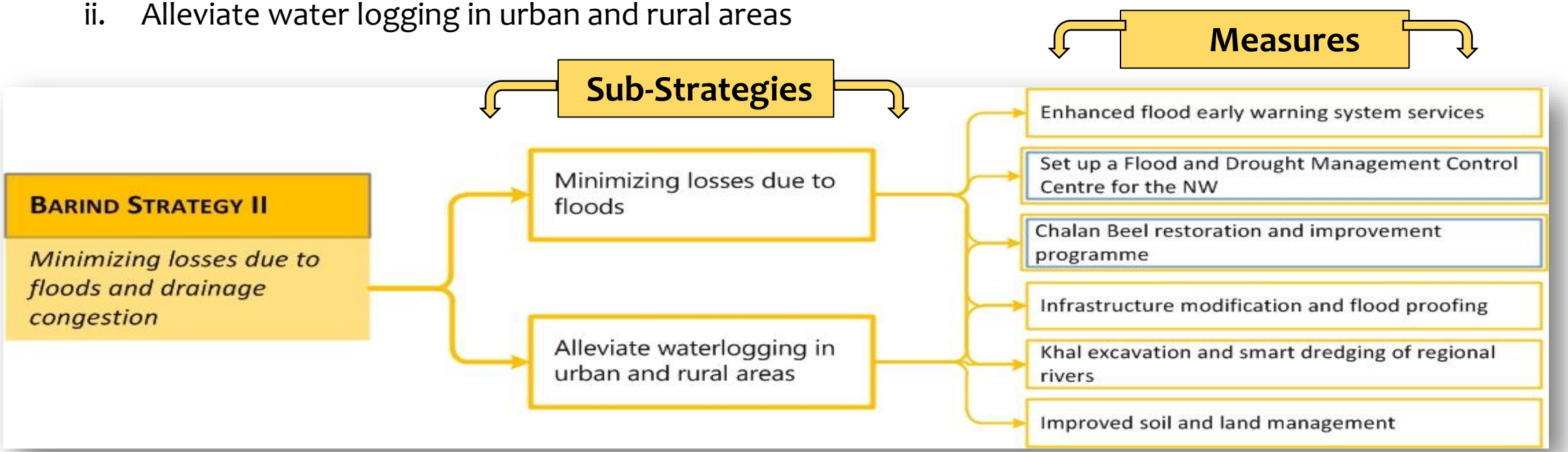
Barind and Drought Prone Areas Strategy

➢ **Strategy Barind (DP) 2 : Minimising losses due to floods and drainage congestion**

❑ **Sub-Strategies**

i. Minimizing losses due to floods

ii. Alleviate water logging in urban and rural areas



➢ **Strategy Barind (DP) 3:** Ensuring water supply and sanitation.

➢ **Strategy Barind (DP) 4:** Management of cross-boundary water issues including river basin developments.

Haor- and Flash Flood Areas (16,574 sq. km)

Key Vulnerabilities of the Haor and Flash Flood Areas Hotspot

Table 1.12: Key Vulnerabilities of the Haor and Flash Flood Areas Hotspot

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Precipitation	Highest rainfall in Sylhet Basin due to its proximity to Cherapungi, India, highest rainfall are in the world	Increase between 300mm in southeast to 800mm in northwest with increase in intensity	Increases in mean annual discharge rivers; may cause flash floods, extensive area under flooding, damage to infrastructure, destruction of crops
2. Subsidence and decreased sediment supply	Tectonically active and subject to gradual subsidence and westward avulsion of Brahmaputra (Assam earthquake 1950)	Further subsidence and river avulsion due to seismically active area (high magnitude earthquake probable)	Vital source for fisheries, irrigation water, ecosystem functioning and navigation may be disturbed affecting 1.9 million ha of the hotspot
3. Land filling, encroachment, land use change	Shrinkage in wetlands (area and volume); 40% out of 260 species of freshwater fish threatened with extinction (IUCN)	Continuing land filling, encroachment, land use change	Reduced flood holding areas; reduced re-charging of groundwater; loss of crucial habitat and breeding grounds, and livelihoods of poor

