

Local Level Planning to Cope with Heat Waves in India



Photo: AIDMI.

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ABOUT THIS ISSUE

With over 2,000 casualties to its name, heat waves have just secured their position among the various hazards to which India is vulnerable. The steady increase in the number of victims of heat related stress every summer has made it imperative for the 'powers that be' to take actions to protect their citizens. As pointed out by UN's Intergovernmental Panel on Climate Change (IPCC), climate change will aggravate the frequency and severity of heat waves in the coming years. Thus, India needs an institutional level planning to combat the threat of heat waves.

This issue of Southasiadisasters.net focuses on the theme of the 'Risk of Heat Waves and Climate Change in India'. This issue tries to highlight the phenomena of heat waves from the perspectives of various stakeholders ranging from the local authorities to the vulnerable communities such as street vendors, construction workers, children and the elderly. The Ahmedabad Heat Action Plan has been highlighted as a policy level intervention worth emulating in other Indian cities. Similarly, an anthropological perspective to heat wave planning is also posited.

The eclectic perspectives on heat waves and climate change highlighted in this issue will help the readers understand the challenges India faces and the opportunities it can leverage to protect its citizens from heat waves and other adverse impacts of climate change. ■

Need for National Strategy for Heat wave Preparedness

No more heat wave deaths are needed in India to come up with a national strategy for heat wave preparedness.

Over 2,000 citizens have lost life over the past few weeks due to not being prepared to face the ongoing heat wave. Loss of health, livelihoods, and business is yet to be calculated. And this loss is avoidable.

At temperatures about 40°C, a "heat wave" refers to a departure of between 4°C to 5°C from the normal temperature while a "severe heat wave" refers to a departure of more than 6°C. At these temperatures, chances of a heatstroke, a possibly fatal illness which results from the overheating of the human body, are high for the citizens under sun.

This heat wave is not sudden. The India Meteorological Department has been making more accurate and timely heat wave predications in India over past four years. The Intergovernmental Panel on Climate Change (IPCC) Special Report on "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) report had concluded that more heat waves will occur and in cities. The Fifth Assessment Report (AR5) Outreach Event in Dehradun by Central Himalayan Environment Association (CHEA) and Kolkata by Jadavpur University in March 2015

had also indicated more frequent and severe heat waves in India's cities.

In South Asian cities, temperatures are reaching high levels in the summer, and worsening due to climate change. In 2010, a heat spike in Ahmedabad caused 1,300 excess deaths, including, among at-risk groups such as outdoor workers, children, the elderly and slum dwellers. The nature and extent of impact of heat wave on homeless, street vendors, baggers, traffic police, hawkers or auto repairers in cities is yet to be recorded.

The AMC health team has worked with Indian Institute of Public Health (IIPH) and Natural Resources Defense Council (NRDC) teams for over 3 years to make India's first and Asia's rare heat wave action plan. The plan lays out actions that the citizens, the public and private institution, and the enabling policy makers can take to reduce the negative impact of heat wave on citizens. The plan has performed over the years and reduced the impact. Last year less citizens died due to heat wave in Ahmedabad and even less suffered health issues. Drinking more water, standing under shed, are some of the key actions. But do our cities offer such facilities to common citizens? The AMC has now institutionalized heat wave planning and put it on its annual plan and budget.

- WITH OVER 2,000 LIVES LOST DUE TO EXTREME HEAT, INDIA NEEDS A STRATEGY TO COMBAT HEAT WAVES
- AHMEDABAD'S INNOVATIVE HEAT ACTION PLAN IS A STEP IN THIS DIRECTION.
- IT RELIES ON A FOUR PRONGED STRATEGY THAT CAN BE EASILY REPLICATED BY ANY INDIAN CITY.

The Ahmedabad Municipal Corporation (AMC) is rapidly improving the city's public health infrastructure in response to the unique Heat wave Action Plan project's recommendations. For example, ambulance services are now located strategically in places where many calls for help are issued. Hospitals receive warnings when extreme temperatures are forecast and now have extra ice packs on hand, and drinking water stations and awareness-building materials are distributed throughout Ahmedabad.

The Heat Action Plan is a four-pronged strategy and almost any city in India can take up. The first involves a communications outreach which informs citizens about the risk of heat illness and preventive measures to take. This year, new media such as mobile messaging service, WhatsApp, are being used as a dissemination channel along with more traditional means such as wall posters and inter-personal communication.

The second involves a warning system in the case of a heat wave with actionables mapped out for various governmental agencies. Who will do what, when, and how is clear to key individuals and units of key departments. The third important step involves training health care professionals-public and some private-to better respond to heat illness while the fourth involves adapting the physical plan of the city to better cope with heat: mapping high-risk areas, making potable water easily accessible and building temporary cooling spaces during periods of extreme heat. The plan is revised as each new lesson is learned.

Strategies which public authorities use to deal with excessive heat are the global norm. After the 2003 heat wave in France, which killed almost 15,000 people, the French government formulated a heat health



Workshop on Highlighting the Ahmedabad Experience: Scaling Heat Action Plans for Key Cities and States in India, April 15–16, 2015, Ahmedabad, Gujarat.

watch warning system, a nationwide system of combating heat illness in case of abnormally hot weather. Some studies estimates that during the 2006 heat wave, 4,400 deaths were avoided as a result of this system being in place. In India we do not have such nation wide studies.

Similarly, the National Workshop on Scaling up Successful Heat Action Plan from Ahmedabad to other parts of India, where the Mayor and Commissioner of AMC were facilitated, attracted interest from the city of Nagpur where later in the month a Round Table was held and more cities in Maharashtra turned up to prepare for Ahmedabad-like heat wave plan.

Over 40 mayors at the recent event in Delhi, organized by UN Habitat, Cities Network Campaign, and Climate and Development Knowledge Network (CDKN), titled, South Asia City Summit, showed interest in Ahmedabad's heat wave plan. The session, Scaling up Successful Heat Action Plan from Ahmedabad to other parts of India concluded that Smart Cities are Heat wave Safe Cities.

Ahmedabad has shown a pathway for towns and cities of India. At the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, the Ahmedabad Heat Action Plan was showcased as a finalist for the prestigious Munich RE Foundation RISK Award alongside 20 other "best proposals" out of 145 submissions from 62 countries.

Cities across the world have protected citizens with a wide range of measures such as tree plantation on city roads for shade, enforcing building bye-laws for overhangs to shade walls and windows, and increasing structures for individuals on duty such as traffic police or street cleaner. Such measures are also taken in Indian cities but at much smaller scale than the heat wave challenge demands.

A disaster is also a creative moment in the life of a nation. And so are heat waves for India. The onus is on us turn this ongoing and increasing loss of life and livelihoods into world's largest national strategy for heat wave preparedness that not only protects citizen from the impact of heat but in fact reduces the impact itself. ■

- Mihir R. Bhatt

Heat Waves in India: Key Facts and Figures

Heat waves are present in countries throughout the world and are broadly defined as periods of abnormal heat. Azhar (et al 2014) defines them as "a prolonged period of unusually and excessively hot weather, which may also be accompanied by high humidity." Definitions vary, in part because a heat wave is measured relative to the usual weather in the area and relative to normal temperatures of the season. In the past three to four decades there has globally been an increased trend in high-humidity heat waves (Masters et al 2012). Extreme heat events have been responsible for more deaths annually than hurricanes, lightening, tornadoes, floods and earthquakes combined. Numerous studies have documented that human induced climate change has increased the frequency and severity of heat waves across the globe. However, heat waves have yet to be taken seriously by most governments and NGOs working on disaster risk reduction. Extreme Heat can lead to dangerous, even deadly, health consequences, including heat stress and heat stroke (Heat action plan 2015).

