

THE CENTRE OF EXCELLENCE FOR URBAN DEVELOPMENT AND CLIMATE CHANGE

12 YEARS OF EXCELLENCE



Cyclone Storm Land slides Capacity Building
Earthquake Infrastructure Air pollution Action Plans
Floods-Droughts Resilience Heat Island Policy
Management Climate Change Disaster Preparedness Sensitivity
Governance Adaptation Mitigation Contingency Plan Smart City
Sustainability Heat Waves Lightning
Socio-Economic Gender Vulnerability Environment & Health



सत्यमेव जयते

12 YEARS OF MAKING A DIFFERENCE

Integrated Research and Action for Development (IRADe) was designated as a Centre of Excellence for Urban Development and Climate Change in 2008, by the Ministry of Housing and Urban Affairs, Government of India, in recognition of its extensive expertise and relentless efforts in these domains.

IRADe Centre of Excellence (CoE) addresses critical issues related to Urban Development and Climate Resilience in India. It works towards capacity building, raising awareness, research and training, integrating various urban development efforts and documenting best practices and policy level prescriptions. It has undertaken rapid vulnerability assessment of 20 cities, devised roadmap for mainstreaming climate and disaster resilience components in the smart city development plans of 10 cities, and piloted urban climate vulnerability index. It has developed hazard vulnerability and critical infrastructure maps for 12 cities, enabling planners and decision makers devise city disaster management strategies and resilience action plans.

Dedicated towards strengthening city health resilience, IRADe CoE is actively working on developing Climate adaptive Heat Stress Action plans, Early Warning System for Dengue and Air pollution Action plans. Research conducted by IRADe CoE facilitates decision-making for various ministries, including Ministry of Environment and Forests and Climate Change, Ministry of New and Renewable Energy, Niti Aayog, Ministry of Power, Ministry of External Affairs, Ministry of Urban Development, Department of Science and Technology, among others.

Inputs from IRADe have contributed to low carbon pathways and the Nationally Determined Contributions until 2030 and 2050 for Climate Policies in India. It has provided analytical support to the Ministry of Environment Forests and Climate Change (MoEFCC) for the Paris Agreement. Results, outcomes and findings from the IRADe CoE are widely shared with various forums and platforms like IPCCSREX, European Union, Rockefeller foundation (ACCCRN), UN Habitat etc.



THEMES AND PROJECTS

Disaster Resilience

- Sustainable and Disaster-Resilient Cities: Case Studies and Capacity Building of 10 JnNURM cities
- Review of City Disaster Management Plans of six cities
- The Time is Now: Sustainable and Climate-Resilient Urban Development
- Vulnerability of Coastal Cities on Rivers to Climate Change: Case Study of Surat
- Developing Disaster Resilience Action Plan through GIS & Prioritizing actions for natural risk reduction

Climate Resilience

- Climate Vulnerability Profiles of 20 Indian Cities
- Policy Brief on Emerging Mechanisms and Responses of Cities to Climate – ACCCRN
- Rapid Assessment of Vulnerabilities to Climate Change of Indian Cities
- Working Paper on HIGS Framework for Climate-Resilient Urban Development
- Policy Landscape for Urban Climate Resilience
- Assessment of Climate induced natural hazard vulnerability of cities
- Developing Climate Resilient Smart Cities
- Developing Urban Climate Vulnerability Index