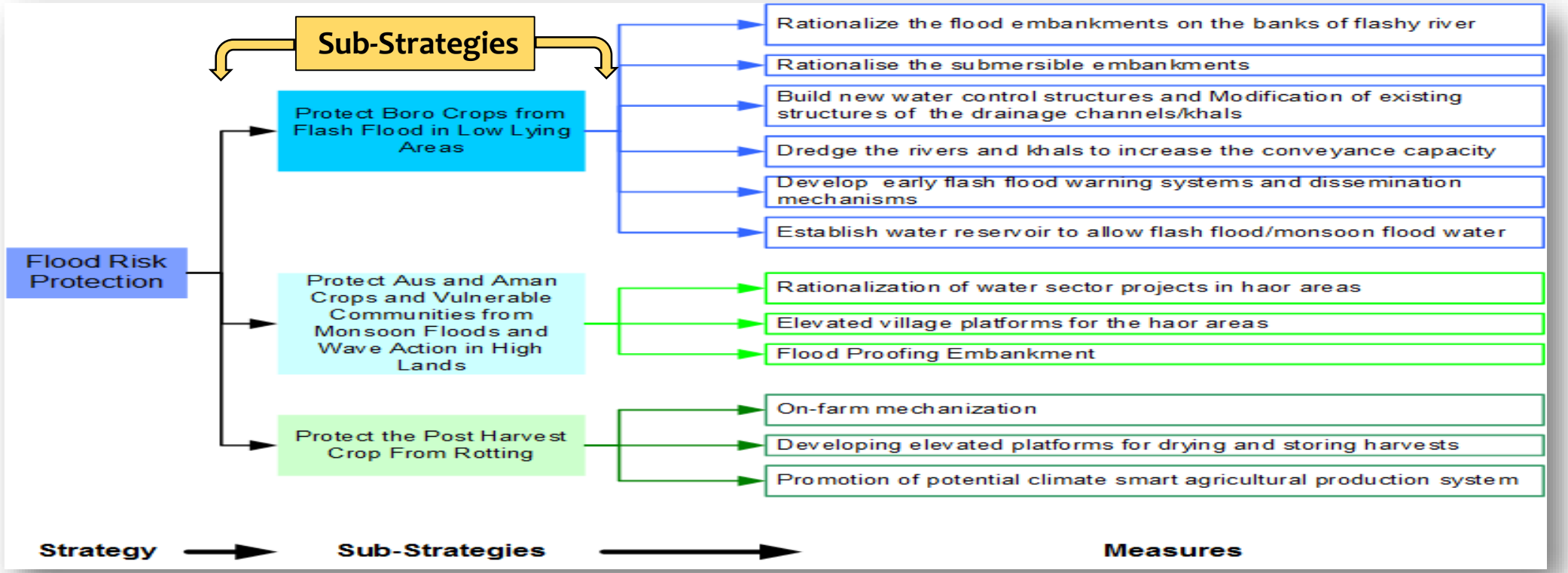
Source: BDP 2100 Technical Team Analysis, GED 2015

Strategies for Haor and Flash Flood Areas

Strategy HR 1: Protect agriculture and vulnerable communities from flood

Sub-Strategies

HR 1.1: Protect Boro Crops from Flash Flood in Low Lying Areas
HR 1.2: Protect Aus and Aman Crops from Monsoon Floods in High Lands
HR 1.3: Protect the Post-Harvest Crop from Rotting



