Geographical study heat wave in Durg district

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ABSTRACT

Durg district has been selected for the study of heat waves. Durg district is located in the central part of Chhattisgarh. Rapid urbanization and industrialization has developed in this area. This area comes under the tropical climate zone due to which the temperature here is higher than normal days in summers, but in the months of May and June, hot air coming from the western region flows here due to which the temperature increases further. And the danger of a heat wave arises. Considering the heat wave as a natural disaster, a comparative study of temperature data of a decade of May from 2014 to 2024 has been done for the study in the research paper. The reasons for the origin of heat waves, the increasing effect of heat waves on human health, environment, and animals have also been studied and government schemes for protection from heat waves, awareness among people, preventive measures like tree plantation by reducing the speed of urbanization are proposed in the presented research paper.

Keywords: heat wave, temperature rise, natural disaster, human health, environment

INTRODUCTION

Heat waves are a natural disaster. Hot winds are listed as a disaster in the National Disaster Management Act 2000 of India. (DM,2011p 23) From 1911 to 2009 Uttar Pradesh witnessed 134, Bihar 117, Orisa 73 , Madhya Pradesh 56, and Maharashtra 77 heatwaves. (DM,2011p 23) Very little attention is paid to this but it is a serious natural disaster. The area in which the heat wave flows has a significant impact on that area. Heat waves pose a threat not only to humans but also to plants and animals, that is, it is harmful to the entire ecological environment. Heat waves mainly occur in summers when the sun moves northwards, then due to more sun heat the temperature increases and hot air is generated. This hot air increases the temperature of the area in which it flows unlimitedly, due to which it creates a hindrance in the ecological balance and the number of mortality of humans and various animals increases. According to the World Health Organization, heat waves caused more than 166,000 deaths from 1998 to 2017.Heat-related mortality for people over 65 years of age increased by approximately 85% between 2000–2004 and 2017–2021 Between 2000–2019 studies show approximately 489 000 heat-related

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deaths occur each year, with 45% of these in Asia and 36% in Europe .In Europe alone in the summer of 2022, an estimated 61 672 heat-related excess deaths occurred. High intensity heatwave events can bring high acute mortality; in 2003, 70 000 people in Europe died as a result of the June–August event. In 2010, 56 000 excess deaths occurred during a 44–day heatwave in the Russian Federation. Global warming has led to an increase in the number of people exposed to heat waves by approximately 125 million between 2000 and 2016.
(WHO,2024)
Due to the Tropic of Cancer passing through the middle of India, most of its area falls under the tropical region. The temperature here starts increasing when the Sun moves northwards and mainly in May and June, the temperature increases more than normal, as a result of which hot winds originate from the west and the area over which this wind flows gives rise to heat. Waves. The severe heat waves of 2016 affected Rajasthan, Madhya Pradesh, Chhattisgarh, Odisha, Jharkhand, Bihar, Haryana, Chandigarh, Delhi, Maharashtra, West Bengal and Gujarat. In India, 3812 deaths occurred due to heat waves between 2015 and 2022.(DM,2011p 23) Apart from this, there was an adverse effect on agricultural productivity, labor productivity, water resources, biodiversity and the ecological environment.Because the Tropic of Cancer passes through the northern part of Chhattisgarh, this area also falls under the tropical region and heat waves occur here too due to which there is a skyrocketing increase in temperature, which becomes important to do a geographical study. Heat waves. In the presented research paper, the geographical location of the heat wave, reasons for its origin, problems arising due to heat waves and suggestions for its solution in the study area of Durg district have been studied.

Study area

It is located in the Durg district on the eastern bank of the Shivnath River in the central part of Chhattisgarh. Its latitudinal extension is from 20 degrees 51 minutes north latitude to 21 degrees 31 minutes north latitude and from 81 degrees 8 minutes east longitude to 81 degrees 87 minutes east longitude. Its total area is 271862 hectares. This area has a tropical monsoon climate. According to Census 2011, the total population of the district is 1721948, in which the largest share is 64.5% urban population and 35.84% rural population. The maximum urbanization in Chhattisgarh has taken place in this district. National Highway NH 57 passes through its middle and South Eastern Railway services of Railways are available here. This area is also industrially rich. Asia's largest iron and steel plant Bhilai Steel Plant and ACC Cement Industry are located here. Intensive agriculture is done here in rural areas. Due to this trees and plants have been cut in very large numbers, due to which the area

of forests is very less. The boundary of the study area touches the boundary of the neighbouring districts Rajnandgaon, Raipur, Bemetara, Balod and Dhamtari.

