

Human Actions To Combat Climate Change

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Climate Change – The Background

- Weather : Short term fluctuating state of the atmosphere characterized by temperature, wind, precipitation, etc.

- Climate : Average weather in terms of the mean and its variability over a certain time span and a certain area.

- Climate Change : Statistically significant variations of the mean state of the climate or its variability, typically persisting for decades or longer

Climate Change is NOT Change in Weather;
it is MUCH MORE and DANGEROUS than that

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CLIMATE CHANGE – THE CAUSE

- Natural Causes like –
  - Uplift of continental blocks that causes changes in global oceanic & atmospheric circulation patterns
  - Change in atmospheric GHG concentration due to complex interactions between organisms, erosion, volcanism, ocean currents
  - Changes in the earth's orbit

- Anthropogenic Activities -
  - Emissions from agriculture, industry, power generation, waste & waste water, transport, building

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CURRENT SCENARIO

Climate Change is aggravated due to immense GHG emissions largely due to anthropogenic activities

- Since the industrial revolution, global GHG emissions due to human activities have increased
- Between 1970 – 2004 GHG emissions increased by 70%
- Since 1750, atmospheric concentrations of CO_2, CH_4 and N_2O have significantly increased due to :
  - Fossil fuel use
  - Agriculture
  - Land use change

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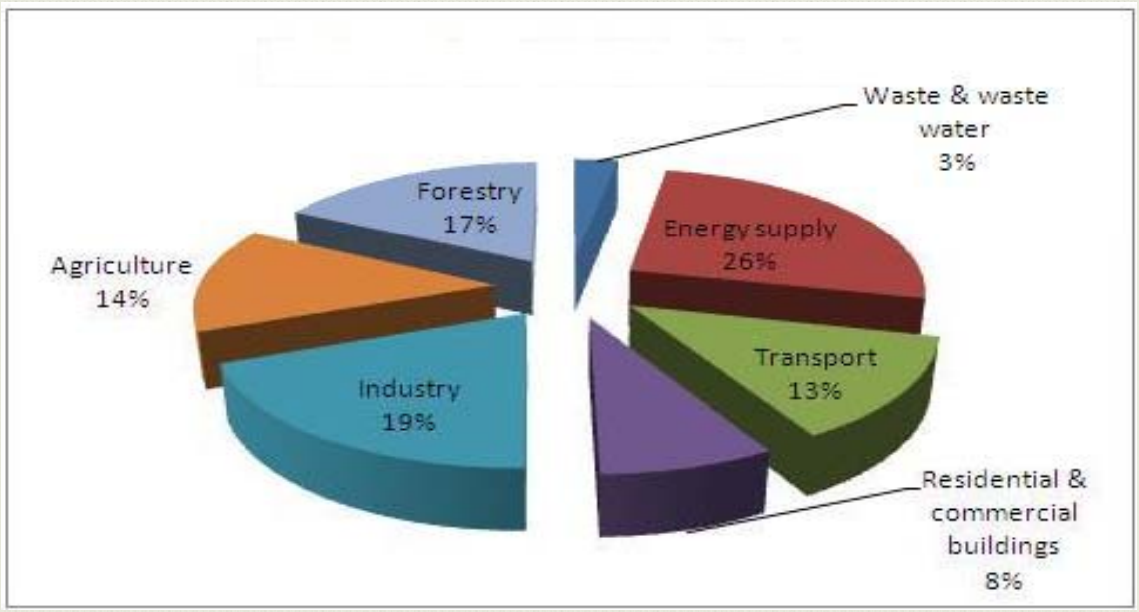
Share of Sectors in World GHG Emissions



Source: Climate Change 2007, Synthesis Report, IPCC

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Observed Climate Change - Global

- 1995-2006 - Warmest years in the instrumental record of global surface temperature since 1850

- Rate of Global Average Sea Level Rise:
  - In the last century - 1.8 mm/yr
  - 1993 to 2003 - 3.1 mm/yr

- Precipitation between 1900 – 2005 :
  - Increase in eastern parts of North and South America, northern Europe and northern and central Asia
  - Decrease in the Sahel, the Mediterranean, southern Africa and parts of southern Asia

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PREDICTION

- Given 2005's annual emission levels, by 2050 annual GHG emissions would double pre-industrial level (in the year 1750) which was 280 ppm CO_2 equivalent

- This level of emission would lead to 2-5°C rise in global mean temperature (Stern Review, 2007)

