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Harnessing Collective Knowledge:
Advancing Adaptation Research and Action through Tracking, Learning, and Sharing Around Extreme Heat

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INTRODUCTION

Adapting to Extreme Heat: Stories, Strategies, and Shared Learning

*By **Prerna Singh,** Programme Director, Climate Adaptation Learning Lab (CALL), Transitions Research, India*

Extreme heat is no longer an abstract future risk. It's here—pressing in on metropolitan cities, small towns, villages, and coastal belts across South Asia. And while the impacts are often visible—dry taps, closed schools, shimmering streets—they are also quietly reshaping lives, especially for those already dealing with layered vulnerabilities.

This issue of *Southasiadisasters.net* focuses squarely on this intensifying challenge. It brings together stories, ideas, and practical lessons from across the region on how communities and institutions are responding to extreme heat. Led by the All India Disaster Mitigation Institute (AIDMI), with co-curation support from Transitions Research, the issue is a product of both long-standing efforts and newer conversations sparked over the past years through focused efforts.

Some of these reflections emerged through the Adaptation Research Alliance's TLS initiative, which connected local actors to share what's working—and what isn't—on the ground. But the issue goes beyond any single project or platform. What unites the contributions is a shared understanding that extreme heat cannot be addressed through top-down technical fixes alone. It demands locally informed responses, inclusive planning, and sustained dialogue across disciplines, sectors, and borders. The issue draws broadly from direct experience, community-led experiments, policy shifts, and old practices being revisited in a new climate context.

The 2024 heat season was one of the most intense in recent memory, with South Asia experiencing record-breaking temperatures and extremely high wet-bulb readings. For many contributors to this volume, these numbers represented more than just data; they reflected their daily lives. The stories shared here illustrate how people are coping, adapting, and rethinking what it means to stay cool, safe, and connected in the face of rising heat stress. Some pieces highlight emerging tools—like localised heat action plans, climate risk insurance, and participatory risk assessments. Others draw from deeper histories, such as indigenous cooling practices or evolving strategies among women-led collectives. And several zoom in on the lived experiences of specific groups: poultry farmers, migrants, and frontline workers. Across these perspectives, a few shared themes stand out.

> *"Extreme heat is no longer a distant threat—it's a lived reality across South Asia, demanding urgent, inclusive, and locally grounded responses that centre both lived experience and collective wisdom."*

First, the importance of context—geographic, social, cultural. What works in a dense Indian city may not work on a riverine island in Bangladesh or in the semi-arid stretches of western Nepal. Second, the value of listening—to those who've been adapting long before the heat was named a climate issue. And finally, the need to see knowledge itself as collective—emerging through dialogue, not prescription.

AIDMI's decades of work in documenting and enabling locally led disaster and climate responses created a strong foundation for this issue. At the same time, the TLS process offered a fresh structure to connect organisations working on extreme heat, share methods and challenges, and amplify what's already working.

Ultimately, this issue is not just a catalogue of ideas. It's an invitation—to act, to reflect, to share. Because extreme heat isn't just a technical problem. It's a public health emergency, a justice issue, and a daily reality for millions. And the more we learn from each other, the better equipped we are to meet it—together. ■

BLOG

Harnessing Collective Knowledge: Advancing Adaptation Research and Action through Tracking, Learning, and Sharing Around Extreme Heat

*By **Diksha Gupta**, Transitions Research, **Prerna Singh**, Transitions Research, and **Mihir R. Bhatt**, AIDMI, India*

What happens when diverse minds from across the Global South come together to tackle extreme heat? Adaptation to climate change is not a solitary journey but a collective endeavour shaped by diverse perspectives, experiences, and knowledge. This is the driving force behind the Adaptation Research Alliance (ARA)'s Tracking, Learning, and Sharing (TLS) initiative.

This summer, Transitions Research led the TLS programme, bringing together organisations from Bangladesh to Indonesia for a dynamic exchange of strategies to adapt to the growing impacts of extreme heat. For the All India Disaster Mitigation Institute (AIDMI), the Asia Pacific TLS Symposium acted as a catalyst for their collaborative initiatives focused on adapting to extreme heat. This event highlighted the transformative power of shared knowledge and positively influenced their approach to adaptation efforts in response to extreme heat. As AIDMI and Transitions Research reflect on the workshop, several key themes emerge that underline the importance of collaboration and shared learning in advancing adaptation.

Adaptation Beyond the Conventional Approach

Adaptation often begins as a technical or institutional response, but the TLS engagements reveal deeper dimensions. Discussions during the symposiums underscored that adaptation is as much about addressing power dynamics, fostering democracy, and confronting inequalities as it is about responding to environmental and climatic changes.

AIDMI's discussions with Chiranjibi Bhattarai from the Nepal Water Conservation Foundation and Cho Cho Shwe from Myanmar highlighted the importance of framing adaptation strategies within their historical and social contexts. These insights prompted AIDMI to reconsider its approach in India and incorporate a more holistic perspective into its initiatives aimed at helping small businesses adapt to extreme heat in six cities. The key takeaway is that technical solutions should be grounded in the social and historical realities of the communities they intend to serve.

The workshop emphasised that adaptation is closely connected to both mitigation and resilience. A discussion with Javed Hussain from the Sindh Community Foundation in Pakistan highlighted the interrelation of these efforts. This encouraged AIDMI and other ARA members to consider integrated approaches.

Effective Knowledge-Sharing Practices

One of the symposium's most valuable lessons was the power of effective knowledge-sharing practices. Whether through case studies or collaborative workshops, participants left with tools and insights they could immediately apply. For AIDMI, the idea of "seeing like the others" was particularly impactful.