Study Objectives

1. The main objective of the study in the presented research paper is to do a comparative study of temperature changes in the Durg district in a decade.
2. To discuss the origin and cause of heat waves in the study area.
3. To study the problems caused by heat waves in the research area and the measures to prevent them.

Methodology

For the presented research study, data related to heat waves has been collected by considering the Durg district as a unit. The research work is mainly based on secondary data from which government and non-government organizations, books, authors, various newspapers, magazines, and various internet websites have been used. A comparative analysis of the data obtained has been done.

Criteria for declaring a heatwave in India as per India Meteorological Department (2024):

The Indian Meteorological Department (IMD) has given the following criteria for Heat Waves :

1. Heat Wave need not be considered till maximum temperature of a station reaches at least 40°C for Plains and at least 30°C for Hilly regions
2. When normal maximum temperature of a station is less than or equal to 40°C Heat Wave Departure from normal is 5°C to 6°C Severe Heat Wave Departure from normal is 7°C or more
3. When normal maximum temperature of a station is more than 40°C Heat Wave Departure from normal is 4°C to 5°C Severe Heat Wave Departure from normal is 6°C or more
4. When actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heat waves should be declared. Higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change.(NDMA,2024)

Analysis of data related to temperature

Temperature expresses the ability of an object, substance or element to be hot or cold.

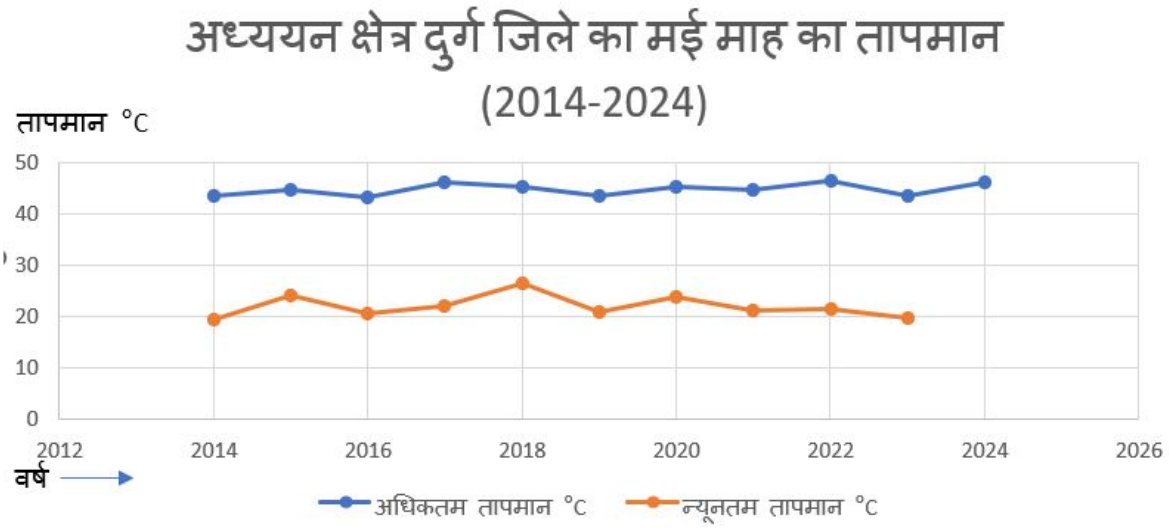
In the study area of Durg district, the hot winds blowing from Rajasthan in May and June created a heat wave area, due to which, severe heat persists during the afternoon and night. In the research paper, the maximum and minimum temperature data of the study area for a decade have been analyzed.