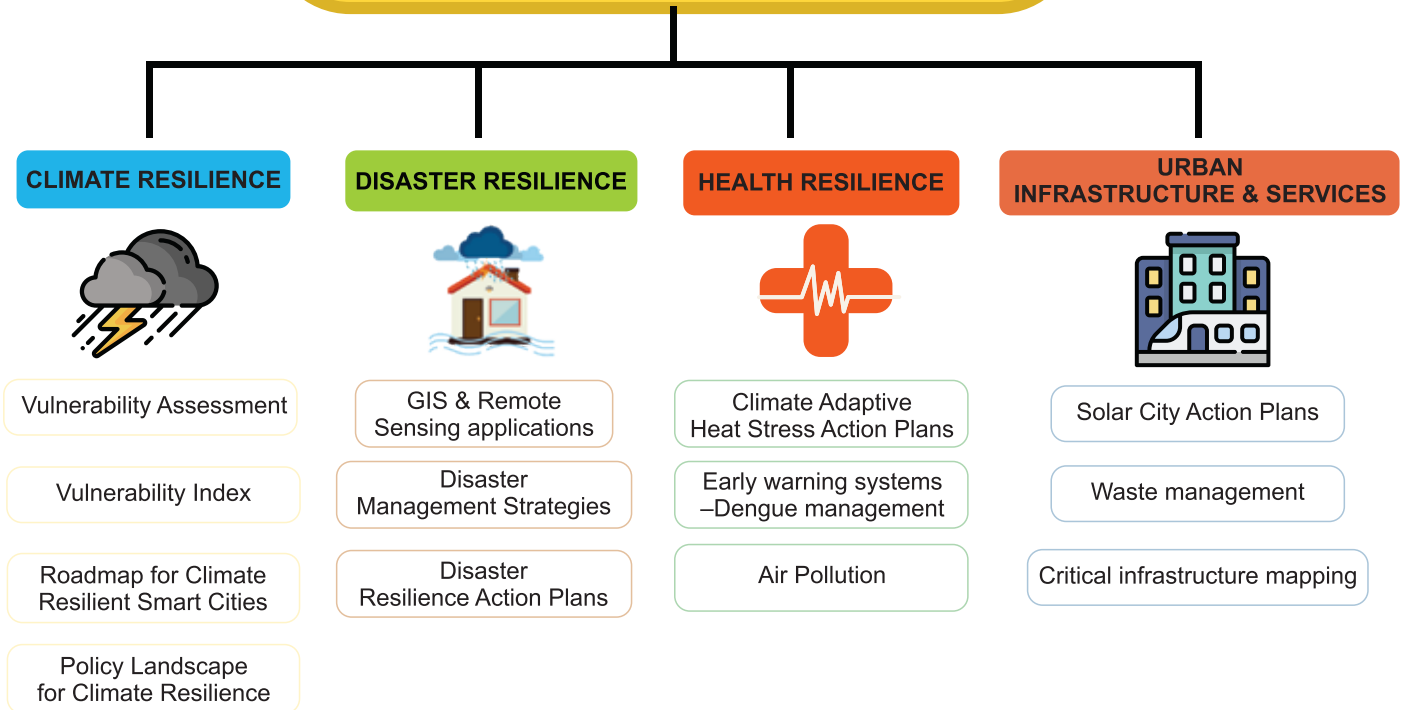
Health Resilience

- Climate Adaptive Action Plans to manage Heat Stress in three Indian Cities
- Prediction of Dengue with Climate Change for Delhi and Rajkot
- Process Analysis, Observations and Modelling: An integrated Solution for Cleaner Air for Delhi

Urban Infrastructure & Services

- Preparation of Master Plan with Detailed Action Plan for Jodhpur, Ajmer & Udaipur
- Landfill Waste Management in Okhla, New Delhi
- Strengthening of Solid Waste Management System in the Industrial Park, Cherlapally

SUSTAINABLE URBAN DEVELOPMENT



IRADe Centre of Excellence for Urban Development and Climate Change



SUSTAINABLE AND DISASTER RESILIENT CITIES

Case studies and capacity building of 10 JnNURM (Jawaharlal Nehru National Urban Renewable Mission) cities - Srinagar, Dehradun, Shillong, Guwahati, Visakhapatnam, Hyderabad, Pune, Bhopal, Ahmedabad

PROBLEMS ADDRESSED

- The state of disaster-resilience at the city-level need to be assessed
- Need to understand the challenges faced by ULBs to keep pace with the need to increase infrastructure and service provision for citizens, and simultaneously ensure inclusive growth for the urban poor

POLICY/ ACTION/ SOLUTIONS

- Four regional workshops held to receive inputs from city officials, policymakers, planners and other stakeholders
- Multi-hazard Assessment Maps for the 10 cities to help decision-makers understand the risks and preparedness of respective cities. Maps can be incorporated in their CDPs/ Master Plans/ Smart City Plans
- Integrated approach recommended for sustainable and disaster-resilient development in cities to help local governments
- Inputs for achieving SDGs 9.1 & 11

CITY DISASTER MANAGEMENT PLANS

Review of City Disaster Management Plans of six cities- Bhubaneswar, Madurai, Shimla, Trivandrum and Vijaywada.

PROBLEM ADDRESSED

Assess the clarity, comprehensiveness, efficiency, appropriateness of climate risk management measures and dissemination, including integration in the CDMP planning process and each plan document.

POLICY/ ACTION/ SOLUTIONS

- Recommendation to improve efficacy, visibility and implementation of CDMP
- Presented Strategy to each city administration for addressing the gap observed during the review process.

