

# SUMMERS LIKE NONE OTHER

A Report on the Heatwave crisis  
in Ten Indian Cities

# CONTENTS

KEY SUMMARY .....	2
INTRODUCTION .....	3
<b>What is a heatwave?</b> .....	3
HOW HEATWAVES AFFECT: ..	4
<b>Human Health</b> .....	4
<b>Economic cost</b> .....	5
SOURCE OF DATA .....	5
STATUS OF HEATWAVES IN APRIL 2021 & 2022 .....	6
<b>New Delhi</b> .....	6
<b>Jaipur</b> .....	7
<b>Lucknow</b> .....	8
<b>Shimla</b> .....	9
<b>Bhopal</b> .....	10
<b>Patna</b> .....	11
<b>Mumbai</b> .....	12
<b>Kolkata</b> .....	13
<b>Hyderabad</b> .....	14
<b>Chennai</b> .....	15
CONCLUSION .....	16

## AUTHORS:

Akanksha & Avinash  
Chanchal

## EDIT AND DESIGN:

Riddhi Kalsi & Saagnik  
Paul

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## KEY SUMMARY

- This year India experienced summer early, beginning from the end of March.
- High summer starts towards the end of April but many parts' levels of mercury peaked at the start of the month. Moreover, heatwaves were also observed early in April — which typically occur later in May.
- [IMD](#) published at the end of April this year that it was the hottest over the North, West, and Central India in 122 years.
- This report finds in its analysis that plains and hilly regions were affected more than coastal regions.
- Delhi, Lucknow, Jaipur, Bhopal, and Shimla have registered maximum numbers of hottest days above 43°C.
- Heatwaves are fatal for public health and the economy. It also puts the ecosystem at risk. We have been witnessing an increased rate of hospitalizations also leading to fatalities as a result.
- We have enough science to link such extreme weather events to climate change. Unfortunately, if we do not act now, the threat is only going to increase in frequency, duration, and magnitude.

Days with **extreme heat** in **April 2022** increased by

<b>122%</b>	in Delhi,
<b>136%</b>	in Jaipur,
<b>145%</b>	in Lucknow,
<b>183%</b>	in Shimla,
<b>183%</b>	in Bhopal, &
<b>27%</b>	in Patna

as compared to **April 2021**.

## INTRODUCTION

Heatwaves as extreme weather events have recently become a concern for India due to their widespread and severe impact on health and the environment. For the last many years, temperatures are soaring, leading to intense heat waves over many parts of the country. According to the climate impact assessment report, India's average temperature has risen by around 0.7°C from 1901 to 2018. This rise in temperature is largely due to increased greenhouse gas (GHG) emissions, partially offset by forcing due to anthropogenic aerosols and changes in land use. These heatwaves are yet another reminder of how climate change and global warming affect our lives.

Recently, Greenpeace India published a report on heatwaves, finding that the number of hottest days in a year in India has increased from 40 in the 1950s to 100 in the 2020s. Multiple climate models have projected that the scenario will worsen significantly. In such a situation, the average temperature will increase by 4°C by the end of the century — implying unprecedented and prolonged heatwaves, more frequent extreme weather events, increased hospitalizations even leading up to fatalities, and irreparable impact on agriculture and wildlife (which, in turn, risks our food and nutritional security).

In the recent report published by the Lancet countdown, India ranks in the top five for the highest exposure of people to heatwaves. Heatwaves have claimed more than 17,000 lives over 50 years in India, according to research recently published by the country's top meteorologists. In addition, it documented 706 heatwaves in the country from 1971 to 2019.

The core heatwave zones span the states of Punjab, Himachal Pradesh, Uttarakhand, Delhi, Haryana, Rajasthan, Uttar Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Chhattisgarh, Bihar, Jharkhand, West Bengal, Odisha, Andhra Pradesh, and Telangana.

