CLIMATE CHANGE AND NATIONAL SECURITY

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Outline of Presentation

- Introduction
- Current Status of Climate Change
- Threat Landscape and Security Implications
- Threats to National Security: Bangladesh Case
- Measures to Take
- Question and Comments

Introduction

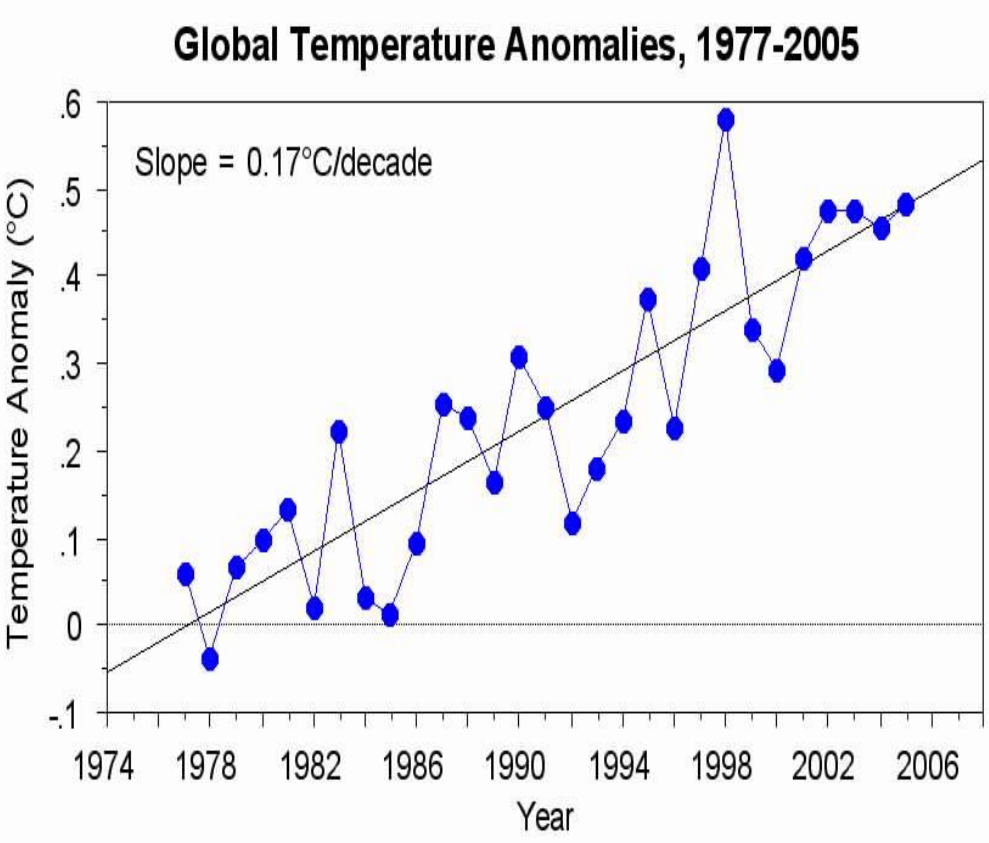
- Climate change has appeared as one of the greatest challenges to national and international security.
- Global warming is predicted to increase the frequency and intensity of various natural disasters i.e. tropical storms, flash floods, landslides etc. which can jeopardise the security of the individual and the state to a great extent.
- Climate change reinforces present trends of instability and conflict while at the same time draw new lines of conflict within and between states.

Current Status of Climate Change

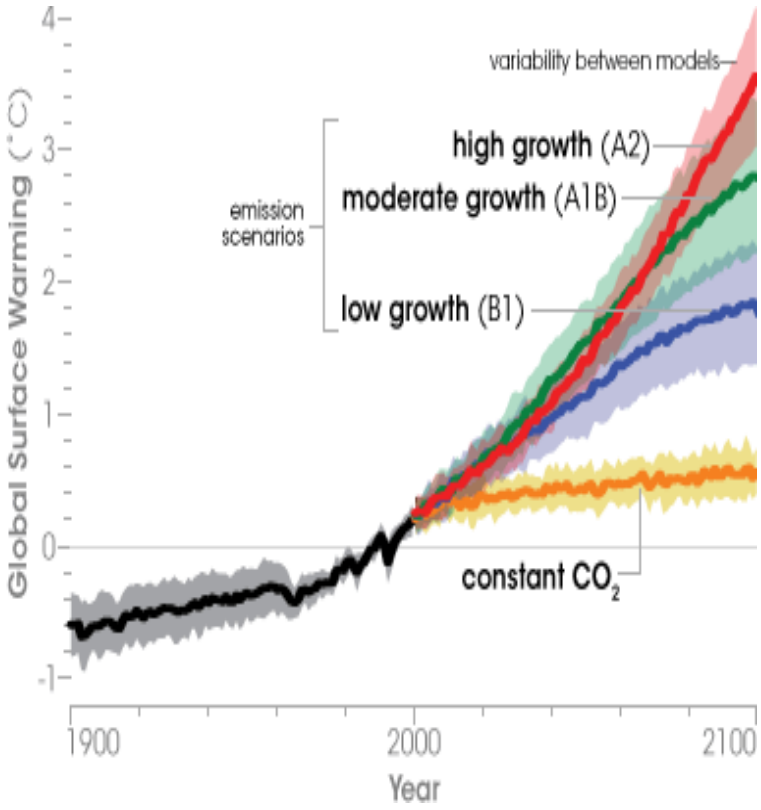
- Long-term changes in climate observed:
  - arctic temperatures and ice
  - precipitation amounts
  - ocean salinity
  - wind patterns and
  - aspects of extreme weather including droughts, heat waves and
  - the intensity of tropical cyclones

Current Status, (contd.)

- The 2007 IPCC report predicts temperature rise of 1.1 - 6.4 °C (2 - 11.5 °F) by 2100.

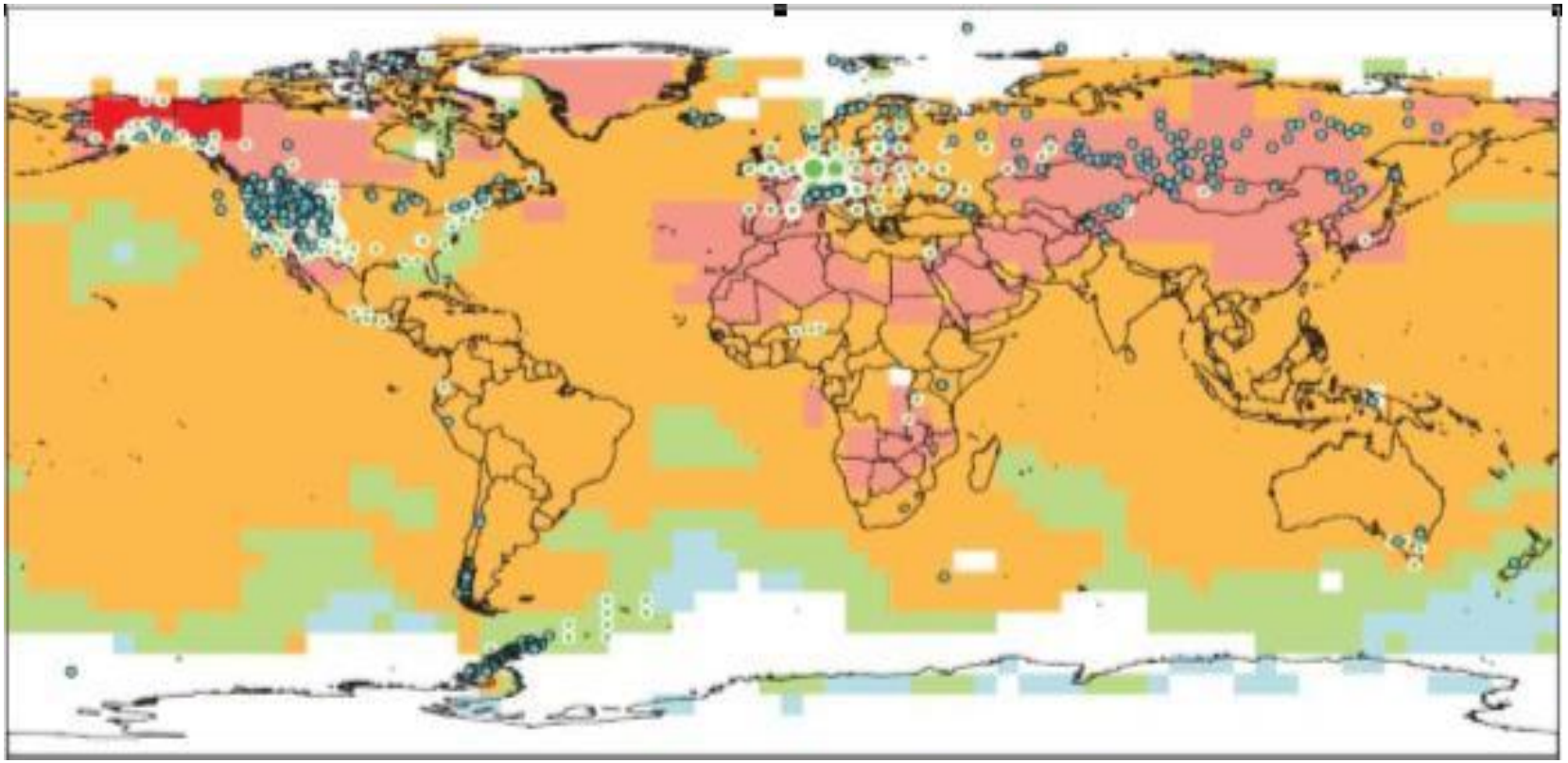


IPCC Warming Projections



Source:
Environmental Protection Agency

Changes in Temperature

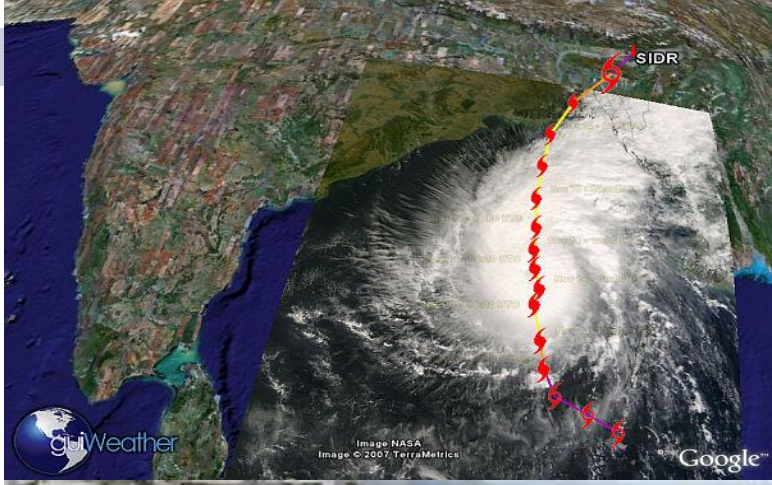


Current Status(contd.)