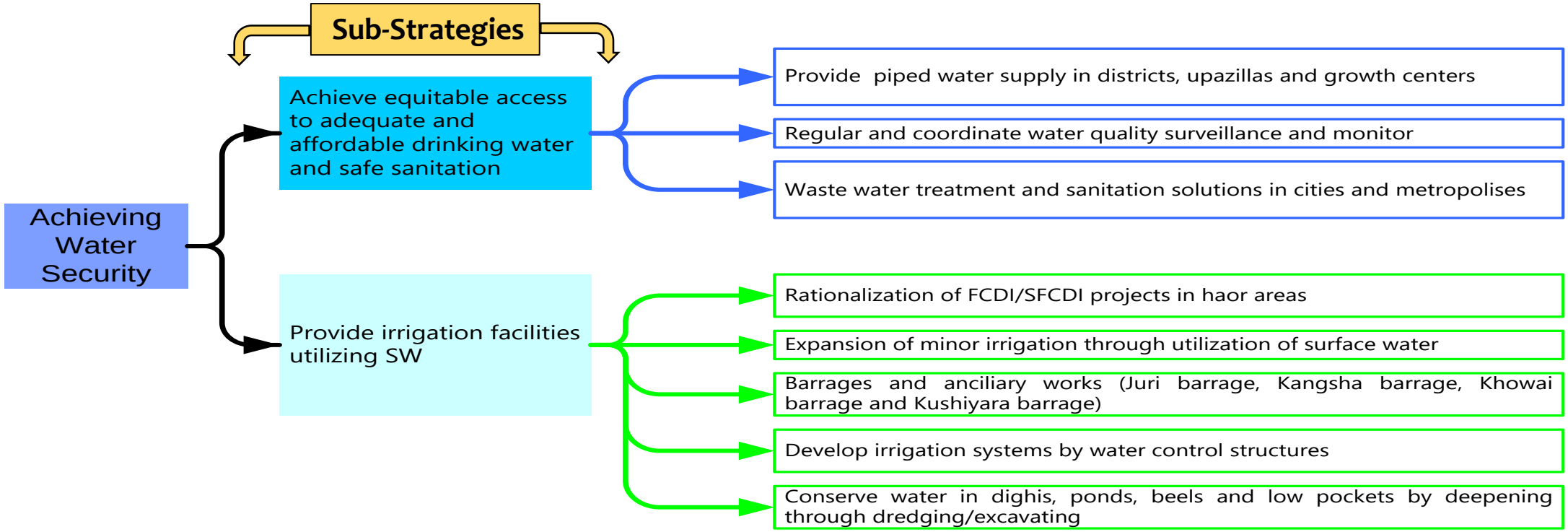
Strategies for Haor and Flash Flood Areas

Strategy HR 2: Achieving Water Security

Sub-Strategies

HR 2.1: Achieve equitable access to adequate and affordable drinking water and safe sanitation.

