

Effect of Climate Change on Public Health in Bhubaneswar Smart City, Odisha, India: Risks and Responses

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Abstract-Climate change will bring new weather patterns and emerging health issues that affect the development of nations. Bhubaneswar is witnessing climate changes in form of increase in the blistering temperature during summer, heavy flood in monsoon and bitter cold in winter. Climate deviation arises due to rapid urbanization, deforestation and accumulation of green house gases. Summers are hot and humid, with maximum temperatures exceed 40°C. Winter with lows plunging to 15⁰C–18°C and the least is jumping to 8°C. A structured questionnaire is used for data collection from the respondents to create awareness regarding climate change. People suffered the risk of skin rashes, dehydration, mosquito-borne dengue and suppression of immune system. Palliation of global climate change by reducing the utilization of fossil fuels, certification of pollution under control, afforestation and increasing the usage of variety of renewable energy technologies. This study assesses the understanding and awareness on the science behind the urban climate.

Keywords: global warming, green house gases, pollution under control, skin rashes, weather pattern

I. INTRODUCTION

Environmental change might be an imperative and developing danger to general wellbeing. Therefore the IPCC was established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) to carryout periodic assessment of global climate system and later the United Nations Framework Convention on Climate Change was adopted with objectives "stabilize greenhouse gas concentrations in the atmosphere at a level that might dangerous phylogeny (human-induced) interference with the climate system." The IPCC report of 2007 concludes that climate change is projected to extend threat to human health and have implications on food production, air quality, water supply, coastal settlements and human health. The dynamic climate can affect the fundamental parts needed for maintaining sensible health: clean air, potable water, adequate food and shelter. The climate of Odisha as originated since ages and the seasons are monsoon, winter, summer, spring and autumn, occur at constant time and continues for sure amount. The climate of the state has been determined due to number of factors such as location, ocean currents, forests, direction of prevailing winds, form of land and influenced by human to a great extent. The on top of factors have modified the climate of the state to a great extent recently. Odisha is facing super cyclones in 1999 and funny in 2019. UN felicitates Odisha for its disaster

management model during cyclone Phailin in 2015. Human beings are exposed to global climate change through dynamic weather patterns either directly or indirectly through changes in water, air, food quality and quantity, ecosystems, agriculture, livelihoods and infrastructure, and conjointly have an effect on diseases transmitted through water and via vectors like mosquitoes. Bhubaneswar the capital city of Odisha has versed speedy urbanization within the previous couple of decades. Bhubaneswar has emerged as one of the fast-growing, important trading and commercial hub in the state and eastern India. Bhubaneswar has been listed among the top ten emerging and steepest growing cities in India by Cushman and Wakefield taking into thought factors like physical, social, demographics and assets infrastructure, current level and scope of economic activities and government support. Bhubaneswar is situated at a line of longitude of 20° 16' 12" N and scope of latitude of 85° 50' 24" E. The city has a mean height of 45 m above ocean level. The atmosphere follows a hot and damp example inferable from its closeness to the sea. March to June are hot and muggy, temperatures frequently shoot past 40° C in May. Bhubaneswar has a record with a strange rankling, an unusual blistering and mercurial rise in summer in the long stretch of June 2005, as the noteworthy temperature rose to 46.5 degree Celsius which was 10 degree better than average. Winter goes on for under in regards to ten weeks, with regularly lows dipping in December and January. Downpours brought by the Bay of

Bengal branch of the south-west summer rain storm lash Bhubaneswar among June and September. The highest monthly rainfall a total of 330 mm happens in August. The city has exceptionally high mugginess level, above 80% from July to October during monsoon storm season and in summer, the relative humidity goes close to 70%. Bhubaneswar is facing drought and monsoon failure. Environmental change presents significant deterrents to progress in meeting the Millennium Development Goals(MDGs) and maintaining progress raising the human development index (HDI). Climate change is closely linked to the broader sustainable development agenda to reduce poverty, child mortality and morbidity. This is an urgent need to sensitize the general population regarding global warming and climate change. Motivation for voluntary mitigation is mostly dependent on perceived susceptibility to threats and severity of climate change or climate variability impacts, where as adaptation is largely dependent on the availability of information relevant to climate change. Strategic activity is required both from people and public/private sector to prevent harmful corollaries from climate change to individuals and society on the loose.

II. CLIMATE REVIEW OF BHUBANESWAR

2.1.AVERAGE TEMPERATURE OF BHUBANESWAR

The hottest month with the recorded most elevated normal high temperature is May: 37.2°C. The month with record-breaking low normal outrageous temperature is December: 28.4°C. The month with the highest average low temperature is May :26.2°C. The coldest months with the least normal low temperature are January and December :15.6°C.