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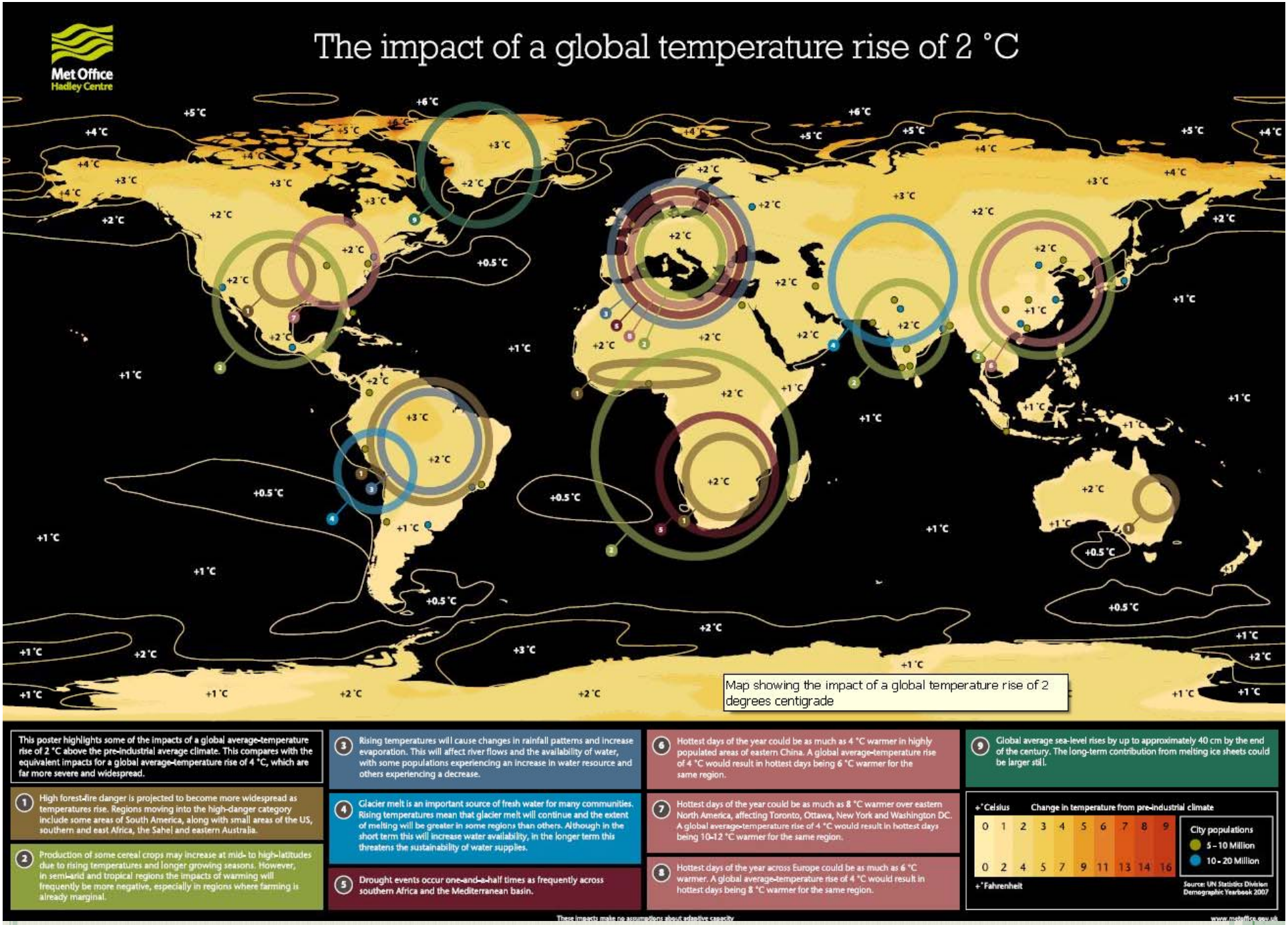
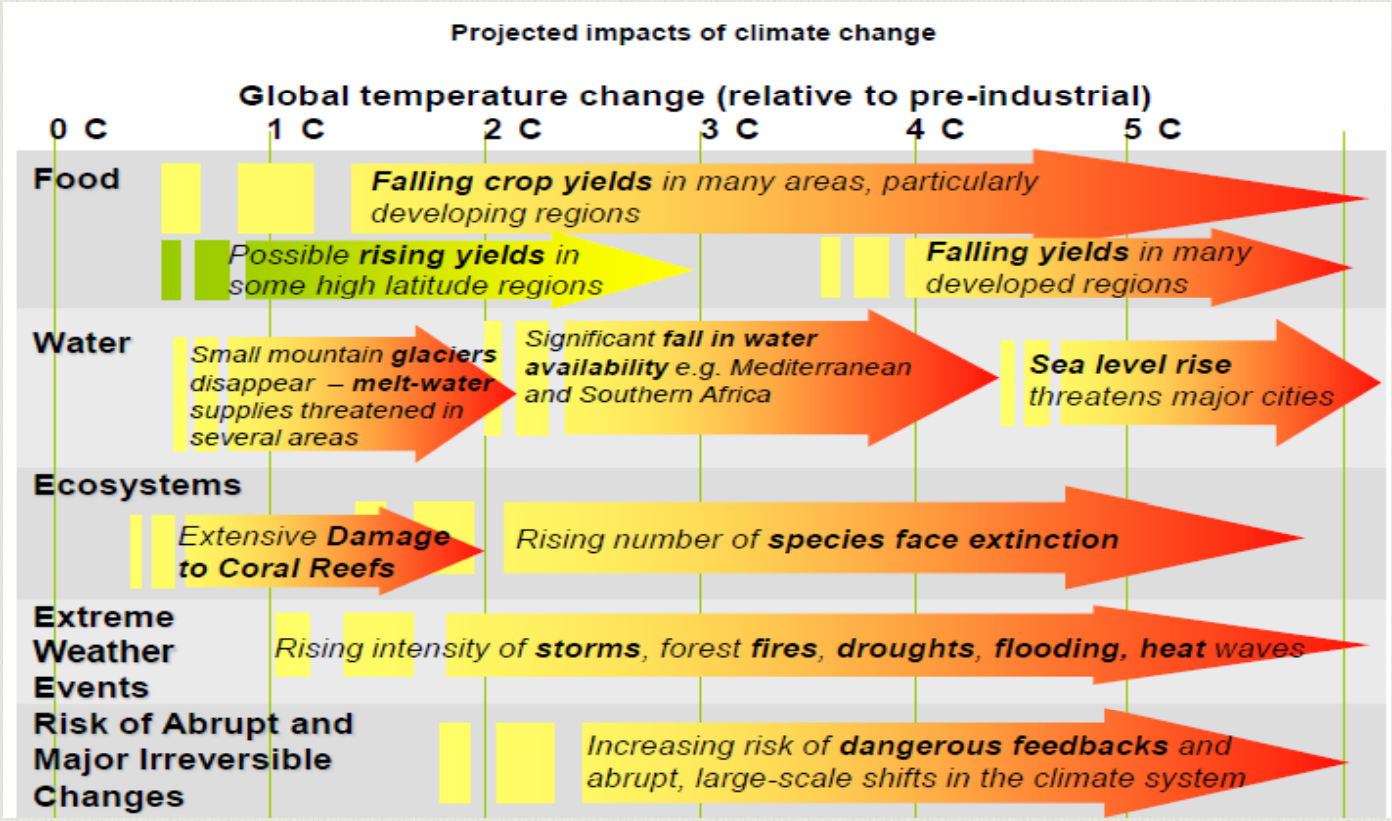


