

WEST BENGAL

HEATWAVE DYNAMICS

A Report on Heat Wave Scenario of West Bengal





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1 | INTRODUCTION

As April brings the onset of summer in West Bengal, residents face an oppressive heatwave exacerbated by low moisture levels, especially impacting urban and industrial areas. Defined by the IMD both qualitatively and quantitatively, a heatwave signifies temperatures posing significant health risks.

- **Quantitative Definition:** A heat wave is considered if the maximum temperature of a station reaches **at least 40°C or more** for Plains and at least 30°C or more for Hilly regions.
- **Qualitative Definition:** A heat wave is a state when the temperature reaches a level that poses a significant risk to human health upon exposure

The research team of the SwitchON Foundation endeavours to provide a comprehensive understanding of heatwaves in Bengal. This report aims to achieve this by documenting past occurrences, analyzing their causes, gathering public opinions on current conditions, and outlining the impacts on health, agriculture, energy, the economy, and the environment in West Bengal. The report offers recommendations to alleviate the negative effects of heatwaves during the intense summer season, addressing vital concerns for the state's welfare and resilience.



2 | Record of Heat Waves in WEST BENGAL

2.1. 1969 to 2019 heat wave record

Total Number of Disastrous Heat Wave Day (Annual) in West Bengal During the Period from 1969 to 2019

