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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 deviationarises due to rapid urbanization,deforestation and accumulation ofgreen housegases.Summers are hot and humid, with maximum temperatures exceed 40°C.Winter with lows dipping to 15–18°C and the lowest is diving 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 climate change by reducing the use of fossil fuels,certification of pollution under control, afforestation and increasing the use of a number of renewable energy technologies.This study assesses the understanding and awarenesson the science behind the urban climate.*

Keywords*:weather pattern, global warming,green housegases , skin rashes,, pollution under control*

I. Introduction

Climate change may be a vital and emerging threat to public health. Therefore theIPCC 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.Thedynamic climate can affect the fundamental parts needed for maintaining sensible health: clean air,potable water,adequate food and shelter.The climate of Odishaas originated since ages and the seasons are monsoon,winter,summer,spring and autum ,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,oceancurrents,forests,direction of prevailing winds,form of land and influenced by human to a great extent.Theon 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,foodquality and quantity,ecosystems,agriculture,livelihoods and infrastructure,andconjointly have an effect on diseases transmitted through water and via vectors like mosquitoes.Bhubaneswar the capital city of Odisha hasversed 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 likephysical, social, demographics and assets infrastructure, current level and scope of economic activities and government support.Bhubaneswar is located at a line of longitude of 20° 16' 12" N and latitude of 85° 50' 24" E. The city has a mean altitude of 45 m above sea level. The climate follows a hot and humid pattern attributable to its proximity to the sea.March to June are hot and humid, temperatures often shoot past 40° C in May.Bhubaneswar has a record with an unusual blistering and mercurial rise in summer in the month of june 2005,as the highest temperature rose to 46.5 degree Celsius which was 10 degree above normal.Winter lasts for under regarding ten weeks, with seasonal lows dipping in December and January. Rains brought by the Bay of Bengal branch of the south west summer monsoon lash Bhubaneswar between June

and September.The highest monthly rainfall total, 330 mm occurs in August.The city has very high humidity level, above 80% from July to October during monsoon season and in summer the relative humidity goes near 70%.Bhubaneswar is facing drought and monsoon failure.Climate change poses major obstacles 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 proverty,child mortality and morbidity.The 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 action is required both from individuals and private/public sector to prevent harmful corollaries from climate change to individuals and society at large.

II. Climate Reviewof Bhubaneswar

2.1. AVERAGETEMPERATURE OF BHUBANESWAR

The warmest month with the recorded highest average high temperature is May: 37.2°C. The month with all-time low average extreme temperature is December: 28.4°C.The month with the highest average low temperature is May :26.2°C. Coldest months with the lowest average low temperature are January and December :15.6°C.

