



Global Climate Change: Implications for the Poor

By

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Greenhouse Gas Concentration in the Atmosphere

- Today's CO₂ concentration has not been exceeded during the past 420000 years and likely not during the past 20 million years
- The increase in CO₂ emissions during the Industrial era has been dramatic when compared to the preceding several thousand years
- The average rate of increase since 1980 is 0.4% per year
- Most of the emissions in the last 20 years are due to fossil fuel burning while the rest 10-30% due to land use change

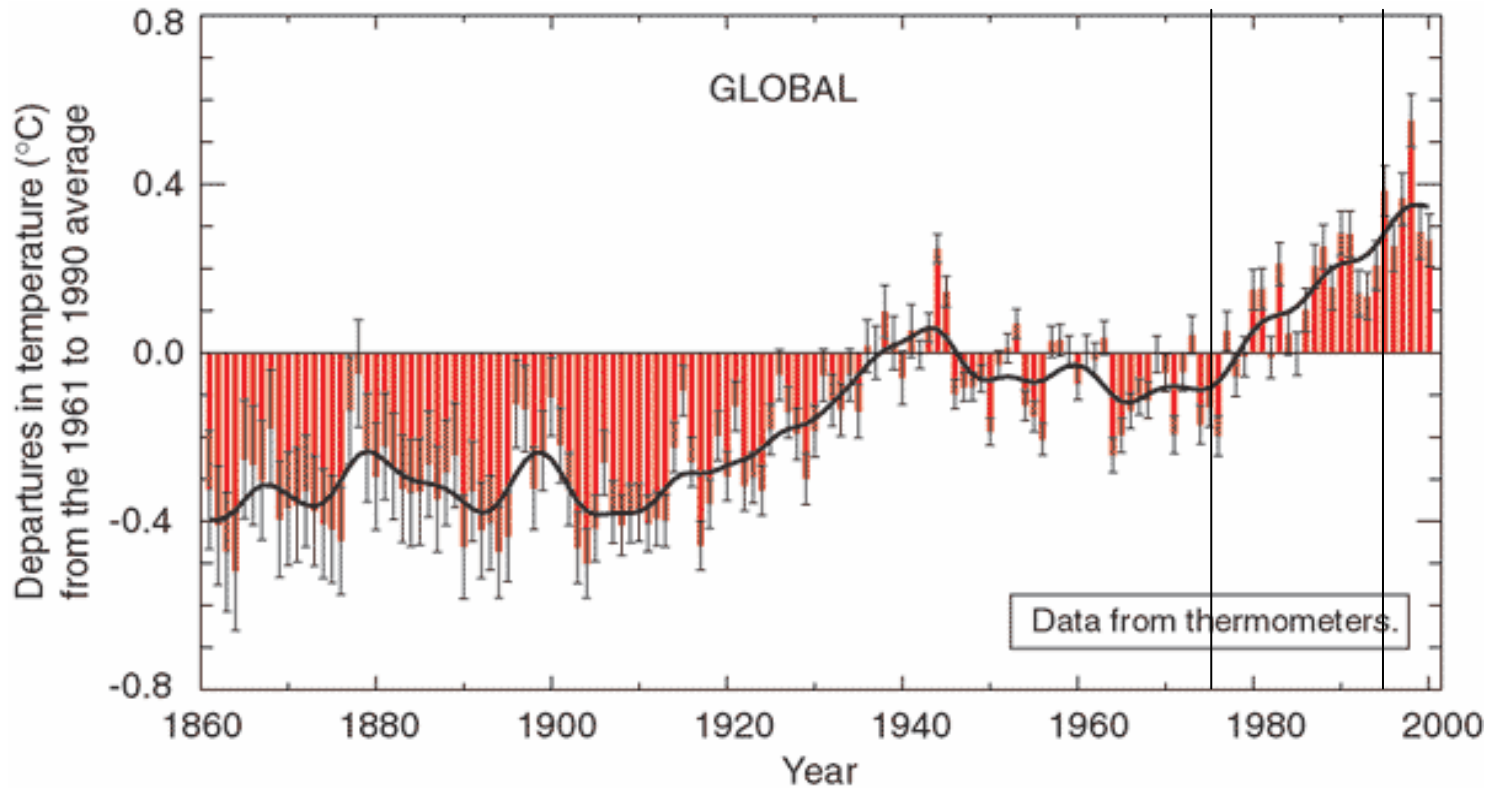


Climate change: is it for real?

