UN Climate Change Conference (COP25)

Capacity Building Knowledge to Action

Mobilizing Mitigation / Adaptation Action at Sub National Level

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Dr. Probal Ghosh
Head Modelling, IRADe

United Nations Framework Convention on Climate Change

15 YEARS IRADe Integrated Research and Action for Development

About IRADe

- Independent advanced research institute, conducts research and policy analysis to engage stakeholders; government, non-governmental organizations, corporations, academic and financial institutions.
- One of the Top Reputed Think Tank in South Asia working in area of Climate Change, Energy and Sustainable Urban Development

Thematic Areas

Sustainable Urban Development (SUD)

Energy and Power System (EPS)

Asia Centre for Sustainable Development

Climate Change and Environment (CCE)

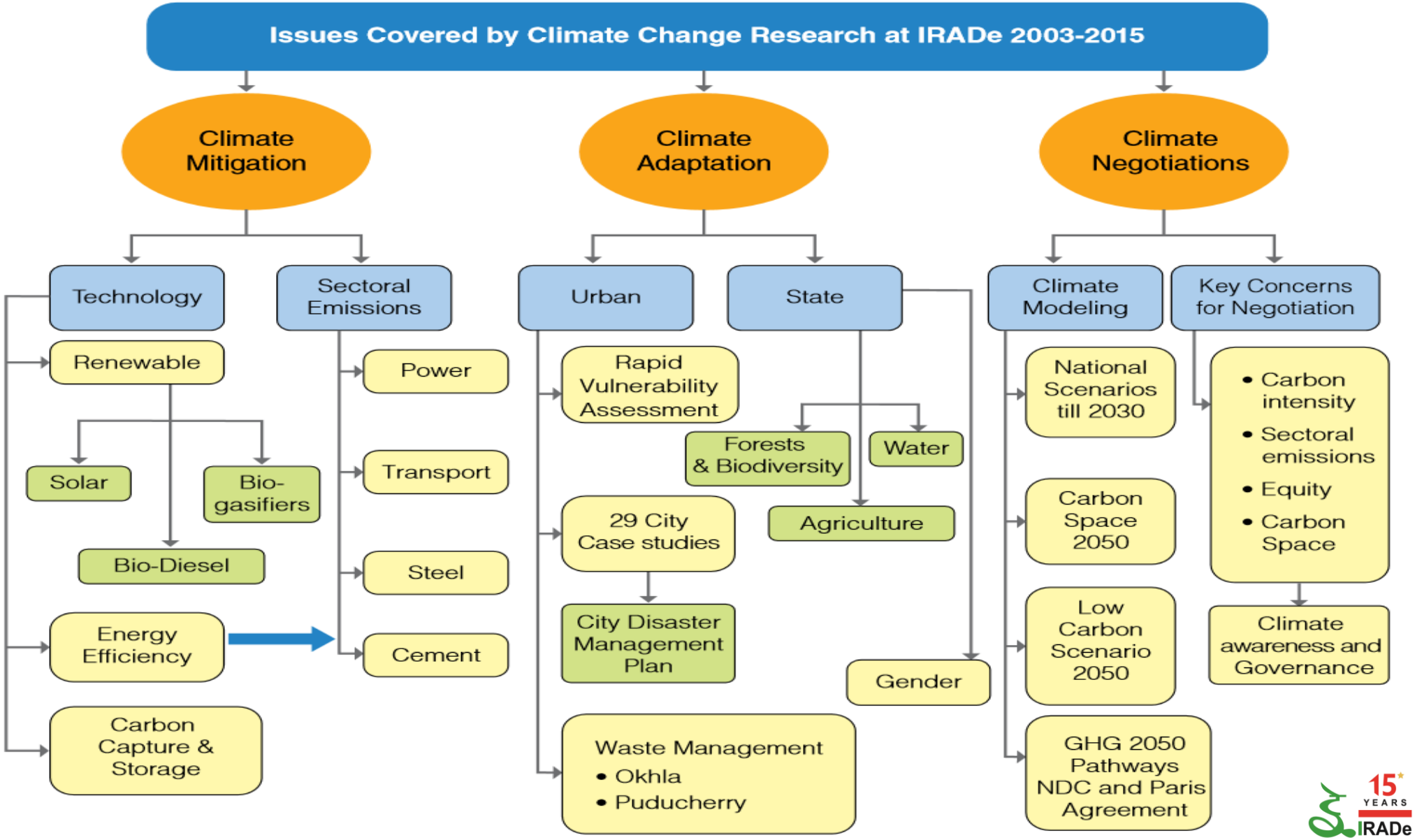
Agriculture and Food Security (AFS)

Poverty Alleviation and Gender (PAG)

- **IRADe has completed 15 years**
- Since inception provided decision support to **11 Ministries in India** & concluded **110 plus projects**
- **Centre of Excellence – Ministry of Housing & Urban Affairs** (Since 2008)

15 YEARS Integrated Research and IRADe Action for Development

Climate Change and IRADe



15 YEARS Integrated Research and IRADe Action for Development

Knowledge to Action

Knowledge	Unfiltered | Implicit | Extensive
Translate	Additional Value | Sharing| Learning | Spreading
Stakeholder Consultation	Engagement | Understanding | Surveys
Redefining Goals	Engagement | Incorporating Perspectives
Identifying Measures	Improvisation | Appropriate Solutions | Redefining Mile Stones
Consensus Building	Policy | Technology Innovations| Managerial Governance
Actions	Implementation | How? | Adaptation | Mitigation

*Is it a **Relay Race** or **End to End Delivery** ?*

15 YEARS Integrated Research and Action for Development IRADe

Knowledge to Action

Who could be Stakeholders ?

PEOPLE's GROUPS / COMMUNITIES

- Students
- Farmers
- Engineers
- Slum Dwellers
- Think Tanks
- Civil Society

ENTITIES / ORGANIZATIONS

- Policy Makers – Central / State
- Regulators – Urban Local Bodies
- Urban Planners
- Private Sector

15 YEARS
IRADe Integrated Research and Action for Development

Climate Adaptation

Capacity Building University Level, INDIA

15 YEARS
Integrated Research and Action for Development
IRADe

Capacity Building at University Level

- **Raise Awareness**
- **Understanding Climate Change**
- **Involving Youth**

7 Indian States

8 Universities

1000 Students

75 Research scholars

60 Faculty members

Climate Awareness in Youth?

AMERICANCENTER

NRDC

15 YEARS IRADe Integrated Research and Action for Development

Capacity Building at University Level

A *Climate Champion* was selected a part of Inter University Debate Competition

Students attending Lecture

Students taking part debating

Students receiving award

15 YEARS IRADe Integrated Research and Action for Development

Climate Adaptive Heat Stress Action Plans

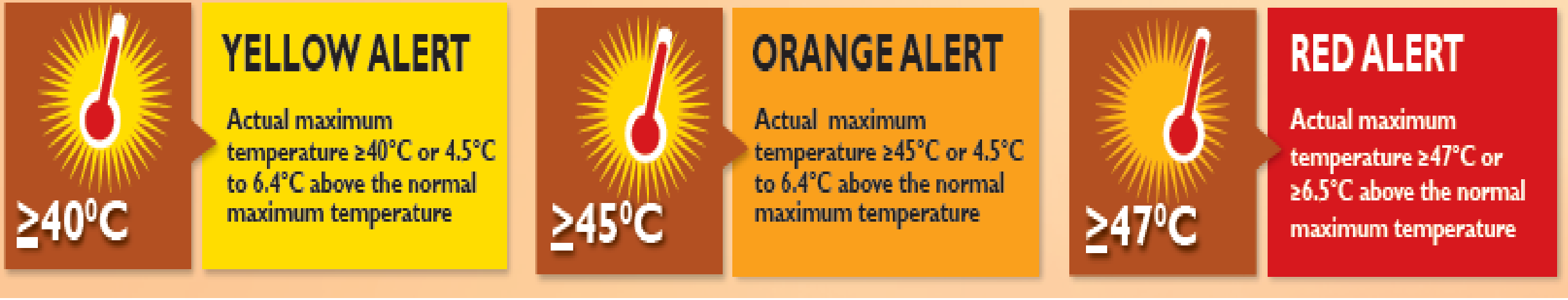
15 YEARS
IRADe Integrated Research and Action for Development

