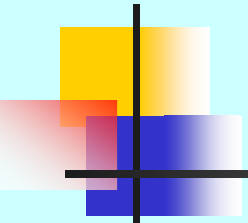


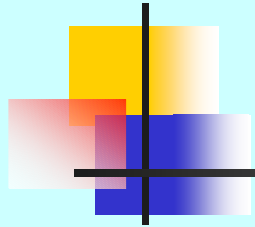
# Climate Change and India: Adaptation issues and concerns: Brief Overview

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# Tools for Adaptation to Climate Change

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- Increasing the resilience and coping capacity of communities;
  - education, training and public awareness;
  - sustainable livelihoods practices;
  - cooperative efforts;
  - insurance;
  - technological intervention; and,
  - research on adaptation.



# Adaptation Concerns and Approaches



# National Features

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- India is a vast country (3.28 million sq. km.)
- Diverse physiographical features
- Himalayas, coastal areas, northern plains, peninsular plateau and islands.
- Occupies 2.4% of the world's land area but support 16.2% of the world's human population.
- Dominating features of climate is the Monsoon.
- Endowed with varied soils, climate, biodiversity and ecological regions.

# India: Impacts of Climate Change



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- Water stress and reduction in the availability of fresh water due to potential decline in rainfall.
- Threats to agriculture and food security.
- Shifts in area and boundary of different forest types and threats to biodiversity with adverse implications for forest-dependent communities.
- Adverse impact on natural ecosystems, such as wetlands, mangroves and coral reefs, grasslands and mountain ecosystems.
- Adverse impact of sea-level rise on coastal agriculture and settlements.
- Impact on human health due to the increase in vector and water-borne diseases, such as malaria.
- Increased energy requirements and impact on climate-sensitive industry and infrastructure.



# Water Resources

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- Change in land use
- Change in cropping patterns
- water conservation
- flood warning systems
- crop insurance
- Integrated Water Resources Management strategy at different levels

*The current strategies to adapt to the two extreme events, namely floods and droughts, will hold good even to the projected impacts of climate change.*

- Flood protection:
  - Structural measures: Construction of dams, construction of levies and dikes .
  - Non-structural: Floodplain zoning, flood forecasting systems, flood insurance and flood preparedness.

Contd.....



# .....Water Resources

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- Drought:
  - Technological management: Medium (seasonal) to long-term (annual to decadal) forecasts
  - Supply side measures: augmentation of the supply of water by sustainable extraction and use of surface and groundwater, improving the water availability, revival of diverse and community-based irrigation systems, soil and water conservation, equitable water distribution, traditional water conservation practices, and groundwater recharge.
- The Government of India is also envisaging the linking of rivers to mitigate droughts, as well as floods.
- Artificial restoration of the hydrological system .
- Biotechnology: may help in increasing crop yields while reducing the water requirement and developing crops that are less dependent on water.



# Agriculture

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- Change in irrigational practices
- Development of resource conserving technologies
- Augmenting production and its sustainability
- To provide Institutional support in the form of improved extension services, markets and infrastructure
- Increasing income from agricultural enterprises.
- Accelerated evolution of location-specific fertilizer practices, improvement in extension services, fertilizer supply and distribution, and development of physical and institutional infrastructure, to improve efficiency of fertilizer use.
- Recycling waste water and solid wastes in agriculture.
- Reducing dependence on agriculture.
- Current programmes, policies, and projects are likely to reduce the vulnerability of agricultural production and conserve soil and water resources.





# Forestry

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- Forest policies: India has formulated a large number of innovative and progressive forest policies, which have the potential to reduce vulnerability. Some examples of policies, which need effective implementation, are as follows:
  - Incorporate climate concern in a long-term forest policy-making process.
  - Incorporate climate concern in the forest ‘working plan’ process to enable incorporation of silvicultural practices to promote adaptation.
  - enhance coverage and effectiveness of protected area; wildlife conservation programmes
  - Link Protected Areas, Wildlife Reserves and Reserve Forests.
  - Enhance support to afforestation and reforestation programmes
  - Forestry and silvicultural practices.
  - Institutional capacity building to address climate change in forest sector.



# Coastal Regions

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- Structural interventions: putting up of artificial physical structures in the landscape (for example building dikes or seawalls or enhancing the natural setting or landscape in such a manner so as to provide protection from the climate-related coastal hazards), planting of mangroves, beach nourishment, etc.
- Non-structural approaches: land-use controls, information dissemination, and economic incentives to reduce or prevent disasters, the Coastal Regulation Zone, or using insurance to cover the risk related to impacts of climate-related hazards.
- Coastal zone management plan should also include R & D activities for cost-effective methods for the protection of coastal lands.
- Rules and regulations must be framed and enforced to have a control over the developmental activities and to put restrictions on seaward extrusion.



# Health

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- Improved malaria drugs, potential immunization and enhanced economic welfare of the people may reduce the incidence of malaria.
- In addition to disease specific measures, the following actions might be taken to develop adaptation strategies for the future:
  - Improved surveillance and monitoring systems.
  - Develop vector specific regional maps.
  - Technological engineering strategies.
  - Improved infrastructure to avoid artificial breeding.
  - Medical interventions.
  - Develop predictive models linking climate and incidence.
  - Develop integrated environmental management plans.
  - Public education.



# Energy & Infrastructure

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- The incorporation of future climate extremes in the project design parameters in the immediate term;
- Improved operational and maintenance practices in the near term; and
- improved climate predictions and creation of insurance markets in the long term.

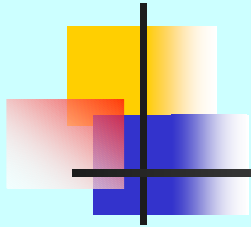


# Lessons Learnt on Country Approaches to Adaptation

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- Adaptation is a dynamic, multi-faceted process
- The involvement of all decision levels, co-operation, dialogue, awareness raising and capacity building are key elements of an adaptation strategy
- The right types – and the right combination – of assessments are needed to move into adaptation actions
- Adapting to current impacts of climate variability and/or change is an important need, but not the only one
- Mainstreaming involves more than integration of adaptation in sectoral planning
- Countries are different, but they can share knowledge, technologies and tools on adaptation

# Conclusion



## *Suggested measures\**

- Capacity building and awareness raising, advocacy and education
- Knowledge management
- Strategic and spatial planning
- Strategic investments in infrastructure
- Disaster management
- Alternative crops, livelihoods
- Attention to water resource management
- Assess local coping & adaptation strategies
- Define indicators and benchmarks of change
- Integrate climate variability into policies and programmes from planning stage.
- Regional and international cooperation
- Identify vulnerable areas, hot spots, and monitoring of impacts



# Way ahead

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KEY TASKS FOR ADDRESSING ADAPTATION NEEDS:  
At local, National and Regional/Global level

1. Capacity Building
2. Knowledge/ Information
3. Institutions/ Partnerships
4. Policy/ Instruments
5. Technology



**THANK YOU**

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