Collaborations with organisations like SERAC Bangladesh, Alternative Futures in India, and Kota Kita Foundation in Indonesia brought new tools, methods, and perspectives that strengthened AIDMI's extreme heat adaptation efforts. These partnerships also demonstrated how framing adaptation as a public good can amplify its societal impact.

Case studies presented by Dr. Soundarya Iyer and Dr. Yanling Yee showcased the power of storytelling and face-to-face engagement in creating deep, actionable insights.

However, the most significant lesson for AIDMI was the importance of viewing its own adaptation measures through a multidimensional lens.

The Role of Global Networks in Local Adaptation

A major theme at the symposium was the role of global networks in driving local adaptation efforts. For instance, discussions about subaltern rights and elite resistance shed light on how global frameworks often clash with local realities. Yet, organisations like Mahila Housing Trust in India demonstrated that empowering women in urban slums to lead adaptation efforts can break down these barriers.

For AIDMI, this was a reminder that adaptation isn't just about

implementing international frameworks—it's about adapting those frameworks to fit local needs. Striking this balance is a challenge, but it's also where the most transformative change can occur.

Moving Forward with Collective Knowledge

The TLS symposium wasn't just about sharing knowledge; it was about turning those lessons into action. For AIDMI, the next step involves piloting community-led adaptation initiatives in Indian cities. Inspired by examples from Bangladesh and Myanmar, they're committed to making these efforts inclusive, participatory, and multidimensional.

For Transitions Research, the symposium reaffirmed the importance of fostering global-local linkages and creating spaces where diverse voices contribute to actionable strategies. The ARA TLS initiative reminds us that by harnessing collective knowledge, we can build a future where no community is left behind. ■

WORKSHOP

Assam Addressing Extreme Heat and Building Climate Resilience

*By **Vishal Pathak**, AIDMI, India*

Assam has been at the forefront of disaster risk reduction in India, may it be making schools safer or making district disaster management plans work. Now Assam again is leading in protecting its urban and rural citizens from accelerating extreme heat in 2025.

ASDMA (Assam State Disaster Management Authority), and AIDMI (All India Disaster Mitigation Institute), a leading member of civil society organisations working on extreme heat since 2014 jointly organised first ever workshop on "Extreme Heat and Building Climate Resilience in Assam" on March 26, 2025, Guwahati. The technical sessions included, understanding extreme heat in Assam and North East Region; Lessons from action plans and cool solutions; extreme heat forecast and early warning; and data-driven cool solutions.

A detailed urgent but long-term cooling plan for thousands of Assam farmers and city dwellers; hundreds of small businesses, and schools and health facilities were outlined by over 400 participants from UN, government, universities, and NGOs including officials from the North East States.

AIDMI has led work on extreme heat in action since 2014, including recent global review of lessons and IPCC's SREx (Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation) report. ■

TRADITIONAL USAGES

Indigenous Knowledge and Practices Towards Extreme Heat Adaptation in Bangladesh

*By **Muhammad Abdur Rahaman,** Director, Center for People and Environ, Dhaka, Bangladesh & Research Scholar, Tripura University, Agartala, Tripura, India*

Heat stress is a phenomenon where an area experiences higher temperatures than surrounding areas. In recent times, heat stress has been a common phenomenon in Bangladesh due to temperature rise. Historically, the Barind Tract of Bangladesh has heating vulnerable areas however, in the last couple of years, all over the country heat stress has become a meteorological disaster during summer. Traditionally, the people of Bangladesh are habituated with different indigenous knowledge and practices to adapt to heat. Mud-made houses are one of the Indigenous practices of Bangladesh to adapt to heat. The width of the walls of a mud-made house is around one foot. The significance of these houses is to cope with the heat, the local community in Barind Tract, Chittagong Hill Tracts, and the coastal belt said that the mud house feels comparatively cooler during the summer. As human beings, the community people also prepare mud-made nests to provide cooler habitation for the birds. Dhop Koll was practicing in Barind areas to support pedestrians during summer for drinking water. While the traditional Dhop Koll system is no longer active, people now support rickshaw pullers and day labourers during heatwaves by providing drinking water. Kulla is the indigenous practice of rearming chicken. This is effective in protecting chickens and ducks from heat waves. As a straw-made structure, Kula does not warm during summer and provides favourable habitation for poultry. During summer, the straw-made wall keeps cool and ventilation for a suitable environment for the poultry and ducks. As a result, this Kulla has a high potential to adapt to climatic extremes around the year. In the current increasing heat concern, it could be a good adaptation action for small-scale chicken farming. Motka is a big pot made of clay. The clay is porous and traps air and also has evaporation circulation while keeping out moisture and pests. Kulhar is also naturally cool, helping to keep food fresh. This Motka, especially designed for water preservation, is used during the summer to keep water cool. The cool water helps alleviate the effects of heat waves, similar to the benefits of ice-cold water. Mulching has the potential to adapt to heat-induced evaporation and can also help manage local drought conditions. When the summer heat intensifies, consuming sweet and juicy mango and jackfruit helps replenish the body's water levels, a practice that is traditionally followed in Bangladesh. ■

Kulhar.

Dhop kol.

COLLECTIVE ADAPTATION

The Potential of Photovoice to Explore the Lived Experiences of Living with Heat in a Wetland

*By **Shibaji Bose,** Independent Research Consultant; and **Madhubanti Talukdar**, Independent Researcher, India*

The climate-affected and vulnerable communities inhabiting the Sundarbans, who have been battling the persistent perils of the accelerating climate crisis in the form of recurring floods, tidal surges, cyclones, and storms, now face a new challenge in the form of extreme heat. The present piece is informed by findings from a study on climate loss and damage in the Sundarbans, conducted using a participatory and collective visual method called photovoice, which allowed us to look at heat, and the everyday experience of living with it, through the lens of communities themselves.

