Climate Change and Cities:

Urban Climate Vulnerability Assessment Framework

WORKSHOP PROCEEDINGS

29th September, 2020

Supported by:

Ministry of Environment, Forest and Climate Change, Government of India (MoEFCC, GoI)

Prepared by:

Integrated Research and Action for Development (IRADe)

"Developing Urban Climate Vulnerability Assessment Framework. Assessing Vulnerability of seven Indian cities"

Supported by: Ministry of Environment, Forest and Climate Change, Government of India (MoEFCC, GoI)

Disclaimer

Acknowledgment

We want to thank everyone who contributed to the National Workshop Climate Change and Cities: Urban Vulnerability Assessment Framework, under the Project "Developing the urban climate vulnerability assessment framework and its application to the vulnerability of Seven Indian cities" supported by the **Ministry of Environment, Forest and Climate Change Government of India (MoEFCC, GoI).** We want to thank MoEFCC & the Ministry of Housing and Urban Affairs (MoHUA, GoI) for their participation and support in organising the workshop.

We are incredibly thankful to Municipal Corporations of all seven cities under the project along with the Urban Development Authorities. We express our sincere thanks to Dr. J.R. Bhatt, Scientist -G, Advisor, Climate Change, and MoEFCC for his constant support and guidance.

We express our gratitude to our project steering committee members, Prof. Kirit Parikh, Chairman, Prof Jyoti K Parikh, Executive Director, IRADe, Dr. Sudhir Krishna, Former Secretary MoHUA, GoI, Dr. G N Qasba, Senior Advisor, IRADe, for providing valuable guidance for evolving the framework.

IRADe extends its gratitude to all the speakers, panelists, and participants of the National workshop for their time, input, and expert advice to finalise the Urban Vulnerability Assessment Framework. Last but not least, we would like to thank the IRADe team; Ms. Moumita Shaw, Research Analyst, Ms. Nimisha Jha, Senior Research Analyst, Ms. Ananya Bhatia, Research Associate and Ms. Yashi Sharma, Research Assistant for support in organising the workshop preparing the proceedings.

Prof. Ajit Tyagi — Senior Advisor, IRADe

Mr Rohit Magotra — Deputy Director, IRADe

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Urban Climate Vulnerability Assessment Framework

1. Introduction

About "68% of the world population will be living in urban areas by 2050. Around 2.5 billion people are expected to make the transition, with close to 90% of this increase taking place in Asia and Africa"[1]. The population growth is increasingly concentrated in urban geography, and along with associated vulnerability due to a host of factors. The climate change is increasing the frequency and intensity of disasters like heatwaves, urban floods, cyclones in the cities. Thereby creating an impending need to assess the Urban Climate Vulnerability and how do the city development authorities, policymakers, and stakeholders evaluate the vulnerability and associated risks? There is a need for rapid assessment of the cities' vulnerability, design frameworks that can assess the city-wise components of vulnerability, raise awareness, prioritize investments, and help strengthen resilience. United Nation's Sustainable Development Goal (SDG) 11 on city resilience is accepted as a critical urban agenda. The inefficient urban systems act as a hindrance in the urban areas to combat Climate Change, making it less resilient.

IRADe has designed the Urban Climate Vulnerability Assessment Framework (UVAF) under seven thematic indicators- ***Physical, Hazard, Social, Demographic, Financial, Infrastructure and Administration vulnerabilities,*** and seventy sub-indicators and indices lying under the respective thematic heads. A specific city's overall risk and preparedness is a weighted aggregation of sub-indicators quantified, normalized, and aggregated to obtain composite vulnerability assessment. The final climate vulnerability score is calculated and a consolidated climate vulnerability scorecard is prepared to assess each city's vulnerabilities—the framework aides in devising city-specific recommendations for assessing climate hazard vulnerability. The comprehensive framework has been tested in Indian cities. It may be replicated to developing and developed country cities for integrated planning and improving community resilience to climate hazards.

The developed framework could help identify and target climate-vulnerable regions, sectors, or populations, raise awareness, and contribute to a monitoring strategy and periodically

[1] (World Urbanization Prospects, 2018)

indicate the state of Indian cities' climate vulnerability. It can further act as a critical tool in India's development of climate resilience and disaster risk reduction in cities. The UVAF implementation will meet the Government of India's dual objectives of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR)

2. About the Project

Objective:

1. To design a **framework for assessment** of Urban Climate Vulnerability of the cities.
2. To identify and **define sub-indices/indicators** which can represent the climate vulnerability of urban areas.
3. To design and **test methodology** for developing urban climate vulnerability index.
4. To prepare **Climate Vulnerability Profiles** of the Selected cities using the identified indicators.

The UVAF was used to draft climate vulnerability assessment of seven cities, which include ***Delhi, Mumbai, Chennai, Bengaluru, Srinagar, Shillong, and Ahmedabad.*** The UVAF assessment will enable the Indian government to identify high-risk cities through a comprehensive predictive qualitative framework while also acting as a vulnerability monitoring tool. It will help identify and target climate-vulnerable regions, sectors, or populations, raise awareness, monitor implemented strategies, and periodically indicate the state of Indian cities' climate vulnerability. The UVAF tool can be a critical tool in India's development of climate resilience and disaster risk reduction in cities by identifying existing vulnerabilities and developing climate-resilient cities and evolving adaptation plans. The UVAF implementation will meet the Government of India's (GoI) dual objectives of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR).

Outputs:

1. **Vulnerability profile** of seven Indian cities
2. Developed a **framework for assessing** climate vulnerability
3. **Identified 70 indicators** and sub indicators to assess climate vulnerability of a city
4. Developed **comprehensive urban vulnerability index**
5. **Sensitization and capacity building** of city/state stakeholders on climate vulnerability
6. Framework for **decision support system**

3. UVA framework

Through Urban Climate Vulnerability Assessment Framework (UVAF), each Indian city can thematic wise derive their respective strengths, weaknesses, opportunities, and threats to the system. It is one method that analyses cross-cutting themes, derives the cumulative score of each theme for depicting the vulnerability score. Hence, this will help in guiding the policies and principles for better risk management. With the latest IPCC reports indicating an increase in climate extremes during this century, a comprehensive and strategic vulnerability framework will allow cities to predict, adapt, and mitigate climate challenges. This seven-city study has revealed the necessity of several preventive and adaptive measures for various vulnerabilities.

The Urban Climate vulnerability assessment framework helps in anticipating the city level risks associated with climate-induced hazards which is categorized under seven broad themes. Each theme is represented by respective sub-indicators, viz. identified, quantified, normalized, and aggregated to obtain composite vulnerability indices for all thematic sectors. The corresponding risk, vulnerability, and preparedness of a city is a weighted aggregation of defined sub-indices.

