

# CLIMATE CHANGE AND REGIONAL SECURITY

## Water and Disaster Management in South Asia

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~ Water and its availability and quality will be the main pressures on, and issues for, societies and the environment under climate change. ~

--IPCC, 2007

~ First, I worry about climate change. It's the only thing that I believe has the power to fundamentally end the march of civilization as we know it, and make a lot of the other efforts that we're making irrelevant and impossible ~

--Bill Clinton

# Outline of Presentation



- Introduction
- Current Trends of Climate Change
- Consequences and Security Implications
- Threats to Regional Security 1: Water Stress
- Threats to Regional Security 2: Disaster Management
- Common Grounds for Regional Cooperation
- Regional Cooperation Framework
- Conclusion

# Introduction

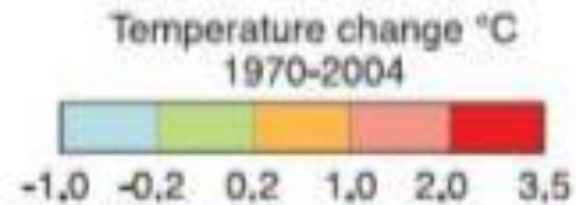
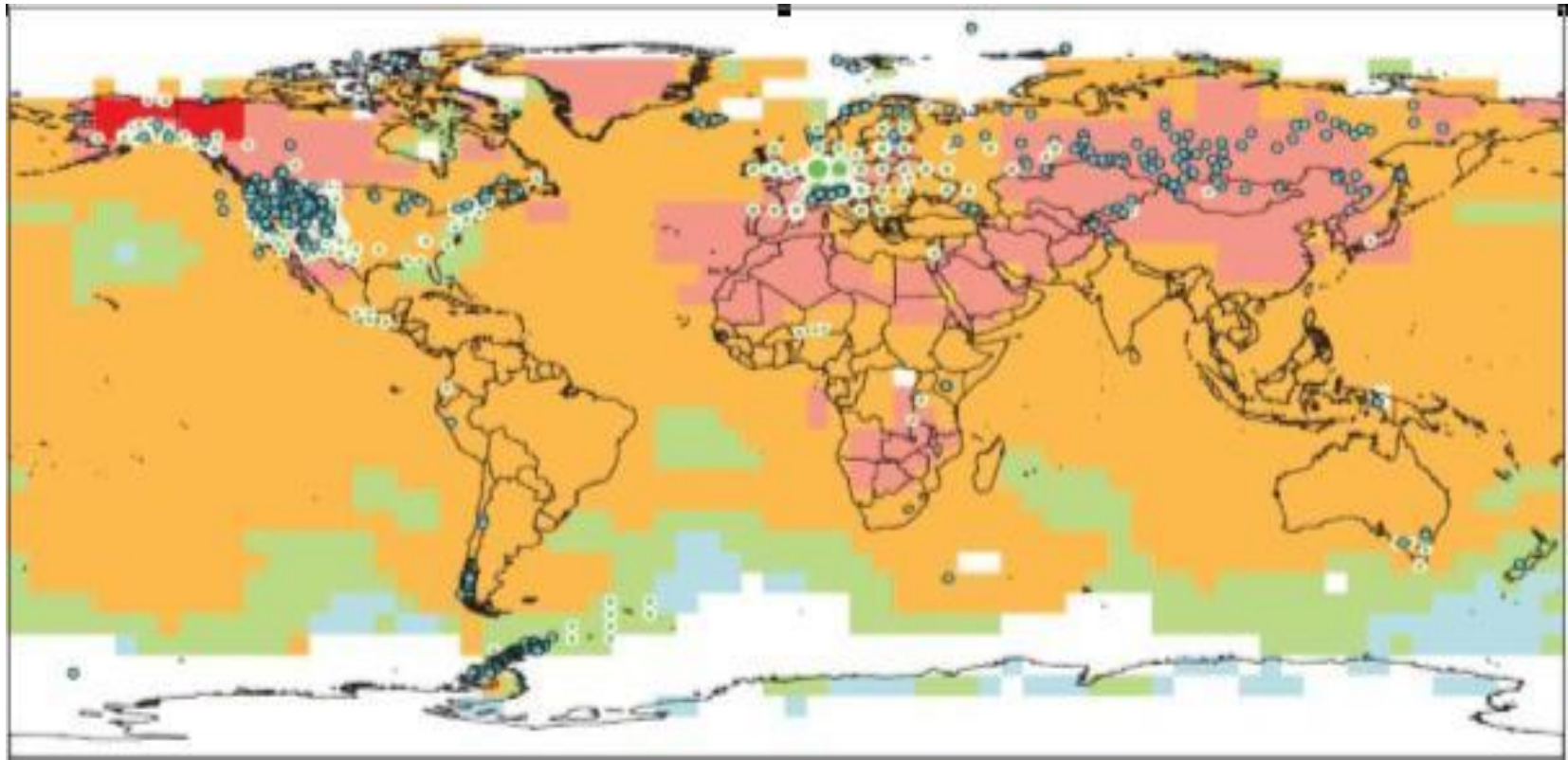
- Climate change has appeared as one of the greatest challenges to national and regional security.
- Global warming is predicted to increase the frequency and intensity of various natural disasters i.e. tropical storms, flash floods, landslides etc. which can jeopardise the security of the regional security along with the individual and the state to a great extent.
- In South Asia, being the most crisis-ridden in the world, climate change particularly water and disaster concerns would reinforce present trends of instability and conflict while at the same time draw new lines of conflict within and between states.
- Disastrous impact of climate change opens new avenues for cooperation and dialogue in the region inviting a joint effort to abate the vulnerability of the region to climate change.



# Current Trends of Climate Change

- Long-term changes in climate observed: arctic temperatures and ice, precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heat waves and the intensity of tropical cyclones
- The 2007 IPCC report predicts temperature rise of 1.1 - 6.4 °C (2 - 11.5 °F) by 2100.
- Significant Sea level rise by 2100 is predicted by IPCC.
- The number of natural disasters in the world may double during the next 10 to 15 years. (Source: WWF)
- 3,852 disasters killed more than 780,000 people over the past ten years, affected more than two billion others and cost a minimum of 960 billion US\$. (Source: figures released by CRED in Geneva)
- The 2001 World Disasters Report of the Red Cross and Red Crescent Societies estimated of 25 million current "environmental refugees".

# Changes in Temperature



# Threat Landscape and Security Implications

Mainly two dimension:

- Human Security
- Hard Security

# Dimensions of Human Security

- Water Security
- Food Security
- Livelihood Security
- Health Security
- Disaster security.
- Energy security





# Hard Security

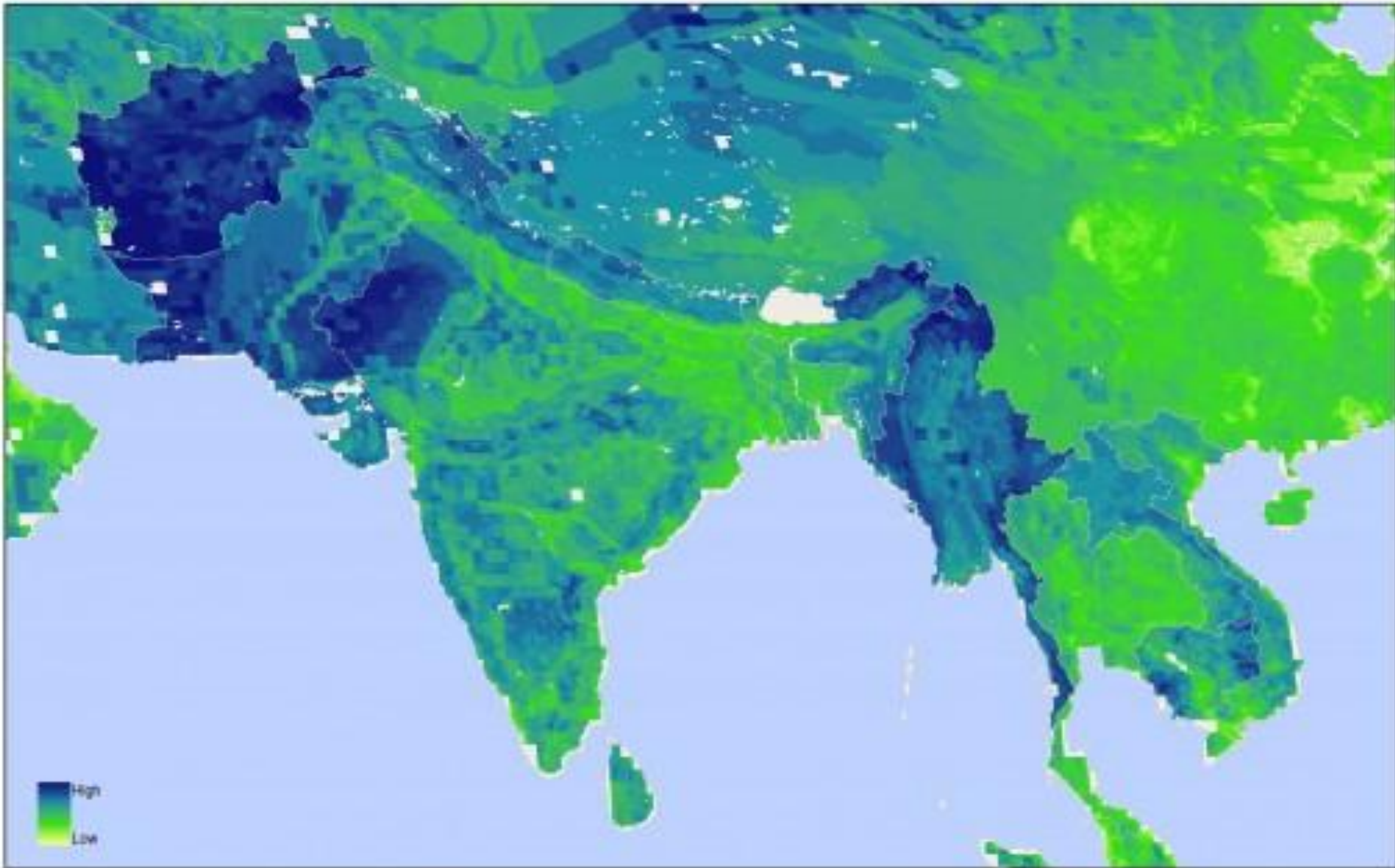
- Socio-political and economic unrest.
- Radicalisation and terrorism
- Resource conflict
- Inter and/or Intra-state conflict potentials
- State collapse
- Regional conflicts



