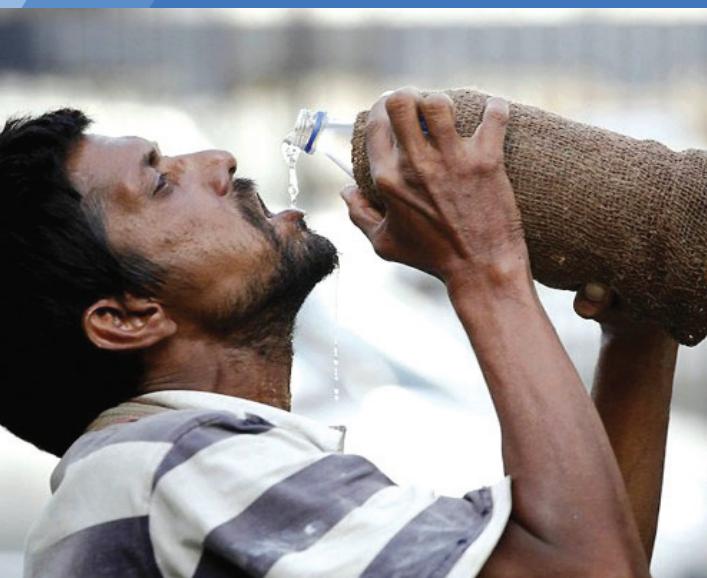


# **HEAT ACTION PLAN 2020 FOR ODISHA**

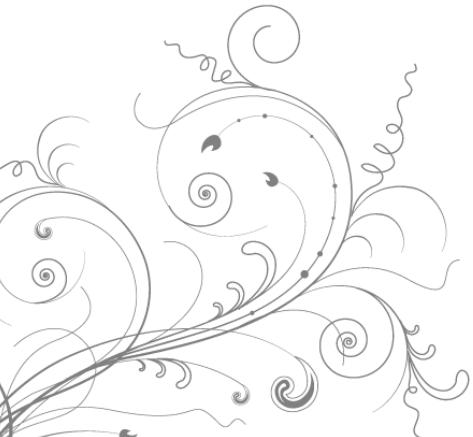


Prepared by  
Odisha State Disaster Management Authority (OSDMA)

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*Documentation & Designed :*

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# HEAT ACTION PLAN 2020 FOR ODISHA





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# ABBRIVIATION

ANM	Auxiliary Nurse Midwife
AIR	All India Radio
ASHA	Accredited Social Health Activist
AWS	Automatic Weather Station
BCC	Behavioral Change Communication
BMC	Bhubaneswar Municipal Corporation
CDMO	Chief District Medical Officer
CHC	Community Health Center
CMRF	Chief Minister Relief Fund
CPA	Critically Polluted Area
CPCB	Central Pollution Control Board
DHH	District Headquarters Hospital
DPH	Directorate of Public Health
ECBC	Energy Conservation Building Code
EOC	Emergency Operation Centre
ERP	Excess Risk Point
EWS	Early Warning System
HAP	Heat Action Plan
H&UD	Housing and Urban Development
HRI	Heat Related Illness
IHI	Industrial Heat Island
IEC	India Meteorological Department
IIPH	Indian Institute of Public Health
IIPH-B	Indian Institute of Public Health-Bhubaneswar
IMD	India Meteorological Department
I & PR	Information & Public Relation Department
IRADe	Integrated Research & Action for Development

IDRC	International Development Research Centre
DSP	Integrated Disease Surveillance Programme
LAI	Leaf Area Index
LULC	Land Use Land Cover
MHU	Mobile Health Unit
MRP	Maximum Risk Point
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NHM	National Health Mission
NOAA	National Oceanic and Atmospheric Administration
NRDC	National Research Development Organization
ORS	Oral Rehydration Solution
OSDMA	Odisha State Disaster Management Authority
PHC	Primary Health Center
PRI	Panchayat Raj Institution
RI	Routine Immunization
RIMES	Regional Integrated Multi-Hazard Early Warning System
SDH	Sub Divisional Hospital
SDRF	State Disaster Response Fund
SIHFW	State Institute of Health and Family Welfare
SPCB	State Pollution Control Board
SRC	Special Relief Commissioner
SRO	Special Relief Organization
TERI	The Energy and Researches Institute
ULB	Urban Local Bodies
UHI	Urban Heat Island
VHND	Village Health Nutrition Day
WMO	World Meteorological Organization
WHO	World Health Organization
WUA	Water User Board



**Pradeep Jena, IAS**  
Additional Chief Secretary &  
Managing Director



**ODISHA STATE DISASTER  
MANAGEMENT AUTHORITY**  
(A GOVERNMENT OF ODISHA AGENCY)

BHUBANESWAR

D.O. NO. \_\_\_\_\_ /OSDMA  
Dated, the 04. 03. 2020



## PREFACE

There has been an increasing trend of heat waves in India over the past several years impacting many States, Districts, Cities and Towns. The World Meteorological Organisation (WMO) has issued a statement on global climate in 2018 asserting that global temperature would continue to increase due to climate change and global warming. Heat Waves in Odisha took a toll of 2042 people in 1998. In 1999, the state implemented the 1<sup>st</sup> Heat Action Plan (HAP). In spite of having HAP in place, the state experienced another massive heat wave causality of 236 in 2005. Since then, the Government is taking various proactive measures like departmental HAP and awareness programmes. As a result, there is a decreasing trend in heat wave related casualties. Keeping in view of World Meteorological Organization (WMO) prediction on heat related fatalities to be doubled in less than next 20 years, there are challenges ahead for the scientific communities, researchers and policy makers to revisit and strengthen Heat Action Plan by taking preventive and adaptive measures and building resilience in economy and livelihood sectors to minimise potential deaths and adverse effects of heat wave.

Like previous years, this year HAP 2020 has been prepared by inclusion of action plans of all stakeholders' departments. I am sure that, the policy makers, administrators and field level functionaries will find the HAP 2020 very useful and hope that the nodal officers of the departments as well as the Districts Collectors will take early and required steps at appropriate time in dealing with heat wave during the ensuing heat wave season from April to June to minimise the adverse impacts.



**(Pradeep Jena)**

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# ACKNOWLEDGEMENT

Odisha State Disaster Management Authority (OSDMA), is mandated under the Disaster Management Act, 2005 to prepare Heat Action Plan for the State in a comprehensive manner by involving all stakeholders. This Heat Wave Action Plan 2020 is updated as per the National Guidelines in October 2019 of NDMA, Government of India. The plan is improvised by considering the increase in heat waves and its impact on social economic lives of people of the state. The Action Plan suggests a number of mitigations, preparedness and response activities to tackle the menace of the heat wave. Mass public awareness through electronic and print media has been accepted as the key to tackle heat wave.

OSDMA takes this opportunity to sincerely acknowledge all the concerned Government Departments for their valuable inputs in preparing the Heat Wave Action Plan 2020. OSDMA also sincerely acknowledges the contribution of Dr. H.R. Biswas, Director of IMD for his valuable insights in making the Heat Wave Action Plan 2020. The contribution made by the team especially P.K Bhatta and S.K.Dastidar, Weather Experts at State Drought Monitoring Cell (SDMC), Laxmi Narayan Nayak, SPO and Nodal Officers deserve sincere acknowledgement.

Finally, OSDMA sincerely acknowledge time to time guidance and advice of Shri Pradeep Jena, Additional Chief Secretary (DM) & Managing Director, OSDMA.

Any error /omission of the document may please be brought to the notice of OSDMA.

**(Dr. Pradeep Kumar Nayak)**  
**Chief General Manager**



heat-stroke  
body  
dangerous  
sun stroke  
heat stroke  
**sunburn**  
prevention  
unhealthy  
red skin  
climate  
sweating  
water  
insolation  
sunlight  
dizziness  
danger  
outdoor  
blackout  
influence  
medicine  
cool  
suffer  
aid  
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symptoms  
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sun  
weakness  
disease  
high pain  
healthcare  
sunbeam  
refreshing  
sunshade  
parasol  
heat illness  
treatment  
fatigue  
hyperthermia  
heat wave  
unconsciousness  
attack  
threat  
burn  
exertion  
overload  
thermoplegia  
sweat  
exhausted  
sport  
holiday  
bathing  
weak  
sunburn  
nauses  
sunshine  
vacation  
searching  
resort  
harm  
collapse  
heat exhaustion  
outdoors  
collapse  
heat exhaustion  
care  
sick  
sickness  
tired  
strong  
summer  
headache  
fever  
thermometer  
thermoregulation  
sick



## Chapter:1

# INTRODUCTION



## Objective of Heat wave Action Plan

The Heat Wave Action Plan aims to provide a framework for implementation, coordination and evaluation of extreme heat response activities in cities/ town that reduce the negative impacts of extreme heat. The Plan's primary objective is to alert those at risk of heat-related illness in places where extreme heat conditions either exist or are imminent, and to take appropriate precautions. The Plan also calls for preparedness measures to protect livestock/ animals as extreme heat causes significant stress to them as well. The heat wave action plan is intended to mobilize departments and communities to help protect their neighbors, friends, relatives, and themselves against avoidable health problems during spells of very hot weather. The Plan also intends to help early warning agencies as well as the media. The administrative/preventive actions that need to be taken by multiple agencies/ ministries/ departments are enumerated in Table 5. All States/district/cities/town can learn from their/ others' experiences and develop a plan to deal with heat wave effectively.

## Preparing a Heat Wave Plan *(NDMA guidelines -October 2019)*

City-level medium/long term measures

- \* Identification and evaluation of factors leading to disproportionate increase in temperature within the city.

- \* Generating a heat wave risk and vulnerability map for developing strategic mitigation action plan.
- \* Mapping hot-spots within the city and integrating them in vulnerability assessment.
- \* Measures to reduce temperature in these hot spots by developing vertical gardens, small parks with a water fountain etc must be developed.
- \* Co-ordination with different research and educational institution for built environment assessment.
- \* Allocate part of research and development in the financial budget approvals for heat wave action planning.
- \* Curbing future UHI manifestation by incorporating findings from the built environment assessment into urban planning and design policies or byelaws.
- \* Integrating heat action plan with development plan. Development plan should focus on reducing heat stress and water stress in the city.
- \* Adhering to building codes in the city

## Goals

### Recurring /Regular Activities

- \* Putting up display boards for colour heat wave alerts and Do's and Don'ts in public places such as parks, hospital, etc.
- \* Multiple medium of communication (preferably in local languages) like TV, Radio and newspaper for awareness.
- \* Identify and reduce awareness gap through disseminating of information using pamphlets hoardings, LED display on advertisement boards.
- \* Change in timings of school, college, office, markets, etc.

### Short-Term

- \* Installing temporary kiosks for shelter, and distribution of water medicines, etc
- \* Developing mobile application for spreading awareness on heat-related issues and locating shelters, drinking water kiosks, etc.
- \* Issuing advisories for tourists.
- \* Setting up special cool shelters for "Wage Employment Programmes" such as Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGA).
- \* Providing shade and drinking water for on-duty traffic personnel.

## **Medium Term**

- \* LED Display boards installed at District Headquarters displaying the real-time weather data pertaining to Rainfall, Temperature, Humidity and Wind Speed should be incorporated into precautionary measures for Disaster Management.
- \* Involving Forest department for collating local coping and adaptation strategies, indigenous technologies such as vernacular building materials, construction of the green building, Energy Conservation Building Code (ECBC)etc. related to heat wave risk mitigation.
- \* New heat wave criteria must be evolved based on gridded date with maximum and minimum temperature, to develop a scientific model to determine all cause mortality.
- \* Zonal / regional Heat Action Plan for megacities like Delhi, Mumbai etc should be developed for its effective implementation.
- \* Identify “heat hot-Spots” in India through appropriate tracking and modelling of meteorological data and promote the timely development and implementation of local Heat Wave Action Plan with strategic inter-agency co-ordination, and response which targets the most vulnerable groups.

## **Long Term**

- \* Focused capacity building-Heat wave mitigation management should be added in school curriculum to sensitize school children and local people. Training programmes in local level/ community level for awareness among people.
- \* Integrate climate variability mitigation and adaptation efforts in HAP.
- \* Yearly improvisation of heat wave plan through response and feedback data Collection.
- \* Operational forecast of maximum temperature over India in short, Medium and extended range timescale is very useful in giving Heat Wave outlook.
- \* Upgradation of forecast system and associated equipment to provide heat wave alerts minimum of 2 to 3 weeks prior to the event.
- \* Health-harming air pollution apportionment studies, emission inventories, and health impact assessment of ambient and household air pollution through State-wise Clean Air Action Plan and use these findings to inform policies targeted at reducing the main sources of pollution via an inter-ministerial approach.
- \* Evaluation of cascading effects of heat waves over flood, drought and hydrological models.
- \* Involvement of academia along with collaboration and more participation from higher

educational institutes may be developed. The centres for excellence and dedicated research centres may have a pivotal role to play.

## Key Strategies

Severe and extended heat waves can also cause disruption to general, social and economic services. Government agencies will have a critical role to play in preparing and responding to heat waves at the local level, working closely with health and related departments on a long-term strategic plan.

- \* Establish early Warning System and Communication System.
- \* Developing inter-agency response plan and coordination in field
- \* Preparedness at the local level for health eventualities
- \* Health care system capacity building
- \* Public awareness and community outreach
- \* Collaboration with private, non-government and civil society
- \* Assessing the impact- feedback for reviewing and updating the plan

## Background

### What is Heat Wave?

Heat wave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can cause deaths as well. The World Meteorological Organization (WMO) defines a heat wave as five or more consecutive days during which the daily maximum temperature exceeds the average maximum temperature by five degrees Celsius. Different countries define heat wave differently in context of their local conditions. In India, as per India Meteorological Department (IMD) classification, heat wave is considered if maximum temperature of a station reaches at least 40°C or more for plains, 37°C or more for coastal stations and at least 30°C or more for hilly regions. Following criteria are used to declare a heat wave:

#### a) Based on Departure from Normal

- \* **Heat Wave:** Departure from normal is 4.5°C to 6.4°C
- \* **Severe Heat Wave:** Departure from normal is >6.4°C

#### b) Based on Actual Maximum Temperature (for plains only)

- \* **Heat Wave:** When actual maximum temperature  $\geq 45^{\circ}\text{C}$
- \* **Severe Heat Wave:** When actual maximum temperature  $\geq 47^{\circ}\text{C}$

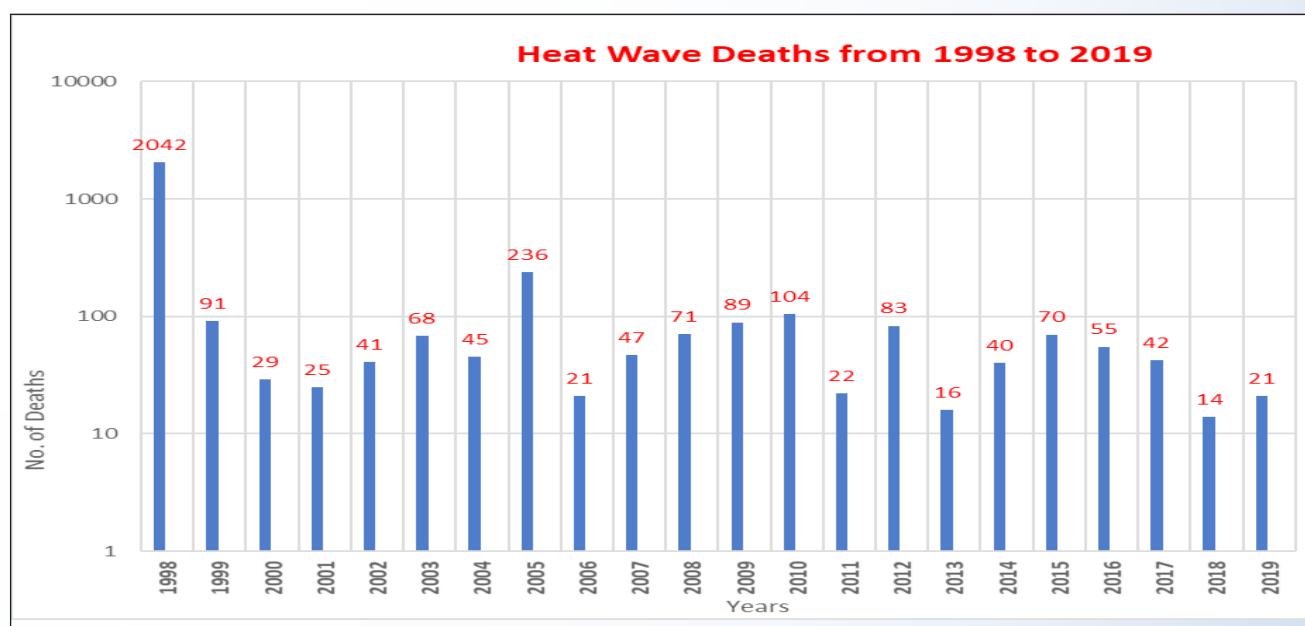
To declare a heat wave, the above criteria should be met at least at two stations in a Meteorological sub-division for at least two consecutive days. A heat wave will be declared on the second day. The level of heat discomfort is determined by a combination of meteorological (temperature, RH, wind, direct sunshine), social/cultural (clothing, occupation, accommodation) and physiological (health, fitness, age, level of acclimatization) factors. There will be no harm to the human body if the environmental temperature remains at 37° C. Whenever the environmental temperature increases above 37° C, the human body starts gaining heat from the atmosphere. If humidity is high, a person can suffer from heat stress disorders even with the temperature at 37°C or 38°C as high humidity does not permit loss of heat from human body through perspiration.

**Source:** NDMA Guidelines for Preparation of Action Plan- Prevention and Management of Heat-Wave-2017

## Heat Wave Situation in Odisha

In the year 1998, the State of Odisha faced an unprecedented Heat Wave situation, as a result of which 2042 persons lost their lives. 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 hard summer and prolonged causing insurmountable human suffering. The poor people, farmers and workers are the most vulnerable groups.