India

Heat waves are a significant health concern in India, extreme heat hazards are projected to increase in frequency and severity with climate change. However, few of the factors driving

- HEAT WAVES ARE STILL NOT CONSIDERED A DISASTER IN INDIA.
- EXPERTS BELIEVE THAT CLIMATE CHANGE WILL FUEL MORE INTENSE AND FREQUENT HEAT WAVES IN FUTURE

population heat vulnerability are documented, though poverty is a presumed risk. "Heat vulnerability can be conceptualized as a function of interacting biophysical and socioeconomic determinants that can be broken down into heat hazard probability as well as factors associated with population exposure, susceptibility and adaptive capacity" (Azhar et al 2013: 2). The literature on heat vulnerability in South Asia is considerably underdeveloped with most studies focused on the global north. However, experts say that India "must recognise rising temperatures as a natural disaster, just like floods or earthquakes, and have a strategy to protect vulnerable peoples" (Bhalla 2015). Neither the central government or the national disaster management authority have put in place preventive measures for the summer nor has the union home ministry declared a heat wave as a 'natural disaster'. As per the intergovernmental Panel on Climate change (IPCC) the average temperature is going to rise by 2-6 °C over the next 80-100 years (Mavlankar 2015). Meaning that unless heat waves are taken seriously in DRR the impact of heat waves and the death count could rise dramatically. The combination of exceptional heat stress and a predominantly rural population make India, especially vulnerable to heat waves. Currently a quarter of the population does not have access to electricity (Holthaus 2015). The use of air-conditioning is increasing by a massive twenty percent each year, which puts a huge strain on the country's delicate power grid and boosts greenhouse gas emissions (Holthaus 2015). This raises the obvious ethical questions it is hard to rationalize the need for growing greenhouse gas emissions

in wealthy counties when people are literally dying of heat in the tropics.

Heat wave in India 2015

It has already been documented that 2400 (05/06/2015) have died due to heat related illness (Singh H 2015). However, it is likely this figure is much higher as heat related illness is often recorded inaccurately and figures from rural areas are hard to attain. It is suggested that it normally takes a month after the heat wave to get a true picture of the impact.

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– Grace Beards, AIDMI

Scaling up Heat Action Plans in India: The Ahmedabad Experience

With increasing observed average temperatures across India over the last decade, climate scientists project more frequent and severe heat waves. According to the most recent IPCC report, over the next two decades, a warming of about 0.2°C per decade is projected for a range of SRES emission scenarios. Temperature extremes are a major underlying cause of mortality in much of the world and the leading cause of directly-mediated weather-related mortality. Heat affects people through shock, dehydration, acute heat illnesses and the worsening of chronic cardiovascular and respiratory diseases. Preparing for and responding to health emergencies caused by a changing climate will be critical to saving lives and protecting developing economies.

In May 2010, Ahmedabad heat wave was associated with 4,462 all-cause deaths: an excess of 1,344 when compared to the reference period (3,118 deaths). After this deadly heat wave of May 2010, the Indian Institute of Public Health – Gandhinagar (IIPHG), the Public Health Foundation of India, the Natural Resources Defence Council and the Climate and Development



D. Thara unveiled the updated 2015 Ahmedabad Heat Action Plan.

Knowledge Network honoured the leadership of the Ahmedabad Municipal Corporation for innovative and outstanding leadership in building disaster risk preparedness and community resilience, the city's first Heat Action Plan in 2013. The Plan was enacted during the 2013 and 2014 heat seasons, which involved stakeholder trainings and capacity building, community outreach activities, and interagency communication.

The summer 2014, a similar heat wave occurred in Ahmedabad. The

number of hot days during 2014 when temperature remained above 44°C was 16 days as compared to 8 days in 2010. While heat stroke cases and fatalities were over 75% less than those in 2010, the overall all-cause mortality during summer reduction was reduced by 6.88% or 1,116 lives indicating that indirect/undiagnosed casualties still exist. Though the reduction cannot be specifically attributed to the Ahmedabad Heat Action Plan, the increased awareness and early warnings may be responsible for the reduction in deaths.

- THE AHMEDABAD HEAT ACTION PLAN (HAP) IS THE FIRST CITY LEVEL PLAN IN SOUTH ASIA TO ADDRESS THE RISK OF HEAT WAVES.
- THE PLAN IS BASED ON SOUND RESEARCH AND ROBUST COMMUNITY ENGAGEMENT.
- AT A NATIONAL LEVEL WORKSHOP, OTHER CITY ADMINISTRATIONS ALSO PLEDGED TO FOLLOW AHMEDABAD'S LEAD.

Presenting the experiences from Ahmedabad's HAP and learning from global best practices, AMC, NRDC and our partners organised a country-wide two day workshop to inform interested cities and government leaders on the steps to prepare their own early warning systems and heat preparation plans. Over 50 delegates and representatives

from city municipalities, Indian Meteorological Department, State Climate Change Departments, National Disaster Management Authority, leaders from NGOs and local medical hospitals participated in the workshop at Ahmedabad. The updated version of the HAP 2015 was also unveiled during the workshop.

Out of the 5 cities that participated, the Odisha and Maharashtra teams had pledged to start HAP in their own cities. Though interested, the teams from Hyderabad and Delhi needed

to build a greater evidence base before work could start. The Maharashtra Principal Secretary (Health), Ms. Sujata Saunik, who participated in the kick off workshop, had immediately requested IIPHG to hold a similar workshop on 8th-9th May, 2015 at Nagpur under the leadership of Nagpur Municipal Corporation and Public health department.

The HAP provides a framework for the implementation, coordination, and evaluation of extreme heat

response activities in cities that reduce the negative health impacts of extreme heat. Through our experience, we can show that this is easily accomplished with significant results at minimal cost and change in existing infrastructure. We hope that other cities take on this task to build a more resilient community in the difficult times ahead. ■

- Priya Dutta, Ajit Rajiva, Abhiyant Tiwari, P.S Ganguly and Dileep Mavalankar, Indian Institute of Public Health Gandhinagar

CLIMATE CHANGE AND DRR

Towards Climate Sensitive Disaster Management Plan in Gujarat

What is a Disaster Management Plan (DMP)?

The word disaster implies a sudden overwhelming and unforeseen event which causes damage to life and property. Disasters are natural or manmade. To address disaster and minimise its impact on human life, property and environment a systematic plan is developed, such plans are generally location specific and covers response mechanism for all types of potential disaster of that particular region.

Climate Change is increasing possibilities of disasters, IPCC 5th Assessment Report released in 2014 noted "Direct and insured losses from weather-related disasters have increased substantially in recent decades, both globally and regionally. Increasing exposure of people and economic assets has been the major cause of long-term increases in economic losses from weather- and climate-related disasters."

Climate Change is directly affecting the communities undermining their livelihoods through gradual, insidious changes in temperature and rainfall patterns, and increasing the frequency and/or intensity of hazards such as floods, cyclones, droughts, unseasonal rains and hailstorms, which causes extensive damage to crops and Agro-Rural economy. Several recent trends in weather extremes are sufficiently clear to press upon the need for appropriate risk reduction efforts. Managing Climate Change in this perspective has therefore become a major challenge to humanity and Governments.

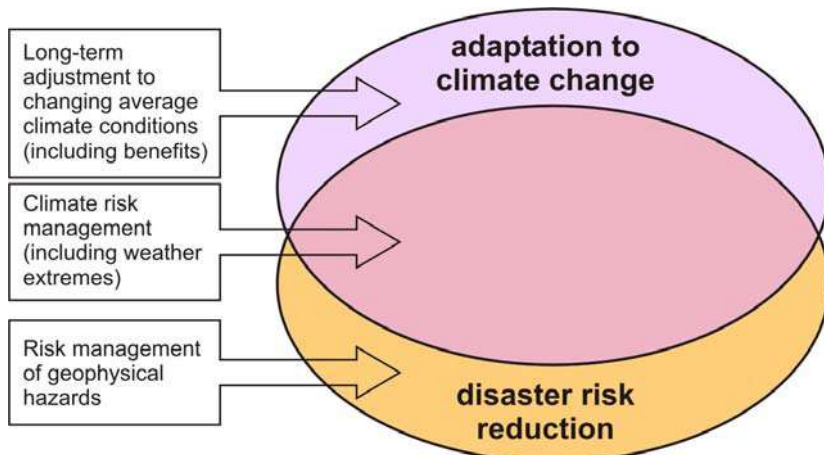


Fig. 1: Adaptation to climate change is almost equals to disaster risk reduction.