Photovoice involves asking selected participants within a community to take photographs on particular themes, after which they explain why they took these photos, and collectively develop an accompanying narrative for them (Wang & Burris, 1997). In our study, the photographs and narratives developed by community members from a village in G-Plot of the Indian Sundarbans pointed to their increasing precarity in the face of extreme levels of heat, an unprecedented hazard that they are not used to coping with, one that has pushed their lives and livelihoods into increased uncertainty. Although using visual methods like photovoice in social science research can yield insights that are otherwise difficult to obtain, in this context, the groups involved repeatedly communicated the challenges of capturing or communicating the experiences of extreme heat through photos.

The study participants were divided into two groups consisting of men and women. They were selected from various sub-communities based on factors such as caste, ethnicity, religion, economic status, and geographical location to ensure that all segments of the diverse population were adequately represented. The women group's photos and narratives highlighted the difficulty of accessing clean drinking water during the hot summer months, who stated, "Most tube-wells and taps in this region don't work. The ones that do had dried up, and it took us thrice the amount of time to get water. There used be long queues at the taps every day. Sometimes fights would break out. It was physically draining, in that heat." The men's group, on the other hand, focused on the difficulty of carrying on with traditional occupations like agriculture, fishing, and manual labour that involves spending long hours outside. When the findings were presented at a community meeting, a rural medical practitioner from the island reported that he had treated several cases of

A woman islander carrying drinking water from a neighbourhood village as some tubewells tend to dry up during the summer months. Photo credit: Shibaji Bose.

Photovoice women learn to operate a digital camera during the orientation workshop. Photo credit: Shibaji Bose.

heatstroke, dehydration and diarrhoea in the region during the unforgiving summer.

These findings substantiate what we already know about rising temperatures in the Sundarbans. In 2024, which saw massive heatwaves across South Asia, the region was ravaged by high wet-bulb temperatures (a deadly combination of high heat and excessively high humidity levels), acute scarcity of drinking water, a variety of heat-related ailments, and even wildfires in its Bangladeshi part. Further, the combination of high atmospheric and surface water temperature has led to an increase in the sea level – a matter of grave concern for the ecologically rich region with its diverse wildlife, marine habitats, and impoverished populations. The lived experiences of communities in the Sundarbans exemplify how these cascading uncertainties result in the further disempowerment of an already vulnerable population. ■

References

1. Wang, C & Burris, M.A. (1997). Photovoice: Concept, Methodology, and Use for Participatory Needs Assessment. *Health Education & Behavior*, 24, 369 – 387.

Key Local Resources on Cooling Extreme Heat

Southasiadisasters.net Publications

Since 2018 AIDMI is capturing local and regional emerging knowledge and experience around extreme heat cooling though its publication that reaches over 20 thousand. Following seven issues are most relevant.

1. **Key Action Areas for Addressing Extreme Heat in the Asia-Pacific: Lessons from Regional Platforms** (Issue No. 217, March 2025) link
2. **Evaluating Extreme Heat Projects and Programs: Key Lessons** (Issue No. 214, October 2024) link
3. **Accelerating Extreme Heat Responses: Perspectives from India** (Issue No. 213, August 2024) link
4. **Extreme Heat Adaptation and Mitigation Programming: Lessons from Affected Populations** (Issue No. 212, July 2024) link
5. **Heatwave Deaths Are Avoidable** (Issue No. 210, May 2024) link
6. **Urgency of Heatwave Risk Management** (Issue No. 209, March 2024) link
7. **Building Adaptation and Resilience to Heatwaves** (Issue No. 204, January 2023) link
8. **Rising Risk of Heatwaves in Asia** (Issue No. 174, October 2018) link

Knowledge Products

Though knowledge about and around extreme heat is substantial, most of it is scientific and programme driven. What do local affected people and institutions think an reflect? For this purpose, AIDMI co-creates knowledge.

1. **Localisation and Adaptation by Communities: Focus on Extreme Heat** link
2. **Building Resilience for Cotton Farmers in India: Evidence from Gujarat and Maharashtra** (IIED Report, September 2024) link
3. **Guidelines for Schools to Combat Heatwaves** (Available in multiple languages, April 2024) link
4. **Local Heatwave Action Planning** (December 2023) link
5. **Advisory for Protection Against Expected Heatwaves** (Available in seven languages, March 2023) link
6. **Adapting Humanitarian Action to Climate Change** (ALNAP Lessons Paper, 2021) link
7. **Urban Resilience in South Asia** (Experience Learning Series No. 77, March 2021) link

These experience-based essential local resources aim to provide inclusive, scalable, and equitable solutions to one of the most pressing climate challenges, extreme heat. For further engagement, contact Manish Patel at knowingrisk@aidmi.org.

RISK REDUCTION

Climate Risk Insurance: What Worked!

*By **Chirayu Brahmbhatt,** Development Associate, Mahila Housing Trust, Gujarat, India*

Mahila Housing Trust is a grass roots socio-technical organisation that works with collectives of poor and low-income women on multiple issues such as access to basic services, climate change and its impact, participatory rights etc. In 2024, MHT embarked on a journey to roll out a Heat Insurance based on a parametric index. The idea of the product was simple: - MHT wanted to provide the women folk with an affordable and a convenient risk transfer mechanism that would particularly address the **residual risks** arising to due to excess heat.

The idea originated from a conversation between the Vikasinis, who are women leaders from the area, and the MHT staff during a training session. They discussed the impacts of climate change, focusing on how rising summer temperatures affected the Vikasinis, many of whom are home-based or non-home-based workers. They expressed concerns about how these high temperatures were influencing their occupations and income-earning potential.