The HIGS framework (consisting of Hazard, Infrastructure Governance, and socio- economic status of the city), and the Climate Index developed by IRADe served as the basis for developing a methodological framework for the current study. Accordingly, the thematic indicators and sub-indicators were developed, after extensive literature review, to create a holistic risk assessment of Climate Change at the city level.

Figure 1 Urban Climate Vulnerability Assessment Framework

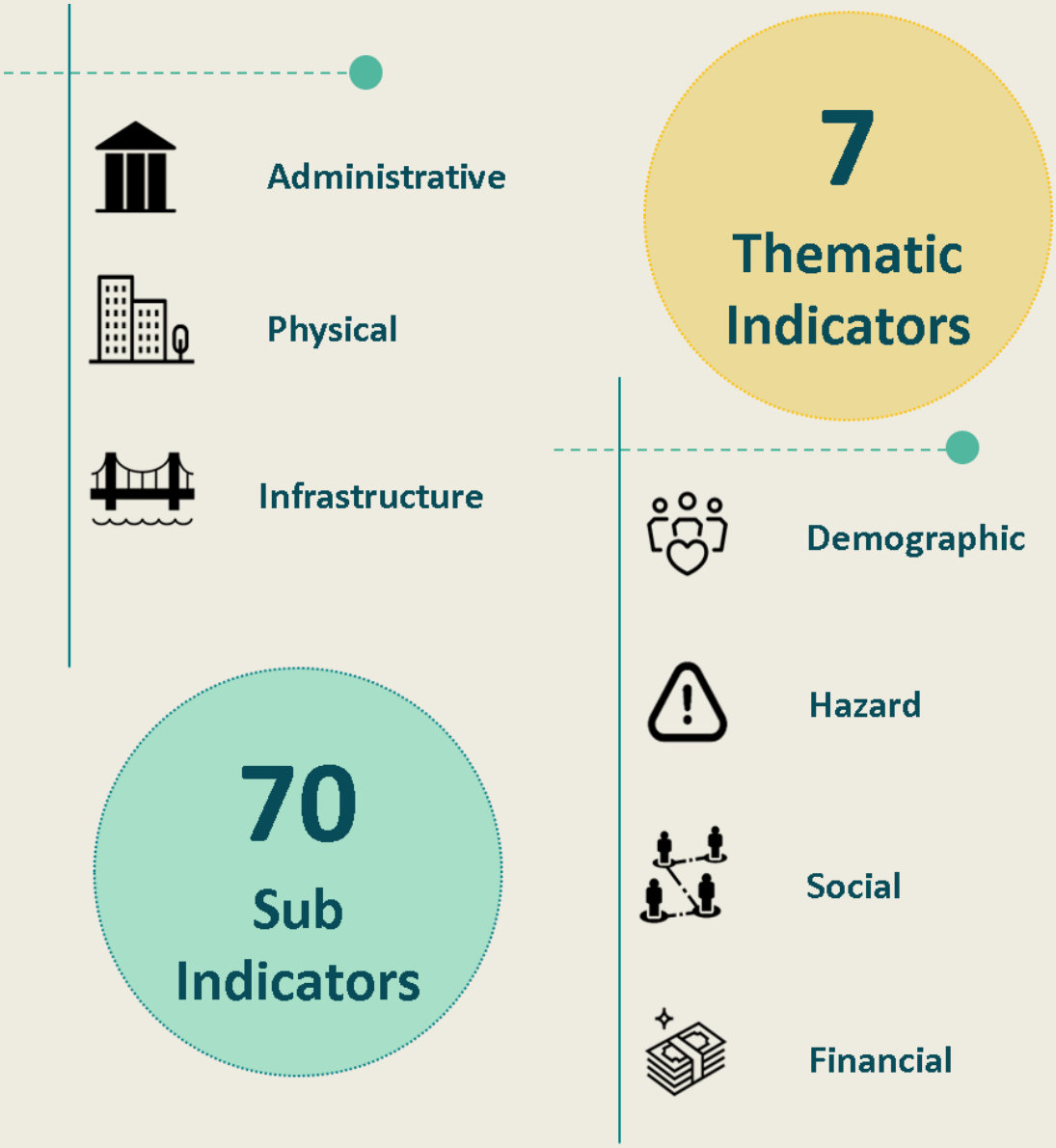


Figure 2 UCAF consist of comprehensive Indicators followed by sub-indicators

The indicators and sub-indicators were developed based on the comparative availability of the data across the cities. The primary data sources were urban local bodies, city development plans, master plans, smart city plans, research studies, state-level climate reports, and city and regional level sector performance reports.

IRADe organised a National Workshop on "Climate Change and Cities: Urban Climate Vulnerability Assessment Framework" on ***29 Sept. 2020.*** The objective of this workshop was dissemination of its ***Urban Climate Vulnerability Assessment Framework (UVAF).*** This framework is based on thematic indicators - *physical, hazard, social, demographic, financial provisioning, infrastructure and administration vulnerabilities*, and their sub-indicators to evaluate the climate vulnerability in Indian cities. It is developed through a targeted constructive feedback, the possible way forward, and valuable suggestions/recommendations by engaging officials from government policymakers, development practitioners, and city municipal corporations.

The National Workshop was inagugrated by Shri Durga Shanker Mishra inaugurated the virtual event***, IAS, Secretary, MoHUA***.

3.1 Inaugural Session

Opening Remarks

Prof. Jyoti K Parikh

Executive Director, IRADe

Prof. Jyoti Parikh gave the welcome address citing the climate challenges faced by Indian cities, mainly the increasing frequency and intensities of climate hazards like cyclones, floods, and landslides. Disaster events expose the vulnerability of cities. She further elaborated on how climate change has direct and indirect effects on urban areas, resulting in increased vulnerability and preparedness. She briefed on how Adaptation and Mitigation to climate risks in cities are essential aspects of the Indian government's efforts to fulfill its commitment to the United Nations Framework Convention on Climate Change (UNFCCC).

She highlighted that IRADe is pioneer in climate adaptation, and resilience since 2007and is also one of 10 pan India Centre for Excellence (Ministry of Housing & Urban Affairs, Govt. of India): Initially, IRADe used Rapid Vulnerability Assessment for 20 cities to identify vulnerabilities. IRADe used the HIGS framework. ***The UVAF (Urban Vulnerability Assessment Framework), she explained, takes the vulnerability assessment to a more advanced level. It will help in improved preparedness, subsequently leading to tackled***

vulnerability at the city level. Detailed studies were conducted in numerous cities, including case studies in Shillong and Gangtok.

She said the seminar would help advance disaster management policies in cities and bring the much-needed knowledge on capacity building on the disaster management front in the administrations and scientific bodies. She thanked the panelists, participants, and the IRADe research staff for their work on UVAF.