Importance of Climate Sensitive DMP in Gujarat

Gujarat is a coastal State with more than 1600 KM coastline, with a population of more than 60 million and population density of 308 km². The major potential natural disaster for Gujarat includes Flood, Earthquake, Cyclone, Drought etc. frequency of these disasters have increased drastically in last couple of decades, which will be continue to

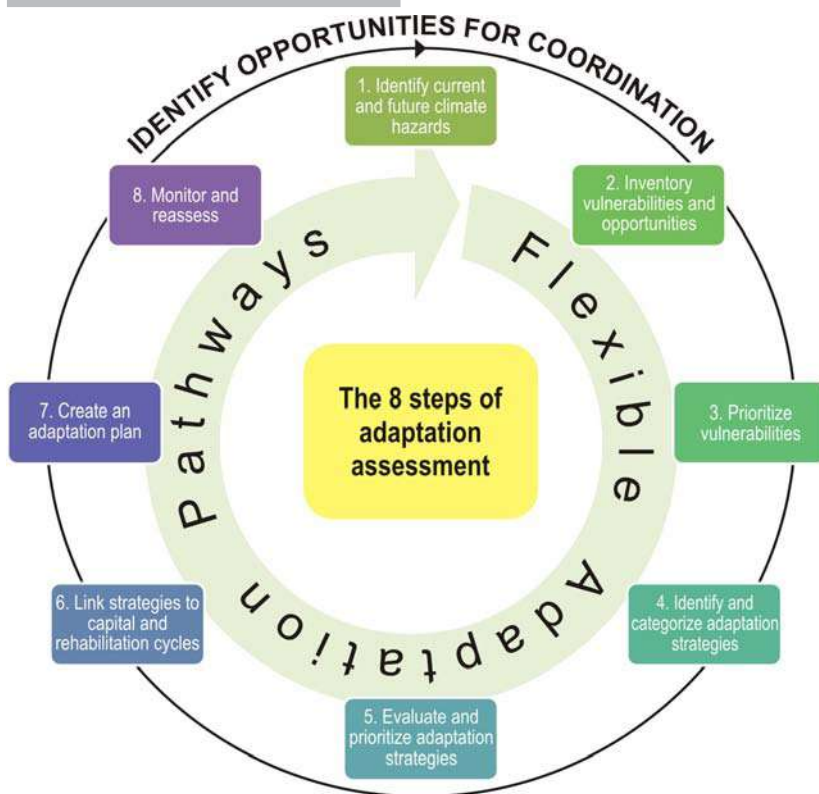


Fig 2. Climate Change Adaptation Process is based on local parameters.

increase in future as well, due to Climate Change. The impacts of such natural disaster are widespread and long-lasting, the impacts also include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, human morbidity and mortality, and consequences for mental health and human well-being (IPCC, 2014).

- THE INTERFACE OF NATURAL HAZARDS AND CLIMATE CHANGE CAN HAVE DISASTROUS IMPLICATIONS FOR GUJARAT.
- TO ADDRESS THIS RISK IT IS NECESSARY TO HAVE CLIMATE A SENSITIVE DISASTER MANAGEMENT PLAN IN GUJARAT.

Climate Change related Disasters: Vulnerability and Adaptation

India has been proactive in taking various policy and institutional measures towards tackling disasters through implementation of Disaster Management Act, 2005. In tandem, the State of Gujarat is the pioneer in bringing institutional framework through Gujarat Disaster Management Act 2003 and subsequent rules there under. This institutional framework helped Gujarat to manage and respond quickly to various disasters. The Gujarat State Disaster Management Authority (GSDMA) is now well equipped and professionally managed agency for preparedness towards addressing the disasters and post disaster relief and rescue work. The recently prepared Gujarat State Disaster Management Plan (GSDMP) 2014 is comprehensive and holistic for tackling all types of disastrous situations. Climate Change has also been emphasised in GSDMP with

evaluation of probable Climate Change related disasters. It is also highlighted that adaptation or resilience measures for Climate Change related disasters are important and upcoming areas of work for GSDMA.

Gujarat is prone to natural disasters like Earthquake, Cyclone, Drought, Flood etc. with the historical records of such disasters in past. There is also possibilities of heat wave, unseasonal rain, hailstorms etc. Now due to increased influence of Climate Change and as per IPCC/WMO reports the frequency of disasters like flood, cyclone, drought, and heat wave will increase rapidly in terms of intensity and occurrence. In GSDMP response and preparedness for all such disasters are documented and responsibility has been delegated from level of State authorities to districts and block administration.

Gujarat has demonstrated various adaptation initiatives for natural disasters like drought, flood, and cyclone, heat waves through initiatives like water harvesting, river linking, coastal area management, and development of natural shield like mangrove cover, rescue and response in epidemic and other emergencies. There is a common element in adaptation to climate change and disaster risk reduction which is shown here in fig. 1, and for Climate Change Adaptation ideal process of 8 steps is shown in fig. 2 which is self-explanatory. ■

- Shwetal Shah,

Technical Advisor - Climate Change

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Heat Waves and Disaster Management Plans in India

Summers in India are worldwide known for its harshness. When searching online for the best time to visit the country, one is advised "April is hot; May and June are scorching."¹ But it was not possible to predict that this year India would be on many international newspapers' front page. Facing one of the toughest heat waves that have ever hit its territory, the death toll already exceeded 2,000². Though the casualties are mainly concentrated in the southern state of Andhra Pradesh, reaching an astonishing amount of 1,300³, record high temperatures are registered throughout the country.

Depicting such scenario, some questions may naturally cross one's mind. Why is that? Is it only in India? Or, most important, how to avoid it? Starting from the middle, as this article is written, heat waves are also witnessed in less likely places such as Britain and Canada, and it is

■ THE FIRST STEP TOWARDS PROTECTING ONE COUNTRY FROM HEAT WAVES IS TO REGARD THEM WITH THE SIGNIFICANCE THEY HAVE. IN OTHER WORDS, DEADLY HEAT WAVES SHOULD BE CONSIDERED DISASTERS.

expected to soon reach Russia as well⁴. This leads us to the first question... Extreme temperatures and weather-related disasters have been registered in the four corners of the world as a result of the well-known, but still largely-underestimated phenomenon of climate change. Whether it is natural or manmade (or both) may be a subject of controversy, the fact is that earth is warming and it imposes serious threats to countries' development. It shall be tackled in every possible way.

The first step towards protecting one country from heat waves is to regard them with the significance they have. In other words, deadly heat waves are natural disasters and require to be addressed accordingly. While this December the world leaders will gather for the 'United Nations Climate Change Conference' in Paris to agree on the next goals to better deal with this phenomenon, India (or any other country) shall not wait for a reversal in the current trend of increased temperatures. Even if it was commonly agreed that climate change is mainly human-induced, and even if greenhouse gas emissions were drastically reduced overnight, it would take significant time before achieving again a balanced climate⁵. That is why it is so important for countries to take a stand and work towards preparedness.

Although heat wave is not as frequent as some other natural disasters, and economic issues due to this event are lesser, it can rank among the ones with highest proportional mortality, as is the case in India⁶. It is, therefore, paramount to acknowledge the devastating impacts of climate change, especially on those who always bear the brunt of disasters: the most vulnerable as children, elderly, and impoverished.