# Climate Change and Regional Security

## South Asian Perspective

- South Asia with its population of about 1.3 billion is one of the world's regions highly exposed to a variety of natural as well as human induced hazards.
- More than 3.5 million people die each year from water-related disease; 84 percent are children. Nearly all deaths, 98 percent, in the developing world. (Source: IPCC 4<sup>th</sup> Ass on climate change in Asia)
- Countries experienced a number of major disasters in the last one and a half decades, which took lives of about half a million people and caused huge economic losses and massive destruction.



## Human Implications of Climate Change: Vulnerability of South Asia

# Water Stress in South Asia

## Water Stress (contd.)

- In South Asia, climate change increases the variability of water supply, leading to floods during some parts of the year and droughts in others.
- Increasing water shortages relative to population growth are putting the Indus Basin irrigation and drainage system in danger of collapse.
- 120 million to 1.2 billion will experience increased water stress by the 2020s in South and South East Asia.

(Source: IPCC 4<sup>th</sup> Ass on climate change in Asia)



# Water Stress- Impact on South Asia

- Decreased water availability and water quality in many arid and semiarid regions.
- An increased risk of floods and droughts in many regions
- Reduction in water regulation in mountain habitats
- Increased incidence of waterborne diseases such as malaria, dengue, and cholera.
- Decreased agricultural productivity
- Adverse impacts on fisheries
- Adverse effects on many ecological systems
- Decreases in reliability of hydropower and biomass production
- Increased damages and deaths caused by extreme weather events

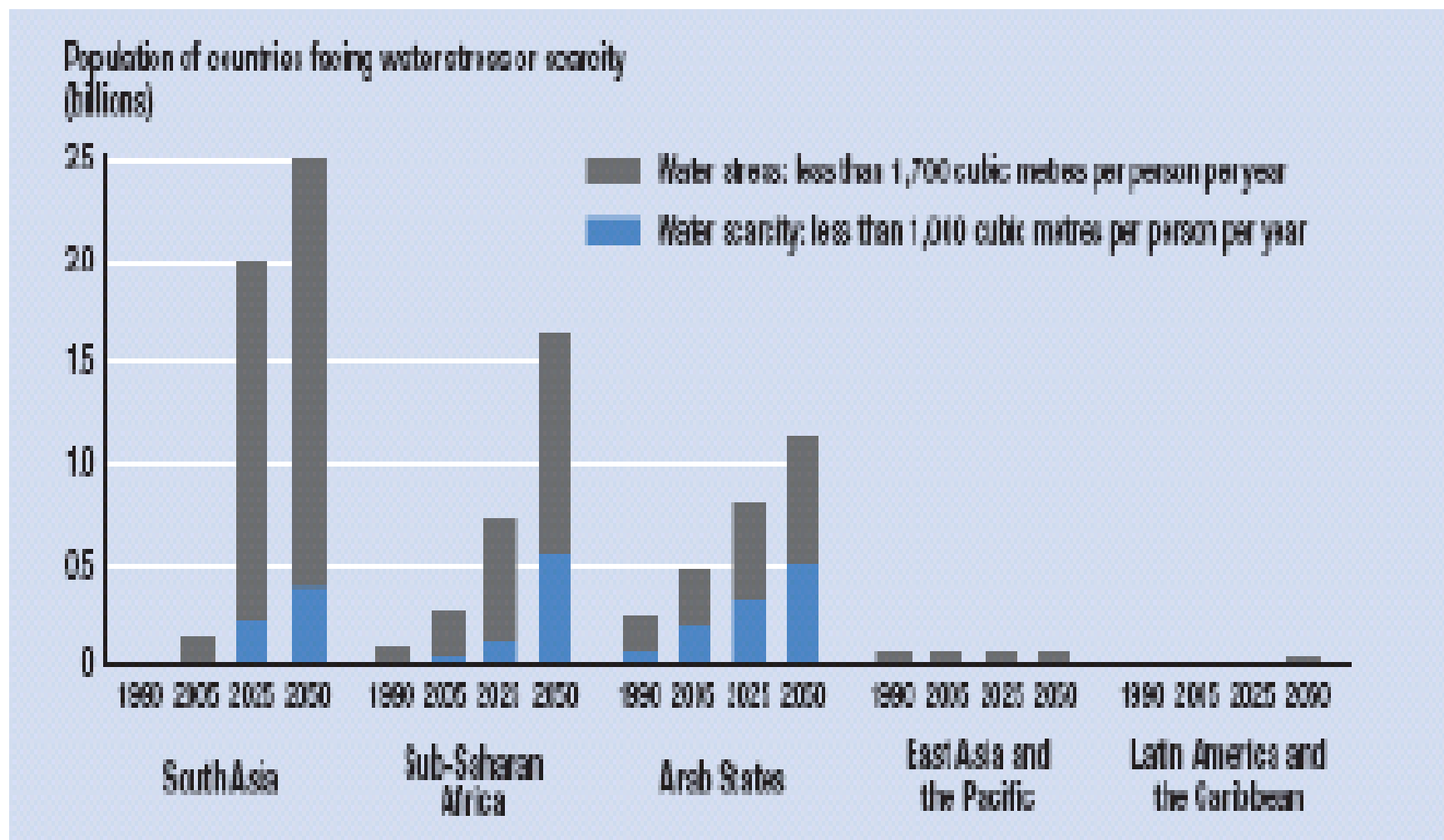
# Contd.

- Water availability on per capita cubic metre basis in the Himalayan River Basins is likely to decline from 7320 to 5700 in case of Bangladesh from 8500 to 5500 in case of Nepal and from 1730 to 1240 in case of India by in 2030.

Report of the Himalayan Challenge: Water Security in Emerging Asia

- The report assessed implications of the likely decline 275 Billion Cubic Meters (BCM) renewable fresh water in India, Nepal, Bangladesh and China by 2030 for food security, health, migration, bio-diversity, social stability and interstate relations in the region.