Source: Ravindranath, N.H., 2010

Projected Impacts of Climate Change



Source: Stern Review, 2007

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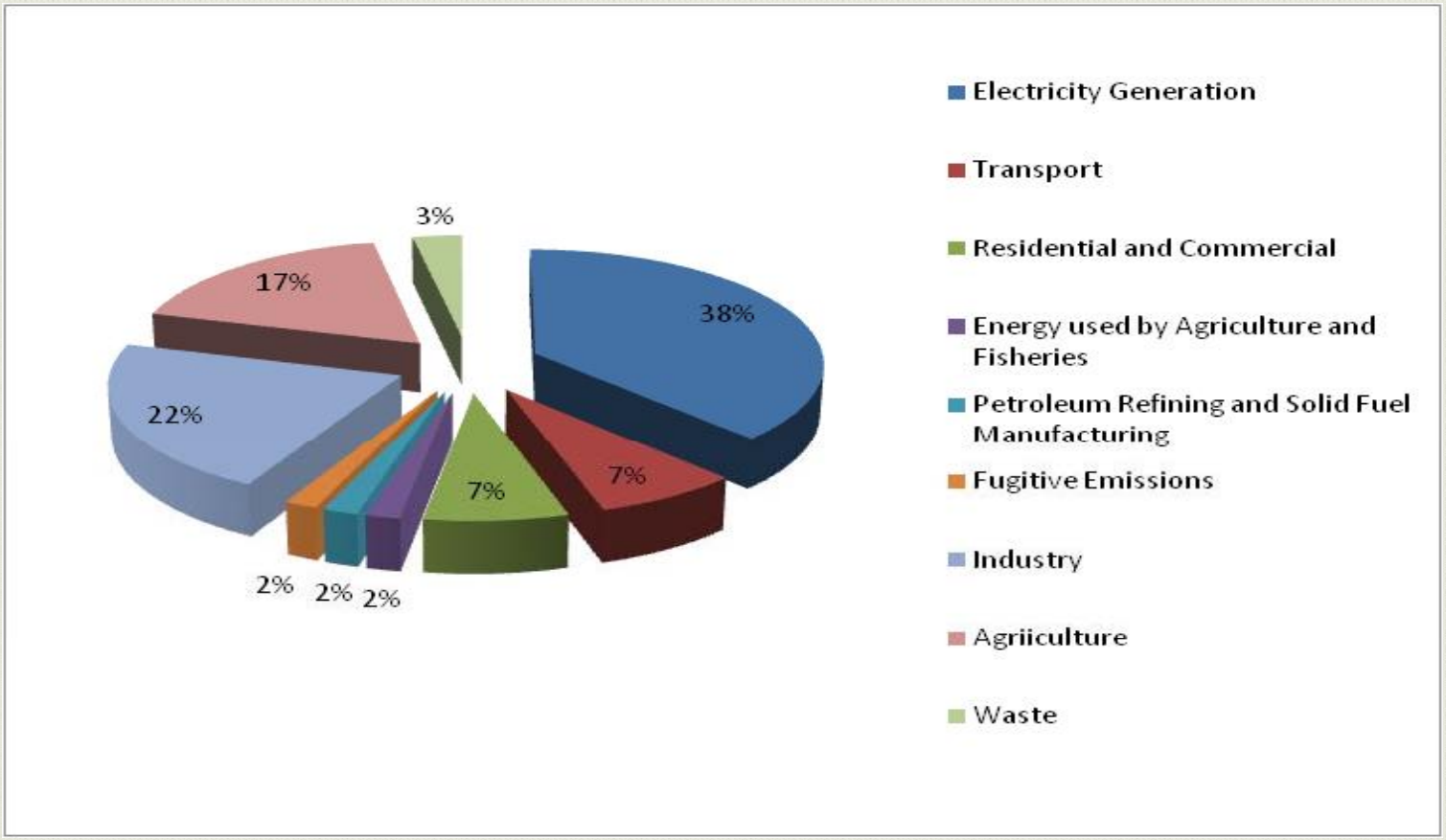
GHG Emissions In India



Source: India: GOI (2010):*Green House Gas Emissions, 2007*, MOEF, New Delhi

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Observed Climate Change - India

- Increasing trend in Surface Temperature
- No significant trend in rainfall on an all India basis
- Regional trends in rainfall is however noticeable
  - Increasing rainfall (+10 to +12% per century) along the west coast, north Andhra Pradesh and northwest India
  - Decline in rainfall (-6 to -8% per century) in east Madhya Pradesh and adjoining areas, northeast India and parts of Gujarat and Kerala

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Projected Climate Change - India

- Overall increase in Temperature

- Overall increase in Rainfall
  - Most of this rainfall will occur during the monsoon
  - Higher rain over a fewer number of days
  - More than 67% of the country, particularly the semi-arid regions will have more than 10% fewer rainy days

Increased likelihood of Extreme Events
(e.g. Floods, Droughts, Cyclones)