Heat Adaptation Plan– Knowledge

Heat Wave – Silent Disaster

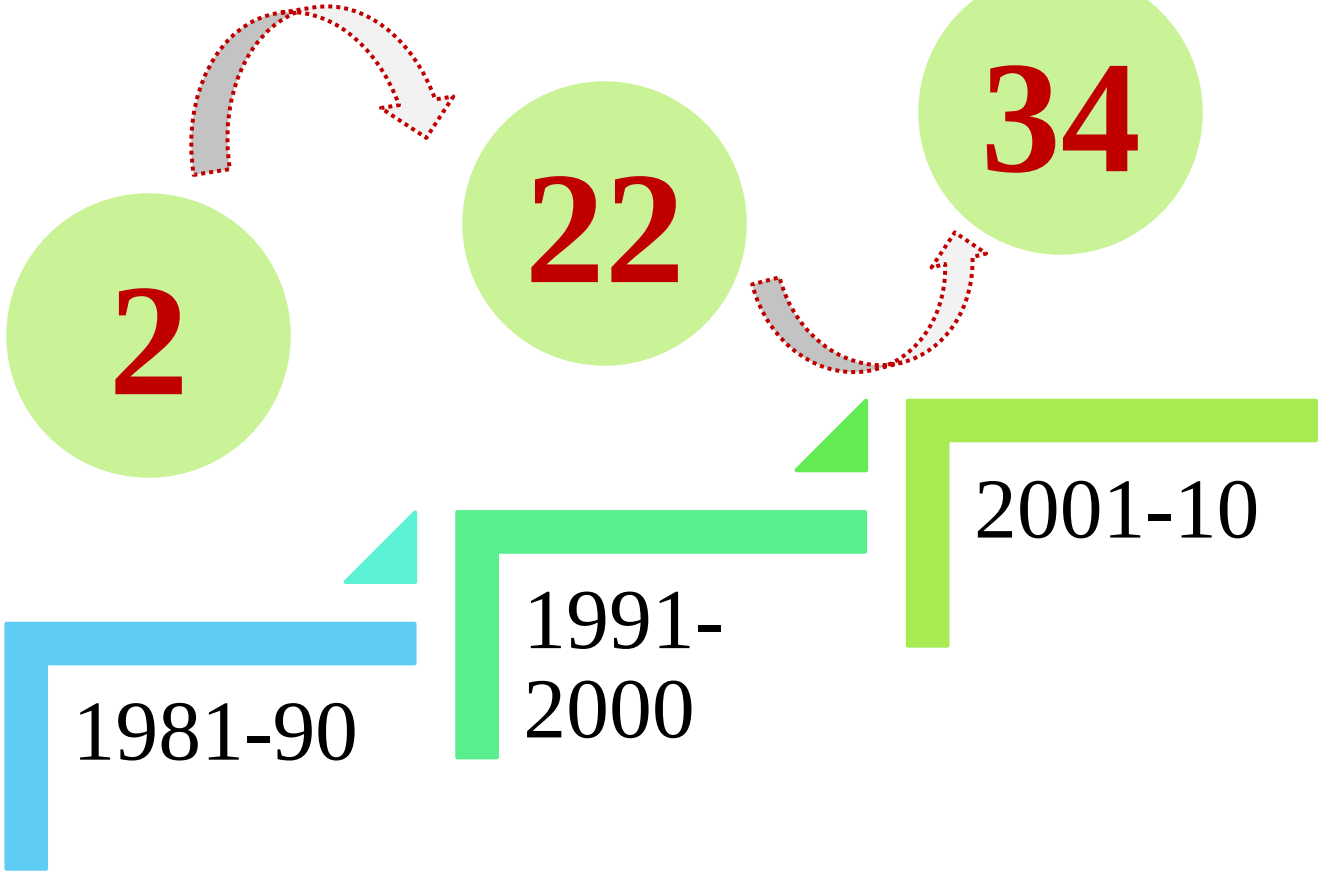
- Heat wave is a **relative phenomenon,** deviation from the normal temperatures .
- Varies **geographically**
- **In India Heat Wave - maximum temperature**
  - **at least 40 ºC for Plains and**
  - **at least 30ºC for hilly areas**

Indian Metrological Department Early Warning criteria - Heat wave



Heat Wave Decadal Trends

Decadal Heat Waves frequency - Rajkot



Rajkot City Location

Source: Ray et al., 2013

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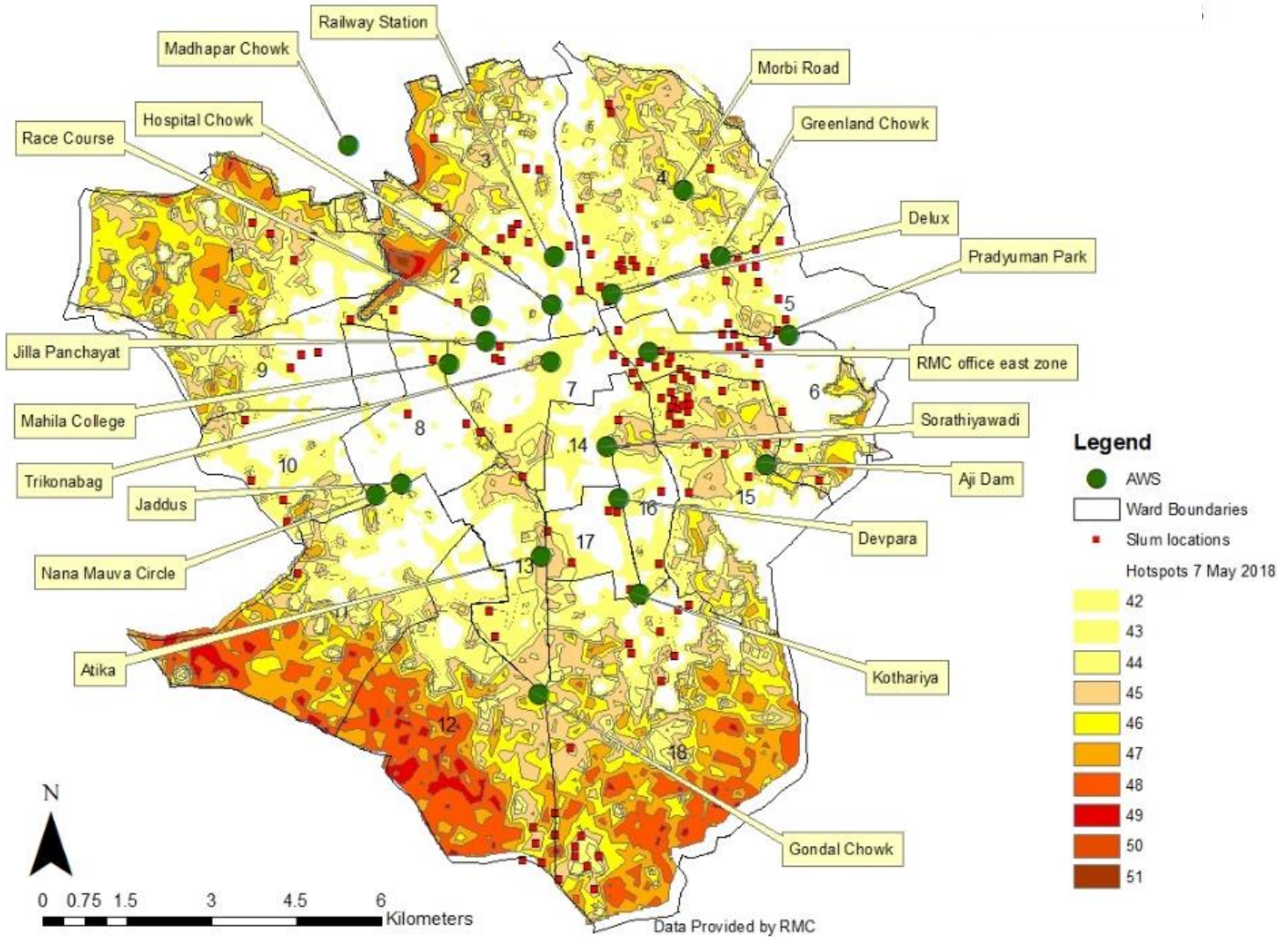
Spatial Variation of Temperature

Thermal Hotspots Maps - Rajkot



Land Surface Temperature

07 May 2018

The temperature varies upto **8°C** within the City

15 YEARS Integrated Research and Action for Development

Heat Adaptation Plan – Stakeholder Engagement

Vulnerability Mapping

Vulnerable areas include:

- **Less urbanized**
- **Minimal** access **-water and sanitation,**
- **Minimal** household **amenities**

Vulnerable groups include:

- **Economically weaker sections**
- **Elderly, Children, Women**
- **Working individuals** – construction workers, factory workers, transport, sweepers, laborers and vendors/street hawkers





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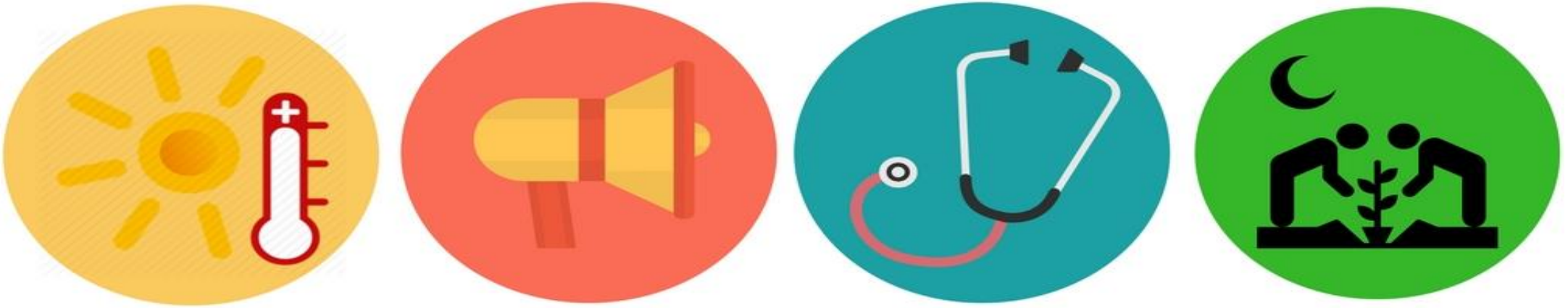
Heat Adaptation Plan– Action

Four Major Components of Heat Action Plan

HAP COMPONENTS



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Action by City Local Government

RMC to lower heat wave warnings by half a degree

Nimesh Khakhariya | TNN | Updated: Jun 28, 2019, 11:51 IST

A- A+

A workshop on heat stress action plan was held on Wednesday

RAJKOT: With temperatures gradually rising over the years, and in fact, the past one decade has registered the historic maximum average temperature, the Rajkot Municipal Corporation (RMC) has decided to revise its warning system to reduce heat casualty. Therefore, it will lower the standard heat wave alerts by half a degree. For example, yellow alert is issued when average temperature touches 41°C. But RMC will declare yellow alert at 40.5°C itself.