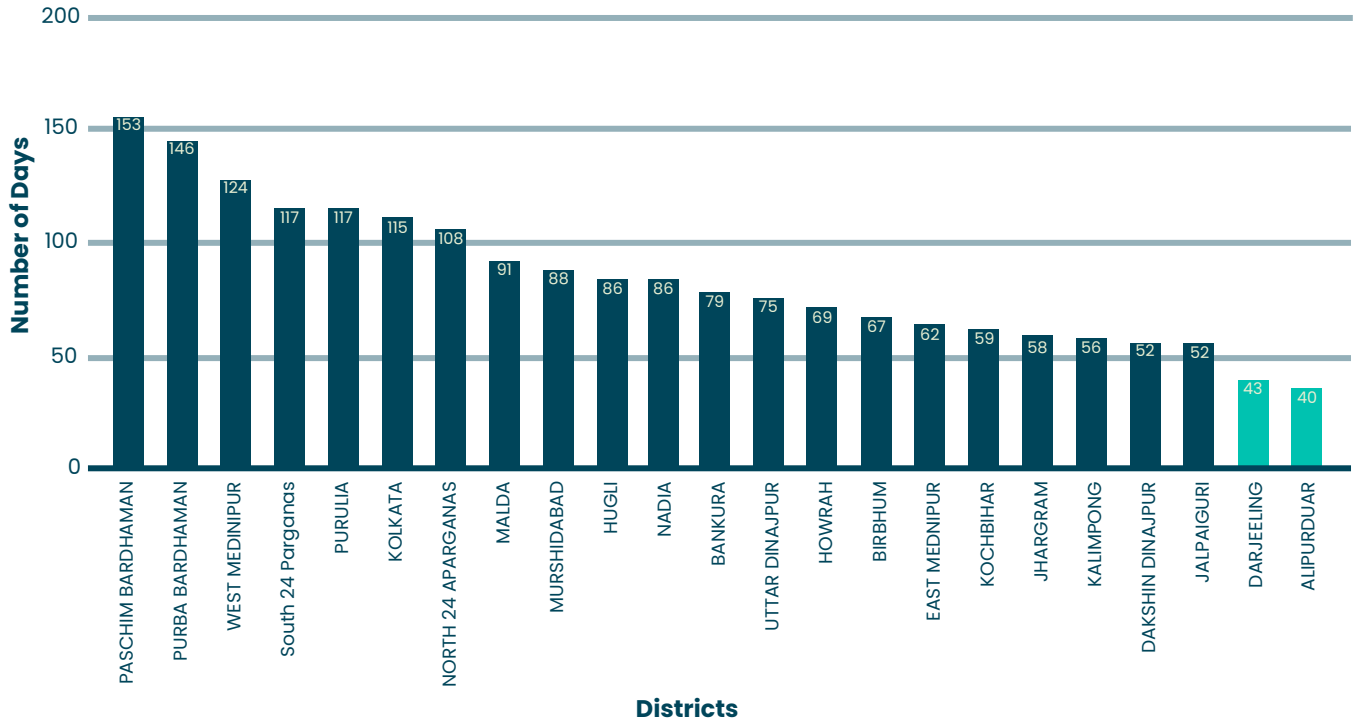


Figure 1: Annual Heat Wave Data Analysis for West Bengal between 1969 and 2019

Data Source: <https://imdpune.gov.in/hazardatlas/heatnew.html>

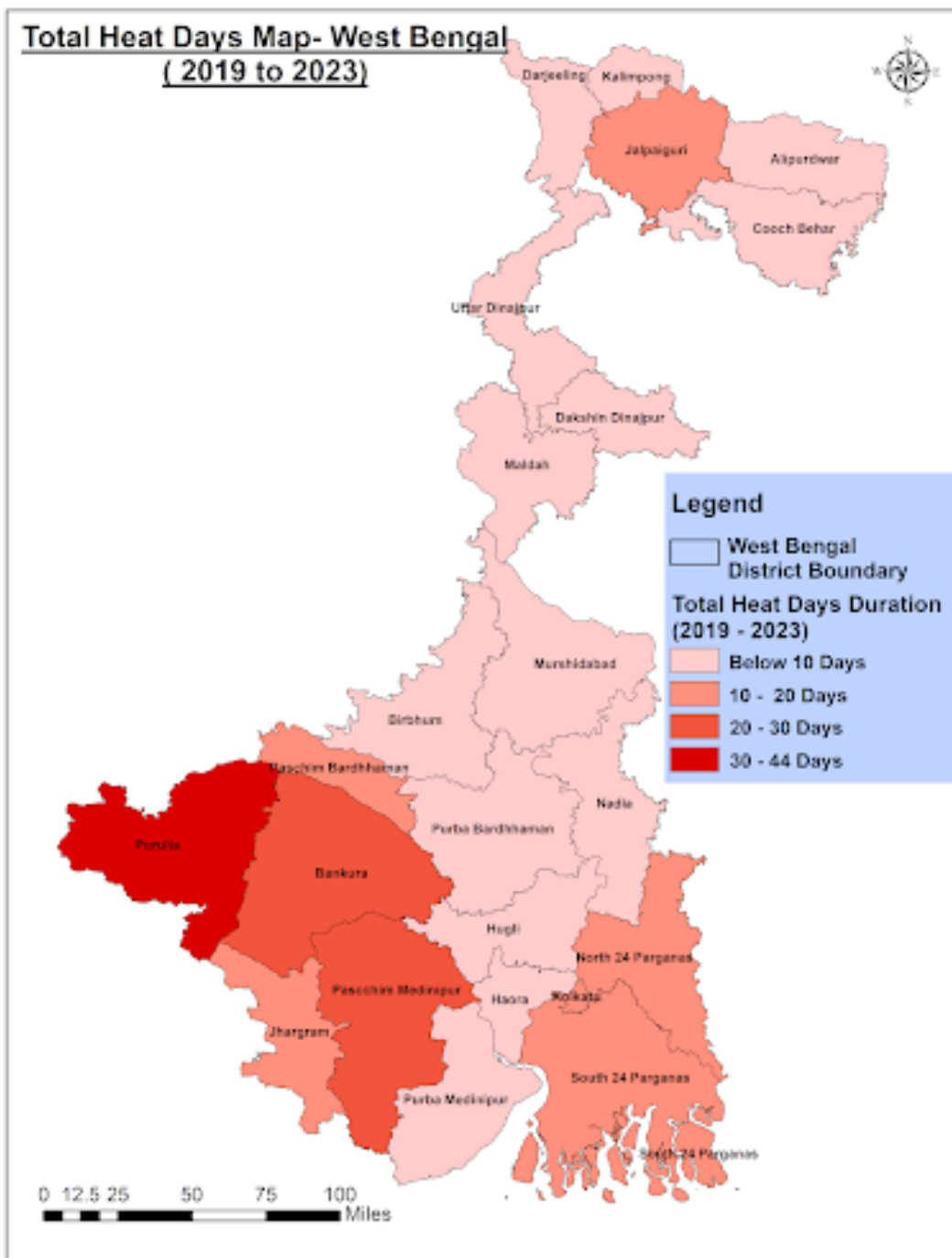
Based on the [IMD Pune](#) heat wave occurrence dataset between 1969 and 2019, the following insights can be drawn from the district-based heat-wave analysis for the state of West Bengal.

- Barddhaman district recorded the highest number of heat wave days in West Bengal.
- Paschim Barddhaman and Purba Barddhaman experienced 153 and 146 disastrous annual heat wave days respectively.
- Both districts had a low normalized vulnerability index of 0.13 and 0.11 respectively.
- Kolkata experienced 115 disastrous heat wave days with a low normalized vulnerability index of 0.1.



2.2. 2019 to 2023 record for $\geq 40^{\circ}\text{C}$

Between 2019 and 2023, an analysis of heat days during the summer months was conducted using maximum temperature data obtained from the IMD Pune website. This analysis focused on identifying days with temperatures reaching 40°C and above in West Bengal, specifically during April, May, June, and July. Through a mapped representation, the total count of days experiencing temperatures equal to or exceeding 40°C over the past five years (2019-2023) has been visually depicted.