## Projected Stress in Water Availability (2025-2050)

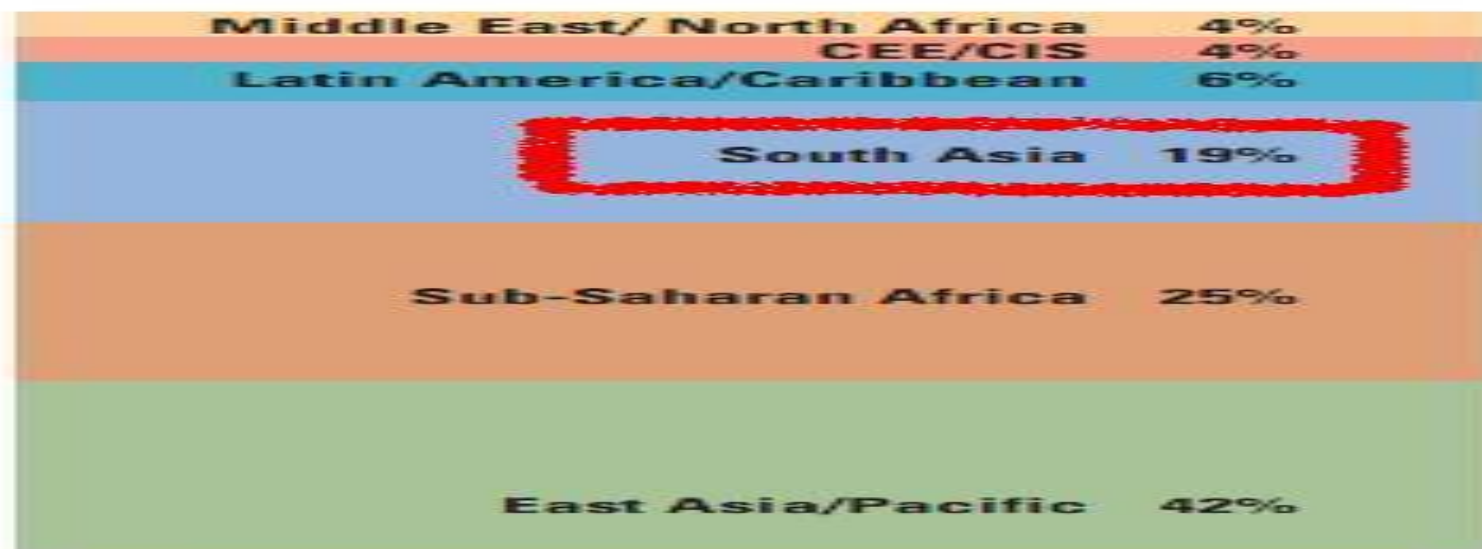




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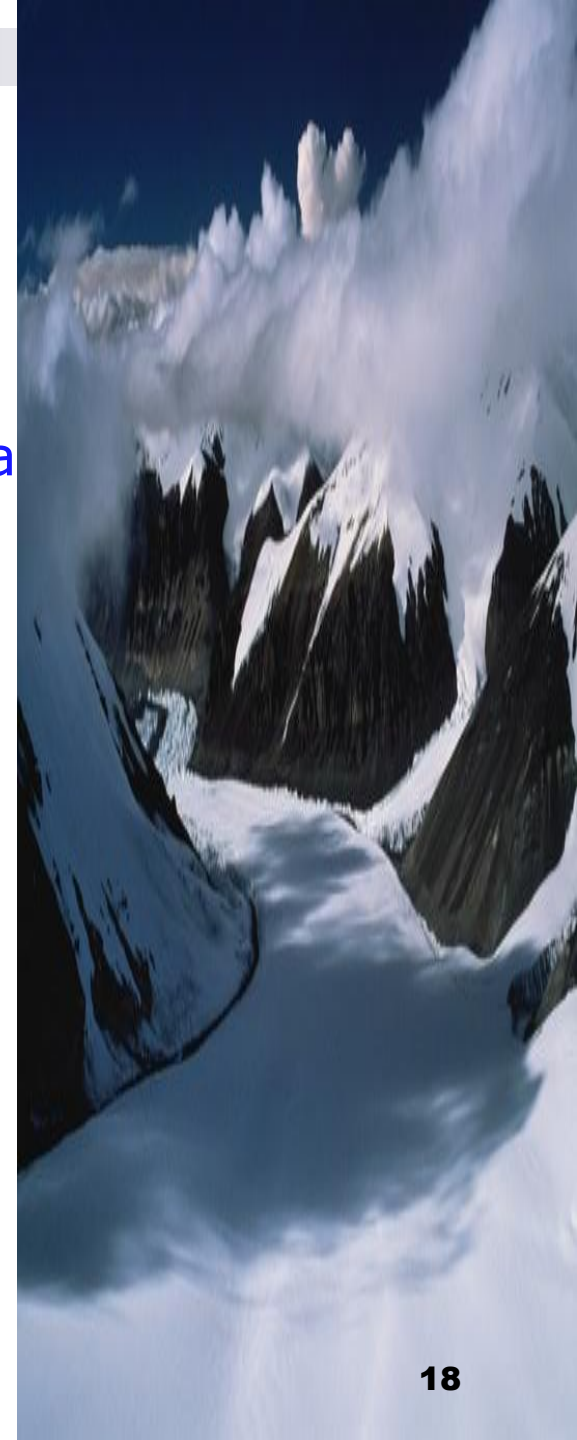
Water has become an element of 'mixed vulnerability' for South Asia. The region has more water when it doesn't need and less water when the need is most acute.

## access to safe drinking water



# Melting Glaciers in the Himalayas

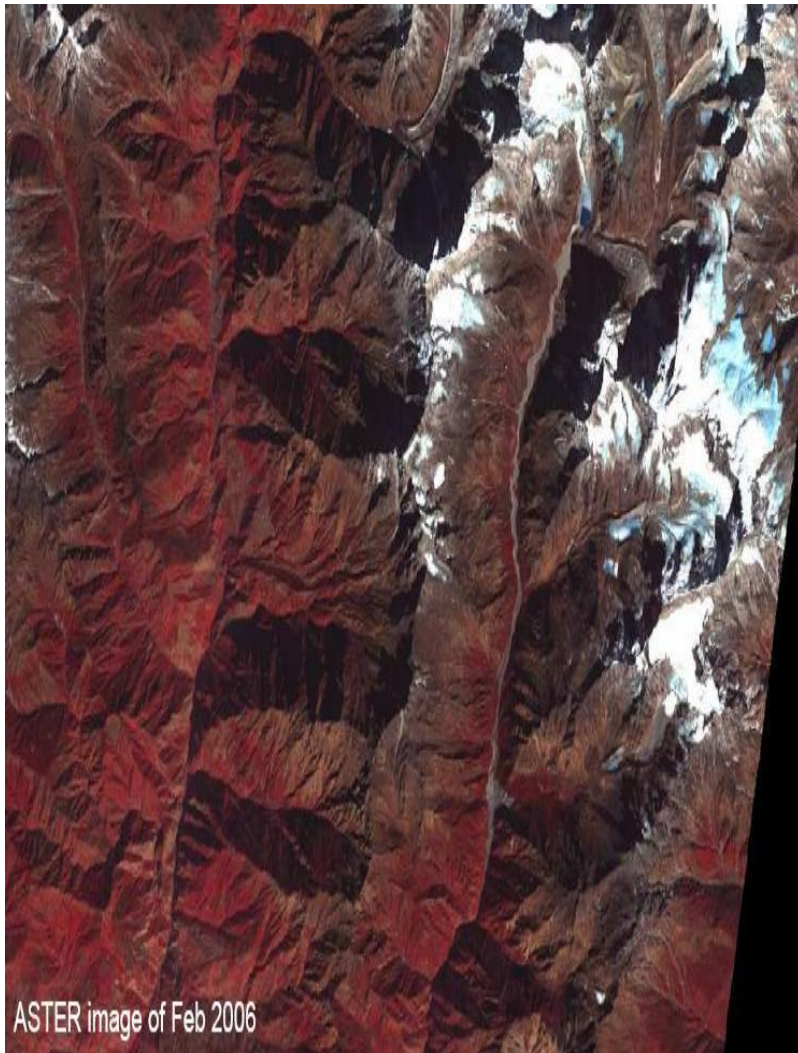
- Glaciers in the Himalayas are receding faster than in any other parts of the world.
- In Northwest China, 27% of the glacier area will decline by 2050 (equivalent to an ice volume of 16,184 km<sup>3</sup>), as will 10 to 15% of the frozen soil area.
- The temperature increase in the Himalayan region has been greater than the global average of 0.74 °C over the last 100 years (IPCC 2007).
- This ongoing rapid warming has a profound effect on the Himalayan environment.
- Retreat of glacier tongues has led to the formation of glacial lakes.