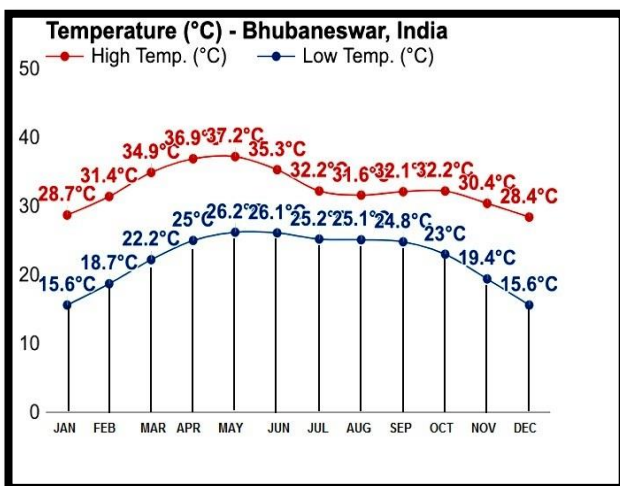


Figure-1:Average temperature of Bhubaneswar

2.2. AVERAGE HUMIDITY OF BHUBANESWAR

The month with the highest relative dampness humidity is August: 85%. Months with the least relative humidity

are January and December : 60%. The average yearly percentage level of humidity is: 70.0%

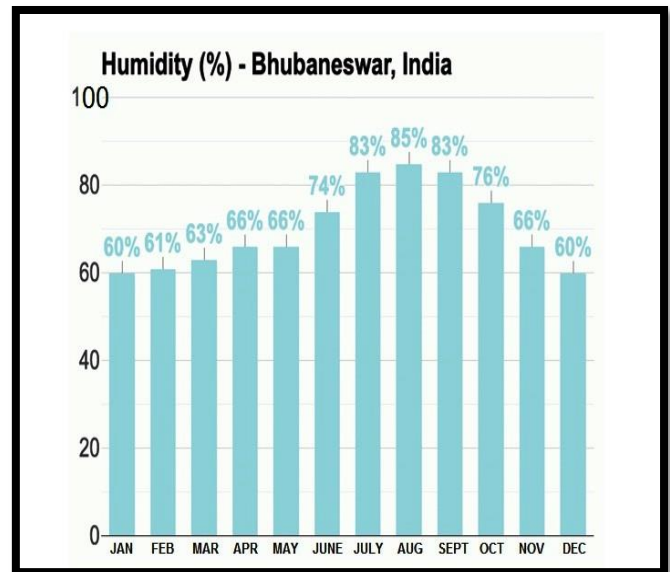


Figure-2-Average humidity of Bhubaneswar

2.3. AVERAGE RAINFALL

The wettest month with the most noteworthy highest rainfall is August :389mm. The driest month with the least rainfall is January :4mm.

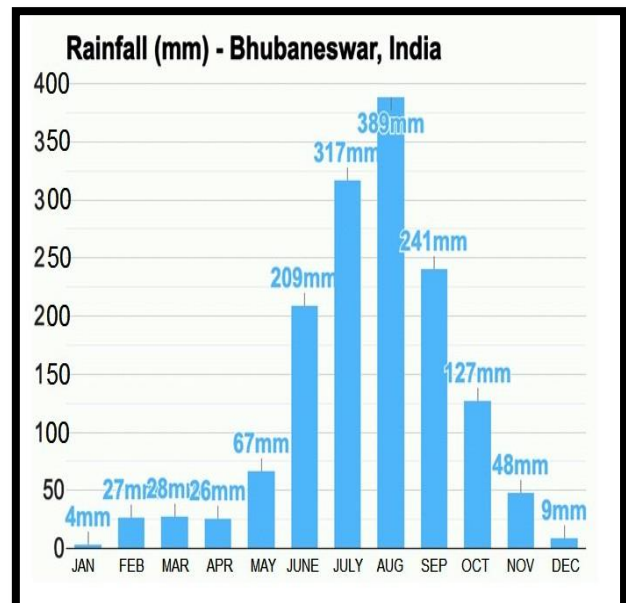


Figure-3-Average rainfall of Bhubaneswar

2.4. AVERAGE RAINFALL DAYS IN BHUBANESWAR

The month with the highest number of stormy rainy days is August :19.1days. The month with the least number of blustery rainy days is January :0.4 days.