- **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)



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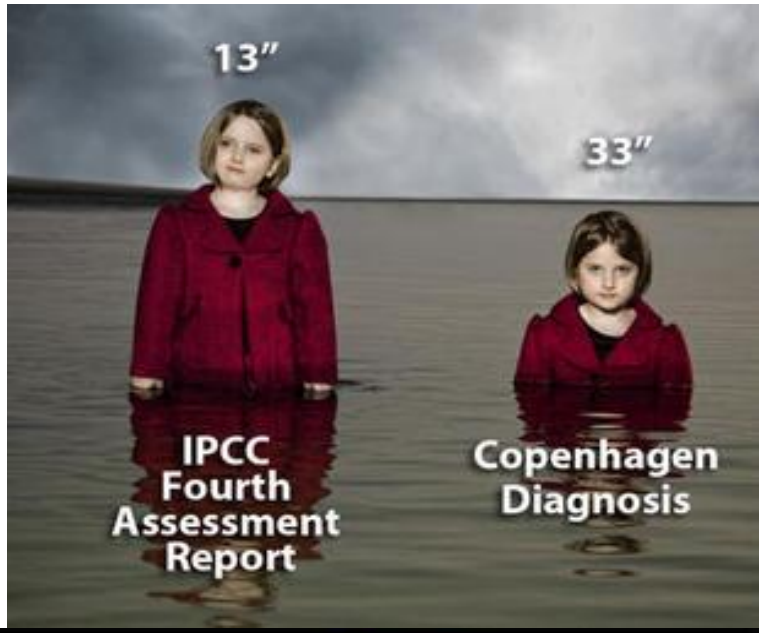
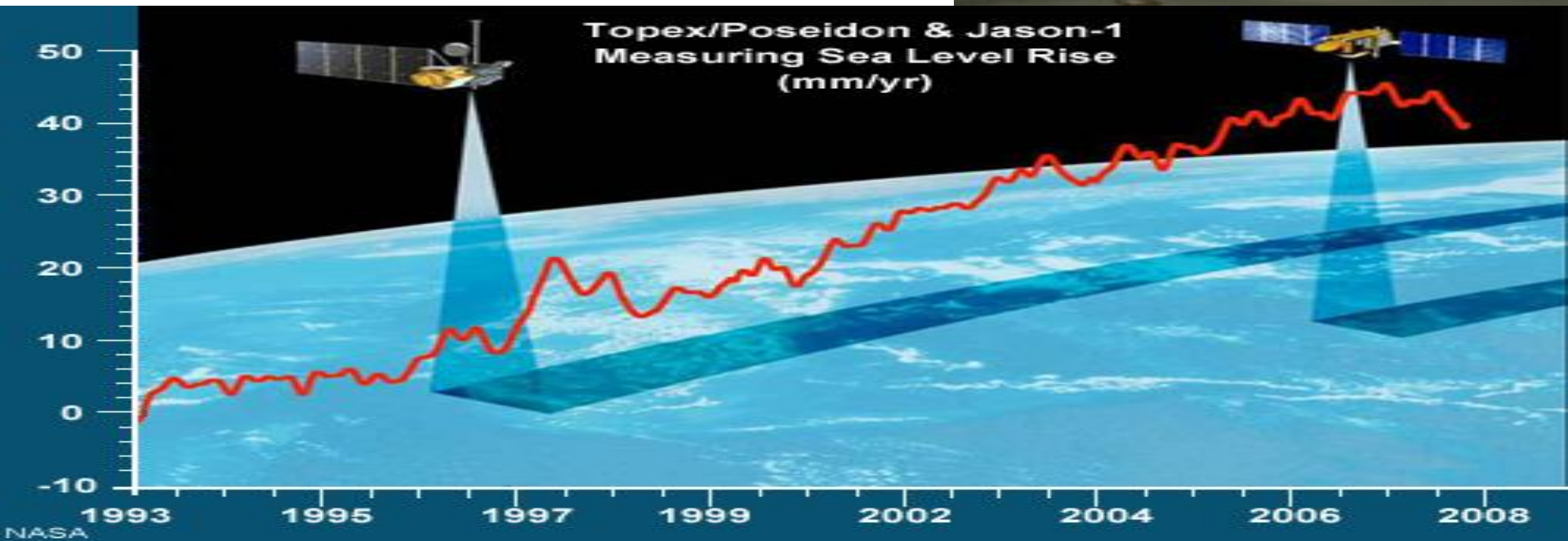
Significant Sea level rise by 2100 is predicted by IPCC.





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- The 2001 World Disasters Report of the Red Cross and Red Crescent Societies estimated of 25 million current “environmental refugees”.

- UN University’s Institute for Environment and Human Security estimates the rise of environmental refugees up to 50 million.

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

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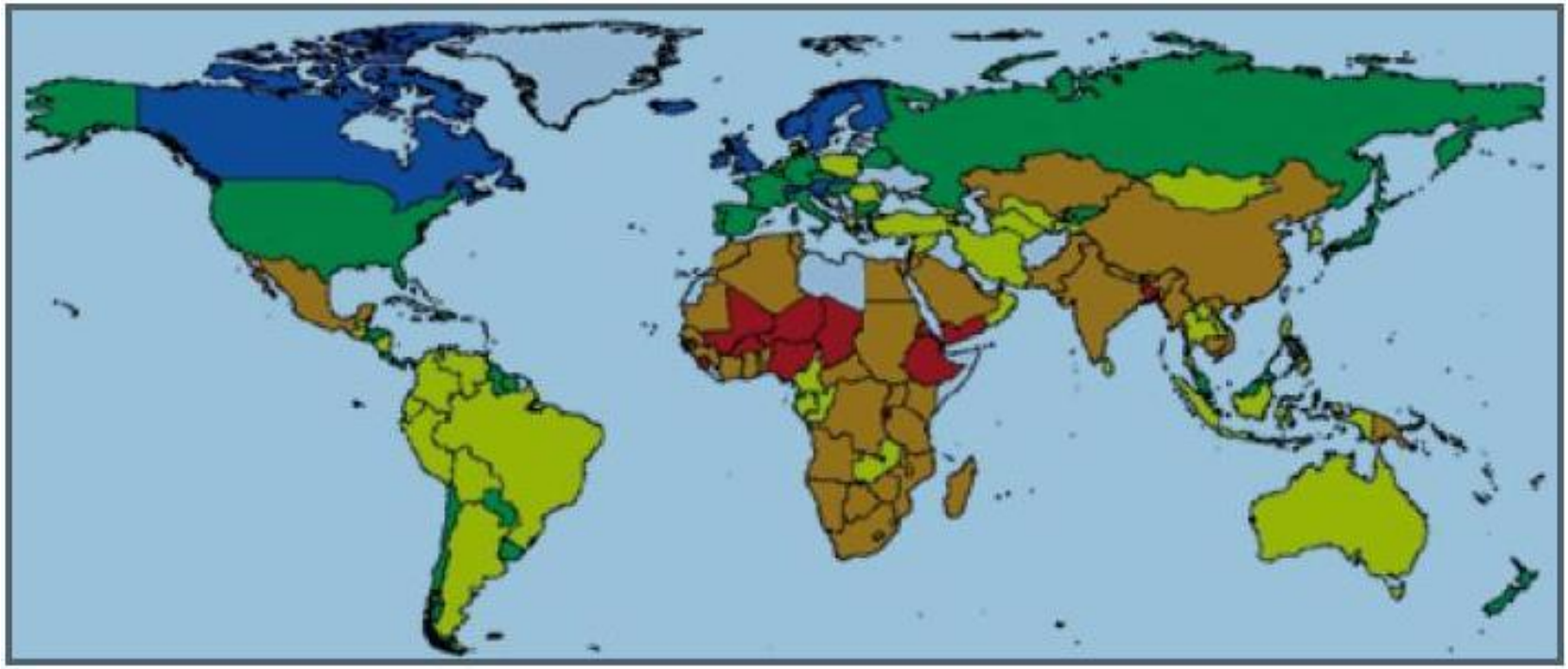
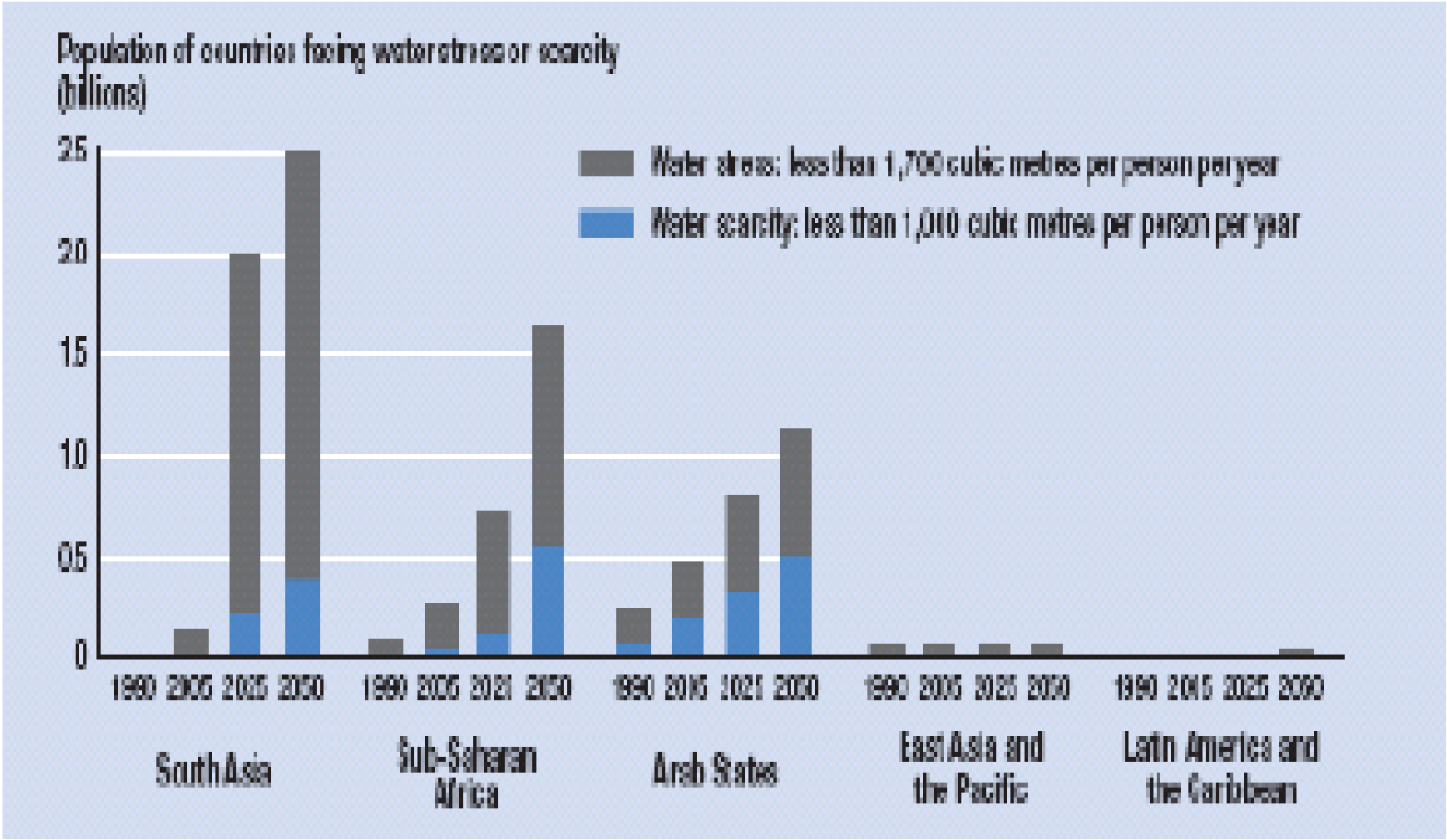
Water Security

- Climate change exacerbates water quality and availability in regions with water scarcity: Africa, South Asia, Southwest Asia, the Middle East and the Mediterranean.
- Currently 1.1 thousand million people are without access to safe drinking water.
- 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 4th Ass on climate change in Asia)
- Freshwater availability in Central, South, East and South-East Asia is likely to decrease that could adversely affect more than a billion people in Asia by the 2050. (Source: IPCC 4th Ass on climate change in Asia)

