WMO

UNEP

Avoiding Dangerous Climate Change – 2nd Keynote Address

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A Scientific Symposium on Stabilization of Greenhouse Gases - Exeter, UK

1st February, 2005

Some Overriding Issues

- Defining “dangerous” is a value judgment
- But some cardinal principles apply
  - Universal human rights
  - Needs of future generations (sustainable development)
- Science can provide the basis
  - Impacts and damage
  - Socio-economic dimensions

The Threshold Approach

- Setting an explicit threshold as dangerous – how valid?
- Reaching the threshold depends on
  - Initial conditions
  - Marginal impacts and damage
  - Costs or valuation of impacts
  - Irreversibility and adaptation
  - Mitigation options

Some Issues of Global Concern

- Dangerous for whom -
  - equity dimensions
- Dangerous by when –
  - inertia in the system
  - inter-generational issues
  - plausible adaptation scenarios
  - plausible mitigation scenarios
- Defining the action required

Some Practical Questions

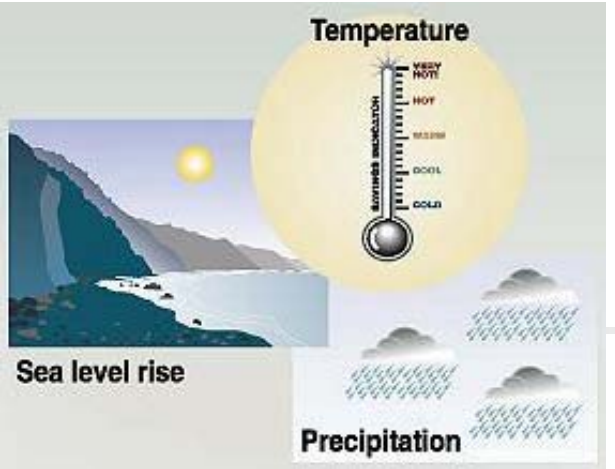
- Can a temperature target capture the limits of what is dangerous?
- Do we have the scientific rationale for setting this target?
- Can a global target represent dangers at the local level?
- How do we determine a concentration level for GHGs?
- What is the trajectory to achieve stabilization?

Some Initial Conditions – Taking Stock

- Increase in global mean surface temperature by over 0.6^{o}C (*highly likely*)
- Decrease in Artic sea ice extent by 10-15% and in thickness by 40% (*likely*)
- Decrease in snow cover area by 10% since observation started in 1960 (*very likely*)
- Coral reef bleaching
- 1990 – the warmest decade of the millennium (*likely*)

Source: IPCC TAR

Source: GRID Arendal



Impacts

Health

Weather-related mortality
Infectious diseases
Air-quality respiratory illnesses

Agriculture

Crop yields
Irrigation demands

Water resources

Water supply
Water quality
Competition for water

coastal areas

Erosion of beaches
Inundation of coastal lands
additional costs to protect coastal communities

Species and natural areas

Loss of habitat and species
Cryosphere: diminishing glaciers

Dangerous for Whom? Some Future Estimates

- Sea level rise and agricultural changes due to climate change are estimated to result in150 million environmental refugees by 2050
- Total flood zone refugees in India alone could be anywhere between 20 million and 60 million, with 30 million taken here as a conservative working figure
- 17% of Bangladesh could be permanently lost to sea level rise coupled with land subsidence. Even with engineering works an estimated 15 million would be displaced
- Egypt would lose between 12 -15 % of its arable land
- 50 million people globally may be displaced due to climate change-induced famine

Source: Myers, N., Environmental refugees in a globally warmed world

Dangerous for Whom? Extreme Events

- The number of disasters of hydro-meteorological origin have increased significantly
- Increase in precipitation in the mountains along with melting of glaciers - increased incidence of floods, mudslides and avalanches
- Recurring incidence of floods and droughts is already apparent (temperate Asia)
- Large areas with high population densities are susceptible to floods, droughts and cyclones in Bangladesh and India. Vulnerability to extreme weather events are expected to increase in these areas