**A map of the outline of the glaciers clearly identifies the new outcrops and the separation of the glaciers.**

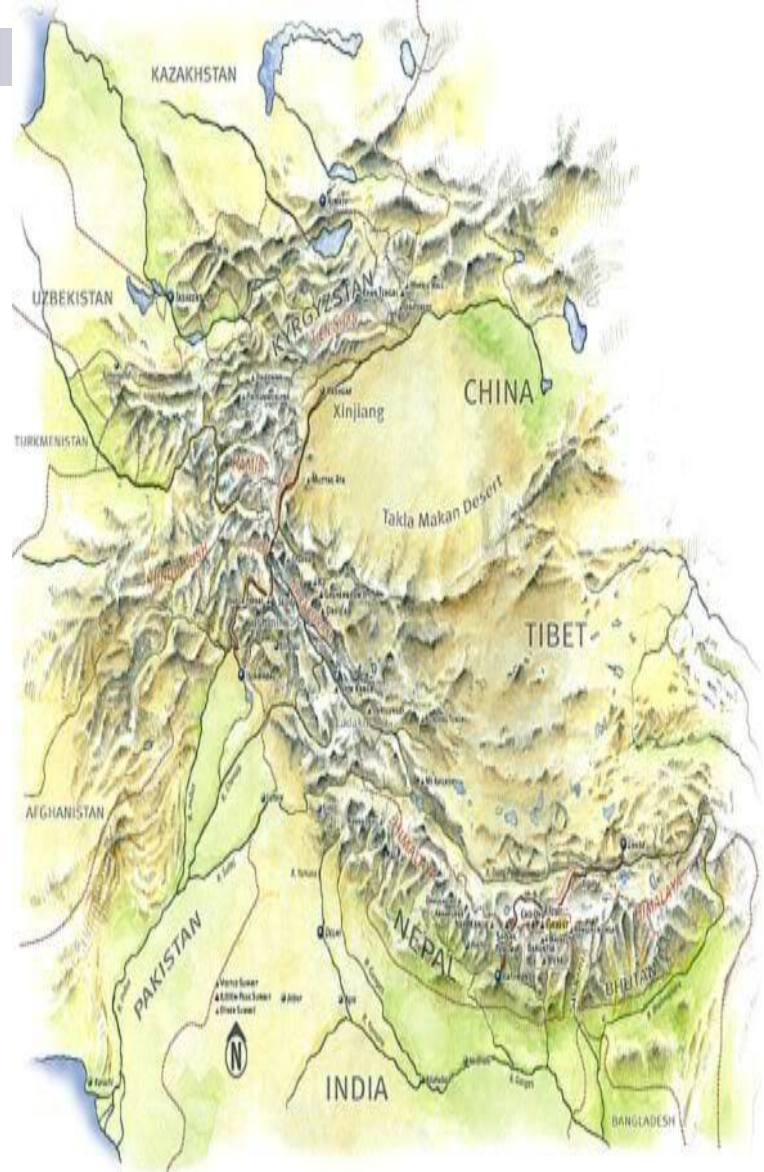


# Snow-cover Changes in the Himalayas



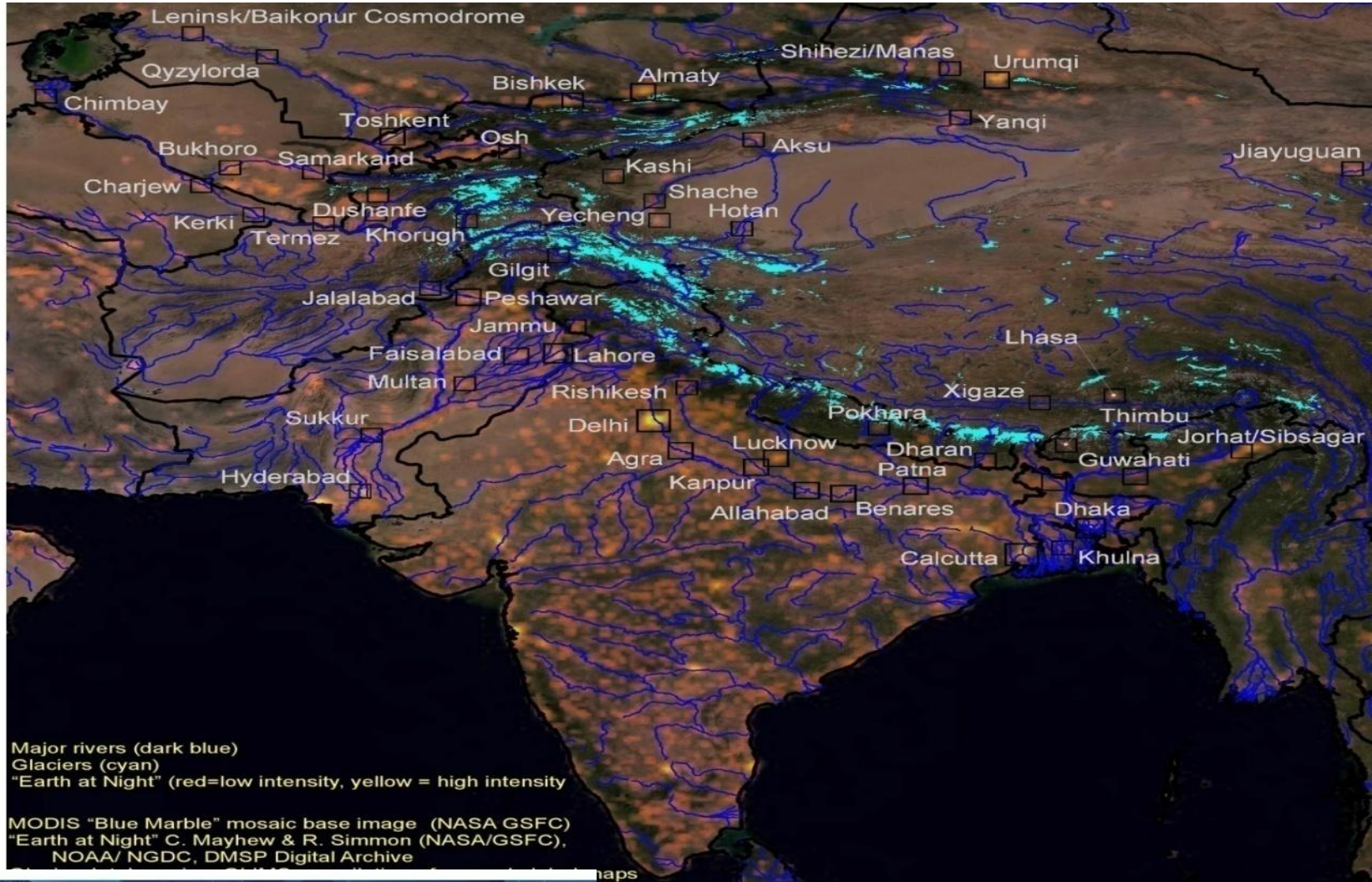
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- The current trends of glacial melt suggest that the Ganges, Indus, Brahmaputra and other rivers across the northern Indian plain could likely become seasonal rivers in the near future.
- This poses a challenge for reducing the vulnerability of the more than 1.3 billion people living in the major river basins downstream from the Hindu Kush-Himalayan region.



**Map of countries depending on  
Himalayan river basin**

# Map of the Himalayan River Basin Area



# Contd.

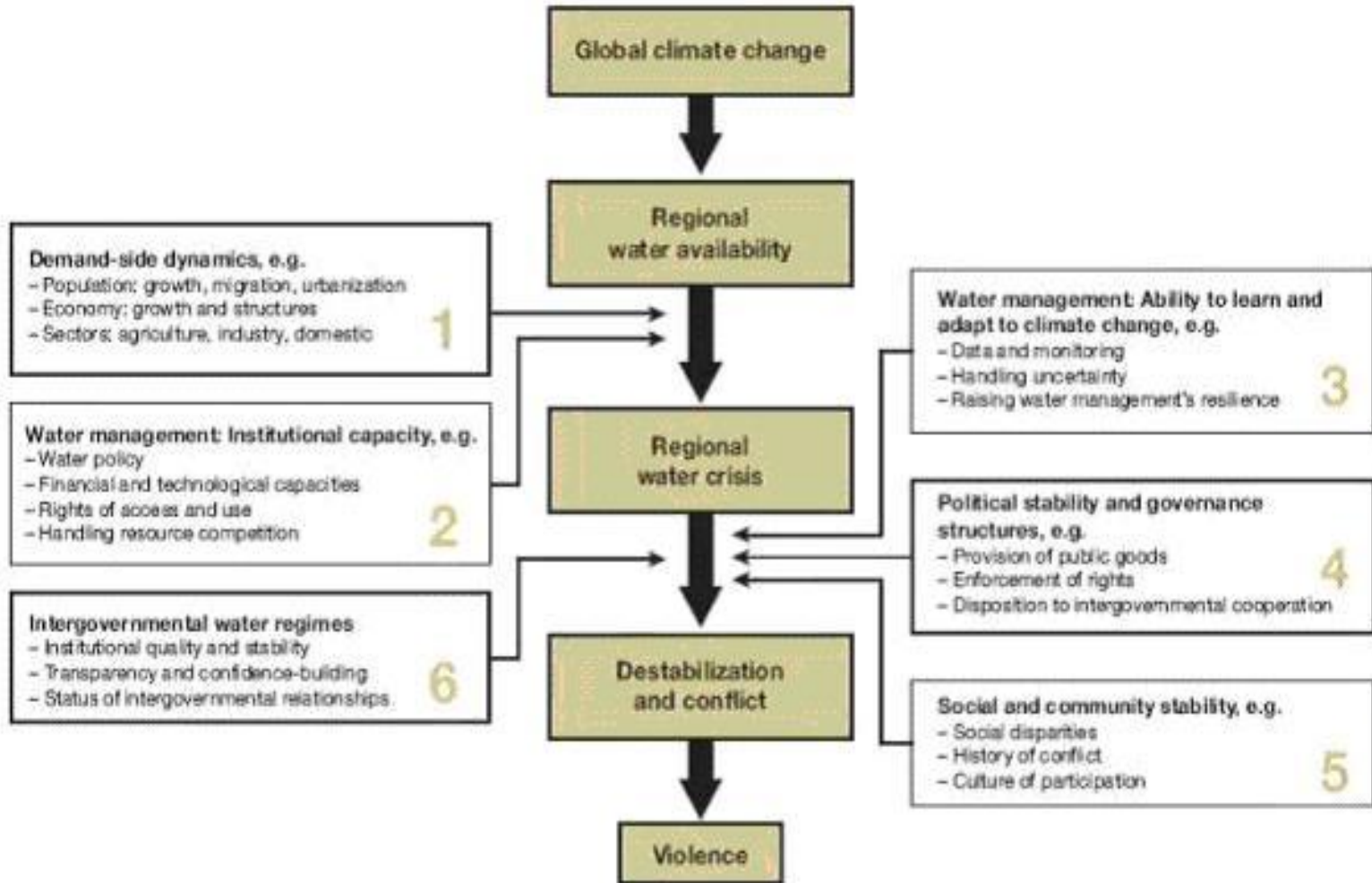
	Area, sq km	Mean discharge (m <sup>3</sup> /s)	% of Glacier melt in river flow	Population x1000	Population density	Water availability per person m <sup>3</sup> /year
Indus	1,081,718	5,533	44.8	178,483	165	978
Ganges	1,016,124	18,691	9.1	407,466	401	1,447
Brahmaputra	651,335	19,824	12.3	118,543	182	5,274
Irrawaddy	413,710	13,565	Small	32,683	79	13,089
Salween	271,914	1,494	8.8	5,982	22	7,876
Mekong	805,604	11,048	6.6	57,198	71	6,091
Yangtze	1,722,193	34,000	18.5	368,549	214	2,909
Yellow	944,970	1,365	1.3	147,415	156	292
Tarim	1,152,448	146	40.2	8,067	7	571
Total				1,324,386		

# Factors leading to cross-border water-related conflicts

Some of the critical indicators of vulnerability to conflict among nations related to water availability are :

- Per capita water availability,
- The level of water withdrawals for annual use in relation to its availability, and
- The extent of dependence on water resources that flow in from the borders.