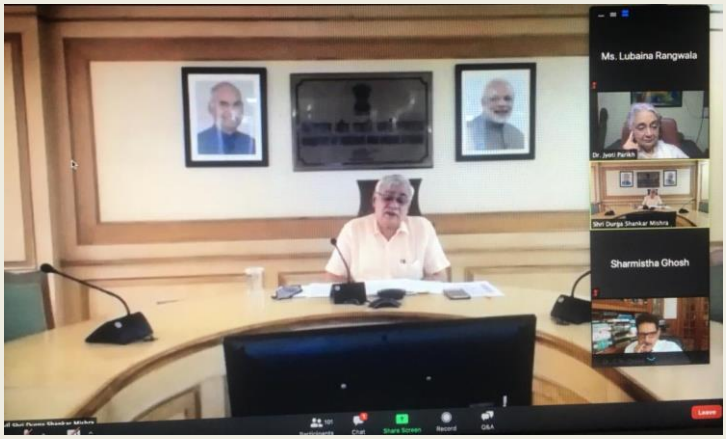
Special Address

Shri Durga Shanker Mishra,

IAS, Secretary, Ministry of Housing & Urban Affairs, GoI

The keynote address was delivered by Shri Durga Shanker Mishra, IAS, Secretary, MoHUA, Government of India. The Secretary lauded the efforts taken by IRADe to organize this vital workshop, which involved municipal commissioners from various cities. The Secretary pointed out that we must be sensitive to the environment to avoid disastrous consequences. He stressed historical data, which shows how climate change destroyed civilizations.

Shri Durga Shanker Mishra, IAS, Secretary, Ministry of Housing & Urban Affairs' Speech: "I welcome the participation of Municipal commissioners in today's webinar as they will provide critical on-ground information that is required by researchers. Climate resilience is critical in today's world. Besides being a part of international climate forums, India realizes the consequences of being insensitive to climate change. Various civilizations and their cities are no longer there because of climate change—Smart City Mission by Hon. Prime Minister Narendra Modi introduced a completely new paradigm on 25 June 2015. A total 100 cities were selected in 3 years, and these cities are like labs for evaluating the impact of



urbanization and challenges from climate change. Around 800 million people are likely to reside in cities. Life will be miserable if challenges aren't addressed. Development cannot happen without inclusiveness, resilience, and without moving away from Business as Usual Scenario. The smart city mission had three major objectives: Liveability (hospitable environment), financial ability (cities to be economically viable), and sustainability (financial, economic, and environmental). The climate-smart cities assessment framework (February 2019) had five important aspects: waste management, water resource management, mobility, air quality, energy and green building & urban planning, and green cover. With the smart city's project(s), city forests are planned and implemented making cities more sensitive towards the environment. The 2019 framework assessed all cities. On 11 Sept. 2020, 138 new cities (with a 500,000 plus and state capitals) were added as a part of the new smart cities movement. Smart solar and smart water, cycle path, bicycle share, pedestrian path was some of the key programs initiated due to the Smart Cities movement. Webinar today is pertinent to the current situation in our country. The COVID-19 pandemic has engulfed the whole country, and cities are the worst impacted. We need to take action to save humanity and create an atmosphere in which every India, Our Hon. PM has made a call for new India 2022, Atmanirbhar Bharat Abhiyan, and a vision of transforming from a 3 trillion to 5 trillion dollar economy -all of which are possible only if we are safe and resilient towards disaster. That is the primary focus of smart cities, and are working towards creating climate-smart city alliances and sensitizing people about climate change. Swachh Bharat's mission's success is an example of a way forward with sensitizing people about climate change. Cities have been impacted more by COVID-19, and ***this UVAF (Urban Vulnerability Assessment Framework) is critical for cities adaptation measures in the future."***

He ended his note by congratulating the webinar as it is pertinent to India's current challenge. He requested for webinar discussions to be shared with the Government of India to inform policy decisions by MoEFCC and MoHUA.

Setting the context

Prof. Ajit Tyagi,

Former DG, IMD &Senior Advisor, IRADe

Prof. Ajit Tyagi set the agenda by highlighting that cities are growth vehicles and are under threat due to the challenge imposed by climatic hazards. He mentioned that with the increase in migration, it is anticipated that more than 50% of the people will reside in the cities within a decade. It brings out the challenge of resilience and sustainable growth in our urban areas. ***He emphasized that unforeseen events like COVID 19 are dealt with carefully. However, predictable, inevitable, and pressing environmental concerns and stated by IPCC require a lot more attention and comprehensive toolkits such as UVAF to overcome the severity.*** He further explained how developing countries are more vulnerable and require robust planning to overcome the associated risks, as some of the climate impacts will be irreversible. Besides, the climatic effects may further extend to the economic and health systems of a country. At last, he set the tone by highlighting the importance and need for a comprehensive framework such as UVAF and how holistically it deals with the existing and future vulnerabilities.

4. Session 1- Urban Climate Vulnerability Assessment Framework

Dr. Sudhir Krishna,

Former Secretary, Ministry of Housing & Urban Affairs, GoI.

Dr. Krishna moderated the session on Urban Vulnerability Assessment Framework and stressed the importance of climate-resilient cities. ***He highlighted that the unsustainable growth scenarios have forced us all to look back and reengineer the growth strategies.*** India's urbanization strategy needs rethinking. Cities remain the growth hub of the country. Cities are engines of growth and its further validated by the decisive correlation factor of 0.8 with the GDP, which requires a sustainable foundation, as explained. We have to urbanize so that people can live in cities productively. He noted that a

hazard needs not turn into a disaster if we have strong sustainable systems in viz infrastructure, governance, and socioeconomic characteristics and awareness. ***He also emphasized the need for a development plan of urban agglomerations and not just the city municipal limits.*** The time has come to make cities more climate-resilient and liveable. Various frameworks are published in the recent past, and cities must decide on the best framework for them. Development and resilience manuals of local administrations must reflect these frameworks. All-important takeaways must be part of municipal manuals.