### **What is a heatwave?**

As per the official terminology, a heatwave is declared when an IMD weather station reaches at least 40°C or more for plains and at least 30° C or more for hilly regions. The departure of maximum temperature from normal is 4-5°C or more for the regions where the normal maximum temperature is more than 40.0°C and 5-6°C for regions where the normal maximum temperature is 40.0 °C or less.

## HOW HEATWAVES AFFECT:

### Human Health

Rising temperatures are among the most obvious effects of climate change — adversely affecting human health. Heatwaves are not only unpleasant but also lethal.

The pathophysiological consequences of heat exposure in humans have been well documented and understood. Thermoregulation is a crucial mechanism by which humans maintain body temperature to protect themselves from external environmental changes. However, excess heat can trigger the failure of thermoregulation, leading to abnormal body temperatures (Osilla, 2020<sup>1</sup>). Except for heat exhaustion and its progression of heat stroke, along with dehydration and electrolyte disorders, if untended, the failure of thermoregulation would finally lead to life-threatening situations due to organ and body system damage, for instance, acute kidney injury, exacerbation of congestive heart failure (Székely et al., 2015<sup>2</sup>).

Although, only a few illnesses and deaths are directly caused by heat (due to elevations in body core temperature for a prolonged period), many are related to the worsening of existing health conditions including chronic pulmonary conditions, cardiac conditions, kidney disorders, and psychiatric illness (WMO & WHO, 2015). Extremely high temperatures contribute directly to deaths from cardiovascular and respiratory disease, particularly among the elderly. High temperatures also raise ozone levels and other pollutants in the air that exacerbate cardiovascular and respiratory diseases. Pollen and other aeroallergen levels are also higher during periods of extreme heat which can trigger asthma (which presently affects around 300 million people). Ongoing temperature increases are expected to aggravate this burden (WHO, 2018<sup>3</sup>).

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<sup>1</sup> Osilla E., Marsidi J., Sharma S., Physiology, Temperature Regulation. [Updated 2020 Apr 30]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK507838/>

<sup>2</sup> Székely M, Carletto L, Garami A. 2015, The pathophysiology of heat exposure. Temperature (Austin) Vol.2: p. 452.

<sup>3</sup> WHO, 2018, Climate change and health. Link:

<https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health#:~:text=Extreme%20high%20air%20temperatures%20contribute,disease%2C%20particularly%20among%20elderly%20people.&text=High%20temperatures%20also%20raise%20the,exacerbate%20cardiovascular%20and%20respiratory%20disease.>

## Economic cost

There is enough science to indicate that heatwaves impact crop production and threaten food security. A report by the McKinsey Global Institute estimated that an increase in lost labour hours due to rising heat and humidity could put approximately 2.5-4.5 per cent of GDP at risk by 2030 — equivalent to roughly \$150-250 billion. The ongoing heatwaves have already impacted the production of wheat this year. The government of India projected that due to the heatwave conditions in the country, the wheat output could fall to 105 million tonnes this year. According to the International Labour Organization, by 2030 the equivalent of more than 2 per cent of total working hours worldwide is projected to be lost every year, either because it is too hot to work or because workers have to work at a slower pace.

## SOURCE OF DATA

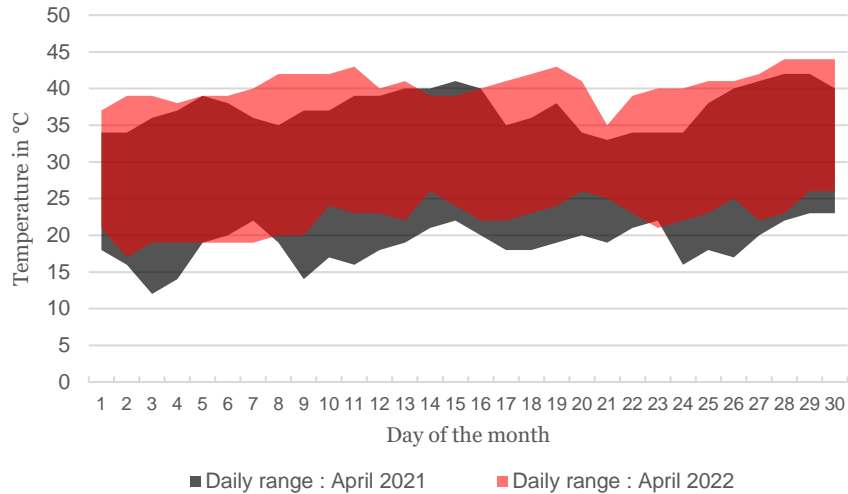
The monthly daily maximum and minimum data for April 2021 and 2022 is acquired from the [AccuWeather website](#). Heatwave declarations rely on accurate temperature, occurrence over consecutive days, and weather humidity data. All the cities considered in this report are capital cities which are growing in terms of population and undergoing increased industrialisation. This results in a hike in emissions of greenhouse gases, ultimately contributing to global warming and resulting in large variations in temperature.