Source: TAR, WGII

Extreme Weather or Climatic Events – Implications

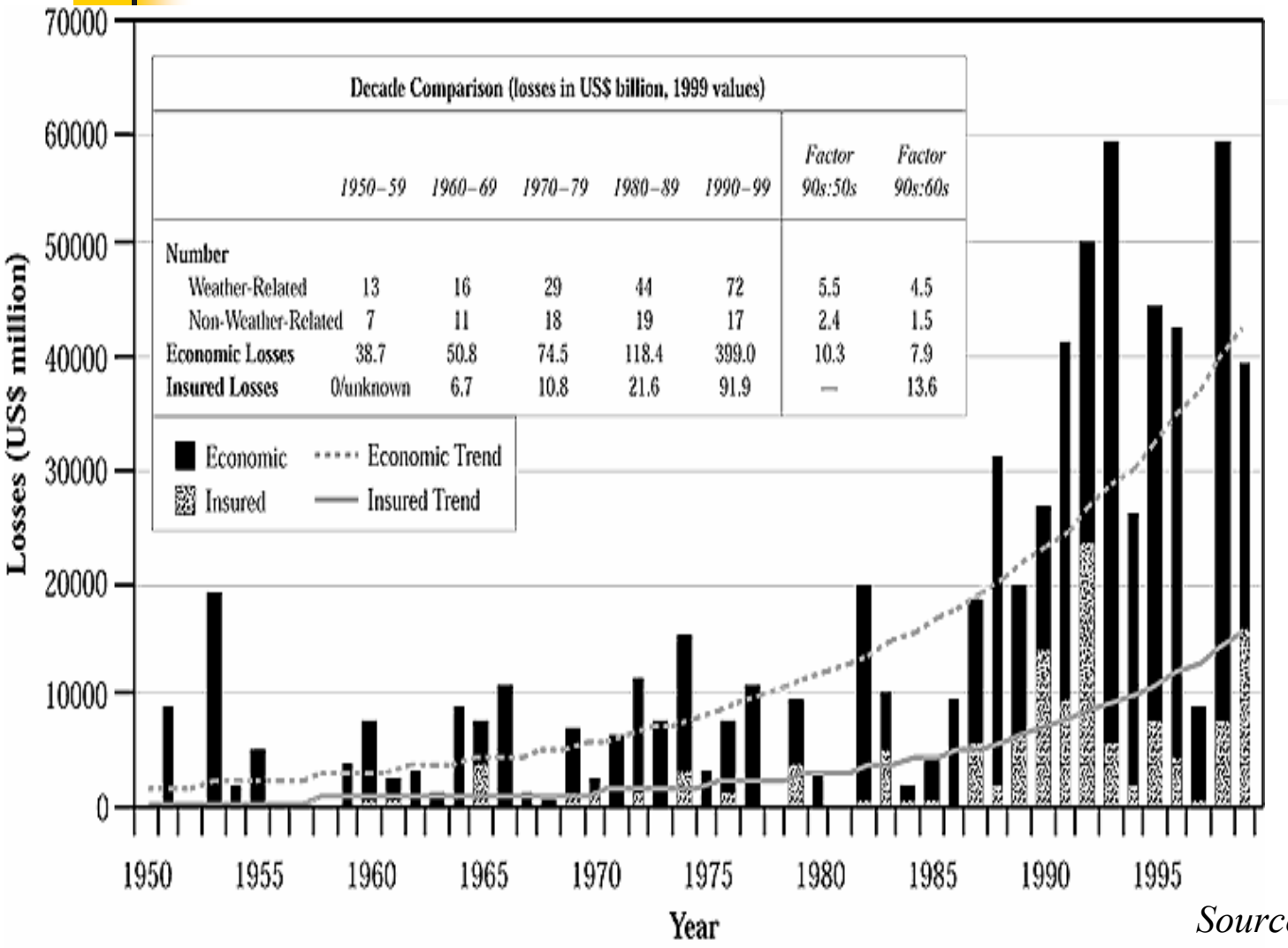
Extreme events are a major source of climate-related impacts.