It is likely that -

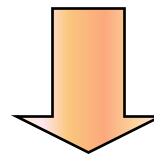
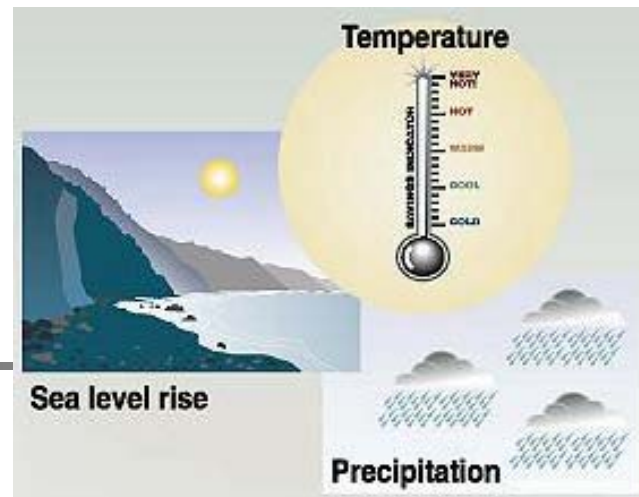
- Globally 1990s were the warmest decade and 1998 the warmest year in recorded history.
- The number of hot days have ↑ while cold days and frost ↓ in all land areas during the 20th century
- Continental precipitation has ↑ by 5-10% over the 20th century although it may have ↓ in some regions
- Frequency and severity of droughts have ↑ particularly in Asia and Africa
- Non polar glaciers have retreated during the 20th century

But for sure...It's been hot



Combined annual land and sea surface temperature anomalies (°C)

Source: GRID Arendal



Health

Weather-related mortality
 Infectious diseases
 Air-quality respiratory illnesses