City Government (Gujarat, India)

Revised warning system by -

lowering the heat alert by **0.5°C**

The current threshold is **40.5°C**

reduced from 41°C

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Heat Adaptation Plan– Adaptation

Medical Practitioners Training State/City Workshop

- To **recognize** and **record** heat related **impacts**
- **Improve sensitization** towards heat stress adaptation

Delhi –May, 2019	Rajkot - May, 2019
	

Stakeholder Consultation on building HSAP

Rajkot – June 2019

Bhubaneshwar - January, 2019

15 YEARS
Integrated Research and
IRADe Action for Development

Mitigation - Heat Alerts

Heat Advisory disseminated in both ***English*** and ***Vernacular*** languages

Dissemination at :

- Bill Boards
- LED Screens
- Hoardings
- Public places
- Press Release
- Municipal Corporation

Media Engagements

The New York Times

In India, Summer Heat May Soon Be Literally Unbearable

By Somini Sengupta

July 17, 2018

198

NEW DELHI — On a sweltering Wednesday in June, a rail-thin woman named Rehmati gripped the doctor's table with both hands. She could hardly hold herself upright, the pain in her stomach was so intense.

DECCAN Chronicle

CLIMATE | CHANGE ■ Heatwaves could get frequent, say scientists

June was the hottest ever

ADITYA CHUNDURU | DC
HYDERABAD, NOV. 6

June and July 2019 have been the hottest months on record, globally. In fact, 2014 to 2019 have been the hottest years ever. Heatwaves are thus among the world's biggest problems, scientists at a climate change conference here.

International agencies like ISA's National Oceanic and Atmospheric Administration have confirmed that June was the hottest June on record, 0.95 Celsius above normal average. It was followed by the hottest month on record in 140 years — 0.95 Celsius above normal average. Experts at the conference, organised at the Centre of Economic and Social Studies and the Indian Society for Ecological Economics on Wednesday, said this temperature rise was caused entirely by anthropogenic emissions.

In a panel discussion on heat waves, Rohit Magotra, deputy director at Integrated Research and Action for Development (IRADe), said 'heat stress' is caused by a combination of a rise in temperature and relative humidity. Abnormally high levels can be catastrophic for the human body. Thousands have perished to heat waves across the country in the past few years, he said.

"The number of heatwaves has been increasing every year," he said. "And summers are also arriving earlier hence the season is getting longer."

IRADe has conducted studies across the country. A team has collected data over four months in New Delhi, Rajkot and Bhubaneswar. "In Delhi there were 49 days with abnormally high temperatures in 2018; this number rose to 66 in 2019. The trends are similar in other places also," Magotra said.

Heatwaves can be the direct cause of wage loss. High temperatures cause exhaustion, dehydration and illness, which force a worker from work.

■ Page 2: Heatwave action plan required: Experts

HEATWAVE ACTION PLAN REQUIRED

From Page 1

Mr Magotra said 90 per cent of men surveyed in Delhi reported their productivity was affected due to heat wave conditions; in Bhubaneshwar, it was 76 per cent; in Rajkot, 77 per cent. The most loss was in informal occupations such casual labour who work in the open. The wage loss potential is in hundreds of crores.

Lipika Nanda of the Public Health Foundation of India introduced the concept of heat threshold. "A heat threshold for a location is the highest temperature beyond which people start dying due to heat," she said. "We study the pattern between temperatures and mortality in an area to calculate this number." Nanda said the threshold can be lower than people may believe. "In Bhubaneshwar, the threshold is only 38.4 degrees, not even 40," she said. A person's underlying illness such as kidney or heart ailment aggravate during heat waves. "There are a number of effects. Some studies suggest that children develop problems as a result of their inability to play outdoors," she said.

40.6° अधिकतम तापमान | 29.4° न्यूनतम तापमान | सूर्योदय (आज) 07:16 | सूर्यास्त (आज) 05:23

दिल्ली जागरण

एक दशक में एक डिग्री बढ़ा तापमान

बढ़ते शहरीकरण ने बढ़ाई दिल्ली में गर्मी

संजीव गुप्ता ● नई दिल्ली

शहरीकरण की अंधी दौड़ कहें या पर्यावरण की अनदेखी, लेकिन जलवायु परिवर्तन का असर दिल्ली पर अब साफ नजर आने लगा है। इसी का नतीजा है कि पिछले एक दशक में दिल्ली का तापमान 1.2 डिग्री सेल्सियस तक बढ़ गया है। विडंबना यह भी कि गर्मियों के सीजन में साल दर साल तपती दिल्ली में इस स्थिति से निपटने के लिए न कोई हीट एक्शन प्लान है और न ही कहीं किसी और रूप में कोई गंभीरता नजर आती है।

गैर सरकारी संस्था इंटीग्रेटेड रिसर्च एंड एक्शन फॉर डेवलपमेंट (इराडे) ने 2010 से 2018 तक के तापमान पर विस्तृत अध्ययन रिपोर्ट तैयार की है। इसमें मौसम विभाग के सफदरजंग, पालम, रिज और आया नगर केंद्रों के तापमान को आधार बनाया गया है। अध्ययन में पाया गया कि दिल्ली के अधिकतम एवं न्यूनतम दोनों ही तापमान में वृद्धि हो रही है। यह वृद्धि भी गर्मियों के चारों महीनों मार्च, अप्रैल, मई और जून के तापमान में हो रही है। रिपोर्ट बताती है कि एक दशक के दौरान मार्च के अधिकतम तापमान में 1.2 डिग्री, अप्रैल व मई में 0.5 डिग्री और जून में 0.1 डिग्री सेल्सियस का इजाफा दर्ज किया गया। इसी तरह न्यूनतम मार्च के न्यूनतम तापमान में 0.9 डिग्री, अप्रैल में 0.43 डिग्री, मई और जून में 0.1 डिग्री सेल्सियस का इजाफा रिकार्ड किया गया है।

तापमान में वृद्धि की मुख्य वजह: रिपोर्ट के मुताबिक, बढ़ते तापमान के लिए प्रकृति नहीं बल्कि दिल्ली वाले खुद जिम्मेदार हैं। कंक्रीट के बढ़ते जंगल से हरित क्षेत्र लगातार घट रहा है। हरियाली का मतलब घास वाले पार्क नहीं बल्कि वन क्षेत्र है। पार्कों में भी बड़े पेड़ होने चाहिए।

इसी तरह से कच्चा क्षेत्र, जहां वर्षा जल संचयन हो सके, दिल्ली में समाप्त होता जा रहा है। कमर्शियल गतिविधियों और वाहनों का उपयोग बढ़ रहा है। इन सभी कारणों से दिल्ली में तापमान लगातार बढ़ रही है।

कनॉट प्लेस में लू से बचने के लिए सिर पर बैग रखकर जाती महिला ● जागरण

पिछले एक दशक में दिल्ली का विकास तो हुआ है, लेकिन इसके नाम पर भवन निर्माण हुआ है या सड़कों पर वाहनों की भीड़ बढ़ी है। इसके विपरीत दिल्ली का प्रकृति प्रदत्त स्वरूप खत्म होता जा रहा है। यही वजह है कि भीषण गर्मी के इस मौसम में दिल्ली वासी घर से बाहर निकलने पर छाया के लिए ठिकाना ढूंढते नजर आते हैं, लेकिन ऐसा ठिकाना उन्हें मिलता ही नहीं है। दिल्ली को अत्यधिक गर्मी से बचाना है तो शहरीकरण पर अंकुश लगाना जरूरी है।

रोहित मगोत्रा, उप निदेशक, इराडे

बिना हीट एक्शन प्लान के गर्मी से जूझ रही राजधानी

राज्य ब्यूरो, नई दिल्ली : इस चिलचिलाती गर्मी में भी दिल्ली में हीट एक्शन प्लान के नाम पर खोखली चर्चा के अलावा कुछ नहीं है। राष्ट्रीय आपदा प्रबंधन प्राधिकरण (एनडीएमए) की 2016 में जारी दिशानिर्देश तक कागजी दस्तावेज बनी हुई हैं। हालांकि इंटीग्रेटेड रिसर्च एंड एक्शन फॉर डेवलपमेंट (इराडे) का हीट एक्शन प्लान दो साल से तैयार है, लेकिन इसे दिल्ली सरकार से मंजूरी मिलने का इंतजार है। सोमवार को भी इराडे ने दिल्ली सरकार को रिमाइंडर भेजकर प्लान पर चर्चा करने के लिए समय मांगा है।

आइआइटी दिल्ली की एक शोध रिपोर्ट के अनुसार, जिन क्षेत्रों में व्यापक पैमाने पर कंक्रीट का जंगल देखने को मिलता है और जिन क्षेत्रों में अभी शहरीकरण का प्रभाव कम है, वहां के तापमान में खासा अंतर होता है। शहर के औसत तापमान से अलग इन क्षेत्रों में मौसम का मिजाज देखा जाता है। एनडीएमए की दिशानिर्देश कहती है, शहरों के तापमान में यह अंतर क्यों है, इसे कैसे पाटा जाए, बढ़ते तापमान पर अंकुश कैसे लगे, अधिक तापमान से स्वास्थ्य पर बुरा प्रभाव न पड़े इत्यादि मुद्दों को लेकर हर बड़े शहर का हीट एक्शन प्लान होना चाहिए। वहीं दिल्ली में इस प्लान पर सरकार और नगर निगमों के स्तर पर सभी बातें चर्चा तक ही रह जाती हैं। थोड़ा बहुत काम भी नई दिल्ली नगरपालिका परिषद वाली लुटियंस हीट स्ट्रोक ही नहीं, हीट स्ट्रेस भी मानव दिनचर्या को प्रभावित कर रहा है। ग्रामीण क्षेत्रों में बढ़ता तापमान चिंता का विषय है। गर्मी जितनी ज्यादा होती है, बिजली और पानी की किल्लत भी उतनी ही बढ़ती जाती है। ऐसे में हीट एक्शन प्लान समय की जरूरत बन गया है, लेकिन सरकार इसे लेकर गंभीर नहीं है। हमने एक बार फिर रिमाइंडर भेजकर सरकार से समय मांगा है। अगर वक्त मिला तो इस प्लान पर चर्चा कर आगे की रूपरेखा तय की जाएगी।