HR 2.2: Providing irrigation facilities utilizing surface water



Strategy → **Sub-Strategies** → **Measures**

Strategies for Haor and Flash Flood Areas

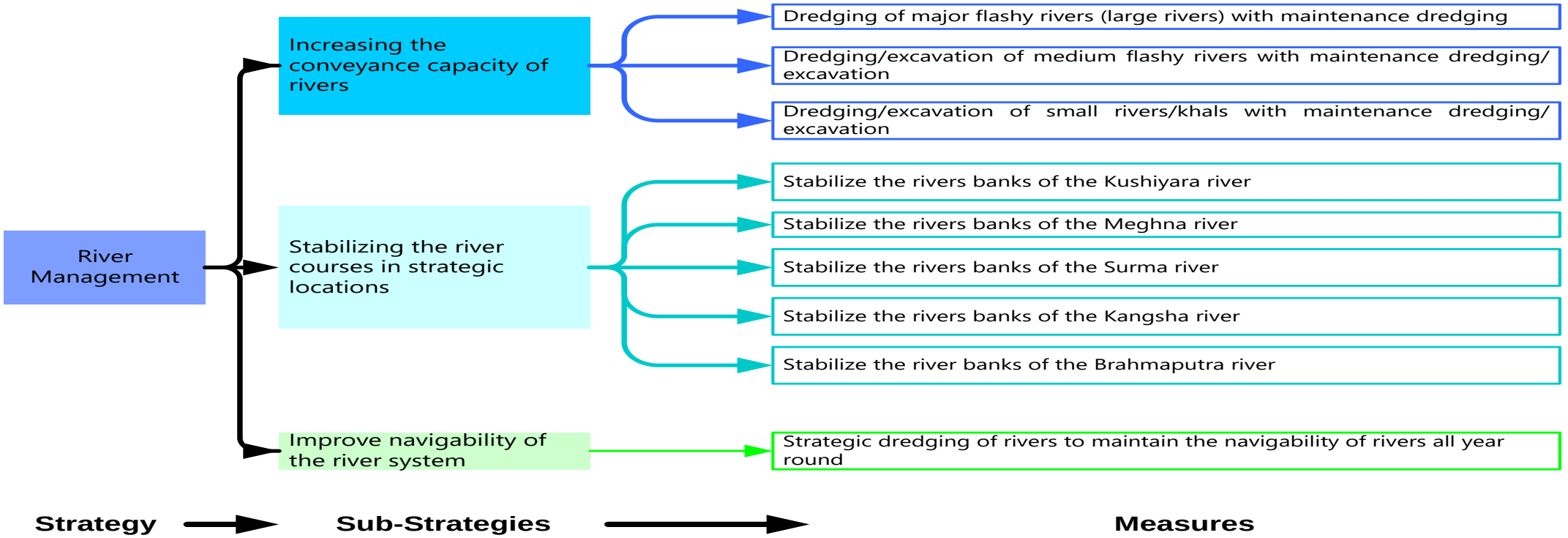
Strategy HR 3: River Management

Sub-Strategies

HR 3.1: Increasing the conveyance capacity of rivers

HR 3.2: Stabilizing the river courses in strategic locations for protecting urban and rural areas

HR 3.3: Maintaining navigability of the medium and minor rivers



Strategies for Haor and Flash Flood Areas

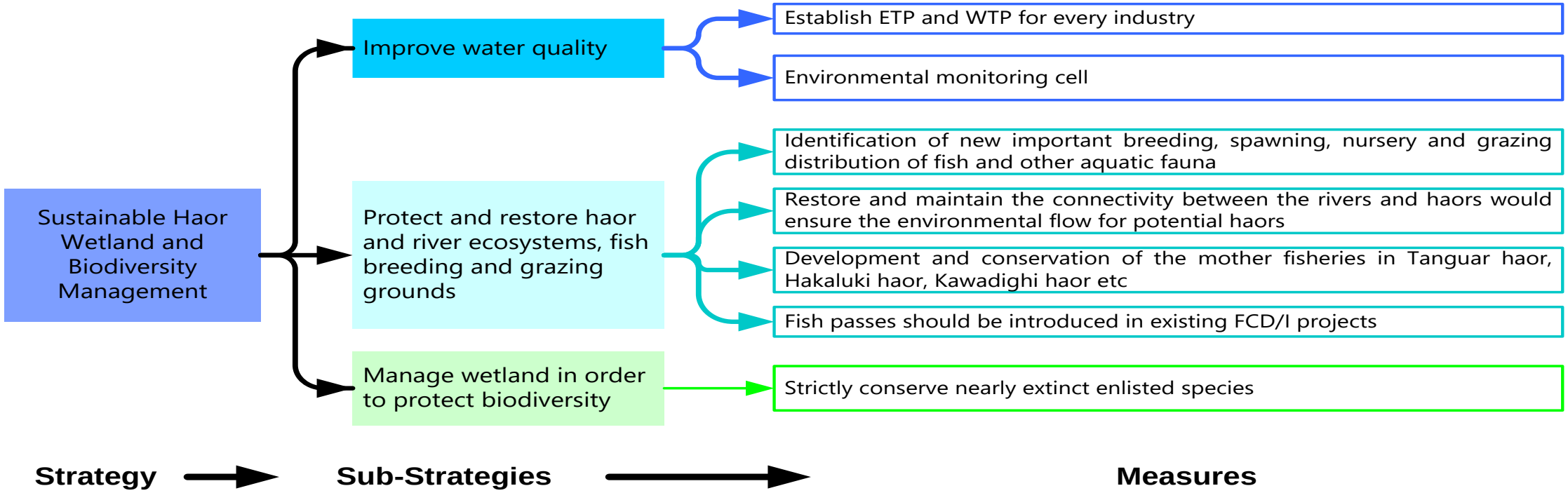
Strategy HR 4: Sustainable Haor Ecosystem and Biodiversity Management

Sub-Strategies

HR 4.1: Improve water quality

HR 4.2: Protect and restore haor and river ecosystems, fish breeding and grazing grounds