The map visually represents that

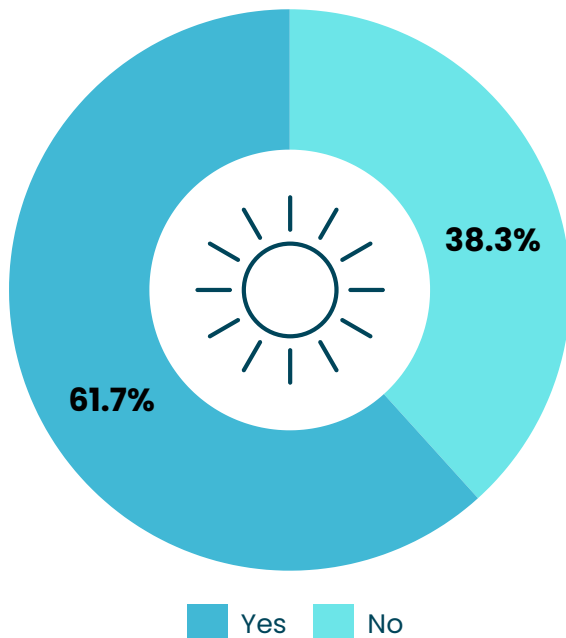
- **Purulia, the westernmost district of Bengal, has witnessed the highest number of days (30 to 44) with maximum temperatures reaching 40°C or higher between 2019 and 2023.** This indicates a consistent encounter with extreme temperatures, surpassing the 40-degree mark on several occasions.
- A comparative analysis of temperature datasets between 1969–2019 and 2019–2023 suggests a notable increase in heat wave days in Purulia.
- Bankura and Paschim Medinipur districts have experienced 20 to 30 days of heat days during 2019–2023. The dataset reveals a significant rise in heat days for Bankura compared to the period between 1969 and 2019.
- Paschim Bardhaman, despite facing the highest number of heat wave days between 1969 and 2019, observed only 10 to 20 days of heat days (temperatures above 40°C) in the 2019–2023 period.
- Jhargram, Kolkata, North 24 Parganas, South 24 Parganas, and Jalpaiguri districts have also experienced 10 to 20 days of heat days during the same timeframe.

3 | Impact Study on EFFECTS OF HEAT WAVES

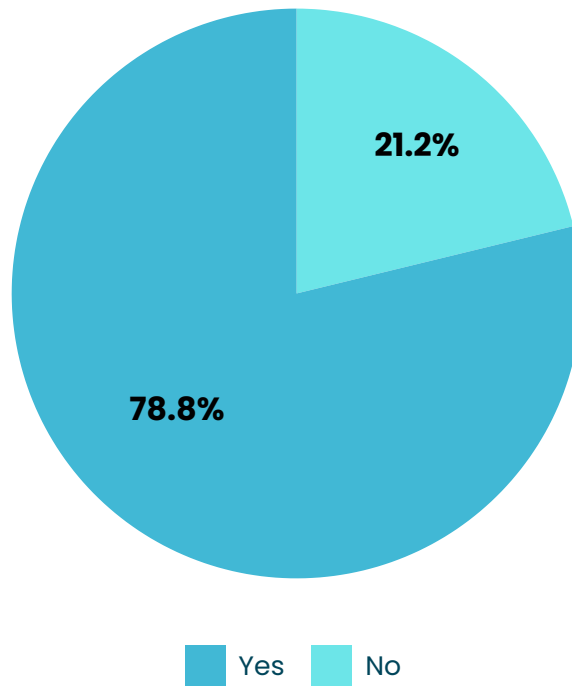
A primary survey was conducted on **815 people** in the east Indian states (West Bengal, Jharkhand, and Odisha) in April 2024 to capture people’s perceptions of the current heatwave situation, how it has changed over the years, the problems people are facing due to the rising temperatures, and how their daily lives are affected. The Google form was shared via several platforms with people, and the responses were completely anonymous.

In this report, we have analysed the **387 responses from West Bengal**. Of the 387 total respondents from West Bengal, 65% were males, whereas 35% were females. The survey was canvassed only in the cities, where people across different age groups, and occupational groups participated in the survey. Here, we present the major findings from the survey-

- **100% of the respondents mentioned that the severity of heat waves has increased over the years.**

