



Impact of Progressive Climate Change in Northeast India

Sr. (Dr.) Alphonsa Diana Haokip, *Assistant Professor, Department of Education, Don Bosco College (Autonomous) Maram*
sr.alphonsahaokip@gmail.com

Abstract: This paper is an attempt to explore how the progressive change of climate in the recent past years and to what extent exposure to the rising heat which is the outcome of the sudden upheavals in the environment has impacted the lives of hundreds of peoples of northeast India in the long run. This is realised through the current study which investigates and divulges the impact of progressive climate change. It unfolds the painful realities associated with climate change and the impact it has made on various sectors of human life in this northeast region. The present study has adopted the method of reviewing the related literature to actualize the project initiated. It is then built upon the accumulated research conducted to unearth the consequence of heat exposure and by analysing diligently how it has wedged the daily life of the people at the local and regional level. The paper further goes on to show that the average temperature that has risen in the recent years and will continue to rise thereby cautioning the people of northeast India regarding the perils of heat exposure. Further, the current study adds to the realization of the effects of progressive climate change and its hazardous impact on agriculture, environment, health, and society. The findings can be helpful to the government, aid agencies, and others involved in the development efforts to tackle natural disasters and the vulnerability related to climate change and heat exposure.

Keywords: *Progressive Climate Change, Northeast India, Impact*

1. Introduction

This century has seen more changes in the climate and globally it is observed that weather is becoming more hostile with frequent heatwaves. The impact of heat exposure is

increasing and is taking an immense toll on peoples' lives. It is seen that the Asian continent, which is the largest landmass on earth is the most diverse, concerning its physical and social geography. It is bounded to the north by the Arctic Ocean, to the east by the Pacific Ocean, and the south by the Indian Ocean. Tesfaye et al (2017) reiterated that the progressive climate change has increased since the middle of the twentieth century in Asia and the impacts is already being felt tangibly in the states of northeast India which was known for its astounding hill stations and amazing favourable cool climate throughout the year. The northeast India which was envied for its favourable climate enjoyed by the people is now threatened. This increasing heat exposure is particularly problematic to the people of northeast region and there is a strong signal of negative impact and future dangers. Although the global greenhouse gas emissions due to human activities have come from just a few countries, its influence has immensely increased the heat waves leading to pressing challenges facing the world and northeast India too will not be spared. Thus, global warming has caused an overall increase of about 0.8°C in northeast India during the last decade and it is still predictable to increase further in the coming years.

2. Literature Review

In the present study, a literature review has been adopted to explore the impact of progressive climate change in Asia and specifically in northeast India. In many parts of the world, climate change during the past few decades has produced higher temperature and occupational heat stress in both outdoor and indoor workplaces. Climate change has become a global emergency influencing human health and occupational safety. Indeed, Lundgren (2012) rightly said climate change can no longer be considered simply an environmental or developmental issue as it endangers human health and well-being. Enrico (2016) affirmed that widespread changes in extreme temperatures have been observed over the last 50 years. At the global level also, increased temperatures have induced continuous and extreme heat occurrences (Ropo, 2017; Ngwenya (2018). Enrico (2016), also believes that the earth is going through a period of climate change with a decrease in the number of cold days and nights and an increase in the number of warm days and nights across most of Asia since 1950 (Tesfaye et al, 2017; Enrico, 2016). In this regard, Johnsona (2019) supports that a worldwide increase in temperature has increased the risk for morbidity and mortality. This is because, human beings are directly exposed to climate change and indirectly through changes in

ecosystems, agriculture, water quality and supply, air quality, food quantity, and quality (Enrico, 2016). Horton (2016), remarked that numerous studies have detected significant changes in the observed occurrence of extreme heat events, irrespective of how such events are defined because high temperatures can result in increased core temperatures and dehydration (Johnsona, 2019). This implies that climate change affects, either directly or indirectly, a wide range of sustainable development issues such as health, food security, employment, incomes and livelihoods, gender equality, education, housing and poverty (Lundgren, 2012; Matthews, 2017).

Since, the global climate change is among the most visible environmental concerns of the 21st century the change has the potential to affect human health, both directly and indirectly (Moda, 2019). According to WHO (2014), heat is one of the naturally occurring hazards associated with climate change, and heat waves account for a significant proportion of human mortality because the air temperatures near the surface of the earth are rising (Matthews, 2017; Ngwenya, 2018). Ngwenya (2018) also stressed that extreme temperatures, particularly in occupational environments, have impacted negatively on humans and many studies conducted have shown the relationship between extreme high temperatures and negative human health outcomes (Sheridan, 2018). Also, Tesfaye et al (2017) posit that climate change poses a formidable threat to the sustainable development of Asia, as the region is vulnerable to the impact of climate change due to high population density. Hence, it is evident that increasing heat exposure during the hottest seasons of each year is the most obvious outcome of global climate change (Tord Kjellstrom, 2014).