Areas Vulnerable to Climate Related Water Challenges

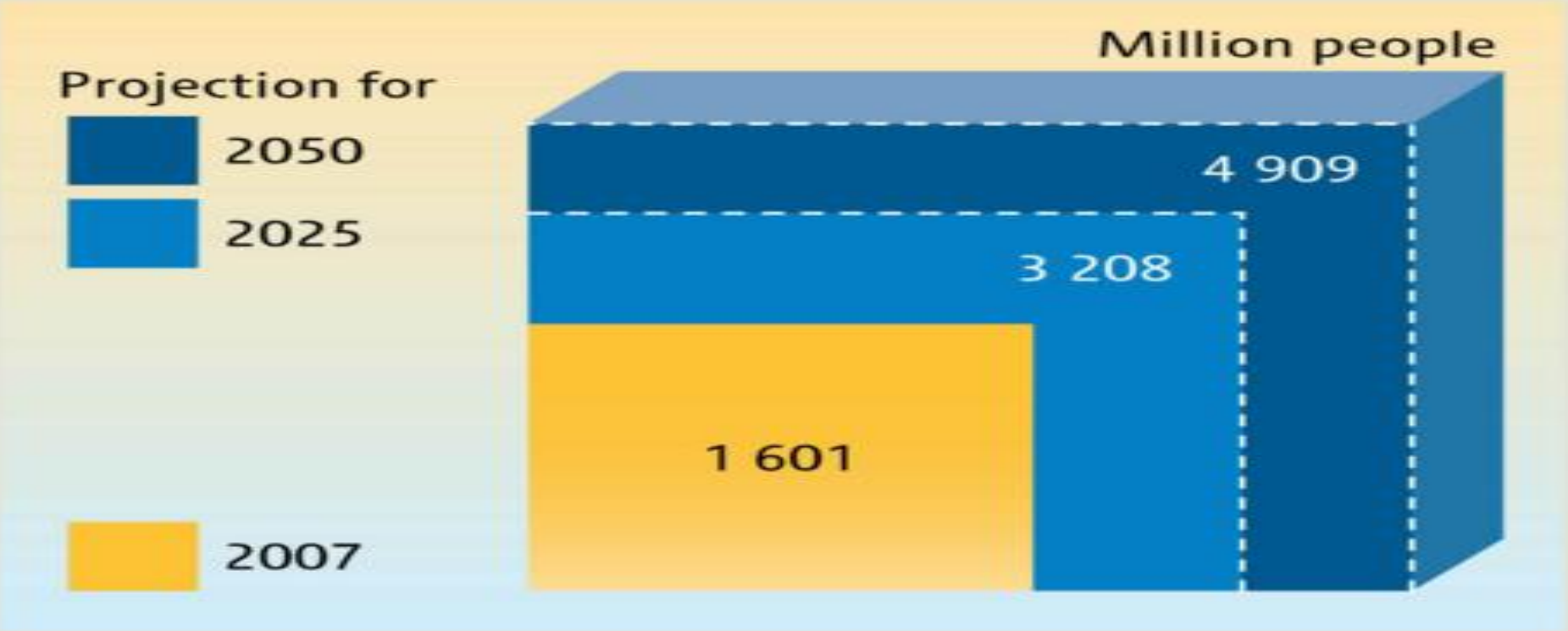


Projected Stress in Water Availability (2025-2050)



Source: HDR, 2006

World population living in river basins with severe water stress

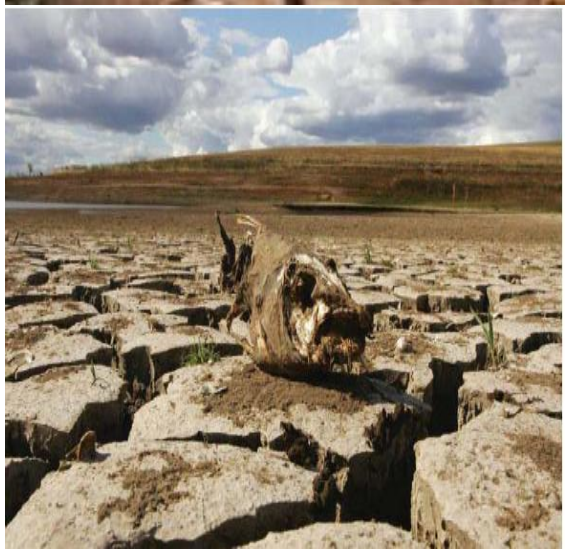


Water availability below 1 000 m3 per capita per year was regarded as an indicator of water stress.
Projections for 2025 and 2050 are computed considering socio-economic and climatic driving forces from the B2 scenario of the IPCC.

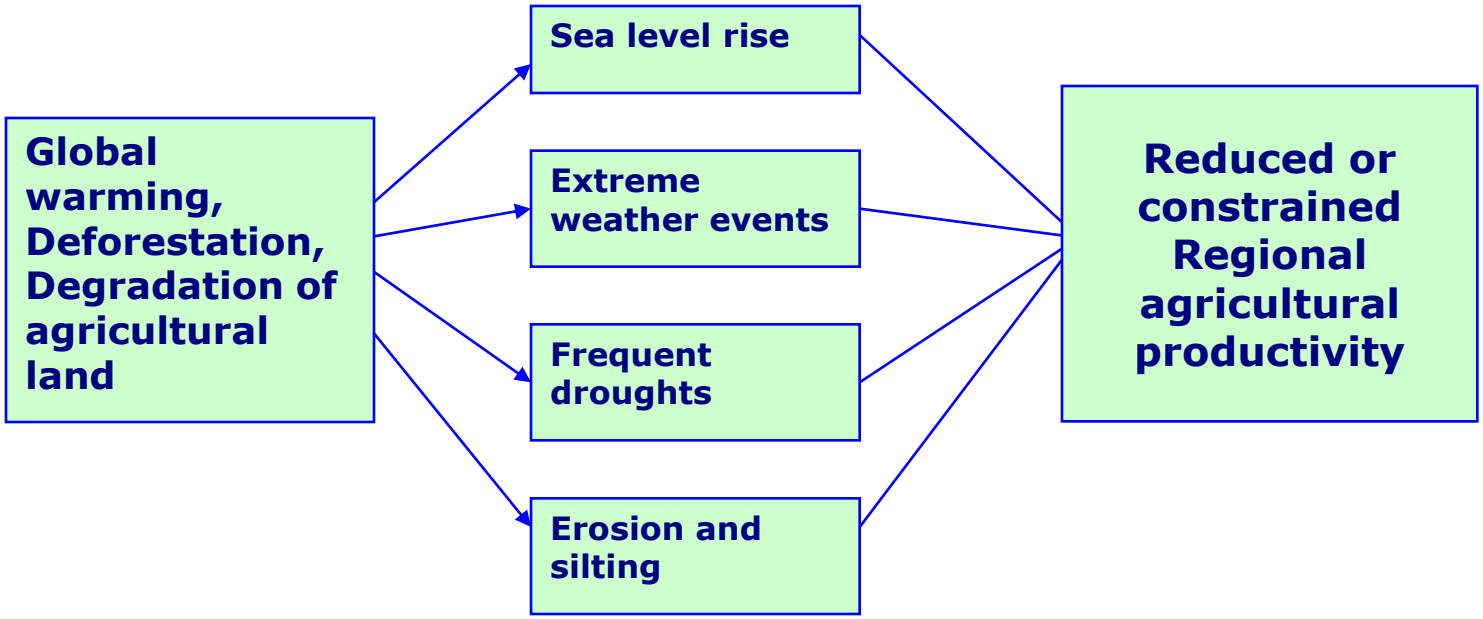
Source: Joseph Alcamo, *et al*, Future Long-term changes in global water resources driven by socio-economic and climatic changes, Hydrological Sciences Journal, 52(2), April 2007.

Food Security

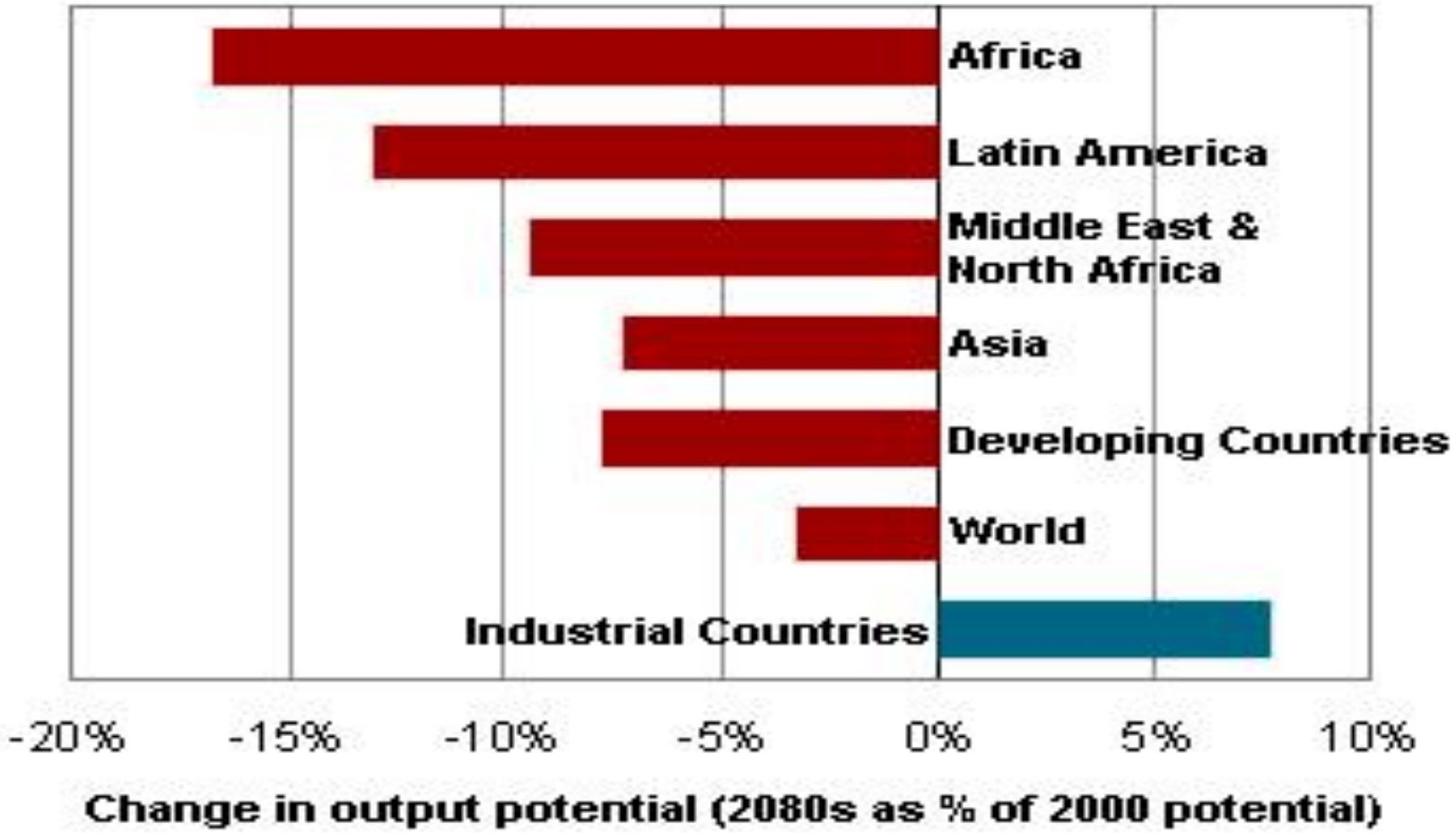
- Reduced agricultural productivity is potentially the most worrisome consequence of climate change.
- If global warming rises to 3 ^{0} C it is likely that the number of people suffering from hunger will increase by 250 million to 550 million. (Stern 2006:72)
- The combination of various climate change impacts will overstretch adaptive capacities in agricultural production. (IPCC, 2007)
- According to German Advisory Council on Global Change, agricultural production from rain-fed agriculture could fall by about 50% in some regions by 2020 (WBGU 2007)