> *"The 750 Rs I have received, have helped me to buy medicines for my husband. He suffered from dehydration while working on a construction site during the summers. I spent 200 Rs for buying medicines and the rest has served has an income for the 2 days of work, he lost due to bed rest."*
>
> ***- Kanti Ben,** a beneficiary of the Excess Heat risk Insurance*

Though the women folk now have a plethora of options to deal with any exigencies with the help of credit/insurance facilities provided by financial institutions, one major risk remained. Credit/Insurance facilities don't cover **the residual risks** i.e. the issue of loss in income/ increase in expenditure due to excess heat.

Since MHT has been working with these women folk on climate change from 2015, we have developed a good understanding of their core issues. They are,

- Lack of awareness about climate changes and its impact
- Zero Product Familiarity
- High Policy Premiums. In order to resolve these issues, we adopted a multi-pronged approach: - **i)** Education through trainings **ii)** Demonstrate tech pilots to generate lived experiences **iii)** Effective product Marketing **iv)** Including Women's opinion in product finalisation for premium finalisation.

MHT conducted a lot of trainings where women folk were educated about the impact of climate change and how an insurance could help them overcome it. We even developed a game called 'Gud Luck' to keep the sessions interactive for women. Some of the women folk were also helped with tech pilots such cool-roof paints so that the community at a large could understand the impacts of climate change via lived experiences. Lastly, the product was designed in a way that it didn't result in a great financial burden for women in terms of the premium payment for the policy.

This strategy was vital for the product's success during its pilot year. Nearly 2,000 female members received a payout of 750 INR due to the activation of the insurance policy. The comprehensive approach, combined with the early payout, has helped build trust among the female members, encouraging more women to embrace the product in the coming years. ■

Women Members playing Gud Luck Game to understand the need for parametric insurance.

Battling Extreme Heat in Cities: Success Stories from Three Cities

*By **Bedoshruti Sadhukhan**, Associate Director, ICLEI, New Delhi, India*

South Asian countries face the double whammy of rapid urbanisation and a changing climate that is forcing its cities to develop in conditions of unprecedented high temperatures and erratic rainfall patterns. The region, which is already in the tropical zone and faces relatively hot humid conditions, are further impacted by the challenge of rising temperatures due to climate change.

According to a World Bank report, the urban population in South Asia is expected to increase by 250 million by the year 2030[1]. While urbanisation can offer socio-economic opportunities for development, it has largely been chaotic and poorly managed in South Asia. Cities typically expand in an unplanned manner at their edges through urban sprawl, leading to the merging of these outer areas into smaller towns known as mofussil towns. Many rural migrants settle in these peripheral regions upon arriving in the cities, choosing low-cost areas primarily due to the lack of basic services. There are reports from different organisations, including ADB[2], World Bank[3] and other agencies[4][5] that show that growing temperatures from a changing climate are adversely impacting the growing urban population, physiologically, socially and economically. According to the IPCC Sixth Assessment Report, the frequency and intensity of hot extremes will continue to increase with increasing global warming levels, even if the global warming is stabilised at 1.5°C.

Solar PV installed as a cool roofing solution for affordable housing in Rajkot. (credit: ICLEI South Asia)

Cities in the region often experience record high temperatures, which are exacerbated by high humidity. Rapid urbanisation has increased the prevalence of concrete and other heat-reflecting surfaces, while reducing green spaces. These changes contribute to the urban heat island (UHI) effect, making cities even hotter. This intensifies heat impacts, affecting public health, energy consumption, and overall urban living conditions, making cities 'less liveable, inclusive and competitive'[6].

In the face of this growing challenge, several cities in South Asia are taking up proactive steps to reduce the impact of extreme heat and plan for early warning and early actions on heat thereby creating inspiring examples. Three such cities –

[1] https://www.worldbank.org/en/region/sar/publication/urbanization-south-asia-cities
[2] https://www.adb.org/features/climate-change-south-asia-12-things-know#:~:text=Without%20global%20action%20on%20climate,%25%20by%202100%2C%20on%20average.
[3] https://www.worldbank.org/en/news/opinion/2023/07/11/cooling-the-heat-can-india-lead-the-world-in-green-cooling-innovation
[4] https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health
[5] https://www.weforum.org/stories/2024/08/extreme-heat-workers-climate-health/
[6] https://blogs.worldbank.org/en/sustainablecities/combating-heat-in-cities#:~:text=And%20as%20outlined%20in%20the,health%2C%20productivity%2C%20and%20growth.

Ahmedabad and Rajkot from India and Narayanganj in Bangladesh are discussed in this article.

The Heat Action Plan for Ahmedabad, Gujarat, India[7]

The Ahmedabad Heat Action Plan (HAP) was first developed in the year 2013, and then updated in 2016 and 2019. The latest HAP serves as a comprehensive guide to mitigating extreme heat impacts in the city. Initiated after the 2010 heatwave that led to 1,344 excess deaths in one month, the plan aims to reduce heat-related mortality and illness. A study[8] in 2018 showed that the plan has been effective – after the implementation of the HAP warnings of extreme heat, there was decreased summertime all-cause mortality rates, with largest declines at highest temperatures.

The HAP (Heat Action Plan) follows a structured implementation strategy divided into three phases: the pre-heat season (January-March), the heat season (March-July), and the post-heat season (July-September). Key strategies include public awareness campaigns, capacity building for healthcare professionals, early warning systems, and inter-agency coordination. The plan also focuses on reducing heat exposure, particularly through the Ahmedabad Cool Roofs Programme, which involves coating rooftops with reflective materials to lower indoor temperatures. The heat alert system is colour-coded (White, Yellow, Orange, Red) to signify escalating levels of heat risk.The Ahmedabad Municipal Corporation (AMC) ensures coordination among government departments, healthcare providers, emergency responders, and community groups making this a structured and effective plan to protect citizens from extreme heat. During the development of the plan, the health department of the AMC communicated with the medical community and research organisations. The Action Plan was created with inputs from different stakeholders, which helped to make the plan inclusive, appropriate and relevant to communities.