HR 4.3: Manage wetland in order to protect biodiversity



Strategies for Haor and Flash Flood Areas

Strategy HR 5: Institutional Development

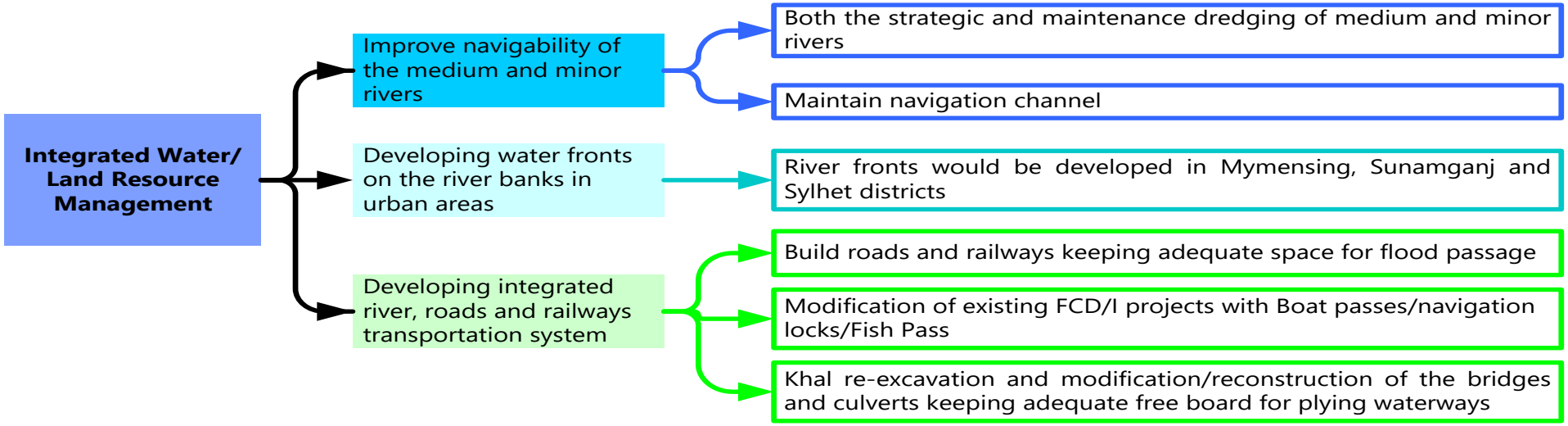
Sub-Strategies

HR 5.1: Increase Institutional Capacity
HR 5.2: Sectoral Coordination
HR 5.3: Resolve water issues of common/border rivers through regional cooperation
HR 5.4: Strengthen the community participation

Strategy HR 6: Integrated Water/Land Resource Management

Sub-Strategies

HR 6.1: Maintaining navigability of the medium and minor rivers
HR 6.2: Developing water fronts on the river banks in urban areas
HR 6.3: Developing integrated river, roads and railways transportation system



Chattogram Hill Tracts (13,295 sq. km)

Key Vulnerabilities of the Chattogram Hill Tracts Hotspot

Table 1.20: Key Vulnerabilities of the Chattogram Hill Tracts Hotspot

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Loss of forest and vegetation cover	Increased water runoff, soil erosion, and drying up of water springs and streams as a result of climate change	Increasing sedimentation of Karnaphuli river	Loss of fertile soils, farmland, crops, homesteads and livelihoods; longer treks in search of water (especially for women and children)
2. Flash floods in hilly terrain	Land degradation, deforestation, land use change.	Increasing soil erosion, sanding of rivers, bank erosion in coastal plains, flash floods, drainage problems	Flash floods, loss of life and crops, increased river sedimentation; river navigation increasingly difficult in the Eastern Hill Region

Strategies for Chattogram Hill Tracts

Strategy CH 1: Protect economic zones and towns from floods and storm surges

Sub-Strategies

CH 1.1: River flood risk management
CH 1.2: Cyclonic storm surge and tidal flood risk management

