

### Introduction

A heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity. Heat wave condition prevails over a region when the maximum temperature of that region continues to be 45°C for two consecutive days. It differs from country to country like in Netherlands, when the maximum temperature increases above 25°C (77°F) for at least 5 consecutive days it is defined as heat wave. In Denmark, a national heat wave is defined as a period of at least 3 consecutive days of which period the average maximum

+ (3 or 4) ° C – Moderate Heat Wave (or HWD)

+5° C or more – Severe Heat Wave Day (SHWD)

- III If the maximum temperature of any place continues to be 45° C consecutively for two days (40° C for coastal areas), it is also called a Heat Wave condition or HWD

### Origin of Heat wave

The weather patterns in summer changes slower than in winter. As a result, the mid-level high pressure also moves slowly. Under high pressure, the air sink towards the surface of the

## Heat Wave : An Alarming Concern for Contemporary World - A Case of Odisha

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temperature across more than fifty per cent of the country exceeds 28°C (82.4°F).

### Table 1. Temperature ranges for heat wave designation (IMD)

- I The normal temperature is < 40° C. Any increase from the above normal temperature is called a Heat Wave.
- + (5 or 6) ° C – Moderate Heat Wave or simply Heat Wave Days (HWD)
- +7° C or more – Severe Heat Wave Day (SHWD)
- II The normal temperature is ≥40° C. Any increase from the above normal temperature is called Heat Wave.

earth. This sinking air acts as a dome capping the atmosphere. This cap helps to trap the terrestrial heat instead of allowing it to lift. For which there is little or no convection and therefore no convective cloud formation with minimal chances for rain. This result in continual build up of heat at the surface that we experience as a heat wave. Rise in greenhouse gases intensifies an unusual atmospheric circulation pattern which becomes more pronounced at a particular period leading to such an extreme situation.

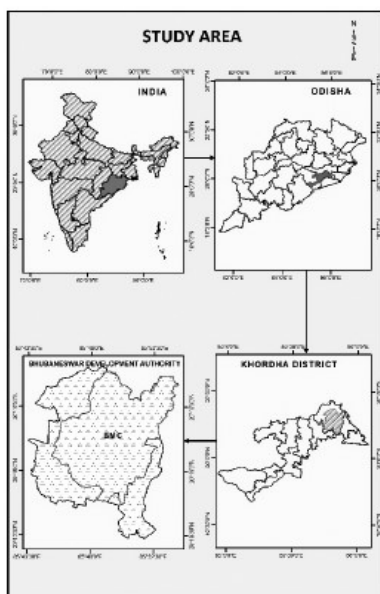
Some meteorologist has the opinion that advection of heat waves from the northwest India due to the strong westerly to north westerly wind

is the cause of heat waves over central and eastern India. Some anticyclones moving over north central India helps in thermal advection and cause heat waves. Favourable conditions which lead to the development of heat waves are as follows:

- There should be a region of warm dry air and appropriate wind direction for transportation hot air over the region.
- There should be no moisture in the upper air over the area.
- The sky should be cloud free to allow maximum insolation over the region.
- The lapse rate should approach to dry adiabatic rate.
- There should be a large amplitude of air flow.