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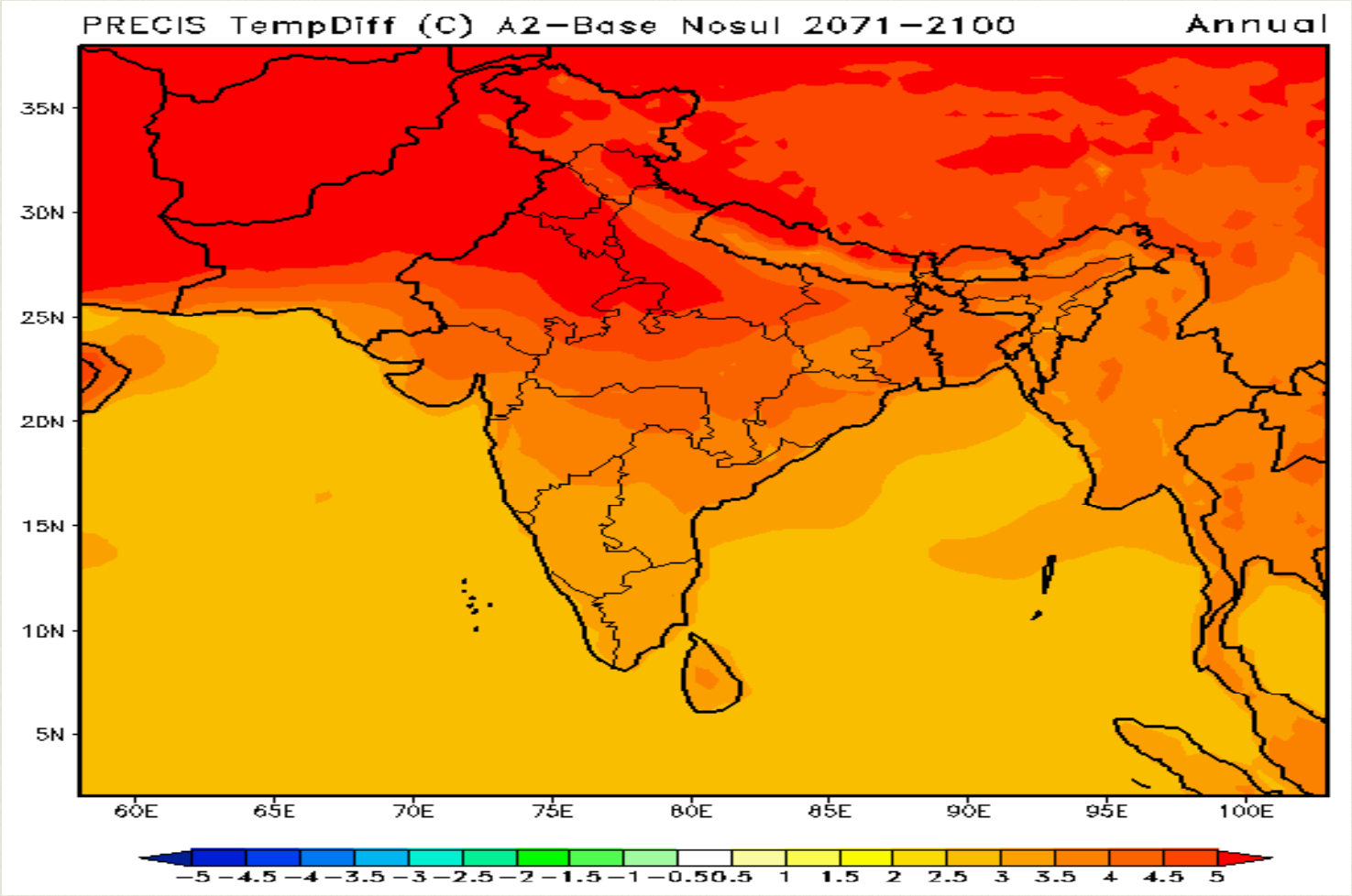
PROJECTIONS – TEMPERATURE



