

A Study On The Impact Of Climate Change On Humans, Animals, Ecosystems, And Public Perception Of Climate Change

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ABSTRACT

This paper is to determine the intricate relation between the health of human, animals, and the environment. The shift in the climate can have a detrimental effect on the ecosystem as having changing precipitation patterns and other factor essential for life. As to which climate has become the major concern related to the environment and human health. Climate change can affect the overall functioning of the surrounding in terms of plant and animal physiology. The discussion of this problem can be in terms of disease emergence, food security, mental health, ecosystem disruption and nutrition. The increase in concentration makes it difficult for the plants to circulate into the systems at a desirable rate. The survival of the organism is based on their tolerance or adaptation to the conditions of extreme climate change. The variation in the climate change can also be due to the geological locations of the area . As ecosystem involves a sequence of interacting biomes, the effect on one component can cause adverse impacts on the other component directly or indirectly. This interconnected in the ecological components is termed as one health. Public perceptions on the climate change will also contribute the target of one health. The holistic understanding this concept can enhance implementing effective strategies for improvement of health of the planet and its inhabitants for the future.

Keywords: Ecosystem, Climate change, Health and Public perceptions .

1. INTRODUCTION

The concept of one health has become one of the burning topics of today's as the world is facing a major crisis and it including all the organisms existing. Its key principles being interconnectedness, collaboration, prevention, and ecosystem health. It also focuses on the saving human and animal lives, sustained living, reduced cost (Zinsstag et al., 2018). The changes in the interaction between human, animals and the environment that we share as being the reason for upbrining "one health". The evolution of the human being has caused the spiking growth of their population and increasing the requirement of living space, resulting in expansion into new geographical areas. As a result humans come in close interaction with the wild and domestic animals

Climate is the one major factor determining the geographical properties of a landscape and the occupation of the people in the region. Climate change causes extreme weather events, drought, heatwaves, drought, thunder storms on the due course of time as a result of greenhouse gases. This basically talks about the intersectoral and integrated approaches of one health toward the betterment of the environment. The earth temperature has been increased by 0.11°C per decade since 1880. The rate of warming has been three times faster since 1982, which is about 0.20°C. according to the recordings from the year of 1850, the warmest year recorded to be 2023 with a global average temperature of 1.18°C consider the average of the 20th century (Rebecca Lindsey et al., n.d.). The combined efforts toward the one health are required due to the interconnected between the earth and its inhabitants. This comes in aims to obtain a sustainable balance and optimized. The beliefs and outlook towards climate change has major impacts on contribution. This determines the impact factor of each individual on the climate. The study on the perspective of people on climate change is done by subjecting selected subjects to the systematically designed questionnaire. The results obtained through statistical analysis is used to discuss the method of approach towards policy implementation and control measures.

1.1 EFFECTS ON PLANTS

Climate changes have vast impact on plants in terms of diseases, as climate is significant for plants to have an impact on ability to suppress or become conducive to diseases (Elad & Pertot, 2014). This is why disease in plants can be analysed for climate change (Elad & Pertot, 2014). The change in climate has caused the advanced flowering in plants which affects the normal flowering activities of the plant seasonally. The flowering is important for various reasons as the plants depend on this for reproduction and if the flowering events take place in advance, alters the autumn and spring events which prolongs the growing seasons for many plants where the summer growth is inhibited by extreme temperature and precipitation. It has been also observed that there is an increase in asynchrony between the flowering season of plants and the migration of certain pollinators in the region for example the peak flowering has advanced the arrival of migrating humming birds but only in the northern breeders. This indicates the greater stress on the poleward direction (Parmesan & Hanley, 2015).

The changes can have impact on the microclimate thus causing the risk of infection. The plants are subjected to genetic changes especially long generation times. Climate changes cause the depletion of native species giving rise to invasive which have the potential to grow in that particular climate conditions leading to growth of new pests and diseases. The trees in the forest are having carbon as the major constituent, which is taken up from the atmosphere for the process of photosynthesis and released out during respiration or when the plant dies. The forests are considered to have 90% of the carbon when considering the terrestrial atmosphere. Therefore, the biomass which is accumulated in the forest trees are the major regulators of atmospheric carbon dioxide. Increased levels of carbon dioxide may increase as most of the plants are C₃ plants, their photosynthesis process is unsaturated at the present carbon dioxide levels. Therefore, this results in more carbon storage thus serving to reduce carbon dioxide levels. (Graham, 1990). The growing season of flowering plants significantly increases with climate change but the study trends show that the changes vary according to the altitude of the location. (Inouye et al., n.d.).