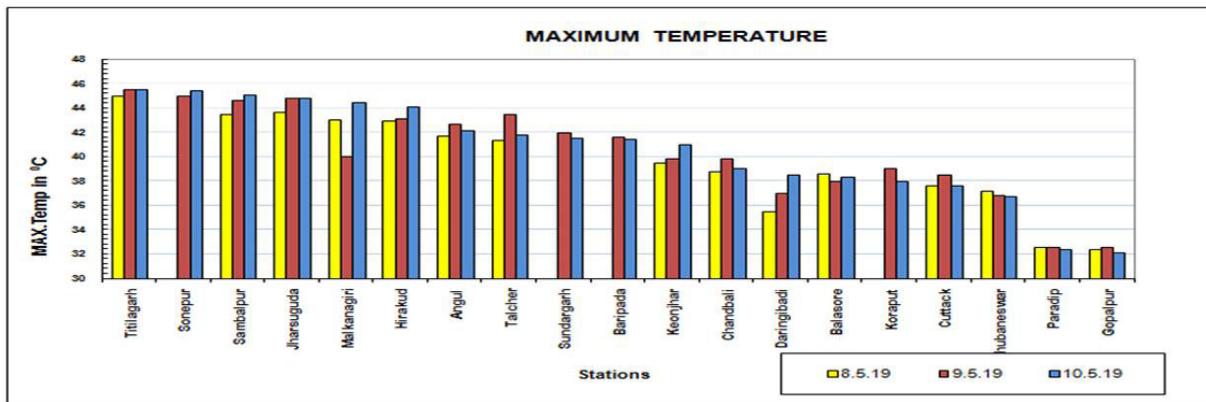
Figure 1: Heat Wave Related Death in Odisha During 1998-2019



(Source: O/o Special Relief Commissioner, Odisha)

**1.05.2019**  
**Heat Condition over Odisha**

Sl. No.	Station	Maximum Temperature (°C)	Relative Humidity (%) at 17.30	Sl. No.	Station	Maximum Temperature (°C)	Relative Humidity (%) at 17.30
1	Titilagarh	45.5	19	13	Daringibadi	38.5	68
2	Sonepur	45.4	23	14	Balasore	38.3	80
3	Sambalpur	45.1	29	15	Koraput	38.0	36
4	Jharsuguda	44.8	13	16	Cuttack	37.6	72
5	Malkangiri	44.4	34	17	Bhubaneswar	36.7	75
6	Hirakud	44.1	22	18	Paradip	32.4	89
7	Angul	42.1	52	19	Gopalpur	32.1	84
8	Talcher	41.8	36				
9	Sundargarh	41.5	63				
10	Baripada	41.4	72				
11	Keonjhar	41.0	38				
12	Chandbali	39.0	66				



**Observations:**

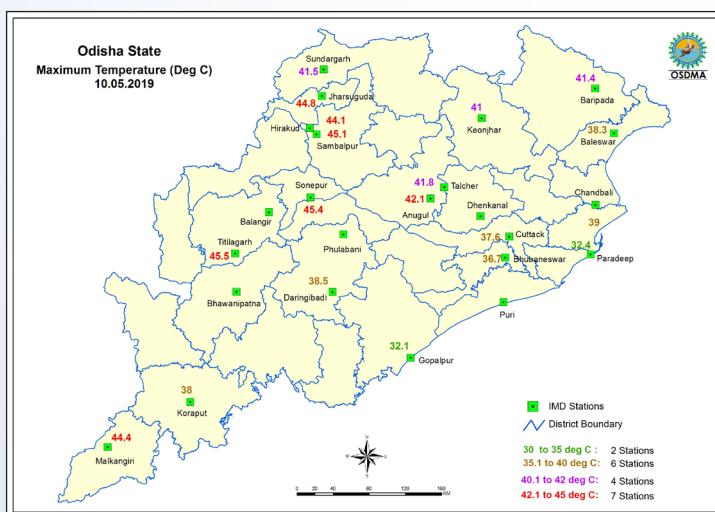
- Slight variation in max temperature in most of the stations.
- Eleven stations have crossed 40°C of the max temp.

**Forecast:**

- Maximum temperature (day temperature) likely to be above normal by 3-5°C over the districts of interior Odisha and 2-3°C above normal over the districts of coastal Odisha during next 2-3 days.
- Light rain or thunder-shower likely to occur at one or two places over the districts of Nayagarh, Malkangiri, Koraput, Nuapada, Bargarh, Sambalpur, Jharsuguda, Sundargarh, Keonjhar, Deogarh, Mayurbhanj, Balasore, Bolangir, Sonepur and dry weather likely to prevail over the rest districts of Odisha.

Data Source: IMD, Bhubaneswar

GIS Cell, OSDMA

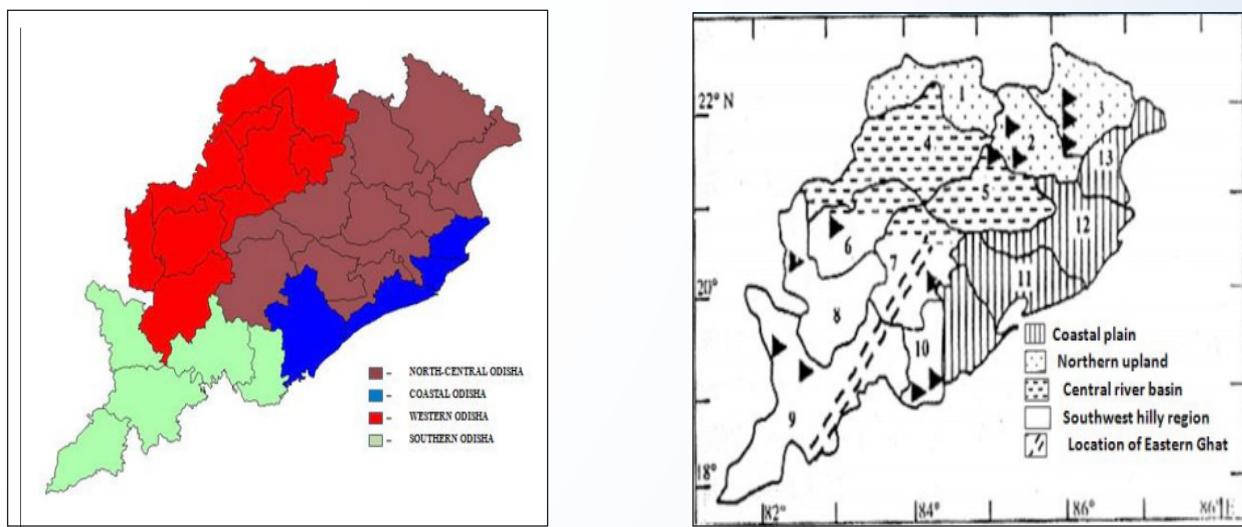


## Geo-physical Snapshot of Odisha

Odisha is surrounded by the states of West Bengal to the north-east, Jharkhand to the north, Chhattisgarh to the west and north-west, Telangana to the south-west and Andhra Pradesh to the south. The state has 480 km of coastline along the Bay of Bengal on its east. According to the 2011 census of India, the total population of Odisha is 4,19,74,218, of which 2,12,12,136 are male and 2,07,62,082 are female, or 979 women per 1000 men. This represents a 14.0% increase over the population in 2001. The population density is 270 per square kilometer. The state projects distinct yet homogeneous features of topography. With a blend of several physiographical features in Odisha, the state exhibits three broad distinct morphological features: coastal plains, southern mountainous and plateau, western rolling uplands. The summer season in Odisha commences in March and stretches till June. The temperatures are quite high during this time and the sun very harsh. The maximum temperature of Odisha, in the summer season, goes well above 40 degree Celsius. The pattern of Heat Wave is different in different parts of the state, like coastal area experiences humid heat, whereas western part experiences more dry heat.

Different temperature zones and temperature ranges are given in *Figure 2*.

**Figure- 2 :Different Temperature Zones in Odisha and Their Temperature Ranges**

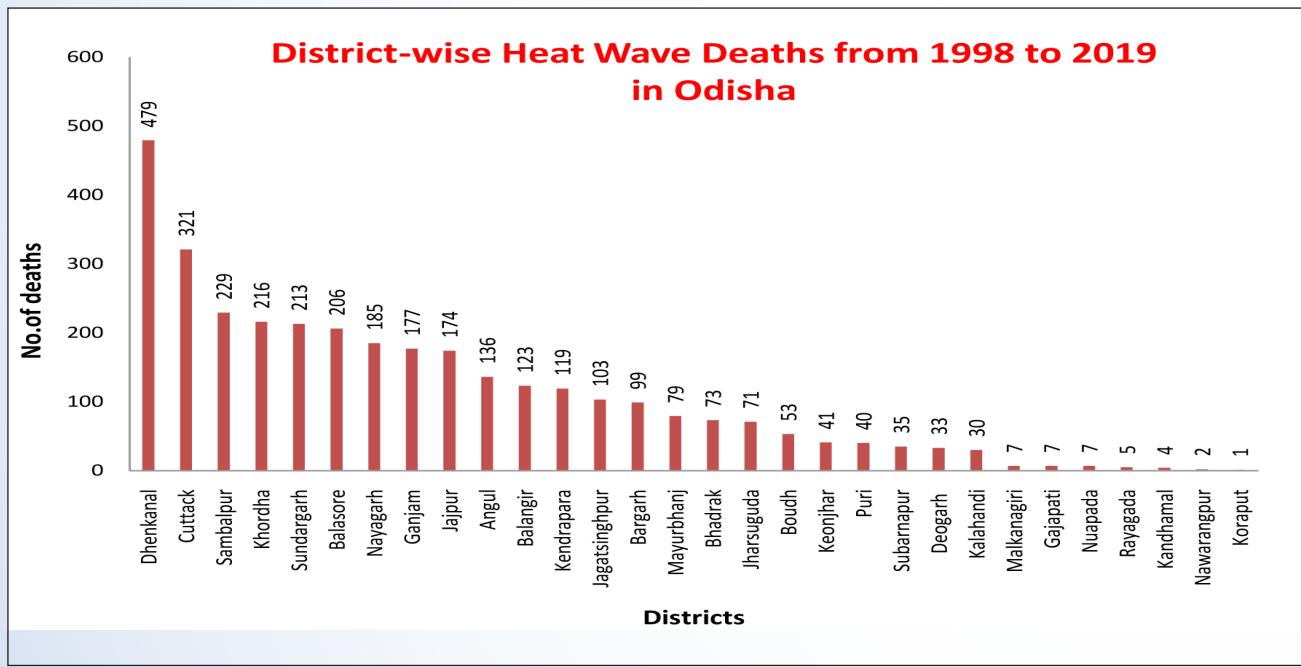


Coastal Odisha: $q \geq 35^\circ C < 39^\circ C$  (Gopalpur, Paradeep, Puri); North-Central Odisha: $q \geq 42^\circ C < 44.50^\circ C$  (Balasore, Cuttack, Baripada, Phulabani, Keonjhar, Chandbali, Bhubaneswar); Western Odisha: $q \geq 44.50^\circ C < 48.00^\circ C$  (Titilagarh, Bhawanipatna, Jharsuguda, Bolangir, Anugul, Sambalpur, Sundergarh, Hirakud) and Southern Odisha: $q \geq 39.00^\circ C < 40.00^\circ C$  (Koraput)

## Rationale for Strengthening the Heat Action Plan (HAP)

Heat Waves in Odisha in the year 1998 killed 2042 people. In the year 1999, the state implemented the first HAP in the state. Despite having a HAP in place, the state experienced another massive Heat Wave casualty in the year 2005 by losing 236 lives. There could have been many possible reasons, which are going to be exacerbated in coming years with growing urbanization, population and industrialization. The problem is further going to be magnified with ongoing climate change. According to estimates, the scenario is likely to become aggravated in coming years<sup>1</sup>, and the World Meteorological Organization (WMO) predicts heat related fatalities will double in less than 20 years. This demands the policy makers and researchers to revisit and strengthen the current HAP. Our preliminary review finds that, till date mostly the Heat Wave measures have been preventive in nature. However, prolonged summer periods, increased temperature and climatic changes require designing adaptive measures and building resilience in the informal economy sector (vulnerability assessment and alternate livelihood generation of the vulnerable population) along with the preventive actions. Under these circumstances, adaptation is a key response strategy to minimize potential deaths and other adverse health effects of Heat Waves.<sup>2</sup>

**Figure 3: Heat Wave Related Deaths in 30 Districts of Odisha During 1998-2019**



(Source: Special Relief Commissioner, Odisha)

<sup>1</sup> IPCC (2007b). Climate Change 2007: Synthesis Report. Contribution of Working Group I, II and III to the Forth Assessment Report of the Intergovernmental Panel on Climate Change, RK Pachauri and A Reisinger (ed). IPCC, Geneva, Switzerland, 104 pp.

<sup>2</sup> Menne, B, KL Ebi (ed) (2006). Climate Change and Adaptation Strategies for Human Health (based on the report of the eCASHh project). WHO Regional Office for Europe, SteinkopftVerlay Darmstadt, Germany, 449pp.

Surprisingly, while coastal Odisha experiences less rise in temperatures compared to interior Odisha, our analysis 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. Particularly, in view of Odisha's distinct geophysical region, it is important to determine region specific thresholds combining temperature and humidity (thermo-hygrometric index) 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 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.

### **Impact of Heat Wave on Agricultural Productivity**

Apart from impact on human life, the Heat Wave has also been found to profoundly affect crop production both in terms of quantity and quality. Primarily, crop loss happened due to flower drop and higher mortality in new plantations. Kharif crops are more impacted than Rabi crops owing to variability in rainfall associated with Heat Wave. Since, Kharif crops are sown in May to June and harvested in September to October; any extreme change in temperature would affect the productivity. Within Kharif, particularly rice production is significantly affected with decreased grain yield which is a matter of concern as rice is a staple diet of all Odisha's population.

### **Impact of Heat Wave on Life and Livelihood**

The human thermo regulatory system has limits. Our muscles generate heat, which must be shed to the environment to maintain our core temperature of about 36.70C. Evaporation of sweat helps human bodies to keep cool when it is hot, however, when there is excessive sweating it leads to dehydration with consequent rise in internal body temperature which will be fatal. More or less, Odisha's population might be acclimatized to heat and humidity but there is an upper level of heat tolerance limit. However, acclimatization to heat can only offer limited protection. When temperature soars beyond the tolerance limit, precautionary measures like avoiding the sun and physical exertion, maintaining hydration, and resting in a cool place are suggested.

However, serious challenges arise when extreme heat events linger for prolonged periods, as cessation of activities for weeks is often not an option. Especially, majority of Odisha's individuals are working in unorganized and informal sectors that have to earn their daily livelihood. Thus, on the advent of long spells of Heat Wave they either have to stay indoors

and compromise their source of income or run the risk of succumbing to Heat Wave related illness upon exposed to sun during their work. This necessitates exploring alternate options for such kind of vulnerable population for income generation to sustain a healthy life. In view of the above, there was a need to revisit and strengthen the existing Heat Wave response plan in order to make it more specific and strategic.

## **Early Warning and Communications**

### **1. Forecast and Issuance of Heat Alert or Heat Warning**

India Meteorological Department (IMD), Ministry of Earth Sciences, is the nodal agency for providing current and forecast weather information, including warnings for all weather-related hazards for optimum operation of weather-sensitive activities. It provides warning against severe weather phenomena like tropical cyclones, squally winds, heavy rainfall/snow, thunder-squall, hailstorm, dust storms, heat wave, warm night, fog, cold wave, cold night, ground frost, etc. It also provides real time data and weather prediction of maximum temperature, heat wave warning, extreme temperatures, and heat alerts for vulnerable cities/rural areas.

IMD issues forecasts and warnings for all weather-related hazards in short to medium range (valid for the next five days) every day as a part of its multi-hazard early warning system. These warnings, updated four times a day, are available at <http://www.imd.gov.in/pages/allindiawxfbulletin.php>.

A new system of exclusively heat-related warnings has been introduced with effect from 03 April 2017. These warnings, valid for the next 5(five) days, are issued around 1600 hours IST daily and are provided to all concerned authorities (Departments of Health, Disaster Management, Indian Red Cross and Indian Medical Association, NDMA etc.) for taking suitable action at their end. A bulletin in extended range with outlook for the next two weeks (for all hazards including heat wave) is issued every Thursday (available at <http://www.imd.gov.in/pages/extended.php>).

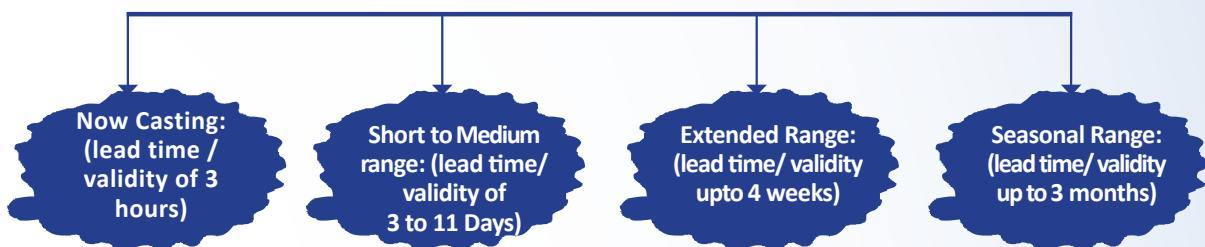
In addition to the above, Climate Forecast System based forecasts maps of daily maximum temperatures and their departures from normal for the next 21 days (issued every Thursday) are also

available on IMD website ([http://nwp.imd.gov.in/cfs\\_all.php?param=tmax](http://nwp.imd.gov.in/cfs_all.php?param=tmax) & ([http://nwp.imd.gov.in/cfs\\_all.php?param=tmaxa](http://nwp.imd.gov.in/cfs_all.php?param=tmaxa), respectively).

From 2016, IMD has introduced a system of issuing seasonal temperature outlooks for the next three months. For 2017, the first outlook valid for March to May was issued on 28 February 2017; and the second one valid for April to June was issued on 02 April 2017. These seasonal outlooks are issued in the form of a press release on the IMD website, and through electronic and print media. These are also provided to all concerned Chief Secretaries, Disaster Managers and to the health sector through the India Medical Association (IMA).

The operational system of weather forecasts and warnings is summarized in the chart below:

#### **Temperature Forecast: Specific Range, Time duration and area**



It currently provides weather forecast information on the basis of satellite imagery, mathematical modeling, GPS Sonde monitoring and Doppler radar system. It gives weather forecasting taking into account the temperature (both dry bulb temperature and dew point temperature), wind pattern, cloud pattern and a few other parameters. The temperature/city forecast is done two times a day i.e. at 10 AM, and 6 PM for one week in respect of 16 cities in the State of Odisha. Besides city forecast, forecast along with warning are also issued for next five days at 10 AM, 1 PM, 6 PM & 9 PM. The 1 PM forecast is forwarded to state agencies and media by fax and E-mails.

IMD gives a Heat Wave forecast particularly during the months from March to mid-June . The cut off temperatures for Heat Wave Forecast are

- \* 37 °C for the coastal areas
- \* 40 °C for the interior areas

The IMD also provides warnings based on heat index (based on temperature and humidity). The reliability of these forecasts is up to a level of 85%. It disseminates information directly to Special Relief Commissioner (SRC) and Odisha State Disaster Management Authority (OSDMA) by fax along with various state agencies, Doordarshan, All India Radio (AIR) and other media houses by mails. In case of an expected Heat Wave, mails are also sent to all the district collectors for alertness and preparedness for action.

## 2. Identification of Colour Signals for Heat Alert

IMD currently follows a single system of issuing warnings for the entire country through a colour code system as given below (Figure-4). This system advises on the severity of an expected heat hazard. However, threshold assessments carried out in different parts of the country tells us that there are different cut-off points that determine the warning signals appropriate for a specific state/region. The States should, therefore, carry out their respective threshold assessments for mortality and provide the information to IMD so that it can provide specific warning alerts to those States.