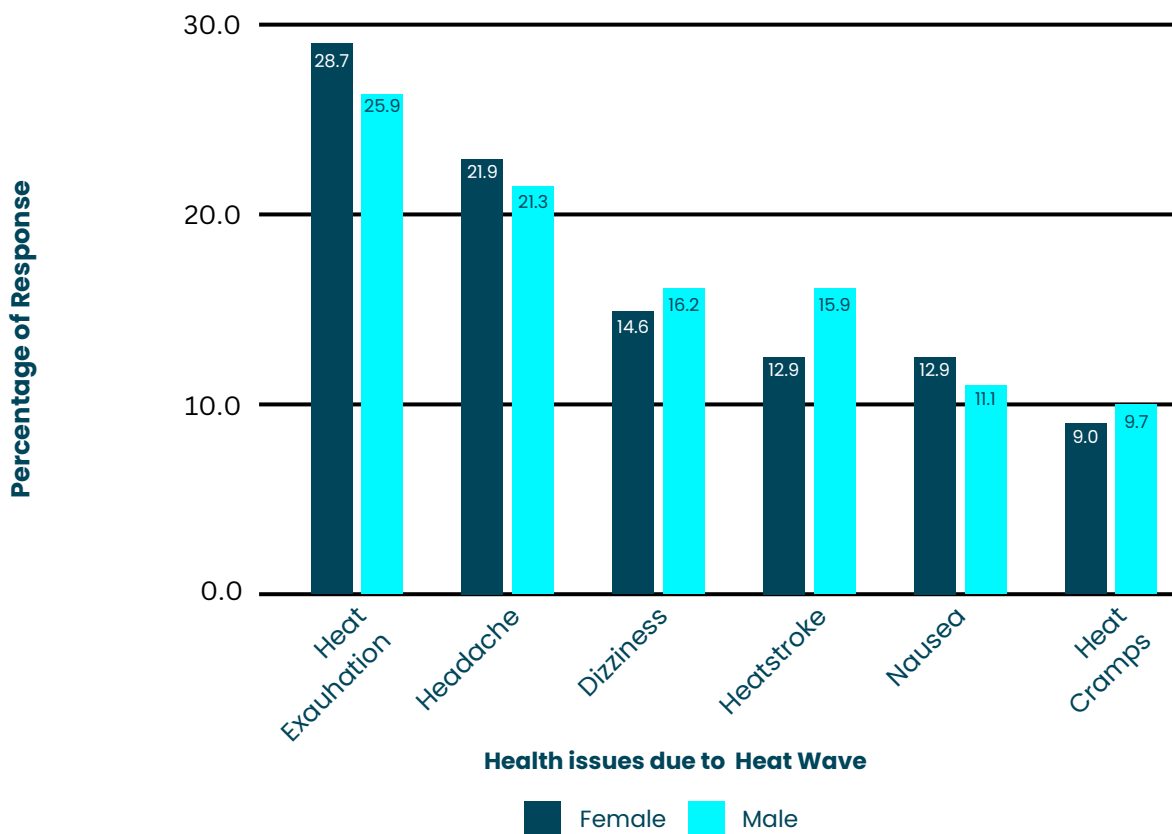


Heat Related illness faced by people of west Bengal



- 61.7% of the respondents said they knew people who had succumbed to heat waves.
- 78.8% of the respondents said they experienced some heat-related illnesses during heat waves.

Female & Male Health Issues due to Heat Wave in West Bengal



- Irrespective of gender, most of the people in Bengal (near about 29% of female and 26% of male respondents) have faced heat exhaustion as a major health issue due to heat waves.
- The male population suffers from dizziness and heat strokes more than the female population.