A Thematic Presentation on 'Urban Climate Vulnerability Assessment - Assessing the vulnerability of seven cities'

Mr. Rohit Magotra, Deputy Director, IRADe
Ms. Yashi Sharma, Research Assistant, IRADe

A thematic presentation explaining the Urban Climate Vulnerability Assessment Framework and associated methodology was made by Mr. Rohit Magotra and Ms. Yashi Sharma. Mr. Magotra, Deputy Director IRADe, in detail, discussed the conception, components, and interpretations, where he said, 'The framework is developed to assess the vulnerability of seven Indian Cities. This project is supported by the Ministry of Environment, Forest, and Climate Change as a part of the National Communication to the United Nations Framework Convention on Climate Change (NATCOM) study. As it is well known, the study's need was the kind of destruction caused by natural disasters globally and in India, which is sometimes irreversible. It is projected that around 49 million people with an estimated USD 1.55 billion damage are affected annually in India. Disaster needs attention, and a lot of the investments as the city gets wiped away through them. Also, around 60% of India's GDP is generated by the urban population. Therefore, it is crucial to assess what kind of risks are incurred by the Indian cities due to climate vulnerability. In this context, the Ministry of Environment, Forest and Climate Change wanted to assess the kind of vulnerability faced by Indian cities and what kind of tools/framework can be used for such assessment. Given the subject, designing a framework for such a study was a challenge. As defining vulnerability consists of various aspects, it has

multiple definitions. In a diverse country like India with different demographics and geography, the challenge was to arrive at a comparative assessment framework.

Further, as a part of the study, we had to define the Sub-indices and indicators under each thematic hand to represent that city's climate vulnerability. Finally, to test this methodology in the seven selected Indian cities and develop the kind of experiences and the results and recommendation policies. The project approach is comprised of looking at the existing methodologies available for assessing vulnerability. Based on this methodology for the study was evolved in consultation with the experts. The cities identified were based on factors like location, ecosystem, population, and likewise. It was followed by reaching out to the city stakeholders, particularly city municipal authorities and development authorities, to provide data and input required for creating such a framework. It was further tested and reviewed by city authorities for any feedbacks. This iterative process was observed to arrive at the scorecard of individual cities. The broad methodologies reviewed for creating such a framework were Environmental Vulnerability Index (UNEP, 2015), city disaster resilience scorecard (UNISDR, 2017), City Resilience Index (ARUP, 2015), and likewise. The UVAF was also used to draft a climate vulnerability assessment of seven cities, including Delhi, Mumbai, Chennai, Bengaluru, Srinagar, Shillong, and Ahmedabad. To share that city of Ahmedabad was added last year based on the request made by the Ministry. The framework is based on the rapid vulnerability Index by the name of HIGS. The framework evolved by looking at existing and projected vulnerability and 100 indicators, which eventually, based on the data availability and consensus, transformed into a framework with seven broad thematic indicators - physical, hazard, social, demographic, financial provisioning, infrastructure, and administration vulnerabilities, and their sub-indicators to evaluate the climate vulnerability in Indian cities. Ms. Yashi further explained the methodology, 'The scoring of the cities is done based on providing simple scores ranging between 1 to 3 with rank number 1 being the least vulnerable and ranked low whereas rank number 3 being the most vulnerable and ranked as high. Each city is ranked according to the ranges based on national, international benchmarks and decadal trends. It is then aggregated and normalized to obtain a composite vulnerability score of that degree. Also, the indicators or sub-indices containing information are only considered while normalizing and otherwise not. The limitations while testing the framework included the availability of data, standardization of data, and updating the existing data.' Mr. Magotra concluded by adding, '***The UVAF analysis showed that Srinagar was the most vulnerable, followed by Bengaluru and Ahmedabad whereas, Shillong was the least vulnerable of all.***

The recommendation includes, City wise, thematic indicator wise, hazard wise, prioritizing investments, linkage with policies, and policy recommendations.'

Shri B. S. Sohliya,

I.A.S, Chief Executive Officer, Shillong Municipal Board, Shillong

Mr. Chyne, an Executive Engineer from Shillong (representative), welcomed the UVAF study and its usefulness to Shillong's current vulnerability assessment and management. He further added that due to the framework's comprehensive nature, it would prove to be an efficient toolkit to predict the city's future vulnerability and accordingly improve required preparedness. ***He emphasized on the need for better and cohesive data availability. Indian cities lack quality data and therefore ended the discussion on the need for investing in the same.***

Dr. G.N. Qasba, Former Commissioner,

Srinagar Municipal Corporation, & Senior Advisor, IRADe

Dr. Qasba, former commissioner of Srinagar said, 'Developing an assessment framework is an important task in urban planning . Cities are now facing huge problems with rapid growth. Urbanization is the face of progress; it cannot be changed by any means. We have had many programmes focusing on developing the town and moving back to the village, but none of them have worked in the past. Urbanization is constant, and as we can see on Soul, it has grown enormously in past decades and is doing very well on the sustainable side. As far as indexing is concerned, IRADe has taken up a big challenge, had a great honor to be associated, especially with Srinagar City. The focus needs to be streamlined, and often authorities have many ideas regarding streamlining the city resilience, which requires assessment. Srinagar is shown highly vulnerable as per the assessment, followed by Mumbai. It is imperative to understand, especially emphasizing the various measures that could make a city resilient. About Srinagar, we have often talked that building embankments on the two sides of the river Jhelum. Most important are the initiatives and inputs which we recommend for developing resilience should be simulated. Secondly, while making master plans of the cities, it should not be a factor of single elements like disaster resilience or liveability rather than complementary to the disaster resilience plan. The indexing we did should be incorporated like a recently approved Srinagar master plan, which has a chapter on the same report. We often talk about communications, being a then-commissioner at the time of the 2014 flood in Srinagar. The

need for disaster-proof communication systems is the need for an hour as all communications cease upon flooding. Therefore, a need for resilient infrastructure for communications is required. Simulation plays an important role in predicting the situation with communication and without communication and then preparing accordingly. Further complimenting Dr. Jyoti Parikh and the entire team for coming up with state-of-the-art research on indexing Urban Vulnerability.'

Prof. Ajit Tyagi,

Former DG, IMD &Senior Advisor, IRADe

Prof. Ajit Tyagi appreciated the challenge taken up by IRADe to rank the cities in terms of the vulnerability. He explained how the framework is relative, and therefore, comparatively, a city might look safe on the scale. However, while looking at an individual hazard, it still imposes significant climatic risks. Further elaborating on data availability in complete consensus with Mr. Chyne, he mentioned the case where the city does not have sufficient data; it does affect the overall index quality of that city. He also discussed, 'The need for planning critical infrastructure; it is observed that critical infrastructure are the first victims at times of critical disaster infrastructure. A resilient plan in place can ensure that the services do not get hampered with the incoming disasters. disaster faced once in 50 or 100 years needs a special kind of preparation. Still, taking the example of recurring floods, it needs efficient preparedness to cope. It is seen that most of the cities experience reoccurring floods are; thus, the concerned city ULBs should be able enough to manage them efficiently with the help of early warning systems and efficient drainage management'. He expressed that now we are on the path of deriving efficient tools and methodologies, the need is to test and bring efficient applicability in the times of need. To address the vulnerability in totality, Prof. Tyagi highlighted that the rise in risk would impact the poor and vulnerable. He added that one must act now to protect our cities from climate hazards. Also, how IRADe has been visionary in its focus on vulnerability in the cities. ***Explaining the UVAF he indicated how developing a holistic framework involving seven thematic indicators and 70 sub-indicators, covering all aspects of cities like, energy, water, and various hazards, can help improve preparedness.*** He sincerely hoped MoES, MoEFCC, and MOHUA increase their urban vulnerability actions seriously and address the climate hazard aspect to make our cities resilient.