# STATUS OF HEATWAVES IN APRIL 2021 & 2022

This section analyses the temperature variation from April 2021 to 2022 in ten cities of India across plains, coastal areas, and hilly regions.

## New Delhi

*National capital region, India*



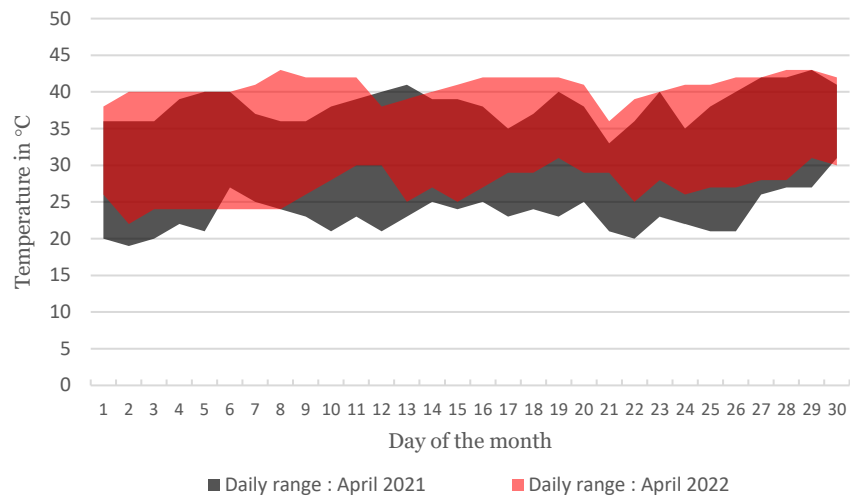
**Figure 1: New Delhi temperature trend for April 2022**

Being the capital city of India, New Delhi is a hub for providing livelihood to numerous people. The highest and lowest temperatures recorded during the month are shown in Figure 1 for April 2021 and 2022. The highest maximum temperature lies in the range of 40-42°C during the month of April 2021. The city recorded a temperature above 40°C after April 12. The maximum temperature recorded was 41°C (15<sup>th</sup> and 27<sup>th</sup> April 2021) and 42°C (28<sup>th</sup> and 29<sup>th</sup> April 2021). The city experienced this temperature for 9 days.

The highest maximum temperature remained between 40-44°C in the month of April 2022. The city recorded a temperature above 40°C after April 6. The maximum temperatures were 43°C (11<sup>th</sup> and 19<sup>th</sup> April 2022) and 44°C (28<sup>th</sup>, 29<sup>th</sup> and 30<sup>th</sup> April 2022). The city experienced these temperatures for 20 days.