E.g., heavy losses of human life, property damage, and other environmental damages were recorded during the **El Niño** event of 1997-1998. The impacts of climatic extremes and variability are a major concern. Preliminary indications suggest that some social and economic systems have been affected by recent increases in floods and droughts, with increases in economic losses for catastrophic weather events.

The number of **weather-related catastrophic events** has risen three times faster than the number of non-weather-related events, despite enhanced disaster preparedness. Part of this upward trend in weather-related losses over the past 50 years is linked to socio-economic factors (population growth, increased wealth, urbanization in vulnerable areas), and part is linked to regional climatic factors (e.g., changes in precipitation, flooding events).

Source: IPCC TAR

Economic and Insured losses related to weather extremes



Decade Comparison (losses in US$ billion, 1999 values)

	1950–59	1960–69	1970–79	1980–89	1990–99	Factor 90s:50s	Factor 90s:60s
Number							
Weather-Related	13	16	29	44	72	5.5	4.5
Non-Weather-Related	7	11	18	19	17	2.4	1.5
Economic Losses	38.7	50.8	74.5	118.4	399.0	10.3	7.9
Insured Losses	0/unknown	6.7	10.8	21.6	91.9	—	13.6

Most insured damages were in the north

Most people were affected in the South

Source: IPCC TAR

Can We Adapt to Irreversible Changes?

Coral Reef Bleaching

- Increased frequency in the 20th century, especially during El Niño events
- The worldwide increase in coral bleaching in 1997-1998 was coincident with high water temperatures associated with El Niño

Frequency and severity of drought

- Increased summer drying and associated incidence of drought in a few areas. In parts of Asia and Africa, the frequency and intensity of droughts have been observed to increase in recent decades.

Source: IPCC TAR

Can We Adapt to Irreversible Changes?

Duration of ice cover of rivers and lakes

- Decreased by about 2 weeks over the 20th century in mid- and high latitudes of the Northern Hemisphere

Arctic sea-ice extent and thickness

- Thinned by 40% in recent decades in late summer to early autumn and decreased in extent by 10-15% since the 1950s in spring and summer.

Non-polar glaciers

- Widespread retreat during the 20th century.

Source: IPCC TAR

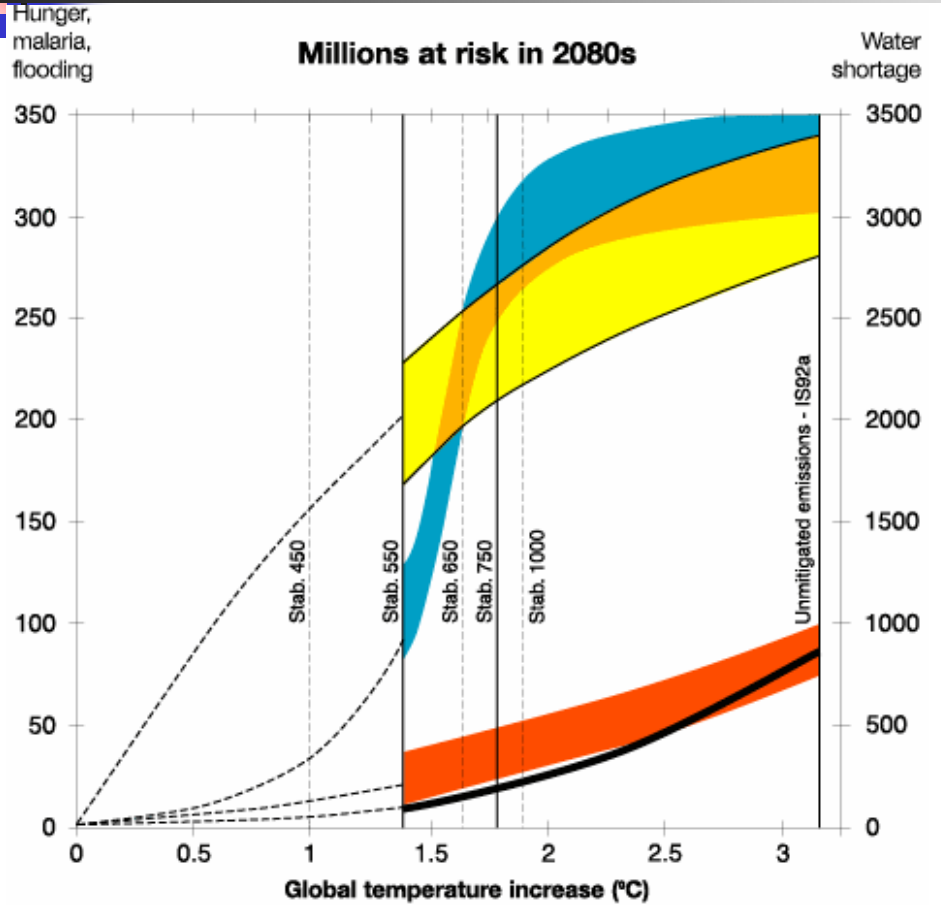
How Likely Are Possible Singular Events?