Heat Wave Affecting Daily Activities of West Bengal



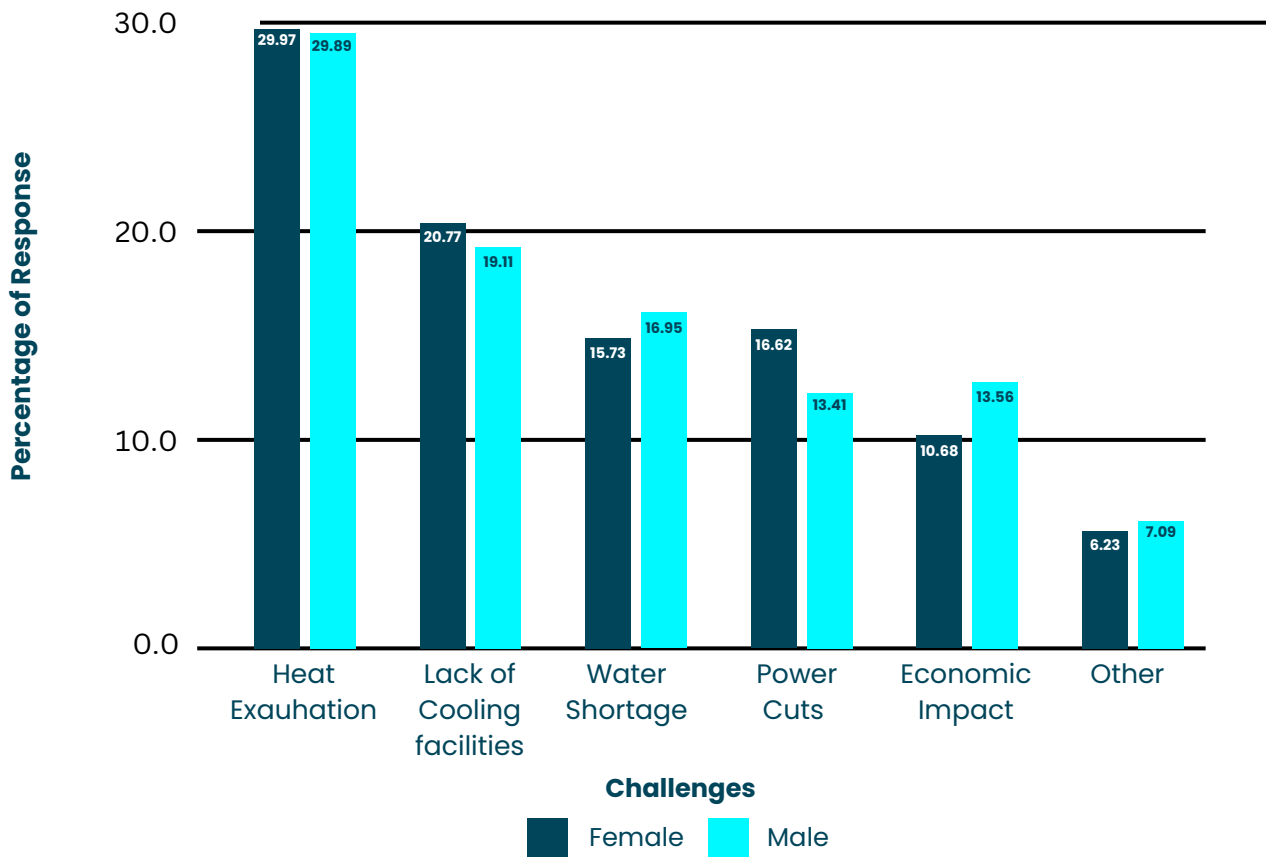
Occupational Classwise Daily

Source: Primary Survey conducted by SwitchON Foundation (April 2024)

- Homemakers and retirees, who predominantly stay indoors, also feel the brunt of heatwaves.
- The senior citizens are the vulnerable group, and they are getting very much affected by the heat waves. Every respondent from these groups noted that heatwaves disrupt their daily routines.



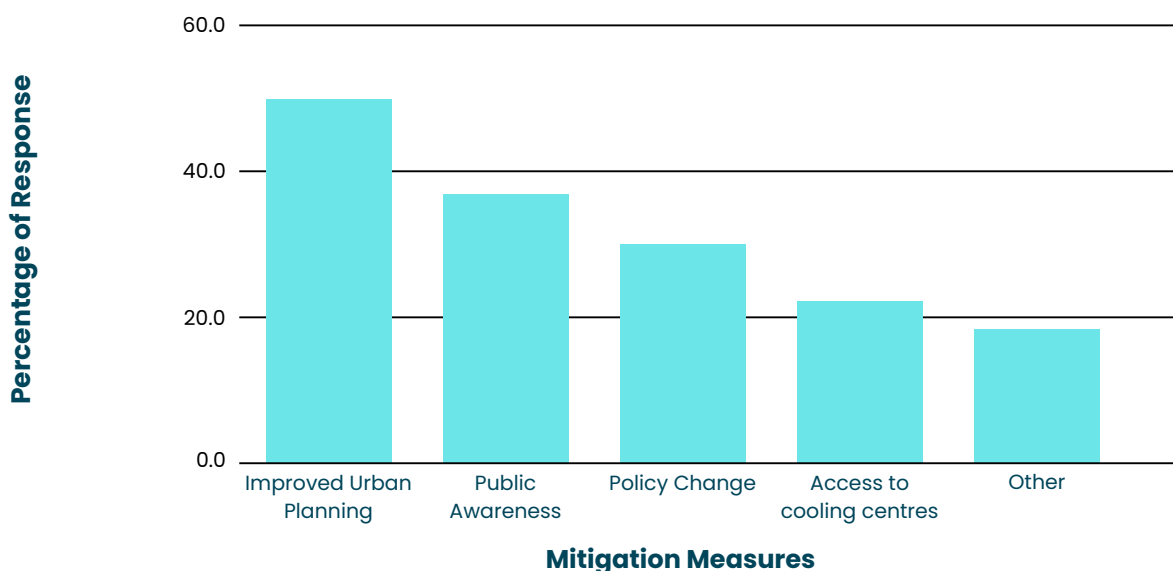
Major Challenges faced by People during Heat Wave in West Bengal



Source: Primary Survey conducted by SwitchON Foundation (April 2024)

- Health issues are the major challenges for the respondents in Bengal due to heat waves. More than 29% of the respondents both male and female face physical problems during heat waves.
- Besides this, lack of cooling facilities and water shortages are other major challenges during heat waves.

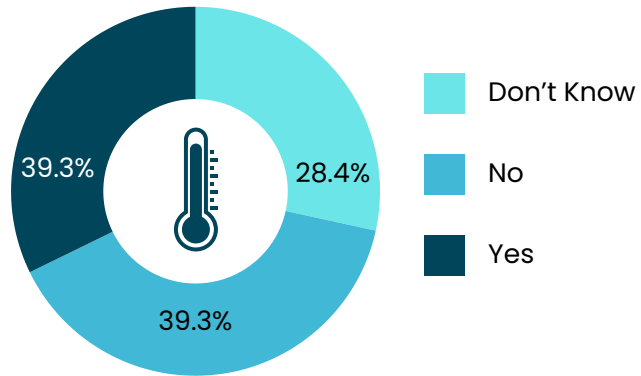
People's Opinion on Mitigation Measures of Heat Wave



Source: Primary Survey conducted by SwitchON Foundation (April 2024)

- As the urban areas experience the worst impacts of heat waves, near about 52% of the respondents have suggested modifying the urban planning to mitigate this extreme scenario.
- Public awareness of heatwave conditions (37.5%) and updating existing policies (32.4%) emerged as two other crucial measures for mitigating heatwaves.

