IMPACT OF CLIMATE CHANGE ON CITIES

TRAINING PROGRAM ON
URBAN CLIMATE CHANGE RESILIENCE

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Urbanisation in India

- The urban population in India grew from 286 million in 2001 to 377 million in 2011.
- Nearly 30% of the population in India is now living in the urban areas.
- It is estimated that by 2030, more than 40% of the population would be living in the urban areas.

Contents

- Vulnerability of Cities
- Direct Physical Risks of Climate Change on Cities
- Uttarakhand’s climate vulnerability
- Associated Impacts on Urban Systems

Vulnerabilities of Cities

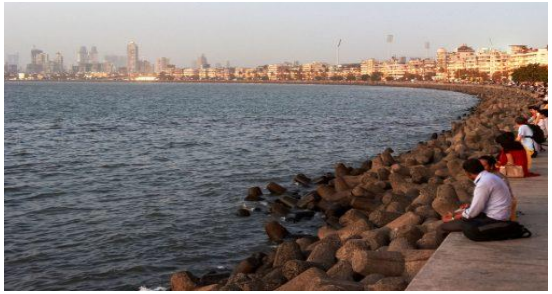
- Cities house
  - More than half of the world's population,
  - Trade, businesses, economic activities
  - Built assets
- Cities are the centres of economic growth generating more than 80% of the global GDP
- Urbanization and economic growth go hand in hand.
- Cities also responsible for a significant share of the GHG emissions and consequent climate change.
- Due to high concentration of people, economic activities, business, property and livelihood.

Cities will be hit hard by Climate Change

Imperative to understand the impacts of Climate Change on cities.

Direct Physical Impacts

Sea level rise



Increase of cyclones

Climate Change A unique challenge for cities.

Increase of heavy precipitation events

Increase of extreme heat events & droughts

INCREASE IN HEAVY PRECIPITATION EVENTS

Landslides

Flooding

Disruption of Traffic

Massive destruction
of lives and property

INCREASE IN EXTREME HEAT EVENTS

- Increased use of mechanical means for thermal comfort and climate control.
- Increase in heat island effect.
- Effect on demand and supply of energy.
- Increased incidences of diseases.
- Lowers overall human productivity and efficiency.

SEA LEVEL RISE

- Impact on large population and crucial economic assets.
- Impact on coastal and port cities.
- Flooding of wetlands and tidal flats.
- Erosion of beaches, sedimentation of river floors in estuarine zones.
- Decreasing coastal aquifers affect fresh water supply and peri-urban agriculture.

INCREASE IN EXTREME DROUGHT AFFECTED AREAS

•Water shortages due to changes in precipitation.

•Water stress due to increased water demand

•Decline of water quality.

•Reduced food supplies.

• Raised food prices &food insecurity.

•Frequent power outages(when hydropower source of electricity)

INCREASE IN FREQUENCY AND INTENSITY OF CYCLONES

•Large scale destruction of lives, property and assets and ecosystems.

•Inundation and Power shutdowns

•Disruption of normal lives, business, and economic activities for several days.

•Heavy financial burden to bring the city back to normalcy.

• Vulnerable to the outbreak of water borne diseases.

Uttarakhand's climate vulnerability

Himalayan region is one of the four most vulnerable regions of India from climate change perspective

The whole Himalayan area is exhibiting an increase in the precipitation in the 2030s scenario. The increase varies between 5% and 20% in most areas, with some areas of Jammu and Kashmir and Uttarakhand showing an increase of up to 50% (MoEF, 4x4 Assessment Report)

Uttarakhand's climate vulnerability

The main direct causes of flash floods in the Himalayan region are:

- Intense rainfall events
- Landslide dam outbursts, glacial lake outbursts, rapid melting of snow and ice, sudden release of water stored in glaciers
- Failure of artificial structures such as dams and levees.