Possible Effects of Environmental Change on Agricultural Productivity



Impact on Agriculture Output Potential

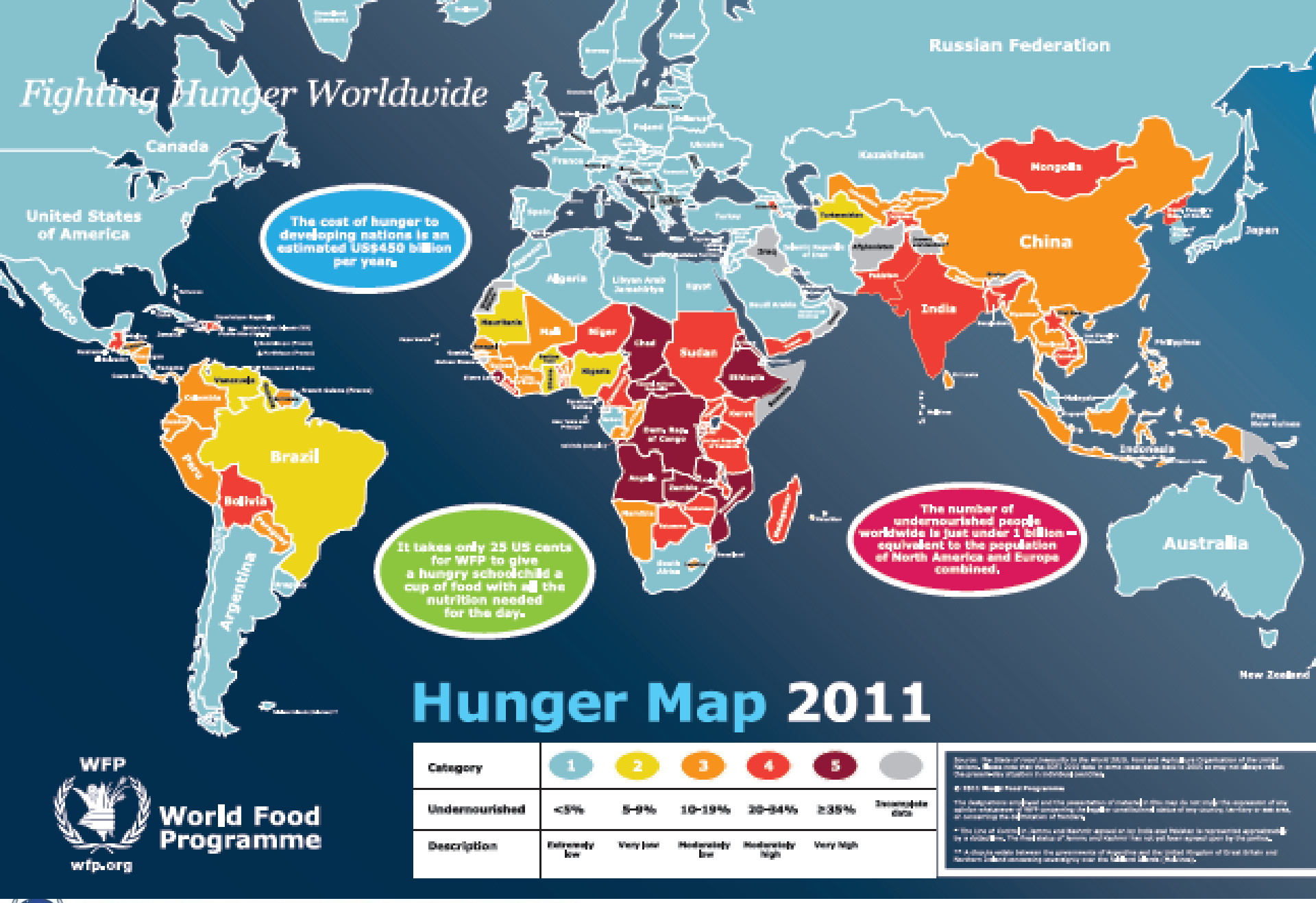


Source: Earth Trends, 2008

Rising Food Price

It has been estimated that rising food prices could potentially push 100 million people back into poverty
(Source: SA Forum on Food Insecurity, 2008)

Source : FAO



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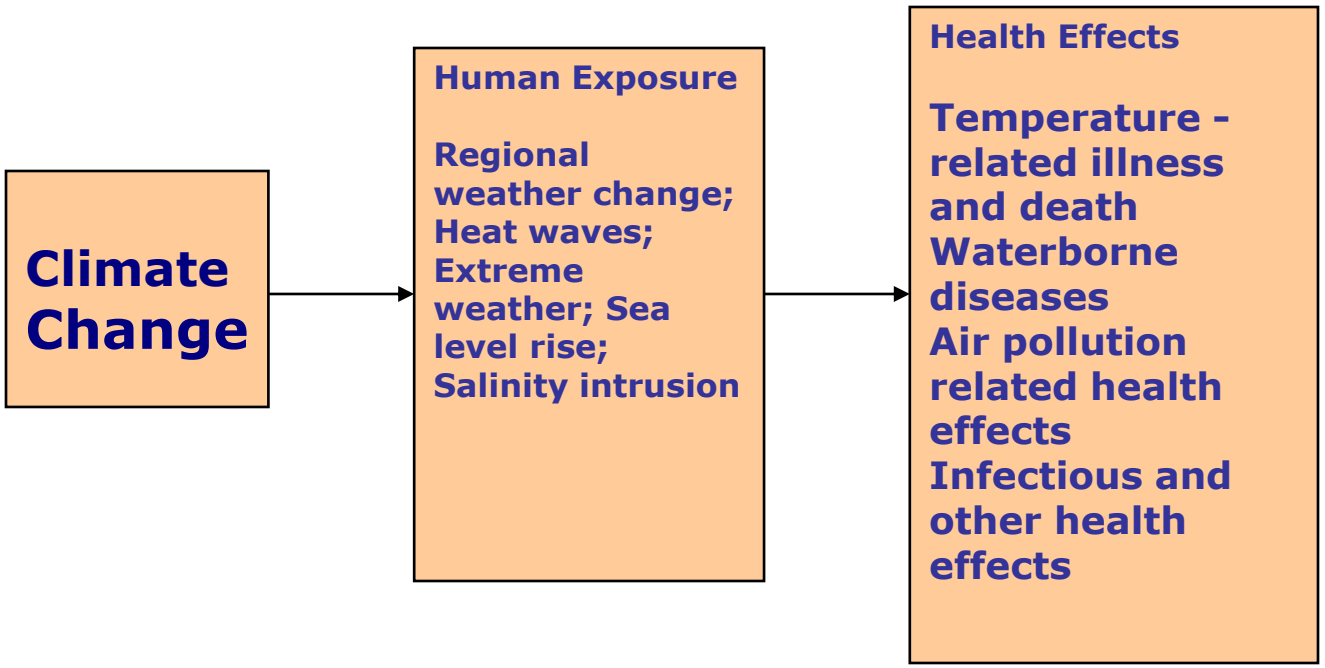
Source : WFO 20

Health Security

- Every year the health of 235 million people is likely to be seriously affected by gradual environmental degradation due to climate change.
- Climate change is projected to cause over 150,000 deaths annually and almost 45 million people are estimated to be malnourished because of climate change.
- Climate change-related diarrhoea incidences are projected to amount to over 180 million cases annually, resulting in almost 95,000 fatalities.

Source: http://www.eird.org/publications/humanimpactreport.pdf

Impact of Climate Change on Human Health



Disaster Security

- Climate change and variability are factors which influence trends- frequency and intensity of disasters.
- In recent years, unprecedented floods: Africa's worst floods in three decades, unprecedented flooding in Mexico, massive floods in South Asia and heat waves and forest fires in Europe, Australia, and California.
- According to Oxfam estimate developing countries will require at least US$50bn annually to adapt to unavoidable climate change.

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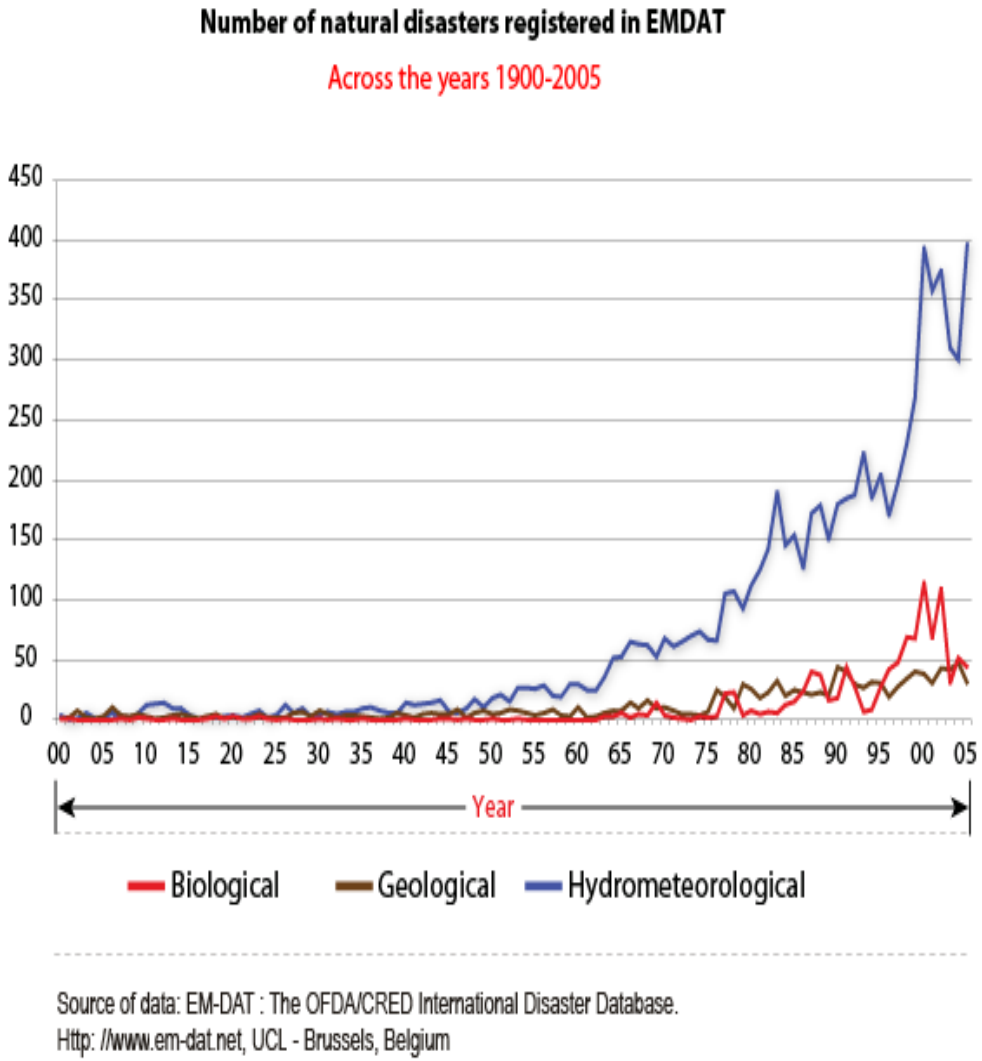
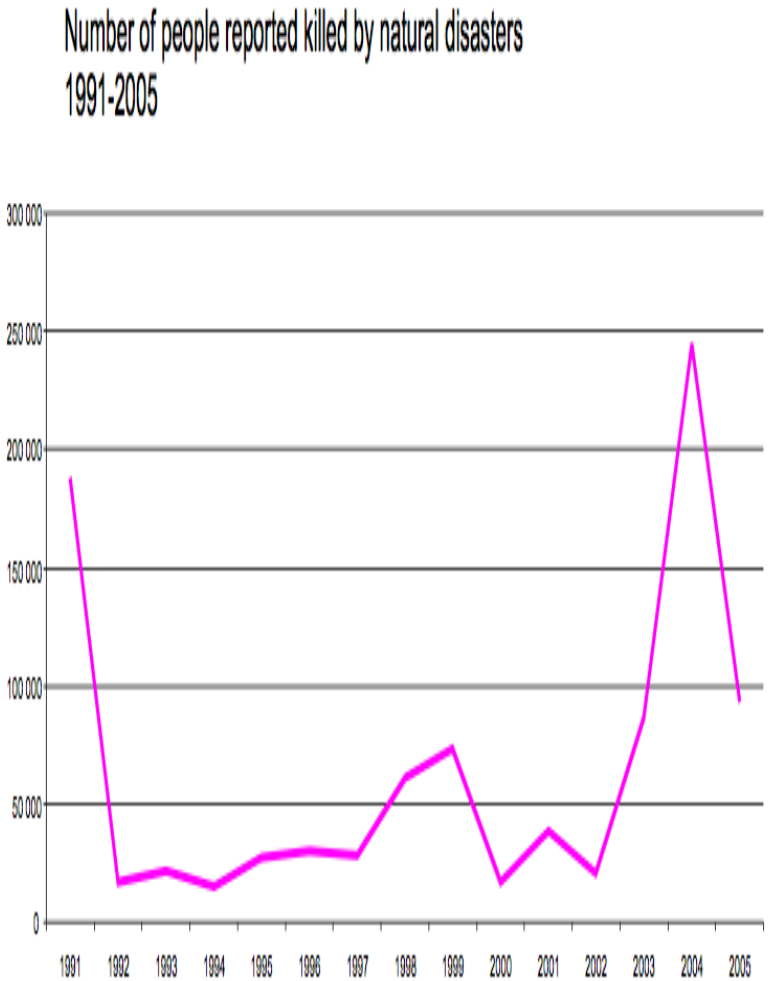


Source of data: EM-DAT : The OFDA/CRED International Disaster Database.
Http: //www.em-dat.net, UCL - Brussels, Belgium



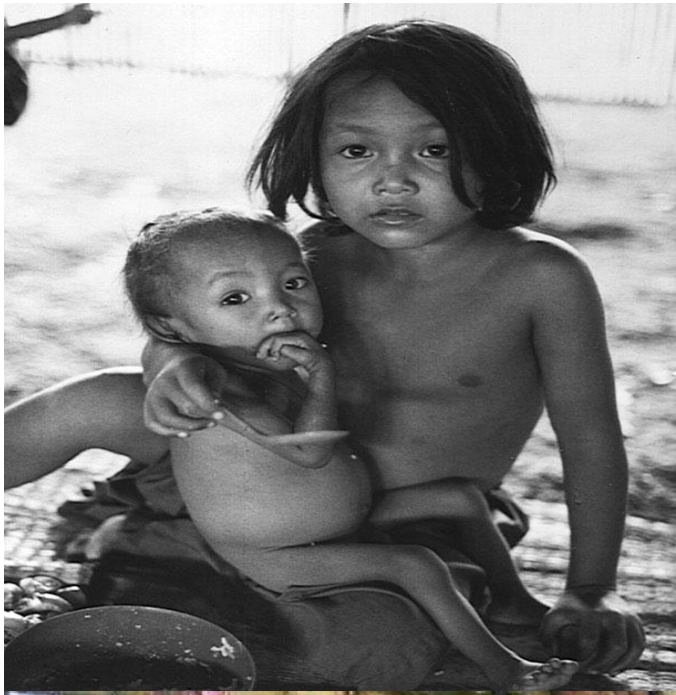
Energy Security

- The impacts of climate change may damage key infrastructures, such as energy, plants, supply pipelines, and consequently destabilise public order.
- Recent earthquake in Japan caused explosion in the Fukushima nuclear plant, for instance, causing human casualties and disruption to energy production.
- The decline in hydroelectric power generation may additionally reinforce competition/conflicts over fossil energy sources.