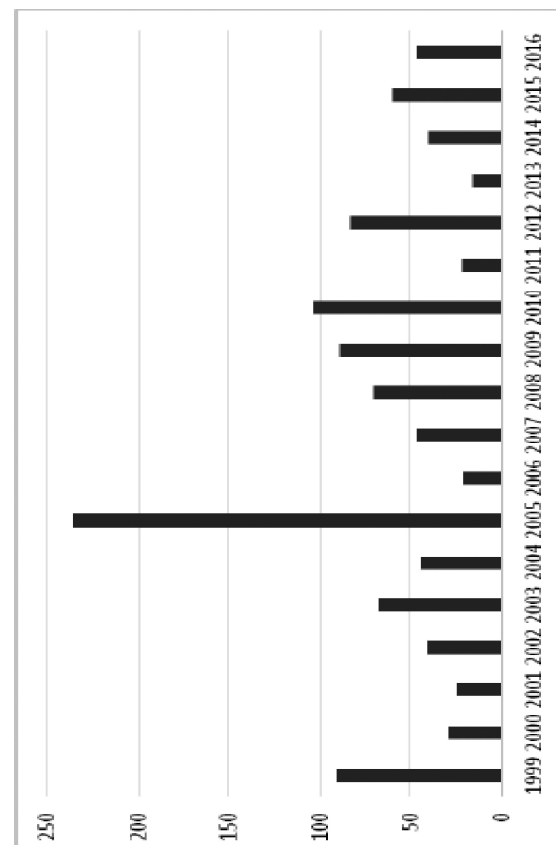
**Objectives:**

1. To analyse the heat wave situations in Odisha
2. To assess the major impacts of heat wave
3. To bring out awareness & adaptive measures for different vulnerable groups.



**Heat wave scenario in Odisha**

Heat wave in 1998 brought havoc in the state causing 2042 deaths which can be termed as “Heat wave year for Odisha”. Different remedial measures, awareness programmes were introduced by the state government to tackle the heat wave situations in future.



**Figure 1. Heat Wave related deaths in Odisha**

Data Source: Special Relief Commissioner, Odisha

Though extensive awareness campaigns have largely reduced the number of casualties during post 1998 period, still a good number of casualties are being reported each year. Heat wave has become a menace during the hard summer causing insurmountable human suffering.

The poor people, farmers and workers are the most vulnerable groups. Surprisingly, while coastal Odisha experiences less rise in temperatures compared to western Odisha, analysis by Heat Action Plan for Odisha reveals that there is an increased incidence in heat related illness in coastal Odisha which merits further attention. One of the factors could be the difference in humidity levels across the zones, while plausibility may be the lower adaptability of the people in coastal areas towards sudden increase in heat causing Heat Wave related morbidity and consequent mortality. At the same time, there is a need to assess community vulnerability for Heat Wave. Accordingly, suitable strategies can be designed

Heat index plays a vital role in heat related illness which combines the air temperature and relative humidity. North central districts of Odisha like Dhenkanal, Khurda, Angul even coastal districts like Ganjam are having highest number of casualties when heat wave is concerned. Western Odisha receive high temperature but due to the less relative humidity in the atmosphere there are less number of deaths owing to heat wave. South Odisha districts like Nawarangpur, Gajapati, Koraput are least affected by heat wave due the geo-physical orientation.

### Heat wave in Bhubaneswar

Bhubaneswar is the capital of Odisha. It is the largest city in Odisha and is a centre of

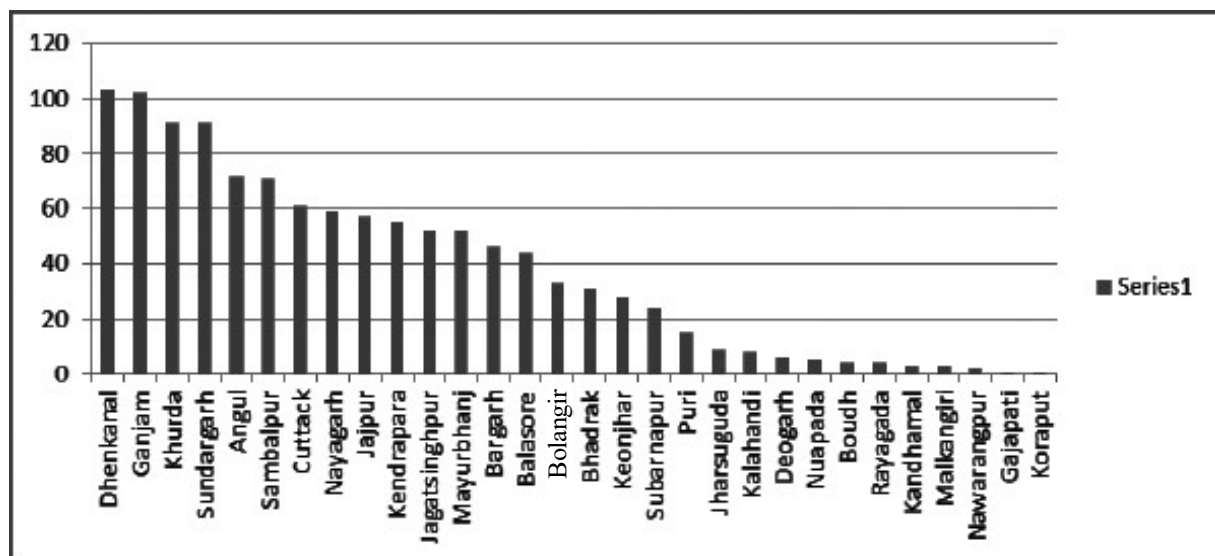
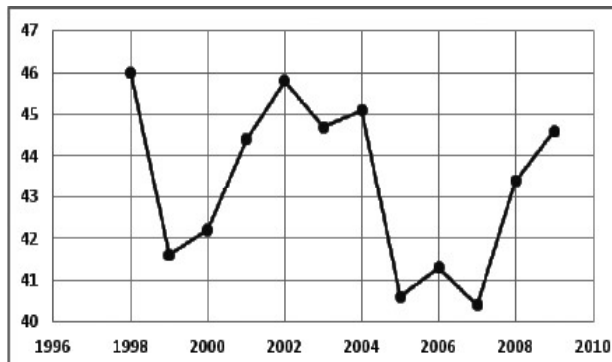