Framework for Urban Cooling Plan, Rajkot, Gujarat[9]

Taking cue from its neighbouring city, Rajkot has developed the Urban Cooling Plan with support from UNEP and ICLEI South Asia. This plan aims to mitigate the urban heat island (UHI) effect and enhance thermal comfort for residents. It provides a scientific and strategic framework to address rising temperatures caused by rapid urbanisation and climate change.

The approach focuses on heat profiling at both the city and neighbourhood levels by utilising satellite imagery, environmental sensors, and drone-based thermal mapping. This study analyses the correlation between land surface temperatures, air quality, vegetation index (NDVI), and urban features in order to identify heat hotspots and opportunities for cooling.

The plan identifies key strategies for cooling such as increasing green spaces and tree cover in the city, improving design of buildings with reflective and cool roofs or passive cooling mechanisms and enhancing public awareness. But apart from the hard interventions that have been identified, the cooling plan has also identified gaps in implementation of existing greening policies and urban planning guidelines, which often exacerbate the heat impacts in the city. The plan therefore has recommended implementation of existing policies for better urban planning and greening, and leveraging national and state programmes for financial and technical support to implement the cooling plan.

Developing a Heat Action Plan for Narayanganj City, Bangladesh

The Climate Resilient City Action Plan of Narayanganj in Bangladesh, developed in 2019, recognised heat and rising temperatures as a major climate risk for the city. Based on its recommendation, the city has begun the preparation of it Heat Action Plan (HAP) for Narayanganj City. The plan will address the increasing heat stress caused by climate change, urbanisation, and environmental degradation. It is being developed by Narayanganj City Corporation (NCC) with technical support from ICLEI South Asia, and aligns with the National Adaptation Plan (NAP) 2023-2050 to protect public health, infrastructure, and vulnerable communities.

This plan will follow the City Heat Resilience Toolkit developed under the CKDN programme by TARU and includes three key steps which are understanding the root causes of heat stress, identifying solutions, and prioritising strategies. At the time of writing the article, the action plan was still a work in progress and has

[7] https://www.nrdc.org/sites/default/files/ahmedabad-heat-action-plan-2018.pdf

[8] Hess JJ, Lm S, Knowlton K, Saha S, Dutta P, Ganguly P, Tiwari A, Jaiswal A, Sheffield P, Sarkar J, Bhan SC, Begda A, Shah T, Solanki B, Mavalankar D. Building Resilience to Climate Change: Pilot Evaluation of the Impact of India's First Heat Action Plan on All-Cause Mortality. J Environ Public Health. 2018 Nov 1;2018:7973519. doi: 10.1155/2018/7973519. PMID: 30515228; PMCID: PMC6236972.

[9] https://southasia.iclei.org/wp-content/uploads/2024/03/Final_Urban-Cooling-Plan-for-Rajkot_04.04.2022.pdf

ample opportunities to learn from other action plans like that of Ahmedabad and Rajkot.

Way Forward

All the three HAPs presented in this article look at the upcoming heat risks and identify interventions that will help to address heat risks before, during and after an extreme heat event. However, an assessment of the Ahmedabad and Rajkot plans which are already being implemented, have revealed that there are existing options available with cities and local authorities such as urban planning and design guidelines or greening policies that can facilitate the protection of green and blue areas in the city, manage construction in ways that allow for green belts around constructed areas and prevent over-concretisation of the cities that will help to keep the cities cool.

While strategies such as the cool roofs and cooling centres are useful for both renovated buildings and new buildings, community engagement processes are just as important to ensure that people are aware of what they should or should not do to avoid exposure to excessive heat. In addition, the strategies may be useful during an extreme heat event, but equally important is to plan in advance and ensure early warning systems are in place for cities and communities to be able to take suitable action before the heat event strikes.

The rising temperatures in the region warrant the preparation of heat action plans for all growing cities in the region, to be prepared for action if and when an event arises. The existing action plans can provide good learnings for the cities in the region to take action on heat. ■

CLIMATE RISK

Extreme Weather Events in the Tropical Water of the Indian Ocean Region (IOR) – A New Perspective Based on the Underwater Domain Awareness (UDA) Framework

*By **Dr (Cdr) Arnab Das**, Founder and Director, Maritime Research Center, Maharashtra, India*

The tropical waters are marked by:

- rich biodiversity providing significant economic potential,
- high population density leading to unique socio-economic, socio-political and socio-cultural characteristics,
- substantial siltation causing complex management challenges for navigability, floods, erosion, livelihoods, etc.,
- sub-optimal sonar performance for any below the surface mapping, surveillance, monitoring and more.

Indian Ocean Region (IOR)

The geopolitical and geostrategic realities in the new global order have ensured that the entire global power play is unfolding in the tropical waters of the Indian Ocean Region (IOR). Every global power wants to ensure its strategic presence in the region, either as a supplier for military hardware, strategic partner to extract energy resources or undersea mineral resources, mentor for sustainability and climate change risk management and more[10]. The nations within the region are increasingly getting subjugated by the extra-regional powers in the name of science and technological support or strategic guidance.

Science and Technology (S&T) Aspects

It is important for us to recognise that the S&T development by the developed world, largely led by the west, happened in the temperate and the polar region during the Cold War era. The demographic realities in the 21st century reveals that these western nations have no manpower to customise their S&T for the tropical waters, where they need to be deployed today[11], However, their economic compulsions dictate them to use coercive geopolitical and

[10] R. Pandit, "Navy monitoring entry of another Chinese 'research' vessel into Indian Ocean Region," MSN, 2024. [Online]. Available: https://www.msn.com/en-in/news/other/navy-monitoring-entry-of-another-chinese-research-vessel-into-indian-ocean-region/ar-BB1knnD4?ocid=BingNewsVerp. [Accessed February 2025].
[11] ILO Stat, "Statistics on the population and labour force," ILO, 2025. [Online]. Available: https://ilostat.ilo.org/topics/population-and-labour-force/. [Accessed February 2025].