Source: Ravindranath, N.H., 2010

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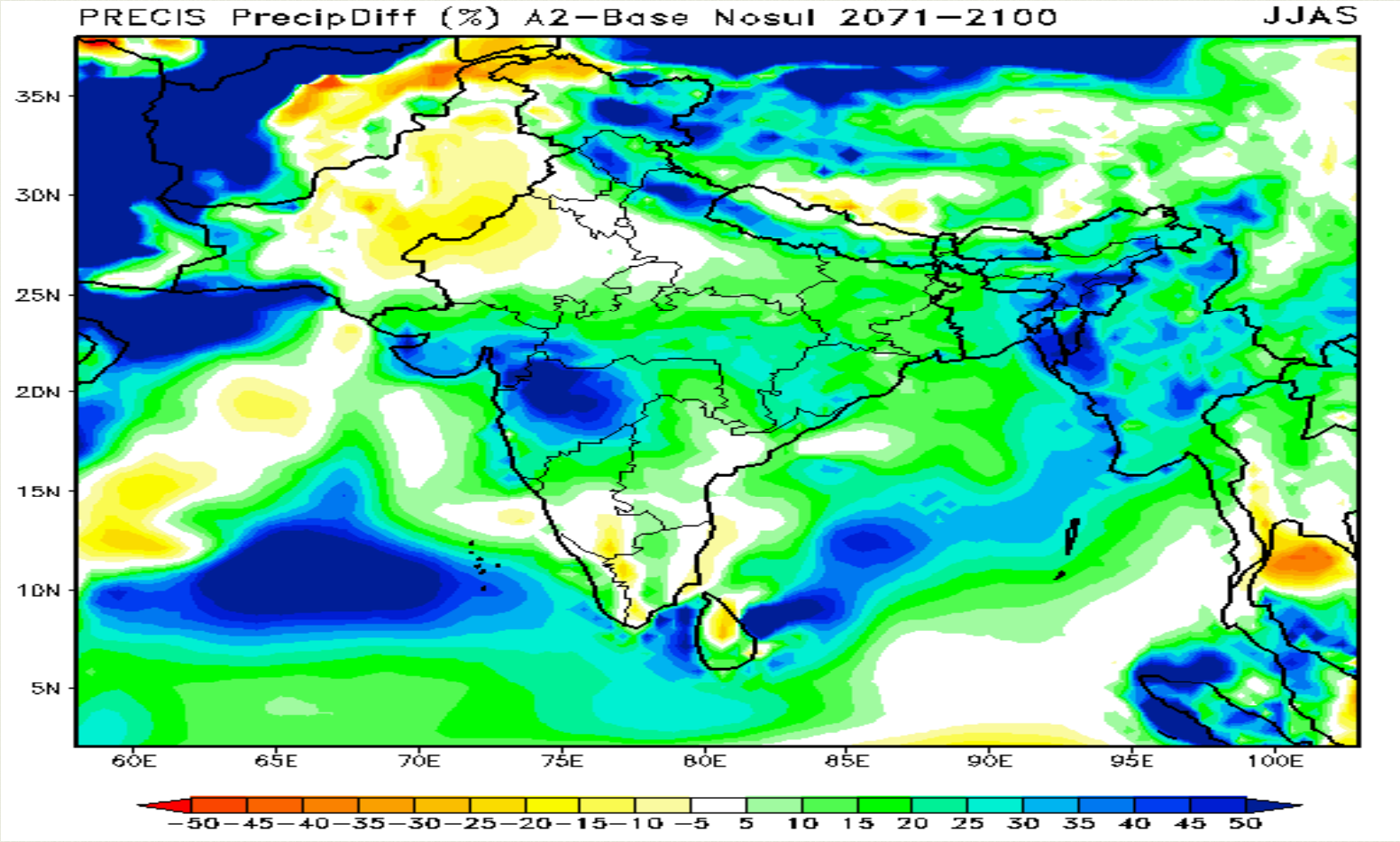
PROJECTIONS - RAINFALL



Source: Ravindranath, N.H., 2010

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Climate Change Impacts - India

- Sea level Rise – Threat to coastal agriculture and settlement
- Erratic monsoons – Threat to agriculture and food security
  - Crop productivity projected to decrease even at 1-2^0 C rise in temperature
  - South Asia: crop yields are projected to decline by 30% by 2050s
  - Increased sea and river water temperature is likely to affect fish breeding, migration and harvest of fish
- Water stress and decline in fresh water supply – Drought
- Increased frequency of floods, droughts, storms – Extreme Events

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Climate Change Impacts - India

- Shifts in forest types – Adverse impact on biodiversity and forest dependent communities
- Adverse impact on natural ecosystems (wetlands, mangroves, coral reefs, mountain ecosystems)
- Adverse impact on health due to increase in vector and water borne diseases (malaria, gastro-enteric disease, etc)

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HENCE THE VULNERABILITY

- Loss of Livelihood
  - Agriculture
  - Livestock Rearing
  - Forestry
  - Fishing
- Threat to Food Security
- Increase in Poverty – Income loss, loss of assets/property
- Increase in Health Risks
- Threat to Natural Resource – Water, Forests
- Increased incidence of extreme events – Floods, Droughts, Cyclones, etc.