# Jaipur

Capital, Rajasthan



**Figure 2: Jaipur temperature trend for April 2022**

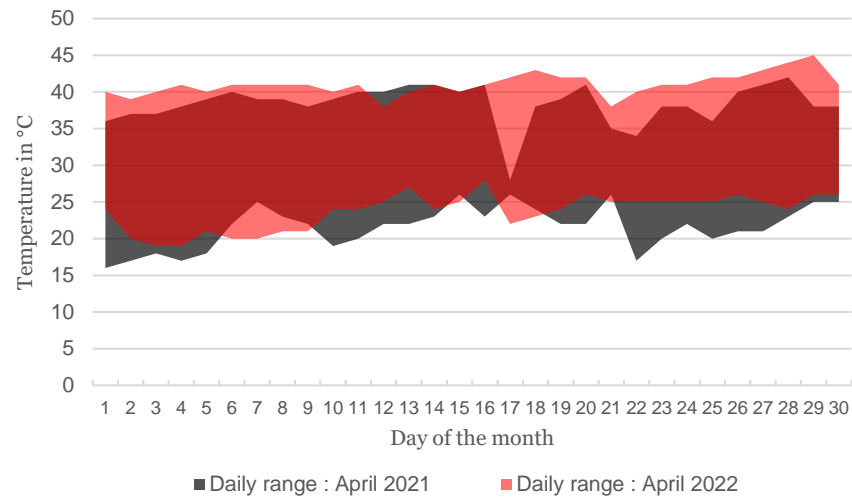
The highest and lowest temperature recorded during the month are shown in Figure 2 for April 2021 and 2022. The highest maximum temperature remains between 40-43°C during the month of April 2021. The city recorded a temperature above 40 degrees after 12<sup>th</sup> April. The maximum temperature recorded was 42°C (27<sup>th</sup> & 28<sup>th</sup> April 2021) and 43°C (29<sup>th</sup> April 2021). The city experienced these temperatures for 11 days.

The highest maximum temperature remains between 40-43°C. In the month of April 2022, the city recorded a temperature above 40 degrees after 1<sup>st</sup> April. The maximum temperature recorded was 42°C (9<sup>th</sup> to 11<sup>th</sup>, 16<sup>th</sup> to 19<sup>th</sup>, 26<sup>th</sup>, 27<sup>th</sup> and 30<sup>th</sup> April 2022) and 43°C (28<sup>th</sup> & 29<sup>th</sup> April). The city experienced these temperatures for 26 days.



# Lucknow

Capital, Uttar Pradesh



**Figure 3: Lucknow temperature trend for April 2022**

The highest and lowest temperature recorded during the month are shown in Figure 3 for April 2021 and 2022. The highest maximum temperature remains between 40-42°C during the month of April 2021. The city recorded a temperature above 40°C after 5<sup>th</sup> April. The maximum temperature recorded was 41°C (13<sup>th</sup>, 16<sup>th</sup>, 20<sup>th</sup> & 27<sup>th</sup> April 2021) and 42 (28<sup>th</sup> April 2021). The city experienced these temperatures for 11 days.

The highest maximum temperature remains between 40-45°C. In the month of April 2022. The city recorded a temperature above 40 °C from 1<sup>st</sup> April. The maximum temperature recorded was 44°C (28<sup>th</sup> April 2022) and 45°C (29<sup>th</sup> April). The city experienced these temperatures for 27 days.