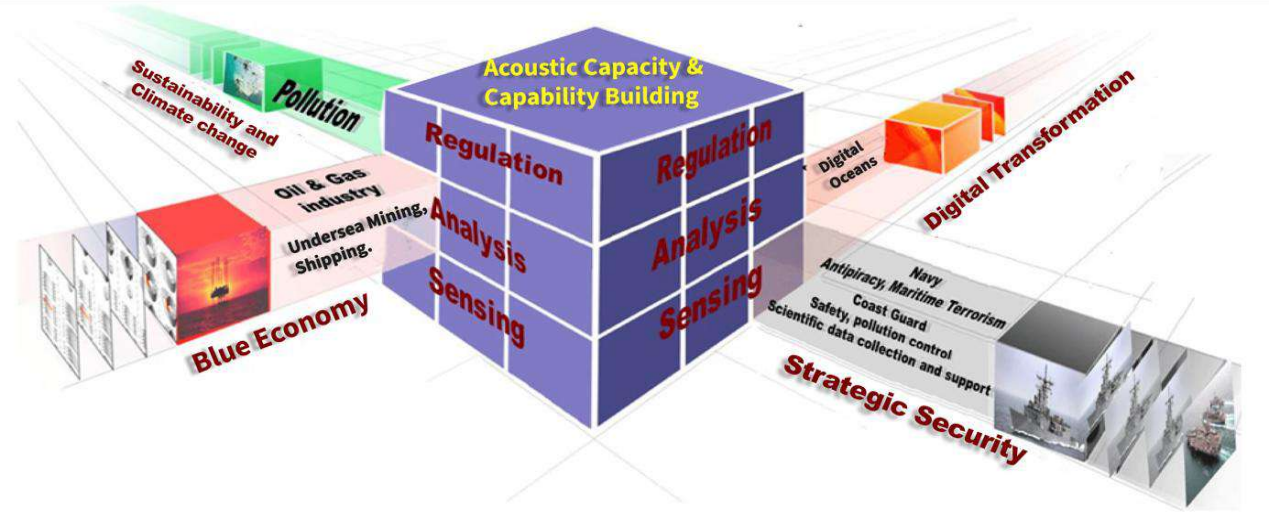

Figure: Comprehensive Perspective of the UDA Framework.

geostrategic tactics to push their obsolete products to the global south, knowing fully well that these suffer significant degradation in the tropical waters of the IOR. These western powers are ensuring massive fragmentations geopolitically within the region and also among the stakeholders within the nations. The four stakeholders, namely strategic security, blue economy, sustainability & climate change and science & technology need to ensuring pooling of resources and synergising of efforts to build nuanced approach.

Climate Change Risk

Climate change led extreme weather events, particularly in the tropical waters of the IOR need no emphasis. The sea surface temperature in the IOR has been recorded as the worst among all the oceans and thus urgent measures are required to not only counter, but also find ways and means to navigate, given the crisis. Digital Transformation is a known governance tool to manage the challenges and opportunities across varied domain[12].

Marine Spatial Planning (MSP)

The digital transformation in the underwater space has been referred as Marine Spatial Planning (MSP)[13], by the global entities and the United Nations (UN) has prioritised MSP, under their decade of the ocean sciences for sustainable development programme. The tropical challenges including sub-optimal sonar performance and the socio-economic and socio-political issues make it extremely difficult to prioritise digital transformation in the IOR. Real-time spatio-temporal coverage of the entire underwater domain, requires site specific Research and Development (R&D) backed by field experimental validation. Such ambitious and resource intensive initiative has to be driven by a nuanced framework.

Underwater Domain Awareness (UDA) Framework

Any new initiative of such scale, requires policy & technology intervention along with capacity & capability building to ensure effective and efficient realisation on the ground. The UDA framework[14] developed by the Maritime Research Center (MRC), in partnership with M/S NirDhwani Technology Pvt Ltd (NDT) provides a comprehensive, structured and inclusive way forward. The tropical challenges and opportunities of the IOR will get addressed in a nuanced manner, if the UDA framework is implemented effectively. ■

[12] A. Prasad, "How does UDA help in Climate Change Risk Assessment? A case for the Indian Ocean Region (IOR)," UDA Digest, 2024. [Online]. Available: https://digest.udafoundation.in/2024/07/18/how-does-uda-help-in-climate-change-risk-assessment-a-case-for-the-indian-ocean-region-ior/. [Accessed February 2025].
[13] Maritime Research Center, "Marine Spatial Planning," Maritime Research Center, 2024. [Online]. Available: https://maritimeresearchcenter.com/marine-spatial-planning/. [Accessed February 2025].
[14] UDA Foundation, "UDA Framework," UDA Foundation, 2024. [Online]. Available: https://udafoundation.in/. [Accessed February 2025].

Assessing Vulnerability and Risks to Extreme Heat: A Researcher's Perspective

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Extreme heat events are becoming frequent and intense, posing significant risks to human health, agriculture, infrastructure, and ecosystems. To inform adaptation strategies in a hotter future, assessing vulnerability and risk to extreme heat becomes crucial. However, most risk assessments rely on secondary data–based methodologies, which while useful for prioritisation, often lack the granularity needed to guide actionable or effective on-the-ground interventions.

As a researcher at the Center for Study of Science, Technology and Policy (CSTEP), I have had the opportunity to assess climate risks across multiple sectors (agriculture and allied, water resources, energy, human health, etc.). In this article, I would like to highlight the limitations and value addition of such assessments.