Being one of the most hazard-prone areas in the globe, disaster management is a key issue in India. So much so that in 2005 the national government enacted the Disaster Management Act (DMA), providing general standards and guidelines to be followed by all districts and states in the country. The DMA requires every district to both prepare and regularly review a disaster management plan (i.e. District Disaster Management Plan, or DDMP). Although the law enforcement is below of what would be necessary to ensure its effectiveness, integrating heat waves in DDMPs are, nevertheless, a great opportunity to address this issue in an action-oriented, holistic, and systematic manner - just like what is needed to tackle this natural disaster. ■

- Ana Richter and Brij Chauhan,
AIDMI

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Why Every Authority should have a Heat Wave Preparedness Plan

Extreme heat events are responsible for more deaths globally than hurricanes, lightning, tornadoes, floods and earthquakes combined. Numerous studies have documented that human induced climate change has increased the frequency and severity of heat waves across the globe. However heat waves have yet to be taken seriously by most governments and agencies working in Disaster risk reduction. Heat waves must become integral to disaster planning. The general perception that extreme heat events are passive and have little impact on communities (when compared to other natural disasters) means that they are rarely given the attention that they desperately need.

Ahmedabad Heat Wave Plan:

Ahmedabad, India, became the first city in South Asia to address the issue of heat waves and construct a Heat Action plan. This was instigated after the deadly Heat wave which hit Ahmedabad in May 2010. The heat wave action plan, fully formed in 2013 by Ahmedabad Municipal Cooperation (AMC), describes both immediate and longer term actions to increase preparedness. The plan was formed based on information collected from mortality data from city hospitals, emergency ambulance call records, heat vulnerability surveys, focus groups and interviews with government officials. Unfortunately the heat wave action plan that was instigated in Ahmedabad has yet to be applied to most other Indian states. This is a likely cause of the heat wave in May 2015 having such disastrous consequences.

Dangers of Heat Waves:

There is a large and strong evidence base about the impact that heat waves

can have to health. Many of the deaths seen in 2010 and 2015 caused by exposure to excessive heat could of been prevented if a very few simple precautions were taken. The purpose of a Heat wave plan is to avoid adverse health effects of excessive heat by raising public awareness and triggering actions by those in contact with people who are most at risk.

What should heat wave plan look like?

A heat wave plan should be organized around a few key points

1. Identification of a lead agency and participating municipalities
2. Use of a standardized warning system that responds quickly to predictions of increase in temperatures.
3. Building public awareness and community outreach
4. Implementation of response activities targeting high-risk populations
5. M&E practices

Comprehensive heat preparedness and response requires involvement from not only government authorities but also nongovernmental organizations. It should also take into account certain groups that are more vulnerable during a heat wave. The local authority should carry out a vulnerability assessment in order to identify the post at risk groups. These can include:

- Old age
- Infants
- Chronic or severe illness
- Homeless peoples
- High exposure livelihoods: Street vendors, traffic police, construction worker etc.
- Slum dwellers

In a moderate heat wave, it is mainly the high-risk groups mentioned above who are affected, however, during an extreme heat wave fit and healthy people can also be affected.

Each city must decide tailor their plan to deal with heat waves in their specific city. However below a few generic suggestions of what the first steps can be:

Water:

Access to water is the key aspect to reduce the impact of heat on people's health. Placing water stations around the city in order to ensure poor and vulnerable people can have free access to water is a great way of limiting the impact and preventing more serious health concerns.

How to mitigate urban heat island effect:

Cities are especially vulnerable to heat waves effect. There are a number of actions that can be taken to including the modification of surface properties and integration of green infrastructure. This also includes keeping parks open for extended and the planting of trees is key to changing urban micro-climates for the better.

Importance of inclusion of other services:

It is vital that emergency services and infrastructure is taken into account during the planning. Water companies and electricity suppliers should be consulted and when a heat wave is predicted any planned work should be delayed. The same precautions should be taken with emergency services. ■

– Grace Beards with
Vandana Chauhan, AIDMI

Beating the Heat: Lessons from Ahmedabad's Heat Wave Action Plan

As India comes to terms with the over 2,000 casualties related with extreme heat stress, it is time to devise a national level strategy and plan to combat this disaster.¹ While heat waves may be at best an inconvenience to those who live and work in air conditioned spaces, the working poor who mostly work on the streets have to fend for themselves in the face of this extreme heat. These include vegetable vendors, auto repair mechanics, cab drivers, construction workers, road side kiosk operators and all others have to work in the extreme heat to make ends meet, often at the expense of their health. Such communities are extremely vulnerable to the adverse impacts of heat waves such as dehydration, heat and sun strokes. Therefore, it is not unsurprising that construction workers, homeless people and the elderly constitute the majority of heat wave casualties in India.

Despite their fatal implications, heat waves are not recognized as disasters at the institutional level in India. As a result, most Indian cities do not have a heat wave action plan to initiate administrative action against

- THE AHMEDABAD HEAT ACTION PLAN HAS BEEN HAILED AS AN INNOVATION.
- THIS PLAN HAS OFFERED MANY LESSONS TO OTHER CITIES TO PROTECT THEIR CITIZENS FROM HEAT WAVES.

the rising temperatures. The lone exception to this institutional apathy is the city of Ahmedabad in the Indian state of Gujarat. Ever since the summer of 2010, when a deadly heat wave killed more than 1,300 people, the local authorities of Ahmedabad have taken concerted action to prevent illness and deaths related with extreme heat.² These efforts have resulted in the Ahmedabad Heat Action Plan which aims to protect the residents of Ahmedabad from the dangers of heat waves.

Ahmedabad's Heat Action Plan can offer a lot of lessons for other Indian cities to emulate and help protect their citizens from the extreme heat. These lessons are as follow:

- **Recognize Heat Wave as a major Health Risk**
The first step towards addressing a problem is acknowledging it. As mentioned earlier, heat waves are yet to be recognized as disasters at the institutional level in India. Other Indian cities can emulate Ahmedabad's experience in recognizing the dangers of heat waves and setting up of a Heat Wave Action Plan. This would help many Indian cities to considerably mitigate the impacts of heat waves on their citizens.
- **Map out the 'High Risk' Communities**
As part of its Heat Wave Action Plan, the Ahmedabad Municipal Corporation (AMC) mapped out those communities which are most likely to be exposed to the extreme heat. These include

street vendors, construction workers, traffic police personnel, children, the elderly, etc. Other Indian cities also house such communities and they should also identify and designate them as most vulnerable to the risks of heat waves.

- **Set up of 'Public Cooling Places'**
One of the simplest yet effective measures taken by the AMC is to set up public cooling spaces to provide relief to the vulnerable people from the sweltering heat. These cooling places have been set up in temples, public buildings and malls. Other cities too can take emulate this and set up public cooling spaces to provide succour from extreme heat.
- **Use different media to convey heat wave alerts**
The AMC has been liberal with the use different media to spread awareness and alerts about heat waves. Media like newspapers ads, wall posters, hoardings, TV alerts, SMS and WhatsApp alerts have been leveraged by the AMC. Municipal authorities in other Indian cities too would benefit greatly by emulating the example set by the AMC.

The Ahmedabad Heat Action Plan has been innovative as it is the first South Asian city to tackle the risk of heat waves on such a grand scale. Other Indian cities and their administrations can take a leaf out of Ahmedabad's book and protect their citizens from the dangers of extreme heat. ■

– Kshitij Gupta, AIDMI

1 Emulate Ahmedabad to Combat Heatwave Threat, The New Indian Express, 05th June 2015 , <http://www.newindianexpress.com/editorials/Emulate-Ahmedabad-to-Combat-Heatwave-Threat/2015/06/05/article2850147.ece>

2 Ahmedabad offers way to beat the heat as 1,786 killed in heat wave, NITA BHALLA, May 29, 2015, <http://in.reuters.com/article/2015/05/29/india-heatwave-disasters-idINKBN0OD2GT20150529>

Ahmedabad's Heat Action Kids: Why You Should Try Harder to Push Climate Change Policy

Ahmedabad is cooking. Pavement scalds feet, bathing water is as if boiled, and to sweat is habituated. Time has lost its demarcations here- even the night withholds relief. Some Ahmedabadis can hop from air conditioned home, to air conditioned car, to air conditioned office, but this is a reality only for the few and wealthy. The reprieve of cooled buildings are not spaces sanctioned for the poor, nor are they places their children can go either.