1.1.1 EFFECT ON AGRICULTURAL CROPS

Growing crop requires an optimum temperature for specific species of crops. Therefore, the effect on the variability on climate change and change on food security is also location specific and following the vulnerable countries including countries with low-income groups, and limited adaptive capability are the ones mostly facing the food scarcity.(Gregory et al., 2009; Von Braun, 2007). The agricultural productivity around the world found to decrease by 2020 (Von Braun, 2007)and it has being estimated that the world agricultural GDP would decrease by 18% by 2050 in recent studies by Intergovernmental Panel on Climate Change (IPCC). It has also been estimated that the production of staple crops like the maize would decline by 24% and crops like wheat would increase by 17%. The increase in wheat production is due the various factor like elevated carbon dioxide, rise in temperature and shifting rainfall which are actually favourable to wheat production.(Ud Din & Haseen, 2024).

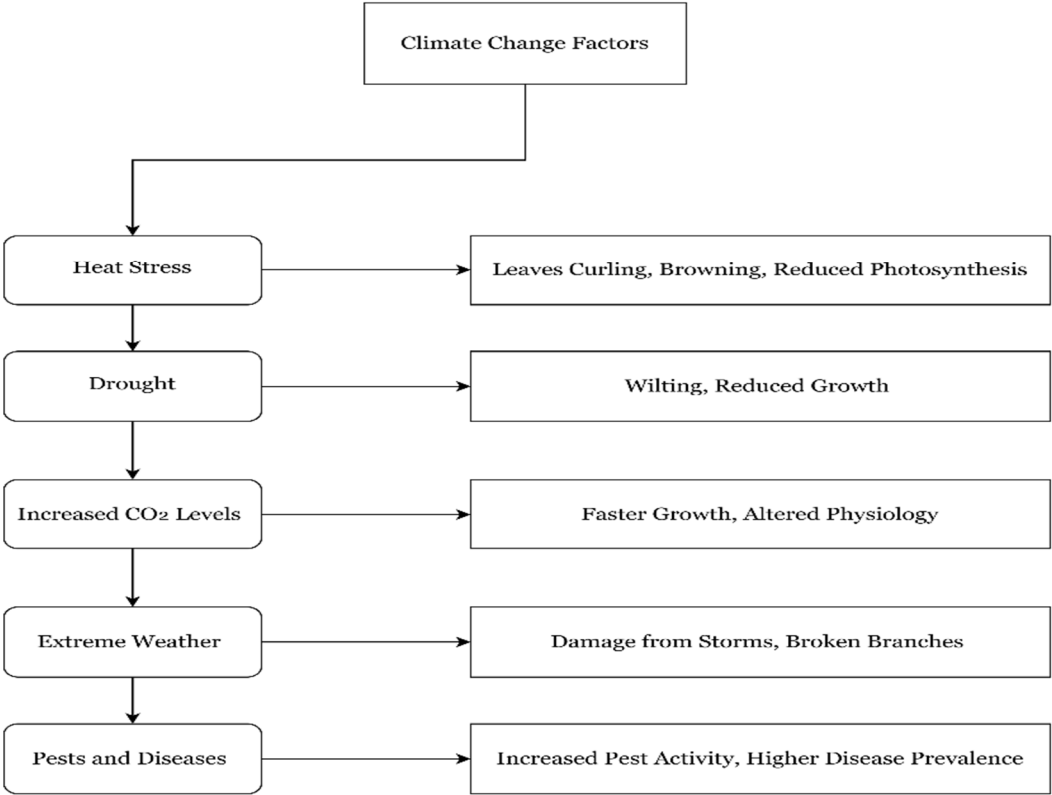


Figure:1 Effects of Climate Change on Plants

1.2 EFFECTS ON ANIMALS

Global climate change can impact on animal well-being as the trends of accumulation increases the global temperature causing the extremities of weather and seasonal changes. Animals including both domesticated and wild. As domesticated animals are essential for daily needs and the growth of the economy while wild animals are essential for the wellness of the ecosystem their health is one of the priorities to assess on (Pörtner et al., 2005). Climate changes lead to behavioural changes, genetic mutations, morphological changes, phenology, changes in species interactions and in the population dynamics. The survival of the species depends on the adaptable characteristics of that particular species.

It increases the susceptibility of animals to diseases due to the introduction of new pathogens or the reduction of immunity against the existing pathogens(Pörtner et al., 2005). This relates to the temperature related animal morbidity and mortality. The increase in density of microorganism causing vector borne diseases, food shortage and food borne diseases.