Agriculture

Crop yields
 Irrigation demands

Water resources

Water supply
 Water quality
 Competition for water

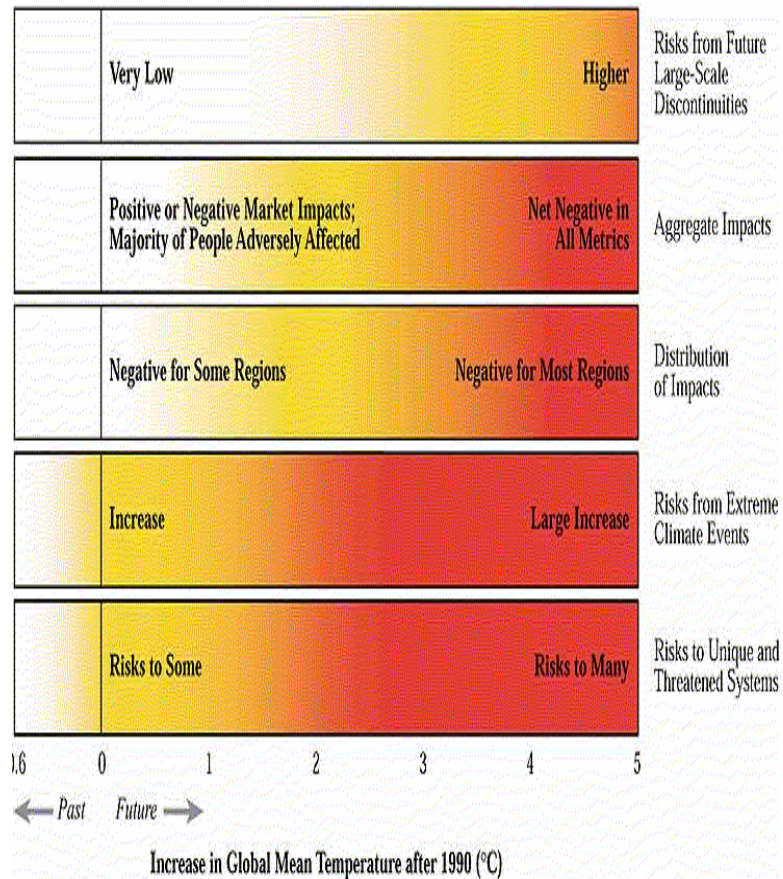
coastal areas

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

Surprises that changing climate can spring



- Transition from one equilibrium condition to another may not be smooth ($1xCO_2 \rightarrow 2xCO_2$)
- Sensitivity of systems to climate change may be - nonlinear, complex and discontinuous
- Singularities could lead to rapid, large and unexpected impacts on local, regional and global scales
- The actual discontinuous impact could lag the trigger by decades to century



For whom the bell tolls

- Sea level rise and agricultural changes due to climate change are estimated to result in 150 million environmental refugees by 2050 (Source: Dr Norman Myers)
- 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 and 15 percent 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



Some Specific Impacts on India

- Stress on the land and water resources
- Threat to ecosystems and biodiversity
- Agriculture: Yields of major crops expected to decline
- Greater vulnerability to extreme climate events like typhoons, cyclones, droughts and floods, particularly in coastal areas
- Potential for drier conditions in arid and semi-arid parts of India



Impacts of climate change on agriculture

- Crop yields and patterns would change due to direct effects of changes in temperature, precipitation, CO₂ concentrations
- Indirect effects of changes in soil moisture, distribution and frequency of infestation by pests and diseases, etc



Agriculture and Food Security

- Role of Agriculture:
 - Largest source of employment - 76.17% and 57% of the population involved in agricultural enterprises in China and India respectively
 - The ultimate role of agriculture in the Asian and African regions is to provide food and fibre to the human population - it holds the key to food security



Agriculture and Food Security

- Effect of Climate Change on Agriculture
 - Crop yields and patterns would change due to changes in precipitation, temperature and Co₂ concentration and indirect effects of soil moisture and infestation of pests and diseases.
 - Climate change will exacerbate water shortages
 - Climate change will lower the incomes of vulnerable populations and increase the absolute number of people at risk of hunger



Assessing Vulnerability

“The impacts of climate change will fall disproportionately upon developing countries and the poorer sections of society in all countries and thereby exacerbate inequities in health status and access to adequate food, clean water and other resources, between the developed and the developing as well as between the rich and the poor “