## Climate Change, water stress and violence

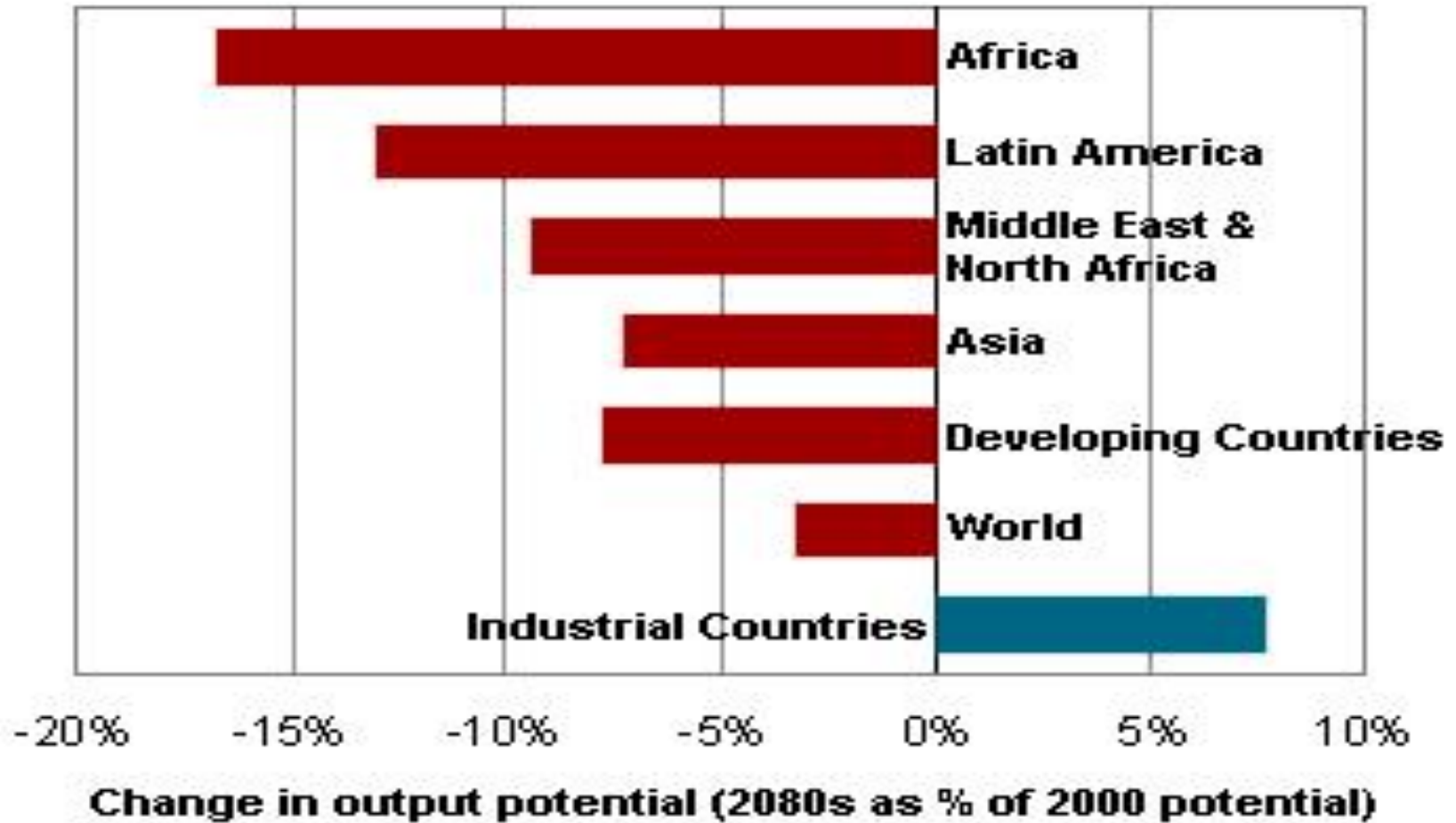
## Per capita water availability in 2000 and 2005 (cubic metres/person/ year)

Country	Basin Name	Population, Thousands	Per Capita Water Availability* 2000	Per Capita Water Availability* 2005
Afghanistan	Indus, Tarim	24,926	2,986	2,610
Bangladesh	GBM	149,664	8,809	8,090
Bhutan	GBM	2,325	45,564	40,860
China	GBM, Indus, Tarim	1,320,892	2,259	2,140
India	GBM, Indus	1,081,229	1,880	1,750
Myanmar	GBM	50,101	21,898	20,870
Nepal	GBM	25,725	9,122	8,170
Pakistan	Indus, Tarim	157, 315	2,961	1,420s

# Water Stress as Driver of Food Insecurity

- In the next 20 years, the four countries in the Himalayan sub-region will face the depletion of almost 275 billion cubic meters (BCM) of annual renewable water.
- The agricultural sector will continue to be the major consumer of water in China, Nepal, India and Bangladesh, although the industrial and domestic sectors will also need more water in the future.
- The crop yield will drop by 30-50% in the case of India, Nepal, Bangladesh and China by the middle of the century.
- Bangladesh had to import nearly 20 lakh tones of food grains in the last fiscal year on top of around 3 crore tones of rice and wheat produced domestically.

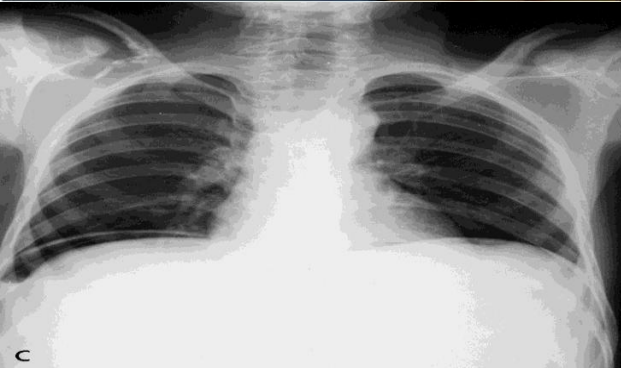
# Impact on Agriculture Output Potential



# Food Insecurity in South Asia

Indicators	Bangladesh	India	Maldives	Nepal	Pakistan	Sri Lanka
	2002-04	2002-04	2002-04	2002-04	2002-04	2002-04
Population (million)	146.7	1065.4	0.32	25.2	153.6	19.1
Food Supply (kcal/person/day)	2200	2470	2600	2430	2320	2390
Number of undernourished (million)	44	209.5	31.9	4.4	37.5	4.2
Proportion of under-nourishment (%)	30	20	10	17	24	22
Dietary energy consumption (kcal/person/day)	2200	2440	2560	2450	2340	2390
	2000	2000		1996	1999	1996
National (Poverty headcount, (% of population))	49.8	28.6	-	42	32.6	25
Rural (Poverty headcount, (% of population))	53	30.2	-	44	35.9	27
Urban (Poverty headcount, (% of population))	36.6	24.7	-	23	24.2	15
	2000	1999-00		1995-96	1998-99	1995
Gini of income (%)	32	33	-	37	33	34
	1981-82	1990	1995	1995	1988	1986
Gini of dietary energy consumption (%)	18	18	14*	15*	18	16

# Water Borne Diseases in South Asia



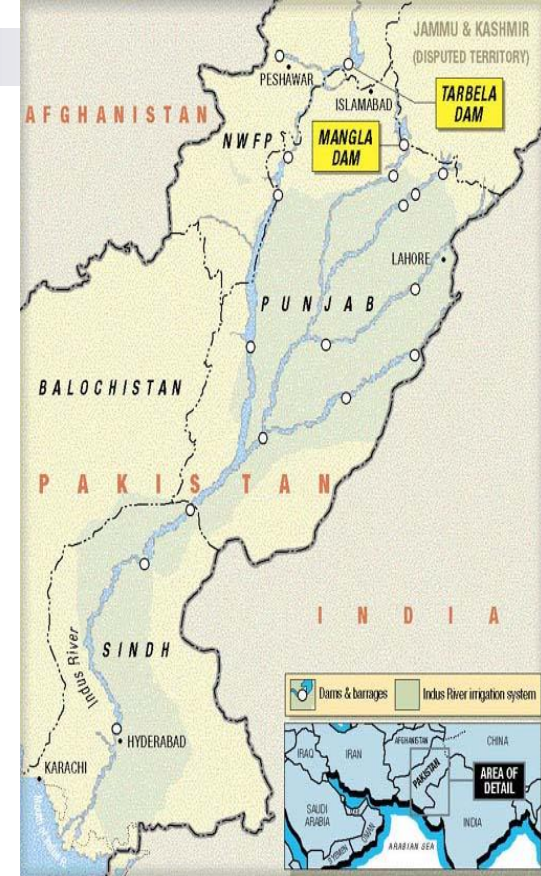
- Almost one in five people in South Asia still lack improved water resources making them susceptible to water borne diseases like Anaemia, Arsenicosis, Cholera, Diarrhoea, Hepatitis, Malaria, schistosomes, Typhoid and so on.
- In South Asia, over two million people die due to water-borne diseases like typhoid and cholera annually.
- 37.7 million Indians are affected by waterborne diseases annually, 1.5 million children are estimated to die of diarrhoea alone.
- In Bangladesh alone, 35 million people are exposed to elevated levels of arsenic in their drinking water, which will ultimately threaten their health and shorten their life expectancy. (Lancet)

# River Management and Violent Hydro-Conflict

- Water- related issues led to interstate tensions and significantly hampered development, such as along the Nile, Euphrates, Indus and Ganges rivers.
- The United Nations estimates 300 potential conflicts over water exist around the world today.
- Water flow ignores political and community boundaries, decisions in one place affect water use elsewhere.
- In the case of shared river basins, water use upstream can affect downstream quality and quantity, thus creating the potential for conflicts of interest.