In our evaluation of climate risks to renewable energy (RE)[15] assets, heatwaves have emerged as a significant hazard, impacting infrastructure integrity, operational efficiency, and energy production. We used the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) risk framework (2014)[16] to identify key drivers of vulnerability for RE assets, such as material degradation, efficiency losses, and cooling demands. While it provided a regional snapshot of heatwave risk to RE assets, the analysis exposed a major shortcoming of such assessments: lack of specificity needed for asset-level adaptation measures to be taken up at scale. Having said that, the study served as a crucial conversation starter, bringing climate risks to RE assets to the attention of key decision-makers. While industry stakeholders were aware of these risks from past experiences, the study helped quantify and visualise the risks, underscoring the significance of such assessments.

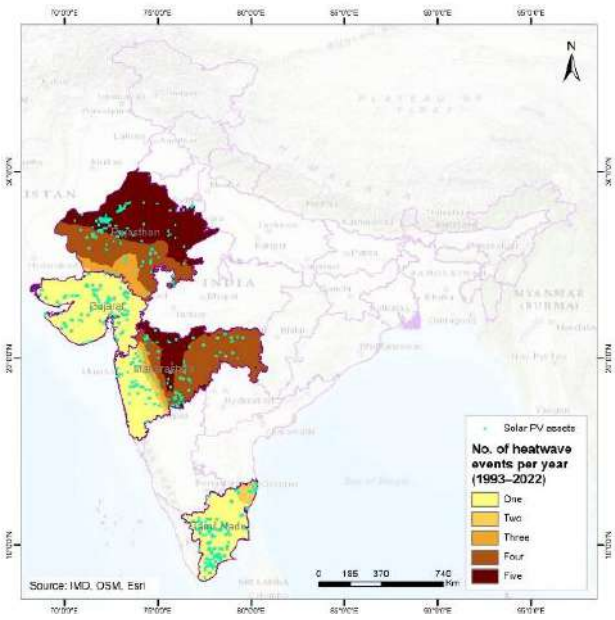

Figure 1: Exposure of solar PV assets to heatwaves.

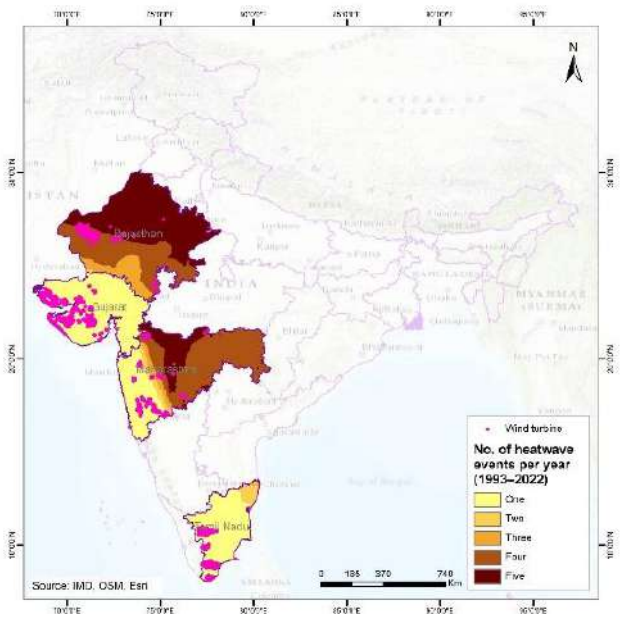

Figure 2: Exposure of wind turbines to heatwaves.

[15] United Nations Development Programme. (2024). Mapping the resilience of renewable energy systems and assets in Maharashtra, Gujarat, Tamil Nadu, and Rajasthan to extreme weather events.

[16] Oppenheimer, M., Campos, M., Warren, R., Birkmann, J., Luber, G., O'Neill, B., & Takahashi, K. (2014). Emergent risks and key vulnerabilities. In: *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Ch. 19, pp. 1039–1099). Cambridge University Press.

I could further explore my sectoral perspective on extreme heat risks through various state-level projects at CSTEP. For example, our historical and current extreme heat risk assessment for Odisha's agriculture and allied sector was undertaken to prioritise districts for promoting climate resilient agriculture practices. The risk assessments identified five priority districts experiencing systemic heat-related impacts such as water stress due to limited irrigation, low crop insurance coverage, and other socio-economic and technological constraints. However, interactions with regional agriculture experts suggested that extreme heat is not currently a major concern for Odisha's agriculture and allied sector.

This discrepancy may arise from inherent biases in our risk analyses that depend on coarse-scale climate data, which may not accurately reflect localised heat risks. This example highlights the limitations of projected climate data, which combines coarse resolution with varying degrees of uncertainty. As a result, decision-makers often struggle to justify proactive adaptation measures when immediate threats are not apparent in their lived experiences. Strengthening fine-scale climate data availability and integrating it with ground-level observations could enhance the credibility and utility of extreme heat risk assessments, making them more persuasive for policymakers and practitioners.

"Extreme heat risk assessments must move beyond regional snapshots to context-specific insights. Without ground-level data and participatory methods, we risk designing solutions that miss the realities on the ground."

Our risk assessments for developing a climate risk visualisation tool for the Union Territory of Puducherry in 2024 focused on key sectors such as agriculture, water resources, urban infrastructure, and public health. Secondary data on human health indicated trends related to heat-related morbidity and mortality, which align with findings from a heatwave health risk index developed for Karnataka.[17]

Through our discussions with healthcare experts, we gained valuable insights into several pressing issues: gaps in awareness, ineffective early warning systems, intersectionality, the disproportionate impact on vulnerable groups, and inadequate policy responses. These recurring challenges underscore the slow and fragmented process of translating research into policy and action. However, this exercise stressed the importance of enhancing the capacity of state-level stakeholders, as their efforts directly shape state policies and programmes. The members of the Puducherry Climate Change Cell (PCCC), for whom we are developing the tool, participated in a phased, pan-India capacity-building programme on vulnerability and risk assessment18. As a result, PCCC actively contributed to the tool's development by identifying key indicators, critically evaluating results based on their field experience, and proposing refinements to improve the assessment. Apart from strengthening the tool's applicability, this collaborative process fostered a more interactive and dynamic exchange of knowledge.