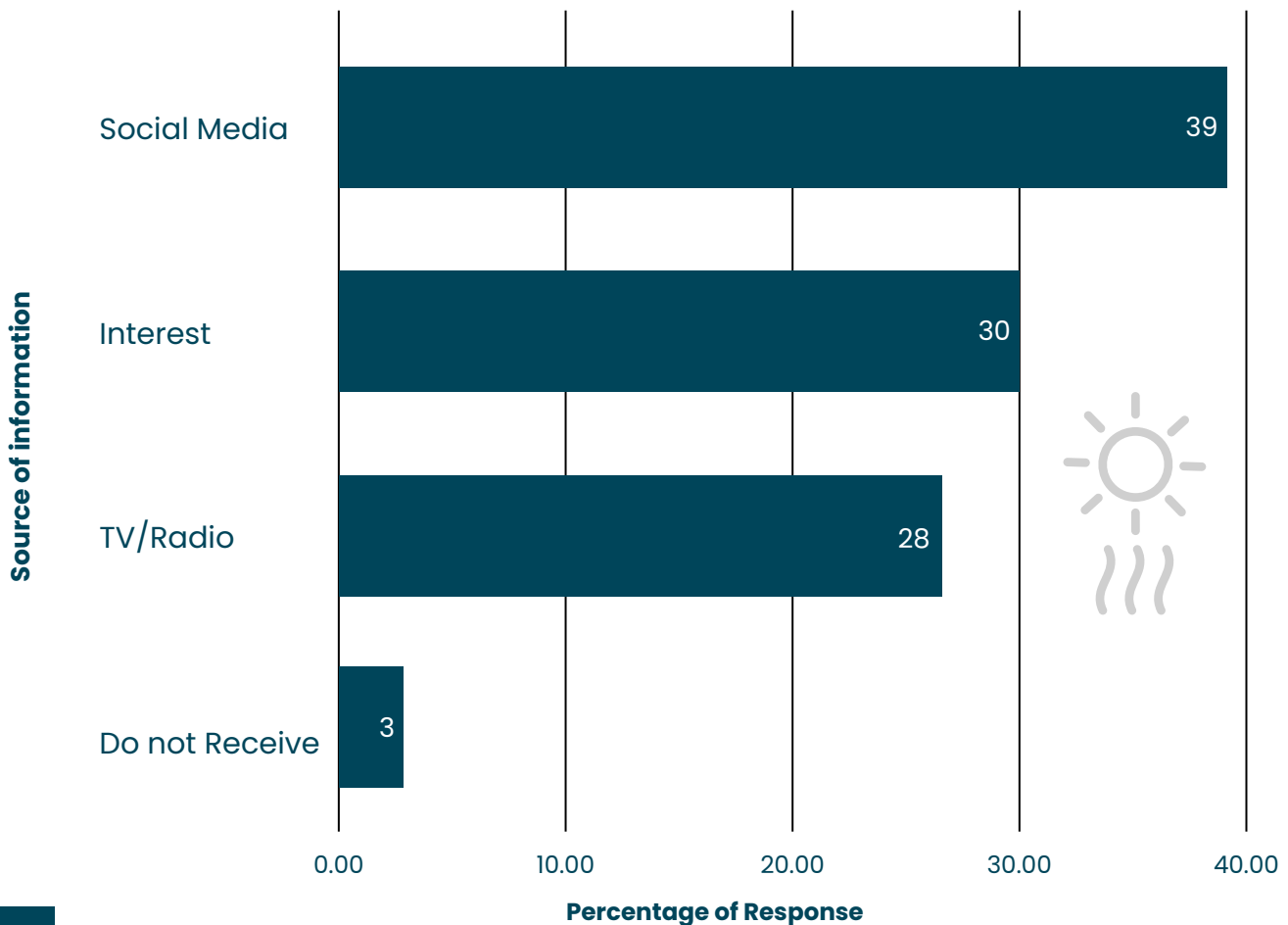
Awareness among People on the Presence of Heatwave Action Plan in Cities of West Bengal



Source: Primary Survey conducted by SwitchON Foundation (April 2024)

- **Merely 32.3% of the surveyed population is cognizant of the government's heat wave action plan.**
- Of the remaining respondents, 39.3% are confident in the absence of such action plans in West Bengal, while the remaining 26.4% lack awareness of their existence.