# Indo-Pak Water Disputes

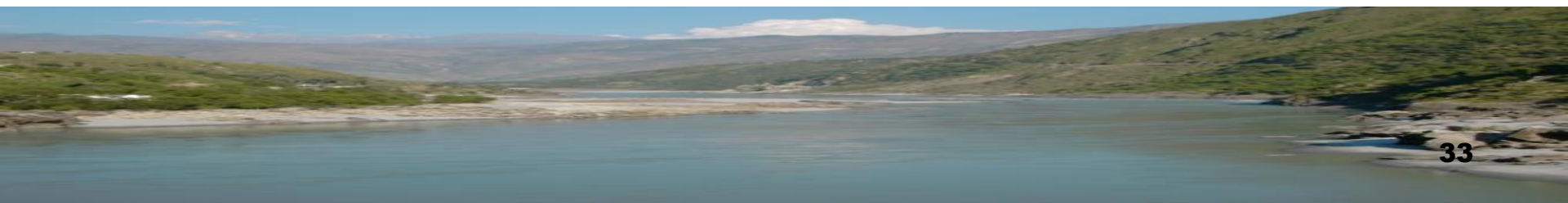
- Indian is hurtling water by building expensive hydroelectric dams in a remote valleys of India controlled Kashmir.
- India plans, being rapidly growing but power-starved economy, to build many more dams over the next decade.
- Concerns over the Indus Waters Treaty that was concluded in 1960 that sets out the legal framework for the sharing of the waters of six rivers: Indus, Chenab, Jhelum, Sutlej, Beas, and Ravi - flow through northern India into Pakistan.
- Concern is growing in Pakistan that India is controlling the water flow of the Indus, Chenab and Jhelum rivers that pass through India's Jammu & Kashmir state.





# Indo-Pak Water Disputes

- Since Indus provides water to over 80 percent of Pakistan's 54 million acres of irrigated land, dam and water withdrawal by India will cause desertification and have devastating impact on Pakistan agricultural productivity leading to wide scale food insecurity in Pakistan.
- Water withdrawal and dam construction by India is potential source of bilateral tension and conflict
- Pakistan fears that India can make the country solely dependent on India in terms of war and can create draught or famine during the crucial time like war
- The level of securitization went to the stage of nuclear redline with the warning from Pakistan
- Afghanistan plans to build 12 dams on the Kabul river with a combined storage capacity of 4.7 million acre-feet, which Pakistan frets will further diminish the Indus water supply.



# Indo-BD Water Disputes

- Bangladesh shares 54 rivers with India, but has agreement for only one river.
- From 1974, India started unilateral diversions of water from Ganges River after the construction of Baraka Barrage.
- The Ganges Water Treaty which was concluded for 30 years in 1996 is not also implemented rightly because of Indian unilateral withdrawal.
- Supply more during the season that cause flood and less supply in dry season resulting in draughts.
- Saltwater intrusion, vegetation damage, erosion, reduced conveyance capacity, disrupted fishing
- Construction of Dam: Tipai Mukh
- Water sharing agreement for Teesta river have failed recently

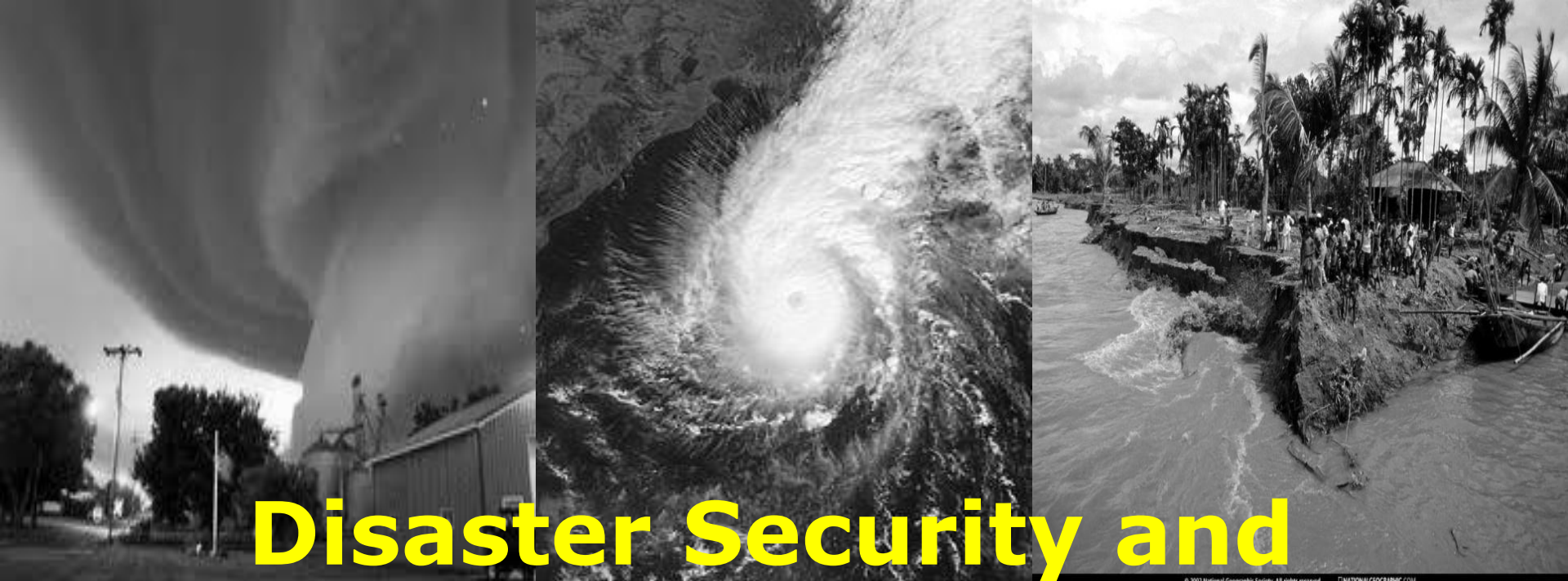


**FARAKKA BARRAGE**



A project of national importance, being the terminal barrage on the river Ganges, located in the state of West Bengal, completed in 1974, serves the purpose of flushing the channels of Calcutta Port, as well as to augment water supply to Calcutta city.





# Disaster Security and Management in South Asia



# Natural Disasters in South Asia

- South Asia is extremely vulnerable to natural disasters, with more than 900 events reported since 1970 alone.
- Between 1990 and 2008, more than 750 million people—50 percent of the population in the region—were affected by at least one natural disaster, leaving almost 230,000 deaths and about US\$45 billion in damages. (Source: World Bank Report, South Asia: Shared Views on Development and Climate Change)
- The toll of natural disasters is high and rising. Since 1970, the number of reported natural disasters in the region has been rising steadily.

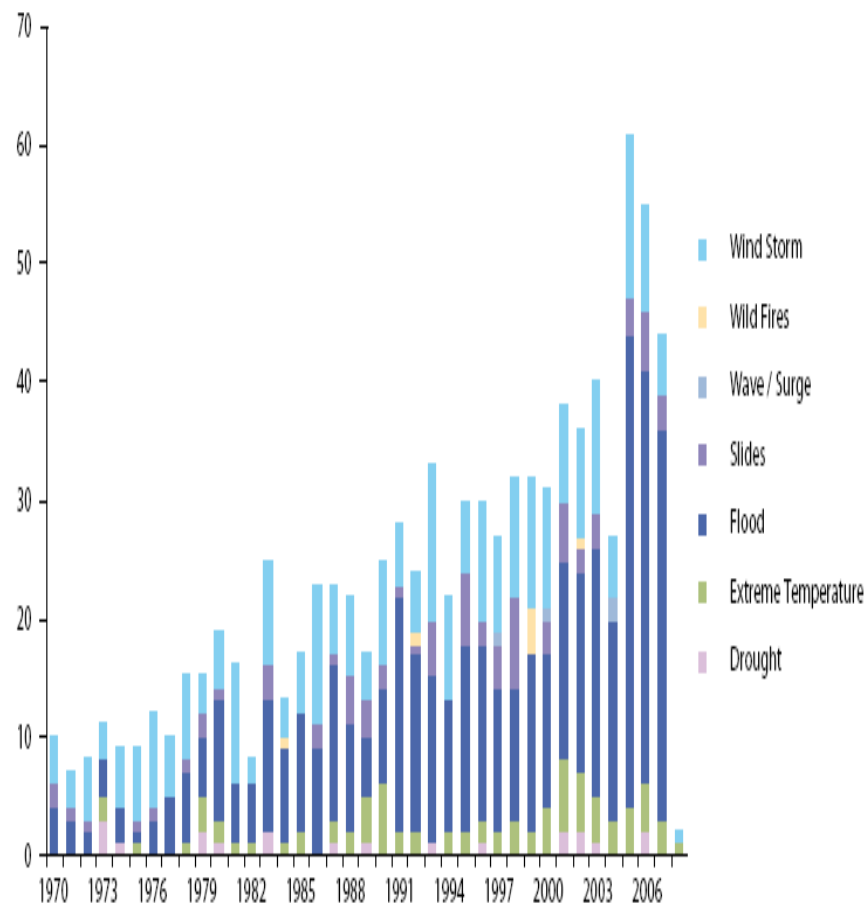


## Frequency of Natural Disasters in South Asia, 2000-09

Year	Type Of Disaster	Country	Frequency
2000	Floods	India	6
2001	Earthquake	India	1
2002	Extreme Temperature, Earthquake	India, Afghanistan	2, 3
2003	Extreme Temperature	India	2
2004	Earthquake, Earthquake, Floods, Floods	Sri Lanka, India, India, Bangladesh	1, 1, 6, 3
2005	Earthquake, Earthquake, Floods	Pakistan, India, India	1, 1, 17
2006	Floods	India	17
2007	Storm, Floods, Floods	Bangladesh, Bangladesh, India	2, 2, 16
2008	Storm	Afghanistan	1
2009	Floods	India	2