# Shimla

Capital, Himachal Pradesh

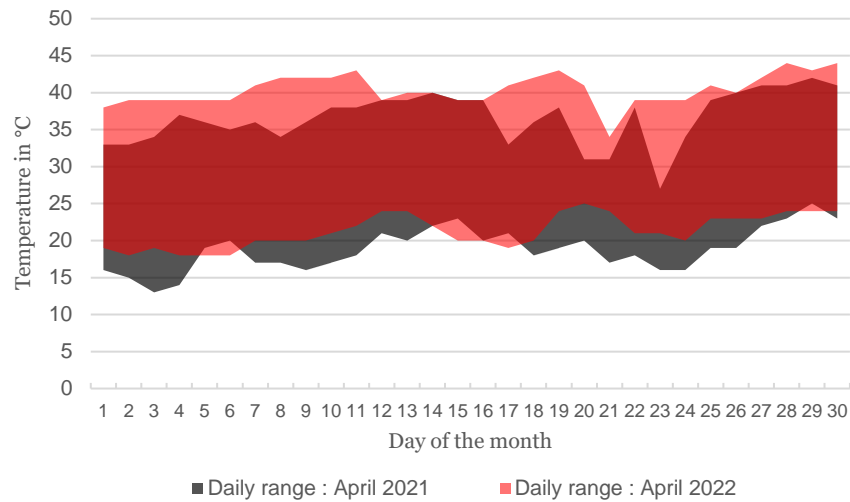


Figure 4: Shimla temperature trend for April 2022

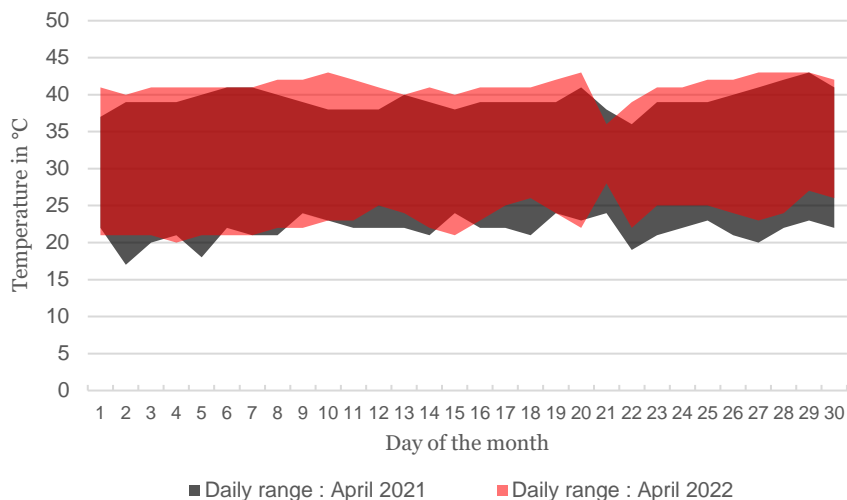
Shimla is a capital city of Himachal Pradesh and hub of tourism due to its hilly region and pleasant weather. But since the last few years Shimla has been facing severe heatwaves because the temperature is consistently rising above 40 degrees in the summers.

The highest and lowest temperature recorded during the month are shown in Figure 4 for April 2021 and 2022. The highest maximum temperature remains between 40-42°C during the month of April 2021. The city recorded a temperature above 40°C after 13<sup>th</sup> April. The maximum temperature recorded was 41°C (27<sup>th</sup>, 28<sup>th</sup> & 30<sup>th</sup> April 2021) and 42°C (29<sup>th</sup> April 2021). The city experienced these temperatures for 6 days.

The highest maximum temperature remains between 40-44°C. In the month of April 2022. The city recorded a temperature above 40°C after 6<sup>th</sup> April. The maximum temperature recorded was 43°C (19<sup>th</sup> & 29<sup>th</sup> April 2022) and 44°C (28<sup>th</sup> & 30<sup>th</sup> April). The city experienced these temperatures for 17 days.

# Bhopal

Capital, Madhya Pradesh



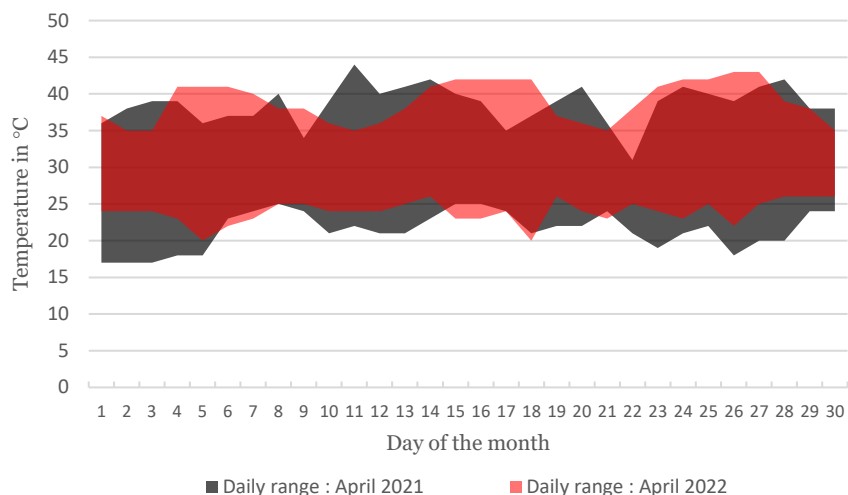
**Figure 5: Bhopal temperature trend for April 2022**