3. Significance of the Study

The study is global in scope, as it explores the impact of heat exposure on Agriculture, Environment, Health, and Occupation. Sudden rise in temperatures, heat waves with greater intensity are increasingly becoming more common and more frequent locally, regionally, and globally due to climate change. The recent recognition made in the scientific and social circles concerning the growing threat of global warming called forth the attention of governments, research institutions, and academia on its severe economic and environmental impacts. Less attention, however, has been given to climate change's effects on the health and quality of life of the worldwide labour force. Therefore, in such a scenario of changing climate, heat poses particular health-endangering problems because it is evident

that increased in temperature will have a significant impact on the vulnerable group of people.

3.1 Aim

The scope of this study is to investigate the impact of progressive climate change in northeast India

3.2 Methods

This study has been realized by reviewing the related literature.

4. Impact

4.1 Agriculture Impact

The temperature has been rising across the northeast region and climate change is a major threat to agriculture because where, how, and when we grow food is vitally connected to our climate's normal patterns (Muthukumara, 2018. p-35). The agriculture impact is severely felt by the farmers who are struggling to keep up with shifting weather patterns and increasingly shortage in unpredictable water supplies. So, it is evident that farms are more likely to face attacks from weeds, diseases and pests, which adversely affect the yield. Further, progressive climate change and temperature variation also threaten crop yields either through floods or reduced water supply. This indicates that agriculture impact due to climate change is related to food security and there is an urgency to develop technologies that could adapt to the changing climate since climate change is already a pressing issue (Tesfaye et al, 2017; Muthukumara, 2018.p-35). Similarly, Horton (2016) argues that climate change signals a major risk to crop production systems, with implications for food security on account of increased heat and unusual weather alterations (Tesfaye et al, 2017; Horton, 2016). Thus, Tesfaye et al (2017), consider progressive climate change as one of the major factors that control the agriculture such since rate of growth, development, and yield of crops goes on to emphasise that crops have specific temperature requirements to complete a given growth stage. In this regard, it is observed that progressive climate changes have impacted the agriculture sector of northeast India particularly in the last decade (Sushma, 2016 p.v; Muthukumara, 2018 p-55).

4.2 Environmental Impact

The sudden rise in temperature as a result of progressive climate change is attributed to heat-trapping emissions from human activities, primarily the burning of fossil fuels

(Kristina, 2019 p-9; Muthukumara, 2018 p-41). This unexpected escalation in temperature is a consequence of climate change which is one of the main environmental issues challenging all the peoples both in the cities and rural areas of northeast India (Sushma, 2016 p-76). In this regard, Lundgren (2012) highlighted that the earth's climate is changing in an accelerating pace, with already documented implications for human health and the environment since the climate change has impacted the global climatic and environmental conditions (Ngwenya, 2018). Moreover, as the environmental change intensifies, heatwaves too will become more frequent (Veronique, 2019 p-12). Therefore, climate change is a matter of concern due to its widespread and severe impact on the environment (Sushma, 2016). The environmental change includes rising temperatures, changing precipitation patterns in the form of deadlier storms, and floods (Kristina, 2019 p-9). As a result, the global world and particularly northeast India is experiencing the impact of environmental change in terms of increased instances of heat waves which are more with each passing year (Sushma, 2016 p-20; Muthukumara, 2018 p-35).

4.3 Health Impact

Working in a hot environment leads to several cases of heat-related illnesses such as heat stroke, decreased chemical tolerance, and fatigue (Enrico, 2016). Rightly so, Ropo (2017) asserted that exposure to increased heat has numerous effects on human well-being and health. This is so because when people are unable to maintain a safe body temperature they are at risk of suffering from heat-related illnesses (Lesley Hughes, 2016 p-11&30). Thus, extreme weather has become a concern due to widespread and severe impact on health such as heat stroke, heart failure, diarrhoea, fainting, exhaustion, and skin disease (Ropo, 2017; Sushma, 2016. p-18). Matthews (2017) illustrated that the health impacts of progressive climate change and rising air temperature are compounded by attendant increases in atmospheric water vapour, which reduces humans' ability to dissipate heat. This alarms that health risks associated with these changes are diverse and serious (Lesley Hughes, 2016 P-30) as Lundgren (2012) expounded that sudden progressive climate change in weather have a significant impact on human physiology and therefore health. Furthermore, upsurge in heat increases accident risk and exposes people to serious heat-related health risks including heat exhaustion and severe dehydration (McKinnon et al, 2014). The common heat-health impacts include cramps, exhaustion and heat stroke (Sushma, 2016 p-35) and the consequences of climate change around the world today are a warning of what is to come (Veronique, 2019 p-