VULNERABILITY OF COASTAL CITIES TO CLIMATE CHANGE

Vulnerability of coastal cities to climate change: Case study of Surat

PROBLEM ADDRESSED

Absence of integrated analytical framework for floods & Disaster Management strategy for urban areas close to Tapi basin, Ulkai dam and the coastline

POLICY/ ACTION/ SOLUTIONS

- Developed hydrological model for Surat using hydraulic modelling system & spatial analysis software. Model assesses the extent of inundation and water depths under various scenarios
- Adaptation actions for climate change resilience of these cities
- Inputs for Government of India's mission to build disaster resilient infrastructure, as well as SDG 9.1, 11 & 13

DISASTER RESILIENCE ACTION PLAN

Developing Disaster Resilient Action Plan for the cities of Shillong & Gangtok

PROBLEMS ADDRESSED

- Non-availability of high-resolution climate vulnerability maps
- Lack of decision-support system for decentralized action at ward level
- Non-availability of Resilience Action Plans

POLICY/ ACTION/ SOLUTIONS

- Developed cadastral maps at the scale of 1:4000 and mapped hazard-wise vulnerable zones in the cities
- Developed critical infrastructure maps at a scale of 1:4000 to identify critical support services lying in hazard-prone areas
- Maps to help in developing disaster resilient action plans for the cities, and guiding decision-makers in mobilizing the right set of actions
- Inputs for achieving SDGs 9.1 & 11, and Government of India's mission to build disaster resilient infrastructure

CLIMATE VULNERABILITY PROFILING

20 Indian cities covered under the Jawarharlal Nehru National Urban Renewable Mission

PROBLEMS ADDRESSED

- Lack of understanding of the city level climate vulnerability and the nature of actions needed for climate resilient development
- Need for Government and institutional frameworks for building resilient infrastructure at the city level, in the wake of climate induced risks faced by the cities

POLICY/ ACTION/ SOLUTIONS

Vulnerability profiles and Matrix for 20 Indian cities Assessment of a coherent set of urban resilience measures, which merge with the natural hazard risk reduction and urban renewal interventions, minimising the impact of climate change on the cities and their inhabitants.

EMERGING MECHANISMS & RESPONSE OF CITIES TO CLIMATE

Policy Brief on Emerging Mechanisms and Responses of Cities to Climate - ACCCRN

PROBLEMS ADDRESSED

Need for policy discourse on emerging mechanisms, responses and measures needed for prioritizing climate resilience into city development

POLICY/ ACTION/ SOLUTIONS

Guidance document for decision makers at national/ state/ city government levels on Urban Climate Change Resilience

URBAN CLIMATE VULNERABILITY INDEX

Assessing Urban Climate Vulnerability Index for six Indian cities - Srinagar, Delhi, Shillong, Chennai, Mumbai, Bangalore

PROBLEMS ADDRESSED

A qualitative & quantitative assessment framework to identify climate hazard vulnerability of the selected cities

POLICY/ ACTION/ SOLUTIONS

- Climate Vulnerability Scorecard with 7 thematic indicators (Physical, Hazard, Social, Demographic, Financial Provisioning, Infrastructure and Administration vulnerability)
- 70 sub-indicators to assess city-level vulnerability
- This would help the Government of India in addressing SDGs - 11 & 13

POLICY LANDSCAPE FOR URBAN CLIMATE RESILIENCE

Mainstreaming Climate Resilience in Urban Development; Policy Landscape for Urban Resilience for the cities of Gorakhpur, Surat and Indore

PROBLEM ADDRESSED

Addressing climate induced natural hazard vulnerability of cities

POLICY/ ACTION/ SOLUTIONS

- Identified opportunities to orient urban development programmes to promote city-level climate resilience
- Learning shared on the national-level, with the city Governments being apprised of relevant opportunities offered by the Central Government
- Integrated policy framework suggested
- Coordinated decision making at the national, state and city levels

DEVELOPING CLIMATE RESILIENT SMART CITIES

Policy level engagement for developing Climate Resilient Smart Cities

PROBLEM ADDRESSED

Need for engaging decision-makers on urban climate change resilience and integrating the concepts into wider planning discourses

POLICY/ ACTION/ SOLUTIONS

- Policy recommendations and interventions for developing Climate Resilient Smart Cities in India, and Climate Resilience component into smart city plans
- Smart solutions for Disaster Resilience and Management in Smart Cities