Climate Change and its Linkages with Sustainable Development

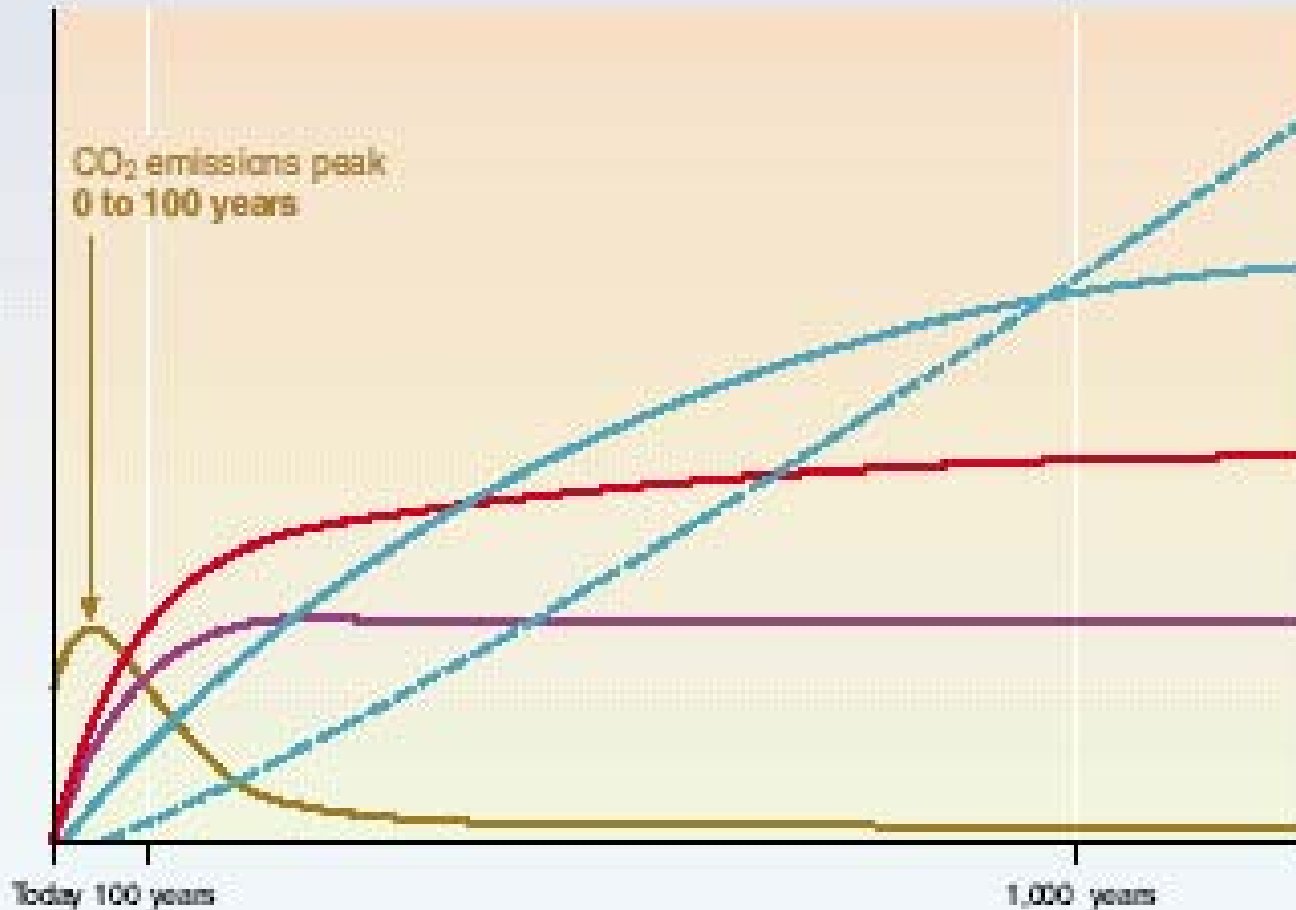
- Primary factors responsible for climate change are similar to those for most technological changes
 - lifestyles and demographic shifts
- Climate change in turn aggravates environmental problems
 - loss of biodiversity, air pollution, desertification etc
- The developmental implications of climate change -
 - accentuating levels of poverty and inequity
 - destruction and damage of infrastructure
 - spread of diseases
 - degradation of natural resources
 - environmental and socio-economic issues
 - economic growth

Adaptation - an immediate necessity



CO₂ concentration, temperature, and sea level continue to rise long after emissions are reduced

Magnitude of response



Time taken to reach equilibrium

Sea-level rise due to ice melting: several millennia

Sea-level rise due to thermal expansion: centuries to millennia

Temperature stabilization: a few centuries

CO₂ stabilization: 100 to 300 years

CO₂ emissions

Varying vulnerabilities in India based on Double Exposure to Climate Change and Globalization

Jhalawar, Rajasthan

- drought prone
- low irrigation coverage, literacy, infrastructure

Jagatsingpur, Orissa

- cyclones, river floods (loss of mangroves)
- high population density
- acute poverty
- proximity to port