1.2.1 EFFECTS ON DOMESTICATED ANIMALS

The developing countries face the extremes of climate change as they are exposed to many challenges and have the limited resources to cope with them. Climate change is one of the factors leading to floods results in the humidity rise in the surroundings creating a favourable condition for the growth of parasites, for example the animals being after with avian influenza caused due to consuming the contaminated water containing the virus. The presence of helminths and other parasites in their free-living stage attains the favourable surviving conditions during water availability. This also explains the rift valley fever in Kenya and Somalia during 1997 and 2007(Pio et al., 2014). much more diseases cause by various vectors including ticks, mosquitoes, flies, midges and insects.

This has a detrimental effect on the developing countries more than the developed countries considering the depends on livestock for farm-based incomes. Researches has come to the conclusion that rates of the changing variables of climate are exceeding the adaptable capacity of the community and the livestock. Helminths are parasites that grow in wet and humid conditions are required for the growth in its developmental stages. When the abundance of this parasite increases in the soil, it tends to enter in the ruminant sac of the cattle. It requires an increased effects by the immune system to combat against the parasite. eventually the host has a reduced immune system (Skuce et al., 2013). The climate change causes the stress on animal oxidative processes. The rise temperature can cause the excessive loss of energy and poor feeding in animals. The heat stress caused due to climate changes causes oxidative stress , which is the impairment of the production of reactive oxygen species and the antioxidant defences of the animal causes oxidative damages to the cells and tissues(Lacetera, 2019)-(Lykkesfeldt & Svendsen, 2007)The immune system of dairy cows and avian birds gets impaired due to heat stress. (Peace, 2020)

1.2.2 EFFECTS ON WILD ANIMALS

Effects of temperature either improves or declines the health of the animals. It can impact directly or indirectly through disease vectors, food , water and air. Metabolic activities of the poultry are 30°C which would lead to excessive energy loss and poor feeding. The reaction of the immune system varies with each organism taken into consideration.(Peace, 2020). The main effect of climate change on the wildlife is loss of habitat, invasive species, pathogen spill-over, accumulation of persistent pollutants, climate change or stratospheric ozone depletion, global environmental change are the causing changes in the biological and physical systems which is becoming an increasing concern around the world and its inhabitants. The effects include heat stress, metabolic disruptions, oxidative stress, and immune suppression and increasing rates of mortality(A.M.Hutson, 2002). It alters the host, agent and environment dynamics of diseases that changes the epidemiological triad(Acevedo-Whitehouse & Duffus, 2009).the disturbances caused by climate change to the surrounding habitat causes the changes distribution in distribution of animals due to the alteration in the landscape and is habituated of adapted organisms survive in the region(Dale et al., 2000). Theories have been suggested that climate change leads to range contraction. As per the palaeontological studies by fossil evidences anatomical comparison and embryological comparison, the changes in the animal physiology over the years have been observed in terms of responses(Graham, 1990).

Climate change causes migration difficulties or alteration in the migratory cycle of the animals and birds. The timing of migration altered due to which the arrival time of the birds or animals would be mismatched with the availability of food resource(Pearson, 2006), along with which birds and animals show a varied patterns in hibernation cycles specifically birds migrating over an altitude gradient. The changes in the migratory and hibernation cycles can cause the phenological mismatches as mentioned(Inouye et al., n.d.).