Uttarakhand's climate vulnerability

Glacial Lake Outbursts

- A recent phenomenon observed in the region
- On 14 June 2013, the banks of the lake Chorbaria Tal (Ghandi- Sarovar) situated above Kendarnath village burst causing flash floods and landslides
- Caused widespread and permanent damage to several settlements in- Uttarkashi, Rudraprayag, Chamoli and Pithoragarh districts

Summarising the Climate induced changes

- Reduction in snow in winter
- Rise in temperature
- An increasing intensity and frequency of flash floods and drying up of perennial streams.
- Receding glaciers and an upwardly moving snowline
- Depleting natural resources
- Erratic rainfall, irregular winter rains, advancing cropping seasons, fluctuations in the flowering behaviour of plants
- Shifting of cultivation zones of apple and other crops

Stressors in the region

District	Activities/Stressors
Udham Singh Nagar	Distilleries and Other industries
Haridwar	Industries, Stone crushing, Tourism
Champawat	Mining, Deforestation
Nainital, Dehradun	Industrial belts, Urban centres, Tourism
Almora	Mining
Pitthoragarh, Bageshwar, Chamoli	Mining, Hydro electric projects
Rudraprayag, Uttarkashi	Hydro electric projects, Tourism

Source: Indian Network on Ethics and Climate Change (INECC) 2011. Climate Vulnerability in North Western Himalayas

Associated Impacts on Urban Systems

- Complex systems with extensive interlink ages.
- Impacts on a broad spectrum of city functions, infrastructure and services:
  - Impacts on economic activities
  - Impacts on physical infrastructure
  - Damage of lives and property
  - Impacts on urban poor
  - Health
  - Air Pollution
  - Nutritional issues
- Aggravates the existing stresses in the city
- Disruption of physical infrastructure impairs the functioning of the city.
- Eventually impacts living conditions, economic activities and livelihood of the city.
- Damage particularly severe in low lying coastal cities where most of the worlds' largest cities are located

Cities need to…

- Identify risks and vulnerabilities
- Tackle the impacts of climate change and direct the focus on developing climate resilient urban systems.
- Consider both current and future climate risks as well as other likely changes in the urban environment for climate resilient urban planning

- There is a strong need therefore, to incorporate climate resilience considerations into
  - City systems (Infrastructure, services, sectors)
  - City planning (Development norms, land-use planning)

Resilient cities in the light of climate change should be able to develop plans for future development and growth bearing in mind the climate impacts that the urban systems are likely to face*.

Climate resilience is not about development in new way.

It is about adding climate variability and change considerations in the planning and development framework to ensure long term sustainability and preparedness to climate change

Cities across the world are engaging in planning for climate resilience.....

.....transforming their systems to address climate variability and change without compromising on present development challenges.

Sea walls, bunds and dykes

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safe and affordable housing

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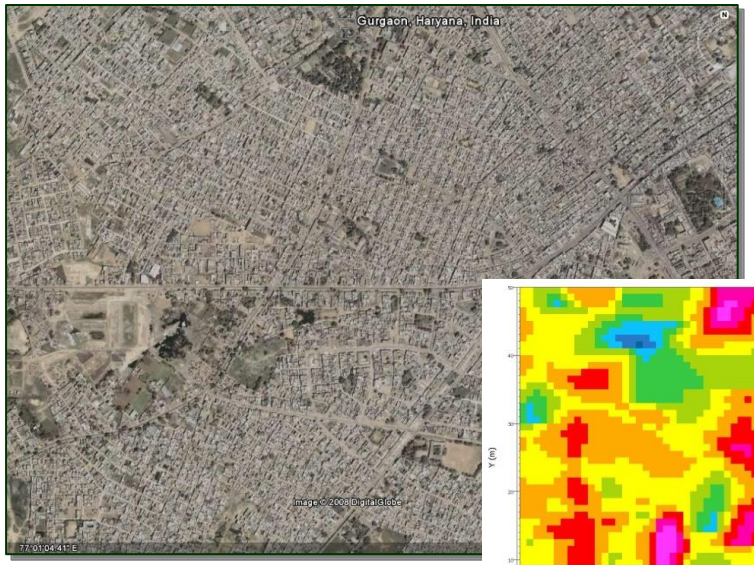

cool roofs for thermal comfort

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urban greenery

How are climate resilient cities different or better?