The highest and lowest temperature recorded during the month are shown in Figure 5 for April 2021 and 2022. The highest maximum temperature remains between 40-43°C degrees during the month of April 2021. The city recorded a temperature above 40°C after 4<sup>th</sup> April. The maximum temperature recorded was 42°C (28<sup>th</sup> April 2021) and 43°C (29<sup>th</sup> April 2021). The city experienced these temperatures for 10 days.

The highest maximum temperature remains between 40-43°C. In the month of April 2022. The city recorded a temperature above 40°C from 1<sup>st</sup> April. The maximum temperature recorded was 42°C (8<sup>th</sup>, 9<sup>th</sup>, 11<sup>th</sup>, 19<sup>th</sup>, 25<sup>th</sup>, 26<sup>th</sup> & 30<sup>th</sup> April 2022) and 43°C (10<sup>th</sup>, 20<sup>th</sup>, 27<sup>th</sup>, 28<sup>th</sup> & 29<sup>th</sup> April 2022). The city experienced these temperatures for 28 days.

# Patna

Capital, Bihar



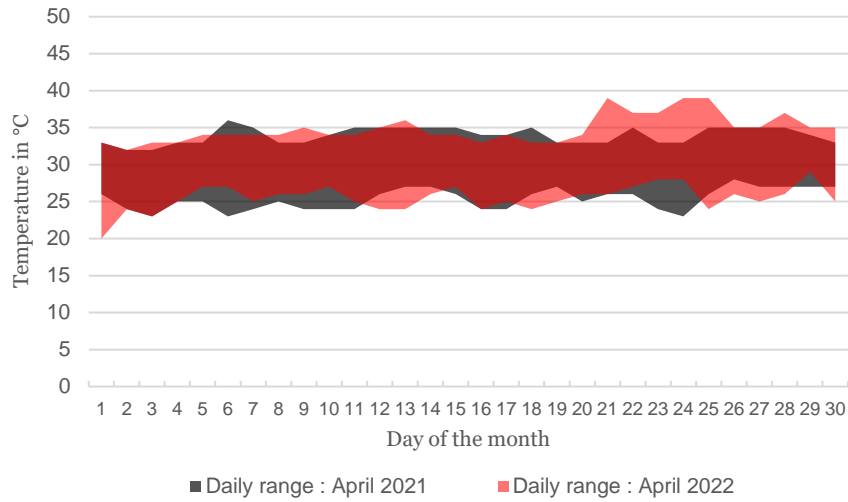
**Figure 6: Patna temperature trend for April 2022**

The highest and lowest temperature recorded during the month are shown in Figure 6 for April 2021 and 2022. The highest maximum temperature remains between 40-44°C during the month of April 2021. The city recorded a temperature above 40°C degrees after 8<sup>th</sup> April. The maximum temperature recorded was 44°C (11<sup>th</sup> April 2021). The city experienced these temperatures for 11 days.

The highest maximum temperature remains between 40-43°C. In the month of April 2022. The city recorded a temperature above 40°C from 3<sup>rd</sup> April 2022. The maximum temperature recorded was 42°C (15<sup>th</sup> to 18<sup>th</sup>, 24<sup>th</sup> and 25<sup>th</sup> April 2022) and 43°C (26<sup>th</sup> and 27<sup>th</sup> April 2022). The city experienced these temperatures for 14 days.