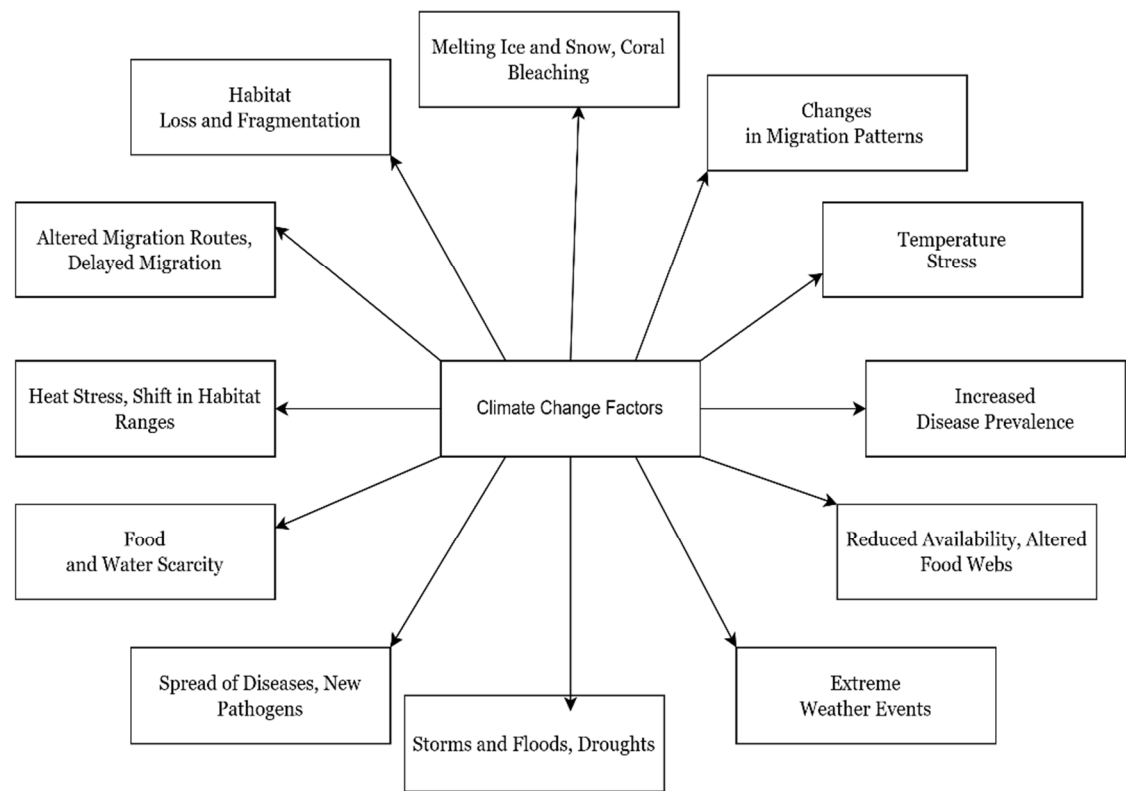


Figure:2 Effects of Climate Change on Animals

1.3 PATHOGENIC REACTION TO CLIMATE CHANGES

As the understanding about the pathogens and their reaction to the climate changes are studied upon and the results are acquired , effective methods and strategies can be implemented to suppress these pathogens. The factors affecting the appearance of plant pathogens depends on the host, pathogen components and the environmental conditions. So, considering the disease triangle which relates the three factors of disease occurrence , climatic factors such as the temperature, humidity, carbon dioxide content, precipitation and cloud cover comes into view. This results in genetic drift, mutation , adaptation and movement of pathogens(Garrett et al., 2009).

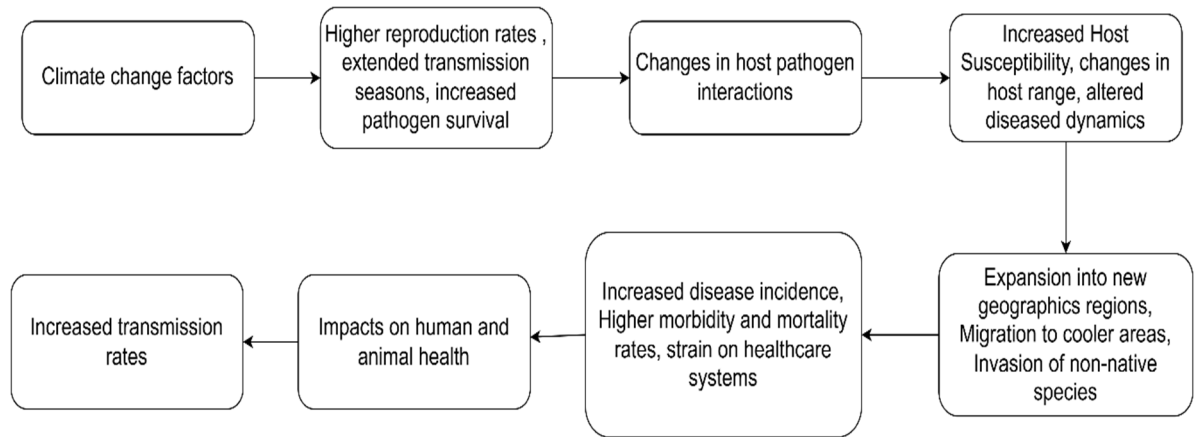


Figure:3 Effects of climate change on pathogens

1.4 EFFECTS ON HUMAN BEINGS

There a wide range of impacts on human population due to climate change . these effects can be localized effects or ecological effects that causes the hindrances in the sustainability goals. The changes in climate have caused the rise in sea levels in the coastal region that increases the erosion of salts in the fresh water resources impacting mental and physical health of the public. The extreme weather resulting in storms , floods, landslides and heat waves causes health related impacts and economic loss by degradation of the surrounding and inducing factor for diseases (Hales et al., 1997).