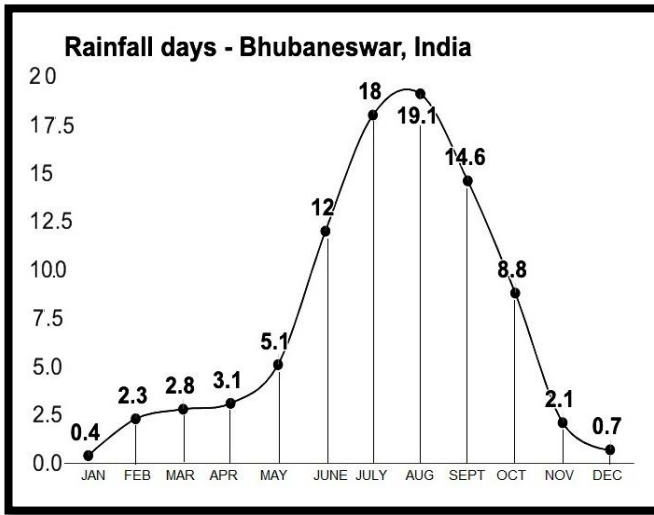


Figure-4-Average rainfall days of Bhubaneswar

2.5.AVERAGE DAYLIGHT / AVERAGE SUNSHINE, BHUBANESWAR

The month with the longest days is June (Average light : 13.4h). The month with briefest days is December (Average sunlight : 10.9h).The month with most daylight is February (Average sunshine:8.4h). The month with least daylight is July (Average sunshine : 3.5h).

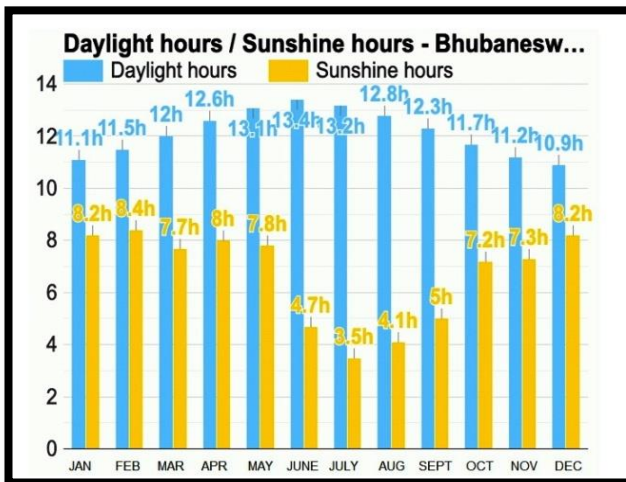


Figure-5-Average Daylight/sunshine hours

III. OBJECTIVES OF THE STUDY

The environmental change is associated with the vulnerabilities of human system arising from climate variability, The study envisages analyzing the impact of climate change on human health.

- 1.To investigate basic connection between the effects of environmental change varieties and extensions for human advancement in the capital city Bhubaneswar.
- 2.To survey individuals' information and discernment on environmental change.
- 3.Tocomprehendpeople's awareness about climate change in the investigation region.
4. To analyze the variability and trend of climate change.

IV. METHODOLOGY

4.1.AREA OF STUDY

The study area of present research is the different localities of Bhubaneswar city comprising of

- L1-Saheed Nagar, L-2-Chandrasekhar Pur,
- L-3-Vanivihar, L-4-Nayapalli, L-6-Kalinga Vihar,
- L-7-Rasulgarh,L-8-Mancheswar,L-9-Dhaulti and
- L-10-Sundarpada.

4.2.SAMPLING TECHNIQUE AND STUDY DESIGN

Multistage sampling technique was adopted to collect information from the respondents of variation age, gender, economy and education. Age of the respondents was above 20 years.