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Coping Strategies – Adaptation & Mitigation

- Adaptation : Modifications in socio-economic and ecological systems in response to actual or expected climate change impacts in order to reduce vulnerability

- Mitigation : Stabilization of GHG concentrations in the atmosphere at levels that would “prevent dangerous anthropogenic interference with the climate system”

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Adaptation

- Adaptation requires adjustments in natural and human systems in response to actual or expected climate stimuli or their effects.

- Adaptation Strategies can be
  - Anticipatory or Reactive,
  - Autonomous or Planned,
  - Public or Private

- Requires less investment in time and resources than mitigation strategies

- Takes into consideration local characteristics and socio-economic dynamics of the impacts of CC at the micro household and community levels.

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Source: http://www.global-greenhouse-warming.com/climate-mitigation-and-adaptation.html, IPCC 2001

Adaptation Strategies

- Detection & communication of early warning systems of extreme events like floods, droughts, cyclones, etc
- Diversification of livelihood through skill formation
- Investments in rainfall & river monitoring & their modeling
- Investment in habitat protection. E.g., forest management schemes
- Capital Investment in Resilience Building Infrastructure (Cyclone/ flood resistant houses, embankment)
- Maintenance Investment in Resilience Building Infrastructure
- Long term Adaptive Capacity Creation in lieu of recurring ad hoc Disaster Relief Expenditure in disaster prone zone
- R&D to develop disaster resistant crop strains
- R&D to develop alternative cropping patterns

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Mitigation

- Mitigation directly affects emission through reduction of emission source and increase of GHG sinks
- Requires high investment in time and resources
- Involves complex interaction between political, social, institutional, economic, environmental and technological processes
- Emission reduction has to be achieved within a predetermined timeframe, without threatening food production and sustainable economic development.

Source: http://www.global-greenhouse-warming.com/climate-mitigation-and-adaptation.html, IPCC 2001

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Mitigation Strategies

- Development of Clean Energy Sources – wind, solar, nuclear, etc.
- Using efficient gas turbines and CFLs reduces emissions by 90%
- Biomass generation can reduce emissions by 95% or more
- CNG or LPG use in transport sector
- Reducing auto dependence by improving public transport, biking, walking, etc.
- Reducing energy consumption of the building sector through better designs, use of energy efficient appliances, etc.
- Improving waste management strategies
- Avoidance of waste generation through recycling & re-use.
- Afforestation

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INDIA: ENERGY SCENARIO

- Electricity Generation in India: Predominantly Thermal
  - 42% through Coal, 24% through Oil (IEA, 2009)
  - 38% of the National GHG Emission (MOEF, 2010)

- Predicted annual growth rate in Power Demand: 4% p.a. (IEA, 2009)

- Consequences:
  - Depletion of domestic stock of coal
  - Increase in GHG emission
  - Increase in National import bill (coal from Australia/China)
  - Threatening of energy security - dependence on others

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Renewable Energy: Need of the Hour

- Supply side solution
  - Solar, wind, hydro, biomass, etc.
  - 26% of the energy supply is through Renewable Sources (IEA, 2009)

- Explore options in Renewable Sources:
  - Low carbon development pathway
  - Maintain energy security
  - Reduce pressure on Import Bill
  - Remove supply side bottlenecks

- Diverse solutions
  - Solar powered Billboards
  - Solar street lights
  - Waste burning – SMEs
  - Solar powered mobile phone towers

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Demand Side Management

- Think!…Change!… Reduce!

Compact fluorescent light bulbs (CFLs) have cool curly shape and save more than 66% of the energy compared to a regular incandescent bulb

Using energy efficient electronic appliances with ENERGY STAR label consumes lesser electricity than others

When electronics gadgets are "off" they may still be using power while plugged in or on standby.