- Climate resilient cities have the capability to reduce and manage the negative impacts of climate change because they have planned and factored these changes in their development goals and planning by:
  - Utilizing climate information (past and future) to identify climate stressors typical to their cities/region
  - Preparing and implementing strategies to reduce vulnerability of population and city systems.
  - Adapting to change, preparing and responding to disasters, mitigating GHG emissions

Responding to Climate Change : From Reactive to Proactive Action

Reactive (driven by actual perceived climate variability)

Proactive (driven by climate forecasting / future scenarios)

Disaster mitigation/ response (post extreme event)	Disaster preparedness measures (based on current variability)	"Climate proofing" at project level	Mainstreaming climate forecasts into sectoral policies and processes	Strategic multi-stakeholder adaptation and mitigation planning

Key actors:

Households, CBOs, aid/relief organizations	Private developers, insurers, development NGOs	Sectoral agencies (environment, water, housing, etc.)	Centralized unit ("climate czar") with strategic planning authority

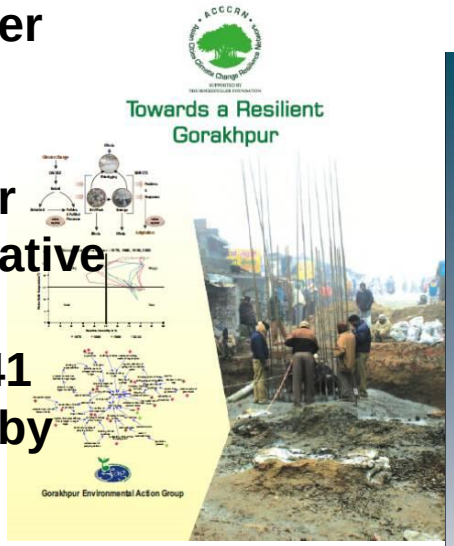
How to plan for climate resilient cities? Are there general rules to follow?

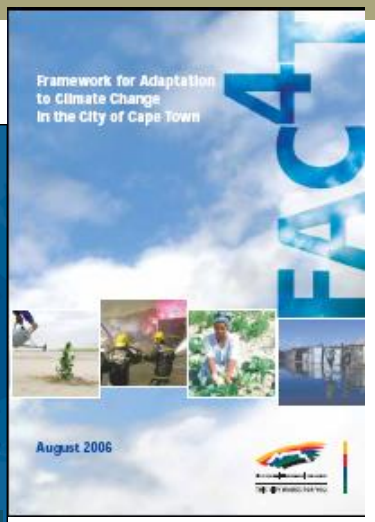
- Key steps:
  - Urban profiling
  - Identification of current and future climate stressors
  - Understanding risks and vulnerabilities
  - Identification of strategies to reduce vulnerability and manage risks- develop resilience
  - Steering governance processes, regulations and institutions for long term benefits
  - Locating finance
  - Involving community throughout

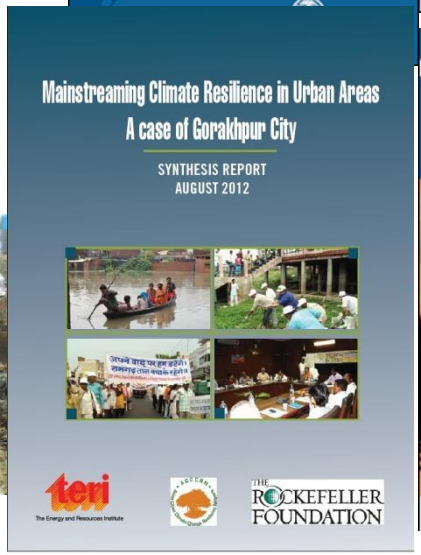
.

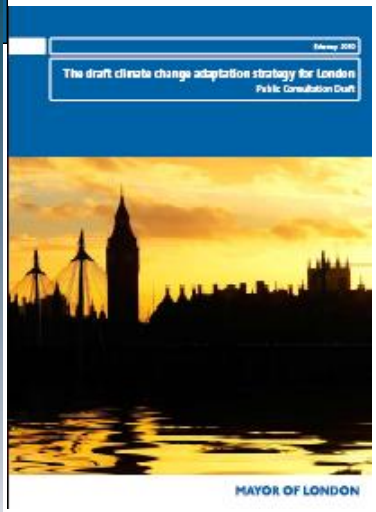
Indian cities planning for resilience

- Surat, Indore , Gorakhpur , Guwahati, Shimla, Mysore, Bhubaneswar under ACCCRN
- Kanpur and Meerut under WWF initiative
- Delhi and Mumbai under Clinton Foundation Initiative
- Climate roadmaps for 41 Indian cities supported by ICLEI-SA