**Figure-4: Color Code, Meaning, Temperature Details and Action Needed**

Colour Code	Alert	Warning	Impact	Suggested Actions
Green (No action)	Normal Day	Nil	Comfortable temperatures	No cautionary action required
Yellow Alert (Be updated)	Heat Alert	Heat wave conditions at district level, likely to persist for 2 days	Heat is tolerable for general public but moderate health concern for vulnerable people e.g. infants, elderly, people with chronic diseases.	Avoid heat exposure
Orange Alert (Be prepared)	Severe Heat Alert for the day	i. Severe heat wave conditions likely to persist for 2 days. ii. With varied severity, heat wave is likely to persist for 4 days or more.	Increased likelihood of heat illness symptoms in people who are either exposed to sun for a prolonged period or doing heavy work. High health concern for vulnerable people e.g. infants, elderly, people with chronic diseases.	Avoid heat exposure—keep cool. Avoid dehydration
Red Alert (Take Action)	Extreme Heat Alert for the day	i. Severe heat wave likely to persist for more than 2 days. ii. Total number of heat/severe heat wave days likely to exceed 6 days.	Very high likelihood of developing heat illness and heat stroke in all ages.	Extreme care needed for vulnerable people.

*Impact & action suggested is based on NDMA Guideline on heat wave*

(<https://ndma.gov.in/images/guidelines/heatwaveguidelines2017.pdf>)



## Chapter : 2



# RESEARCH AND FINDINGS ON THRESHOLDS

## Finding of Study on Health Effects of Exposure to Heat Stress, Vulnerability, and Heat Threshold in Odisha

(Indian Institute of Public Health-Bhubaneswar, Public Health Foundation of India)

### 1. Studying the Effects of Heat Stress on Health and Productivity

Effect of heat stress on health and productivity of high risk population in Bhubaneswar (Conducted by IIPH-Bhubaneswar, funded by IRADe)The study aimed to assess the impact of heat-stress on vulnerable population. IIPHB conducted a survey during May-June 2018 on vulnerable households and individuals with high risk occupations. It identified 10 hot-spot clusters in Bhubaneswar city and interviewed 25 to 30 randomly selected households, and about 100 individuals with high-risk occupation (HRO).

#### Key Findings

##### Household

- At household level, the frequently reported symptoms of exposure to heat stress were: sweating (91.4%), headache (45.4%), dizziness (41.9%), %), dehydration (37.1%),

excessive thirst (30.2%), and heat rash (29.9%). The median discomfort period ranges from 10 am to 4 pm. Majority of respondents were aware of the treatment facilities available within the city, though the most preferred methods for receiving heat-stress information were Radio/TV (78.4%) and Newspapers (27.5%).

2. Comfortable clothing, using hand fans, electric fans/AC/cooler, and drinking water frequently were frequently used mechanisms to cope with heat-stress at individual level. About 77% and 63% households sought treatment from public and private healthcare providers, respectively. Distance and poor quality were the major reason for not availing public health care services. Though majority of households (84%) used piped water as principle source of drinking water, about 28% didn't have access to toilet at the household level.
3. With respect to financial risk protection, it was found that about 83% households did not have any health insurance.

## **High Risk Population**

1. 99% of high risk population faced problem due to heat-stress. Some of the frequently reported symptoms were: sweating (95%), excessive thirst (53%), dizziness (52%), headache (41%), heat rash (41%), dehydration (29%), and heat cramp/muscle cramp (17%). With respect to their health seeking behavior, it was found that 79.8% of respondents sought treatment from public healthcare providers. Distance to health centers of service(48.4%) and poor quality (25.8%) have emerged as the main reasons for not availing public health care services for those who didn't seek treatment. On an average, each respondent spent INR 182/- towards treatment. Further, 90% Heat Related Illness (HRI) has no health insurance.
2. Drinking water frequently (92%), comfortable clothing (57%), frequently splashing face with water/ wet cloth (38%) were most sought-after mechanisms to cope with heat-stress, since almost none (98%) had cooling facilities at workplace.
3. Two third of respondents reported that they had taken leave during summer due to excessive heat and the average length of such leaves was found to be 6 days. About 52% respondents reported loss in monthly income between INR 1,000 and INR 10,000.

## **2. Vulnerability Assessment**

The study was conducted in the slums of twin cities- Bhubaneswar and Cuttack.

## Key Findings

- \* In comparison to non-slum areas, slum residents are more at risk of getting exposure to heat because of the housing structures, heat trapping materials on roof (asbestos and tin), overcrowding, lack of electric supply, and access to water supply and exposure to additional heat during cooking because of use of solid fuel chullah. Slum dwellers suffered from skin diseases and infections. Chronic conditions and prolonged use of medication predisposes individuals to adverse effects of heat.
- \* The adaptive practices to heat wave vary across the area because of socio-economic conditions and affordability. People in slum areas are more dependent on water and other traditional cooling mechanism, whereas, Households in non-slum areas spends more on personal protection and architectural modification to avoid heat exposure.
- \* Nearly 80% of slum people believes, avoidance of sun, drinking enough liquids and proper clothing will save them from heat related events, whereas, more than 90% of non-slum people think that proper dressing, avoiding sun and taking rest in cooler place can prevent heat related illness.
- \* Males staying indoor were two times higher at risk of getting heat related illness compared to females. Presence of kitchen outside the home makes the residents two times more vulnerable towards the heat exposure and illness. Presence of chronic conditions predisposes higher risk (2-4 times) of getting heat illness. Practice of cooling methods like use of fan/ac/cooler decreases the chance of getting heat illness by 60%. Further, it was found that most of the hazards occurred during the transport to the workplace.

## Suggested Proposal for Preventing Heat Illness at Work

### While Travelling to Workplace

- \* Provision of more public transport instead of using bike/cycle
- \* Travel timing to office should not be between 12 noon-3pm (including lunch)
- \* Shedding at public bus stops with water facility
- \* 'First aid' training of the drivers, conductors, students and others
- \* Senior citizen and other diseased people should adopt special precaution with an identity card
- \* Promote selling of water in public transport 'not carbonated drinks'
- \* All the transport services should have cold water, ice box and first aid box

- \* Plantation of more trees on road side and at major public stoppages
- \* First aid box should have two components: Medical emergency and Environmental hazards (Sun stroke, chemical spill)

## At Workplace

- \* Change of working time (if possible) and encourage shift duty hours
- \* Provide adequate shading, water, ice box and 'first aid' at workplace
- \* Change in timing of lunch or provision of canteen at workplace with quality food
- \* Work station designing such as shifting of heavy work station from top floor (Also in hospitals wards for vulnerable group of patients)
- \* Adequate ventilation and cooling mechanism (albedo painting)
- \* Creation of heat resistant building instead 'tin roofed' vending zones.
- \* Periodic checking of health status working in direct sun such as construction workers, manual labourers
- \* Plantation and creation of green environment at workplace.
- \* Specific Do's and Don'ts for key occupation groups has to be developed and shared

## 3. Determining the Heat Threshold

The threshold study was conducted for Bhubaneswar city, one of the near coastal cities of Odisha, which experiences long and scorching summers like other cities of India. The months of March to July for the years 2007 to 2014 were considered for the analysis. Daily records of maximum and minimum temperature and humidity at 08.30 and 17.30 hours were collected from Bhubaneswar meteorological station. Daily all-cause mortality data for those days was collected from Bhubaneswar Municipal Corporation, which were included as the outcome in the time-series dataset. Days of the week and days of the year were the other variables.

Poisson Regression method was used to model the all-cause mortality data, where the maximum temperature was the principal explanatory variable, which was included in the model with a fixed thin-plate regression spline with 3 degrees of freedom. The curvy-linear relationship between the relative risk of mortality and maximum temperature was plotted; 95% confidence intervals plotted for the curve. From the ensuing plot, it was inferred that two threshold points for maximum temperature – the first being the point where the point estimate of relative mortality risk crossed the null value, referred to as minimum risk point (MRP); and the second threshold point being that when the lower limit of the 95% confidence interval of the relative risk crossed the null value, referred to as the excess risk point (ERP).

## Urban Heat Island Effect and Mitigation Action Plan for Ib-Jharsuguda, Odisha

(The Energy and Resources Institute (TERI) in collaboration with TERI University under the Climate Change Innovation Programmes funded by Department for International Development (DFID)

Urban Heat Island (UHI) is a situation with elevated air or surface temperatures in urban areas in contrast to their non-urban rural vicinities. The phenomenon is present in all big and small cities around the world with varying intensity. UHI has adverse effect on human health can also significantly affect the economic productivity. The Ib-Valley region of Odisha is a rapidly growing industrial hub in Odisha with a range of large industries, such as steel, aluminum, thermal power plants, as well as coal mining. There are concerns that this district is highly vulnerable to Heat Island (HI) effect, and the relative importance of these effects is not well understood.

### The key findings of the study are:

1. There has been a steady build-up of heat in the region over the years resulting in higher night time temperatures. Coal Mining, Industries, Urban settlements and open non-vegetated surface have been identified as thermal hot spots. - based on Remote Sensing – Land Surface Temperature Model
2. ‘Bhushan Steel Area’ and ‘Market Road’ are hotspot locations in summer; ‘Market Road’ is hotspot location in monsoon as well as combined period (summer and monsoon). This is likely because of the high built-up area on market road. - based on Ambient Air-Temperature- Thermal Retentivity Model.
3. ‘Bhushan Steel Area’, ‘Municipality’, and ‘Market Road’ are hotspot locations in summer; ‘OPGC’, ‘Market Road’, ‘Municipality’ are hotspot locations in monsoon; ‘Bhushan Steel Area’, ‘Market Road’, ‘OPGC’ are hotspot locations in the combined period. Higher heat sources combined with higher built-up as well as more rotating population contributes to the higher heat index.- based on Ambient Air Temperature- Heat Index Model.
4. Coal Mining, Industries and Urban settlements are high thermal sources; forests, vegetation and water bodies are high thermal sinks. - based on Remote Sensing- Biophysical Model.
5. Coal Mining – Impact of bio-reclamation of de-coaled area (in terms of heat release per unit de-coaled area) highest for Lajkura and Lakhapur, least for Lilari.- based on Heat Release Model.

This action plan is a framework to develop comprehensive strategies for mitigation and adaptation of the heat island effect. The sectoral contribution of different sources and sinks to heat islands has been analysed to determine where actions can be targeted. Sector specific measures to reduce the heat island effect over the IB-valley region in Jharsuguda have been recommended on the basis of analysis of the contribution of each measure to the reduction in heat release.

## Coal Mining

Key measures recommended for the five open cast coal mining projects viz. Samleshwari, Lakhanpur, Lajkura, Lilari and Belpahar include:

- a) Improved management of de-coaled areas through creation of water bodies in void spaces to reduce self-oxidation as well as act as a heat sink as well as through increased bio-reclamation area within the mine boundary;
- b) Setting up of more coal washeries which would reduce the ash content of coal, thereby reducing its self-oxidation potential – an exothermic process which releases heat into the ambient atmosphere;
- c) Moving from 95% to 100% surface miner technology for coal removal which would completely replace the conventional blasting operations, thereby improving the stability of benches and high-walls. This would consequently result in reduced self-combustion of loose coal due to the limited presence of oxygen; and
- d) Large-scale afforestation of the diverted forest area.

## Industries

**Key measures recommended in industries include:**

- a) Stockpile inventory management which would enable optimizing coal purchase and keeping the stockpile inventory at an optimum level, thereby not only resulting in cost savings but also environmental benefits;
- b) Stockpile design changes from cuboidal to dome-shaped so that lesser surface area is exposed to environment, consequently resulting in lower heat radiation.

## Urban Planning

Traffic congestion in certain parts of the district has been identified as a key issue to be addressed. Some of the measures that can be taken in this regard include shifting the bus

terminus away from the market road, construction of flyover at strategic points, construction of new approach road to State Highway (SH10) :Sambalpur-Jharsuguda bypass road), etc. In addition, plantation of trees with higher LAI (Leaf Area Index) bordering along the pavements of national highways, state highways and newly proposed roads, have also been included under the urban planning section. Species specific recommendations have been provided for national and state highways, city artillery roads and the municipal areas. Jharsuguda airport has been identified as a priority area for undertaking plantation activities due to extreme barrenness of the area. In the buildings sector, green roofing has been recommended as a voluntary measure to reduce ambient air temperature as well as cooling demand of air conditioners. Adopting higher albedo road surface materials such as concrete, where possible, can also go a long way to mitigate the rise in temperature.

## Agriculture

In the agriculture sector, the key recommendation includes moving towards conservation tillage, which not only improves the productivity of land but also increases the surface albedo of the land mainly during the fallow period, thereby reflecting most of the incoming solar radiation back into the atmosphere.

## Adaptation

On the adaptation front, the focus is on developing coping mechanisms to deal with heat stress in the hotspot regions. This involves coordination among agencies such as Indian Meteorological Department (IMD), state government agencies, and urban local bodies. Apart from the government establishment, civil society also plays a key role in creating public awareness and knowledge dissemination. Additional roles have been recommended for the various government agencies over and above their current role in heat wave action plan. It has been recommended to increase the number of Automatic Weather Stations (AWSs) especially in the heat-wave prone districts to obtain a spatial distribution of temperature. This would improve the quality of early warning forecasts sent by IMD to the state government. Odisha State Disaster Management Authority (OSDMA) to undertake capacity building measures to deal with emergency response and preparedness for heat wave and heat island effects, especially among the health workers and district medical officers. The Disaster Management (DM) office is the key point to implement emergency response measures. This must be equipped with information on heat-stress vulnerable regions in the municipality and villages. In addition, they must ensure water availability in kiosks at strategic points; create public awareness through newspapers and radios on hotspot zones, direct municipalities and panchayats to ensure the safety of women and children in the vulnerable zones, etc.

## Excerpts from “Heat Island Study in Angul-Talcher Area of Odisha”- By Prof. Manju Mohan

(Consultant-In-charge, Centre for Atmospheric Sciences, Indian Institute of Technology, Delhi )

A study has been done to assess Industrial Heat Island (IHI) scenario in Angul-Talcher area of Odisha. Angul-Talcher Industrial Area (ATIA) is one of the oldest industrial areas of the country and has been declared as one of the Critically Polluted Area (CPA). Central Pollution Control Board (CPCB) and State Pollution Control Board (SPCB), Odisha. In addition to settlements and townships, varieties of industrial activities are perceived to be releasing substantial quantity of heat contributing towards high ambient temperatures. The significant heat island hot spots, major causative factors and also the relationship of IHI with land use - landcover, major industrial units, mining activities, demographic features, weather parameters and suitable mitigation strategies has been carried out through secondary data information, well designed field monitoring programme, satellite observations, statistical and numerical modelling approach. This study includes detailed site investigation in an area of 3000 km<sup>2</sup> study domain, collection of background information, selection of study area, classification of Land use - Landcover (LULC) of study area, selection of monitoring stations and developing detailed sampling and monitoring protocol for conducting the field programme.

Subsequently, heat island intensities and hotspots are assessed based on in-situ observations and satellite derived data. Further empirical modelling has been performed to relate weather parameters, land cover, demography etc. to industrial heat island intensity. State-of-the-art numerical modelling is performed for impact assessment of various causative factors and also to propose mitigation strategies.

## Mitigation Measures Evaluated

The built environment in study region of Angul-Talcher primarily consists of industries and rural settlements. Hence scope of application of mitigation measures is mainly two-pronged viz. (i) alteration in building properties, and (ii) alteration in LULC. These methods are described in following sub-sections.

### Alteration in Building Properties

One of the main causes of heat island effect is release of heat stored by built structures.

Hence any measure which would lower down storage of heat by building materials will in effect reduce the heat island intensity. Alteration of such properties is usually achieved by increasing albedo so that the material reflects back greater radiation and hence stores lesser energy. With increasing the solar reflectance of urban surfaces, the outflow of short-wave solar radiation increases, less solar heat energy is absorbed leading to lower surface

temperatures and reduced outflow of thermal radiation into the atmosphere. This process of negative radiative forcing effectively counters warming (Akbari and Mathhews, 2012).

Another method is greening of roofs. A green roof is a vegetative layer grown on a rooftop. Green roofs provide shade and remove heat from the air through evapotranspiration, reducing temperatures of the roof surface and the surrounding air (EPA, 2017).

### **(i) Reflective Roofs and Walls**

There are a wide range of materials used for roofing. In general, the residential market is dominated by concrete. Painting the roofs with reflective paints improves albedo of the material thereby reducing heat exchange. A sample modelling exercise was carried out to examine change in temperature using reflective paints of albedo 0.7 value on all industrial sites (Fallman et al, 2016).

### **(ii) Reflective Pavements**

As in case of roofs and walls, road surfaces can also be painted with reflective paints. However, reflective pavements achieve lower albedo than reflective roofs and therefore a simulation was carried out where ground surfaces in industrial stations are painted with reflective paint of albedo 0.4 (Takebayashi et al, 2007).

### **(iii) Greening of Roofs**

A green roof (introduction of vegetation on building roof) increases the evapotranspiration in urban areas through soil and plants on rooftops (redirecting available energy to latent heat) and ultimately reduces sensible heat flux in the atmosphere (Li et al, 2014). Simulation was carried out where all buildings in industrial roof tops are converted on green roofs.

## **Alteration in Land Use/Land Cover**

Increase in vegetation has long been known to weaken heat island effect. As explained above, it increases evapotranspiration and consequently reduces sensible heat flux. In addition,

water body is another land use type with negative influence on heat island as the water bodies achieve cooling effect by transpiration and heat exchange with the surrounding environment (Yang et al., 2015; Manteghi et al, 2015).

## **Conclusions**

Future of the climatic conditions over the Angul-Talcher area and its surrounding regions has been projected for the representative concentration pathway 8.5 emission scenario up to the year 2090 using the simulations of NCAR-global climate model, at a spatial resolution of 25x25 km.

- (i) The region will experience a marginal decrease in temperature in the next couple of decades, however subsequently (2030-2060) the temperature will increase up to 1°C, and then in the later phase of the century (1960-2090) the temperature will fall.
- (ii) A similar behaviour is noticed over the southernmost part of Orissa i.e. Koraput and Rayagarh districts. However, the north-eastern Orissa will experience severe warming in the mid-future and relatively more than that will occur over the Angul-Talcher area.
- (iii) In the later phase of the century (2060-2090), the state in general will experience cooling - this is counter intuitive as most of the nation and the globe will experience warming then.
- (iv) Analysis of rainfall reveals that in the near future there will be a marginal reduction in rainfall over the Angul-Talcher area as well as Bargarh, Sambalpur, Jajpur, Dhenkanal and Kendrapara regions. Whilst other parts of the state will receive more rainfall (by 6-7 mm/day). However, there will be an increase in rainfall over the regions in the mid and far future with varying magnitude. Relatively southern and northern parts of the state will gain more than the central belt in terms of the increase in rainfall.