These kids, the children of Ahmedabad's poor, are among those most vulnerable to the extreme heat we have been suffering. They cannot regulate their body temperatures like adults, falling victim to heat stroke more readily. So what are the city's children doing to tough it out? Before the heat waves rolled in this year, the All India Disaster Mitigation Institute (AIDMI) visited the Ahmedabad's public schools to find out.

The children participating in our visits have a basic understanding of climate change, natural disasters, and

- THE CHILDREN OF AHMEDABAD'S POOR ARE EXTREMELY VULNERABLE TO EXTREME HEAT STRESS.
- INSTEAD OF BEING SILENT VICTIMS, THESE CHILDREN ARE CATALYSING FORCES IN THEIR COMMUNITIES TO ENGENDER ADAPTATION TO THE THREAT OF HEAT WAVES.



Photo: AIDMI.

Students discuss climate change at the Bapunagar Hindi School.

how to engage in risk reducing behaviours. These are kids who have experienced or know someone who has become ill from the heat. Living in slums where the poor condition of housing is exacerbated by density, children face a higher risk to heat illness at home than at school.

When we visited the schools, we met with bright-eyed, engaged students eager to voice their knowledge and experience. There was common consensus to regularly hydrate. We were informed water at home is kept in clay basins to remain cool. During summer months, the children don white clothing to reflect the sun, covering themselves in light, breathable fabrics. They stay out of the sun, taking refuge in what shade they can find. A potassium-packed treat, mango is eaten when they can get it. All community based mitigation measures.

The children also know why the heat is getting worse: **Climate Change**.

They know that the factory puffing smoke is not for their benefits, that

the daily traffic jams and chaos of the city is hurting their chances to grow up healthy. But what can they do?

"Call the police!" one boy exclaims. And we can, in a more roundabout way. Residents have the power to push policy. Do you want these kids, and yours, to grow up in a city where the pollution is increasing and it gets in your eyes? Where the heat is worse with each passing year? As Ahmedabad expands, this can only get worse.

The children of the city's slums are inspiring. They are catalyzing forces in communities where parents never went to school, scolding their parents when they pollute, when their neighbours burn garbage. But the most these kids can do is adapt in ways that don't further contribute to harmful practices. Every bit does make a difference, but what makes a bigger difference is enforcing stricter regulations on polluting industries, which is something those able to afford modern reprieves from this heat have the power to do. ■

- Kasia Knap, AIDMI

Schools to Build Resilience against Heat Waves

In recent times, heat waves have caused more damage to lives than any other weather events, including floods. At temperatures about 40 degrees Celsius, a "heatwave" refers to a departure of between 4-5 degrees Celsius from the normal temperatures, while a "severe heatwave" refers to a departure of more than 6 degrees Celsius.¹ During the period of April-July every year, spells of hot weather occasionally occur over certain parts of India. Prolonged heat wave periods result in scarcity of water, drought spells and diseases and eventually to death tolls. Generally heat waves develop in the north-western parts of India and from this area they progress to neighbouring subdivisions of the country. The 2015 Indian Heat Wave has been very devastating claiming more than 2500 lives till now, the most affected regions being Andhra Pradesh, Telengana, West Bengal, Odisha and Uttar Pradesh. The poultry industry too has suffered

severely with deaths of animals and loss of productivity.

D.S. Pai, head of the Long Range Forecast Division at India Meteorological Department, Pune, in a recent interview said that compared with the previous four decades, the occurrence of heat waves and severe heat waves in the country has increased during the period of 1961-2010, the last decade (2001-2010) being the warmest². The most vulnerable section of the population to heat waves are however our children. Children often fail to understand the variability related to extreme weather conditions. Depletion of salt and electrolyte in the body cause heat cramps and outdoor activities under the direct sun lead to heat exhaustion and eventually heat strokes.

The increasing spells of heat waves are the in fact direct effect of changing climate throughout the globe. With increasing carbon emissions, the globe is getting hotter every day. Heat waves are sort of 'Silent Disasters'. They often catch us by surprise. Even though heat waves are expected during summers, people often are not prepared for them. Increase in temperatures is such that it starts effecting even before anyone realising it. This is where it becomes so very dangerous. Heat waves in our country are still not considered in the categories of other natural disasters. However, with its seriously increasing impacts, it is high time that mitigation measures are required in line with Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA).

A lot more concrete work is required to be done in order to withstand these waves. Heat wave is such a disaster which requires extreme personal care. At such a key juncture, the children at school must be the first priority.

- The class hours in schools can be adjusted so that students don't get exposure in peak hours and peak summer days. Educational institutions should use the data and announcements related to heatwave prediction by IMD (Indian Meteorological Department). The IMD has been making accurate and timely heatwave predictions in India over the past four years.
- Cool water systems may be installed in and around schools.
- Preparing a preparedness plan with high focus on awareness at the school in summer season can be very useful.
- Plantation of trees are the key. A greener environment is always a safer environment. Schools are the best place to promote and encourage.
- Provision of proper ventilation is a must in the school buildings.
- Awareness campaigns related to heat waves by schools must be conducted.

The awareness campaigns of Do's and Don'ts can prove very vital in case of standing against its ill effects. The protection and risk reduction both are important component where school can play important role in the society. ■

– Maitreya Goswami, AIDMI

■ CHILDREN ARE EXTREMELY VULNERABLE TO STRESSES OF HEAT WAVES.

■ SCHOOLS ARE IMPORTANT STAKEHOLDERS THAT CAN TAKE CORRECTIVE MEASURES TO PROTECT CHILDREN FROM THE DANGERS OF HEAT WAVES.

1 Bhatt M. (2015), Too Hot to Handle, Governance Section, Ahmedabad/ Heatwave Action Plan, Views on News, <http://viewsonnewsonline.com/?p=1273>.

2 The Hindu, June 04, 2015; <http://www.thehindu.com/todays-paper/tp-national/heat-waves-on-the-rise-in-india/article7279950.ece>.

An Anthropological Approach to Understanding Heat Waves

Cultural anthropology forces us to take the everyday seriously and to ask ourselves what we can learn from the lived experience of ordinary people. An anthropologist questions why people do what they do, observes how they make their decisions and pays attention to their priorities and values. This kind of curiosity, observation and attention breeds creative thinking and innovative solutions. Perhaps this is where an anthropological approach may provide particular insight to disaster management.

Ahmedabad's heat wave put the health and earnings of the working poor at risk. Street-based workers such as vendors, cobblers and construction workers spend their entire day under the hot summer sun. So, what do they do to bear the scorching heat? What are their daily strategies and coping mechanisms?

Vegetable vendors, in particular, face great difficulties since their produce is highly heat-sensitive. They must employ myriad solutions to meet their needs for shade and water. A spot under the shade of a tree is considered prime real estate to vendors during the summer months. Those without shade attach old cotton saris to lampposts to make makeshift shelters. Many vendors lay their vegetables out on a wet jute sack and sprinkle water on leafy greens to keep them fresh. These strategies to secure shade and water not only protect against heatstroke, they also extend the life of their perishable produce. If their produce is at-risk, so are their earnings. Small physical adjustments can have large impacts on livelihoods.



Photo: AIDMI.

Sonjibhia Patani, Ahmedabad, Gujarat.

In order to support these kinds of existing heat wave coping mechanisms, an anthropological methodology has much to offer. The approach begins by paying attention to the details of everyday life like the makeshift tarp or the wet jute cloth. While consulting the most vulnerable is clearly essential, so are observing and listening. The jute cloth that a vendor uses may not come up in an interview but a good observer will notice its importance. Furthermore, an anthropologist also tries to suspend judgment, to step out of themselves and their opinions. Doing this allows them to ask certain fundamental questions: what and how does this person think about heat waves? What matters to them? Through this anthropological exercise, innovative heat wave solutions regarding water, trees, heat-absorbent concrete or air pollution may begin to emerge.