# Mumbai

Capital, Maharashtra



**Figure 7: Mumbai temperature trend for April 2022**

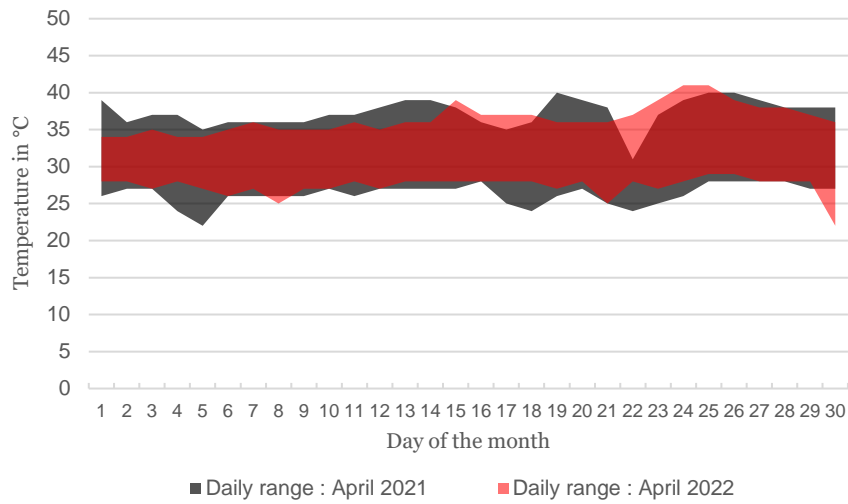
The highest and lowest temperature recorded during the month are shown in Figure 7 for April 2021 and 2022. The highest maximum temperature remains between 32-36°C. during the month of April 2021. The city recorded a temperature above 32°C after 3rd April. The maximum temperature recorded was 36°C (6<sup>th</sup> April 2021). There was no heatwave trend in the whole month.

The highest maximum temperature remains between 32-39°C degrees. In the month of April 2022. The city recorded a temperature above 32°C from 1<sup>st</sup> April. The maximum temperature recorded was 39°C (21<sup>st</sup>, 24<sup>th</sup> & 25<sup>th</sup> April 2022). There was no heatwave trend in the whole month.



# Kolkata

Capital, West Bengal



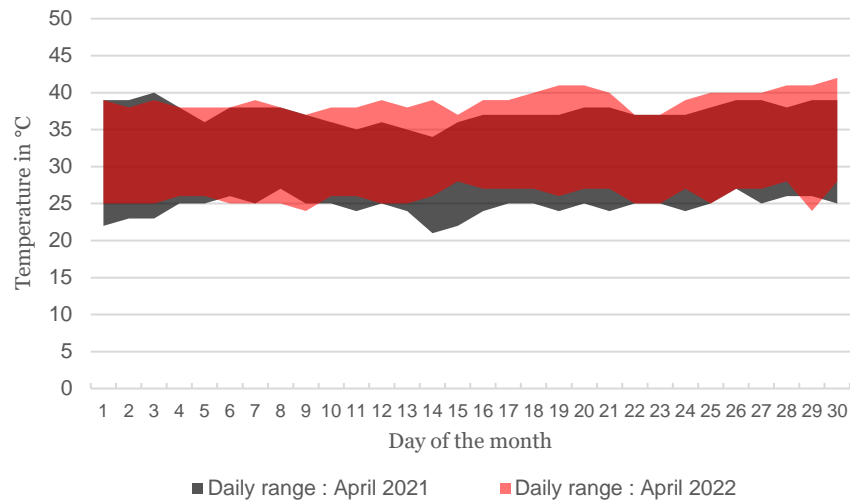
**Figure 8: Kolkata temperature trend for April 2022**

The highest and lowest temperature recorded during the month are shown in Figure 8 for April 2021 and 2022. The highest maximum temperature recorded was 40°C on 19<sup>th</sup>, 25<sup>th</sup> & 26<sup>th</sup> April 2021. The city experienced these temperatures for 3 days.

In the month of April 2022, the maximum temperature recorded was 41°C (28<sup>th</sup> & 29<sup>th</sup> April 2022). The city experienced these temperatures for 2 days.