- Breakdown of the thermohaline circulation
- Disintegration of the West Antarctic ice sheet
- Shift in mean climate towards an El Nino like state
- Runaway carbon dynamics - reduced sink capacity, release of methane from hydrates, carbon from permafrost
- Rearrangement of biome distribution

Such events can overwhelm our response strategies

Source: IPCC TAR

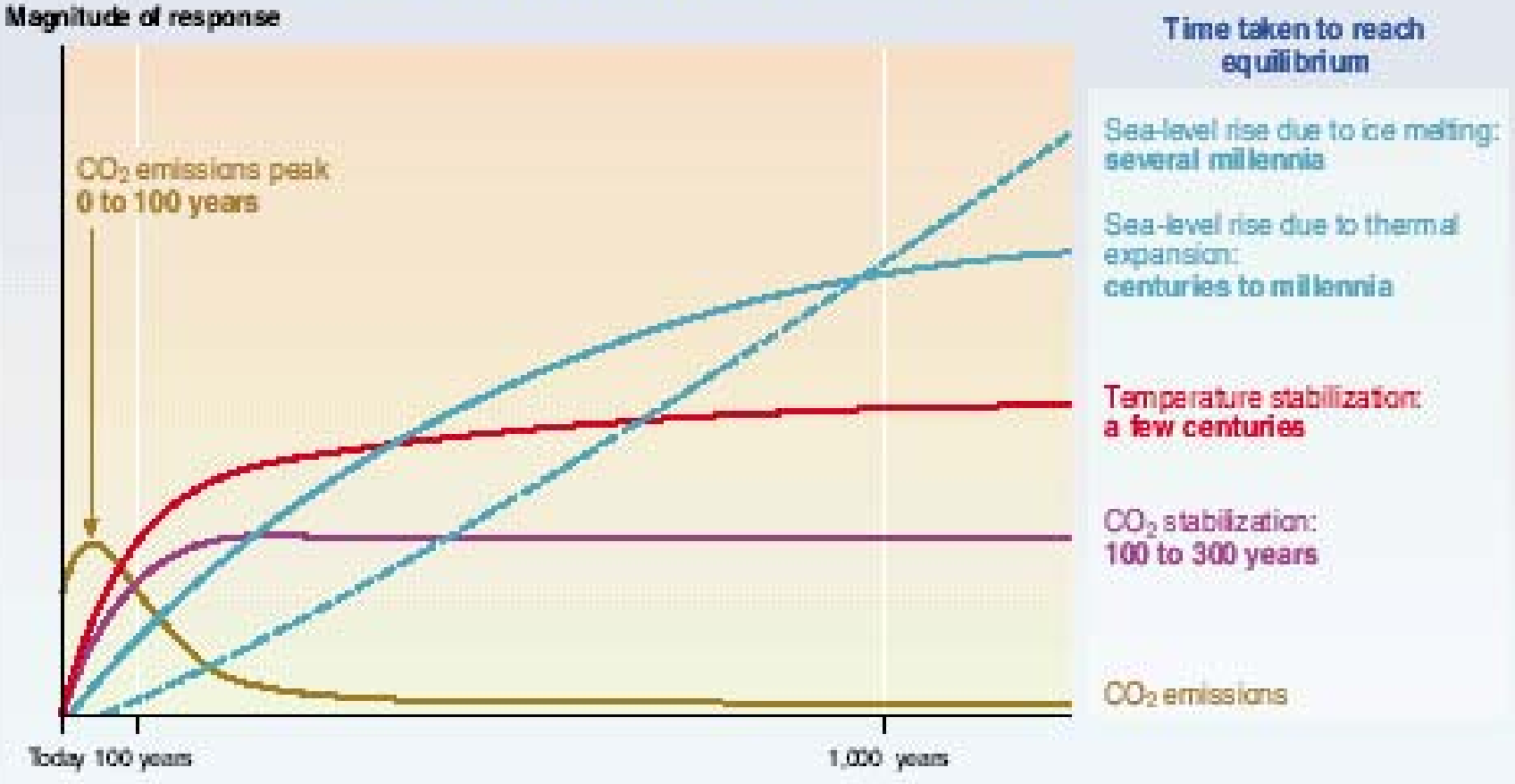
Additional millions at risk for increases in global temperature