44). Besides, other negative impacts on health include sweaty palms, fogged-up safety glasses, dizziness and impairment of brain function responsible for reasoning ability (Vuuren, 2019 p-15). The average daily wage worker often works more than six hours a day regardless of the climatic conditions with prolonged sun exposure (Enrico, 2016). This implies that the longer our bodies remain overheated, the greater the risk of heat-related illnesses (Kristina, 2019 p-16) indicating that during the summer months the chances for serious human discomfort and heat-related illnesses is higher (Ropo, 2017). Hence, there is an urgent need to establish heat warning systems and protective measures based on public health (Kristina, 2019 p-35).

4.4 Occupational Impact

The intensity of temperature increase as a consequence of progressive climate change may vary within countries but the impact could be more felt in cities (Vuuren, 2019 p-26; McKinnon et al, 2014). This is because heat can cause daily wage workers and other workers to take off protective clothing due to discomfort, thereby putting the worker at a higher risk of dangerous exposure and injury (Lundgren, 2012). Further, Lesley Hughes (2016) expounded that as greenhouse gases continue to accumulate in the atmosphere from the burning of fossil fuels more heat is trapped in the lower atmosphere. This rising heat in the workplace is a matter of concern for any person working out-of-doors or in-indoor conditions without climate control (McKinnon et al, 2014). This suggests that days of extreme heat are generally correlated with lower worker productivity and the exposure to extreme heat can result in occupational illnesses and productivity losses (Muthukumara, 2018 p-25; Vuuren, 2019 p-15). Likewise, most of the heatstroke deaths reported have been associated with occupational exposure at construction sites, agricultural settings, and hot industrial jobs requiring heavy work (Lundgren, 2012). So, progressive climate change has significantly worsened and adversely impact the various occupation of the people of north east India. Lesley Hughes (2016 p-7) and Lundgren (2012) also confirmed that it is generally the farmworkers who are at a higher risk, as they work under high pressure and perform extended hours of work in the heat and high humidity. This upholds that agricultural and construction workers will be the worst affected with the progressive climate change in recent years (Vuuren, 2019. p-25) as they often suffer dehydration due to lack of sufficient knowledge regarding prevention from heat exposure (Lundgren, 2012). This points out that excessive heat while working, generally at temperatures above 35° Celsius, creates occupational health

risks and reduces work capacity and labour productivity (McKinnon et al, 2014; Moda, 2019). Therefore, it is evident that daily exposure to heat during hot weather is particularly dangerous for people working in jobs that are not conducive to health (Enrico, 2016).

4.5 Societal Impact

The impact of climate change is so diverse and varied that it is difficult to foresee or avoid (Kristina, 2019 p-39) as the effect of heat is more felt year after year since it is affecting peoples' lives (Sushma, 2016 p-28). The twenty-first century has witnessed numerous cases of extreme heat waves producing large societal impacts (Horton, 2016). Truly, acute heat stress is a growing cause of societal upheavals in the developed world and is slowly garnering attention at the national and international scenario (Veronique, 2019 p-19). Lundgren (2012) opines that human populations have a great capacity to adapt physiologically to gradual climate changes in nature. On the other hand, if the heat keeps rising as a result of progressive climate change it is natural that most outdoor jobs cannot usually provide cooling systems other than natural shade (Enrico, 2016). So, when extreme heat conditions prevent our bodies from adequately cooling, our core temperatures rise, causing a variety of symptoms (Kristina, 2019 p-16). Hence, excessive heat occurrences are crucial from a humanitarian perspective, since they are a prime driver of mortality (Ropo, 2017). Therefore, sudden changes in weather can have a significant impact on human society especially about their mode of settlement and migration for survival (Lundgren, 2012). Thus, the more we allow heat to rise in frequency and severity, the more it will disrupt our lives and the normal functioning of the society (Kristina, 2019 p-34). In the year 2016 too, it was recorded that 330 million people were impacted by the heat waves that took about 160 lives thus affecting the population and stability of the society (Sushma, 2016 p.31).

5. Conclusion

In northeast India, the consequences of progressive climate change has an alarming impact on the health, living conditions, and population of the region. This is because outdoor labourers, including construction workers, are more exposed to extreme heat, and more vulnerable to heat's effects on health, as they have fewer adaptation options available. Moreover, the daily temperatures and the intensity of heat are predicted to increase further as the years pass by. Hence, strategies for mitigating the effects of extreme heat can be adapted

in northeast region to protect outdoor workers from the increasingly severe effects of climate change.

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