Sources of Heat Wave related Informations in West Bengal



Source: Primary Survey conducted by SwitchON Foundation (April 2024)

- Social media emerges as the primary source of heatwave information in West Bengal, with 39.15% of respondents relying on platforms like Facebook, Twitter, and Instagram.
- The internet is also a significant information channel, with 30.02% of respondents utilizing online resources such as news websites and weather apps to stay updated on heatwave conditions.
- Traditional media like TV and radio remain relevant, with 27.73% of respondents obtaining heatwave information through these conventional mediums. However, their usage appears slightly less prevalent compared to social media and the internet.
- **In this concern, 99% of the respondents of West Bengal think that the government authorities should take more action to address the impacts of heat waves**

4 | Reasons behind THE HEAT WAVE

Several factors contribute to the occurrence and exacerbation of heatwaves in West Bengal. Firstly, **disruptions in the customary summer thunderstorms**, known as "Kalboisakhi," delay cooling down temperatures due to hindered moisture flow caused by dry northwest currents. For instance, Kolkata experienced prolonged intense heat in 2022 due to delayed Norwesters obstructing moisture-laden winds from the Bay of Bengal.

Secondly, **rapid urbanization and mining activities alter landscapes** and escalate temperatures. Urban expansion in Kolkata and Asansol encroaches on water bodies and depletes forests, increasing built-up areas and reducing vegetation. Satellite studies depict reduced green cover and higher land temperatures, highlighting the link between urbanization and heat.

Furthermore, **West Bengal's gradual onset of hot summers and delayed monsoons exacerbates heat waves**. Kolkata's average air temperature reaches 30°C in April, with humidity-driven heat indices even higher. Climate change exacerbates these shifts, leading to increased variability and extreme weather events, according to IMD's Bandyopadhyay.

Globally, rising temperatures correlate with intensified and more frequent heatwaves, driven by human-induced climate change since the 1950s. Regional impacts, such as Bengal's susceptibility to temperature changes, and projections indicating a rise in heatwave occurrence, further underscore the influence of climate change. El Niño events and marine heatwaves in the Bay of Bengal exacerbate these effects.

Human activities, notably greenhouse gas emissions and land use changes, exacerbate the greenhouse effect, amplifying heat waves. Such alterations in land use patterns intensify heatwaves, particularly in industrial and residential areas. In summary, a combination of delayed thunderstorms, rapid urbanization, climate change, and human-induced factors contribute to the severity of heat waves in West Bengal.



5 | Effects of HEATWAVES

Heatwaves are deadly events that take several lives every year. As per a **study by the University of Cambridge**, the deadly heat waves of India fuelled by climate change are endangering the development of India in terms of health, production, infrastructure and environment.

5.1. Effects on Health

- Heatwaves in the Indian subcontinent have caused over 24,000 deaths between 1992 and 2015 ([Ravindra et al. 2024](#)).
- Deadly incidents in 2022, intensified by climate change, left nearly 90% of Indians vulnerable to health issues, food shortages, and increased mortality risks ([Casciato, 2023](#)).
- Heat-related illnesses span from mild conditions like prickly heat and heat cramps to severe cases such as heat stroke, characterized by impaired brain function due to uncontrolled body heating, akin to a stroke ([Patel, 2024](#)).
- These illnesses pose significant public health challenges during heatwave events.

As per **IMD report-**

- Heatwaves lead to heat exhaustion and heat stroke, posing life-threatening risks.
- Symptoms include nausea, dizziness, headache, rapid heartbeat, and confusion.
- Elevated temperatures cause dehydration, headaches, fatigue, and respiratory issues like asthma.
- Heatwaves increase the likelihood of cardiovascular problems such as heart attacks and strokes.
- They also impact mental health, causing increased stress and anxiety, especially without access to cooling measures.

5.2. Effects on Farming

- Crop failure: Heatwaves cause crops to wilt, reducing yields or leading to complete loss.
- Damage to plant cells: High temperatures hamper photosynthesis and food production.
- Reduced soil moisture: Increased evaporation creates drought-like conditions hindering crop growth.
- Increased pest activity: Heatwaves foster ideal environments for pests, leading to further crop damage.
- Livestock health challenges: Heat stress reduces milk production, and fertility rates, and can lead to death.
- Water scarcity: Heatwaves accelerate water source depletion, escalating irrigation demands and potentially sparking conflicts.



5.3. Effects on the Energy sector

- Increased electricity demand: Air conditioning and fan usage surges, straining the energy grid and risking blackouts.
- Reduced power plant efficiency: High temperatures hinder power generation, potentially leading to reduced output or shutdowns.
- Equipment failures: Heatwaves cause transmission and distribution failures, decreasing grid reliability, especially in equipment unprepared for high temperatures.
- Wildfire risk: Heatwaves heighten the risk of wildfires, damaging energy infrastructure and causing power disruptions.
- Escalating energy prices: Increased demand and constrained supply during heatwaves lead to higher bills for consumers and businesses.