RAPID ASSESSMENT OF VULNERABILITY TO CLIMATE CHANGE

Rapid assessment of vulnerability to climate change for 14 Indian cities

PROBLEMS ADDRESSED

- Need for a methodological framework and index for rapid assessment of urban climate vulnerability
- Non-availability of baseline data pertaining to urban development in terms of socio-economic and infrastructure characteristics

POLICY/ ACTION/ SOLUTIONS

Methodological framework for rapid climate vulnerability assessment, efficient urban policies and programmes

HIGS FRAMEWORK OF CLIMATE RESILIENT URBAN DEVELOPMENT

Working paper on the Hazards, infrastructure, Governance, Socio-economic (HIGS) variables framework for Climate-Resilient Urban Development

PROBLEMS ADDRESSED

- A framework was developed to analyse city-level climate risks by integrating information on physical and meteorological hazards
- Analysis of infrastructure and urban services; Governance variables; and socio-economic and demographic indicators

POLICY/ ACTION/ SOLUTIONS

- A customizable approach for cities to analyse their vulnerability in order to understand potential areas of corrective action, and compare it across cities
- Inform national, state and local policymakers on urban development and management.
- The framework spurs autonomous action by enabling cities to assess their vulnerability using the HIGS framework

INTEGRATED SOLUTIONS FOR CLEANER AIR FOR DELHI

Process, Analysis, Observations and Modelling: Integrated Solutions for Cleaner Air for Delhi (PROMOTE)

PROBLEMS ADDRESSED

- Air pollution is a pressing issue in Delhi and other cities
- Critical need for proper monitoring and mitigating actions

POLICY/ ACTION/ SOLUTIONS

- Assessed the socio-economic and health impacts on the marginalized and lower-income citizens
 - Stakeholder mapping to understand the contributions of different stakeholders in air pollution
 - Campaigns conducted and health advisories distributed in schools
- Inputs for SDG 3

PREDICTION OF DENGUE WITH CLIMATE CHANGE

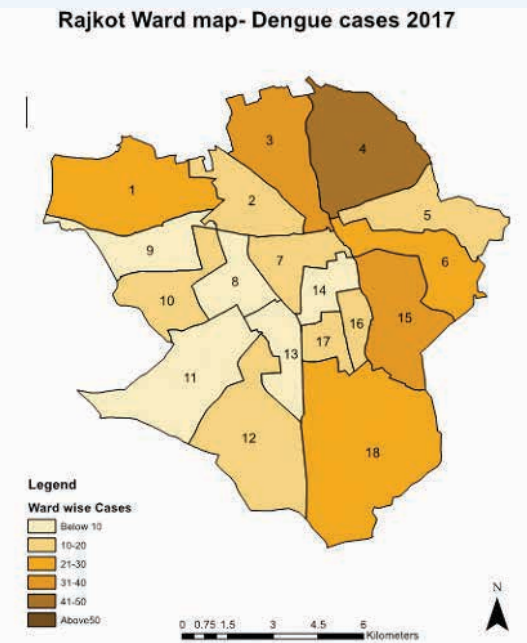
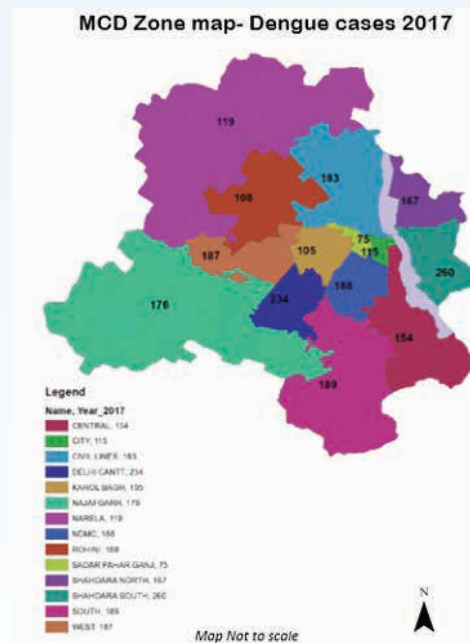
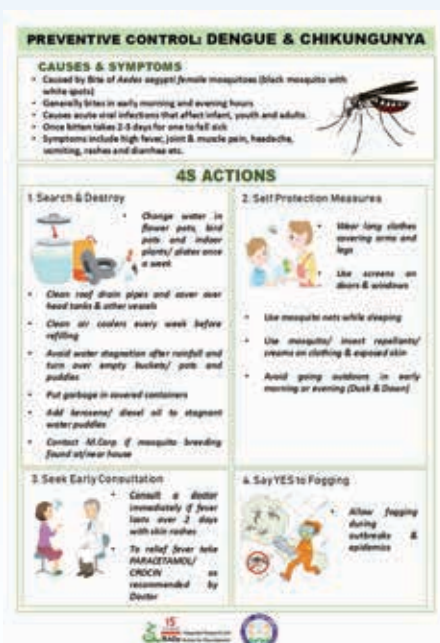
Prediction of Dengue with climate change for Delhi and Rajkot: A statistical analysis and development of warning system