Strategy CH 2: Ensure water security and sustainable sanitation

Sub-Strategies

CH 2.1: Increase water use efficiency of all sectors and ensure sustainable water use
CH 2.2: Development of sustainable and safe water supply and sanitation system

Strategy CH 3: Ensure integrated river management

Sub-Strategies

CH 3.1: Integrated sediment and erosion management
CH 3.2: Integrated management of rivers and hilly streams

Strategy CH 4: Maintain Ecological Balance and Values (assets)

Sub-Strategies

CH 4.1: Protect and restore water related ecosystems, including forests and hill sides
CH 4.2: Promote wise-use of soils and water bodies for sustainable livelihoods

Strategies for Chattogram Hill Tracts

Strategy CH 5: Increase institutional capacity for integrated water resources management

Sub-Strategies

CH 5.1: Strengthen institutions and cooperation for integrated holistic watershed management
CH 5.2: Early warning, storm surge and flood risk preparedness

Strategy CH 6: Develop multi-purpose resources management system for sustainable growth

Sub-Strategies

CH 6.1: Development of safe, reliable and optimal use of land, water ways and energy
CH 6.2: Strengthen resilience of livelihoods and sustainable food production.

River System and Estuaries (35,204 sq. km)

Key vulnerabilities of the River Systems and Estuaries Hotspot

Table 1.19: Key vulnerabilities of the River Systems and Estuaries Hotspot

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Riverine erosion and accretion	By 2013, riverine erosion along the Ganges, the Jamuna, the Padma and the Lower Meghna recorded at 179,258 ha while accretion only 75,263 ha	With 13% increase in precipitation projected and annual discharge of rivers over the the Ganges- the Brahmaputra- the Meghna floodplains, riverine erosion could increase	Loss of farmland, crops, homesteads and livelihoods affecting thousands of hectares along major rivers; damage to infrastructure
2. Drought / dry periods and reduced riverine flows	Upstream reduction of flows on transboundary rivers; difficulty of navigation during dry season, high abstraction of groundwater; water scarcity for irrigation	Aggravation of current problems	Loss of agricultural production, water scarcity, disturbed navigation in the Northwest Region, reduced groundwater recharge
3. River avulsion, sedimentation off-take, subsidence	Maintaining navigation facilities, rivers becoming morphologically inactive, banks become erosion prone in wet season	Increasing detrimental effects	Reduced / blocked navigation, deterioration of water quality from discharged effluence and waste materials from industries in the North-Central Region; maintaining sediment balance in the Northeast Region will be difficult

(to be continued)

Key vulnerabilities of the River Systems and Estuaries Hotspot

(continued)

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
4. Tidal fluctuations and SLR	Lack of fresh water, salinity, groundwater arsenic and subsidence of polders	Loss of land from SLR, increase in salinity, loss of polders to storm surges, water logging, SLR	In the Southwest and South-Central increase in vulnerability and losses in agricultural production, possible negative health impacts from salinity, and out-migration due to loss of livelihoods
5. Flash floods in hill terrain and dry periods	Land degradation, deforestation, land use change, drying up of springs	Increasing soil erosion, sanding of rivers, bank erosion, flash floods, drainage problems	Increasing water scarcity in dry periods; flash floods, loss of life and crops, increased river sedimentation; river navigation increasingly difficult in the Eastern Hill Region

Source: BDP 2100 Technical Team Analysis, GED, 2015

Strategies for River Systems and Estuaries

Strategy RE 1: Provide adequate room for the river and infrastructure to reduce flood risk

Sub-strategies:

i. Reduce flood risk by construction of new embankments and repair, upgrade or maintenance of existing embankments

ii. Maintain discharge and drainage capacity of rivers, tributaries and branches by strategic dredging

iii. Improve flood resilience of properties and infrastructures

iv. Secure discharge and storage capacity by allowing space for the river and by avoiding or removing encroachments and by avoiding constriction by bridges.

v. Reduce extreme discharges

Strategy RE 2: Improvement of the conveyance capacity as well as stabilize the rivers

Sub-strategies:

i. River stabilization and channelization with use of combined river training works and river bank protection

ii. Controlled and accelerated stabilization of newly formed (char) lands and land reclamation