5. Session 2- Way Forward

A Way Forward session took place to discuss the future course of action to make cities more resilient to existing and new vulnerabilities. This session was chaired by Prof. Jyoti Prikh, Executive Director, IRADe

Dr. Divya Sharma,

Executive Director, Climate Group

Dr. Divya Sharma, Executive Director, Climate Group India, said, 'there is scope to include small and medium towns and mid-sized cities under a planned development and governance framework in India. While National Flagship Schemes like AMRUT and Smart Cities have helped cities plan their basic services, infrastructure needs and improved urban management system, we still lag behind in city planning, integrating disaster risk reduction with urban planning and climate resilience planning in Indian cities. Indian cities are diverse in typology and differ in terms of population, demography, and location. To top this, governance capacities and economic base of a city largely defines the current and future pathways for the cities which must be pre-planned and taken into account while making growth projections. Cities are complex systems and will tend to develop organically, but development regulations and building bye laws integrating climate concerns can go a long way.

There is scope for improvement around land use planning, detailed infrastructure planning, and neighbourhood level planning in Indian cities. Neighbourhood planning for example, can help cities integrate walkable, car free spaces or parks and green areas that have potential to reduce GHG emissions as well as reduce heat island effect. Unfortunately, the traditional urban planning practices which still have potential to build climate resilient and climate smart cities are either forgotten or ignored. Nature-based solutions that are indigenous in nature have a lot to do with climate resilience. It is critical to focus on the climate; innovation around making indigenous techniques relevant to present urban planning and incorporate the nature-based solution into the planning. Often municipal bodies are urban management bodies; they are not planning bodies. Therefore, there is a considerable difference in land use planning and translating the same in infrastructure planning and neighbourhood level planning or city placemaking and managing these places. IRADe's Urban climate assessment framework consists of some excellent indicators and directly relates to how the cities are traditionally

understood. The vulnerability framework is a good starting point, and such a framework must be brought in the mainstream while working closely with the government. The vulnerability framework will further help in understanding and projecting the risks. Planning, budgeting, implementing, and monitoring the outcomes requires a dynamic process, and such tools can help do so'.

Prof. Anil K Gupta,

Professor, National Institute of Disaster Management (NIDM)

Prof. Gupta, NIDM, discussed, 'Indian cities are far from western and thus coming up with a vulnerability framework for Indian cities is a constant challenge from the past decade. Rapid transition is witnessed in tire three and four cities, unlike the metro, which has always attracted the attention. Reiterating the process of identifying vulnerability, it is many times independent of hazards. Therefore, the assessed vulnerability should focus on anthropogenic factors. It results in a simplistic framework that can be replicated pan India while taking account of the non-climatic factors and helping cities identify respective risks. While elaborating on infrastructure vulnerability, they are dealt in isolation. In a cohesive urban system, infrastructure services are interdependent in nature. Capturing interdependency while tackling the issue vulnerability assessment is a key question. Indian cities are unique in the vulnerabilities; new resilience measures are needed in our fast-growing urban regions. Peri-urban areas are one example of the need for inclusion while calculating the associated vulnerability. Considering the nature-based solutions as a way, which model of green cities is being contemplated in India? In the light of the current pandemic COVID 19, has forced management to think about certain relevant factors. Such as data on migration, practically cities had no precise data in the time of need. The urban areas are planned based on the available data set. Therefore, a significant focus is required on migrant and floating populations while improving urban resilience processes. Other new land uses such as urban agriculture needs to be understood and recognized to improve and help in better evaluating the future vulnerability and plan for better resilience. For a successful implementation process, instead of rigid planning modules, they must be dynamic in nature to accommodate changing baselines in land use, planning, economic structure/ business continuity, and hazards.'

Dr Ashwani Kumar,

Associate Professor, Faculty of Planning, CEPT University

Dr Kumar said, 'India will soon have 50% of the population living in urban areas by 2050, compelling the urban planners, city managers, and authorities to visualize the cities' growth trajectories. He reflected on the possible way forward to improve climate change and adaptation in India into five major components, which are policy and governance, climate change assessment framework, advanced technologies, nature-based solutions and funding, and implementation. Further elaborating on the climate change assessment framework are the multi-aspect assessment framework for calculating the vulnerability. Many such frameworks are brought out by MoUD, national agencies like IRADe, and another research institute NGOs. These assessment frameworks are quite dynamic and need to be adjusted from time to time. Hence, there is a need for collaborative efforts to establish a centrally coordinated inter-ministerial research group that may play a crucial role. It is achievable in light of the recent efforts to establish the urban observatories, city-based SCADA systems, smart city control rooms, and climate change groups at NIUA. Advanced technologies are required for smart and resilient cities. The need for the efficient working of the city generates the need to adapt to the multi-dimensional approach, including the newer technologies, resilient infrastructure as well as land-use planning. Once the technologies are brought into the cities, it gets locked for 30 to 40 years, and it is difficult to change the technologies in later stages. Therefore, the assessment of such interventions is vital before introducing them into the city systems. City dwellers dwell upon the growth of natural resources as well as on the human and energy resources. Natural resources include land, water, air, food, and biodiversity. New technologies introduced under the smart city programme have already demonstrated the success of managing the cities and some of its transport and land resources. Cities are also trying to upgrade management and services, contributing to the making of smart and resilient cities. Often, intending to build climate resilience, the quick fix results in constructing something in the wake of the situation. It is thus important to motivate the city with a sense of achievement by implementing nature-based solutions. Nature-Based approaches are required in cities to achieve long-term sustainable adaptation and resilience measures. Further, a more collaborative framework is required to bring together Central and state government and associated stakeholders with an aim to mainstream the climate change adaptations through coordinated actions. Funding for

innovation, upscaling proven technologies, and systemic financial systems must be established'.