PROBLEMS ADDRESSED

- Dengue incidences have increased over past decades
- No proper monitoring and recording of mortality and morbidity related to dengue

POLICY/ ACTION/ SOLUTIONS

- Developed spatial maps to develop ward -level dengue incidences in Delhi and Rajkot
- Analysis of trends in dengue incidences at ward-level for the period 2011-2017
- Development of advisories and awareness strategies for dengue prevention and management in cities
- Connecting meteorology, statistical modelling and geospatial mapping to develop early warning system for dengue
- Inputs for SDG 3



MANAGE HEAT STRESS IN INDIAN CITIES

Climate Adaptive Action Plans to manage Heat Stress in 3 Indian cities - Delhi, Bhubaneshwar & Rajkot

PROBLEMS ADDRESSED

- Climate Adaptive Heat Action Plans at city levels
- Assess the impact of heat stress on health, productivity and livelihood at the vulnerable sections of the city
- Lack of awareness to manage heat stress and related illnesses
- Building awareness on heat as a disaster
- Spatial identification of vulnerability of population to heat stress

POLICY/ ACTION/ SOLUTIONS

- Impact of heat stress on health, productivity and livelihood of vulnerable population
- Generating awareness towards heat stress through advisories
- Developed spatially differentiated and gender sensitive HeatStress Action Plan for cities in consultation with stakeholders
- Capacity building of frontline health workers
- Capacity building of medical stakeholders and developed training module for managing heat stress related illnesses
- Framework for recording heat related mortality and morbidity
- Inputs for India's Cooling Action Plan and SDG 13

DELHI AIR QUALITY FORECAST & HEALTH ADVISORY
| APHH-PROMOTE Initiative |

All AQI indicates how polluted the air is & considers PM10, PM2.5, NO2, CO, O3, SO2, NH3 & Pb. More AQI info on SAFAR site & App: <https://safer.org/india/>

AQI 0-50	AQI 51-100	AQI 101-200	AQI 201-300	AQI 301-400	AQI 401-500
GOOD	MODERATE	UNHEALTHY FOR SENSITIVE GROUPS	UNHEALTHY	VERY UNHEALTHY	HEALTHY
Everyone should be able to enjoy outdoor activities.	People with respiratory issues, children & older adults should reduce longer or more strenuous outdoor activities.	People with long-term respiratory issues, children & older adults should reduce longer or more strenuous outdoor activities.	People with long-term respiratory issues, children & older adults should reduce longer or more strenuous outdoor activities.	People with long-term respiratory issues, children & older adults should reduce longer or more strenuous outdoor activities.	Everyone should be able to enjoy outdoor activities.
Health Effects...	Who is More Affected?				
<ul style="list-style-type: none"> • Eye irritation, sore throat, cough, and asthma symptoms • Irritation of nose, throat, and lungs • Irritation of eyes, nose, and throat • Irritation of skin • Irritation of the respiratory system 	<ul style="list-style-type: none"> • People with respiratory issues, children & older adults • People with long-term respiratory issues, children & older adults • People with long-term respiratory issues, children & older adults • People with long-term respiratory issues, children & older adults 	<ul style="list-style-type: none"> • Keep your surroundings clean-free of dust • Use a mask around bus/boor when outdoors • Use Indoor Plants as natural air purifiers: Money Plant, Bamboo Palm, Aloe Vera, Snake Plant, etc. • Eat greens, lemon, fruits & green vegetables • Drive vehicle, car pool or use public transport to travel • Don't burn rubbish • Plant a tree that filters the air and reduce air pollution • Wash your facekeys with clean water at night before sleeping • Keep automobile, fuel filters & silencers carbon free • Drink 8-10 glasses of lukewarm water per day • Wash/sprinkle water in/around your school & home premises • Do not burn garbage • Don't burn wood, dung for cooking/heating purpose • Don't sleep with doors & windows open at night • Don't smoke and don't burn incense/agarbatti inside the house 	<ul style="list-style-type: none"> • Avoid awareness by displaying air quality index (AQI) on mobile based/digital board • Shift school timings when AQI is very poor to severe • Avoid assembly in the open during morning hours/ school meeting assembly • Use mask during work, (N95/N100) • Use HEPA filtration system & air purifiers • The immediate third congested road-side had a suspension of humans in water, add honey and drink • Use pepper to clean your throat • Wash face and eyes with fresh water to remove irritation • Avoid heavy traffic areas during 8-10 AM to 4 PM and plan outdoor activities when pollution levels are low (7 AM - 9 AM) • Avoid applying sunscreen in open (AM - 8 AM) & (2 PM - 4 PM) • Ventilate the house when AQI is low (1 AM - 5 AM) 	<p>See Your Doctor if...</p> <ul style="list-style-type: none"> • You've trouble breathing • Have had runny nose for about a week • Are if cough persists for more than two weeks 	