Strategies for River Systems and Estuaries

Strategy RE 3: Provide fresh water of sufficient quantity and quality

Sub-strategies:

i. Secure sufficient fresh water trans boundary inflow during the dry season

ii. Restore and maintain flow distribution (connectivity) from main rivers to branches and floodplains

iii. Optimise the distribution of fresh water by water retention and flow diversion

Strategy RE 4: Maintain ecological balance and values (assets) of the rivers

Sub-strategies:

i. Preservation of ecosystems

ii. Restoration and revitalization of ecosystems including wise use of resources

Strategy RE 5: Allow safe and reliable waterway transport in the river system

Sub-strategies:

i. Improve navigability of the river system

ii. Improve marine infrastructure facilities

Strategy RE 6: Strengthening river and estuaries management in the newly accreted Char areas

Urban Areas (19,823 sq. km)

Key Vulnerabilities of the Urban Areas Hotspot

Table 1.23: Key vulnerabilities of the Urban Areas Hotspot

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
1. Urban sprawl, unplanned settlements and development	Settlements in hazardous areas such as high flood risk areas, riverbeds, coastal flood plains, cyclone and storm surge risk areas, and eroding areas along the rivers and coasts; slum growth in Dhaka City at 7% per annum	increasing risk of floods in inner city areas; breakdown of basic services – water supply, sanitation, waste disposal; increase in water borne diseases; contamination of surface waters; reduced re-charging of groundwater sources	Loss of life and property; rescue and relief efforts increasingly hampered and difficult; vulnerable and poor in slums will suffer most
2. Lowering of groundwater levels	Less freshwater available for industrial and domestic consumption; drying up of shallow tube wells in dry season	Increasing water shortages	Decline of industrial output; social unrest due to water shortages; water borne diseases due to use of contaminated water for drinking
3. Untreated sullage / faecal sludge and industrial effluents	Surface / groundwater contamination from dissolved solids and chemicals	Increasing pollution of surface water and groundwater sources	Environmental and health hazards for all sections of the urban population; agricultural output / horticultural products grown close to urban areas irrigated with contaminated surface and groundwater

(to be continued)

Key Vulnerabilities of the Urban Areas Hotspot

(continued)

Vulnerability from	Current State	Expected Change	Consequences under a BAU scenario
4. Air and noise pollution	Increasing traffic and traffic jams; increasing emissions and noise pollution	Further increase in traffic, noise and emissions	Increase in respiratory illnesses; loss of time sitting in log jams; decline in economic productivity and increasing health costs
5. Sea level rise and increasing precipitation	Higher tides and blocking of receding monsoonal rains (e.g. Chattogram)	Risk of permanent inundation; increasing flood risks; breakdown of disaster-risk management structures	Loss of life and property; reduction in economic output and loss of GDP

Source: BDP 2100 Technical Team Analysis, 2015

Strategies for Urban Area

Strategy UA 1: Increase Drainage Capacity and Reduce Flood Risk in Urban Areas

Sub-strategies:

i. Integrated urban drainage improvement
ii. Integrated flood risk management (in cooperation with the national flood risk strategy).

Strategy UA 2: Enhance Urban Water Security and Water Use Efficiency

Sub-strategies:

i. Water availably and accessibility.
ii. Improved water quality.

Strategy UA 3: Managing river systems and estuaries in newly developed areas

Sub-strategies:

i. Land reclamation
ii. Integration of River stabilization/erosion control and land reclamation with urban development.

Strategies for Urban Area

Strategy UA 4: Conserve And Preserve Urban Wetlands and Ecosystems and Promote Their Wise-useo

Sub-strategies:

i. Urban wetland preservation
ii. Promote urban green and blue spaces

Strategy UA 5: Develop Effective Urban Institutions and Governance

Sub-strategies:

i. Improved urban planning
ii. Improved implementation of urban plans

Strategy UA 6: Integrated and Sustainable Use of Urban Land and Water Resources

Sub-strategies:

i. Introduction of integrated spatial planning in spatial policy making on national/regional scale.
ii. Advancements in local urban planning and land use regulations.

Thank You

Open Discussion
&
Question-Answer