Ms Lubaina Rangwala,

Senior Manager- Urban development & Resilience, WRI

Ms Rangwala discussed the need for encouraging the bottom-up perspective and mainstreaming vulnerability assessment and making it part of planning. In light of considering the bottoms-up perspective, there are three aspects: location sensitivity, accessibility to services, and the most important aspect of adaptive capacities. Ensuring that assessment frameworks are sensitive enough to acknowledge how sensitive are people's adaptive capacity is. It is affected by the factors of neighbourhood they live, housing condition, access to services, and occupation type. These vulnerabilities often don't get captured at the city level, as these communities are not segregated based on their locational or occupational risks. Therefore, understanding how to collect adaptive capacity data is essential. Another important factor is differential capacities based on individuals; for instance, even within a household, people may differ in terms of gender, economic capacities, age, and likewise. Capturing such details helps in localizing actions to make informed decisions, device appropriate actions, and mitigation strategies in vulnerable areas. States in India have prior disaster management experiences and are in a better position to manage hazards. States have their social network in place and know the on-ground systems have been able to better and equitability cope with the disasters and build capacities in the communities. For example, ASHA workers have played a crucial role in health vulnerability assessment and resilience in Kochi, Kerala. Visible risk and invisible risks must be evaluated differently for their risks, as individual responses are different. Three key principles must be addressed: MNE protocols to be made more robust, UVAF to address master plan, decentralized approach to vulnerability assessment.

Dr. Nimisha Jha

Senior Research Analyst, IRADe

Dr. Nimisha Jha gave vote of Thanks, she expressed that IRADe is happy to see the participation of policymakers, practitioners, city

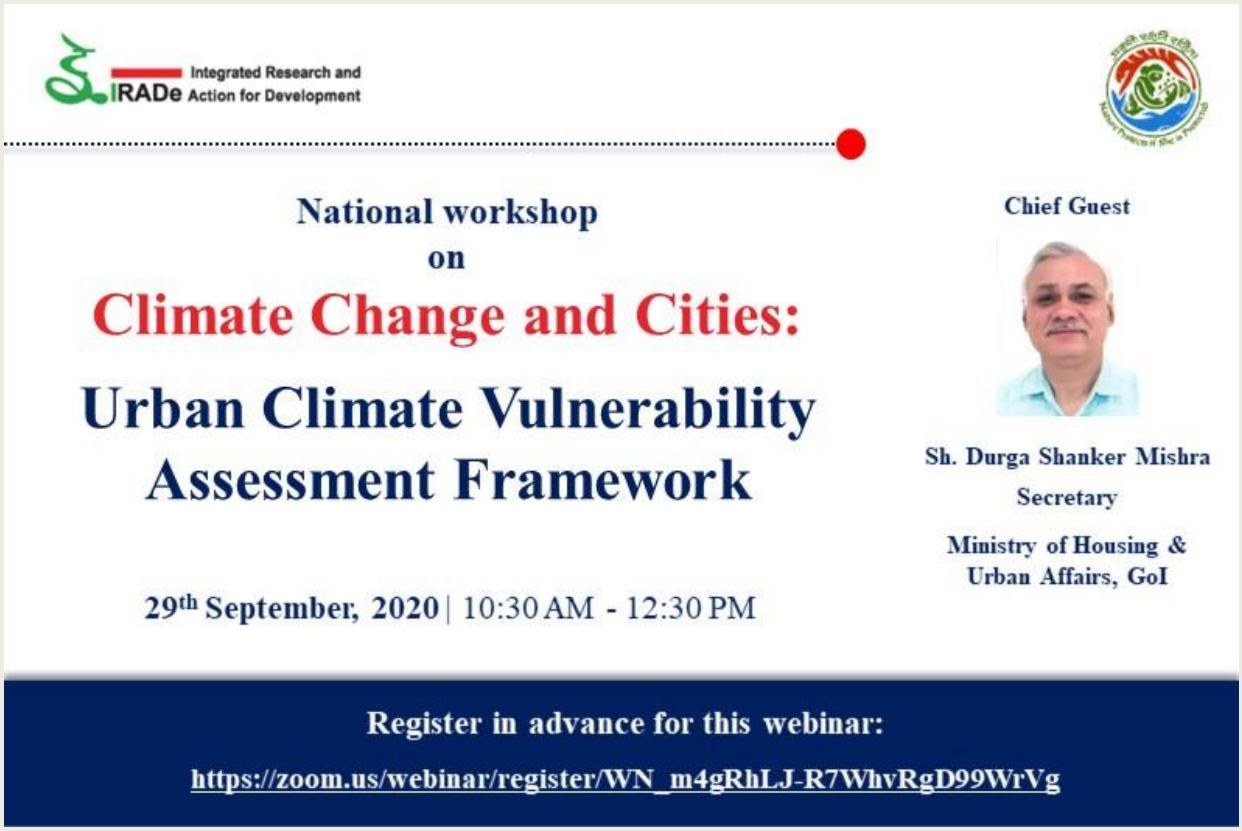
authorities from India and South Asia. She further thanked all the esteemed panelists and eminent speakers.

Annexure

Annexure 1: Agenda for the National Workshop

10:30-11:00	**Inaugural Session**	
	Opening Remarks	•**Prof. Jyoti K Parikh,** Executive Director**,** IRADe
	Special Address	•**Shri Durga Shanker Mishra,** IAS, Secretary, Ministry of Housing & Urban Affairs, GoI
	Vote of Thanks	•**Prof. Ajit Tyagi,** Former DG, IMD &Senior Advisor, IRADe
11:00-11:55	**Session: 1 Urban Climate Vulnerability Assessment Framework**	
	Session Moderator	•**Dr. Sudhir Krishna,** Former Secretary, Ministry of Housing & Urban Affairs, GoI
11:00-11:15	**Thematic Presentation**	•**Mr. Rohit Magotra,** Deputy Director**,** IRADe
		• **Ms. Yashi Sharma,** Research Assistant, IRADe
11:15-11:45	**Panelists**	• **Shri B. S. Sohliya, I.A.S,** Chief Executive Officer, Shillong Municipal Board, Shillong
		•**Prof. Ajit Tyagi**, Former DG, IMD & Senior Advisor, IRADe
		• **Dr. G.N.Qasba**, Former Commissioner, Srinagar Municipal Corporation, & Senior Advisor, IRADe
11:45-11:55	**Q&A**	
11:55 – 12:30	**Way Forward**	
	Session Moderator	•**Prof. Jyoti K Parikh, Executive Director,** IRADe
11:55 – 12:30	**Panelists**	•**Prof. Anil K Gupta**, Professor, National Institute of Disaster Management (NIDM)
		•**Dr. Divya Sharma,** Executive Director, Climate Group
		•**Dr. Ashwani Kumar,** Associate Professor, Faculty of Planning,CEPT University
		•**Ms. Lubaina Rangwala,** Senior Manager- Urban development & Resilience, WRI
	Vote of Thanks	• **Dr. Nimisha Jha,** Senior Research Analyst, IRADe

Annexure 2: Workshop Flyer



Annexure 3: Media Coverage

https://delhipostnews.com/climate-change-and-cities-irade-develops-critical-assessment-framework/

https://twitter.com/Delhipostnews/status/1311174481465847808

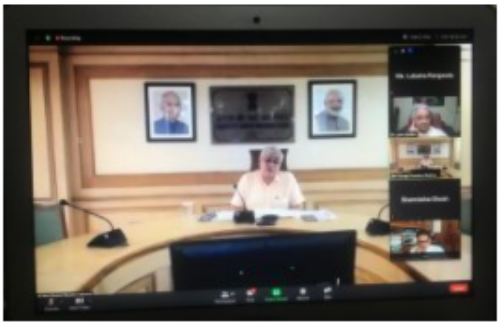
DELHI POST
Politics | Democracy | Development

Climate Change and Cities: IRADe Develops Critical Assessment Framework

The UVAF can act as a critical tool in India's development of climate resilience and disaster risk reduction in cities, through identifying existing vulnerabilities and there by working strategies developing climate-resilient cities and evolve adaptation plans.