Chitradurga, Karnataka

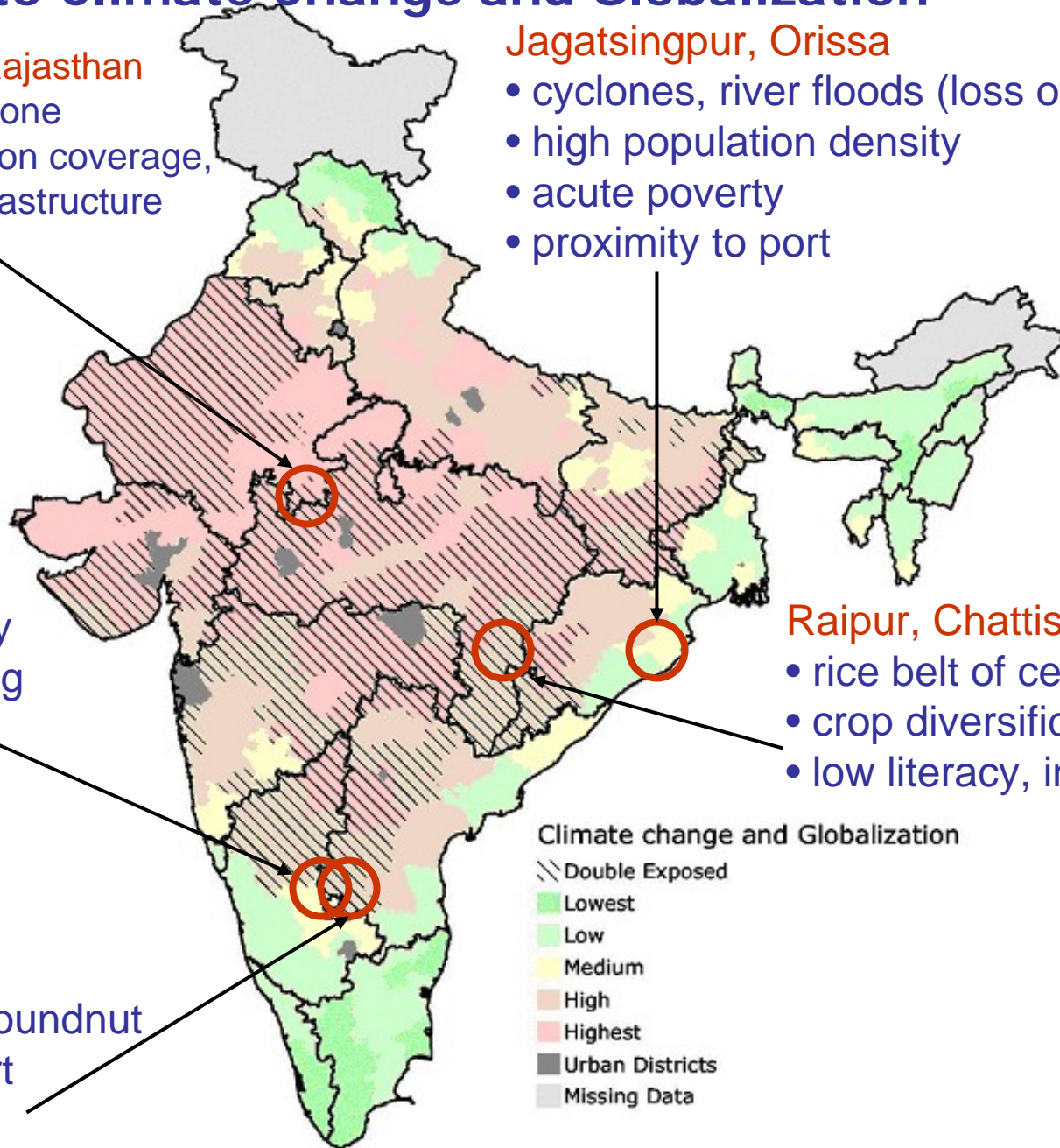
- water scarcity
- proximity to city
- contract farming and exports