# Hyderabad

Capital, Telangana



**Figure 9: Hyderabad temperature trend for April 2022**

The highest and lowest temperature recorded during the month are shown in Figure 9 for April 2021 and 2022. The highest maximum temperature recorded was 40°C on 3<sup>rd</sup> April 2021.

The highest maximum temperature remains between 40-42°C. In the month of April 2022, the city recorded a temperature above 40°C from 18<sup>th</sup> April. The maximum temperature recorded was 42°C on 30<sup>th</sup> April 2022. The city experienced these temperatures for 10 days.

# Chennai

Capital, Tamil Nadu

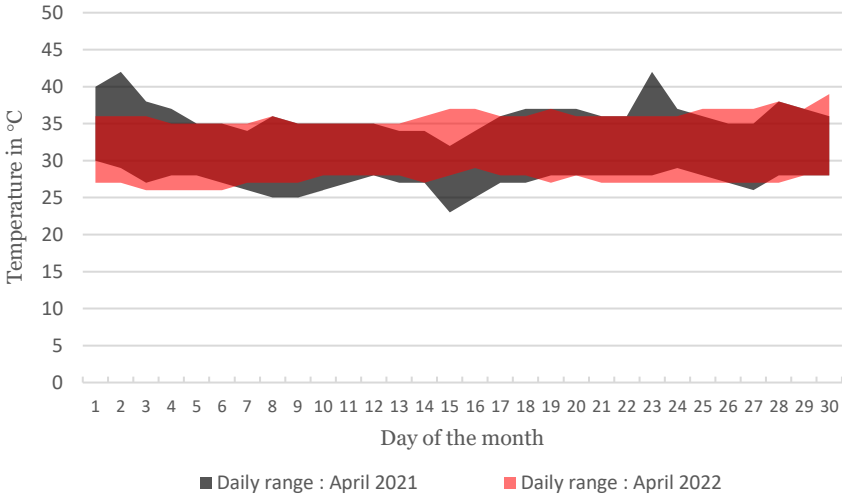


Figure 10: Chennai temperature trend for April 2022

The highest and lowest temperature recorded during the month are shown in Figure 10 for April 2021 and 2022. The highest maximum temperature remains between 40-42°C during the month of April 2021. The city recorded a temperature above 40°C from 1st April 2021. The maximum temperature recorded was 42°C (2<sup>nd</sup> & 23<sup>rd</sup> April 2021). The city experienced these temperatures for 3 days.

The highest maximum temperature remains between 35-37°C in the month of April 2022. The maximum temperature recorded was 37°C for 7 days.

## CONCLUSION

The ongoing heatwaves and other extreme weather events show that we have already crossed the proclaimed “safe limit” of climate change, and we are now living amidst a climate crisis. The rising temperature on Earth accompanied by weather changes has an adverse effect on the biodiversity. Humans are directly affected, especially in various ways that can cause damage to human health, economy, and biodiversity. Below is a summary of the key highlights of this report:

- Heatwave related health information should be developed in advance for effective communication. The communication plan should include advice to people on how to protect themselves and others, how to reduce the exposure to heatwaves, and how to recognise heat-related symptoms.
- The city must take measures for protecting vegetation and plantations including rooftop gardening and community nutritional gardens, increasing green spaces, and conserving the water bodies.
- The government should release an advisory to change the working hours, so that outdoor workers can stay indoors during peak temperatures.
- Establishing a stronger early warning system integrated with health and other departments will help the authorities and communities prepare better. It can help reduce the impact on human health from heatwaves through timely notification of preventative measures to vulnerable communities.
- While it is important to introduce adequate adaptation policies and actions to protect people from these conditions, it is also the need of the hour to implement strategies to mitigate climate change. The government and corporations need to prioritise transitions in to clean energy and sustainable agriculture and facilitate transitions in other sectors to tackle climate change. Phasing out from burning fossil fuels (including the energy sector and transportation systems) is the most practical and urgent solution the governments need to implement to protect public health and future generations.