In many ways, the All India Disaster Mitigation Institute has a very anthropological approach in that it is community-based and sees local culture as a resource rather than an obstruction to disaster management. AIDMI has always strengthened the knowledge and coping mechanisms of disaster-affected communities to build their resilience.

After the Boxing Day Indian Ocean Tsunami of 2004, AIDMI incorporated local building techniques into temporary shelter construction for 1,395 households in 5 locations of Tamil Nadu and Pondicherry. AIDMI's work shows us that the relevance of anthropology extends far outside of academia. By drawing from its methodology and core principles, we may inform disaster management efforts. ■

- Maya Potter,
Fulbright-Nehru Research Fellow

Climate Change within Disaster Risk Reduction

A seminal policy year for development and sustainability occurs in 2015 due to three parallel processes that seek long-term agreements. Through the UNFCCC negotiations, a legally binding agreement will be sought for climate change in Paris in December. Meanwhile, the voluntary Sendai Framework for Disaster Risk Reduction was signed in Japan in March while the voluntary Sustainable Development Goals will be finalised at UN headquarters in New York in September.

Little reason exists to separate these three processes and agreements, since all examine and aim to deal with many similar topics, namely reducing vulnerability and enhancing resilience to a broad range of phenomena. Despite the intersections and overlaps amongst climate change, DRR, and sustainability, too many efforts exist to separate them.

For example, resilience is frequently defined in climate change circles as being about "returning to normal" or "bouncing back to a pre-event state". That diverges from many other approaches which prefer to do better than normal by not bouncing back to the state of vulnerability which caused a disaster in the first place. If post-earthquake Nepal were reconstructed to its "normal" state, it would mean perpetuating the inequality, governance difficulties, poverty, and conflicts which ensured that over 8,000 people died in the April catastrophe.

Similarly, the climate change notion of "double exposure" highlights how vulnerability is augmented by having to deal simultaneously with problems from the impacts of global environmental change and economic globalization. People daily must deal

with numerous other challenges, from earthquakes to energy supply and from discrimination to drought caused by water overuse rather than by rainfall deficits. The reality, as long articulated in disasters and development science, is "multiple exposure" to multiple challenges—some of which bring multiple opportunities to do better.

No reason exists to emphasise climate change over other hazard influencers or to separate climate change from wider contexts. Instead, we should be working together by linking topics and by finding connections that end disagreements and that ensure our work is not counterproductive to others.

In particular, climate change is one contributor to disaster risk, mainly through influencing hazards but sometimes affecting vulnerability. But climate change is not necessarily the most prominent or most fundamental contributor to disaster risk. Yet climate change has become politically important, as shown by the run-up to the Paris meeting, yielding an opportunity to highlight and tackle the deep-rooted vulnerability processes that cause "multiple exposure".

To enhance resilience processes that address the challenges, a prudent place for climate change would be as a subset within disaster risk reduction. Climate change adaptation therefore becomes one of many processes within disaster risk reduction, ensuring that it is addressed



Roads which flood after a short downpour represent neither climate change adaptation, nor disaster risk reduction, nor sustainability. From the Bahamas, photo by Ilan Kelman.

while being careful that no single issue dominates.

In turn, disaster risk reduction should sit within development and sustainability to avoid its isolation from wider topics and topics which disaster risk reduction cannot address. Without this approach, we might successfully address climate change while increasing disaster risk or we might successfully address disaster risk while harming longer-term endeavours.

What good is an energy efficient and flood-resistant school which collapses in the next earthquake? What good is an energy efficient, flood-resistant, and earthquake-resistant school in a country where girls or lower castes cannot be educated?

Integrating the topics as proposed here moves beyond limited expressions of vulnerability and resilience towards a vision of disaster risk reduction's future that ends tribalism and separation in order to work together to achieve common goals for humanity. ■

– Ilan Kelman, JC Gaillard, and Jessica Mercer

This article is summarised from the paper published earlier this year in the International Journal of Disaster Risk Science which is freely available at <http://link.springer.com/article/10.1007/s13753-015-0038-5>

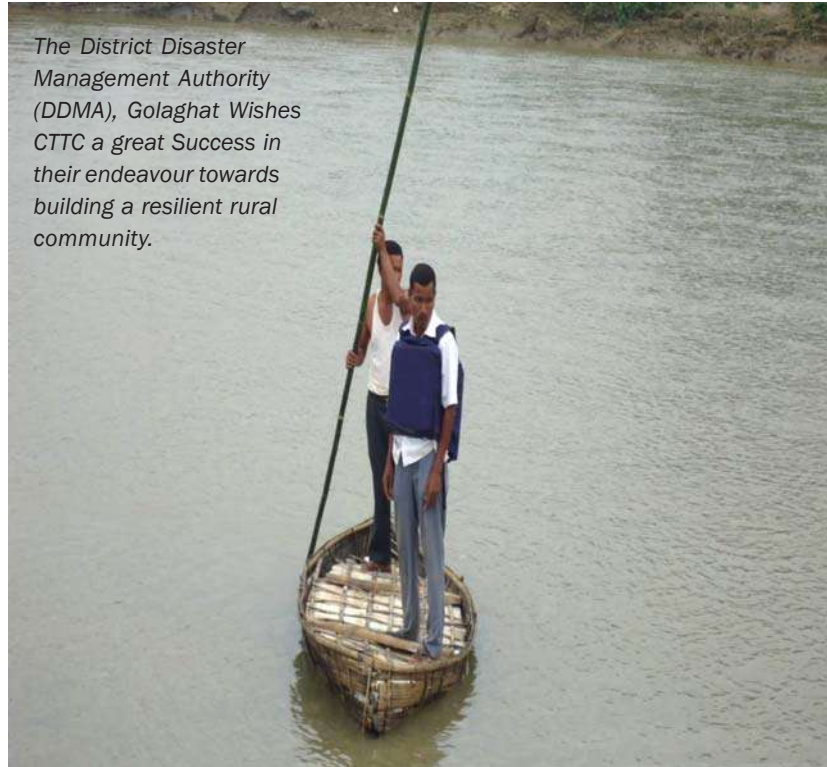
Documentation of Best Practice of the Community at Choudangpathar Golaghat

The Choudangpathar Technical Training Centre (CTTC), a non government organization proved that with knowledge, zeal and an adventurous spirit an innovation is possible. This practice began with the effort and struggle of Mr Kamal Bora, B.sc (President) and Mr Simanta Thengal, B.A (Secretary) of CTTC, at Choudangpathar, Ghiladhari Mouza under Golaghat Revenue Circle, Golaghat district about 30 km from HQ.

The CTTC was established in 2011 with the objective of making the rural educated youth self-dependent through various technical trainings. The prime focus of the Centre is the agriculture sector as the district is prone to flood and drought which affects the agrarian community in the district.

Therefore the CTTC is engaged in developing low cost floating materials, improvised boats and life jackets for the flood affected community to respond effectively during the flood period.

When the CTTC came into contact with the District Disaster Management Authority (DDMA) Golaghat, the DPO was very much enthralled by their indigenous knowledge and their skill. This was further shared with the Addl. Deputy Commissioner, DDMA, Golaghat. And after a few days of meeting and discussions, the Fire and Emergency Services including the State Disaster Response Force (SDRF) was involved in examining the feasibility of the boat. This idea was further shared with the Executive Engineer, Inland Water Transport (IWT), Dibrugarh and his team was invited for



The District Disaster Management Authority (DDMA), Golaghat Wishes CTTC a great Success in their endeavour towards building a resilient rural community.

technical verification of the improvised boat. The IWT however sent a note about strengthening the boat using aluminum sheet and tar. The CTTC was then instructed to retrofit the boat using aluminium as directed by the IWT. The CTTC had in the meantime constructed boats with bamboo, aluminium wire and thermocol (thermacol box available from the fish market).