Temperature in May in the study area Durg district (2014-2024)

Year	Maximum Temperature°C	MinimumTemperature°C
2014	43.6	19.4
2015	44.6	24.3
2016	43.2	20.5
2017	46.1	22.2
2018	45.2	26.4
2019	43.6	20.8
2020	45.4	24.0
2021	44.8	21.2
2022	46.4	21.6
2023	43.6	19.7
2024	46.2	

Source : Patrika Newspaper (1 June 2024) (Weather api)

Temperature in May in the study area Durg district (2014-2024) MAXIMUM, MINIMUM



On 31 May 2024, the mercury reached its highest-ever high of 46.2 degrees centigrade this year. This is the third time in a decade that the mercury has reached 46 degrees centigrade. Earlier, the temperature of the study area was recorded as 46.4 degrees centigrade in 2015, 46.1 degrees centigrade in 2020 and 46.2 degrees centigrade in 2024. The highest-ever temperature of 47.4 degrees centigrade was recorded in 1988. There has been an increase of 2.6 degrees centigrade in temperature from 2014 to 2024. As compared to 2014, the temperature in 2015 was 2.8 degrees centigrade. Whereas, there was an increase of 0.9 degree centigrade in temperature in 2020 as compared to 2019. There will be an increase of 1.4 degrees centigrade in temperature from 2021 to 2022 and 3 degrees centigrade from 2023 to 2024. There has been an increase of 100 centigrade temperature. The temperature has been increasing continuously since 2014 which indicates climate change in the future. Most of the study area has developed as urbanization, as a result of which the heat absorption capacity of cities is more than that of rural areas. Also, this area is industrially developed and as it is an area of small and big industries, the temperature here increases dramatically during hot winds which is becoming a matter of concern.The mercury settled at 46.2 degrees Celsius at Nandyal in Andhra Pradesh, 45.3 degrees at Palwancha in Telangana, 44.3 degrees at Karur Paramathi in Tamil Nadu, 45 degrees at Bolangir in Odisha, and 44.3 degrees at Kalaikunda in West Bengal. (Economic Times 2/5/24)

Causes of Heat Wave Generation

The heat wave generation in the research area is directly related to climate change. The following are the factors responsible for the origin of this **phenomenon**

1. Uttarayan of the Sun

Since India is located on the Tropic of Cancer, when the sun moves northwards, it shines directly on the Tropic of Cancer, due to which the air temperature here increases, due to which local wind Loo is generated and this Loo flows from the western region towards various areas. The study area is also one of the areas where Loo flows, due to which heat waves are generated here. This is the primary reason for the heat wave generation.

2 **Greenhouse Gas**

Since the study area is an industrial and urban area, the concentration of greenhouse gases is high, which contributes to increasing the temperature.

3. **Urbanization**

Most of the study area is affected by urbanization. Here, government and residential buildings, roads are all made of concrete structures. This concrete structure absorbs a lot of heat, due to which the temperature remains constant, due to which the temperature becomes higher during heat waves.

4. **Reduction in forest area**

Forests cover 44% of Chhattisgarh, while in Durg district, the forest cover is less than one percent. Forest-free areas have a higher heat absorption capacity than forest areas, due to which the temperature increases during heat waves.

5. **El Nino**

One of the reasons for heat waves is El Nino, a warm ocean current flowing in the Pacific Ocean. When El Nino enters the Indian Ocean, it increases the temperature here, which becomes a reason for heat waves.

Effect of heat wave on the study area

The study area is a tropical monsoon region and hence intensive agriculture is done here, in which mainly food crops like rice and wheat are produced, due to which high population and high density are seen. The number of trees in the study area is very low because a large number of trees have been cut as a result of intensive agriculture and urbanization. The effect of heat waves is seen on human health, agriculture, water resources, trees, plants, animals and sudden fire incidents here, which are as follows

1. **Effect on human health**

According to WHO, exposure of the human body to extreme heat causes serious symptoms such as vomiting, diarrhea, fatigue, unconsciousness due to heat stroke, heat-related cramps, fatigue, heat stroke, headache, irritability, lethargy weakness, and chronic diseases people suffering from long-term diseases start emerging.