रोहित मगोत्रा, उप निदेशक, इराडे

जोन में ही हो पा रहा है।

दो साल पहले इराडे ने हीट एक्शन प्लान पर दिल्ली सरकार से संपर्क किया। सरकार ने ओएसडी स्तर के अधिकारी को इसकी जिम्मेदारी सौंप दी, लेकिन इसके बाद कुछ नहीं हुआ। इस साल फिर इराडे ने सरकार से संपर्क किया, लेकिन ओएसडी की ड्यूटी लगाकर दोबारा इतिश्री कर ली गई। हालांकि इराडे ने उत्तरी दिल्ली नगर निगम (एनडीएमसी), दक्षिणी दिल्ली नगर निगम (एसडीएमसी) एवं पूर्वी दिल्ली नगर निगम (ईडीएमसी) से भी बात की, हीट एक्शन प्लान की जरूरत भी सभी ने महसूस की, किन्तु नतीजा कुछ नहीं रहा। सभी जगह से जवाब मिला कि हीट एक्शन प्लान में जिन विभागों की सबसे अहम भूमिका होगी, वे दिल्ली सरकार के ही अधीन हैं। इसलिए, उनकी सहभागिता के बगैर प्लान पर काम नहीं हो पाएगा। विशेषज्ञों के अनुसार, सरकार के स्तर पर सहमति और अनुमति मिलने के बाद भी इस हीट एक्शन प्लान को लागू करने में करीब दो साल लग जाएंगे। वजह, इसके तहत पहले इराडे दिल्ली के इलाकों की मैपिंग करेगा। इसके बाद सभी क्षेत्रों पर विस्तृत शोध किया जाएगा कि कहां की भौगोलिक स्थिति कैसी है, वहां का तापमान कम या ज्यादा क्यों है। हरियाली और वन क्षेत्र की स्थिति वहां कैसी है। इस शोध के बाद विस्तृत एक्शन प्लान तैयार किया जाएगा कि क्या-क्या उपाय किए जाएं, जिससे यहां का तापमान बहुत ज्यादा न जाए और भीषण गर्मी में भी राहत का दौर कैसे बनाए रखा जाए।

हीट एक्शन प्लान के इर्द-गिर्द एक नजर: इस प्लान में गर्मी को तीन हिस्सों में बांटा गया है। 41.1 से 43 डिग्री तापमान को येलो अलर्ट श्रेणी में रखा गया है। इसके लिए हॉट डे एडवाइजरी जारी होगी। 43.1 से 44.9 डिग्री तापमान को ऑरेंज अलर्ट श्रेणी में रखा गया है। इसके लिए हीट अलर्ट डे की घोषणा होगी। 45 डिग्री से ऊपर तापमान होने पर रेड अलर्ट हो जाएगा एवं एक्सट्रीम हीट अलर्ट डे की घोषणा कर दी जाएगी। हर स्थिति से निपटने के लिए परिवहन, स्वास्थ्य, बिजली, जल बोर्ड, महिला एवं बाल विकास, लोक निर्माण विभाग, शिक्षा विभाग, एनजीओ और मीडिया को शृंखला बनाकर उनकी भूमिका तय की जाएगी। हर श्रेणी के अलग उपाय होंगे जो उस श्रेणी में अपने आप ही लागू हो जाएंगे।

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Adaptation Actions – Benefits

1. **Prevents deaths** associated with heat strokes.
2. Government commitment to **protect the poor** and vulnerable citizens.
3. **Reduces** chances of **illness** due to heat waves.
4. Making cities future ready, **Climate resilient Indian cities**.
5. Better **preparedness of hospitals/health** centers.
6. **Reduce Economic losses-** labor productivity, loss of job days, reduced labor and opportunity loss.

Heat Adaptation plan - 1.7 Million Citizens will benefit

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Vector Borne Disease - Dengue

India Burden of Dengue

Dengue fever - vector-borne disease is caused by dengue virus transmitted to humans by the **infected mosquitoes *Aedes (Ae.) aegypti* and *Aedes ablopictus***

1780	1st Dengue like incidence in Chennai
1963-64	1st Epidemic in Calcutta & East Coast (200 Deaths)
1996	4 States reported - 16517 cases, 545 deaths
2006	7 States - cases registered 3427
2012	34 out of 35 states / UTs reported dengue
2017	India experienced over 18700 cases

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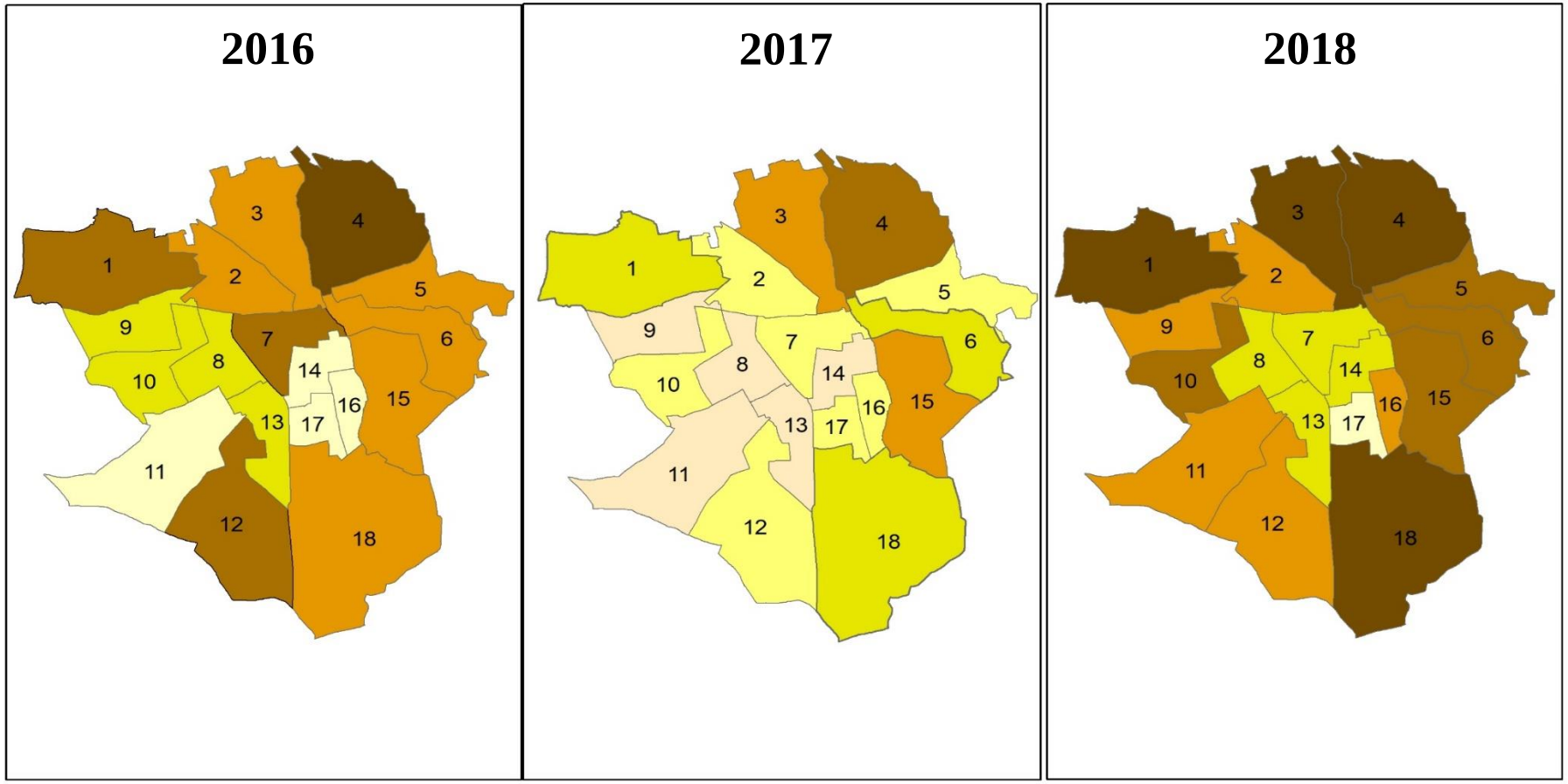
Dengue - Climate Adaptation Knowledge

Ward wise Dengue Trends - Rajkot



- Dengue incidences has **increased** over the years
- **4 wards** recorded **above 50** incidences in 2018

Legend

- Below 10
- 10 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- Above 50

0 2 4 8 12 16 Kilometers

N

Prepared by IRADe

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Dengue- Climate Adaptation Action

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Dengue Actions

Field Surveys in Delhi & Rajkot

Consultations/ meetings with Rajkot Municipal Corporation Health Officers

Dissemination of Awareness Posters in collaboration with RMC

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Disaster Resilience

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Urban Disaster Knowledge

Urban Climate Disaster – Losses Incurred

Cyclone Hudhud 2014 - 7 billion USD Andhra Pradesh
City of Visakhapatnam was the worst affected.