## Excerpts from “Climate Adaptive Heat Action Plan for Bhubaneswar” - By R. Magotra

*(Deputy Director, Integrated Research and Action for Development (IRADe)*

### Introduction

Integrated Research and Action for Development (IRADe) is preparing a climate Adaptive Heat Stress Action Plan for the city of Bhubaneswar in collaboration with Odisha State Disaster Management Authority (OSDMA), Bhubaneswar Municipal Corporation and India Institute of Public Health (IIPH)- Bhubaneswar. The project was financially supported by International Development Research Centre (IDRC), Government of Canada. The Heat Stress Action Plan developed through this initiative will support the city in prioritizing and integrated adaptive resilience with the agenda of climate resilient smart cities.

### Heat Wave Events in Bhubaneswar

It is observed in the study that the total heat wave events have increased over two decades. The city has witnessed steep increase in the past decade post 2010, where major measure heat wave events are observed in 2014 followed by 2016 and 2012.

### Thermal Hotspot Maps for Bhubaneswar

The surface temperature maps of the city id developed using LANDSAT 8 satellite data and superimposed on the ward-boundaries map of the city to develop the city hotspot area. Wards with temperature above 40 degrees Celsius were delineated across the city.

### Identification of Ward- level Vulnerability- Bhubaneshwar

Bhubaneshwar Surveyed Hotspots	Ward Number
Neheru palei, Infocity backside	1
Sriram Nagar slum	5
Jagannath Ambatota slum	6
Sailashree vihar, Mahavir vasti	7
Munda sahi, Rangamatia upara sahi	9

*Cont....*

Bhubaneshwar Surveyed Hotspots	Ward Number
Doordarshan kendra	12
Ekamra villa	15
Ghatikia village	23
Mangala slum	20
Subash nagar slum	65

Heat stress vulnerability across the above identified wards in hot spot areas of Bhubaneswar were analysed using the comprehensive index, comprising of nine (9) sectors- Sanitation, Water, Electricity, Health, Transportation, Housing, Cooking Awareness and Heat Symptoms and their respective sub-sectors.

The cumulative ward-wise heat stress vulnerability analysis indicated, nearly four (4) wards in West Bhubaneswar are highly vulnerable and minimum basic amenities available to the vulnerable group to cope with heat stress.

Vulnerable wards	Wards Number (Out of 10 Thermal Hotspots)	Total
Low	(20 , 12 , 15 , 5 , 65 )	5
Medium	( 6 )	1
High	( 7 , 23 , 9 , 1 )	4

## Wage and Productivity Loss Due to Heat Stress

**Wage loss occupation wise:** Casual workers are the ones majorly affected by the heat stress. The majority wage loss is observed in the casual labours across various occupation as they are highly exposed to the direct heat. The average wage loss in the city is the range INR 1 to 999.

**Wage loss gender wise:** Majority of the males reported wage loss due to heat. The average monthly wage loss for women is INR 600 while meals it is INR 700.

**Productivity loss:** 40 % of the people reported productivity loss ranging from either 1-15 days, which include number of reduced working hours and absenteeism from the work. It is observed that majority of the males have reported maximum productivity loss. In addition, the average loss in number of days due to extreme heat event in both males and females is 1 day. Casual laborers are the most vulnerable and have reported majority of productivity loss across all the occupations. This could be due to the prolonged exposure to heat.

## THRESHOLDS BASED ON PUBLISHED RESEARCH

*Source NDMA: A preliminary Study to estimate Temperature Threshold for Heat wave Warning in India : September 2019*

Bhubaneswar rapidly growing urban centre with a population of 837,737 (Census 2011). The city experiences hot and humid summers, starting in March and continuing up to July, when the advent of monsoon rains ushers in relatively cooler weather. The thresholds for Bhubaneswar city have been calculated by India Institute of the Public Health Bhubaneswar. The study found a 2 % increase in the risk of mortality at 36.2°C maximum temperature

### Heat- Health Temperature Warning for Bhubaneswar

Yellow	Hot day advisory	36.2 <sup>°</sup> C
Orange alert	Heat alert day	39.1 <sup>°</sup> C
Red alert	Extreme heat alert day	Above 41.4 <sup>°</sup> C

### Month-wise Threshold for Heat Wave Warning for some Towns

City	Month	Yellow	Orange Alert (Heat Alert Day)	Red Alert (Extreme Heat Alert Day)
Bhabanipatna	April	42.5	43.0	44.5
	May	43.5	44.5	45.5
	June	39.5	40.6	42.7
Jharsuguda	April	44.0	44.5	45.2
	May	44.3	45.0	45.5
	June	44.5	45.0	45.5
Keonjhargarh	April	40.0	41.0	42.1
	May	40.0	40.8	42.5
	June	36.3	37.8	40.4
Koraput	April	37.0	37.4	38.2
	May	37.0	37.6	39.1
	June	33.5	35.0	37.3
Sambalpur	April	42.2	43.2	44.6
	May	43.4	44.5	45.7
	June	41.1	42.6	44.8

### 3. Prevention, Preparedness and Mitigation Measures

**Cool Roofs to Provide Affordable Thermal Comfort:** Urban residents living in slums have fewer options available to adapt to rising temperatures. This increases their vulnerability to heat and results in greater adverse impacts of extreme heat on these communities. In their issue brief “Rising Temperatures, Deadly Threat”, the NRDC and IIPH Gandhinagar identified several specific factors that increase the vulnerability of slum residents to extreme heat:

- \* **Higher Exposure to Extreme Heat:** Slum residents are more likely to be exposed to heat since they work primarily outside or in unventilated conditions, they live in homes constructed of heat-trapping materials with tin or tarpaulin roofs, and their communities lack trees and shade.
- \* **Greater Susceptibility to Health Effects of Extreme Heat:** Lack of access to clean water, poor sanitation, over-crowding, malnutrition, and a high prevalence of undiagnosed/untreated chronic medical conditions due to poor access to healthcare heighten slum community members’ susceptibility to extreme heat’s effects on health.
- \* **Fewer Adaptation Options Available:** Slum residents lack control over their home and work environments, with limited access to (and inability to afford) reliable electricity and cooling methods like fans, air coolers and air conditioning, insufficient access to cooling spaces, and a dearth of health information on which to act. All these factors reduce slum residents’ opportunities to adapt to increasing temperatures.

An affordable solution is cool roofs. A cool roof is a white reflective roof that stays cool in the sun by minimizing heat absorption and reflecting thermal radiation to help dissipate the solar heat gain. Studies have shown that cool roofs can be up to 30° C cooler than conventional roofs, and can bring the indoor temperatures down by 3-5° C. When implemented on a large scale, cool roofs can reduce the urban heat island effect in a city.<sup>1,2</sup> Cool roofs include coatings and treatments such as lime-based whitewash, white tarp, white china mosaic tiles and acrylic resin coating, and provide an affordable solution for providing thermal comfort.

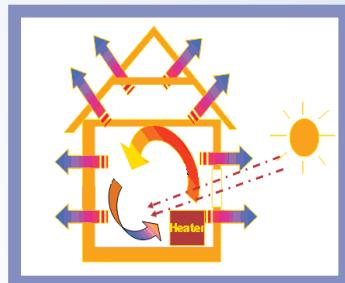
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<sup>1</sup> Natural Resources Defense Council, “Looking Up: How Green Roofs and Cool Roofs Can Reduce Energy Use, Address Climate Change, and Protect Water Resources in Southern California”, June 2012, <https://www.nrdc.org/sites/default/files/GreenRoofsReport.pdf> (last accessed on April 5, 2017)

<sup>2</sup> Vishal Garg, Cool Roofs Toolkit, “Cool Roof Activities in India”, <http://www.coolrooftoolkit.org/wp-content/uploads/2012/04/Vishal-Presentation.pdf> (last accessed on April 5, 2017)



## Chapter : 3



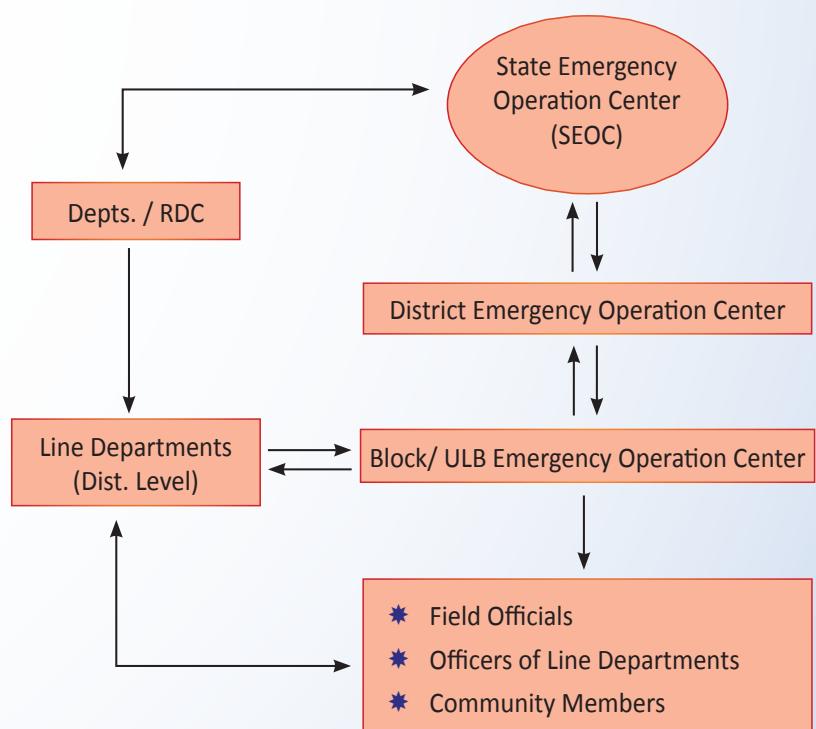
# EXISTING INSTITUTIONAL MECHANISMS TO ADDRESS HEAT WAVE IN ODISHA

## Ongoing Activities of Government of Odisha

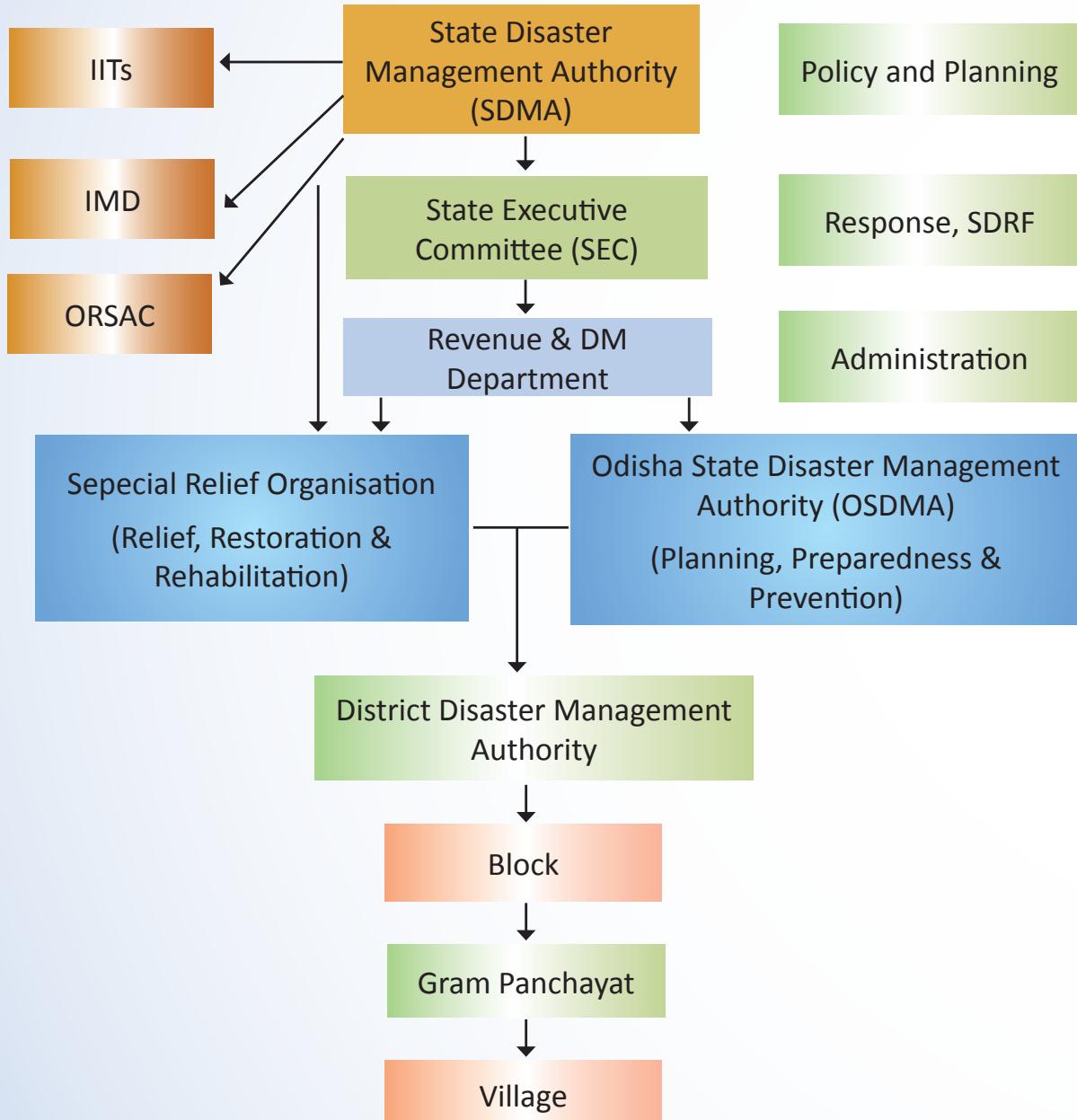
Every year all the District Collectors are instructed to take required precautionary measures for mitigating the heat-wave situation and the Chief Minister reviews the preparedness activities of the related departments. The chain of command that is followed after the issuance of a heat alert as depicted in figure 5.

**Figure 5: Flow of Information Followed in Government of Odisha During a Heat Wave Alert**

(Source: OSDMA)



**Figure 6: Institutional Mechanism for Heat Wave Management**



During the summer months (March to June), the role Indian Meteorological Department (IMD), the Emergency Operations Centre (EOC) (Control Room) at the state and also at the district levels become alert about Heat Wave warning by analyzing the daily reports of India Meteorological Department (IMD). Immediately upon receipt of such a warning, the state and district Emergency Operation Centres make necessary arrangements for flashing the warning through all forms of media. Simultaneously, departments of Health and Family Welfare, School and Mass Education, Labour & Employees' State Insurance, Transport and Commerce, Public Health Engineering & other related departments remain alert and put necessary emergency measures in place. The OSDMA is the nodal agency which is responsible for the prevention and mitigation activities. The most important work of the OSDMA is to sensitize the necessary stakeholders, engage in their capacity building in forms of intra-departmental trainings and prepare and share the guidelines for different occupational groups, institutions, urban local bodies, PRI and civil societies. It works in tandem with the Special Relief Organization which acts as the main executing body under the leadership of the SRC during a Heat Wave condition and issues directives to all the concerned governmental and non-governmental organizations for a prompt action. Apart from this, the OSDMA also involved in establishing the Heat Wave related mortality tracking system and updating the data set periodically.

## **Ex-Gratia Relief**

Earlier, the State Government had made provision in the Odisha Relief Code for payment of Rs.10,000/- towards ex-gratia relief to the bereaved family of each sunstroke victim. Since, there is no provision in the items and norms of expenditure for incurring expenditure from the State Disaster Response Fund (SDRF) & National Disaster Response Fund (NDRF) to provide relief to the victims of 'Heat Wave', the State Government was incurring such expenditure out of the Chief Minister's Relief Fund (CMRF). However, the State Govt. has declared Heat Wave as a State Specific Disaster with effect from 1st April 2015 under the revised provisions of SDRF/NDRF norms & made provision for payment of ex-gratia of Rs. 50,000/- to the next of kins of the sunstroke victims.

## **Process of Awareness and IEC plan**

The proposal is initiated by OSDMA and the concerned nodal officer of Directorate of Public Health (DPH) and it communicates to State Institute of Health and Family Welfare (SIHFW) which develops the prototype of IEC in consultation with DPH. Once the prototype is approved by DPH, funding is released, and the materials are printed at SIHFW and distributed to districts and to lower levels. For media (print and electronic), the SIHFW sends the prototype

to Information and Public Relations (I&PR) Department. They publish it in Newspapers and disseminate it in electronic channels.

Figure 7: Process of IEC Material Development and Dissemination at the State Level





## Chapter : 4



# STANDARD OPERATING PROCEDURES (SOP) FOR DIFFERENT DEPARTMENTS, DISTRICT ADMINISTRATIONS AND OTHERS

## 1. Special Relief Organization (SRO)

Under the direction of the Special Relief Commissioner the SRO would ensure the following:

- Issue appropriate directives to the concerned departments for taking preparatory and precautionary measures for Heat Wave management.
- Posters and IEC materials on safety tips relating to heat-wave are prepared and distributed by Department of Health & Family Welfare for general awareness of the public. Advertisements on such safety tips to be given through local newspapers, radio and television channels.
- To instruct All India Radio, Door darshan and other private Television channels to organize discussions and other programmes for creating public awareness.
- Issue directives to Department of Forest and Environment, Fisheries and Animal Resources, Women and Child, Health and Family Welfare and OSDMA for awareness activities, provision of water and essential preparatory measures concerning Heat Wave management.
- Action plan for mitigating water scarcity problems in different towns and rural areas, where acute scarcity of drinking water is felt, to be prepared. Required numbers of water tankers are to be deployed for supply of drinking water and defunct tube wells to

be replaced / repaired. Essential medicines, saline and ORS packets to be stored in the District Headquarters Hospitals, Community Health Centers and Primary Health Centers. Special arrangements to be made and separate beds are earmarked for treatment of heat-stroke patients in different Hospitals.

- The working hours for daily Laboures need to be re-scheduled i.e. from 6 a.m. to 11 a.m. and 3.30 pm to 6 pm. Orders to be given to make provision of drinking water at the work sites.
- Plying of buses during peak hours i.e. between 11.00 AM to 3.30 PM to be regulated. Orders to be given to carry portable water and ORS in public transport vehicles.
- Power distributing companies to be instructed to ensure uninterrupted power supply in summer.
- The time table of the schools to be re-scheduled from 6.30AM to 10.30 AM.
- Facilitate involvement of Civil Society Organizations for taking different mitigation activities.
- An amount of Rs.50,000/- as ex-gratia relief to the bereaved family of each sunstroke victim is provided by the State Government.

## **2) Odisha State Disaster Management Authority (OSDMA)**

- Constitute State Steering Committee for strengthening the State Heat Action Plan.
- Convene State Steering Committee meetings to review and update the heat action plan annually and share the revised heat action plan in a broader platform.
- Periodic coordination meetings with all the departments towards implementation of heat action plan.
- Incorporate and update information related to Heat Wave in the existing website of OSDMA.
- Review of current IEC initiatives and accredit all IEC materials along with knowledge partners.
- Promote research on heat related morbidity, mortality and mitigation measures in collaboration with knowledge partners located in the state.
- Organize capacity building programs on Heat Wave prevention and management for different stakeholders.