Figure 2. Heat Wave related deaths in 30 districts of Odisha during 1999-2009

Source: Special Relief Commissioner, Odisha.

to prevent and mitigate the problem. Limited attention has been given to community vulnerability assessment as well as creating mechanisms for building community resilience in the context of Heat Wave (HAP, 2017).

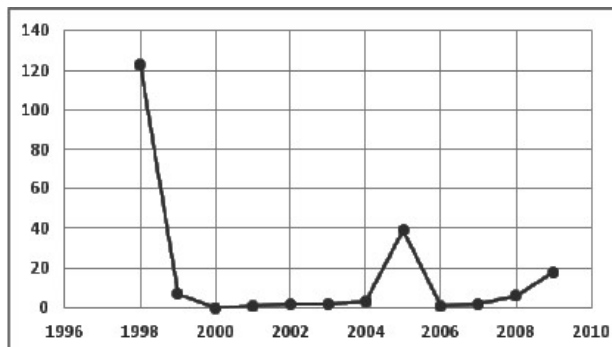
economic and religious importance in Eastern India. Due to rapid expansion of the cities with changing land use and land cover Bhubaneswar is experiencing change in weather patterns in recent times.



**Figure 3. Peak Temperatures of Bhubaneswar**

Data Source: Indian Meteorological Department (IMD), Bhubaneswar

Most of the green patches has been deforested for construction activities. It is having a humid climate due to its proximity to sea for which rise in temperature is more dangerous for its inhabitants. Over the period Bhubaneswar experienced number of deaths in different years.



**Figure 4. Number of deaths due to Heat wave in Bhubaneswar**

Data Source—Indian Meteorological Department (IMD), Bhubaneswar

In 1998, 123 people died due to heat wave after which in 2005, 39 people died due to the heat wave related to the El-Nino phenomena. With different remedial measures from

Government of Odisha and Bhubaneswar Municipal Corporation heat related death has been diminished.

### Impacts of Heat Wave

Heat wave has various impacts on environment, human health & different socio-cultural impacts on our society. Heat wave impacts on human health:

- **Heat Cramps:** It is a type of heat illness, are muscle spasms that result from loss of large amount of salt and water through exercise. Heat cramps are associated with cramping in the abdomen, arms and calves. This can be caused by inadequate consumption of fluids or electrolytes. Heavy sweating causes heat cramps, especially when the water is replaced without also replacing salt or potassium.
- **Heat exhaustion:** it is caused by failure of the body's cooling mechanism to maintain a normal core temperature. Due to physical work blood flow to skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock.
- **Heat Hyper pyrexia:** a condition marked by dizziness and nausea and weakness caused by depletion of body fluids and electrolytes, insolation, sunstroke, thermic fever, sudden prostration due to exposure to the sun or excessive heat. Type of: collapse, prostration. an abrupt failure of function or complete physical exhaustion.
- **Heat stroke:** a condition marked by fever and often by unconsciousness, caused by failure of the body's temperature-regulating mechanism when exposed to excessively high

temperatures. It is life-threatening and often referred as sunstroke.