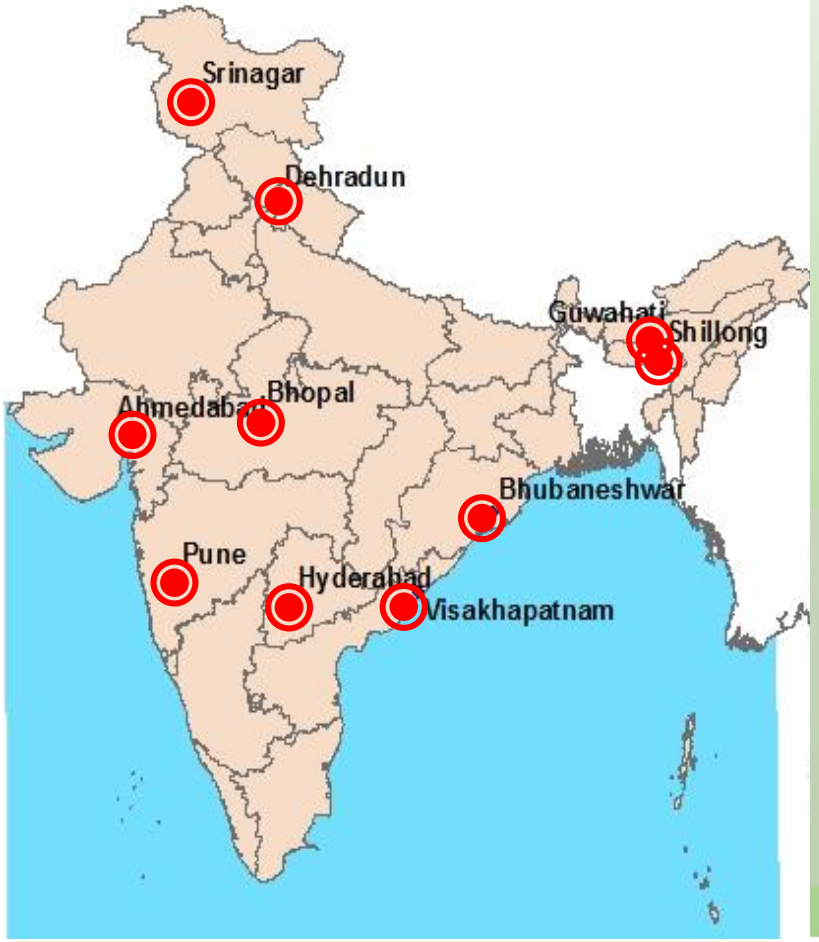
Jammu and Kashmir, Srinagar Floods 2014 - 16 billion USD,

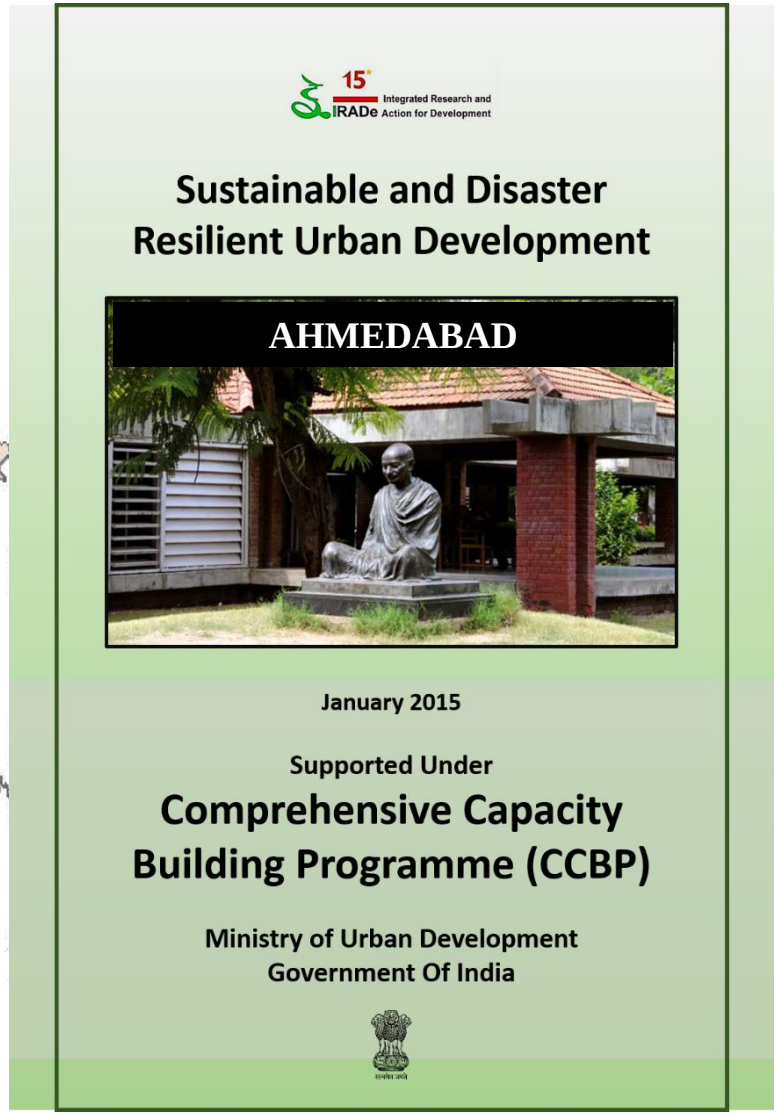
- **affected 3.6 million people,**

Chennai Flood in 2015 - USD 3 billion (Approx.)
Kerala Floods 2018 - USD 4 billion

Sustainable and Disaster Resilient Urban Development, India: 10 Cities (2015)

Location of Selected Cities





- **10 cities selected from 10 states across India**
- **Assessed state of resilience**
- **Roadmap** to **disaster resilience**
- **Wide range of parameters**
- **First of its kind work which was referred for develop smart city plans for 9 cities by the Ministries.**

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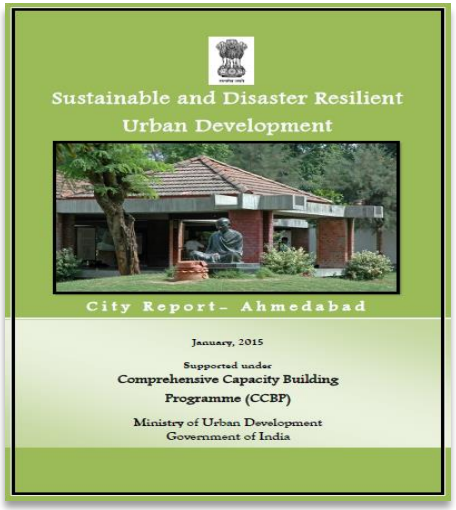
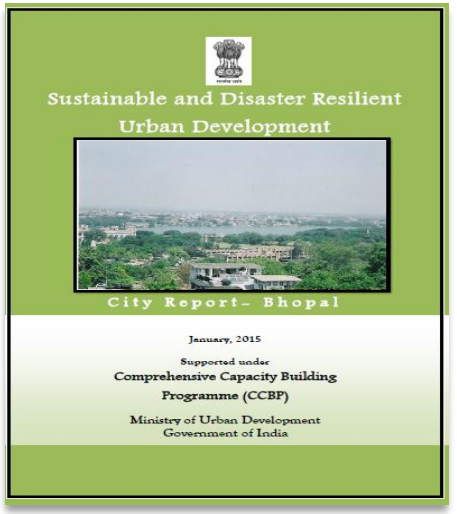
Actions on Sustainable and Disaster Resilient India