Climate Change and Migration

- Climate change could potentially trigger large-scale displacement and migration from one region to other in search of new avenues for employment and/or settlement.
- 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).
- Loss of livelihoods will trigger IDPs in vulnerable regions.



Hard Security

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

Radicalisation and Terrorism

- Radicalisation and terrorism may increase in many developing societies particularly in South Asia due to the climate induced social and economic deprivation.
- When a government can no longer deliver services to its people, conditions are ripe for the extremists and terrorists to fill the vacuum.
- The Rohingyas of Myanmar is a very relevant example of how marginalized people get involved in radicalisation and subsequently to terrorism.

Conflict over Resources

- Resource scarcity has the potential to be a contributing factor to conflict and instability.
- The 1994 genocide in Rwanda was furthered by violence over agricultural resources.
- The 1974 Nigerian coup that resulted largely from an insufficient response to famine.
- Situation in Darfur, Sudan, which had land resources at its root and which is increasingly spilling over into neighboring Chad.
- In the late 1990s conflict took place over timber resources in Liberia.

(Source: CNA Report, 2009)

Challenges of Environmental Scarcity

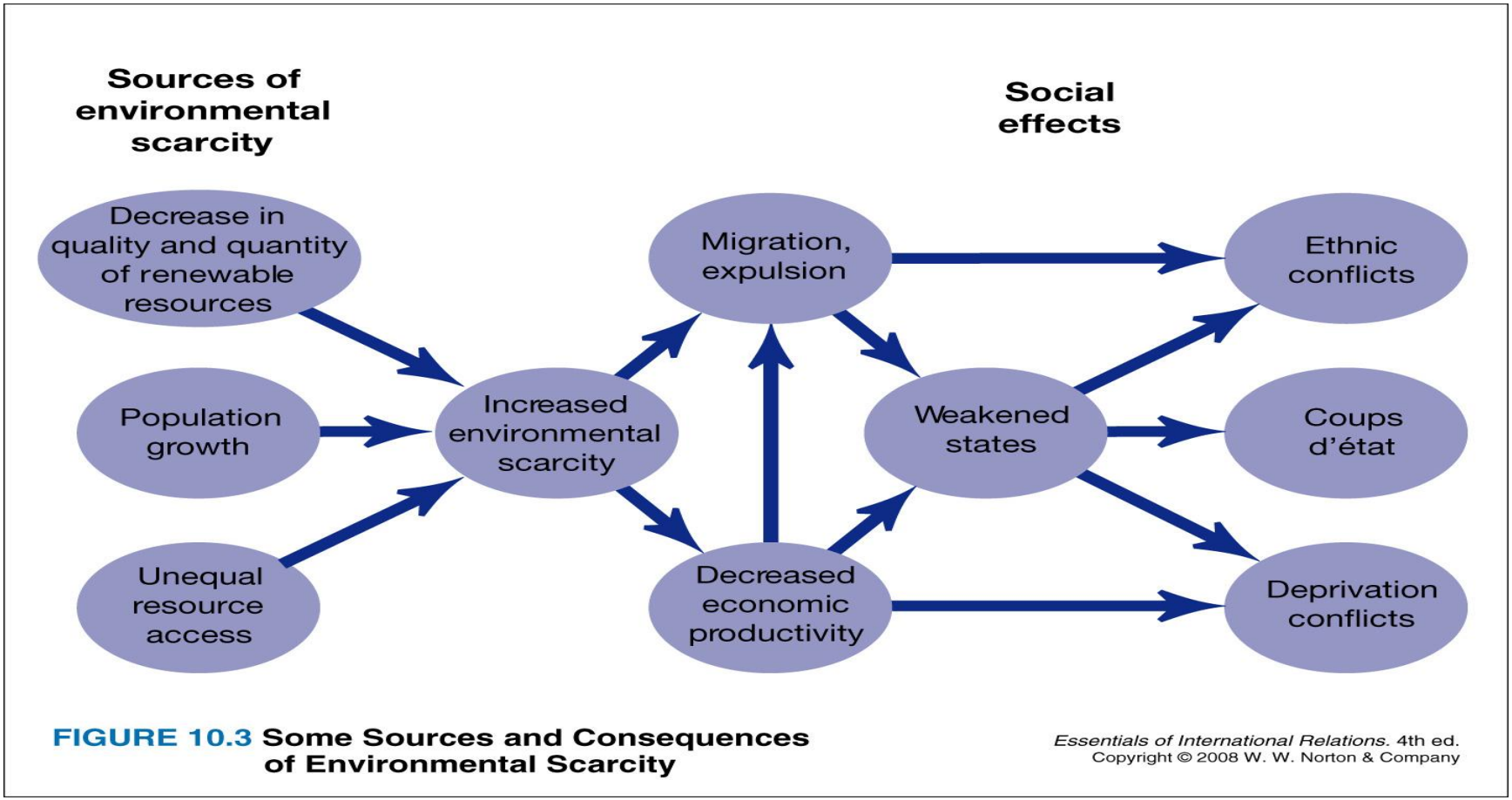


FIGURE 10.3 Some Sources and Consequences of Environmental Scarcity

Inter-state Conflict

- Rising tension
- Localised war
- Inter-state conflict/war

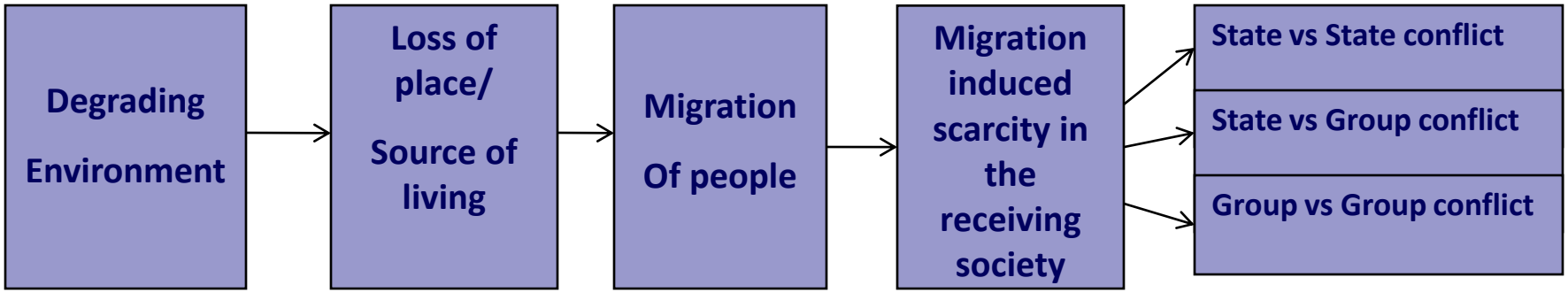
"For centuries, wars have been fought for territorial expansion, ideological or religious dominance, and national pride. In the future, as climate change progresses and its effects become more pronounced, conflicts between states over natural resources could increasingly take centre-stage."

Byers & Dragojlovic, Human Security Bulletin, October 2004

Intra-state Conflict

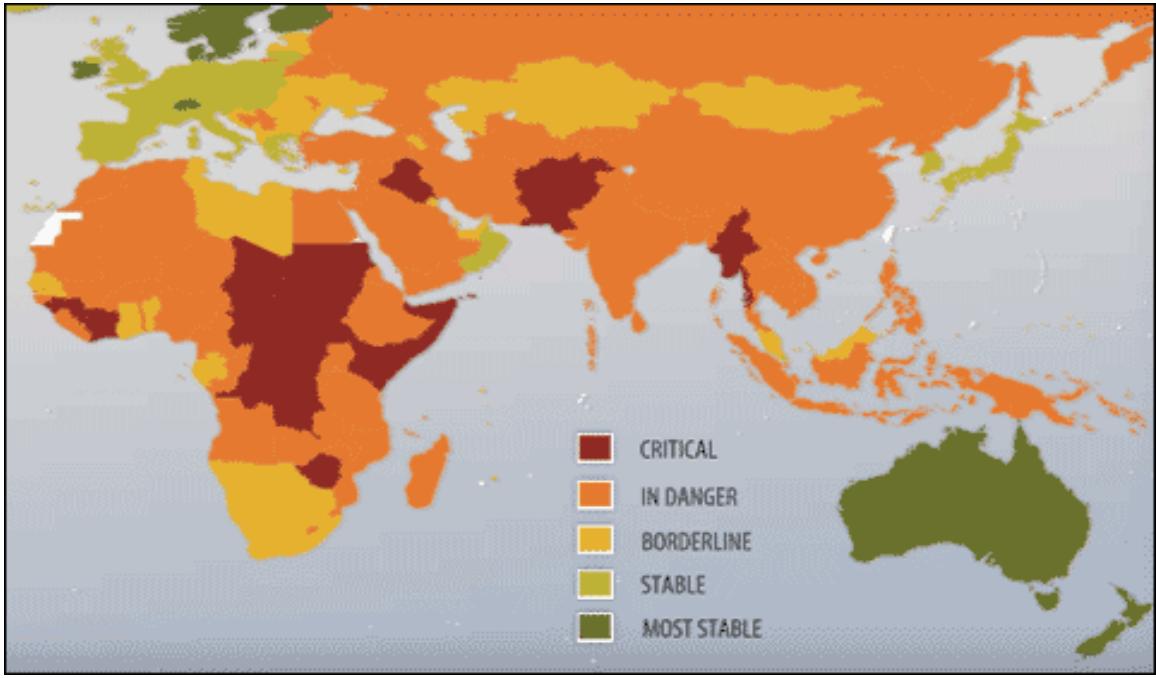
- Ethnic conflict
- Civil strife
- Terrorism
- Social Fragmentation