This was also demonstrated at Banmukh village, Sibsagarh District, where the community appreciated the use of the boats. The Addl. Deputy Commissioner, DDMA, Sri Rohiteswar Deori, ACS, and DPO, DDMA had together witnessed the viability of the improvised boats in Dhansri River of Golaghat. In the first instance "I was doubtful and had fear of falling off the boat when fifteen of us stood over it... some

were purposely shaking the boat to test its balance, it still stood majestically and I was with the life jacket (prepared by CTTC) and after traveling some distance I took it out as I was free of the false notion".

Even in the Exhibition at the Book Fair from 15th November to 24th November 2014 at General Field, Golaghat the model was displayed and highly praised by the public. The CTTC has also developed Life jackets using cloth and thermocol. They have also prepared floating houses which could be used for temporary shelter during emergencies and also for recreational purpose. The CTTC is now engaged in making the flood vulnerable community aware of the practice. ■

- Ronney P. Rajkumar, D.P.O,
DDMA, Golaghat, Assam

Addressing Changes in Climate in Tripura: Agenda for Action

Tripura, a culturally and ethnically rich state located in the North-eastern part of India lies in a unique geographical terrain and has limited accessibility options. As a State which constitutes 3% of the Nation's population with majority living in rural and hilly areas, Tripura does not generally stay in the limelight. Of late however, good governance and visionary political will has accorded the state valued achievements in different fields. The state has shown examples to the nation on matters concerning development and implementation of developmental programs.

Climate Change and Tripura

The State Action Plan on Climate Change states that the issues of vulnerability of the state of Tripura to climate change were intimately related to its location and indigenous population. The people of Tripura depended primarily on forests and other natural resources for their livelihoods. The SAPCC recognizes the state as uniquely placed in the context of climate change sensitivity. With 60% of its land under forest cover, the state has the potential to significantly contribute and build country's stronghold on carbon credit through mitigation. However, being in close proximity to Bangladesh (nearly 86% of its total borders), the state lies definitely to the highest impact as Bangladesh is being

recognized as hotspot to climate change by the global community.¹

The economy of Tripura is characterized by the near absence of an industrial base, with manufacturing accounting for less than 3 per cent of Net State Domestic Product (NSDP). Agriculture and the primary sector together accounts for over fifty percent of the state domestic product of Tripura. A significant number of persons and families in Tripura continue to depend on forests and jhumcultivation as their main source of livelihood. With the entire Eastern and North Eastern Himalayan ecology of which Tripura forms a part of, being predicted to face the worst effect of different uncertainties due to rise in temperature and pattern of rainfall, the state stands at the margin of vulnerability as the food intake, health and livelihood of the masses depend upon natural resources. Moreover, being in close proximity to Bangladesh which is extremely vulnerable to extreme cyclones, sea level rise, increased temperature, increased flooding other impacts of climate change, Tripura is exposed to the risk of being severely affected by extreme events.

Climatic Extremes

Tripura, basically a hilly state, has 16 rivers and 1138 rivulets that are majorly fed by rainwater. In fact, numerous rivulets originated from

upland of hills feed water flows on rivers.² Critical analysis of the available material shows that in Tripura, the flood magnitude is likely to increase by about 25 % in the future as compared to the present. The number of drought weeks during monsoon months shows an increasing trend to the tune of about 25 % increase in future³. The state has already experienced severe floods in 1999 and 2004 with huge economic costs. Tripura witnessed a prolonged dry spell during 1998-99 causing a loss of Rs. 5566.70 lakh for a damaged agricultural area of 31684 hectares.⁴ Placed on a higher rank on socio economic vulnerabilities including poverty index, hunger index etc and with projected impacts in agriculture, forestry, water resources and other critical sectors, the state is on the verge of suffering severe impacts of climate change.

Climate Change Adaptation and Mitigation in Tripura

Through the **State Action Plan on Climate Change (SAPCC)** of Tripura which is a very well researched and comprehensive document, the government of Tripura is implementing a host of adaptation and mitigation activities in line with eight missions of National Action Plan on Climate Change. The Government of India recently approved the plan and allocated Rs. 1250 crore for the implementation of

1 Details derived from State Action Plan on Climate Change of Tripura (2012-2017) available at <http://www.moef.nic.in/sites/default/files/sapcc/TRIPURA.pdf>

2 Read more at: <http://www.merineews.com/article/climate-change-leaving-rivulets-dry-serious-damage-in-tripura/15882175.shtml&cp>

3 Predictions taken from State Action Plan on Climate Change of Tripura (2012-2017) available at <http://www.moef.nic.in/sites/default/files/sapcc/TRIPURA.pdf/pn-16>

4 State Profile of Tripura as stated in National Disaster Risk Reduction Portal, NIDM available at <http://nidm.gov.in/PDF/DP/TRIPURA.PDF/pn-9>

5 News Taken from <http://www.tripurainfoway.com/news-details/TN/7598/centre-approves-rs-1250-crore-state-action-plan-on-climate-change-for-tripura.html>



A farmer is working in a cabbage field in the outskirts of Agartala, capital city of Tripura. Photo taken by Jayanta Dey.⁷

the plan.⁵ Solar mission and sustainable agriculture received the highest share of allocation. The plan will go a long way in making the state climate change resilient.

Some projects that aim at climate change adaptation and mitigation are mentioned below:

The Indo-German Development Cooperation (IGDC) Project titled "Participatory Natural Resource Management in Tripura" is a forest based bi-lateral project between the Government of India and the Federal Republic of Germany. It primarily aims at enhancing the livelihoods of poor rural people (with the focus on tribal shifting cultivators) and improvement in the environmental conditions in the target areas as a secondary purpose.⁷

The Tripura JICA (Japan International Cooperation Agency) Project is a registered society under the name of "Tripura Forest Environment Improvement and Poverty Alleviation Society". This project, focuses on restoring degraded forests and improving the livelihoods of the people, especially the tribal population engaged in traditional shifting cultivation. Afforestation in 51,000 hectares of forest land, farm forestry, agro forestry and soil and moisture conservation are the key components of the project.

The GoI-UNDP program on Institutional and Community Resilience to disasters and climate change is another feather adding impetus to the existing efforts of the state in the direction of fostering adaptation to climate change with

specific focus on extreme events. The program which has been initiated very recently promises to increase community resilience through a multi-pronged strategy.

A Climate Smart Disaster Risk Management (CSDRM) approach has been developed and co-created by more than five hundred practitioners, policymakers, scientists and academics from climate change, disasters and development communities in ten 'at-risk' countries across Africa and Asia (Bangladesh, India, Nepal, Sri Lanka, Kenya, Tanzania, Sudan, Cambodia, Indonesia and the Philippines), led by Institute of Development Studies, UK. It tries to re-use the concepts and techniques that government and the working bodies are already familiar with such as empowerment of local

⁶ DebbarmaAjoy, Forestry Initiatives in the Wake of Climate Change Impacts: A Case Study from Tripura, published in academia.edu available at https://www.academia.edu/9350055/Forestry_Initiatives_in_the_Wake_of_Climate_Change_Impacts_A_case_study_from_Tripura

⁷ <http://www.csmonitor.com/World/Asia-South-Central/2012/1207/India-tests-ways-to-help-farmers-cope-with-climate-change>

community. The approach can improve the present ways of working and includes 'climate smart' in each of its future and current activities.

A climate smart and disaster resilient community will mean lesser amount of damages. Few key relevant action points regarding it may be:

- Strengthening the collaboration between the various communities or stakeholders as a part of preparing mitigation action plans. The population density of Tripura is less than the National standards due to sparsely populated hilly terrains.
- Promotion of environmentally sensitive and climate smart development planning.
- Addressing vulnerable and poor communities keeping in mind the disaster context of the region.
- Ensuring policies and practices to tackle changing disaster risk are flexible, integrated across various sectors and have regular feedback.
- Strengthening the ability of community members and the local governmental and nongovernmental organisations to experiment and innovate.