By Nimisha Jha — On Sep 30, 2020

In India most of the cities are vulnerable to the climate-induced natural hazards. As per the National Disaster Management Authority (NDMA) 58.6 per cent of the Indian landmass is vulnerable to floods and river erosions, 5700 km of the country's coastline is prone to cyclones and tsunamis and more than half (68 per cent) of its cultivable area is drought-prone. In terms of the number of disasters faced by the country, it has been found that within a period of 30 years (1980–2010) the country has experienced a total of 431 disaster events which took toll of around 43,039 lives and affected 1521 million people. The total economic damage caused by these disasters was approximately USD 48 billion. On an average, the natural disasters in India affect a population of 49 million per year and bring the estimated economic damage of USD 1.55 billion. Recent events of disasters in cities like floods in Chennai, Guwahati, and Srinagar (floods due to incessant rainfall, the situation worsened by poor drainage system), and the cyclone in Visakhapatnam have brought attention to the vulnerability of Indian cities.



With an urban population of 31 per cent, India is at a point of transition where the pace of urbanisation will speed up. The urban population contributes over 60 per cent of India's GDP. It is projected that urban India will contribute nearly 75 per cent of the national GDP in the next 15 years. The aspect of climate change is a pressing environmental concern in cities, and is creating an additional stress on urban infrastructure and lifeline services. Inevitably it is creating a huge problem for the city residents. In this scenario, adaptation and mitigation to climate risks in cities are important aspects of the Indian government's efforts to fulfill its commitment to the United Nations Framework Convention on Climate Change (UNFCCC).

The Integrated Research and Action for Development (IRADe), a reputed public policy think tank based in New Delhi, has designed and developed Urban Climate Vulnerability Assessment Framework (UVAF) with an aim to make Indian cities climate-resilient uses seven broad thematic indicators—physical, hazard, social, demographic, financial provisioning, infrastructure and administration vulnerabilities, and their sub-indicators to evaluate the climate vulnerability in Indian cities.

Also Read : Global Response Mechanism for the Climate Crisis Needed

https://twitter.com/Secretary_MoHUA/status/1310890271614275591


Durga Shanker Mishra
@Secretary_MoHUA
Delighted to share my views in the inaugural session of Webinar on 'Climate Change & Cities: Urban Climate Vulnerability Assessment Framework' organised by IRADe.
COVID-19 pandemic has moved us beyond our usual ways of working to relying heavily on digital mediums & technology.
Ms. Lubaina Rangwala
Sharmistha Ghosh
IRADe and 5 others
4:02 PM · Sep 29, 2020 · Twitter Web App
18 Retweets
49 Likes

Annexure 4: List of Attendees

S. No.	Name	Organization
1	Kk Sarma	North Eastern Space Application Centre
2	Suprava Patnaik	Indian Institute Of Forest Management
3	Siraz Hirani	Mahila Housing Sewa Trust
4	Sugata Hazra	Jadavpur University
5	Dr. Priya Dutta	Indian Institute Of Public Health Gandhinagar
6	Ramakrishna Nallathiga	National Institute Of Construction Management And Research
7	Harish Chandra	Integrated Research And Action For Development
8	Govinda Choudhury	University Of North Bengal
9	Samraj Sahay	Independent Consultant
10	Vijay Raj	Integrated Research And Action For Development
11	Raju Mandapalli	Formerly With Geological Survey Of India
12	Ramesh Babu	Evangelical Fellowship Of India Commission On Relief
13	Chandrashekhar Singh	Integrated Research And Action For Development
14	Jerin Abraham	United Nations Development Programme
15	Mohanasundari Brammadevan	Tamil Nadu Agricultural University
16	Rupa Kumar Kolli	International Clivar Monsoon Project Office
17	Aminul Hoque	Coastal Association For Social Transformation Trust
18	Vinod Kumar Agrawal	Integrated Research And Action For Development
19	Thangkholet Baite	Evangelical Fellowship Of India Commission On Relief
20	Dr.Aditi Dandotiya	Indian Institute Of Public Health Gandhinagar
21	Sumeet Agarwal	Sustainable Environmental And Ecological Development Society
22	Juthika Banerjee	DISC
23	Parthiban Raja	Vellore Institute Of Technology
24	Subrat Sharma	Gb Pant National Institute Of Himalayan Environment

25	Md Shamsuddoha	Center For Participatory Research And Development-Cprd
26	Phalguni Dasgupta	Integrated Research And Action For Development
27	Riya Mallick	International Center For Sustainable Cities Consultancy Services Llp
28	P.V.S Raju	Amity University Rajasthan
29	Sangeeta H	Center For Sustainability, Policy & Technology Management
30	Dr. Shubha Avinash	Karnataka State Natural Disaster Monitoring Centre
31	Manisha Subedi	Planeight Risk Consulting
32	Anohar John	TFINS
33	Montosh Taluckdar	Adarsha Samajik Progoti Sangstha (Asps)
34	Manish Priyadarshi	International Institute Of Health Management Research, Delhi
35	Prem Livingstone Navaneethar	Evangelical Fellowship Of India Commission On Relief
36	Surbhi Dubey	Cluster University Of Jammu
37	Barbara Asenso	Mcgill University
38	Abhipsa Das	Iter Soa University
39	Uma Pal	Acclimatise
40	Palak Patel	Centre For Advanced Research In Building Science And Energy (CARBSE)
41	Sujatha Byravan	
42	Yash Agarwal	Indian Institute Of Technology, Mandi
43	Hita Unnikrishnan	
44	Parimal Bhattacharjee	Vivekananda Kendra Institute Of Cultureure
45	Sarat Sahu	Siksha' O' Anusandhan Deemed To Be University, Bhubaneswar, Odisha
46	Sandeep Srivastava	Shohratgarh Environmental Society
47	Ritu Mathur	The Energy And Resources Institute (Teri)
48	Abha Mishra	United Nations Development Programme
49	Brijesh Bhatt	NTPC School Of Business
50	Dushyant Mohil	Wetlands International South Asia