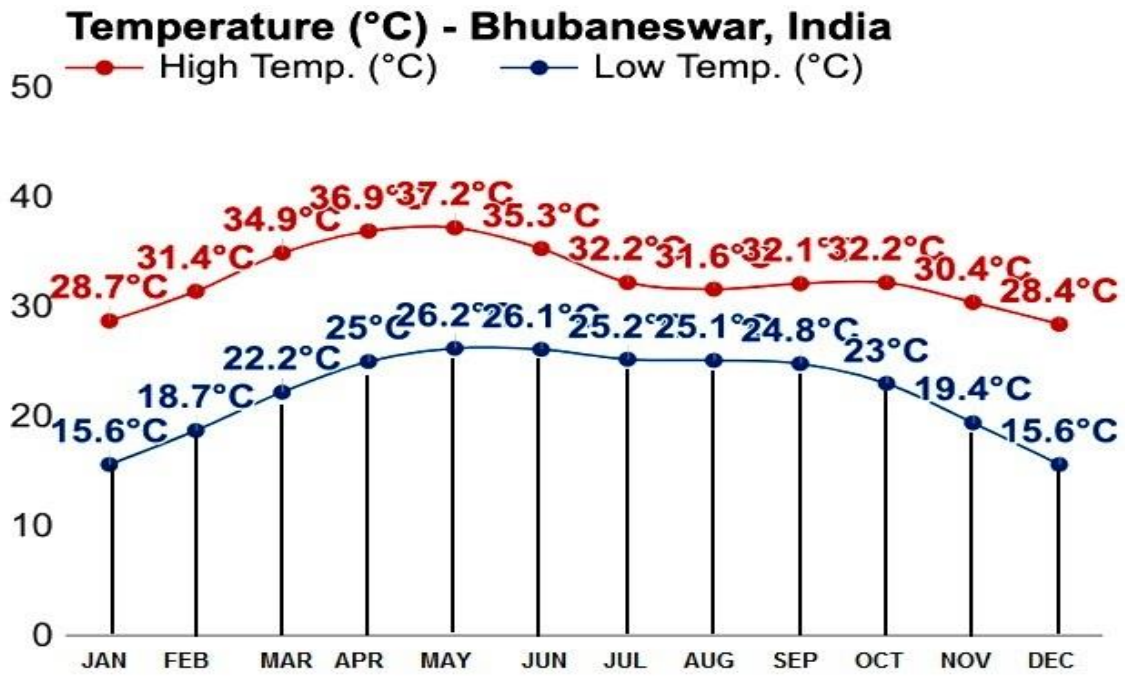

Figure-1:Monthly average temperature

2.2. AVERAGE HUMIDITYOF BHUBANESWAR

The month with the highest relative humidity is August: 85%. Months with the lowest relative humidity are January and December : 60%.The average annual percentage of humidity is: 70.0%