V. EFFECT OF CLIMATE CHANGE ON HUMAN HEALTH

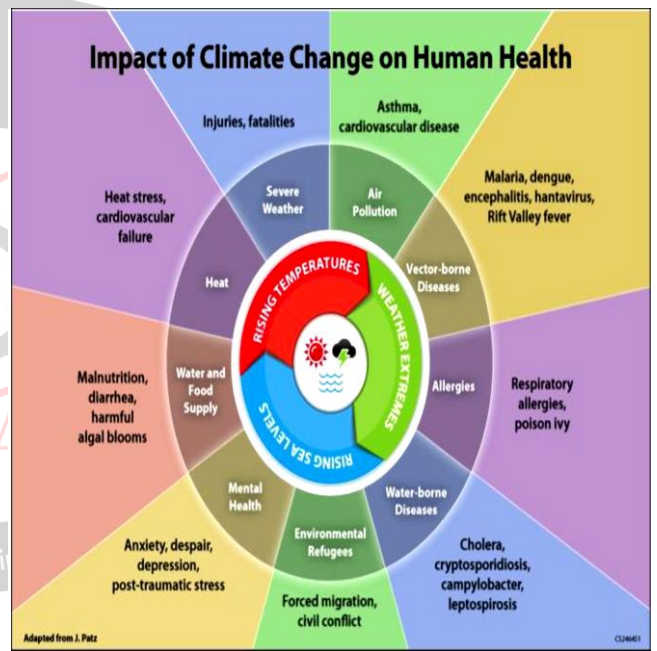


Figure-6-Climate impact on human health

5.1.Air Pollution – Related Health Effects:

Even healthy people can experience health impacts from sullied impure and contaminated air including metastasis disturbance or respiratory challenges during exercise or out of doors activities. High pollution levels will cause quick medical issues including aggravated cardiovascular and respiratory illness, added stress to heart and lungs, which must work harder to supply the body with oxygen, harmed and damaged cells in the respiratory system. Long-term exposure to sullied impure air can have permanent health impacts such as quickened maturing of the lungs, loss of respiratory organ capacity and diminished lung function, development of diseases such as bronchial asthma, bronchitis, emphysema, and presumably cancer, abbreviated life expectancy.

5.2. Health effect of extreme temperature:

Extreme heat conditions are connected to deaths from heat exhaustion, stroke and cardiovascular disease. The primary reason behind the irruption of diseases in summer is the presence of favorable weather for micro-organism, virus and other parasites to breed. Common summer diseases are - food and water-borne diseases (such as cholera, typhoid, hepatitis-A, food poisoning, un-wellness, and the runs), sore eyes, measles, mosquito - borne diseases (such as dengue and malaria), skin conditions (such as prickly heat and sunburn). Diseases in winter-colds, sore throat caused by viral infections, asthma, norovirus, painful joints, cold sores, heart attacks, cold hands and feet.

5.3. Water and food borne disease:

Foodborne, generally known as food poisoning and waterborne illnesses are conditions brought about by intake or drinking food or water that's debased by organisms or the toxins they turn out. They typically cause gastrointestinal symptoms such as abdominal pain, vomiting, nausea and diarrhoea.

5.4. Effect of food and water shortages:

Rising temperatures and regularly changing rainfall patterns are anticipated to decrease crop yield in a few nations, stressing and worrying upon food provides. The impact of dry spell on health embody deaths, malnutrition (under sustenance, protein-vitality lack of healthy sustenance and /or micro-nutrition deficiencies), drought lessens dietary assorted variety and reduces overall food utilization, and should thus, cause micro-nutrient deficiencies.

5.5. Health impacts of extraordinary climate occasions:

Extreme and outrageous weather events like severe storms, drought and floods have asserted thousand of lives all through the past barely any years and have unfavorably influenced the lives of millions and cost fundamentally regarding conservative misfortunes and harm to property. Extreme weather events could cause panic, loss of wealth, suicide, depression, psychologically insecure and occupational hazard. Super cyclone in 1999 was unexampled for the sheer severity. Funny in Bhubaneswar in 2019 caused a huge damage. Large flooding and serious rain battered in Bhubaneswar causes a loss .

5.6. Health impacts of rising sea levels:

Potential consequences on health due to sea level rise include-death and injury due to flooding, reduced availability of fresh water due to salt water intrusion, contamination of water supply through pollutants from submerged waste pumps, change the distribution of disease-spreading insects, health effect on the nutrition due to loss in agriculture land and changes in fish catch, health impact related to population displacement.

5.7. Health effects of more variable precipitation patterns:

Increasingly variable rain patterns are probably to have an effect on the provision of the supply of fresh and potable water. A scarcity of safe water will compromise hygiene and menace the risk of diarrheic sickness, that kills over 500K children aged under 5 years, every year. Water inadequacy results in drought and famine. Diseases in rainy season-cold and cough, dengue, malaria, loose motion, fever, typhoid and pneumonia are some of the diseases in the top of the list.

5.8. Health effects due to food insecurity:

Increasing temperatures and additional variable rain falls and loss of farming area due to blaze floods are relied upon to decrease yields in several tropical developing regions. Food insecurity causes malnutrition, lack of sufficient nutrients resulting vulnerability to infectious diseases such as malaria, diarrhoea and respiratory illness. There have been numerous investigations recommending that food insecurity among kids has adverse health effects, including increased rates of iron-deficiency anemia, chronic illness, acute infection and developmental and mental health problems.