Beat The Heat: Heat Wave Advisory

Highly Vulnerable Groups: Infants and children, Senior citizens, Outdoor workers, Pregnant women, Traffic policemen

PREVENTIVE MEASURES

- Drink four to five litres of cold water
- Drink chaach, shikanji, ORS frequently
- Wear loose cotton clothes
- Shower with cool water
- Avoid going outdoors during peak hours (12 pm to 4 pm)
- Use limestone as paint or wet gunny bags on rooftops
- Run cold water on your wrists
- Take shelter during peak hours
- Cover your face, head and carry an umbrella
- Avoid intense physical activities
- Do not leave children or pets in a parked car
- Hang wet curtains on windows and doors

Symptoms of Heat Stress

HEAT SYNCOPE	HEAT EXHAUSTION	HEAT STROKE
<ul style="list-style-type: none"> • Light-headedness • Brief loss of consciousness • Dizziness • Fainting 	<ul style="list-style-type: none"> • Feeling overheated • Light-headedness/lethargic • Nausea • Sweaty and thirsty • Mildly elevated body temperature • Muscle cramps • Fatigue, dizziness 	<ul style="list-style-type: none"> • Throbbing headache • Difficulty in breathing • Rapid and strong pulse rate • Nausea and vomiting • Dry red skin • High temperature but no sweating • Fever above 104°F, which does not resolve with paracetamol/ibuprofen • Unconsciousness

First Aid

1. Take the patient indoors and place him or her under a fan/ceiling fan
2. Lay the patient down and raise the legs and hips
3. Loosen clothes
4. Immerse the body with a wet cloth
5. Sponge with ice packs and cold water
6. Give plenty of IV fluids and electrolytes
7. Immediate hospitalization if body temperature does not go below 104°F after taking paracetamol or ibuprofen
8. If conscious, give him or her cool water to sip

Call 102 for emergency

DETAILED ACTION PLAN FOR CITIES UNDER SOLAR CITIES DEVELOPMENT PROGRAMME

Preparation of master plan with detailed action plan under solar cities development program for Jodhpur, Ajmer and Udaipur

PROBLEM ADDRESSED

No solar city master plan existed for Jodhpur, Ajmer and Udaipur

POLICY/ ACTION/ SOLUTIONS

- Detailed action plan prepared for setting a goal of minimum 10 percent reduction in projected total demand and conventional energy, to be achieved through energy efficiency measures and generation from renewable energy installations
- Inputs for goals set under National Solar Mission, NDC goals and SDG 13

LANDFILL WASTE MANAGEMENT

Landfill waste management in Okhla, New Delhi

PROBLEM ADDRESSED

Lack of appropriate strategies for managing gaseous emissions from landfill sites

POLICY/ ACTION/ SOLUTIONS

Detailed analysis to understand commercial feasibility of methane gas captured from the landfill site in Okhla

SOLID WASTE MANAGEMENT SYSTEM

Strengthening of Solid Waste Management system in the industrial park - Cherlapally