- Mobilization of funds for heat action plan review, documentation and Heat Wave management.
- Ensure that Municipal Corporations provide mortality data (all causes) to them every quarter.
- Review and follow-up action on monthly basis.
- Include heat wave under IDSP (Integrated Disease Surveillance Programme)
- DPOs responsibilities- to coordinate with Department of Health & Family Welfare, Govt. of Odisha.
- Issue of GIS based information on the heat conditons and heat wave situation on a daily basis and disseminitions through diffrent modes.

### 3) India Meteorological Department (IMD)

- Issue early warning and disseminate heat alert to all the key stakeholders
- Issue bulk emails to the key institutions/ key offices and persons.
- Media brief using TV/ Radio/ FM/ Newspapers
- Provide temperature data for determination of Heat alert and for better mitigation activities, daily as well as annually.
- Provide 5 days forecast and warning on heat wave for all the districts of Odisha.
- Provide past 24 hours weather data
- Provide city forecast for 7 days consisting of Maximum & Minimum Temperatures, sky condition and weather of selected cities of Odisha.

### 4) Housing and Urban Development Department

- Give directives to Urban Local Bodies (ULBs) /Development Authorities to take up appropriate measures for tackling heat wave
- Promote and construct ‘Heat Resistant Building’ as a mitigating measure in the long run.
- Improve sanitation and hygiene of the water distribution points
- Give directives to Urban Local Bodies (ULBs) /Development Authorities to increase access to public parks, water bodies, public libraries for general public.
- Create small, accessible green spaces by using vacant spaces such as side lots, parking medians, spaces between buildings and roads.

- Keep large public parks open during peak hours to provide cool resting spaces for the public.
- Give directives and ensure cool roofs initiative to paint roofs white (albedo paint), create green roofs and walls, and plant trees in neighborhoods to keep them cool.
- Develop a strategy to incorporate the green belt concept in urban planning, evaluate the efficacy of these initiatives and the highest priority locations for intervention.
- Issue directives to ULB/Development Authorities for use of K-glass, doubly glazed glass in buildings and vehicles which prevent the extra entry of heat inside.
- Provision of funds in the departmental budget for capacity building.
- Implement building codes that entail passive cooling practices such as increased reflectivity of building roofs, green roofs, increased natural ventilation and rainwater harvesting. Incentive mechanisms (e.g., reduced taxes) can be used to accelerate green infrastructure development.
- Promote green energy technology, energy efficient building promotion, restricted use of heat producing equipment, and increasing use of renewable energy
- Provision of funds for Heat Wave management.
- Provide annual mortality data from their vital statistics division of Municipalities to the OSDMA

## 5) Panchayati Raj & Drinking Water Department

- Prepare Vulnerability population and area map
- Sensitize vulnerable population on Heat Wave
- Public announcement about the do's and don'ts issued by the department of Health and Family Welfare and OSDMA.
- Provision of water kiosks, tube wells, tankers at strategic locations. The Collector and PD, DRDA shall review weekly progress of preventive maintenance work of tube wells and PWS so that this can be completed in the mission mode.
- Provision of funds in department budget for capacity building.
- Encourage for alternative livelihood activities.
- Restrict the working hours from 11 AM to 3 PM under MGNREGA

- Supply of Drinking water and shade nets at working sites
- Construction of ponds, artificial lakes for cooling the environment by evaporation
- Identification of cooler places
- Provide cool shelter during summer (must be explored through innovation and partnership)
- The water scarcity village as per experience in the last summer shall be identified and preventive measures shall be taken at the time of necessity for supply of drinking water through Tankers / Tractors loaded with water Tanks etc.
- Provision of funds for Heat Wave management.

## 6) Department of Health and Family Welfare

- For the year 2020, the IEC activities in print and electronic media with effect from 1st March for public awareness and precautionary measures
- These awareness activities should not be confined to the summer season only. Rather it has to be done throughout the year to inculcate good practices to change general mindset of the people towards heat.
- Take necessary steps for albedo/white painting of roof tops of all hospitals, Community Health Centers (CHCs), Public Health Centers (PHCs) and patient resting areas.
- Instructions to be issued from Health and Family Welfare Department to all health officials to share copy of the post-mortem report of heat wave as well as other disaster related causalities with the Tahsildars to make the process of ex-gratia payment smooth
- Take necessary steps to prevent diarrhoea and other health hazards during summer season
- Daily reporting of cases and deaths to be done through the prescribed format. (Reporting format enclosed). Even a Nil report is required to be sent. Daily report should be collected from all health institution by evening. Complied and transmitted, it is to the State health control room by Fax or E-mail by 12 noon of next day. This report is being transmitted by State Control Room daily to the Revenue Control Room.

## Chronic Diseases and Medication

People at risk should be identified in particular persons with chronic conditions (single or multiple). IEC materials should be more designed towards people with chronic conditions.

The Do's and Don'ts advertisements for each chronic illness during summer would help in guiding individuals towards heat.

- Capacity building of Health Care Service Providers (Doctor, Nurses, Pharmacist and health workers) on diagnosis and management heat related illness.
- Maintaining data base and surveillance on heat related morbidity and mortality.
- Provision for Health facility readiness to manage heat affected patients (beds, staff, inventories, ambulance etc.).
- Special attention towards high risk patients like geriatric/ pediatric/pregnant women etc.
- Training of 108 workers and 'Mobile Health Units (MHU)' for management of heat related cases
- Display do's and don'ts of Heat Waves on 'Swasthya Kantha' (village health wall),
- Sensitize community on Heat Wave related issues at Kishori Swasthya Mela (adolescent health meet), and Village Health Nutrition Day (VHND) and Routine Immunization (RI) sessions and distribution of IEC materials
- Strengthen the control rooms for providing heat related information
- Establishment of mobile base alert system through the ASHA/ ANM/ health workers for effective and immediate assessment of heat stroke cases.
- Development of specific reporting form for heat related events including morbidity and mortality.
- Coordinate with private hospitals to collect heat related morbidity and mortality data.
- Provision of power back up during summer.
- Provision of funds for Heat Wave management.
- Provide annual mortality data from their vital statistics division to the OSDMA

## **7) Labour and Employee's State Insurance Department**

- The labourers / workmen, due to their exposure to the sun during work, are susceptible to heat stroke and dehydration. It is therefore necessary to reschedule their working hours and ensure that physical hard work is avoided between 11.00 A.M. to 3.30 P.M. w.e.f. 1st April to 15th June.

- All the executing agencies working under different Departments of the state Government as well those of Government of India and private employers may be advised to reschedule working hours in such a way that no work is executed during the peak heat hours from 11.00 AM to 3.30 PM. from 1st April to 15th June every year.
- Rescheduling of work in progress may be made as far as practicable so that the works are done during morning and late afternoon hours without hampering the quantum of production or work done and without reduction of wages. Such arrangements may be made keeping in view the local requirements and weather conditions.
- Where the nature of work is such that, the rescheduling of working hours is not possible or where the work is of emergent nature or connected with maintenance of essential services the concerned employers, contractors and executants should be asked to ensure all appropriate precautionary measures such as provision of sufficient drinking water, O.R.S. packets and first-aid ,rest sheds for workers at worksite.
- The ESI Hospitals and dispensaries, which are meant to cater to the health needs of workers, labourers have a special role to play on this score. They should remain alert and be in readiness to treat the patients suffering from sun stroke and other similar problems.
- The Project Directors of all NCLPs should be instructed to reschedule the school timing for all Special Schools running under NCLP in accordance with the timings prescribed by Government in School & Mass Education Department.
- The labourers and workers should be sensitized about risks, signs and symptoms of heat stress during a probable Heat wave like situation.
- Training on heat illness diagnosis and management for factory medical officers.
- Advisory for one A/C relief chamber at factory facilities for emergency
- Ensure supervision of construction sites, quarries, factories and other vulnerable worksites, particularly during high temperature periods, to enforce labor laws related to heat safety.

## 8) Department of School and Mass Education

- Restriction of school timing (6.00 am to 11.00 am) during summer
- Ensure Avoidance of physical activities during school hours
- Issue directive for Albedo painting on school roofs

- IEC activities on Heat Wave prevention and management in schools
- Promote School Safety Plan
- Encourage Plantation of trees and promote green campus
- Provision for safe drinking water, ice packs, ORS, etc., at schools and examination centers.
- Training to the teachers and mock drills among students via special workshops and classes on identification, health risks and the subsequent management during Heat Waves.
- Provision of funds for Heat Wave management.

## **9) Department of Energy**

- Create awareness among people on energy conservation
- Develop a policy for power cuts depending on vulnerable areas and population
- Guideline for workers of the department
- Power shedding should be cut down/reduced during severe heat (frequency and timing)
- The timing should be announced before one day
- Frequency and regularities should be maintained
- Provision of power back up for life line institute
- The Superintending Engineers / Executive Engineer will record / monitor the peak load of primary sub stations / feeders under their control daily, so as to avoid break down due to failure of power transformers / overloading and consequent snapping of conductors in co-ordination with the competent authorities.
- All JEs / SDOs will monitor and record the peak load status of the DTs (250 KVA & above), so as to avoid burning of DTs due to over loading and consequent power outages there to. The weekly report may be submitted to the concerned Division Engineer for taking appropriate action to avoid any failure of DT.
- The concerned Electrical Section Officer and the Sub-Divisional Office shall inform the Customer Care Centre (Ph: 1912) before taking the shutdown / break down and also after restoration of power supply, so as to avoid any unpleasant situation by public.
- Provision of funds for Heat Wave management.

## 10) Department of Commerce and Transport

- Provision for creating awareness among drivers and other staffs
- Issue a guideline for each public transport to address Heat Wave
- Restriction of bus plying times during peak hours.
- Provision of safe drinking water, ice pack, ORS in buses and provision of cool resting spaces at bus stops.
- Provision of water kiosk on highways
- Provision of funds for Heat Wave management.
- Provisions to be made for safe drinking water, ice packs, ORS in buses.
- Provisions for cool resting spaces at bus stops.
- Overcrowding of passengers in the public transport vehicles be avoided.
- Jalachhatras to be opened at bus stands and bus stops for the passengers.
- Temporary passenger sheds to be erected near bus stops with provision of drinking water.
- Provision of water kiosk on Highways.
- Proper checking to be made by the Enforcement wing of this department and penalty be imposed against the erring Transporters/ operators.
- The Control rooms at RTO office should function round the clock during the period of heat wave.
- The Bus / Truck Associations of the districts and the local NGOs should be suitably instructed to involve themselves in public awareness campaign about the Heat wave
- Regular meetings be held to sort out the issue.
- For creating awareness , posters and banners to be displayed in bus stops and busy junctions on precautionary measures to be taken during the heat wave period.
- Timing of the public transport service be rescheduled so that plying of buses during peak heat wave hours i.e. between 11.00 AM to 3.00 PM can be restricted.

## 11) Department of Water Resources

### ► Short Term Measures

- » Sufficient storage of water at reservoir to meet the heat wave.
- » Release and storage of water in all the canals during summer.
- » Release of canal water to the affected areas for public use, to increase the underground water level reduces the atmospheric temperature and also improve the green areas.
- » Canal water to be feed to nearby ponds, tanks, low lands for secondary storage of water during summer.
- » The working hours for daily labourers need to be re-scheduled i.e. from 6 a.m. to 11 a.m. and 3.30 pm to 6 pm. Orders / instruction to be given to make provision of drinking water and rest shade at the work sites.
- » Construction of small temporary earthen check dams at Rivers / streams to instant storage of surface water for cooling the environment by evaporation.
- » Regularly evaluate the availability of water in Reservoirs, rivers, ponds and lakes.
- » Promote rotation of canal water supply.
- » Create awareness among the community about heat wave through Water Users Associations (WUA)/Panipanchayat.

### ► Medium Term Measures

- » Construction of check dams at small streams for in stream storage.
- » Periodically evaluate the availability of water in Reservoirs, rivers, ponds and lakes.
- » Conservation of rain & stream water.
- » Create awareness among the people on Water conservation and effective use.
- » Steps have been initiated for Plantation at road side, Dam site, Office & Colony Campus, Canal & Flood Embankment etc. from 2018.

### ► Long Term Measures

- » Improving the forest coverage and green areas.
- » Construction of Barrage/ check dams at Rivers / streams for in stream storage r.

- » Conservation of storm water.
- » Rejuvenation of Reservoir, rivers & streams to improve the water retaining capacity.

## 12) Department of Industry/ Steel and Mines

- 👉 Issue directives for Heat Wave prevention and management for industries and mines.
- 👉 Generate awareness through IEC activities.
- 👉 Provision for water sprinkling to settle down the suspended particles.
- 👉 Provision of funds for Heat Wave management.

## 13) Department of Tourism and Culture

- 👉 Ensure proper registration of tourists who are visiting the State.
- 👉 Ensure availability of heat relief measures at tourist places
- 👉 Display of Heat Wave precautionary measures for tourists during summer at tourist points and related information in website of department of tourism.
- 👉 Ensure the availability of drinking water and cool resting sheds
- 👉 Restrict the timing of the visit of tourist places during peak summer days
- 👉 Mapping of high-risk zones (e.g. Dhenkanal, Angul, Sundergarh, Cuttack, Khordha, Ganjam) under the guidelines of India Meteorological Department (IMD) conducting workshops for the District Tourism Office staff covering the high-risk zones, including the use of SATARK platform for enabling greater responsiveness.
- 👉 Provision of funds for Heat Wave management.

## 14) Women and Child Development & Mission Shakti Department

- 👉 Use the Village Health Nutrition Day (VHND) and RI sessions for creating awareness and educate young girls and mothers regarding the dangers of Heat Waves, its related health impacts and the precautionary measures to be taken.
- 👉 Display IEC materials at Anganwadis and encourage Anganwadi workers to disseminate Heat Wave related information with special focus on infants, children below five years, pregnant and lactating mothers, and geriatric population to protect them from dehydration.

- Provision of drinking water and first aid at all the Anganwadi Centers, old age homes, Child Care Institutions (CCIs).
- Provision of funds for Heat Wave management

## 15) Department of Forest and Environment

- Ensure proper afforestation (greenery) under public place.
- Continuous watch in the forest area to avoid forest fires. Each forest fringe village should be fixed with some remuneration so as to engage themselves actively for prevention of forest fire.
- Directive for making water available for animals in reserved/ protected forests and make necessary provisions, where necessary.
- Issue directives to the Zoo Authorities for special arrangements for the animals in zoo to protect them from the effect of Heat Wave.
- Directive for provision of water to human habitations facing water scarcity inside reserved forests
- Provision of funds for Heat Wave management.
- Prior to the hot weather season, village level meetings should be conducted through NGOs who can make them aware regarding extinguish or not setting forest fire.
- Each forest fringe village should plant at least 10 nos. of Banyan (*Ficus moraceae*) / Peepal (*Ficus religiosa*) around their village.
- Each Forest Division should dig out at least 06 nos. of causeway-shape pond so that the wild animals like elephant, tiger, deer, sambar, rabbit etc. can get water.
- To harvest / conserve rain water, the pits of size 1 cubic meter should be dug out at a distance of 10 meters inside forest and hill area. At least each Division should dig out 4000 nos. of such pit prior to rainy season by mentioning the GPS reading.
- **For Nandanakanan**
  - » Provision of shade.
  - » Provision of water supply.
  - » Feed supplementation:
  - » Provisions of air coolers:

- » Medicines
- » Installation of thermometers
- » Special squads:
- » Amenities for visitors
- » Prevention of incidents of fire

## 16) ST & SC Development, Minorities and Backward

### Classes Welfare Department

- 👉 Provision of availability of safe drinking water, ORS packets, ice packs and other required first aid material in school to manage Heat Wave related illness.
- 👉 Capacity building of key functionaries-trainings on Heat Wave management.
- 👉 Awareness generation among students through IEC materials display and activities.
- 👉 Changing the timing of examinations, changing the school timings.
- 👉 Provision of funds for Heat Wave management.

## 17) Department of Fisheries and Animal Resources Development

- 👉 The farmers are to be requested not to leave their animals outside the shed during 11.00 AM to 4.00 P.M.
- 👉 Provision of adequate cold drinking water to be made for the animals and birds with its timely replacement.
- 👉 The farmers can rest their animals under the sheds of bushy trees during scorching heat.
- 👉 The Livestock and Poultry should not be over fed during peak hours of heat. More preferably the total ration required by the animals per day may be fed either in the early morning or during evening hours to avoid the heat incensement.
- 👉 The owners of the Livestock and Poultry may be requested to plant more numbers of bushy trees nearing the animal sheds.
- 👉 To avoid dehydration of the animals and birds electrolytes may be mixed with drinking water. In case of animals, common salt and molasses may be mixed with water for achieving the purpose.

- The animals and birds should not be vaccinated or dewormed during heat hours of the day to avoid any extra stress.
- The animals should be restrained from hard work in open areas/ field during heat hours of the day.
- The animals need to be bathed at least once during a day Accordingly arrangements/provisions are to be made.
- Animal sheds and poultry pens may be covered with water drenched clothes or gunny bags which may be periodically drenched.
- Usually in deep tube well waters remain cold during summer, which may be used for drinking of animals and birds.

## 18) Knowledge Partner

### (i) India Institute of Public Health, Bhubaneswar (IIPH-B)

- Conduct health effect and threshold studies in Angul, Talcher, Titlagarh, Bhawani patna, Balangir and Jharsuguda.
- Provide technical support for strengthening the HAP for Odisha, improving health system preparedness and on developing communication strategy for behavior change by giving evidence and recommendations.
- Conduct operational research studies to gather evidence on the heat related mortality and morbidity.
- Undertake mapping of vulnerable groups of population by using a structured questionnaire and suggest alternate livelihood strategies for the vulnerable populations.
- Develop policy briefs on community vulnerability, concurrent monitoring and process evaluation of implementation of Government strategies.
- Evaluate of the role of media on disseminating Heat Wave related alerts and precautionary measures and suggest better communication strategies.
- Undertake concurrent monitoring in key locations.

### (ii) RIMES

- SATARK is a decision support system based on the Web / Smartphone that helps

to provide early warning information for different risks. Application developed by OSDMA in collaboration with RIMES.

- » Heatwave system was developed under SATARK.
- » Heatwave advisory system uses IMD defined heat wave thresholds to automatically generate advisories based on forecast and disseminate advisories to the users well ahead of time about the likelihood of a heatwave along with precautionary measures to be taken.
- » Every day, the SATARK system transmits the 10-day forecast information to the government officials concerned at State, District and Block level by e-mail automatically.
- » Improved risk communication in place. "SATARK" mobile application was developed both in IOS and Android, providing block level alerts and preparedness advisories (Do's and Don'ts) in Odia and English languages.
- » The application incorporated with observation and forecast data from Indian Meteorological Department (IMD) and the best available forecast products.
- » Block level and location specific alerts are issued through Mobile App, E-Mail, SMS and other available sources.
- » The advisories are available in both Odia and English languages through SATARK mobile Application, which is freely available.
- » In the near future, all the forecast information provided by the application includes the value-added information provided by IMD-RC.