5.4. Effects on Economy

- As per [Greenpeace](#) organisation following are the effects on the economy due to the heat wave
- Economic Risk: **McKinsey Global Institute predicts a 2.5–4.5% GDP risk by 2030** due to increased lost labour hours from rising heat and humidity.
- Monetary Equivalent: This risk translates to approximately \$150–250 billion in potential losses, highlighting the substantial economic impact of heat waves.
- Crop Production Impact: Heatwaves have already affected wheat production, with India projecting a potential decrease to 105 million tonnes this year due to heatwave conditions.
- Global Workforce Impact: The **International Labour Organization estimates that by 2030, over 2% of total working hours worldwide could be lost annually due to extreme heat**, hindering productivity.
- Labour Efficiency: Heatwaves not only make it too hot to work but also force workers to operate at a slower pace, further exacerbating productivity losses.

5.5. Effects on Environment

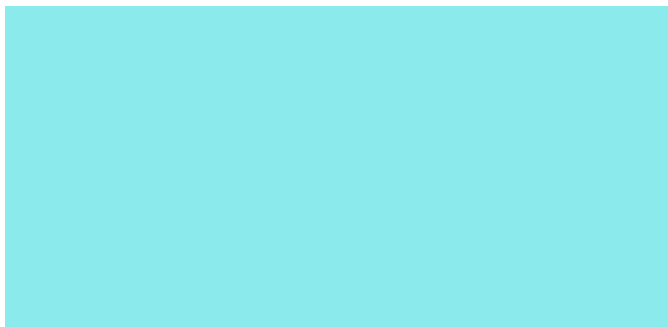
As per [WBDMD \(2020\)](#), in the ecologically rich Himalayan region, the Sunderbans area, escalating temperatures are threatening diverse flora and fauna, potentially leading to rapid ecological transformations. While much attention has been focused on visible effects like glacial melting, the severe impact of heat waves on biodiversity underscores the urgent need for a broader perspective on climate-related challenges.



6 | State Government INITIATIVE

6.1. West Bengal Heat Wave Action Plan 2023

- In West Bengal, the State Disaster Management Authority (SDMA), District Disaster Management Authorities (DDMAs), Municipalities, and Local Bodies collaborate to develop and execute the Heat Wave Action Plan.
- The West Bengal government focuses on constructing shelters and sheds, and providing water points, while the Health Department stocks Oral Rehydration Solution (ORS) and sets up medical posts to care for vulnerable groups amidst heat waves. Additionally, the Health Department conducts surveillance, deploys response teams, and ensures care for vulnerable groups.



7 | Recommendations on Mitigative Measures TOWARDS SUSTAINABILITY

7.1. Adaptation Measures:

- Raise public awareness through government-led campaigns.
- Establish cooling shelters and water stations in urban areas.
- Ensure uninterrupted power supply by enhancing infrastructure.
- Improve water infrastructure and promote rainwater harvesting.
- Develop cyclone warning centres and evacuation plans.
- Plant trees to enhance green cover and combat air pollution.
- Implement policies to reduce greenhouse gas emissions and promote renewable energy sources.

7.2. Mitigation measures:

- Enforce existing pollution control laws to combat air pollution.
- Reduce private vehicle usage during high AQI days and promote public and electric vehicles.
- Educate the public on extreme weather conditions through advisories.
- Form an expert committee to develop comprehensive guidelines.
- Promote sustainable transportation through designated Bicycle Days.
- Expand solar panel usage to reduce coal dependence.
- Implement afforestation and rainwater harvesting techniques for nature-based solutions.
- Advocate for climate-resilient livelihood strategies and early warning systems.

8 | CONCLUSION

The comprehensive analysis of heatwave dynamics in West Bengal underscores the urgent need for proactive measures to mitigate the adverse impacts of rising temperatures. From historical trends to present scenarios and future projections, the report elucidates the multifaceted challenges posed by heatwaves on human health, agriculture, energy, the economy, and the environment.

The primary survey highlights the problems that people are facing due to the heat waves, and how their daily livelihood is getting affected by the soaring temperatures. People's health, both physical and mental are getting compromised. 99% of the surveyed population said that they look forward to the government for more actions for the heat waves. The respondents want mitigation measures from the government, like urban planning, increasing greenery, and also educational awareness among the common masses.

By examining the factors contributing to heatwave occurrences, such as climate change, urbanization, and regional influences, alongside recommendations for adaptation and mitigation, the report provides valuable insights for policymakers, stakeholders, and communities alike. Urgent action is imperative to build resilience and safeguard against the escalating risks posed by heatwaves in West Bengal and beyond.





9 | WAY FORWARD

Moving forward, concerted efforts are imperative to tackle the escalating heatwave challenges in West Bengal. Urban planning modifications, heightened public awareness, and policy updates are crucial steps. Citizens must stay informed and take necessary precautions, while the government should prioritize disseminating information, establishing cooling shelters, enhancing water infrastructure, enforcing laws against pollution, and collaborating with electricity companies for sustainable energy management.

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