PROBLEM ADDRESSED

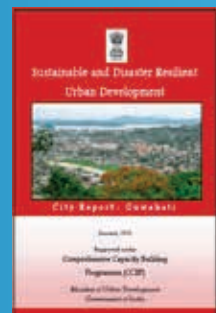
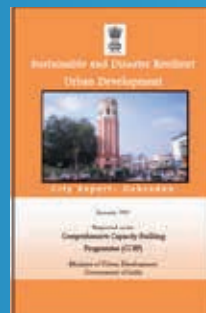
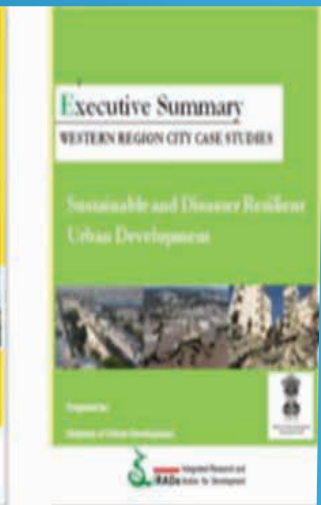
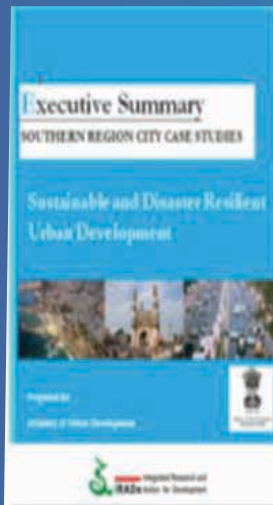
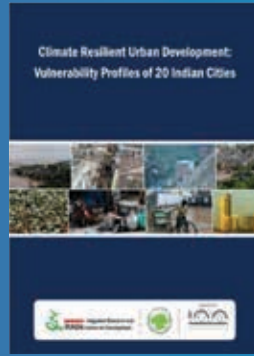
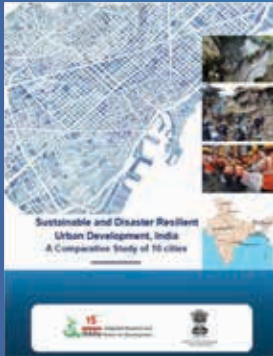
Lack of appropriate strategies and action plan to manage municipal solid waste in cities

POLICY/ ACTION/ SOLUTIONS

- Analysis of different waste streams and the state of existing waste management system in the industrial park - Cherlapally
- Mapping of stakeholders involved and recommending viable cost-effective technical options for efficient municipal solid waste management system
- Provided inputs for Swachh Bharat Abhiyan



COE PUBLICATIONS



GLIMPSES OF SELECT PROJECTS

Stakeholder consultation on – “Consultation for choices & pathway



Developing Disaster Resilience Action Plans through GIS



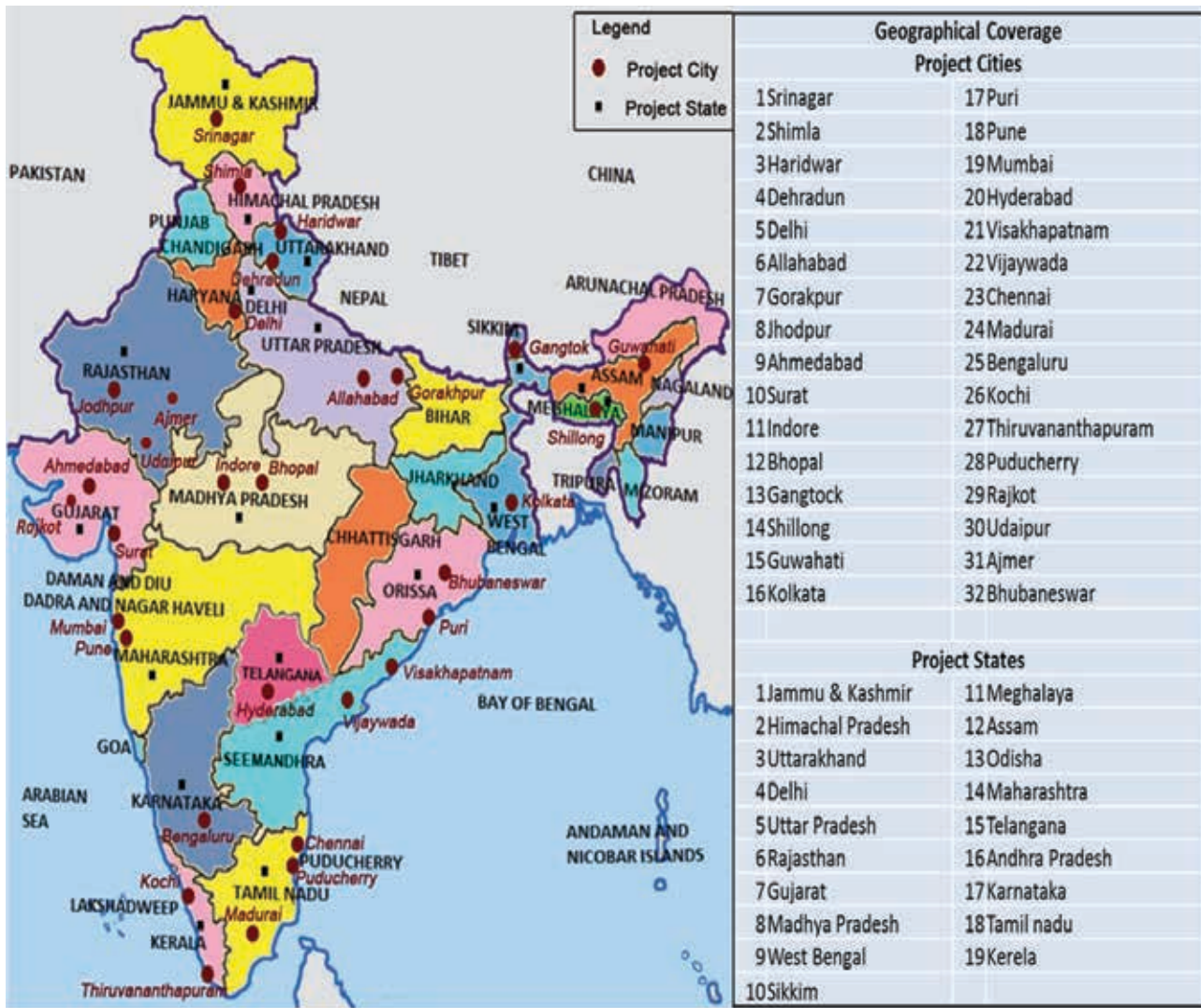
Experts' Consultation on Developing Disaster Resilience Action Plan through GIS and Prioritizing Actions for Natural Disaster Risk Reduction in Urban Agglomerations of Shillong and Gangtok, DAt: 30th July, 2019, Venue: Shillong