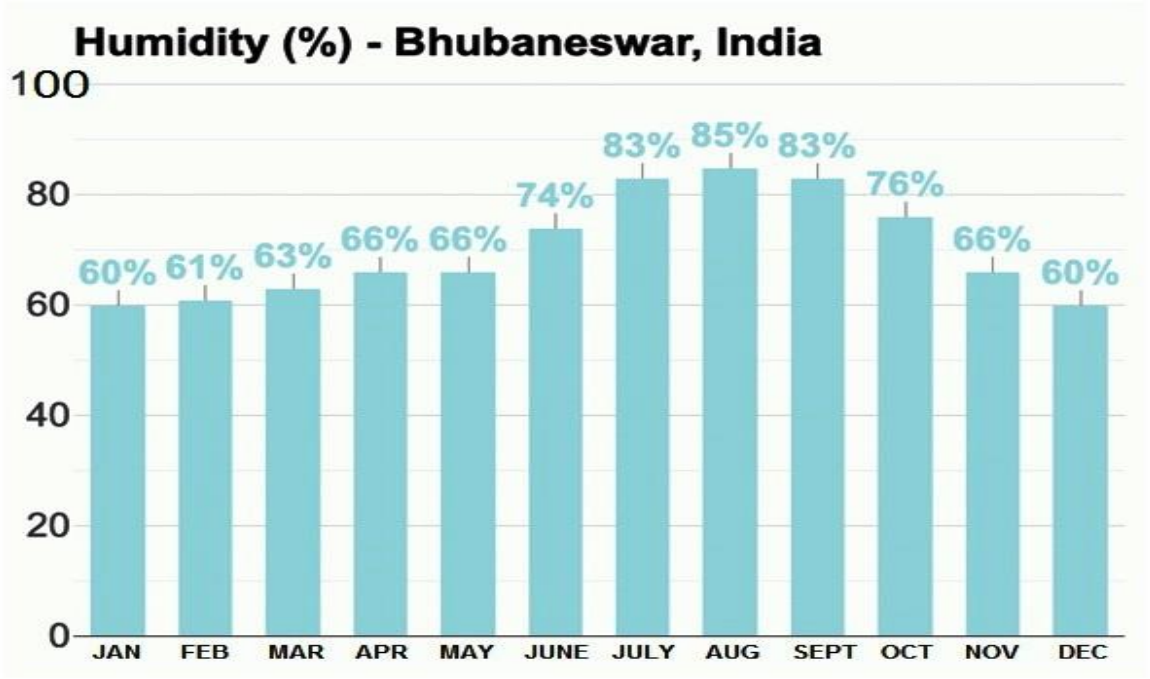

Figure-2:Monthly average humidity

2.3. AVERAGE RAINFALL

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

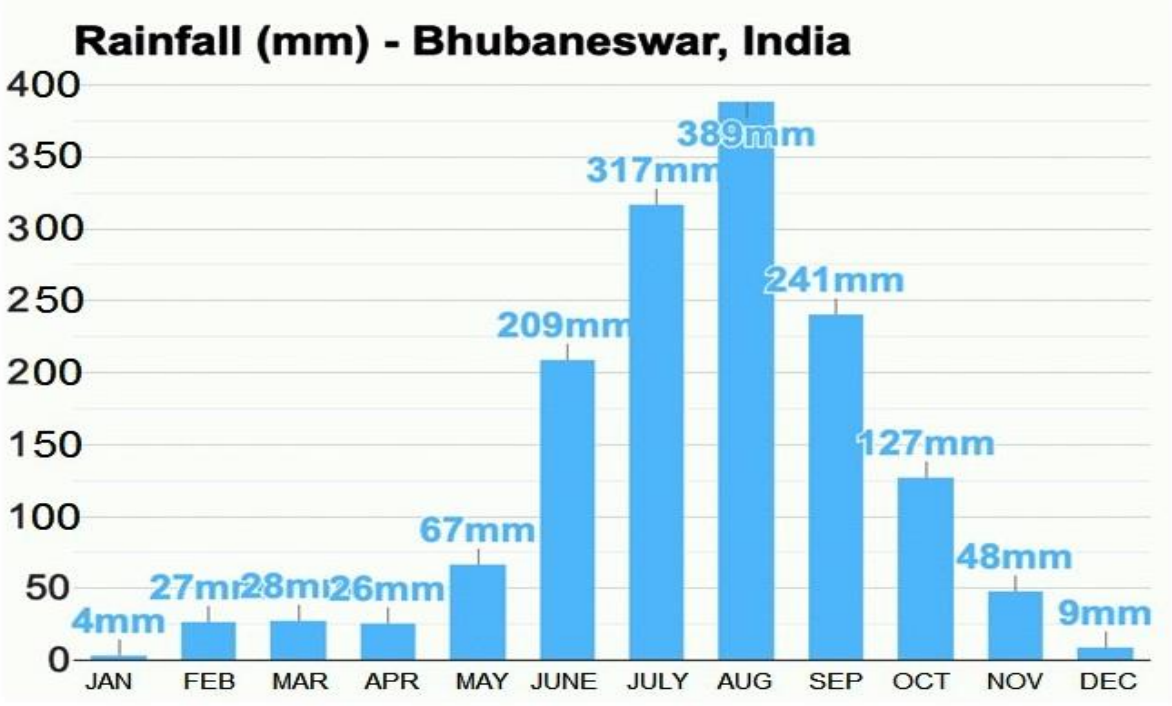

Figure-3:Monthly average rainfall

2.4. AVERAGE RAINFALL DAYS IN BHUBANESWAR

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

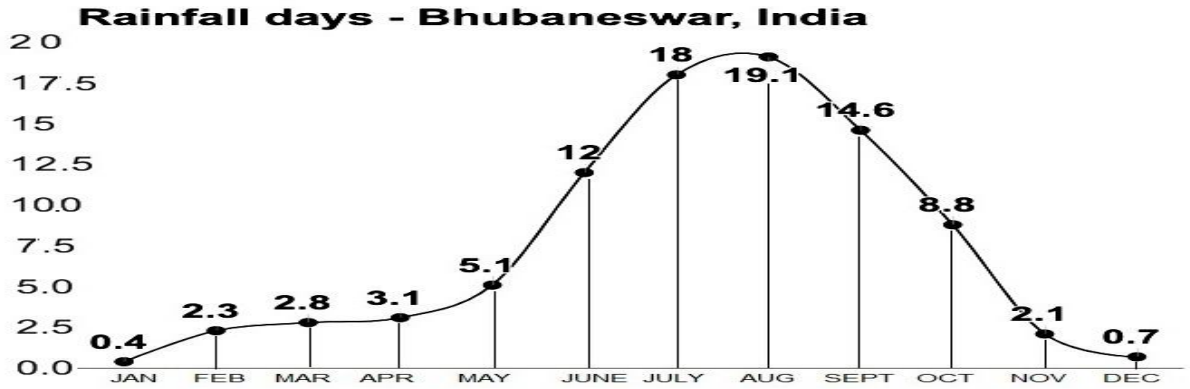

Figure-4 :Monthly rainfall days

2.5.AVERAGEDAYLIGHT/AVERAGE SUNSHINE,BHUBANESWAR

The month with the longest days is June (Average daylight: 13.4h). The month with shortest days is with most sunshine is February (Average sunshine:8.4h). The month with least sunshine is July (Average sunshine: 3.5h).