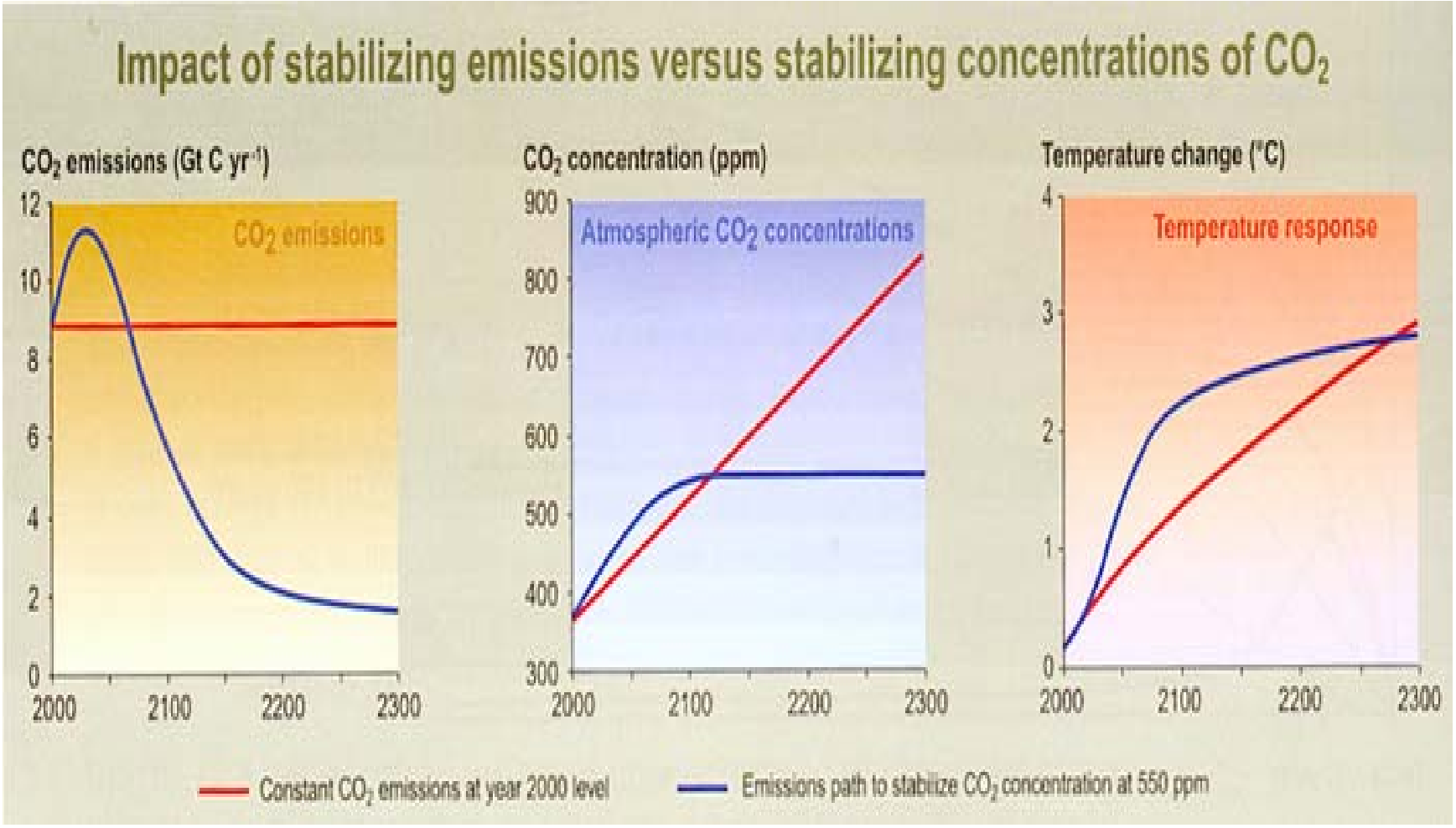
- Risk of water shortage
- Risk of malaria
- Risk of hunger
- Risk of coastal flooding