Medical Stakeholders Training for Management of Heat Related Illnesses & Orientation to Heat Stress Action Plan

| 11th May 2019 | Amaltes Hall, India Habitat Center | Delhi |

COE GEOGRAPHIC FOOTPRINTS



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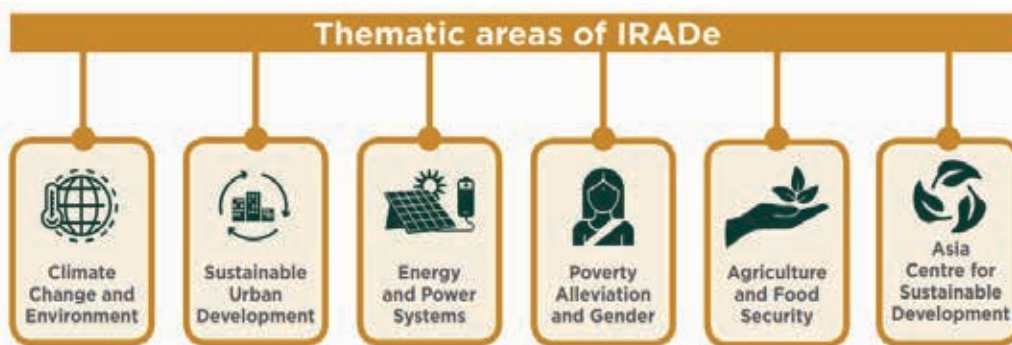


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Department of Sciences
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About IRADe

IRADe is an independent non-profit, advanced research institute which aims to conduct research and policy analysis to engage stakeholders such as government, nongovernmental organisations, corporations, academic and financial institutions. Energy, climate change, urban development, poverty, gender equity, agriculture and food security are some of the challenges faced in the 21st century, IRADe's research covers these issues, as well as the policies that affect them. IRADe's focus is effective action through multi-disciplinary and multi-stakeholder research, to arrive at implementable solutions for sustainable development and policy research that accounts for the effective governance of techno-economic and socio-cultural issues.

IRADe was established under the Society's Act, in 2002 at New Delhi. It is certified as a Research & Development Organisation by the Department of Scientific and Industrial Research (DSIR), Ministry of Science and Technology (MoST), Government of India. It has also been selected as a Centre of Excellence by the Ministry of Urban Development (MoUD), Government of India for urban development and climate change. In addition, it provides expertise to other ministries, national and international institutions and partners with other reputed organisations.



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