## 19) Civil Society Organizations/ Corporate Social Sectors

- 👉 To support the Govt. departments in generating awareness in community
- 👉 Support in setting up Jal Jagana Kendras (water kiosks) on road ways, remote places
- 👉 Distribute IEC materials duly accredited by the state health department and OSDMA
- 👉 Promoting healthy living style during summer
- 👉 Support the state government in establishing shelter and sheds

## 20) District Administration

- 👉 Public Awareness campaign through electronic and print media on Heat Wave precautionary measures ( Do's & Don'ts)

- ☛ Give directions to prevent the Sunstroke deaths to various line departments/ functionaries as per the Heat Action Plan.
- ☛ Involve Civil Society Organizations and PRI members in awareness campaign and other measures to tackle the situation arising out of Heat Wave.
- ☛ Action plan for mitigating water scarcity problems in different towns and rural areas to be prepared. Water scarcity areas are to be identified in advance and supply of water for drinking and other uses through tanker to those areas has to be ensured. Preventive maintenance of tube wells has to be ensured. Suitable arrangement also to be made to promptly respond to reports of water scarcity anywhere in the district.
- ☛ Jala Jogana Kendras (Water Kiosks) are required to be opened by Urban Local Bodies/ Gram Panchayats at market places, bus stands and other congregation points. Civil Society Organizations also to be encouraged/ involved for opening of Jala Jogana Kendras.
- ☛ Construction/ repair of vats also to be ensured for roaming livestock
- ☛ Provision of drinking water in all schools and colleges are to be ensured.
- ☛ Ensuring that the timing of classes and examinations in schools and colleges during summer are rescheduled between 6.30 AM and 10.30 AM.
- ☛ Water and Health needs of all Child Care Institutions within the district should be properly monitored.
- ☛ Life saving medicines, saline, ORS to be stored in dispensaries, PHCs, CHCs and District Headquarters Hospitals sufficiently to meet the crisis. Special arrangement may be made, and separate beds be earmarked for treatment of heat stroke patients in different hospitals.
- ☛ The timing for engagement of labourers/ workers at worksites may be rescheduled. No work should be executed during heat wave during the peak hours from 11.00 AM to 3.00 PM. The employer should make necessary arrangements for supply of drinking water, ORS packets and provision of rest shed at worksite.
- ☛ Provision of portable water and ORS packets must be made in public transport vehicles. During severe heat wave condition, timings of public transport services should be rescheduled and plying of buses during peak hour, i.e. between 11.00AM to 3.00 PM should be restricted.

- ☛ Electricity distributing Company should be instructed to ensure uninterrupted power supply during heat wave period or during peak hours. Uninterrupted power supply also to be ensured for critical facilities such as hospitals and urban health centers.
- ☛ All effort should be made to see that no human causality takes place due to heat wave. However, if any information on causality is received or report published in news paper, it should be immediately enquired into.
- ☛ Prompt steps are also to be taken for payment of ex-gratia to be bereaved family where, upon enquiry, the death is confirmed to be due to sunstroke.

## **21) Bhubaneswar Municipality Corporation (BMC)**

### **• Repair & Installation of Tubewell**

Till date 2928 Tube wells under PHEO are now functioning in different parts of the Bhubaneswar Municipal Corporation area. Repair of Tube well will be made on war footing basis on getting the complaints within 72 hours. For this purpose, one additional team is to be formed by the Engineering Section on deploying additional staff as per requirement. One additional vehicle will also be provided exclusively for repair & maintenance of tube well during the above period. Estimate for requirement of spare parts to meet the urgent minor repair works of Tube well has been prepared which will be procured on urgent basis at EPM rate. Steps have also been taken for numbering of all the tube wells installed / maintained by PHEO.

### **• Dedicated Drinking Water Supply Strategy**

The Executive Engineers, P.H.Division No.I,II & III , Bhubaneswar are requested to provide adequate drinking water to the Jal Seva Shibira under their jurisdiction in the interest of public service.

Water supply is being made through water tankers wherever necessary in scarcity pockets.

### **• Sunstroke Death**

Upon receipt of information on alleged human casualty, the same will be intimated to Collector, Sub-Collector, Sadar and Tahsildar, Sadar .Such cases will be jointly inquired by a local Revenue Officer(to be designated by Sub-Collector, Sadar ) and Medical Officer( to be nominated by CDMO). In case, death is confirmed by above Joint Inquiry, exgratia would be paid by district administration as per guidelines of Special Relief commissioner.

### • Food Enforcement Activities

Complaints are frequently received regarding sale of stale/unhygienic food in various catering in city area leading to health hazards. A food raid squad lead by food inspector will check sale of stale and noxious foods and drinking water supplied by different stalls and Hotels. They will collect samples from suspected shops indulged in food Centers and cateries, Chat and Gupchup carts will be inspected and the squad will destroy preserved contaminated food items. The squad would submit a consolidated report on seizure/destruction made.

### • Sanitation & Disinfection

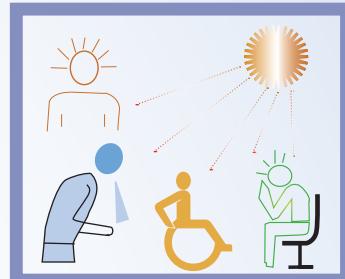
The Sanitary Inspectors of Bhubaneswar Municipal Corporation will maintain sanitation in BMC areas and disinfect all the wells of the City at least for two rounds before the rainy season.

### • Public Awareness Programme

Five big Hoardings / Display boards on “ Dos and Don’ts” on Heat Wave will be erected at different locations having public congregation such as Railway Station, Bus Stand, Capital Hospital etc. for awareness of general public. Steps have also been taken to print leaf-lets on heat wave and distribute the same for public awareness. Deputy Commissioner(PR & Communication), BMC will ensure for fixing of Hoardings and distribution of leaflet in due time. Apart from these, various awareness measures will be taken up such as: Sensitization of Cos and AWWs through CHO, Organization of awareness camps among volunteers/Cos/ SHGs/AWWs etc., Conduct sensitization camps for students in the schools, providing drinking water facilities through the Jalachatra Yojana through SHGs/NGOs, Coordinate with PHCs/ Govt. hospital functionaries, Loud Speaker announcement for wider mass awareness and information, Distribution of Leaflets & handouts and display of posters and banners at various places carrying messages Dos and Don’ts.



## Chapter : 5



# DEALING WITH HEAT RELATED ILLNESS

## 1. Prevention of Heat Related Illness

Heat waves characterized by long duration and high intensity have the highest impact on morbidity and mortality. The impact of extreme summer heat on human health may be exacerbated by an increase in humidity. There is growing evidence that the effect of heat wave on mortality is greater on days with high levels of ozone and fine particulate matter. Global climate change is projected to further increase the frequency, intensity and duration of heat waves and attributable death (WHO).

Heat related illness is avoidable. It can be best prevented if the vulnerable populations/communities are made aware of prevention tips, basic Do's and Don'ts through effective use of various media. Knowledge of effective prevention and first-aid treatment, besides an awareness of potential side-effects of prescription drugs during hot weather, is crucial for physicians and pharmacists to best mitigate the effects of heat illnesses.

## Symptoms and First Aid for various Heat Disorders

Heat Disorder	Symptoms	First Aid
Heat rash	Skin redness and pain, possible swelling, blisters, fever, headaches.	Take a shower using soap to remove oils that may block pores preventing the body from cooling naturally. If blisters occur, apply dry, sterile dressings and seek medical attention.
Heat Cramps	Painful spasms usually in leg and abdominal muscles or extremities. Heavy sweating.	Move to cool or shaded place. Apply firm pressure on cramping muscles or gently massage to relieve spasm. Give sips of water. If nausea occurs, discontinue
Heat Exhaustion	Heavy sweating, weakness, Skin cold, pale, headache and clammy extremities. Weak pulse. Normal temperature possible. Fainting, vomiting.	Get victim to lie down in a cool place. Loosen clothing. Apply cool, wet cloth. Fan or move victim to air-conditioned place. Give sips of water slowly and if nausea occurs, discontinue. If vomiting occurs, seek immediate medical attention; call 108 and 102 for ambulance.
Heat Stroke (Sun Stroke)	High body temperature. Hot, dry skin. Rapid, strong pulse.  Possible unconsciousness or altered mental status. Victim will likely not sweat	Heat stroke is a severe medical emergency.  Call 108 and 102 for ambulance for emergency medical services or take the victim to a hospital immediately. Delay can be fatal. Move victim to a cooler environment. Try a cool bath or sponging to reduce body temperature. Use extreme caution.  Remove clothing. Use fans and/or air conditioners.  DO NOT GIVE FLUIDS ORALLY if the person is not conscious.

## Hospital Preparedness Measures for Managing Heat Related Illness

Director/In-charge of Hospitals in State/Districts should ensure that the following measures are in place:

- 👉 A detailed action plan to tackle heat-related illnesses well in advance of hotter months.
- 👉 Standard Operating Procedures to tackle all levels of heat-related illnesses. Capacity building measures for doctors, nurses and other staff should be undertaken.
- 👉 Cases with suspected heat stroke should be rapidly assessed using standard Treatment Protocols.
- 👉 Identify surge capacities and mark the beds dedicated to treat heat stroke victims and enhance emergency department preparedness to handle more patients.
- 👉 Identify RRT (Rapid Response Teams) to respond to any exigency call outside the hospitals.
- 👉 Ensure adequate arrangements of Staff, Beds, IV fluids, ORS, essential medicines and equipment to cater to management of volume depletion and electrolyte imbalance.
- 👉 May try to establish outreach clinics at various locations easily accessible to the vulnerable population to reduce the number of cases affected. Health Centres must undertake awareness campaigns for neighbourhood communities using different means of information dissemination.
- 👉 Primary centres must refer the patients to the higher facility only after ensuring adequate stabilization and basic definitive care.
- 👉 Hospitals must ensure proper networking with nearby facilities and medical centres to share the patient load which exceeds their surge capacities.
- 👉 All cases of heat-related illnesses should be reported to IDSP (Integrated Disease Surveillance Programme) unit of the district.

## Acclimatization

Those who come from a cooler climate to a hotter climate, especially during the heat wave season, are at risk. They should be advised not to move out in open for a period of one week. This helps the body get acclimatized to heat. They should also be advised to drink plenty of water. Acclimatization is achieved by gradual exposure to the hot environment during a heat wave.

## 1. Heat Illness Treatment Protocol

Recognizing that treatment protocols may vary slightly according to the setting (EMS, health centre, clinic, hospital emergency department, etc.), the following should apply generally to any setting and to all patients with heat related illnesses:

1. Initial patient assessment primary survey (airway, breathing, circulation, disability, exposure), vital signs including temperature
2. Consider heat illness in differential diagnosis if:
  - a. Presented with suggestive symptoms and signs
  - b. Patient has one or more of the following risk factors:
    - Extremes of age (infants, elderly)
    - Debilitation/physical deconditioning, overweight or obese
    - Lack of acclimatization to environmental heat (recent arrival, early in summer season)
    - Any significant underlying chronic disease, including psychiatric, cardiovascular, neurologic, hematologic, obesity, pulmonary, renal, and respiratory disease
    - Taking one or more of the following:
      - Sympathomimetic drugs
      - Anticholinergic drugs
      - Barbiturates
      - Diuretics
      - Alcohol
      - Beta blockers
3. Remove from environmental heat exposure and stop physical activity
4. Initiate passive cooling procedures
  - a. Cool wet towels or ice packs to axillae, groin, and around neck; if patient is stable, may take a cool shower, but evaluate risk of such activity against gain and availability of other cooling measures

- b. Spray cool water or blot cool water onto the skin
  - c. Use fan to blow cool air onto moist skin
5. If temperature lower than 40°C, repeat assessment every 5 minutes; if improving, attempt to orally hydrate (clear liquids, ORS can be used but not necessary; cool liquids better than cold). If temperature is 40°C or above, initiate IV rehydration and immediately transport to emergency department for stabilization.

## 2. Livestock preparedness during hot weather

Extreme heat causes significant stress to livestock. There is a need to plan well for reducing the impacts of high temperatures on livestock. Keeping an eye on the weather forecasts and developing a mitigation plan for high to extreme temperature can be effective in ensuring that the livestock has sufficient shade and water on hot days

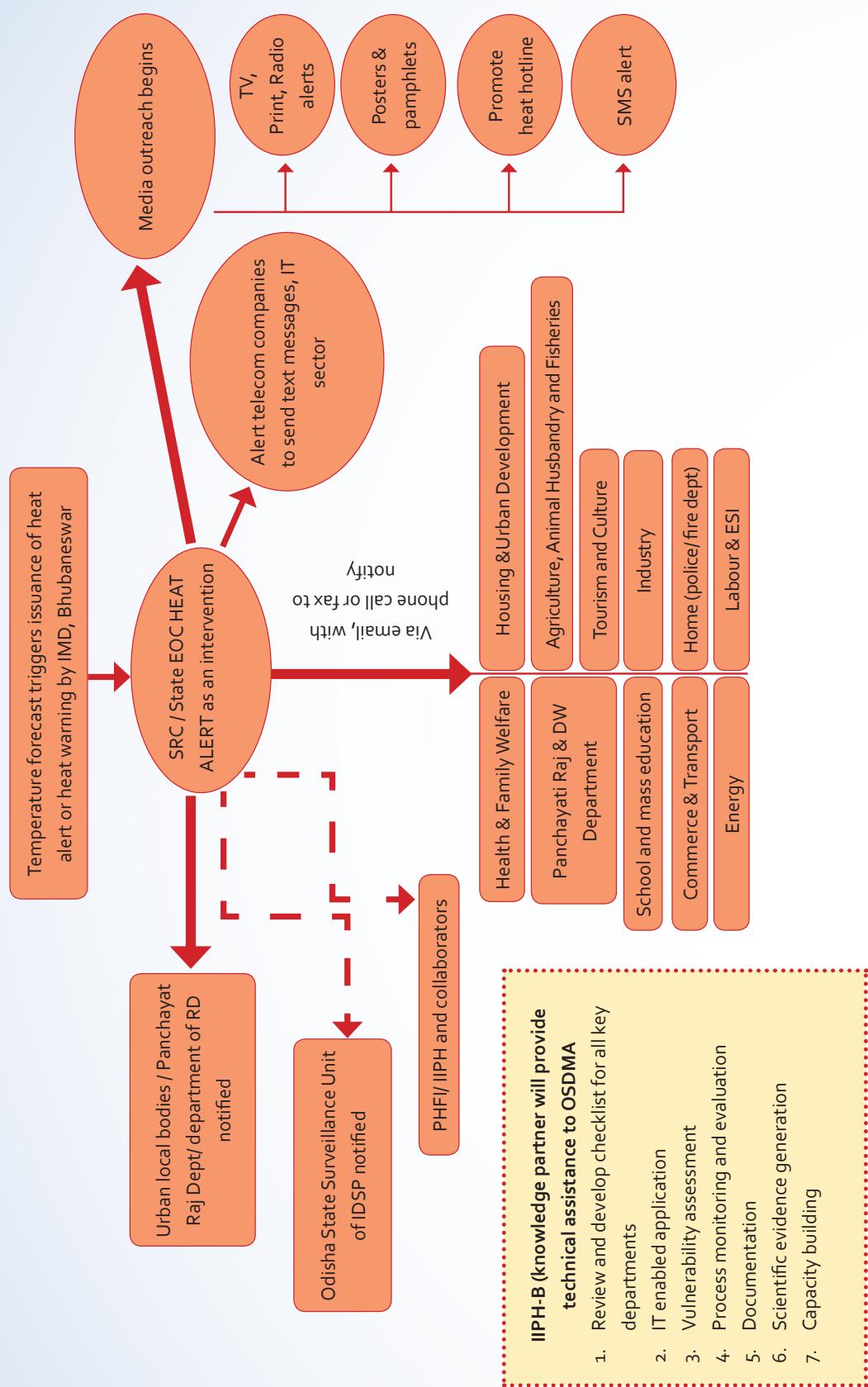
## 3. Maintenance of Data on Heat Related Deaths and Illness

As per “Guidelines for preparation of Action Plan – Prevention and Management of Heat-Wave 2017” issued by National Disaster Management Authority (NDMA), New Delhi, data on age group, sex, occupation, economic status of those who died due to heat wave, place of death etc. are to be collected and furnished for proper analysis and under taking mitigation measures.

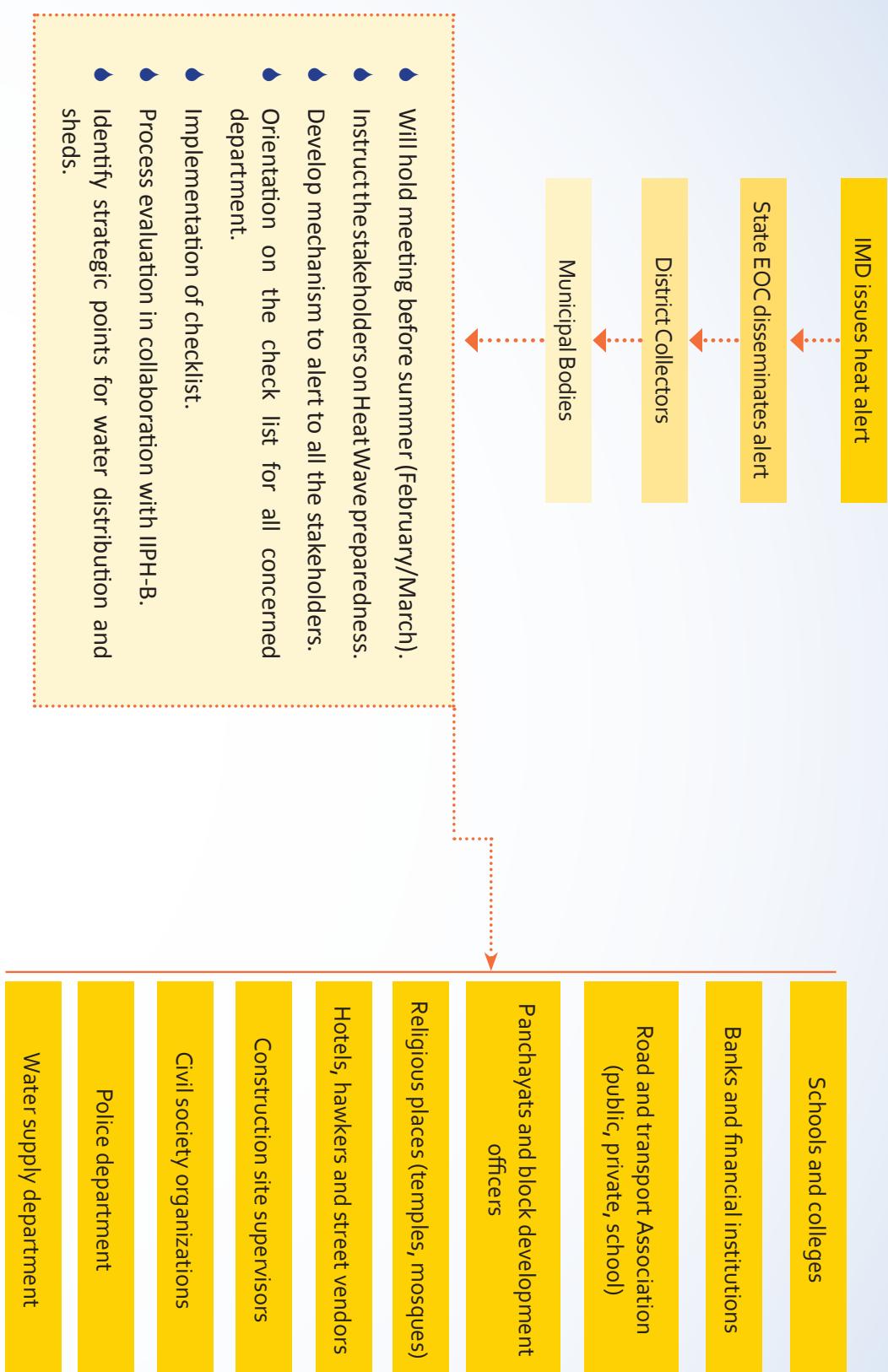
As per the instructions issued by the O/ o Special Relief Commissioner vide letter No. 1777/R & DM (DM) Dated 03.04.2018 information as per Format-I (Annexed) may be collected and furnished to the Department along with every joint enquiry report of heat stroke death. Besides, a permanent register with detailed information as per Format- II (Annexed) is to be maintained both in the Tahasil Office and District Office and weekly report in the said format to be submitted to the Department every Monday by 1.00 PM.