During the heatwave in the year 2024, there has been an increase in the number of patients suffering from various heat wave-related diseases like vomiting, diarrhea, dehydration, fatigue, weakness, fever etc. in Shastri Hospital, Chandulal Chandrakar Medical College, District Hospital Durg located in the study area Durg. More than 1000 people have been affected by heat wave in the state (Nai Duniya Newspaper, 1 June 2024)

2. **Effect on environment**

Heat waves have an effect not only on humans but also on plants. When the temperature increases, the process of photosynthesis gets obstructed and plants stop absorbing CO2 in high temperatures, which can become a huge problem. Due to the drying of ponds, various aquatic animals suffer heavy losses. Due to this, the net ecosystem gets destroyed.

3. **Formation of heat island**

In the study area, big cities like Durg Bhilai turn into a complete heat center due to hot air, due to which a heat island is formed in the city.

4. The study area is an agricultural area where agriculture is done in 33548 hectares, but due to high temperature, crop failure, low yield and lack of irrigation have an adverse effect on agriculture, due to which farmers suffer huge financial loss.

5. Water is obtained from some big dams of the state for various industries, ponds, drinking water and irrigation in the study area, but due to severe heat, the water level of the dams is continuously going down. Due to this, there is an obstruction in the supply of water. The water level of Gangrel Dam, which supplies water to the Bhilai Steel Plant of the research area, has gone down in May 2024 as compared to May 2023 last year. While the water level was 50.99 percent in May 2023, the water level came down by 28.31 percent in May 2024. Even in Tandula Dam, the water level which was 50.58 percent in May 2023 has come down by 15.207% in May 2024. The heat wave has had a direct impact on these water resources.

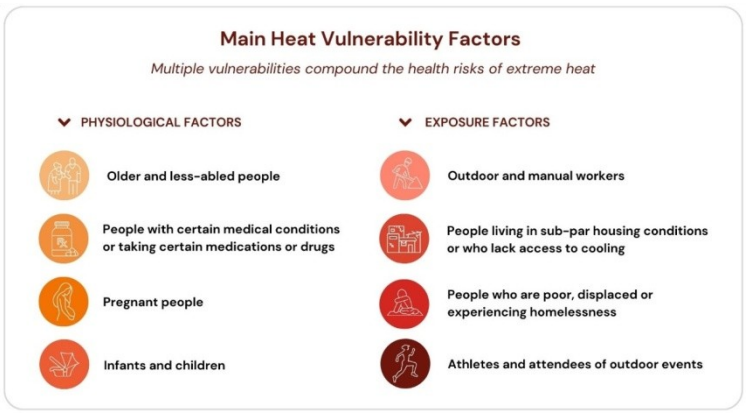
6. There are about 5 lakh consumers of the electricity company in the rural areas including Durg Bhilai city, due to the scorching heat, has had a direct impact on the consumption of electricity. To avoid the heat, the use of AC, coolers and fans by people has increased the consumption of electricity. Last year in May, the average electricity consumption was 201 MW, which increased to 224 MW in May 2024. That is, an increase of 23 MW was recorded as compared to last year. (Nai Duniya News, Bhilai Durg 1 June 2024)

7. Due to the scorching heat, various incidents of fire are coming to the fore, such as a sudden fire on the waste material of the factory located in Bhilai Three on May 27, a sudden fire in cars running on the roads, massive fire on Parvat bushes, apart from this, fire in the transformer due to overloading of electricity, all these fires have been caused by the heat wave.

Who is more vulnerable

Although heat waves affect everyone, from children to the elderly and even animals can suffer from them. There may be age-related, dietary and situational differences in the people who are more likely

to be affected by heat waves. The World Health Organisation has identified certain situations in which heat waves are more likely to cause them, as shown in the following chart.



Source- WHO infographic,2024

Heat Wave impact on health

It is possible that the same high temperature may have different effects on different individuals. It is therefore often the case that one person suffers from a heat wave in high temperature while another person does not. There are many situational factors that can cause this, the most important of which are:

1. The amount of food and water present in the body
2. And the body's metabolic process
3. The amount of heat radiation from the body
4. The type of clothing worn as this has a significant effect on the amount of heat radiation
5. The mode of direct or indirect exposure to heat waves.