Raipur, Chattisgarh

- rice belt of central India
- crop diversification
- low literacy, infrastructure

Anantapur, Andhra Pradesh

- semi-arid
- response of groundnut farmers to import competition



Climate change and Globalization

- \\ Double Exposed
- Lowest
- Low
- Medium
- High
- Highest
- Urban Districts
- Missing Data



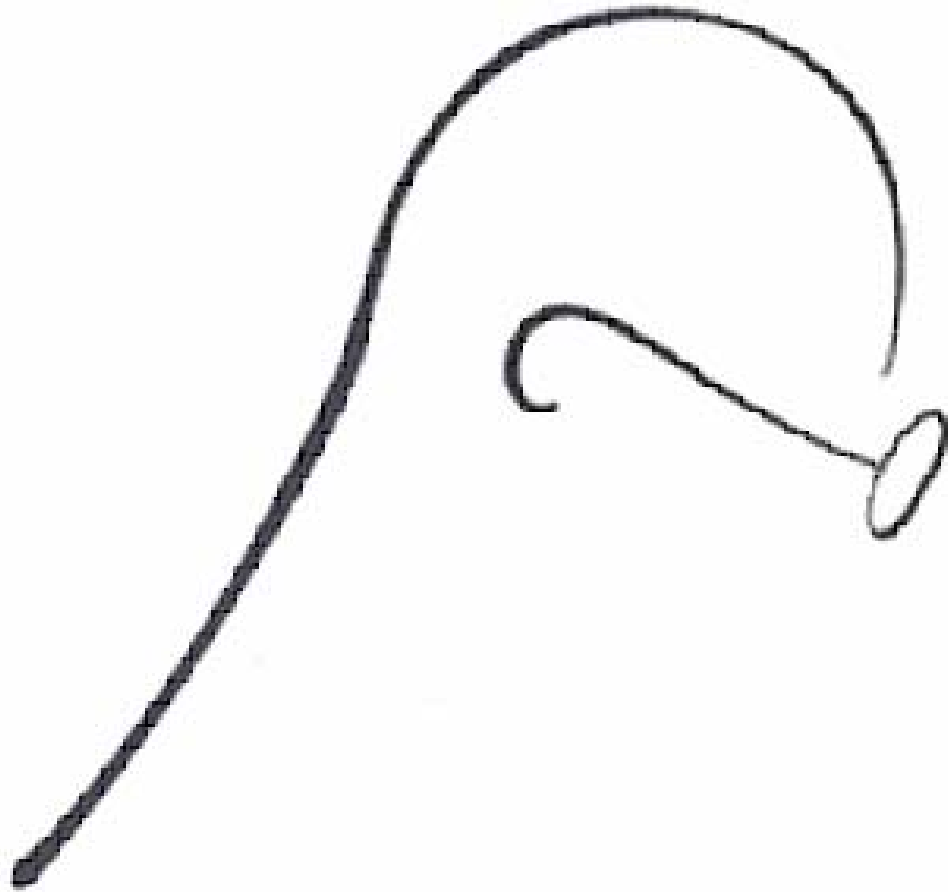
Adaptation to climate change

- Farm-level adaptations - changes in inputs, timing, crops grown, cultivar traits, etc
- The adaptive capacity of farmers in developing countries is severely restricted by heavy reliance on natural factors and lack of complementary inputs and institutional support systems



The world suffers from many existing stresses

- Depletion and degradation of natural resources
- Extreme poverty
- Growing income and wealth disparities
- Threat of climate change is an add on



A time is coming when those who are in the mad rush today of multiplying their wants, will retrace their steps and say; what have we done.... Modern civilization is such that one has only to be patient and it will be self-destroyed.