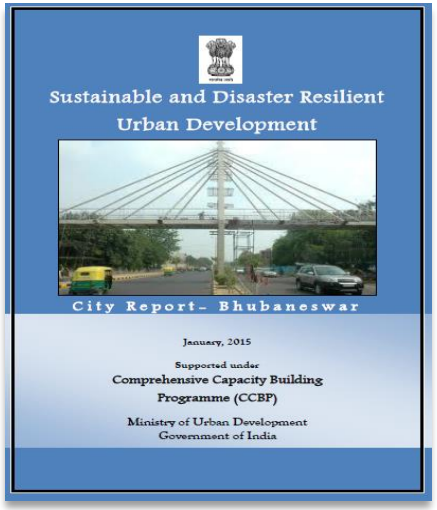
AHMEDABAD



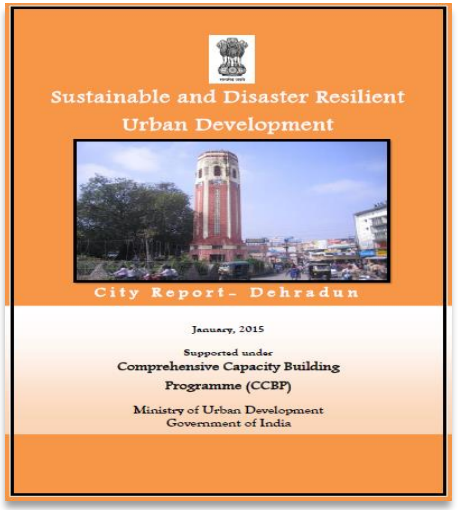
BHOPAL



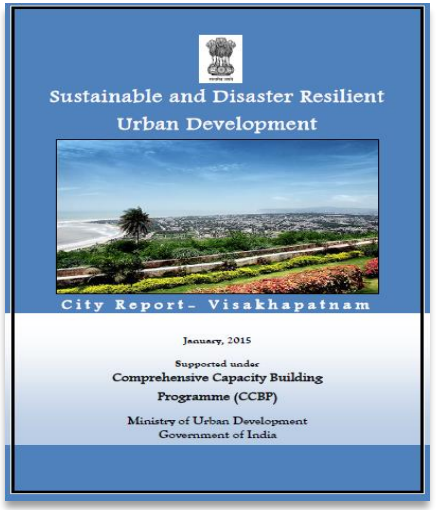
BHUBANESWAR



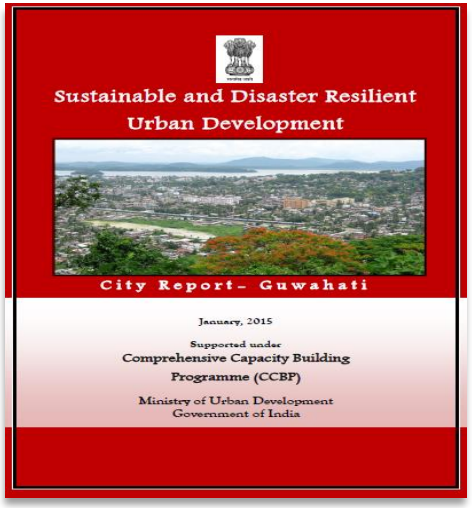
DEHRADUN



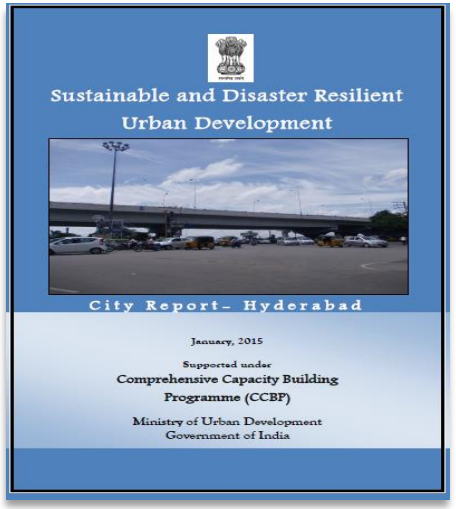
VISAKHAPATNAM



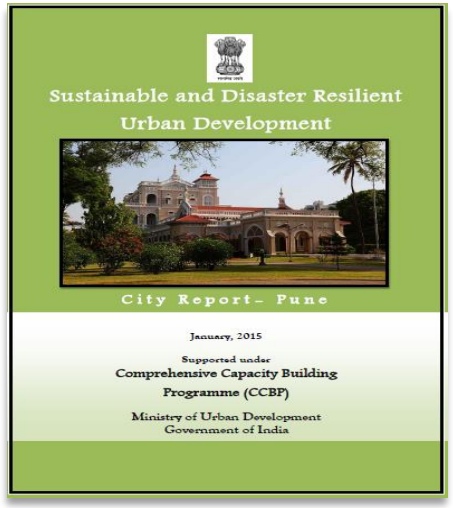
GUWAHATI



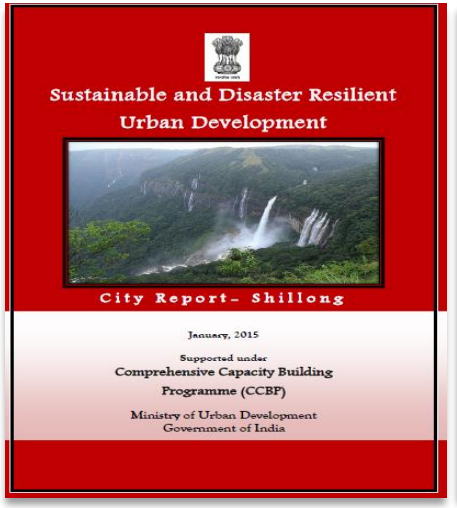
HYDERABAD



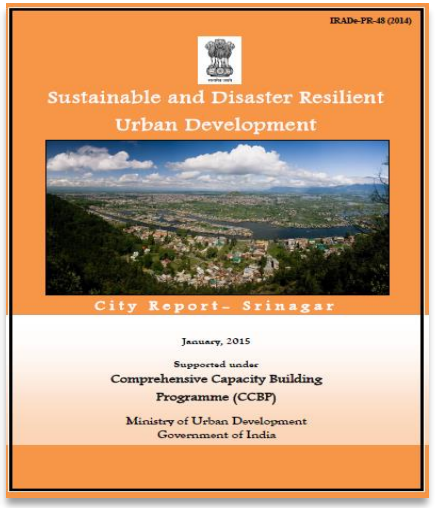
PUNE



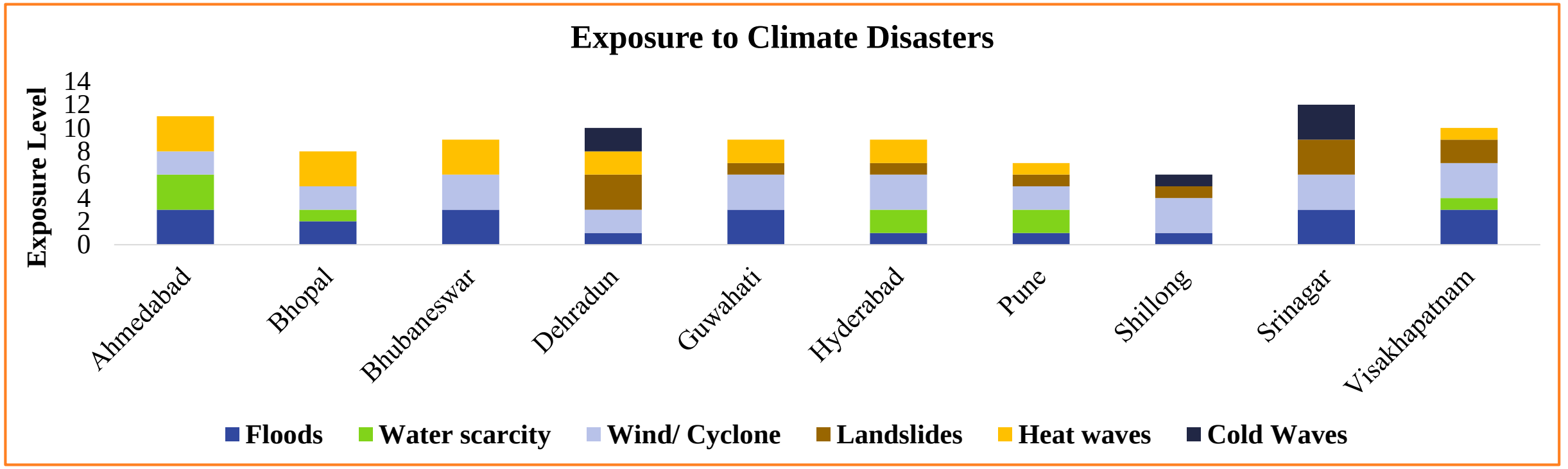
SHILLONG



SRINAGAR



Exposure to Hazards



- Almost all the cities are in **flood risk zone** and with unplanned development leading to encroachment of the water bodies, the risk just amplifies

- Climate Disaster vulnerable cities - **Srinagar, Ahmedabad, Dehradun, Guwahati and Visakhapatnam**

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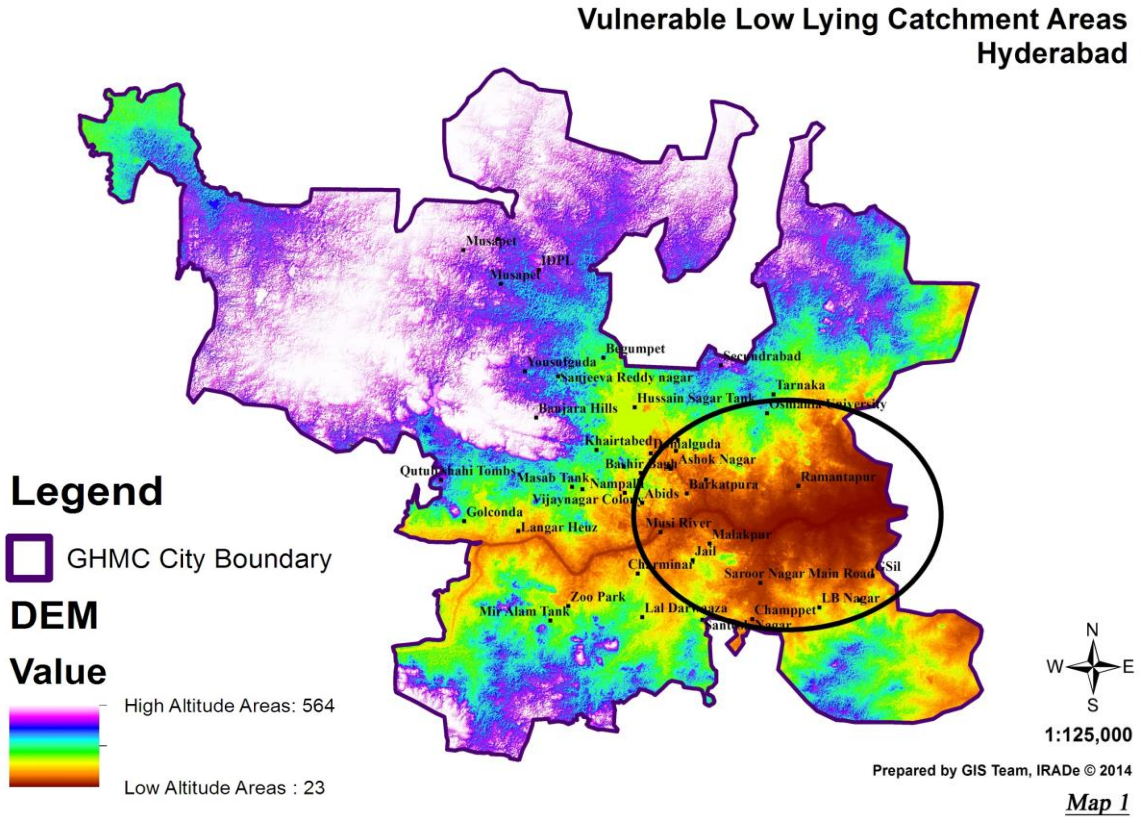
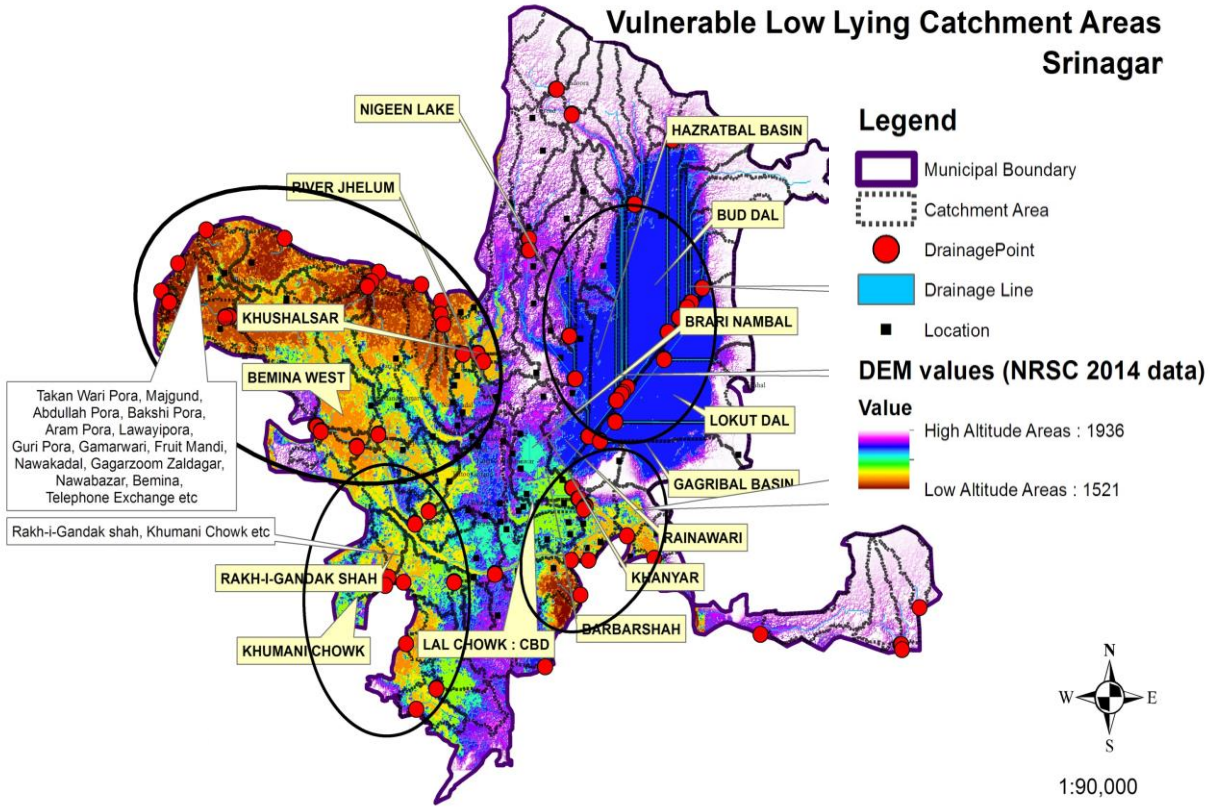
Hazard Vulnerability Maps