Source: Millions at Risk, M L Parry and M Livermore, University of East Anglia

CO_2 concentration, temperature, and sea level continue to rise long after emissions are reduced

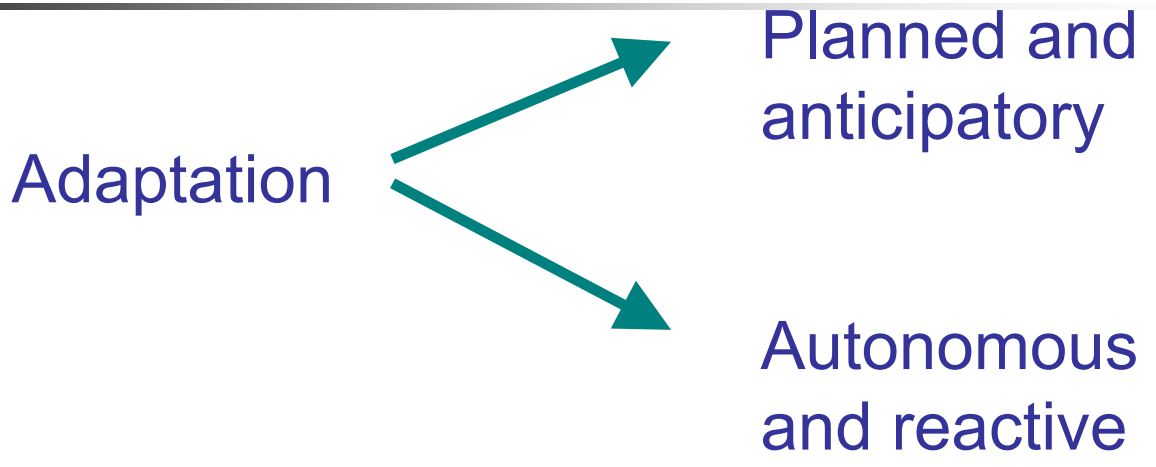


Source: IPCC Syn report



Source: IPCC TAR

Adaptation



Planned anticipatory adaptation has the potential to reduce vulnerability and realize opportunities associated with climate change

Source: IPCC TAR

Exploiting the Synergies

- Effective mitigation policies would also further other sustainable development goals (economic, equity, environmental)
  - Maximizing co-benefits of the mitigation strategy
  - Implementing no regret options

- The key linkages between mitigation and development are many - macroeconomic impacts, employment creation, inflation, trade

Where do we go from here?

- Develop framework and boundaries for decision making
- Answer the question “Dangerous for whom?”
- Define what is expected from science
- Lodge science rationally in the decision framework
- Create “value” for value judgement