The Environmental Trap: Environment and Conflict



State Collapse

- Vulnerable state
- Weak state
- Fragile state
- Failed state
- Non-state

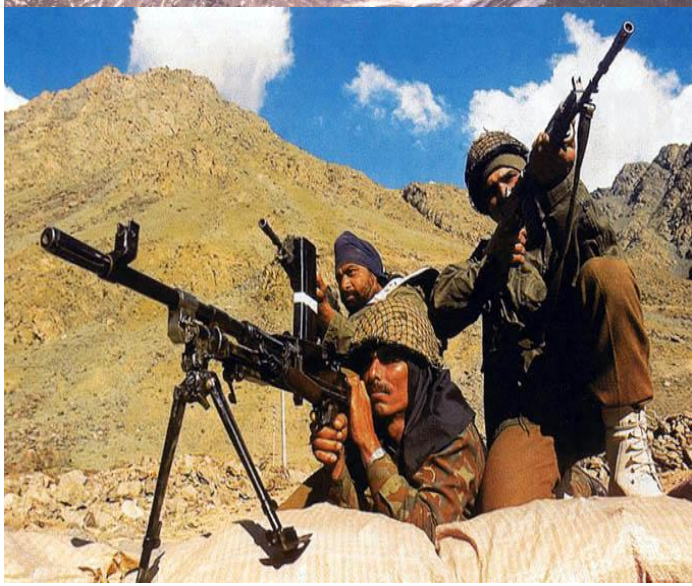


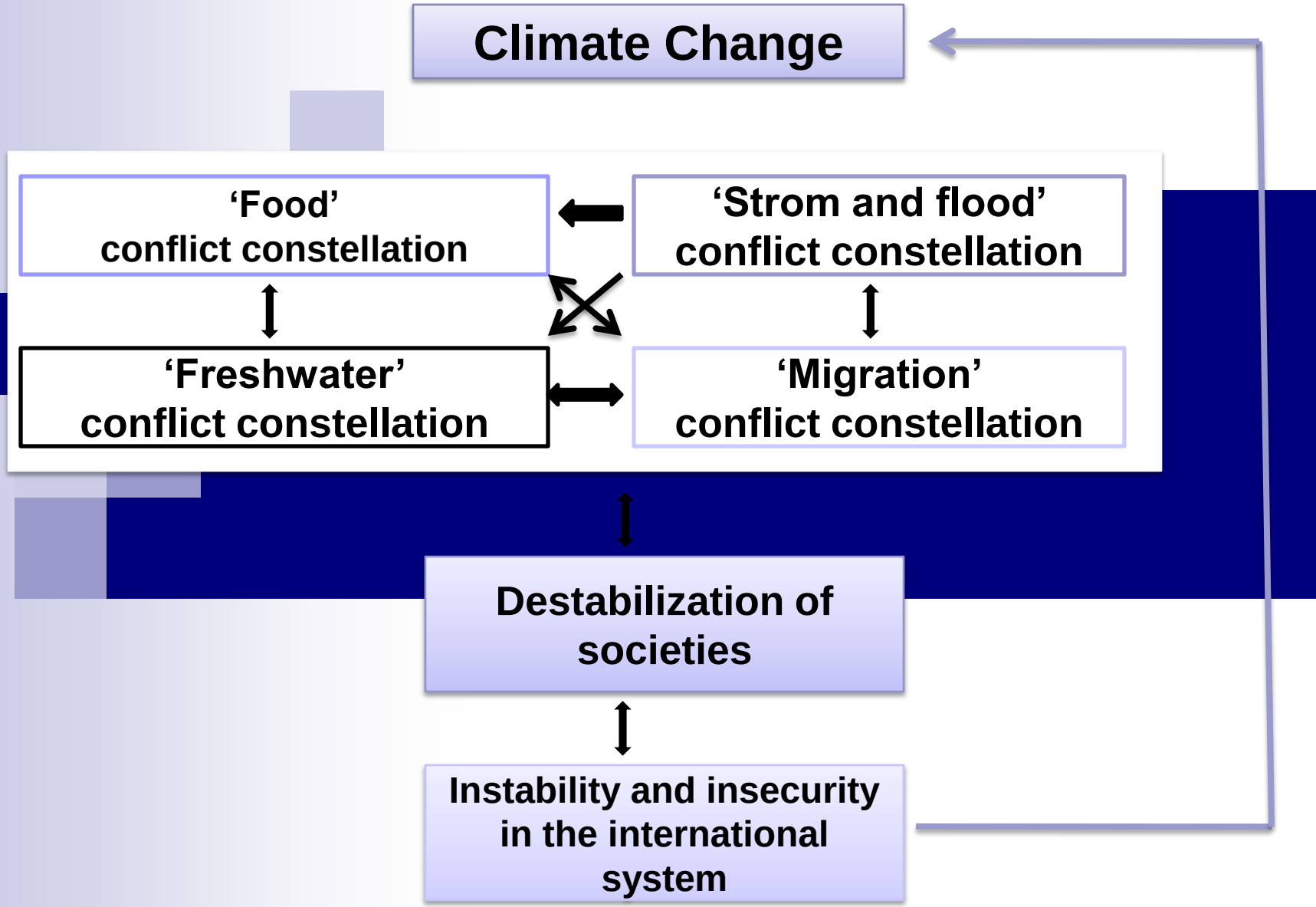
"When climate change significantly or environmental conditions deteriorate to the point that necessary resources are not available, societies can become stressed sometimes to the point of collapse"

CNA Report on the National Security and the Threat of Climate Change

Regional Destabilisation

- Climate change acts as a threat multiplier for instability in some of the most volatile regions including South Asia.
- Projected climate change will seriously exacerbate already marginal living standards in many Asian, African, and Middle Eastern nations, causing widespread political instability and the likelihood of failed state.





Climate Change as drivers of international destabilization

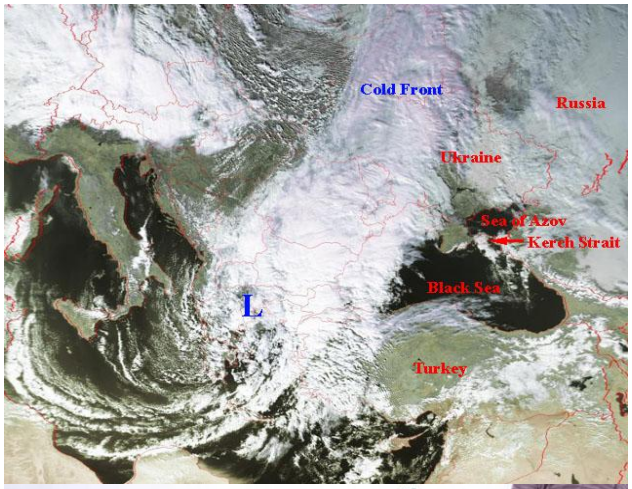
National Security Impacts: Bangladesh Case

Environmental Degradation in Bangladesh

- Natural Disasters (Flood, Draught, Cyclone, Earthquake, Tornado)
- Soil Erosion
- Sea Level Rise
- Scarcity of Foods
- Scarcity of Natural Resources
- Scarcity of Water

Global Warming Impacts on Bangladesh

- If nothing is done to curb emissions, sea levels could climb more than three feet
- 17- 20% of Bangladesh could be under water if sea water rises 1 meter (IPCC Report)
- The mangrove forests of Sundarban islands, a world heritage site, the Bengal tiger and hundreds of bird species may disappear



Source:http://www.askasia.org/

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- The rainfall could increase to 10% at the same time, changing drastically usual rainfall patterns

- The seawater rise would cause more havoc as it is estimated that by 2100 the level would increase by 88 cm from the current level

Impact of sea level rise on Bangladesh

- The coastal region covers almost 29,000 sq. km or about 20% of the country. Again, the coastal areas of Bangladesh cover more than 30% of the cultivable lands of the country. About 53% of the coastal areas are affected by salinity.
- The IPCC statistics shows that rising sea levels will wipe out more cultivable land in Bangladesh than anywhere in the world. By 2050, rice production is expected to drop 10 percent and wheat production by 30 percent.
- About 20 to 30 million people in Bangladesh alone could be on the move by 2050 because of climate change, causing the worst migration in human history.

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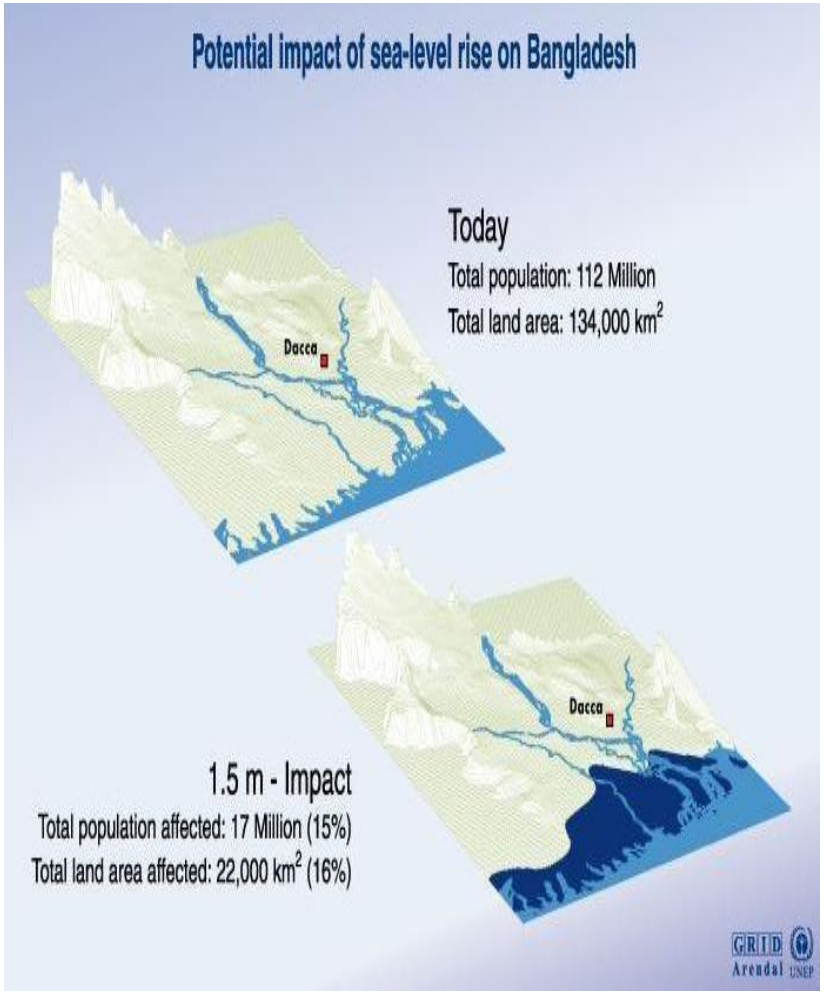
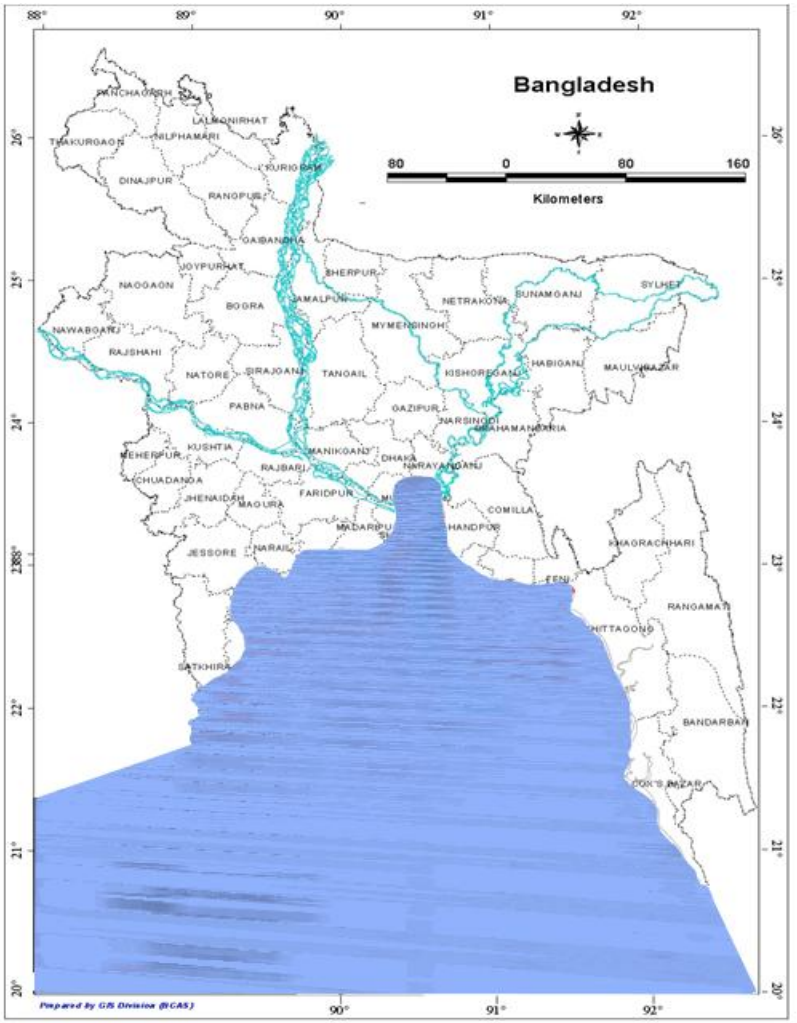