Further, data on heat related illness is needed to carry out meaningful analysis of heat related health events and undertaking appropriate measures. Information of all cases of heat related illness and deaths as per Format- A (Annexed) needs to be collected by the Directorate of Health Services and submitted to the Department daily.

**Figure-8: Conceptual Framework of HAP at the State Level**



**Figure-9: Flow of Information from State to District During a 'Heat Wave' Alert**



**Figure-10: Time Duration and Importance of the Roles and Responsibilities of concerned departments in execution of the strengthened HAP**

<b>Department/ Organizations</b>	<b>Immediate (Before and During Sum- mer)</b>	<b>Short term (Before Six months of Summer)</b>	<b>Long term (Throughout the Year)</b>
OSDMA			
Indian Meteorological Depart- ment			
Health and Family Welfare			
Panchayat Raj			
School & Mass Education			
Road and Transport			
Labor			
Energy			
Information and Public Relation			
Water Resources			
Animal Welfare and Fisheries			
Steel and Industry			
Tourism and Culture			
Forest and Environment			
Women and Child			
Home and Fire			
Housing and Urban Development			
Tribal affairs			
IIPHB/PHFI			
SRCS/ SEOCC			

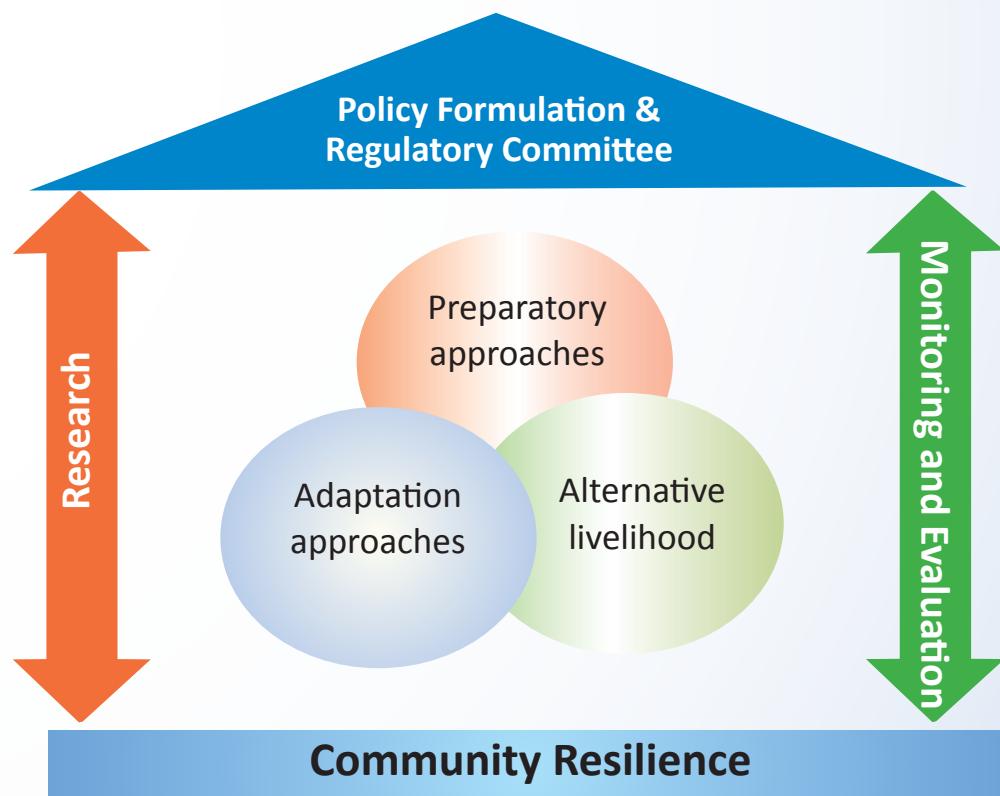
Colour code indicates period of involvement in HAP

## Way Forward

Heat Wave is a phenomenon culminating from multiple factors comprising both man-made and natural causes. It is being observed that the problem of intense and long heat spells is growing consistently over the last two decades almost assuming the proportion of a disaster. Further, with climate change and global warming the situation is going to be exacerbated in future. Needless to say, this poses a perpetual and major public health threat for the state with potential repercussions on human life and productivity. Thus, there is a need for efforts to design context specific and cost-effective strategies which are informed by scientific evidence and knowledge generation. Creating such evidence base can strengthen the heat action plan to achieve its stipulated goals and objectives efficiently and effectively. In the coming days it is proposed that strengthening of the heat action plan will be carried out in the following phases

1. Determining threshold temperature for multiple cities and towns of Odisha
2. Conducting vulnerability assessment in more cities and designing an intervention.

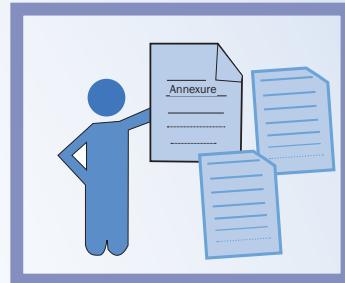
**Figure-11: Approach Towards a Strengthened HAP Using a Schematic Diagram**







## Chapter : 6



# ANNEXURE

## Heat Wave DOs and DON'Ts

### DOs

#### Must for All

- 👉 Listen to Radio; watch TV; read Newspaper and other sources for local weather news/heat advisories.
- 👉 Drink sufficient water - even if not thirsty.
- 👉 Use ORS (Oral Rehydration Solution), homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. to keep yourself hydrated.
- 👉 Wear lightweight, light-coloured, loose, cotton clothes.
- 👉 Cover your head: Use a cloth, hat or umbrella and uses protective goggles.
- 👉 Avoid caffeine, alcohol or sugared soda because they kind make fluid leave your body.

#### Employers and Workers

- 👉 Provide cool drinking water near work place.
- 👉 Caution workers to avoid direct sunlight.

- Schedule strenuous jobs to cooler times of the day.
- Increasing the frequency and length of rest breaks for outdoor activities.
- Pregnant workers and workers with a medical condition should be given additional attention.

### **Other Precautions**

- Stay indoors as much as possible.
- Keep your home cool, use curtains, shutters or sunshade and open windows at night.
- Try to remain on lower floors.
- Use fans, damp clothing and take bath in cold water frequently.
- If you feel faint or ill, see a doctor immediately.
- Keep animals in shade and give them plenty of water to drink.
- Carry water with you.

### **DON'Ts**

- Avoid going out in the sun, especially between 11.00 noon and 3.00 p.m.
- Avoid strenuous activities when outside in the afternoon.
- Do not go out barefoot.
- Avoid cooking during peak hours. Open doors and windows to ventilate cooking area adequately.
- Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.
- Avoid high-protein food and do not eat stale food.
- Do not leave children, pets or anybody in parked vehicles - as they may get affected by Heat.
- Don't drink ice-cold drinks as they can cause stomach cramping.

## IEC Materials Disseminated by the Government of Odisha

**ଅଂଶୁଧାତ ପ୍ରତି ସତକ' ରୂହନ୍ତୁ**

**କ'ଣ କରିବା ଉଚିତ୍ !**



- ଦିନ ୧୧ ଜାନୁଆରୀ ଉଚିତ୍ ଖରାର ତାତି ସବୁଠାରୁ ଅଧିକ ଥାଏ ।  
ଏଣୁ ଟାଣ ଖରାରେ ପଦାକୁ ବାହାରନ୍ତୁ ନାହିଁ ।
- ଆବଶ୍ୟକ ସ୍ଵଳେ ବାହାରକୁ ଯିବାକୁ ହେଲେ ମୁଖ୍ୟ ଓ ଦୋ  
ଗାମୁହାରେ ଘୋଡାନ୍ତୁ ଏବଂ ଛତା, ଯୋତା ଓ କଳା ଚଷମା ବ୍ୟବହାର  
କରନ୍ତୁ ଓ ସାଥୀରେ ଥଣ୍ଡାଯାଣି ନିଅନ୍ତୁ ।
- ବାହାରକୁ ଯିବା ଆଗରୁ ଓ ପହଞ୍ଚିବା ପରେ ସ୍ଵରେଇ, ମାଠିଆ ଓ ଘୁମ ଆଦିରେ ଥିବା  
ପାଣି, ଲେନ୍ୟ ସରବତ, ଘୋଲଦାନ୍ତି, ଲୁଣ ମିଶା ତୋରାଣି ପିଅନ୍ତୁ ।
- ଶରୀରରେ ବାଯୁ ଚଳାଚଳ ପାଇଁ ସୂତା ଲୁଗା ବ୍ୟବହାର କରନ୍ତୁ ।
- ହାଲିଆ ଲାଗିଲେ ଛାଇ ଯାଗା ଓ ପବନଚଳାଚଳ ସ୍ଥାନରେ ବିଶ୍ରାମ ନିଅନ୍ତୁ ।
- ଘରେ ଚିଶ ଓ ଆଜବେଷ୍ଟ ଛାତ ଥୁଲେ ତା' ଉପରେ ନଡ଼ା ବିଛାନ୍ତୁ ।
- ଦେହରୁ ଅଧିକ ଖାଲବୋହିଲେ, ପାତି ଥୀ ଥୀ ଲାଗିଲେ - ପ୍ରତ୍ୱର ପାଣି, ଓ.ଆର.ଏସ.,  
ଓ ପଣା ପିଅନ୍ତୁ ।

**କ'ଣ କରିବା ଅନୁଚିତ୍ !!**

- ✗ ଟାଣ ଖରାରେ ଶାରିରାଙ୍କ ପରିଶ୍ରମ କରନ୍ତୁ ନାହିଁ ।
- ✗ ବୃଦ୍ଧ, ଅସୁସ୍ତ ଲୋକ, ଶିଶୁ, ଗର୍ଭବତୀ ମହିଳା ଏବଂ ରତ୍ନାପ ଓ ମଧୁମେହରେ ପାତିତ  
ବ୍ୟକ୍ତି ଟାଣ ଖରାରେ ବାହାରକୁ ଯାଆନ୍ତୁ ନାହିଁ ।
- ✗ ଅଂଶୁଧାତ ଗୋଟା ଦେହରେ ବରଫ ଘଷନ୍ତୁ ନାହିଁ ।
- ✗ କେହି ଅସୁସ୍ତ ଅନୁଭବ କଲେ ତାଙ୍କର ଚିକିତ୍ସା ପ୍ରତି ଅବହେଳା କରନ୍ତୁ ନାହିଁ ।
- ✗ ନିଶା ଦ୍ରବ୍ୟ ସେବନ କରନ୍ତୁ ନାହିଁ ।

ଓ.ଆର.ଏସ ପ୍ୟାକେଟ୍ ସମ୍ପଦ “ଆଶା” ଅଜନ୍ତୁତି କେନ୍ତ୍ର, ସାମ୍ବୁ ଉପକେନ୍ତ୍ର, ସାମ୍ବୁକେନ୍ତ୍ର ଓ ସରକାରୀ ଢାକରଖାନା  
ଗୁଡ଼ିକରେ ମାଗଣାରେ ମିଳେ । ସରକାରୀ ଢାକରଖାନା ମାନଙ୍କରେ ଅଂଶୁଧାତ ଗୋଟାଙ୍କ ପାଇଁ ଚିକିତ୍ସା ସୁବିଧା କରାଯାଉଛି ।

**ରାଜ୍ୟ ସାମ୍ବୁ ଓ ପରିବାର କଲ୍ୟାଣ ପ୍ରତିଷ୍ଠାନ, ଓଡ଼ିଶା**



ସାବଧାନ !

ସାବଧାନ !

## ଅଂଶୁଘାତକୁ ସାବଧାନ



ପାଖରେ ଥୁବ ପାଣି ବୋତଳ

ହାତରେ ଥୁବ ଛଡ଼ା

ପାଦରେ ଥୁବ ଚପଳ ଯଦି

ଖରାକୁ ନାହିଁ ଚିନ୍ତା

- ଦିନ ୧୧ ଟାରୁ ଶାଶ ଭିତରେ ଖରାର ତାତି ସବୁଠାରୁ ଅଧୂକ ଥାଏ । ଏଣୁ ଟାଣ ଖରାରେ ପଦାକୁ ବାହାରକୁ ନାହିଁ ।
- ଅଧୂକ ପାଣି, ଓ.ଆର.ଏସ., ପଣା, ତୋରାଣି, ଘୋଲଦହି, ଆଖୁରସ ପିଅନ୍ତୁ ଓ କାକୁଡ଼ି, ତରଭୂଜ ଆଦି ଖାଆନ୍ତୁ ।
- ଖରାରେ କଠିନ ପରିଶ୍ରମ କରନ୍ତୁ ନାହିଁ ।
- ହାଲିଆ ଲାଗିଲେ ଛାଇ ଯାଗାରେ ବିଶ୍ରମ କରନ୍ତୁ ।
- ମୁଣ୍ଡ ଓ ଦେହରେ ଓଦା ଗାମୁଛା ପକାନ୍ତୁ ।
- ନିଶାଖାଇ ଟାଣ ଖରାକୁ ବାହାରିଲେ ଜୀବନ ପ୍ରତି ବିପଦ ଥାଏ ।
- ଅଂଶୁଘାତ ରୋଗୀଦେହରେ ବରଫ ଘଷନ୍ତୁ ନାହିଁ ।

ସରକାରୀ ଡାକ୍ତରଖାନାରେ ଅଂଶୁଘାତ ରୋଗୀଙ୍କ ଚିକିତ୍ସା ପାଇଁ ସୁବିଧା କରାଯାଇଛି ।



ସ୍ଵାସ୍ଥ୍ୟ ଓ ପରିବାର କଲ୍ୟାଣ ବିଭାଗ, ଓଡ଼ିଶା ସରକାର  
ପ୍ରସ୍ତୁତି : ରାଜ୍ୟ ସ୍ଵାସ୍ଥ୍ୟ ଓ ପରିବାର କଲ୍ୟାଣ ପ୍ରତିଷ୍ଠାନ, ଓଡ଼ିଶା







# ଆହୁପାତ୍ର ପତି



**OSDMA**

ଓଡ଼ିଶା ଗାନ୍ଧୀ ଦିପର୍ଯ୍ୟ ପରିବାଳନ କର୍ତ୍ତ୍ତ୍ଵପତ୍ର  
ଶକ୍ତି ଉଦ୍‌ଦେଶ୍ୟ, ଜୀବନେଥିର

**ପାତାକାରେ ପାଦକୁ ବାପାରଙ୍ଗିଲାଛି।**

କିମ୍ବା ପରିଶ୍ରମ କରିବାକୁ ନାହିଁ।

ଜୀବନାଳାମରେ ବାହାରକୁ ଯିବାକୁ ହୋଲେ ମୁଣ୍ଡରେ ଓଡ଼ା ପାଦକା, ଛତା, ଚପଳ, କାଳା  
ରକ୍ଷମା ବ୍ୟବସାର କରିଛୁ।

ବାହାରକୁ ଯିବା ଯମକରେ ପାଶି ବୋଲେ ପାଇଗରେ ନିଅଛୁ।

ଜଳ ଶୁଷ୍କତାରୁ କଷା ପାଇବା ପାଇଁ ଅଧିକ ପାଶି, ଓ.ଆର.ୱ୍ୟ ଦ୍ରିଷ୍ଟି, ପଶା,  
ଚୋରାଣୀ, ଯୋଳଦେଖି ଏ ଆଶ୍ରମର ସିଅଛୁ। କାଳାଢି, ରେତୁଜ ଆଦି ଖାଆଛୁ।

ମାଦକ ଦ୍ରିବ୍ୟ ପେନ୍ କରିବାକୁ ନାହିଁ।

ହାଲକା ଓ ତିଳା ତେର୍ପେ ପାଲିଯାନ କରିଛୁ।

**ଆଶ୍ରମରେ ଆବ୍ରାତ ବ୍ୟକ୍ତିଙ୍କୁ ଯଥାକାରୀ ଦାକ୍ତରଙ୍କା ଲେବ ରିକିପ୍ୟାଳିବାକୁ**



**ପାତାକାରେ ପାଦକୁ ବାପାରଙ୍ଗିଲାଛି।**

**ହିଁ ସୁଧିକା!**

# ଆମ୍ବୁଦ୍ଧାତ ପ୍ରତି ସାବଧାନ !



-  ଅତି ପ୍ରବଳ ଖରାରେ ପଦାକୁ ବାହାରକୁ ନାହିଁ ।
-  ଆବଶ୍ୟକ ସ୍ଥଳେ ବାହାରକୁ ଯିବାକୁ ହେଲେ ମୁଣ୍ଡକୁ ଓଦା ଗାମୁଛାରେ ଘୋଡ଼ାକୁ ଏବଂ ଛତା, ଜୋତା ଓ କଳା ଚକ୍ଷମା ବ୍ୟବହାର କରନ୍ତୁ ଓ ସାଥୀରେ ଅଞ୍ଚା ପାଣି ନିଅନ୍ତୁ ।
-  ଘର ଭିତରେ ଥିବାବେଳେ ଓ ଶୋଷ ହେଉ ନଥୁଲେ ମଧ୍ୟ ପ୍ରବୁର ପାଣି ପିଅନ୍ତୁ ।
-  ଟାଣ ଖରାରେ ଶାରାରିକ ପରିଶ୍ରମ କରନ୍ତୁ ନାହିଁ ।
-  ଆମ୍ବୁଦ୍ଧାତ ରୋଗ ଦେହରେ ବରଫା ଘସନ୍ତୁ ନାହିଁ ବା ଅଚେତ ବ୍ୟକ୍ତିଙ୍କୁ ପାଣି ପିଆନ୍ତୁ ନାହିଁ ।
-  କେହି ଅସୁସ୍ତ ଅନୁଭବ କଲେ ବା ଅଚେତ ହୋଇଗଲେ ତାଙ୍କୁ ଶାୟ ନିକଟରୁ ଡାକ୍ତରଖାନାକୁ ନେଇ ଯାଆନ୍ତୁ ।
-  ଗୃହପାଳିତ ପଶୁପକ୍ଷାଙ୍କୁ ମଧ୍ୟ ଛାଇରେ ରଖି ପ୍ରବୁର ପରିମାଣରେ ପାଣି ପିଇବାକୁ ଦିଅନ୍ତୁ ।