5.9. Vector borne disease: Weather affects vector population dynamics and illness transmission, with temperature and humidness thought of as key variables. Changes in climate are likely to change frequency, lengthen the transmission seasons, and alter the geographic range of important vector-borne diseases like Japanese encephalitis (JE), corona, malaria and dengue. Unplanned urbanization has contributed to the spread of Plasmodium vivax. Vector-borne diseases are illnesses that are transmitted by vectors, that embrace mosquitoes, ticks and fleas. These vectors can carry infective pathogens such as viruses, bacteria, and protozoa, which can be transferred from one host (carrier) to a different.

5.10. Psycho-social impacts on Displaced Populations:

Expected increases in the frequency and severity of floods and storms can end in the destruction of homes, agricultural lands, medical facilities and different essential services, impacting particularly on people residing in slums and other marginal living conditions. Crowding due to population displacement is likely to exacerbate already encountered housing problems may increase the prevalence of mental disorders, depression, chronic stress, schizophrenia and suicide.

VI. RESULTS AND DISCUSSIONS

6.1. RESPONSE ANALYSIS FROM RESPONDENTS :

The following information were collected from the respondents through questionnaire of 10 locations of Bhubaneswar city using Simple Random Sampling Method.

Our observation during field survey revealed that the respondents were familiar about the climate change.

TABLE-1:CAUSES OF CLIMATE CHANGE

Causes of Climate Change	Number of Respondents	% of Respondents
Human activities	624	78
Natural process	176	22
Total	800	100

TABLE-2:REASON ABOUT CLIMATE CHANGE

Reason of climate change	Number of Respondents	% of Respondents
Deforestation	220	27.5
Unplanned construction	112	14
Destroy of natural resources	124	15.5
Global warming	156	19.5
Vehicular and industrial pollution	188	23
Total	800	100

TABLE-3:EFFECTS OF CLIMATE CHANGE

Following occurs due to climate change	Number of respondents	% of Respondents
Change in temperature	352	44
Untimely rain fall	204	25.5
Cyclone	112	14
Drought	76	9.5
Coastal erosion and sea level rise	56	7
Total	800	100

Maximum people from the study locations were aware of climate change, impact of climate change on human health and precaution measures. Results further indicated that most of the respondents have fair general knowledge about the subject except a few from daily labours and in slum areas.

6.2.POLICY IMPLICATIONS:

Various strategies are developed for quantitative estimation of health impacts of future global environmental change. WHO has outlined various methodologies to measure the disease burden caused by 26 risk factors at selected time points up-to 2030. Addressing climate change will need prompting mitigation and adaptation strategies without hampering economic development, good scientific evidence and coordination action by multiple stakeholders.

- 1.Strengthening health systems and service delivery mechanism.
- 2.Provision of drinking water and sanitation facility to all or any.

- 3.Provision of funding for low income communities with poor sheltering and high exposure/risk to heat and cold waves
- 4.Educating people about climate change.
- 5.Public awareness is high despite some limitations on the knowledge on climate change.
- 6.Certification of pollution under control
- 7.Afforestation and use of range of renewable energy technology
- 8.Standardized monitoring methods for long term measurement of climate sensitive diseases.

VII. CONCLUSION

The paper shows that connection of global climate change and human health are complex and multilayered and predictions of the longer term health impacts of climate changes are still unsure. Climate change is continuing and emissions are bound to increase due to growing economy of the state. Due to climate change, there is a change in land use pattern, cropping system and productivity of major crops, change in rate of migration and pattern employment, change in standard living and human health. Considering the increasing the rate of impact of climate change on human health, adoption of mitigation measures like strengthening health systems and repair delivery mechanism through early monitoring disease surveillance, vector and disease control, and health insurance to counter the same become imperative. Investment in environmental change research and development, health risk assessment studies, vulnerability mapping studies, establishment of base line conditions, state of affairs modeling and adoption of clean development mechanism are the need of the hour. People’s awareness on climate change should increase through the public health engineering organization (PHEO) of Odisha state and education is an important measure to motivate people at all levels to play an active role in mitigating and adapting to climate change. The survey reflects that a general population in urban area is aware about global climate change as well as role of human activities in climate change. The survey suggested that awareness programs relating to climate change and measures to combat to be introduced for higher preparation. The result counsel that improving basic education, climate acquisition and public understanding of the local dimensions of climate change are vital for public to have interaction themselves in adaptation and mitigation measures.

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