International Programs supporting Resilience

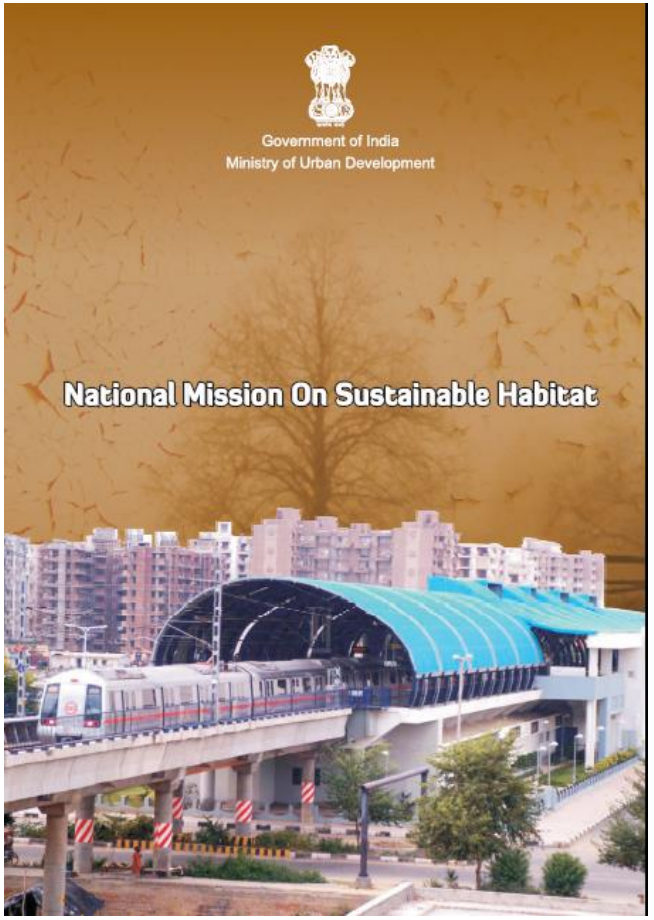
- Asian Cities Climate Change Resilience Network
- Cities Development Initiative of Asia
- UNHABITAT's cities and climate change initiative
- Rockefeller Foundation's recent 100 resilient cities program
- USAID's Climate Change Resilient Development(CCRD) program have been working towards addressing knowledge gaps with improved mechanisms to support cities to be climate resilient.
- Global Resilience partnership
- ADB's Urban Climate Change Resilience Partnership(UCCRP)

…..to name a few

National Programs –existing and Future opportunity

- National and state level:
- National Mission on Sustainable Habitat
- State action plan on climate change
- National schemes like UIDSSMT,RAY, BSUPS
- Smart cities program

- Local level
- Master planning process
- District disaster management plans
- Zoning regulations/ building bye laws
- CDPs/ DPRs



Challenges

- Lack of understanding of the impacts of climate change and the fact that adaptation interventions are best employed and covered at local level.
- Creating awareness amongst the local government that adaptation is synonym to their functions and their development goals
- Already pressing development pressures might overlook adaptation issues
- Integrating adaptation at municipal level would be difficult because of the perception of contest for budget.
- Lack of capacity within the local government .
- Development plans of cities do not factor climate change related factors in a targeted way.
- Translation of global impacts of climate change to local level (downscaling) has been missing
- Lack of data and modeling framework at the city level

Need for a robust ‘Institutional Policy Arena’ To be made available to support city resilience building

Key Enablers

- **Policy and mandate** at national and state level
- **Integration of climate agenda** with city development agenda
- **Institutionalization** of urban climate resilience planning.
- **Strong Political leadership** at local and state level
- Use and involvement of **local expertise** to generate context specific locally driven solutions
- **Capacity building** and awareness generation to generate momentum and facilitate action at all levels
- **Access to knowledge** on climate variability and change
- **Data management** and updating to facilitate decision making

Need for Resilience planning

- Would enable including climate variability and change considerations in the urban planning and development framework

- Would ensure addressing current and future risks and hazards for long term sustainability

THANK YOU