51	Ayush Tiwari	Integrated Research And Action For Development
52	Satheesan K	Cochin University Of Science And Technology
53	Prof Anil K Gupta	Nation Institute Of Disaster Management
54	Vishakh Saraf	Indian Institute Of Public Health Gandhinagar
55	Heena	Goa University
56	Tr Manoharan	Independent Consultant
57	Birupakshya Dixit	Practical Action
58	Virinder Sharma	Asian Development Bank
59	Sakshi Dasgupta	Swiss Agency For Development And Cooperation
60	Evelyn Teh	Third World Network
61	Chinmai H	Ruchini Environment Sustainability Planners
62	Ishwar Poojar	United Nations Development Programme
63	Himanshu Medhi	Regional Medical Research Centre, Dibrugarh
64	Saurav Chowdhury	World Wildlife Fund, India
65	Rajasekaran Chandrasekaran	Vellore Institute Of Technology (Vit University)
66	Kessang Nima Bhutia	Land Revenue And Disaster Management / Sikkim State Disaster Management Authority
67	Subha Mukhia	
68	Moumita Shaw	Integrated Research And Action For Development
69	Bs Charan	Directorate General Of Health Services
70	Dr Bs Charan	
71	Falguni Joshi	Paryavaranmitra
72	Chandra V	Vellore Institute Of Technology
73	Sr Mania	Research And Analysis Consultants
74	Aniket Baregama	Center For Study Of Science, Technology And Policy
75	Mahadev Bera	Ramakrishna Mission Vivekananda Educational And Research Institute
76	Sathish Nanjappa	Honeywell
77	Dechamma C.S	Azim Premji University
78	Muhammad Aslam Khan	Gomal Damaan Area Water Partnership

79	Ananya Bhatia	Integrated Research And Action For Development
80	Abhiyant Tiwari	Gujarat Institute Of Disaster Management
81	Sachin S	Centre For Environmental Planning And Technology University
82	Manu Gupta	Sustainable Environmental And Ecological Development Society
83	Inecc Mumbai	Indian Network On Ethics And Climate Change
84	Jitu Kumar	Evangelical Fellowship Of India Commission On Relief
85	Gauri Jauhar	IHS Markit
86	Pm Mohan	Pondicherry University Off Campus
87	Deeksha Vazalwar	Indian Institute Of Public Health Gandhinagar
88	Vivek Kumar Pandey	University Of Allahabad
89	Dr Suresh Kumar Agarwal	Pragyan Foundation
90	Dinesh Dhakal	Sikkim State Disaster Management Authority
91	Niti Mishra	Tata Institute Of Social Sciences
92	Harsh Ganapathi	Wetlands International South Asia
93	Shikha Vardhan	Ministry Of Health And Family Welfare, Government Of India
94	Liton Chowdhury	Songshoptaque
95	Rabindranath Barik	Padmanava College Of Engineering, Rourkela
96	Srinivas Kota	Birla Institute Of Technology And Science, Pilani
97	Alam Sarder Shafiqul	International Centre For Climate Change And Development
98	Dr.Vikas Desai	Urban Health And Climate Resilience Centre
99	Satarupa Rakshit	Madras School Of Economics
100	Nicky Patel	Indian Institute Of Public Health Gandhinagar
101	Ervin Tariang	Indian Institute Of Public Health Gandhinagar
102	Rahul Singh	ICLEI South Asia
103	Anitha V	University Of Kerala
104	Vrinda Kumra	Ministry Of Housing And Urban Affairs
105	Judith Christiana	South Asia Consortium For Interdisciplinary Water Resources Studies

106	Harshan Yesudas	Evangelical Fellowship Of India Commission On Relief
107	Harshi Jain	Forest Survey Of India
108	Atul Goyal	United Residents Joint Action
109	Pankaj Batra	Integrated Research And Action For Development
110	Mariadoss Alphonse	Vellore Institute Of Technology (Vit University)
111	Vishnu Pratap Pandey	Integrated Research And Action For Development
112	Dr.Kim Hong Tra	Green dot Connection Consultancy
113	Debesh Roy	Integrated Research And Action For Development
114	Sudhir Prasad Sinha	Society Of Hill Resource Management School
115	Jay Anand	Corecarbonx
116	Chandra Prabha	Independent Writer, Editor, Knowledge Management Specialist
117	S Sreekesh	Jawaharlal Nehru University
118	Mohit Kumar	Integrated Research And Action For Development
119	Thejaswini Kalasamudram	Indian Institute Of Technology, Mandi
120	Amitkumar Akoijam	Jawaharlal Nehru University
121	Kartikay Sharma	Centre For Environmental Planning And Technology University
122	Ruchi Tomar	Environmental Defence Fund
123	Shyamala Mani	Public Health Foundation Of India And National Institute Of Urban Affairs, New Delhi
124	Nakul Sharma	Climate Action Network South Asia
125	Meera N	University Of Kerala
126	Pugazenthi Dhananjayan	Integrated Research And Action For Development

About Project

Urban Climate Vulnerability Assessment Framework aims to identify and target climate action in vulnerable cities. This study is supported by the Ministry of Environment, Forestry & Climate Change (MoEFCC) to assess urban climate vulnerability and design climate vulnerability Index for seven Indian cities- Delhi, Mumbai, Chennai, Bengaluru, Shillong, Srinagar, and Ahmedabad. The framework consists of seven broad thematic indicators - Physical, Hazard, Social, Demographics, Financial Provisioning, Infrastructure, and Administration vulnerabilities. Further, seventy indicators and sub-indicators were defined under each thematic indicator to represent the climate vulnerability of the identified cities. Sector specific adaptation strategies are recommended which the cities may use and prioritize to improve their climate resilience and integrate the same in their respective city developmental initiatives.

About CoE

As a Centre of Excellence, IRADe is furthering the agenda of integrating various urban development efforts and documenting best practices and policy level prescriptions that could be understood and adopted by state and national level decision-makers; local administrations to help them link climate issues with the existing programmes in urban development. The project findings, results, methodology, cities covered and future strategy for India's Urban Climate Resilience has been delivered to various forums like IPCC-SREX, European Union and others. For more details, check **www.climateandcities.org**

About IRADe

IRADe is an independent advanced research institute that aims to conduct research and policy analysis to engage stakeholders such as government, non-governmental organizations, 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. Therefore, IRADe research covers these, as well as policies that affect them. IRADe's focus is effective action through multidisciplinary 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. For more details, check **www.irade.org.**

Contact Us

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