Potential impact of sea-level rise on Bangladesh
Today
Total population: 112 Million
Total land area: 134,000 km2
Dacca
Dacca
1.5 m - Impact
Total population affected: 17 Million (15%)
Total land area affected: 22,000 km2 (16%)
GRID
Arendal
UNEP


Bangladesh
80 0 80 160
Kilometers
88°
89°
90°
91°
92°
26°
25°
24°
23°
22°
21°
20°
PANCHAGARH
LALMONIRHAT
NILPHAMARI
THAKURGAON
DINAJPUR
RANGPUR
KURIGRAM
GAIBANDHA
JOYPURHAT
BHERPUR
NAOGAON
JAMALPUR
SYLHET
SUNAMGANJ
NETRAKONA
BOGRA
MYMENSINGH
NAWABGANJ
RAJSHAHI
NATORE
SIRAJGANJ
TANGAIL
KISHOREGANJ
HABIGANJ
MAULVIBAZAR
PABNA
GAZIPUR
NARSINGDI
MUNSHIGANJ
KUSHTIA
MANIKGANJ
DHAKA
MEHERPUR
RAJBARI
NARAYANGANJ
CHUADANGA
FARIDPUR
JHENAIDAH
MAGURA
COMILLA
MADARIPUR
CHANDPUR
JESSORE
NARAIL
KHAGRACHHARI
FENI
RANGAMATI
CHITTAGONG
SATKHIRA
BANDARBAN
COX'S BAZAR
Prepared by GIS Division (BCAS)

- If sea levels were to rise by the predicted amount of 88 to 89 cm (2-3 ft) then the effect on Bangladesh would be disastrous. An 89cm increase in the sea level would eat up roughly one fifth (20%) of Bangladesh's landmass, displacing nearly 20 to 30 million people who will become environmental refugees (IPCC 2007)

(Source: UNEP, Vital Water Graphics, 2nd Edition, 2008)

- About 75% area of mangrove forest, Sundarban (60007 Sq. km) will submerse if the sea level will increase 45 cm.

Impact on Agriculture Productivity

- Sea level rise, and salinity intrusion decrease agricultural production by unavailability of fresh water and soil degradation. (Rashid et al., 2004; Ashraf et al., 2002).
- For example Loss of rice production in a coastal village of Satkhira district rice production in 2003 was 1,151 metric tons less than the year 1985, corresponding to a loss of 69 per cent. Ali (2005)

	Year	1985	1990	1995	2003
Area & months under rice and shrimp farming in ha (% crop land)	HYV Aman July - Nov.	345.5 (100)	344.6 (100)	332.4 (97.0)	314 (91.9)
	HYV Boro Dec. - May	200.4 (58)	269.6 (78.2)	122.4 (32.8)	58.2 (17)
	One shrimp cycle Dec. – Jan.	36.5 (10.6)	75.0 (21.8)	210.0 (67.2)	255.8 (91.0)
	Two shrimp cycle Dec. – Nov.	0	0	20.6 (3.0)	55.0 (8.0)
Expected total rice production		1373	1689	1679	1673
Observed total rice production		1265	1260	745	522
Decline in rice production due to loss of	Area	108	221	670	890
	Yield	-	208	264	261
Total loss of rice production		**108**	**429**	**934**	**1151**

(Adapted from Ali, 2005)

Food Scarcity in Bangladesh

- In 2008, 65 million people (approximately 45 percent of the population) were food insecure and consumed less than 2, 133 kcal per day in Bangladesh (WFP 2009)
- By 2008, the poor were spending 80 percent of their income on food in comparison to 70 percent in the previous year (WFP 2009).

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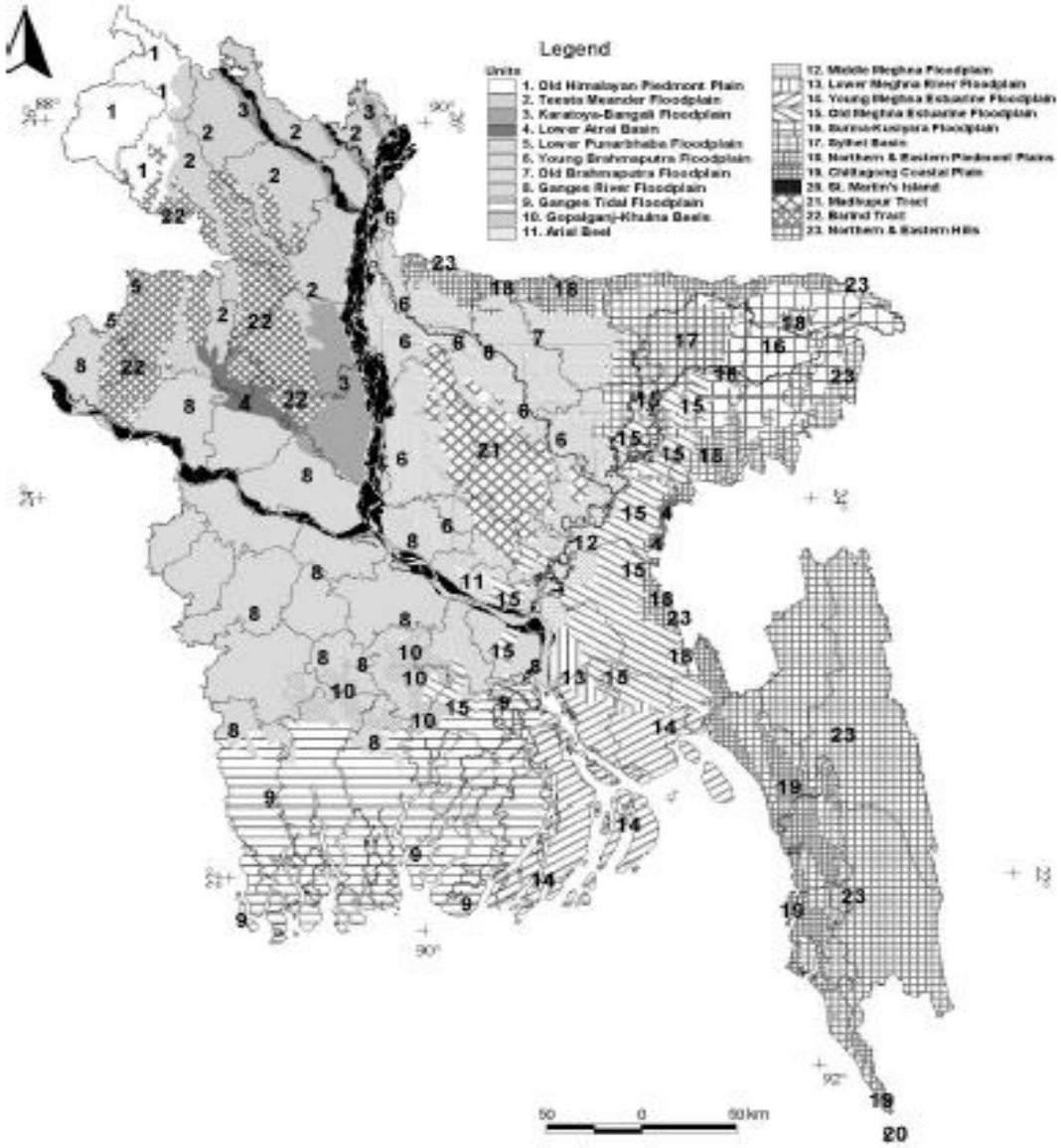
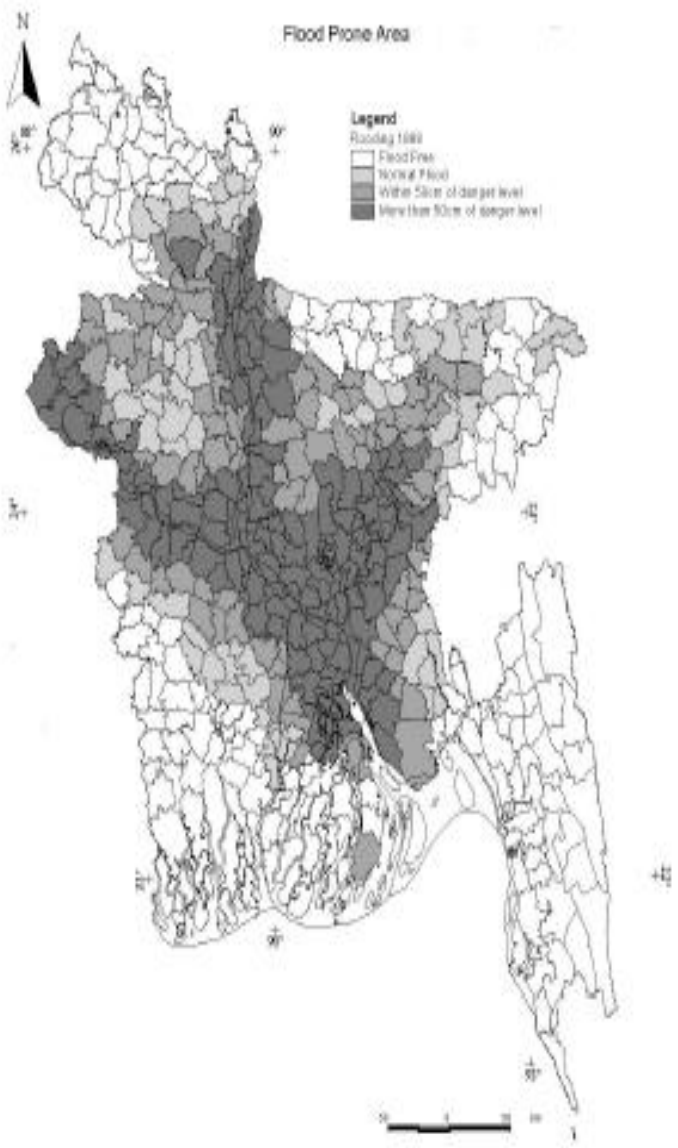
Water Shortage in Bangladesh

- Lack of access to adequate safe and drinking water
- Contamination & disease due to lack of safe water
- Lack of water for irrigation & cultivation
- Irregular discharge of water
- Between 35 and 77 million of the 125 million Bangladeshis were at risk of drinking contaminated water.(WHO, 2000)

Coastal Flooding: Is Bangladesh Sinking?