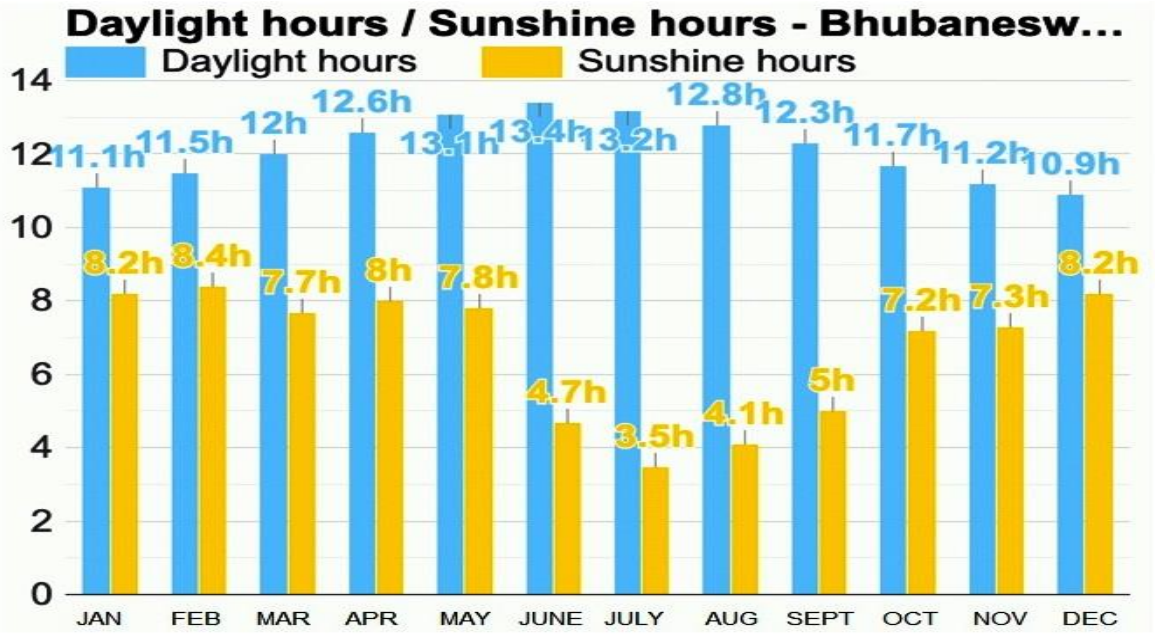

Figure-5: Monthly average sunshine

III. Objectives Of The Study

The climate 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 explore critical link between the impact of climate change variations and scopes for human development in the capital city Bhubaneswar.

2.To assess people's knowledge and perception on climate change.

3.To understand people's awareness about climate change in the study area.

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 L-1-Saheed Nagar, L-2-Chandrasekhar Pur,L-3-Vanivihar,L-4-Nayapalli,L-6-Kalinga Vihar,L-7-Rasulgarh,L-8-Mancheswar,L-9-Dhauli 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. Impact Of Climate Change On Human Health