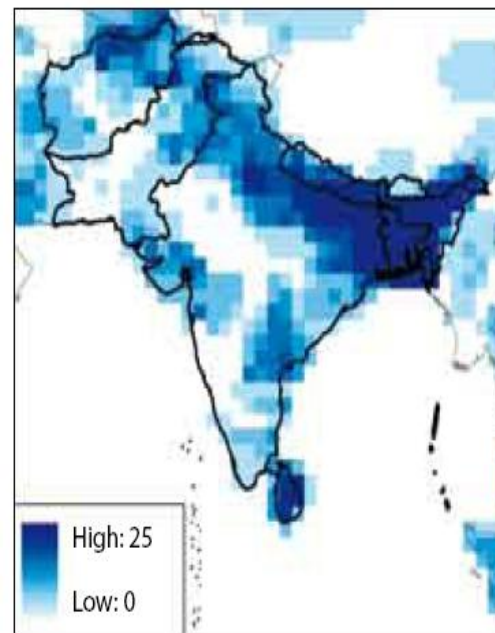
Source: EM-DAT

## Numbers of Reported Disasters in South Asia by Disaster Type (1970-2008)

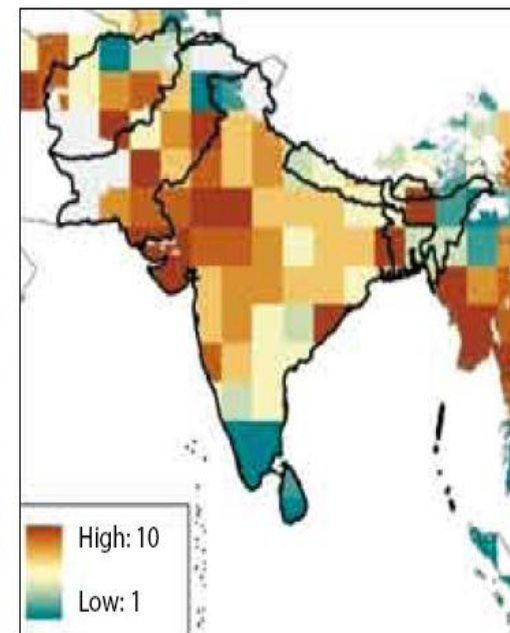


Source: Emergency Events Database (EM-DAT: The OFDA/CRED International Disaster Database) (<http://www.em-dat.net>).

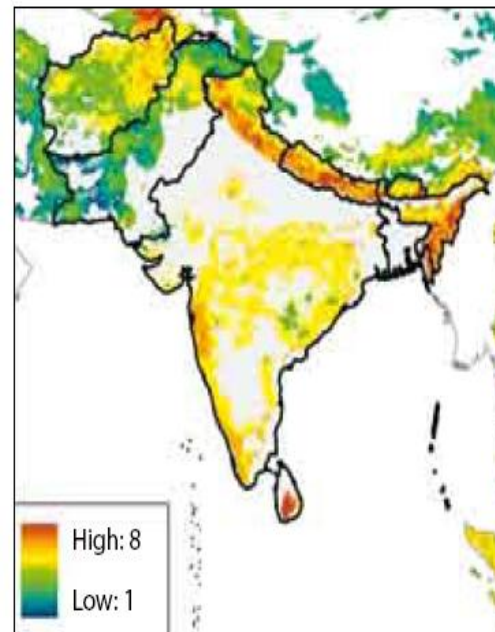
# Distribution of Hazard Risk Hotspots in South Asia



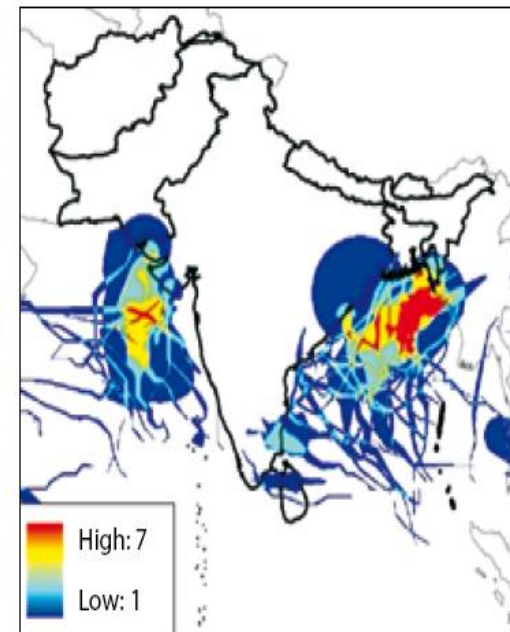
Map 1: Flood frequency index<sup>59</sup>



Map 2: Drought frequency index<sup>60</sup>



Map 3: Slides frequency index<sup>61</sup>



Map 4: Cyclone frequency index<sup>62</sup>

## **Natural Disasters- Impact on South Asia**

- Human casualties and damages of properties from extreme weather events
- Loss of shelter, large-scale displacement outbound migration
- Water-logging and human sufferings from large-scale flooding
- Loss of agricultural production due to flood and drought
- Adverse impacts on fisheries
- Increased incidence of diseases such as malaria, dengue, and cholera
- Pressure on scarce resources, resource competition and from social instability to violent conflicts
- Trans-boundary migration and interstate tension and conflicts
- Damage of critical infrastructure- nuclear plants, energy pipelines and so on

## Contd.

- The areas and populations that face the highest risk from natural disasters are located in Bangladesh and Nepal.
- According to the recently published 2011 World Risk Report, countries like Bangladesh, India, Nepal and Pakistan exhibit a high level of vulnerability as demonstrated by their lack of coping capacities and adaptive capacities.
- In September, 2011, a 6.9-magnitude earthquake in Nepal's Kathmandu Valley displaced 12,301 people and killed six people.
- There are growing fears that the country's capital, Kathmandu, home to two million inhabitants, is due to experience a devastating earthquake – like the 8.0-magnitude quake that occurred 77 years ago and killed more than 225,000 people – and is not prepared.

(Source: Searchlight South Asia, <http://urbanpoverty.intellecap.com/?p=388>)

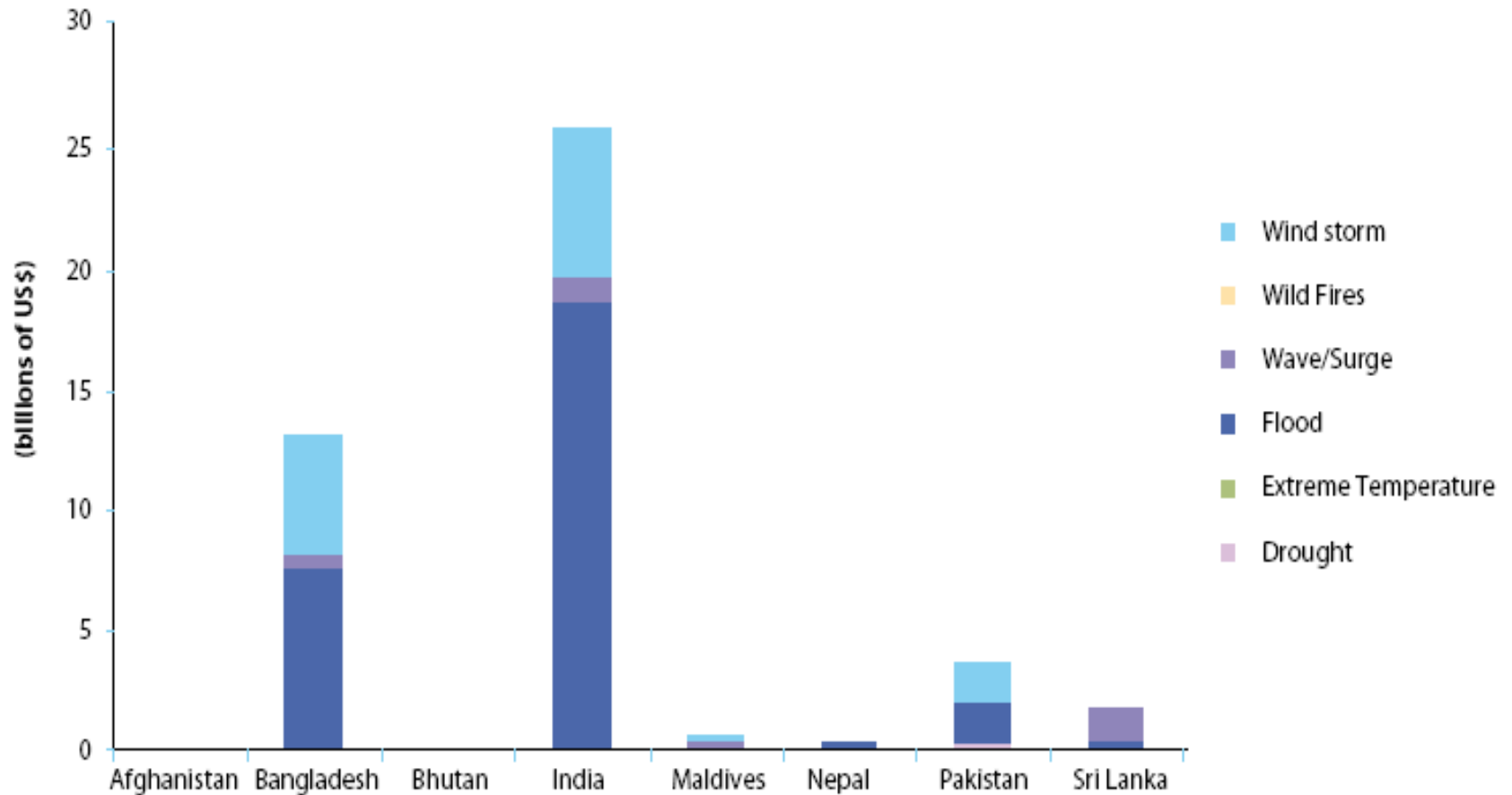


## Reported Natural Disaster Impacts in South Asia (1990–2008)

Country	Population <sup>56</sup> (‘000)	Deaths (‘000)	People Affected (‘000)	Population Affected (%) <sup>57</sup>	Damage (US\$millions)
Afghanistan	22,615	6.1	5,410	23.9	69,060
Bangladesh	143,990	155.3	145,713	101.2	12,984,000
Bhutan	602	0.2	66	11.0	3,500
India	1,071,608	53.4	885,244	82.6	25,743,100
Maldives	279	0.0	2	0.7	500,100
Nepal	25,278	4.6	2,796	11.1	245,100
Pakistan	162,662	9.4	27,943	17.2	3,573,054
Sri Lanka	19,258	0.5	6,331	32.9	1,670,070
<b>Total</b>	<b>1,368,327</b>	<b>229.5</b>	<b>1,073,504</b>	<b>78.5</b>	<b>44,787,984</b>