Physiography of Bangladesh showing major floodplains

Areal coverage of the 1998 flood

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

Health Hazards

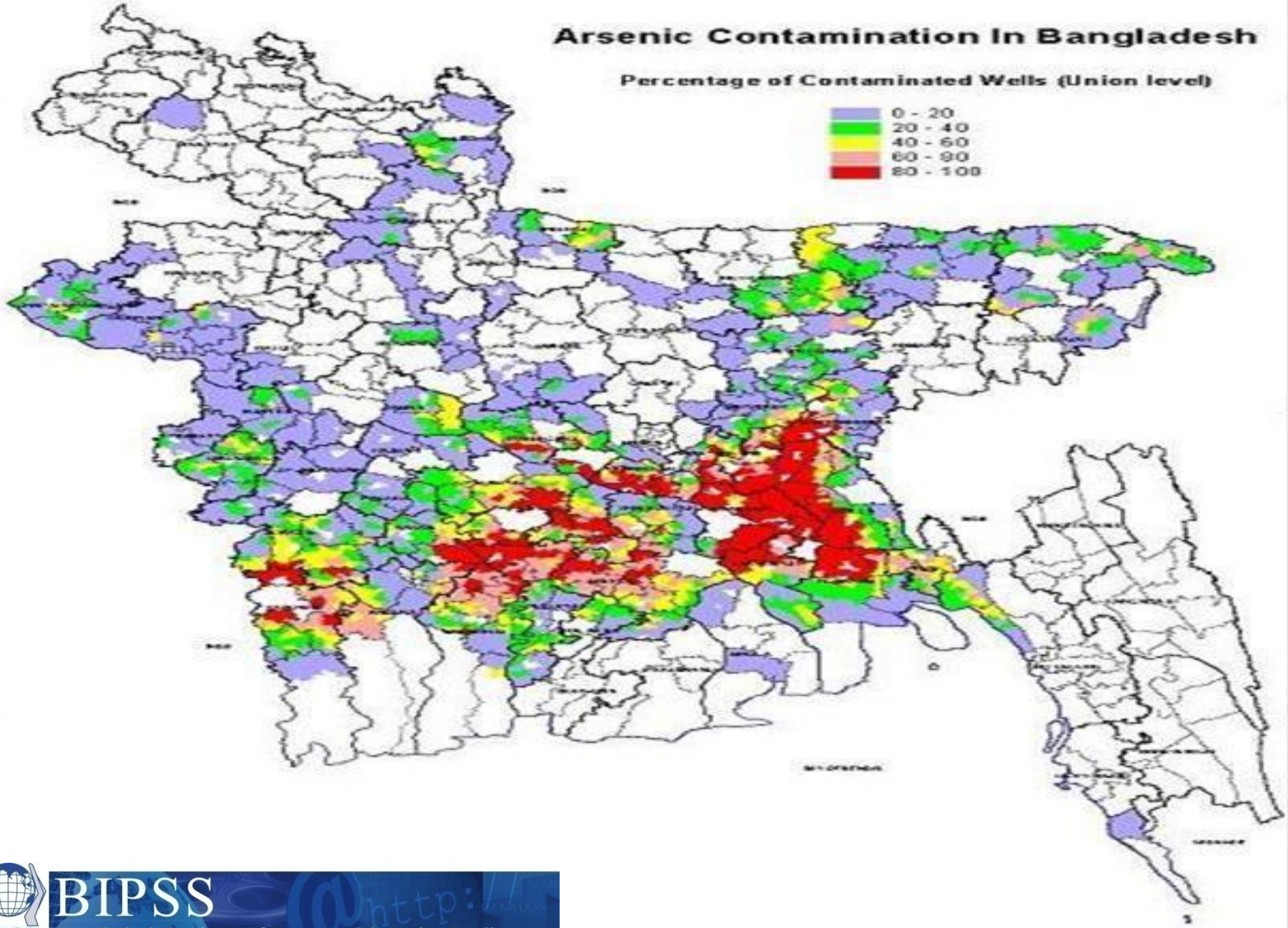
Spread of Climate-sensitive Diseases in Bangladesh

Diseases	Total cases per period	Period	Average annual cases
Diarrhoea	48302636	1988-2005	2842273
Skin diseases	23697833	1988-1996	2623092
Malaria	1018671	1974-2004	33956
Mental disorders	201881	1988-1996	22431
Dengue	19830	1999-2005	3305

Source:http://www.searo.who.int/LinkFiles/Regional_Health_Forum_volume_12_No_1_climate_change_and_its_impact

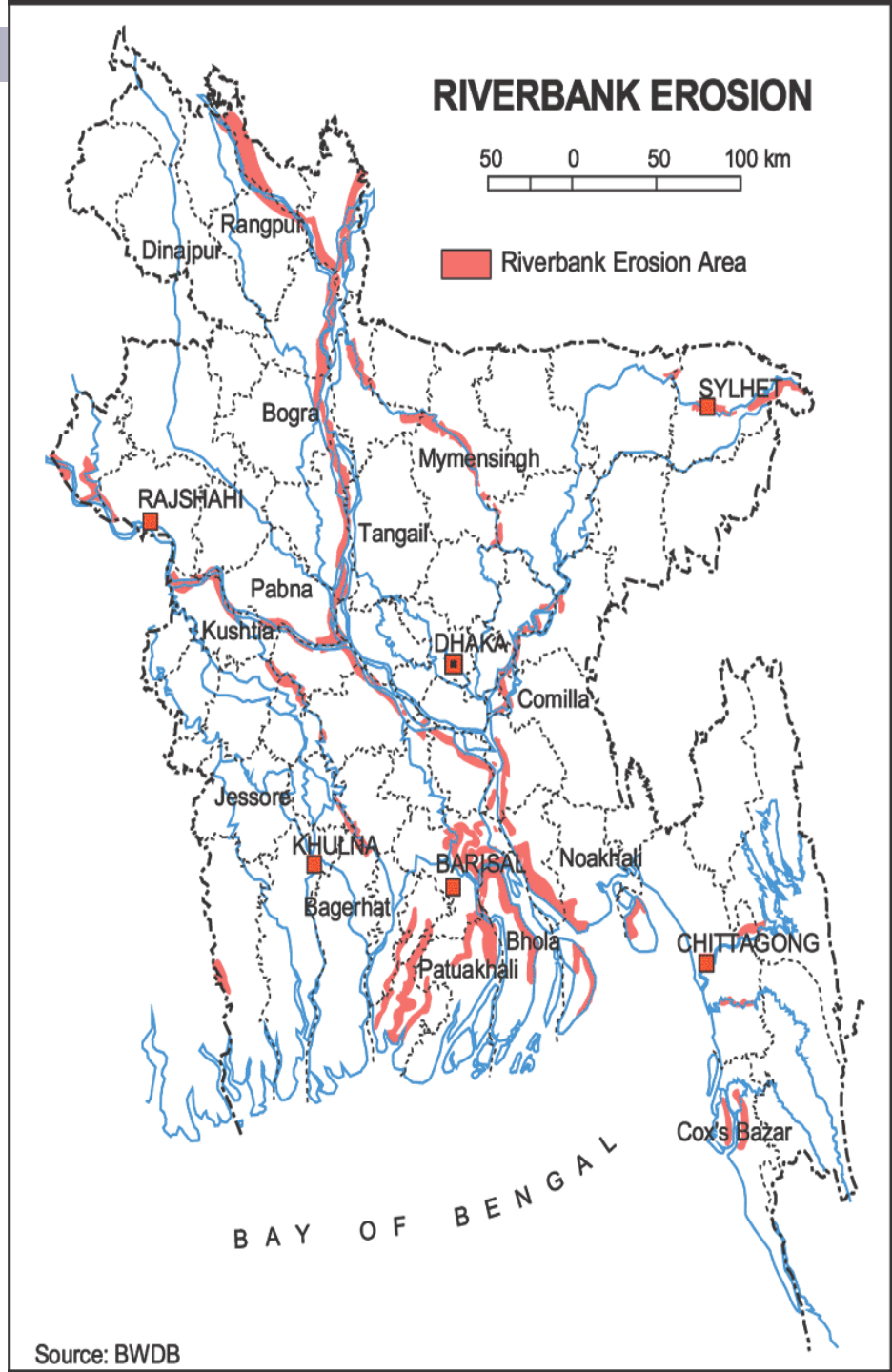
Arsenic Poisoning

- World Health Organization described the arsenic contamination in Bangladesh as "the largest mass poisoning of a population in history".
- Half of Bangladeshis, up to 77 million people, have been exposed to the toxic arsenic (according to British Medical Journal "The Lancet")


Arsenic Contamination In Bangladesh
Percentage of Contaminated Wells (Union level)
0 - 20
20 - 40
40 - 60
60 - 80
80 - 100

River Bank Erosion

- Sea level rise will increase morphological activities in the river, inducing increased river flow. Accelerated river flow will increase river bank erosion too (Alam 2003, p.13).
- Bank erosion is severe in char areas and sometimes it may wipe out chars from the map of Bangladesh.
- About 196 square kilometers of char area was eroded and a total of 11 chars were disappeared from Meghna river estuary area during the period of 1972-1987 (Pramanik, 1988; Cited in SDNP, 2004).



Salinity affected areas in the coastal and offshore regions of Bangladesh

Description	Total cultivated area(ha)	Saline Area(ha)
Non-saline with very slightly saline	4,25,490	1,15,370 (27%)
Very slightly saline with slightly saline	4,20,420	3,09,190 (73%)
Slightly saline with moderately saline	2,57,270	2,40,220 (93%)
Moderately saline with strongly saline	1,98,890	1,98,890 (100%)

Source:http://www.pakbs.org/pjbot/PDFs/38(5)/PJB38(5)1359.pdf

Human Exposure and Tracks of Cyclones in Bangladesh

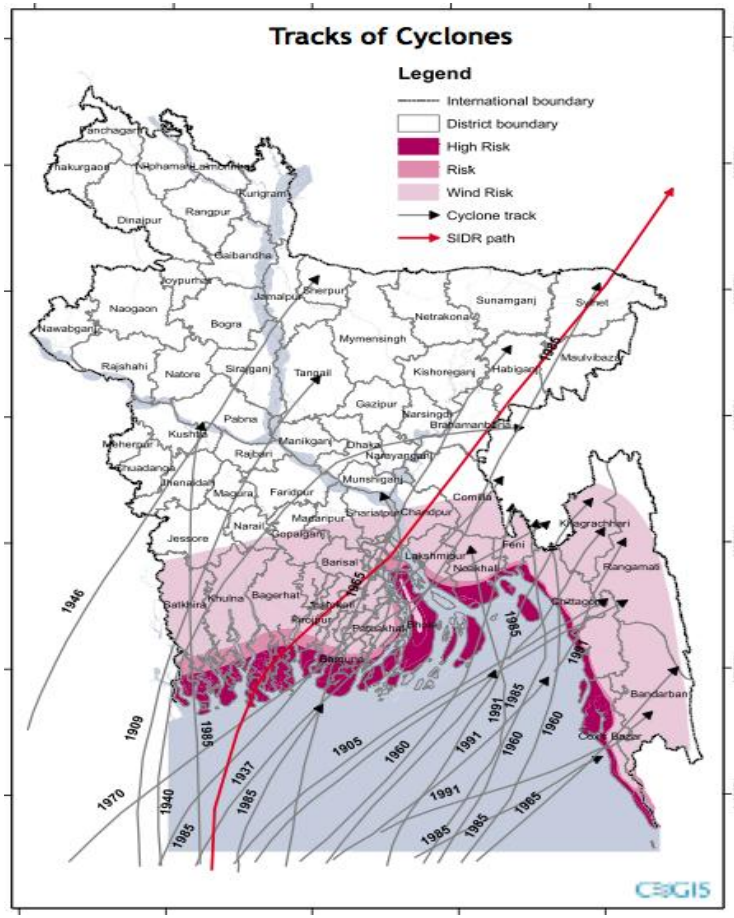
Human Exposure

Modelled number of people present in hazard zones that are thereby subject to potential losses.

Absolute human exposure

	Average people exposed per year	Country
1	22,548,120	Japan
2	16,267,090	Philippines
3	9,933,174	China
4	7,607,821	India
5	6,507,695	Taiwan, prov. of China
6	4,641,060	Bangladesh
7	3,573,351	United States of America
8	2,083,071	Korea (Rep. of)
9	1,885,541	Madagascar
10	872,234	Viet Nam
11	867,976	Myanmar
12	629,325	Mexico
13	602,264	Dominican Republic
14	488,556	Cuba
15	423,511	Hong Kong

Legend:
Tropical Cyclones (Saffir-Simpson categories)
Cat1 Cat2 Cat3 Cat4 Cat5



Source:
http://www.preventionweb.net/english/hazards/statistics/risk.php?hid=58

Human Displacement and Migration

- The forecasted land erosion will cause displacement of coastal population. Most of the poor people do not own land.
- According to several authors, between 64, 000 and 1 million Bangladeshis are rendered homeless every year due to riverbank erosion alone (Haque and Zaman 1994; Lein 2000; Siddiqui 2005).
- Myers (2002) argues that climate refugees from Bangladesh alone might outnumber all current refugees worldwide. He projected that 26 million refugees will come from Bangladesh.

Loss of Bio Diversity in Bangladesh

- Climate change induced natural calamities contribute to biodiversity loss
- Bangladesh is affected from both climate change and loss of biodiversity particularly in Sundarbans area, the most bio-diverse forest supporting around 40% of total biodiversity of Bangladesh.

Measures to take

- Capacity building of the states, military and the coastal community.
- Knowledge, information, technology and expertise sharing and exchange.
- National/ Regional policy framework.
- Public Awareness.
- Political will and co-operation.
- Strengthening the Role of international organization.
- Legal regimes.

"It is undoubtedly true that development rarely takes root without security; it is also true that security does not exist where human beings do not have access to enough food, or clean water, or the medicine they need to survive...This is why the world must come together to confront climate change. There is little scientific dispute that if we do nothing, we will face more drought, famine and mass displacement that will fuel more conflict for decades."

-Barack Obama, US President

US President Barack Obama's Nobel Award Acceptance Speech

Questions and Comments

Thank You

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