- **Integrated Land-Use-Vulnerability maps,** indicating precise location of sites where people, the natural environment or property are at risk due to a potentially catastrophic event / climate hazards

- **Ward level information** helps in developing effective planning Adaptive and Mitigation strategies

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Climate Resilient Smart Cities

Stakeholders Workshop

“Developing Disaster Resilience Action Plan Through GIS & Prioritizing Actions for Natural Disaster Risk Reduction In Shillong & Gangtok”,

Feb, 2018

Climate and Disaster Resilient Smart Cities

October 2015, New Delhi

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Climate Resilient Smart Cities

West India Regional Work Shop on Sustainable and Disaster Resilient Urban Development

September 2014, Ahmedabad, India

International Workshop on Sustainable And Climate Resilient Urban Development

2010 New Delhi

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Direct Interaction with Stakeholders - Adaptation and Mitigation

Theme	Number of Surveys	Stakeholders	Research scope
Heat Stress	**900** (Households)	1. Slum Dwellers 2. Construction workers 3. Street Vendors 4. Casual Workers 5. Women	1. Productivity 2. Livelihood 3. Health 4. Gender
Solar Pumps	**300** (DISCOM and Farmers)	1. DISCOMs 2. Farmers	1. Irrigation sources and practices 2. Crops grown
Energy Access	**810** (Policy Makers, LPG Distributors, End users – Women)	1. Policy Makers 2. LPG Distributors 3. End users – Women	1. LPG Adoption 2. Cooking fuel mix 3. Health hazards
Electric Vehicles	**500** (EV Consumers)	1. Two /Three /Four Vehicle Owners 2. Petrol Pump utilities 3. Charging station owners	1. Charging behaviour 2. Consumer Preferences 3. Consumer Experiences 4. Driving Practices

Knowledge to Action for framing NDC Implementation

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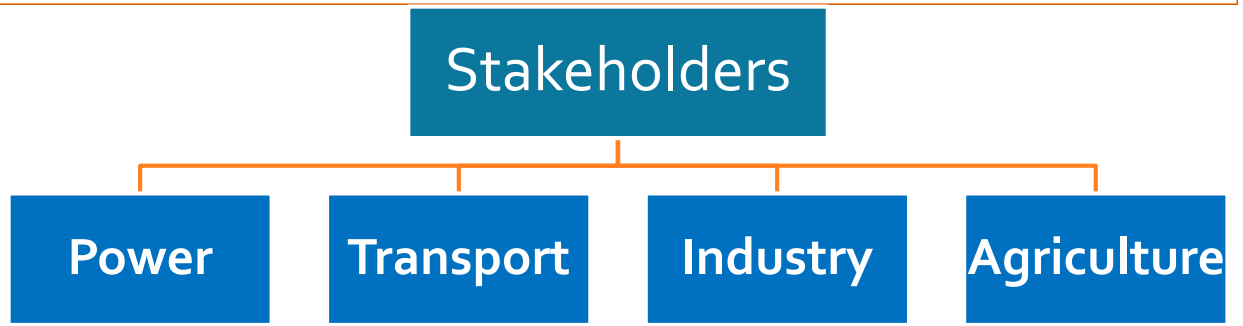
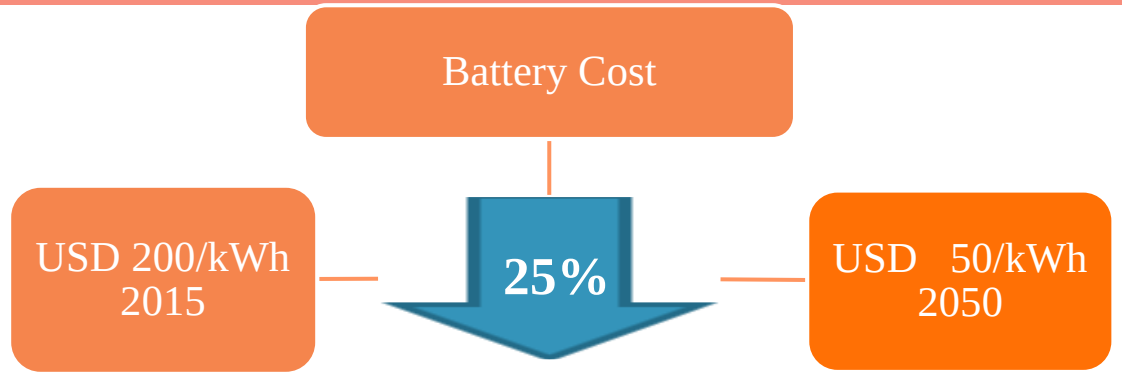
Mobilizing Stakeholder to implement NDC commitments

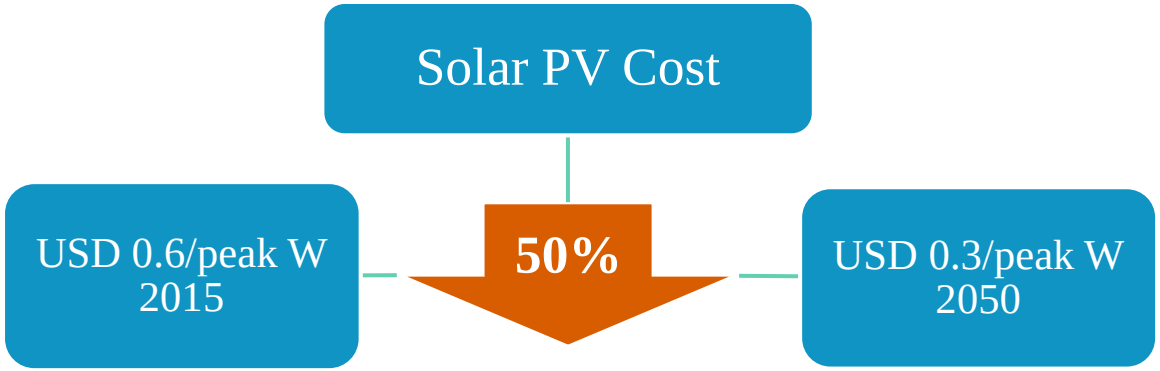
Objective is to mobilize stakeholders to implement NDCs through Govt intervention and market policies



Low Carbon Policy for NDC

- Optimizing macro model for long term demand supply options
- Macro pathway:- Scenarios with NDC commitments projected





- Road map for implementation at state & sector levels
- Current policies assessed & emissions reduction potential estimated
- Sectoral priorities outlined