 ତୋରାଣି	 ପାଣି	 ତରଭୁଜ	 ଗୃହପାଳିତ ପଶୁ
 ଓ.ଆର.ୱସ	 ଚପଳ, ଛତା	 କାକୁଡ଼ି	 ସର୍ବତରକାରୀ ପରିଧି
 OSDMA	<b>ଓଡ଼ିଶା ରାଜ୍ୟ ବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ</b> <b>ରାଜୀବ ଭବନ, ଭୁବନେଶ୍ୱର</b>		
<b>ସର୍ବତରକାରୀ ପରିଧି ହିଁ ସୁରକ୍ଷା!</b>			

# ଅସୁରାତ ପ୍ରତି ସାହିତ୍ୟ !



- ▶ ଗଣ ଖରାରେ ପଦାକୁ ବାହାରନ୍ତୁ ନାହିଁ ।
- ▶ କଠିନ ପରିଶ୍ରମ କରନ୍ତୁ ନାହିଁ ।
- ▶ ଜରୁରୀ କାମରେ ବାହାରକୁ ଯିବାକୁ ହେଲେ ମୁଣ୍ଡରେ ଓଡା ଗାମୁଛା, ଛତା, ଚପଳ ଏବଂ ଜଳା ଚଷମା ବ୍ୟବହାର କରନ୍ତୁ ।
- ▶ ବାହାରକୁ ଯିବା ସମୟରେ ପାଣି ବୋଲି ସାଙ୍ଗରେ ନିଅନ୍ତୁ ।
- ▶ ଜଳ ଶୁଷ୍କତାରୁ ରକ୍ଷା ପାଇବା ପାଇଁ ଅଧିକ ପାଣି, ଓ.ଆର.ୱେ ଦ୍ରୁବଣ, ପଣ୍ଡା, ତୋରାଣି, ଘୋଲଦିନି ଓ ଆଖୁରସ ପିଅନ୍ତୁ । କାକୁଡ଼ି, ତରଭୁଜ ଆଦି ଖାଆନ୍ତୁ ।
- ▶ ମାଦକ ଦ୍ରୁବ୍ୟ ସେବନ କରନ୍ତୁ ନାହିଁ ।
- ▶ ହାଲୁକା ଏବଂ ଭିଲା ପୋଷାକ ପରିଧାନ କରନ୍ତୁ ।
- ▶ ଅସୁରାତରେ ଆକ୍ରାନ୍ତ ବ୍ୟକ୍ତିଙ୍କୁ ଯଥାଶୀଘ୍ର ତାତକରଖାନା ନେଇ ଚିକିତ୍ସା କରନ୍ତୁ ।
- ▶ ଗୃହପାଳିତ ପଶୁପକ୍ଷୀ ମାନଙ୍କୁଛାଇରେ ରଖନ୍ତୁ ଏବଂ ପ୍ରତ୍ୟେକ ପରିମାଣରେ ପାଣି ପିଇବାକୁ ଦିଅନ୍ତୁ ।



ତୋରାଣି



ପାଣି



ତରଭୁଜ



ଓ.ଆର.ୱେ



ଚପଳ, ଛତା



କାକୁଡ଼ି



ଓଡ଼ିଶା ରାଜ୍ୟ ବିପର୍ଯ୍ୟକ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ  
ରାଜୀବ ଭବନ, ଭୁବନେଶ୍ୱର

ସର୍ବେଜଳା ଓ ସର୍ତ୍ତକା  
ହିଁ ସୁରକ୍ଷା!

## Information Booklet Published by OSDMA for Heat Wave Situation During Summer

### ଗ୍ରୀଷ୍ମ ପ୍ରବାହ (Heat Wave)

#### ଗ୍ରୀଷ୍ମ ପ୍ରବାହ କ'ଣ ?

ଯଦି କୌଣସି ଛାନର ତାପମାତ୍ରା  $40^{\circ}$  ସେଲ୍‌ସିଆସ ପାଖାପାଖୁ ଥାଏ ଏବଂ ଏହା ସେହି ଛାନର ସାଧାରଣ ତାପମାତ୍ରା ୦ରୁ  $4^{\circ}-7^{\circ}$  ସେଲ୍‌ସିୟସ ବୃଦ୍ଧି ହୋଇଥାଏ, ତାହାକୁ ଗ୍ରୀଷ୍ମ ପ୍ରବାହ ଓ  $3^{\circ}$  ସେଲ୍‌ସିୟସରୁ ଅଧିକ ବୃଦ୍ଧି ହୋଇଥିଲେ, ପ୍ରବଳ ଗ୍ରୀଷ୍ମପ୍ରବାହ କୁହାଯାଏ ।

ଯଦି କୌଣସି ଛାନର ସର୍ବୋତ୍ତମା ତାପମାତ୍ରା  $40^{\circ}$  ସେଲ୍‌ସିୟସରୁ ଉର୍ଧ୍ଵ ଥାଏ ଏବଂ ଏହା ସାଧାରଣ ତାପମାତ୍ରା ୦ରୁ  $4-8^{\circ}$  ସେଲ୍‌ସିୟସ ବୃଦ୍ଧି ପାଇଥାଏ ତେବେ ତାହାକୁ ଗ୍ରୀଷ୍ମ ପ୍ରବାହ ଓ  $7^{\circ}$  ସେଲ୍‌ସିୟସରୁ ଉର୍ଧ୍ଵ ବୃଦ୍ଧିକୁ ପ୍ରବଳ ଗ୍ରୀଷ୍ମପ୍ରବାହ କୁହାଯାଏ ।

ଯଦି କୌଣସି ଛାନର ତାପମାତ୍ରା  $44^{\circ}$  ସେଲ୍‌ସିୟସ ବା ତତ୍ତ୍ଵରୁ ହୁଏ, ତେବେ ସେ ଛାନରେ ସାଧାରଣ ତାପମାତ୍ରା ଯାହା ହେଲେବି ଏହାକୁ ଗ୍ରୀଷ୍ମପ୍ରବାହ କୁହାଯାଏ ।

ବେଳେବେଳେ ଅତ୍ୟଧିକ ଗ୍ରୀଷ୍ମପ୍ରବାହ ହେତୁ ମଣିଷ ମୃତ୍ୟୁମୁଖରେ ପଡ଼ିଥାଏ । ୧୯୯୮ ମସିହା ଏପ୍ରିଲରୁ ଜୁନ ମାସ ମଧ୍ୟରେ ଗ୍ରୀଷ୍ମପ୍ରବାହ ହେତୁ ଓଡ଼ିଶାରେ ୨୦୪୭ ଜଣଙ୍କର ମୃତ୍ୟୁ ଘଟିଥିଲା । ଏହାକୁ ଅଂଶୁଘାତ ଜନିତ ମୃତ୍ୟୁ ବୋଲି କୁହାଯାଏ ।

#### ସୁରକ୍ଷା ଉପାୟ -

ଗ୍ରୀଷ୍ମ ପ୍ରବାହ ଓ ଅଂଶୁଘାତର ପ୍ରଭାବ କମ କରିବା ପାଇଁ ନିମ୍ନଲିଖିତ ସୁରକ୍ଷା ବ୍ୟବସ୍ଥା ଗ୍ରହଣ କରିବା ଉଚିତ ।



୧. ଶାଶ ଖରାରେ ବାହାରକୁ ବାହାରକୁ ନାହିଁ । ହାଲୁକା, ପିକା, ଡିଲା ସୂତା ଲୁଗା ବ୍ୟବହାର କରନ୍ତୁ । ଘରେ ପରଦା ଶାଶକୁ । ରାତିରେ ଢରକା ଖୋଲା ରଖନ୍ତୁ, ଫଳରେ ଘର ଥଣ୍ଡା ରହିବ । ଯେତେଥେର ସମ୍ବନ୍ଧରେ ଥଣ୍ଡା ପାଣିରେ ଗାଧାନ୍ତୁ ।
- ଶୋଷ ନଥିଲେ ମଧ୍ୟ ପ୍ରତ୍ୱର ପାଣି ପିଅନ୍ତୁ । ଓ.ଆର.୬ସ୍. ପାଉଡ଼ର କିମ୍ବା ଘରେ ଉପଲଷ୍ଟ ପାନୀୟ ଯଥା : ଲେପି, ଘୋଲ ଦହି, ତୋରାଣି, ଲେମ୍ୟୁ ପାଣି, ଦୁଧ ଇଣ୍ଡାଦି ପ୍ରତ୍ୱର ପରିମାଣରେ ପିଅନ୍ତୁ । ଗରିଷ୍ଠ ଜୀବ୍ୟ ଖାଆନ୍ତୁ ନାହିଁ ।
- ଚା, କପି, ମାଦକଦ୍ରବ୍ୟ ଓ କାର୍ବନ୍‌ମୁଦ୍ରା ଥଣ୍ଡା ପାନୀୟ ବ୍ୟବହାର କରନ୍ତୁ ନାହିଁ ।

ଯଦି ବାହାରକୁ ଯିବାକୁ ପଡ଼େ, ନିଜକୁ ରକ୍ଷା କରିବା ଭଲି ଉପକରଣ ଯଥା : କିଳା ଚଷମା, ଜୋଡ଼ା ବା ଚପଳ ଏବଂ ଧଳାଛତା ବା ଚୋପି ବ୍ୟବହାର କରନ୍ତୁ । ସାଙ୍ଗରେ ପାଣି ନେବାକୁ ଭୁଲନ୍ତୁ ନାହିଁ ।

ଭାଷଣ ଖରାରେ ବିଶେଷକରି ଦିନ ୧୭ଟା ୩୦ରୁ ମାତ୍ର ପର୍ଯ୍ୟନ୍ତ କଷ୍ଟକର ଶାରୀରିକ ପରିଶ୍ରମ କରନ୍ତୁ ନାହିଁ ।

୭. ବାହାରେ କାମ କରୁଥିଲେ, ଛତା ବା ଚୋପି ବ୍ୟବହାର କରିବା ସହ ଓହ ଗାମୁଛାରେ ମୁଣ୍ଡ, ବେକାଦି ଶରାରର ବିଭିନ୍ନ ଅଂଶକୁ ଘୋଡ଼ାର ରଖନ୍ତୁ ।
୮. ଅସୁଷ ଅନୁଭବ କଲେ ତୁରନ୍ତ ତାଙ୍କୁରଙ୍କ ପରାମର୍ଶ ନିଅନ୍ତୁ ।
୯. ବନ୍ଦ ଗାଡ଼ି ଭିତରେ ଛୋଟ ପିଲାଙ୍କୁ ଛାତି ଆସନ୍ତୁ ନାହିଁ ।
୧୦. ଗୃହପାଳିତ ପଶୁମାନଙ୍କୁ ମଧ୍ୟ ଛାଇରେ ରଖୁ ପ୍ରତ୍ୱର ପାଣି ପିଲବାକୁ ଦିଅନ୍ତୁ ।

### ଅଂଶୁଘାତରେ ପାତିତ ବ୍ୟକ୍ତିର ଚିକିତ୍ସା

୧. ପାତିତ ବ୍ୟକ୍ତିର ଦେହ ଉତ୍ତାପକୁ କମାଇବା ପାଇଁ ଥଣ୍ଡା ଓ ଛାଇ ଯାନରେ ଶୁଆଇ ରଖୁ ପ୍ରଥମେ ଓଦା କନା ବା ଗାମୁଛାରେ ତାଙ୍କୁ ପୋଛି ଦିଅନ୍ତୁ । ଆବଶ୍ୟକ ହେଲେ ମୁଣ୍ଡରେ ଥଣ୍ଡା ପାଣି ଭାଲନ୍ତୁ ।
୨. ଓ.ଆର.୬ସ୍. ପାଉଡ଼ର ପାଣି, ତୋରାଣି କିମ୍ବା ଲେମ୍ୟୁ, ଦହି ସର୍ବତ ଇତ୍ୟାଦି ପିଆଇ ଦେବର ଜୀବୀୟଥା ପରିମାଣକୁ ଠିକ୍ ରଖିବାକୁ ଚେଷ୍ଟା କରନ୍ତୁ ।
୩. ଅଂଶୁଘାତ ବେଳେବେଳେ ମନ୍ତ୍ରୀର କାରଣ ହୋଇଥାଏ । ଆୟାତପ୍ରାୟ ବ୍ୟକ୍ତିଙ୍କୁ ତୁରନ୍ତ ନିକଟରେ ସାଧ୍ୟକେନ୍ଦ୍ରୀ ପଠାଇବାର ବଦ୍ୟାବସ୍ଥା କରନ୍ତୁ ।

### ମନେରଖନ୍ତୁ :

ଅଂଶୁଘାତରେ ପାତିତ ବ୍ୟକ୍ତିଙ୍କୁ ଏକାବେଳକେ ଅତ୍ୟଧିକ ପାନୀୟ ପିଲବାକୁ ଦିଅନ୍ତୁ ନାହିଁ । ସୁଷ୍ଠୁ ହେବା ପର୍ଯ୍ୟନ୍ତ ପ୍ରତି ଅଧି ଘଣ୍ଟରେ ଅଧା ଗୁପ୍ତ ପାନୀୟ ଦେବା ଉଚିତ ।

## SATARK Web & Mobile App



Web Link : [https://satark.rimes.int/Login/login\\_form](https://satark.rimes.int/Login/login_form)

**What's new •**  
Last updated 11 Dec 2019

SATARK Mobile App is available in the App Store for Android & IOS

Home		Heatwave		Heatwave	
		<b>Bhubaneswar , Khordha</b>		<b>Favourite Location Status</b>	
		<i>Today's Heatwave Status</i>		<b>BHUBANESWAR</b>	
		Maximum Temperature <b>27.1°C</b>		Max Temp <b>27.1°C</b>	
		Status <b>Normal</b>		Status <b>Normal</b>	
		<i>Next 10 Days Forecast</i>		<i>Next 10 Days-&gt;&gt;</i>	
		2020-02-18 27.1°C Norms	2020-02-19 28°C Normal	2020-02-20 30.4°C Norms	2020-02-21 31.6°C Normal
		<i>Heatwave Advisory</i>			

Format-I																			
Information to be submitted with every joint enquiry report of heatstroke deaths.																			
District:										Date:									
Sl.No.	Name of the deceased with Address (If unidentified mention unidentified)	Age	Gender (Male/Female/Third Gender)	APL/BPL	Occupation of the deceased (Farmer/Labour/Hawkers/others to be specified)	Place of attack of Heat Stroke					date and time of attack of Heat Stroke	Date and time of Death	Whether person was hospitalized?	Whether cause of death (Heat Wave ) Confirmed by medical officer? (Yes/No)	Any ancetedent illness chronic disease present (Ask the family member)	cause of death as per joint enquiry report	Whether post mortem conducted? (Yes or No)	Remarks	
						Name of the BLOCK/ ULB	Name of the Village/ Ward	Rural/U rban	Indoor/O utdoor	Location									crop field
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

(Name and Desination of the Reporting Officer)

Signature with Seal



**Format-II**

**Details of the Death reported to Heat Wave Joint Enquiry & Payment of Ex- gratia**

**Recorded to be maintained Tahasil & District Officer and Weekly report to be submitted by District officer to SRC)**

District-								Years-					
Sl No.	Name of the deceased	Original Address of the deceased (Village /GP/Blocks/ ULB)	Age	Gender (Male Female Third gender)	Economic Status APL/BPL	Occupation of the Deceased Femal Labourer Hawker Other to be soecifie	Name of Block/ULB	Place of attack of Heat Stroke				Date and time of Attack of Heat Stroke	
								Name of the Village/Ward	Rural/ Urban	Indoor /Outdoor	Location (crop field/market/ bus stop/street/home/office/ any other)		
1	2	3	4	5	6	7	8	9	10	11	12	13	

Date and Time of Death	Maximum Temperature of the Day(in C) recorded at nearest weather stations (mention the location of weather station )	Whether the persons was hospitalised ?		Maximum Temperature Recorded (retail and Oral)	Date and time of Post Mortem Conducted	Date of Joint enquiry by the local revenue and medical officer	Any antecedent illness/ chronic disease present (Ask the Family memebers)	Remarks regarding cause of death		No. of date Sanction Order of ex-gratia	Name of NOK	Date of Payment of ex-gratia
		(Yes)/Not	If Yes Name of the Hospital/ Health Centre					As per Post Mortem/ Report of treating physician	As per Joint Enquiry Report			
14	15	16	17	18	19	20	21	22	23	24	25	26

**Format- A**

**Daily Report to be Submitted by Health Department on Cases and Deaths Due to Heat Related Illness**

**Date:**

Sl.No.	Name of the District	New cases admitted / treated due to Heat Related Illness during the day	Cumulative no. of cases admitted / treated due to Heat Related Illness since 1 <sup>st</sup> April 2018	Deaths reported due to Heat Related Illness During the day	Cumulative no. of deaths due to Heat Related Illness since 1 <sup>st</sup> April 2018	Remark (If any shortage of ORS / IV Fluids / Treatment facilities etc.)
1	2	3	4	5	6	7

(Name & Designation of the Reporting Officer)

(Signature & Seal)

## References

1. Guidelines for preparation of Action Plan- Prevention and Management of Heat Wave, October-2019, National Disaster management Authority (NDMA), Govt. Of India.
2. A Preliminary Study to Estimate Temperature Threshold for Heat Wave Warning in India, September 2019.
3. Climate Change Innovation Programme-Heat Island Mitigation Action Plan for Ib-Jharsuguda, Odisha by The Energy and Resources Institute (TERI).
4. Studying Health Effects of exposure to heat stress, vulnerability, and heat threshold in Odisha by Indian Institute of Public Health, Bhubaneswar, Public Health Foundation of India (IIPHb).
5. Early Warning and Communications –India Meteorological Dept. (IMD).
6. Heat Island Study in Angul-Talcher Area of Odisha" By Prof. Manju Mohan – Consultant-Incharge, Centre for Atmospheric Sciences, Indian Institute of Technology, Delhi
7. Climate Adoptive HAP for Bhubaneswar by R. Magotra, Dy. Director, IRADe, New Delhi



**WATER**



**MEDICAL**



**SHADE**



**REST**



**OSDMA**

**Odisha State Disaster Management Authority(OSDMA)**

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