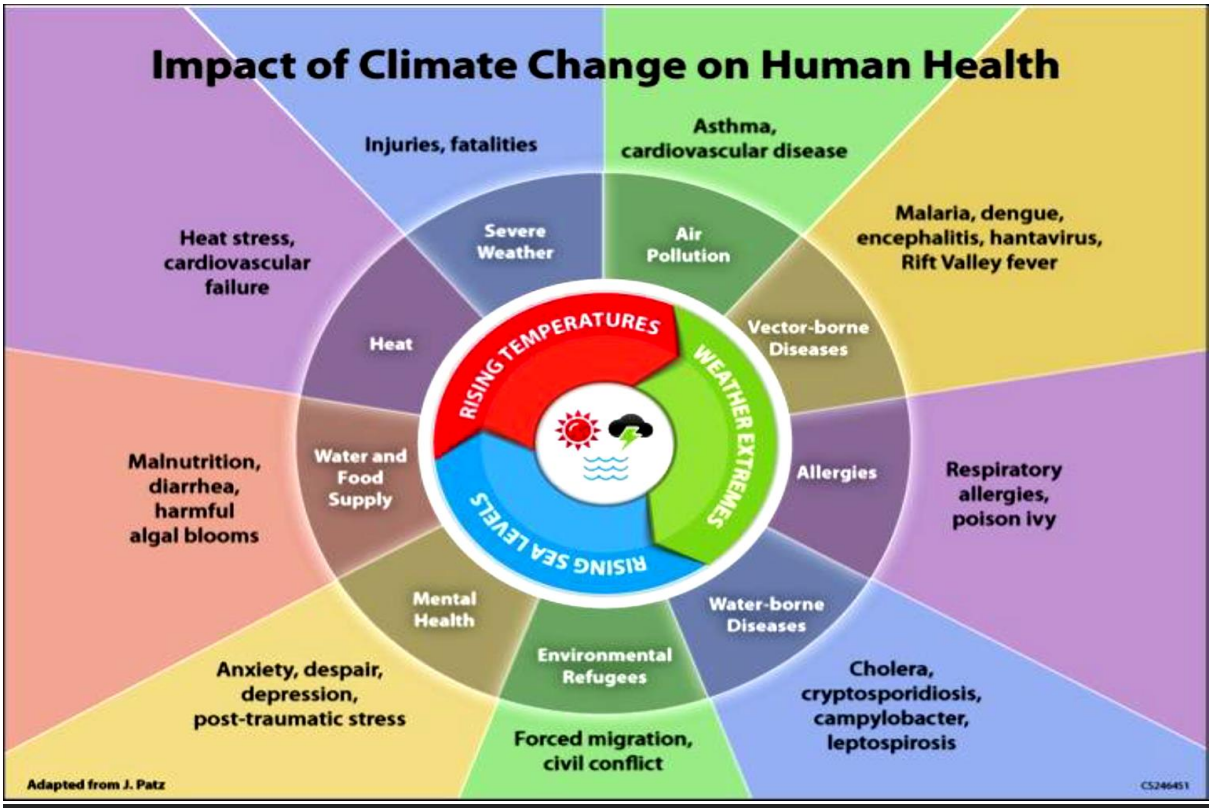

Figure-6: Impact of climate change on public health

5.1.Air Pollution – Related Health Effects:

Even healthy people can experience health impacts from impure and polluted air including metastasis irritation or respiratory difficulties during exercise or out of doors activities. High pollution levels will cause immediate health problems including aggravated cardiovascular and respiratory illness,added stress to heart and lungs, which must work harder to supply the body with oxygen,damaged cells in the respiratory system.Long-term exposure to impure air can have permanent health effects such as accelerated aging of the lungs, loss of respiratory organ capability and decreased lung function, development of diseases such as bronchial asthma, bronchitis, emphysema, and presumably cancer, shortened life span

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 -food and water-borne diseases (such as typhoid, cholera, hepatitis A, un-wellness, food poisoning and diarrhea), sore eyes,measles,mosquito-borne diseases (such as dengue and malaria),skin conditions (such as sunburn and prickly heat).Diseases in winter-Colds,sore throat caused by viral infections, asthma,norovirus,painful joints. cold sores,heartattacks,cold hands and feet.

5.3.Water and food borne disease:

Foodborne, usually known as food poisoning, and waterborne illnesses are conditions caused by intake or drinking food or water that's contaminated by microbes 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 ever changing patterns of rainfall are projected to decrease crop yield in several countries, stressing upon food provides. The impact of drought on health embody deaths, malnutrition(under nutrition, protein-energy malnutrition and /or micro-nutrition deficiencies), drought diminishes dietary diversity and reduces overall food consumption, and should thus, cause micro-nutrient deficiencies.

5.5.Health effects of extreme weather events:

Extreme weather events like severe storms,floods and drought have claimed thousand of lives throughout the previous few years and have adversely affected the lives of millions and cost significantly in terms of economical losses and damage 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 effects of rising sea levels:

Potential effects 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 ton the provision of the supply of fresh water. A scarcity of safe water will compromise hygiene and increase the risk of diarrheicsickness, that kills over 500000 children aged under 5 years, every year.Waterinadequacy results in drought and famine.Diseases in rainy season-cold and cough, malaria, dengue, stomach infection, diarrhoea, 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 agricultural land due to flash floods are expected to cut back 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 many studies suggesting that food insecurity among children 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),malaria and dengue.Unplanned urbanization has contributed to the spread of Plasmodium vivax Malaria and Dengue.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 aboutthe climate change.

TABLE-1:Causes Of Climate Change

Causes of Climate Change	**No. of Respondents**	**% of Respondents**
Human activities	**624**	**78**
Natural process	**176**	**22**
Total	**800**	**100**

About the causes of climate change,78% respondents revealed that human activities are the main cause of climate change and only 22% respondents mentioned that climate change is occurring due to natural process**.**

Table-2:Reason About Climate Change

Reason of climate change	**No. 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**	**23.5**
Total	**800**	**100**

When reason about climate change is asked to the respondents,27.5%revealed that deforestation is the main cause followed 23.5% by vehicular and industrial pollution.19.5% mentioned about global warming and 14% mentioned about unplanned construction.

TABLE-3:Effects Of Climate Change

Following occurs due to climate change	**No. 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**

The questions asked about the effects of climate change were intened to determine whether the respondents have observed any change in temperature and rain fall pattern.25.55 respondents mentioned about untimely rain fall and only 7% mentioned about coastal erosion and sea level rise are the effects.

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 andin slum areas.

6.2.POLICYIMPLICATIONS

Various strategiesare developed for quantitative estimation of health impacts of future global climate change. WHO has outlined general methodology to quantify 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 developmentgood 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.stabdardized monitoring methods for long term measurement of climate sensitive diseases.

Conclusion

The paper shows that linkages between 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 going on 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 trend 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 research and development,health risk assessment studies,vulnerability mapping studies,establishment of baseline conditions,state of affairs modeling and adoption of clean development mechanism are the need of the hour.Increasing people's awareness on climate change through 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 wellas 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,climateacquisition 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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