Apart from the health impacts it also affects other aspects. In addition to physical stress, excessive heat causes psychological stress, to a degree which affects performance, and is also associated with an increase in violent crime. High temperatures are associated with increased conflict both at the interpersonal level and at the societal level. Heat wave badly affects the agricultural activities. It is very tough to work in field when there is a heat wave condition. Even it sometimes destroys the crops, with excess of heat that creates shortage of moisture content making it harder for the crops to survive. Heat wave affects the daily wage labourers. In summer it becomes hard to work under the scorching sun. sometimes the working hours are changed to maintain the gap, it seems simple but there are lots of complexities with it. Energy consumption during the heat wave condition rises. The electric transmission system is impacted when power lines sag in high temperature. The combination of extreme heat and added demand for electricity to run air conditioning causes transmission line temperature to rise. There are several impacts on transportation too. Aircraft lose lift at high temperatures. Stress is placed on automobile cooling systems, diesel trucks and railroad locomotives. This leads to an increase in mechanical failures. Train rail develop sun kinks and distort. Refrigerated goods experience a significant greater rate of spoilage due to extreme heat. The demand for water increases in during periods of hot weather. In extreme heat waves, water is used to cool bridges and other metal structures susceptible to heat failure. This causes a reduced water supply and pressure in many

areas. The rise in water temperature during heat waves contribute to the degradation of water quality and negatively impacts fish populations. It can also lead to the death of many other organism in the water ecosystem. High temperatures are also linked to rampant algae growth, causing fish kills in rivers and lakes.

#### **Adaptive measures for heat wave:**

Safety measures to be taken before Heat wave:

- Listen to local weather forecasts and stay aware of upcoming temperature changes.
- Be aware of both the temperature and the heat index. The heat index is the temperature the body feels when the effects of heat and humidity are combined.
- Discuss heat safety precautions with members of your household. Have a plan for wherever you spend time—home, work and school—and prepare for power outages.
- Check the contents of your emergency disaster kit in case a power outage occurs.
- Know those in your neighbourhood who are elderly, young, sick or overweight. They are more likely to become victims of excessive heat and may need help.
- If you do not have air conditioning, choose places you could go to for relief from the heat during the warmest part of the day (schools, libraries, theatres, malls).
- Be aware that people living in urban areas may be at greater risk from the effects of a prolonged heat wave than are people living in rural areas.
- Get trained in First Aid to learn how to treat heat-related emergencies.

- Ensure that your animals' needs for water and shade are met.

Measures to be taken during heat wave condition:

- Stay hydrated by drinking plenty of fluids even if you do not feel thirsty. Avoid drinks with caffeine or alcohol.
- Eat small meals and eat more often.
- Avoid extreme temperature changes.
- Wear loose-fitting, lightweight, light-coloured clothing. Avoid dark colours because they absorb the sun's rays.
- Slow down, stay indoors and avoid strenuous exercise during the hottest part of the day.
- Postpone outdoor games and activities.
- Take frequent breaks if you must work outdoors.
- Check on family, friends and neighbours who do not have air conditioning, who spend much of their time alone or who are more likely to be affected by the heat.
- Check on your animals frequently to ensure that they are not suffering from the heat.

Treating heat related illness:

- Get the person to a cooler place and have him or her rest in a comfortable position. Lightly stretch the affected muscle and gently massage the area.
- Give an electrolyte-containing fluid, such as a commercial sports drink, fruit juice or milk. Water may also be given. Do not give the person salt tablets.
- In case of emergency consult to a doctor as fast as possible.

### Conclusion:

Heat waves have significant implications for human beings and environment. This is

compounded by the increased frequency, length and intensity of heat waves in future predicted by a number of organisations such as intergovernmental panel on climate change. Existing studies played more focus on environmental issues. Future studies are required to focus on socio-cultural impacts to inform decision making. Think about a daily wage labourer and the dependence of their family on him/her. If he/she don't work for a day due to heat wave their family members suffer.

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