About 5-10 % of electricity can be drained by "vampire" energy loss

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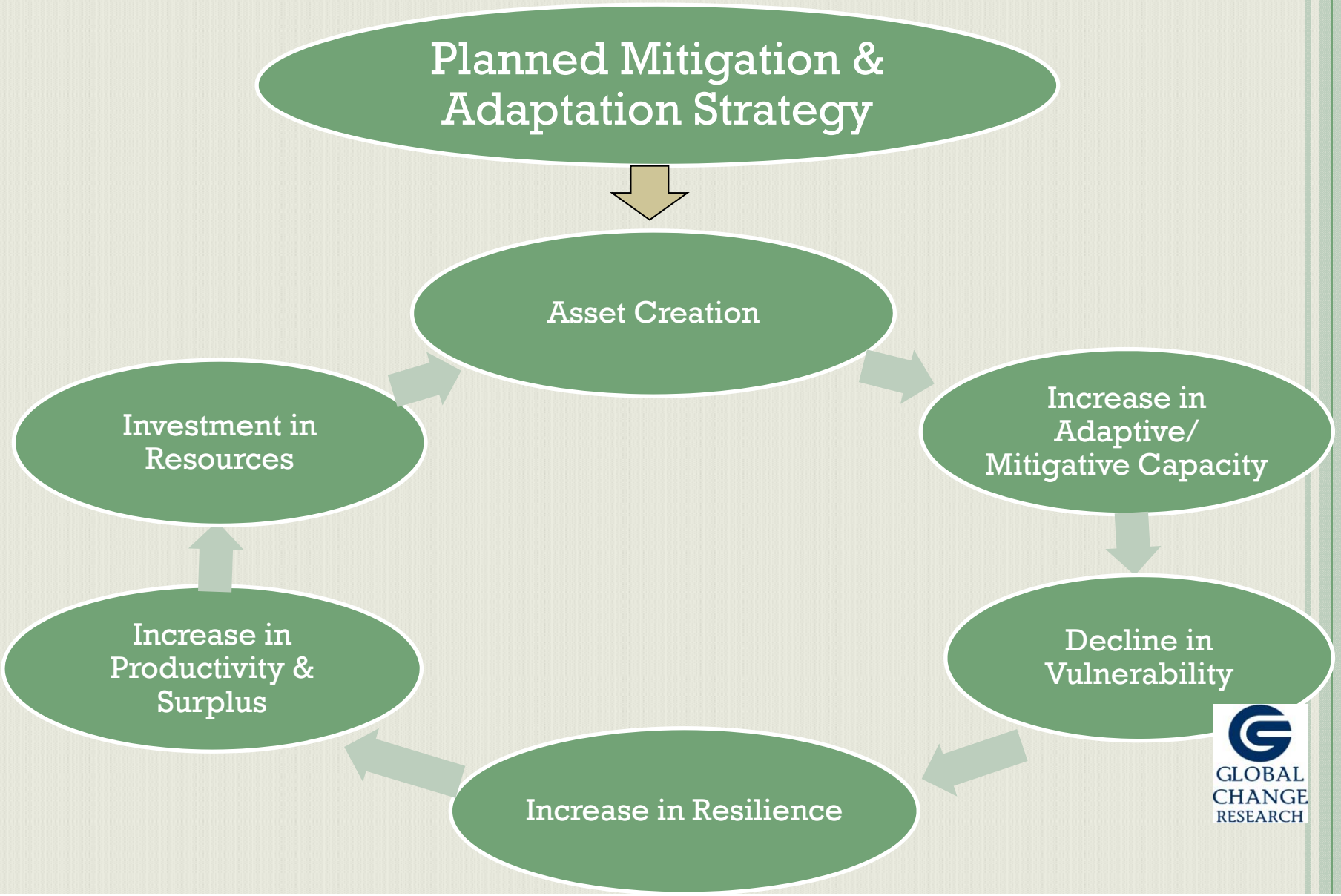
Enabling Condition for High Resilience Capacity



NEED OF THE HOUR

- Mainstreaming of Adaptation & Mitigation in the Conventional Development Process

- Sustainable Development – Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (IPCC, 2007)

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WHY MAINSTREAM?

Traditional Development Practices are generally divorced from climate change impact reduction strategies (e.g. land use zoning and building restrictions in flood plains, water resource development strategies that "take-into-account" variability)

Increased Vulnerability due to Climate Change

Unsustainable Long-term Development

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Adaptation or Mitigation?

- Mitigation deals with the causes of CC
- Adaptation deals with the effects of CC
- Mitigation has a more global applicability than Adaptation which is more applicable at the local level
- Adaptation requires less investment in time & resources than mitigation

High Mitigation ⇨ Low Impact ⇨
Low need for Adaptation

High Adaptation ⇨ Less vulnerability to any degree of CC impact

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Adaptation or Mitigation – Barriers

- Are WE Aware? – CC, Adaptation, Mitigation
- What is the EXACT Impact? – Evidences!
- Do we have enough INVESTIBLE Resources?
- Do we ENOUGH TIME?
- Do we have the MINDSET/WILL?

BARRIERS MUST BE REMOVED –

PARADIGM SHIFT IS A MUST

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Climate Change is a reality from which we cannot escape …

Ignore it and *Mankind* will go away

Thank You