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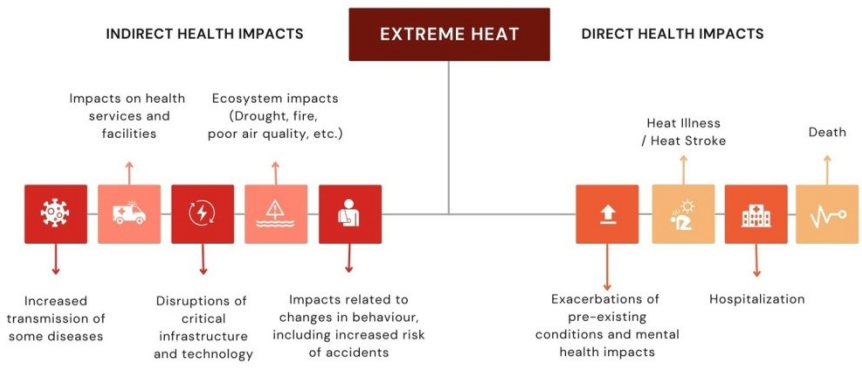

Source- WHO infographic,2024

Conclusion

A heat wave or Loo is a natural disaster and it increases the temperature of the area where it occurs, due to which hurts human health, plants, animals, agriculture, electricity, water resources, and ecological balance. Heat waves should be considered as another natural disaster and a special plan should be implemented for it. The study area of Durg district is affected by heat waves every year in May and June due to which the temperature is continuously increasing and it is continuously affecting human health. Hence, to save the people from heat waves, the state government can save the study area of Durg district from heat waves by making proper planning, creating awareness among people, developing medical facilities, tree plantation, and reducing the pace of urbanization.

Suggestions to prevent heat waves

Heat waves are a natural disaster. Certainly, unlike other natural disasters, heat wave is not given much attention but it has emerged as a serious problem. The following measures can be taken to prevent it.

1. Prepare an action plan in the study area. Prepare the heat wave prevention action plan in two parts, the first part should be immediate and the second part should be a long-term plan. The immediate plan should include awareness among people, medical facilities, water supply, electricity and in the long term, tree plantation, reducing the pace of urbanization, and reducing greenhouse gases.

2. The health department issues information related to heat waves from time to time, which can be disseminated to as many people as possible to prevent the damage caused by heat waves.

3. To increase the number of trees in the research area, trees should be planted in the vacant area so that the heat can be reduced.

4. By reducing the ever-increasing rate of urbanization by creating awareness among the government and people.

5. To reduce the number of vehicles and ACs in the study area, the government can adopt various formulas like one in the car, construction of houses with open spaces etc. to reduce the emission of greenhouse gases.

6. Some beds should be reserved in all hospitals for heat wave-related patients so that the patients can be treated on time and the mortality rate can be reduced.

Reference

1. World Health Organization (2024) https://www.who.int/health.Topics/heatwaves#tsb=tsb_1
2. Disaster management 2011 https://asdma.gov.in/pdf/publication/undp/disaster_management_in_india.pdf
3. Durg weather history https://www.weatherapi.com/history/may/q/durg-1113695
4. Economic Times 2 May,2024 : Intense heat sweeps east, south India; https://economictimes.indiatimes.com/news/india/intense-heat-sweeps-east-south-india-nandyal-in-andhra-sizzles-at-46-2-degrees/articleshow/109793569.cms?from=mdr
5. Government of India Ministry of Jal Shakti Department of Water Resources, River Development & GR Central Ground Water Board North Central Chhattisgarh Region, Raipur RAIPUR 2018, Durg District https://durg.gov.in
6. Govt. Of India Ministry of Earth sciences india meteorological department (2024). https://mausam.imd.gov.in

   Main Heat Vulnerability Factors,16 May 2024 WHO Infographic. https://www.who.int/multi-media/details/main-heat-vulnerability-factors
7. NDMA 2024 : National Disaster management authority https://ndma.gov.in/Natural-Hazards/Heat-Wave#:~:text=When%20actual%20maximum%20temperature%20remains,globally%20due%20to%20climate%20change.
8. Patrika (30 May 2024), Bhilai Durg https://epaper.putrika.com/home/mindex/
9. Scale and nature of the health impacts of heat : 16 May 2024, WHO Infographic. https://www.who.int/multi-media/details/scale-and-nature-of-the-health-impacts-of-heat
10. Uttar Pradesh State Disaster Management Authority Lucknow (2024) https//upsc/ms.up.nic.in
11. WHO , 28/5/24 https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health