In conclusion, for adaptation planning to be truly effective, it must go beyond top-down assessments. While quantitative risk models offer valuable insights, their utility is limited without complementary, ground-based assessments. Participatory methods, qualitative data, and a strong understanding of local contexts are indispensable for designing targeted interventions. Thus, addressing extreme heat risks requires a multi-scale approach that combines broad vulnerability frameworks with nuanced, place-based analyses, ensuring that adaptation actions are both context-specific and actionable. Without bridging the gap between assessment and action, we risk repeating the cycle of knowledge generation without meaningful implementation. ■

[17] Thakkar, V., Vidya, S., Pradeep, M. S., Madappa, T., Anushiya, J., & Murthy, I. K. (2025). Heatwave health risk index for Karnataka, India. *The Journal of Climate Change and Health*. In press.
[18] Dasgupta, S., Barua, A., Murthy, I. K., Borgohain, P. L., Baghel, T., Sankhyayan, P., Vidya, S., Narwal, H., Jan, A., Vyas, S., Luniwal, Y., Ghosh, S., Cheranda, T. M., Alam, M. K., Matthew, S., & Pradeep, M. S. (2024). District-level climate risk assessment for India: Mapping flood and drought risks using IPCC framework. Department of Science and Technology, Government of India, and the Swiss Agency for Development and Cooperation (SDC), Embassy of Switzerland. https://cstep.in/publications-details.php?id=3074

WAY AHEAD

Harnessing Collective Knowledge for Extreme Heat Adaptation: The Way Ahead

*By **Mihir R. Bhatt,** AIDMI, India*

Since 2014 when AIDMI started its work on extreme heat as a follow-up to IPCC's Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX), AIDMI found that extreme heat events are becoming more frequent and severe due to climate change caused by the way we live, posing challenges to public health, livelihoods, and nature itself. To build resilience, collective knowledge—spanning scientific research, traditional wisdom, and community-led initiatives—must be harnessed effectively at local level under the leadership of affected population. A collaborative local approach ensures extreme heat adaptation strategies are inclusive and actionable. Here is a way ahead for advancing extreme heat adaptation. It is coming out of the contributions by the leading practitioners in South Asia.

1. **Ensuring Policy Support for Funding:** Sustained policy backing and sustained financial investment are essential for effective adaptation. Governments should allocate resources for research and implementation in the hands of affected people and those who directly work with them. Climate risk insurance and public-private partnerships support long-term resilience. Sadly, hardly any policy mentions amounts and sources of funding, AIDMI has found in its work.
2. **Integrating Adaptation into Urban and Rural Planning:** Urbanisation intensifies extreme heat. Strategies such as increasing green spaces, implementing universal cool roofs, and designing heat-resilient infrastructure mitigate these effects. Rural areas can adopt mulching and agroforestry to reduce heat stress on grain and horticulture crops. More adaptations measure a can directly be exchanged between towns and villages.
3. **Up Scaling Community-Led Adaptation Initiatives:** Empowering communities to lead adaptation efforts ensures sustainability. Programmes like Mahila Housing Trust's heat insurance show the effectiveness of community-driven approaches. Engaging marginalised groups fosters inclusive solutions on the ground.
4. **Enhancing Knowledge Platforms:** Efficient local and lateral knowledge-sharing mechanisms, including digital platforms, workshops, and community forums, help disseminate best practices. Case studies and visual tools like photovoice make adaptation knowledge more accessible and practical to all.
5. **Strengthening Collaborative Networks:** Collaboration among governments, researchers, NGOs, and local communities to start with is crucial. Platforms such as the Adaptation Research Alliance (ARA) and the Tracking, Learning, and Sharing (TLS) initiative facilitate knowledge exchange where it matters the most, helping to scale adaptation strategies first locally in South Asia.
6. **Integrating Local Knowledge:** Local communities have long adapted to extreme weather using traditional techniques. Practices such as mud-built houses, community water storage systems, and agricultural modifications offer insights into natural cooling and water conservation. Combining these only where and when needed, with modern science enhances adaptation.
7. **Embedding Socio Historic Contexts in Adaptation:** Adaptation strategies must consider the socio-economic and historical contexts of affected communities first, as AIDMI work indicates. Small businesses and informal workers need tailored interventions, such as cooling spaces and financial support before heatwaves strike especially in urban areas.
8. **Bridging Research and Action:** A gap often exists between scientific research and real-world implementation. Policymakers must translate climate data into action. Fine-scale climate risk assessments, integrated with ground-level observations, enable more targeted interventions by local communities.
9. **Strengthening Early Warning and Anticipatory Action Systems:** Investing in early warning systems and preparedness plans is critical. Cities like Ahmedabad, India, have implemented Heat Action Plans (HAPs) that include public awareness campaigns, emergency response measures, and cool roof programmes that address challenges of South Asia.
10. **Fostering Interconnected Approaches:** Extreme heat adaptation must be integrated across to start with, health, infrastructure, agriculture, and economic planning. Collaborative approaches ensure interventions complement one another. Improved building designs and settlement planning reduce energy consumption and benefit public health.

Harnessing collective local knowledge of affected population is essential for developing effective extreme heat adaptation strategies in South Asia. Strengthening collaboration, integrating Indigenous wisdom, improving knowledge-sharing, and embedding adaptation into policy and planning will help communities become more resilient against extreme heat. The way forward requires a multidisciplinary and participatory approach to ensure no one is left behind. ■

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