Source: Emergency Events Database (EM-DAT: The OFDA/CRED International Disaster Database) (<http://www.em-dat.net>) and United Nations World Population Prospects (<http://esa.un.org>)

# Reported Costs of Damage in South Asia by Country and Disaster Type(1990–2008)



Source: Emergency Events Database (EM-DAT: The OFDA/CRED International Disaster Database) (<http://www.em-dat.net>).

# The Worst Flood in the History of Pakistan

- ❑ The 2010 Pakistan floods began in late July 2010, resulting from heavy monsoon rains in the Khyber Pakhtunkhwa, Sindh, Punjab and Baluchistan regions of Pakistan and affected the Indus River basin.
- ❑ Approximately one-fifth of Pakistan's total land area was underwater, approximately 796,095 square kilometres (307,374 sq mi).
- ❑ According to Pakistani government data the floods directly affected about 20 million people, mostly by destruction of property, livelihood and infrastructure, with a death toll of close to 2,000.





## **Flooding in Bangladesh**

## Impacts of Major Floods in Bangladesh

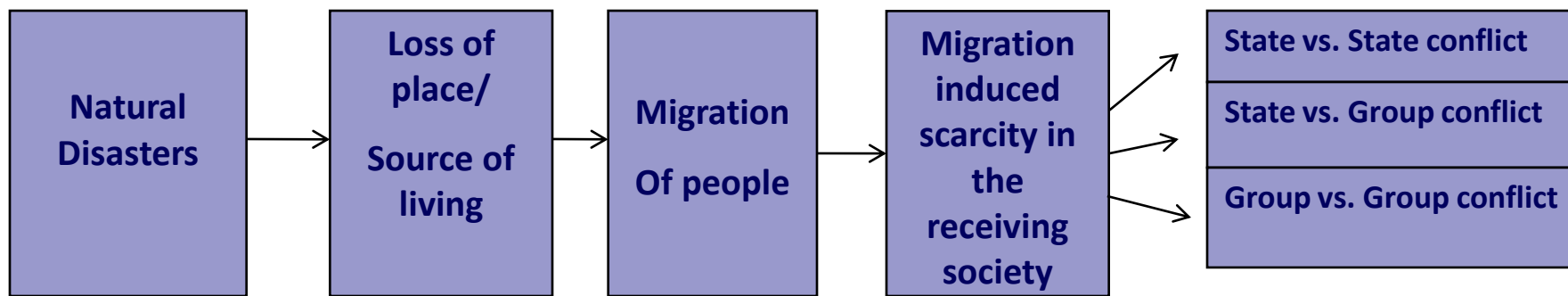
Event	Impact
1954 floods	Affected 55% of country
1974 flood	Moderately severe, over 2,000 deaths, affected 58% of country, followed by famine with over 30,000 deaths
1984 flood	Inundated 52,520 sq-km, cost estimated at US\$378 million
1987 floods	inundated over 50,000 sq-km, estimated damage US\$ 1.0 billion, 2055 deaths
1988 floods	Inundated 61% of country, estimated damage US\$ 1.2 billion, more than 45 million homeless, between 2,000-6,500 deaths
1998 floods	1,100 deaths, inundated nearly 100,000 sq-km, rendered 30 million people homeless, damaged 500,000 homes, heavy loss to infrastructure, estimated damage US\$ 2.8 billion
2004 floods	Inundation 38%, damage US\$ 6.6 billion, deaths 700, affected people nearly 3.8 million

# Disaster and Trans-boundary Migration in South Asia

- Climate change induced migration is going to be in acute condition in South Asia.
- Major disasters-flood, earthquake or cyclone may induce massive transboundary migration.
- One of the riskiest places to live is in low-elevation coastal zones. Worldwide, the largest populations living on low-lying coasts are in Asia-Pacific, in countries like China, India, Bangladesh, Vietnam, Indonesia and the Philippines.
- It is estimated that by 2050, 150 million people could be displaced by climate change related phenomenon like desertification, increasing water scarcity, floods and storm etc. (IPCC Ass. Report)



# Natural Disasters, Migration and Conflict



- Large-scale migration will add extra pressure on the scarce resources in the society and thereby heighten competition and conflict over resources.
- Intra-regional forced migration, such as those from Bangladesh to India is subject to stimulate bilateral tensions.

# Natural Disasters and Vulnerability of Critical Infrastructure







# **Water and Disaster Management in South Asia through Regional Cooperation**

# Common Grounds for Regional Cooperation

- Interlocked by common geography and geology
- Common vulnerabilities
- Natural disasters do not respect national boundaries.
- All major flood have their origin and consequence beyond one single country.
- Earthquake in the Himalayas are likely to affect more than one country.
- Countries have interest in water sharing, disaster management and cooperation.

# Existing Regional Framework

- Existing regional mechanisms include–
  - South Asian Association for Environmental Cooperation,
  - South Asia Cooperative Environment Programme (SACEP),
  - South Asia Environment Outlook (SAEO),
  - SAARC Natural Disaster Rapid Response Mechanism
- Though these mechanism exist but hardly function



## **Regional Cooperation Framework The Way Ahead**

# Regional Cooperation Framework

- Adoption of regional policy to reduce the common environmental degradation
- Enhanced political and economic cooperation
- Legal regimes and institutional framework
- Regional environmental adaptation and mitigation plan
- Documentation and sharing of data, lessons from good practices
- A common meteorological greed
- Wider dialogue among all the stakeholders in the region

# Framework for Water Management

- Regional framework for water pollution control and sustainable and renewable use of water resources
- Improved ground water management and river basin preservation
- Regional common policies for dam construction and water withdrawal
- Regional legal convention on water sharing
- Bilateral water sharing and trans-border river management agreements based on the regional and international legal standard
- Common regional plan for handling Himalayan glacier melting

# Framework for Disaster Management

- Sustainable management: not relief but resilience
- Regional disaster management strategy
- Regional early warning systems
- Strengthen regional and national response mechanisms
- Establish a regional information sharing mechanism
- Develop and implement Disaster Management training, education, research and awareness programmes
- Common flood control and management mechanism
- Strategic coordination between the disaster risk-management and the climate-change agendas
- Develop network of institutions and organizations
- Apply the ICT for disaster management.



# Conclusion

- Common problems need common solutions.
- Only cooperation among the countries of South Asia can reduce the imminent natural disasters and the consequent man made conflicts.
- Improved relations among the countries of the region and harmonisation of strategies and actions.



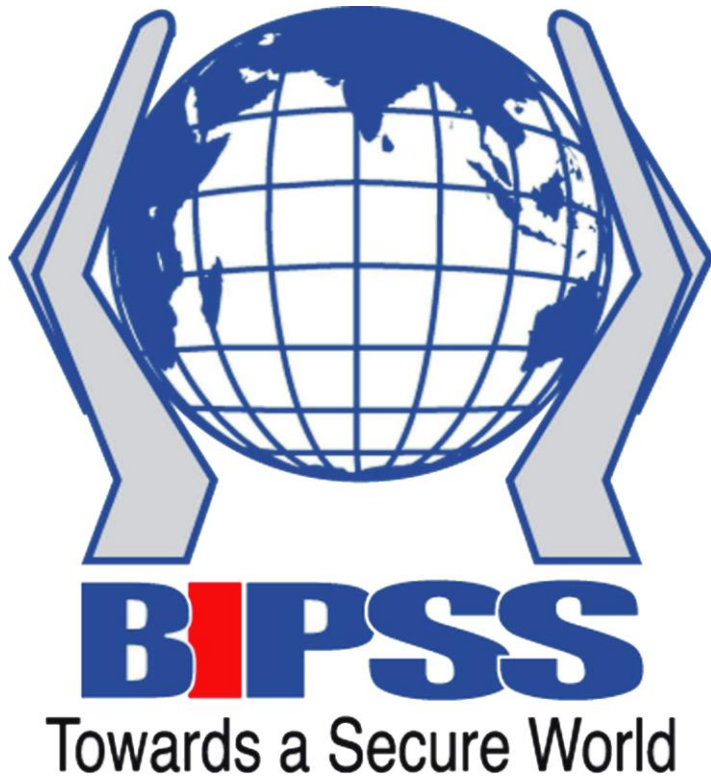


Questions

and

Comments





**Thank You**

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