Subnational Consultation

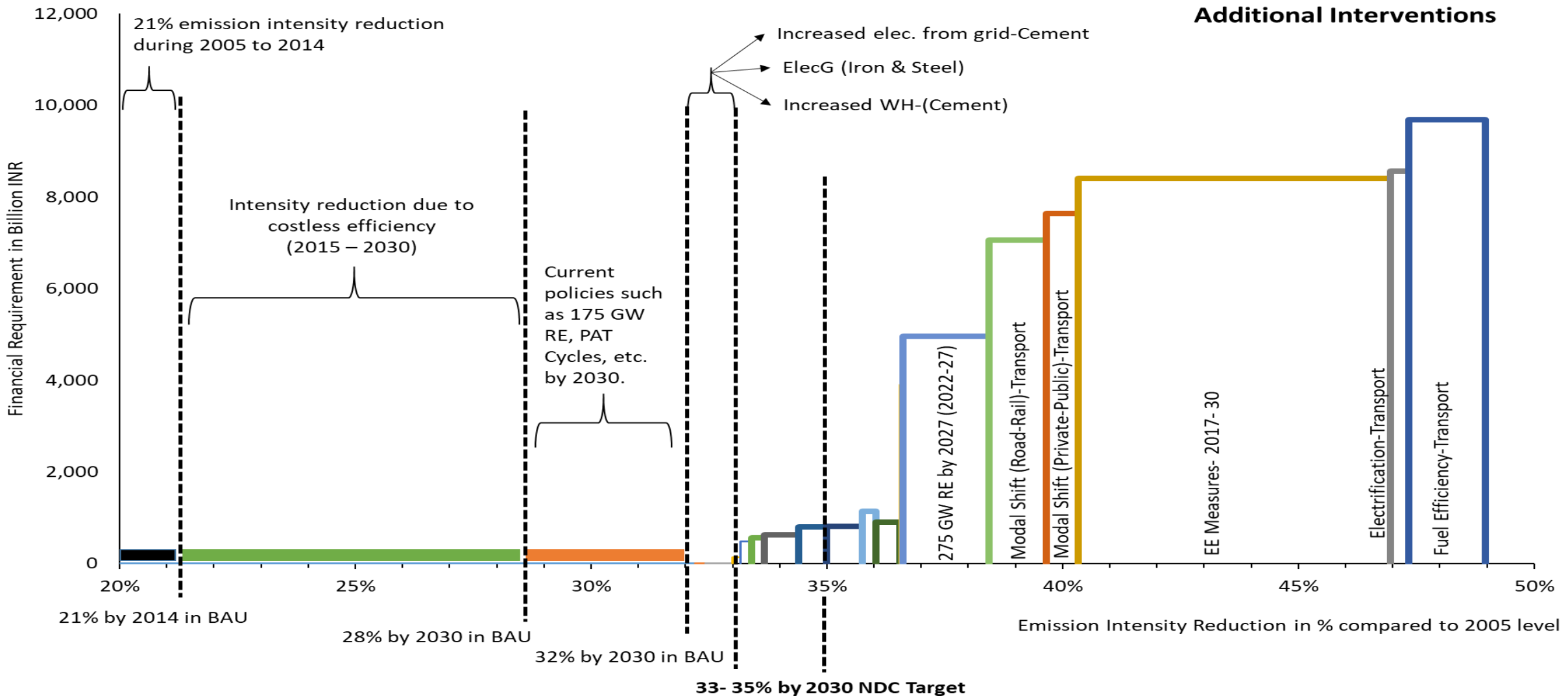
NDC is a national commitment, However policy making controlled by city & state Govt

Stakeholder engagement for further achievement of NDCs at sub national level being carried out in

Gujarat **Odisha** **Assam**

Power	Govt. controls Dist. & Gen. from Thermal, Hydro & Nuclear.	Nuclear & Hydro constrained (Ethical & Env. Issues)	Renewables preferred for Low Carbon Pathways through Priv. Players
Transport	Various stakeholders at different Govt. levels	Increasing no. of Priv. Veh. Public transport req. heavy Investment	Large no. of small Priv. players; Data gaps exists; Policy making is uncertain
Agriculture	Current solar pumps - mostly on pilot mode with high subsidy.	Need for Business Model for substantial scale up	

Road map to implement NDCs- Increasing Ambition for emission intensity reduction



**Hydro addition of 6.8 GW by 2022 is kept ahead of Hydro addition of 12 GW by 2027 as per their timeline of installation.*
Different Energy Efficiency measures such as PAT in industries, standard and labelling, street light prog, UJALA schemes are clubbed into one EE Measures 2017-2030 as the individual scheme cost are not available in the BEE document.

Oil Price Reforms for Sustainable Consumption

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Oil Subsidy Reforms- Policy & Implementation Experience

- **Policy issue in 2011-12**
  - India's Oil Import Dependence was **80% & Growing**.

    Crude Oil prices volatile- **$40 (July 2008)** ➡ **$135 (July 2009).**
  - Diesel Price – Difference in cost & sale price borne by Govt & PSU Oil Marketing Companies (OMCs).
  - Policy makers reluctant to pass price rise to consumers, as increase in goods distribution cost, will cause inflation which will affect the poor.
- **Stakeholders Engagement- Farmers, Truckers, Consumers, Govt, OMCs**

Stakeholders – Concerns

CONSUMERS

⬆ Price increases mobility cost

GOVERNMENT

⬆ Prices impacts economy otherwise impacts Govt finances

TRUCKERS

⬆ cost of distribution

⬇ profits

Oil Retailers

Under recoveries

FARMERS

impact irrigation cost & livelihood

Research to address Stakeholder Issues

- What would be the impact of
  - Diesel price rise on inflation
  - Under recoveries on inflation
  - Diesel price increase on other prices, consumers & other stakeholder sectors
  - **Cost of not raising price**
- A Macro Economic Model was used
  - Impact on Inflation and Growth & Impact on Stakeholders
  - With & without price change

Knowledge to Policy Implementation

Scenarios

- **No change**: Subsidy continues, No increase Diesel price
- 4 Quarters: UR is reduced by equal diesel price over 4 quarters.

Policy implication

- **No action has a cost**
  - Diesel subsidy reduction leads to a some inflation.
  - Policy status quo- a much higher rate of inflation over time.
- Trade off b/w short term pain & much larger long term gain in inflation & GDP.
- Subsidy reforms lowers inflation (9% → 6.6% p.a.)
- Increases GDP growth to 8% compared to 6%.
- **Inaction also has a cost**- Policy status quo- a much higher rate of inflation over time & lower GDP

Consensus building

- Results used to convince stakeholders in national workshop & newspaper articles. Report accepted by **Ministry of Finance, GoI**.

Govt policy reform

- **Sept 13, 2012**: Diesel price by GoI: Rs. 5 & policy adopted for monthly increase of Rs. 0.5 from January 2013; slowly eliminating subsidy burden & making diesel prices market determined.

(Press Information Bureau 2012)
http://pib.nic.in/newsite/PrintRelease.aspx?relid=87740

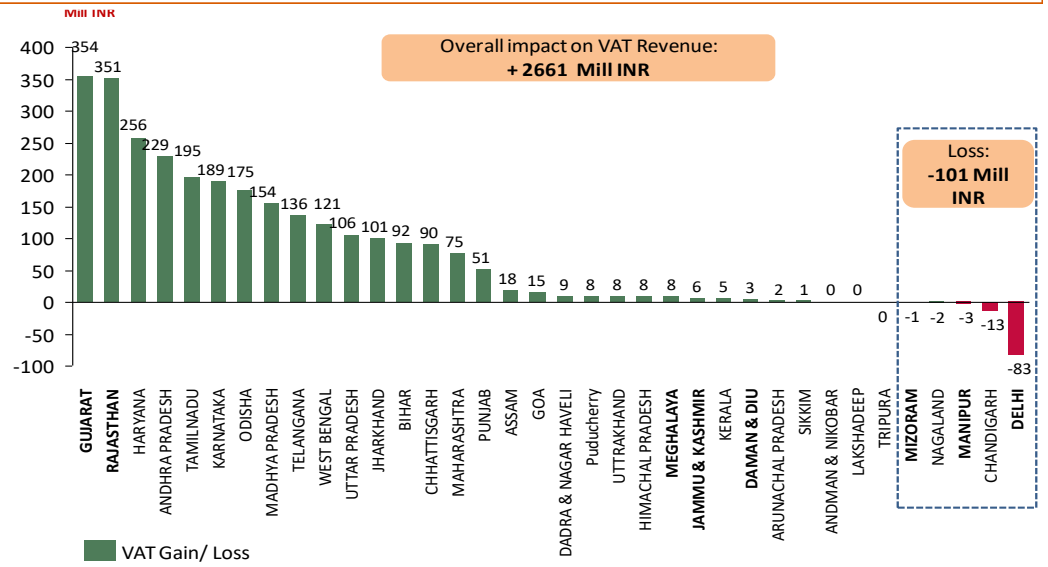
Rationalization of differential taxation b/w Petrol & Diesel- Stakeholder Engagement

Issue at stake in 2017

- Diesel cheaper due to differential Excise rate & State VAT
- No incentive for efficiency
- Distorted Diesel consumption- 4 times of Petrol & Substituted for Fuel Oil
- Higher imports of Diesel & Higher carcinogenic emissions

Scope for Rationalization

- Equalize central excise duty, reduce impact of state VAT
- Equalization that preserves revenue and accounts for change in consumption due to change in price
- Price elasticity:
  Diesel -0.56, Petrol -0.85



Stakeholders

- State Revenue
- Truckers
- Consumers
- Farmers
- Car Manufacturers
- Bus Operators & Passengers

Most states Gain in Revenue except few.

Econometric estimate showed that impact of Freight Prices

Consumer Expenditure of poorest is marginal

Impact is marginal & 0.24% of state GDP in the worst case

Sales of Diesel Car goes down & Petrol Car increases; Total Car Sales unaffected

Improving Vehicle Productivity, Ticket Rate, Bus Operated to Held Ratio mitigates diesel price rise impact.

Knowledge to Action

Ratio of Price of Petrol/Diesel

In 2014
1.34

10%
Reduction

In 2017
1.21

Consensus building

A workshop was organized 30th August, 2017 with representatives of all stakeholder- Ministry of Finance, Petroleum & Natural Gas, State Government, Oil Marketing Companies, Automobile, Trucking, State transport & other allied sectors.

Shri Dharmendra Pradhan, Honourable Minister of Petroleum & Natural gas & Minister of Skill Development & Entrepreneurship, Govt. of India inaugurated the workshop & released the report

https://pib.gov.in/newsite/printrelease.aspx?relid=170374

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