A community based action approach can always lead to successful results. Climate change in today's world is inevitable and it is now up to us how smartly we can adapt to it. With State taking the impacts and prediction on climate change on priority and initiating concrete actions for adaptation and mitigation, Tripura appears to lead and guide other states on the path to climate change adaptation and mitigation. Many of the activities identified as response to climate change have development benefits and vice versa. These win-win approaches are good starting places for addressing adaptation and can be undertaken despite uncertainties about the impact of climate change. ■

- Anand Prokash Kanoo, AIDMI

LOCAL PLANNING

Agenda for Action: Floods in Tripura

The state of Tripura resides at the far north-eastern corner of India. It has spread over a small expanse of about 10,000 kilometer square. Big things come in small packages and the state of Tripura proves that with a rich and colorful historical background and equally vibrant culture. The state is connected with the rest of India by only one road (NH-44) that runs through the hills to the border of Karimganj District in Assam and then winds through the states of Meghalaya, Assam and North Bengal to Kolkata.¹

Tripura is the second smallest state in terms of area, but the second most populous state in the North Eastern Region. While the state Tripura is small with a population of only over three million, and the most interesting part of the state is the social composition of the population is diverse and around one-third of the population constitutes people belonging to the Scheduled Tribes. According to final results of 2011 census, the state's population stood at 36.74 lakh, with a density of 350 persons per sq. km.

Floods in Tripura

Tripura is vulnerable to Floods. Floods are recurrent and have potential for disaster. It occurs every year during normal monsoon season and cause temporary floods in valley and plain-lands, and urban flooding in Agartala and other urban localities. The flood strikes the state whenever rivers are in spate due to excessive rain causing loss to life, property, livelihood activity, physical

infrastructure etc. Every year the state receives excessive rainfall during the period of June to September due to south west monsoon.² The State is bestowed with a relatively high average annual rainfall of 212.2 cm with average number of rainy days at 92. The State has in the past witnessed worst form of disasters caused by floods rendering normal life paralyzed by way of disruption of means of communications caused due to damage of roads and bridges and also blockage of roads due to landslides.

The total flood prone land area of the state is 750 km. almost all the rivers in the state are rain-fed and are prone to flood.

Recent Incidents of Floods in Tripura

Though there were few major floods in 1983, 1993 and 1998 some of the recent devastating floods in the state are as follows:

Floods in 1999: The 1999 floods followed incessant rain that was almost double the normal rainfall and it was extremely heavy during the period of July and flood was the consequent. Amongst the eight districts in the state of Tripura, South Tripura and West Tripura districts were severely affected by flood causing immense loss and damage. Especially Gumti River had turned immensely destructive and the total damage caused by this flood was estimated at Rs. 498.5 million³.

2007 Flood: West Tripura district was highly affected by this flood, all the

1 Tripura state portal available at <http://tripura.gov.in/knowntripura>

2 Tripura Disaster management authority, India available at http://www.tdma.in/History_Of_Earthquake.htm

3 ENVIS, Tripura state pollution control board available at <http://trpenvis.nic.in/test/disaster.html>

sub divisions were affected by the immense flood. Approximately 30,000 people became homeless and 724 hectares paddy areas were washed away in the 2007 flood in Tripura state.⁴

2008 Flood: Dharmanagar subdivision at North Tripura districts was submerged due to flood as the Juri River and Kakri rivers got over flowed due to incessant rain causes huge devastation of crops, livestock and infrastructure.⁵

Flood Risk Reduction in Tripura

Though Tripura is the second smallest state in terms of its geography, the measures taken for reducing flood risk are robust and praiseworthy. The essence of the actions envisioned and taken can be seen in the draft State Disaster Management Plan and Policy which prescribes strong structural and non-structural measures for prevention, mitigation, response and recovery for all disasters including floods. Going deeper at the level of districts, flood management plans have been prepared and implemented at district level to induct measures as per the specific needs of the district. Scientific studies to understand flood patterns and river behavior have also been conducted from time to time.

Tripura is prone to erosions which in turn is making the river basins rise. Due to erosions, there have been incidents in recent times where farmers have been compelled to sell their lands in northeastern part of India. Erosion mitigation thus is one such issue which is deserves proper focus alongwith floods. The state flood management plan to support other district disaster management plans in the state of Tripura is a brilliant initiative.

Flash floods in the past have occurred which is even more dangerous.



An old women carrying her grandson in a flood affected area in Tripura.

(Image Source: ENVIS Centre, TSPCB, GoT)

Community based early warnings system thus holds the key. There should be proper monitoring and evaluation processes while building embankments. Flash floods often effect sub standard embankments. Embankment breaches are dangerous as it is next to impossible to reconstruct it during the prevailing monsoon season.

Few helpful techniques to mitigate losses against floods can be:

1. The focus, if given towards capacity building and the risk reduction measures taken are community based then the losses can definitely be reduced.
2. Availability of disaster response teams at the community level can be particularly helpful.
3. There should be a conscious effort to tap the traditional wisdom of the community and promote their indigenous coping mechanisms like construction of raised houses and raised community granaries, having bamboo protected plinths in houses, having raised hand

pumps, making banana log boats etc.

4. Moreover, emergency crisis management facilities such as shelter homes, medical care etc. must operate in a structured way under efficient supervision.
5. Rain water harvesting can also lead to solutions regarding Tripura's drought periods.
6. Urban disaster management plans should be made keeping in mind the impact floods can have over cities starting from structural point of view to waste management and beyond.

Faced with multiple complexities due to impacts of climate change which is likely to cause more variations in rainfall resulting in possible floods in future, the state government must also incorporate strong measures for mitigation and adaptation in particular at the community level. Vibrant capacity building at all levels will contribute to effectively take scientific adaptation to the communities in need in a channelized, guided and well directed manner. ■ - Sonali Das, AIDMI

4 Flood Management Plan of West Tripura available at <http://tdma.in/allPlans/8.pdf>

5 Flood Management Plan of North Tripura available at <http://northtripura.gov.in/DisesterManagement/FLOOD.doc>

INFORMATION SHARING

Criteria for a Heat Wave

Heat wave need not be considered till maximum temperature of a station reaches at least 40C for plains and at least 30c for hilly regions.*

When normal maximum temperature of a station is less than or equal to 40c

- Heat wave departure from normal is 5c to 6c
- Severe heat wave departure from normal is 7c or more

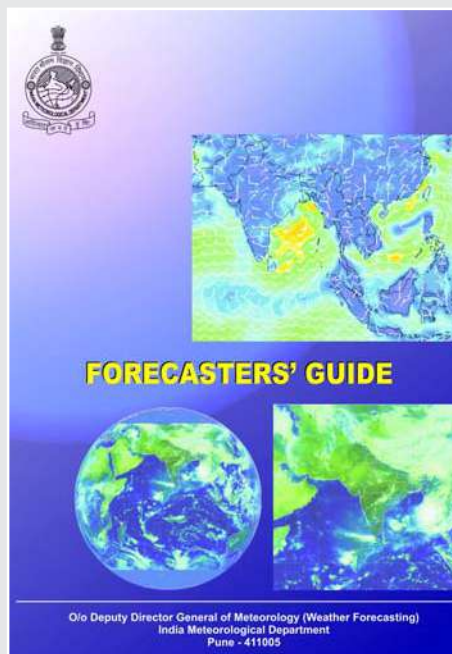
When normal maximum temperatures of a station is more than 40c

- Heat wave departure from normal if 4c to 5c
- Severe heat wave departure from normal is 6c or more

When actual maximum temperature remains 45c or more irrespective of normal maximum temperatures, heat waves should be declared.

* As defined by Indian Meteorological Department

Source: Indian meteorological department http://www.imd.gov.in/section/nhac/dynamic/forecaster_guide.pdf



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