Climate change has a strong connect with related to human health. Climate change has a strong link to human health which includes heat related diseases . As it is estimated that the average global temperature of the world would increase by 1.0-3.5°C over the coming century the heat related diseases would be a matter of most concern. It also gives raise to various vector borne diseases. The direct impact on crop growth will affect human beings in terms of food security and economic growth additionally increasing hunger and malnutrition around the world(AJ McMichael & A Haines, 1997).

2. METHODOLOGY

The perception of climate change by the public by using the results questionnaire survey. The questionnaire is based on the perspective of people towards the impact on climate change. This paper views on their views on people’s contribution, the sensibility, their concerns towards climate change. The responses are collected based on the demography of the population and then regression models are applied to obtain the result of the survey to assess the situation and put forward necessary action. The statistical analysis is carried out as mentioned below:

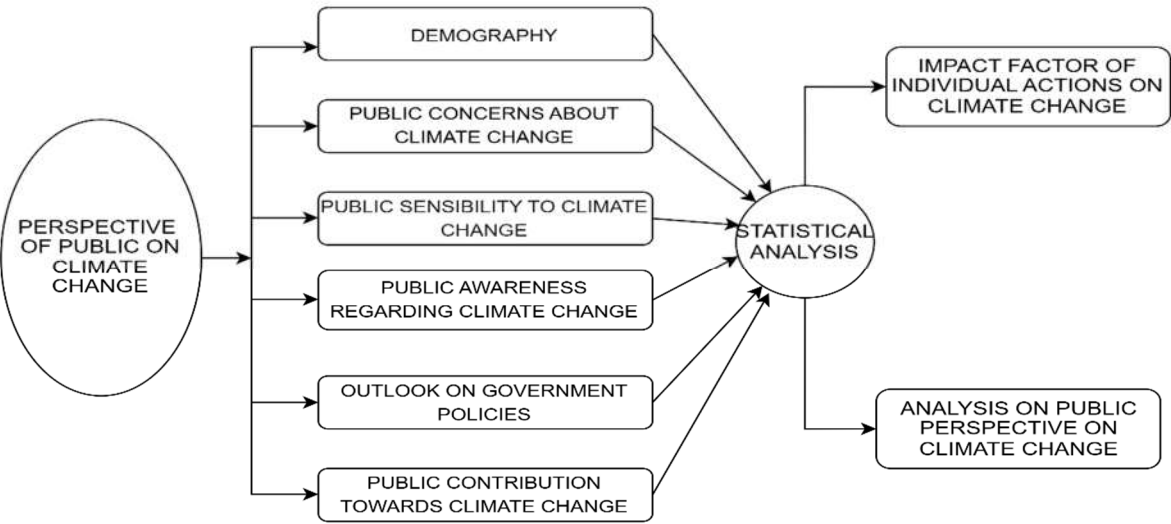


Figure:5 Statistical Analysis

3. RESULTS

The table 1 represents strong support for aiming at climate change, with 68.3% strongly agreeing and 28.4% agreeing that individual actions can help reduce its effects. A significant 60.1% agree and 27.4% strongly agree that societal changes are necessary, though 40.4% strongly agree and 47.3% agree that climate change is inevitable due to societal structures. Additionally, 40.1% strongly agree and 48.4% agree that reducing energy consumption is essential. Responsibility for climate change is seen as falling partly on developing countries, with 38.9% agreeing. Concerns are prevalent, with 53.6% agreeing and 24.9% strongly agreeing that climate change is frightening, and 53.4% agreeing that its effects could be catastrophic. However, 29.7% agree that the evidence for climate change is unreliable, suggesting a need for greater public awareness and education.

Parameters	Characteristics	n(%)
Gender	Female	254(63)
	Male	145(36)
	Prefer not to say	2(1)
Age	16-24	211(53)
	25-34	91(23)
	35-44	44(11)
	45-54	50(12)
	55-64	4(1)
	65-74	1(0)
Highest Qualification	10th Standard	4(1)
	12th Standard	31(8)
	Post Graduate	250(62)
	Under Graduate	116(29)

Table 2: Statistical analysis of Participant Demographics

The table 2 represents sample of 401 participants is predominantly female (63%), with males making up 36% and a small proportion (1%) preferring not to disclose their gender. Age distribution is skewed towards younger adults, with 53% aged 16-24, 23% aged 25-34, and smaller representations in older groups, including 1% aged 55-64 and less than 1% aged 65-74. Educational attainment is notably high, with 62% having postgraduate degrees, 29% undergraduate, 8% completing 12th standard, and 1% reaching the 10th standard. These statistics highlight a youthful, well-educated sample with a slight gender imbalance, indicative of a population likely in early professional or academic stages.

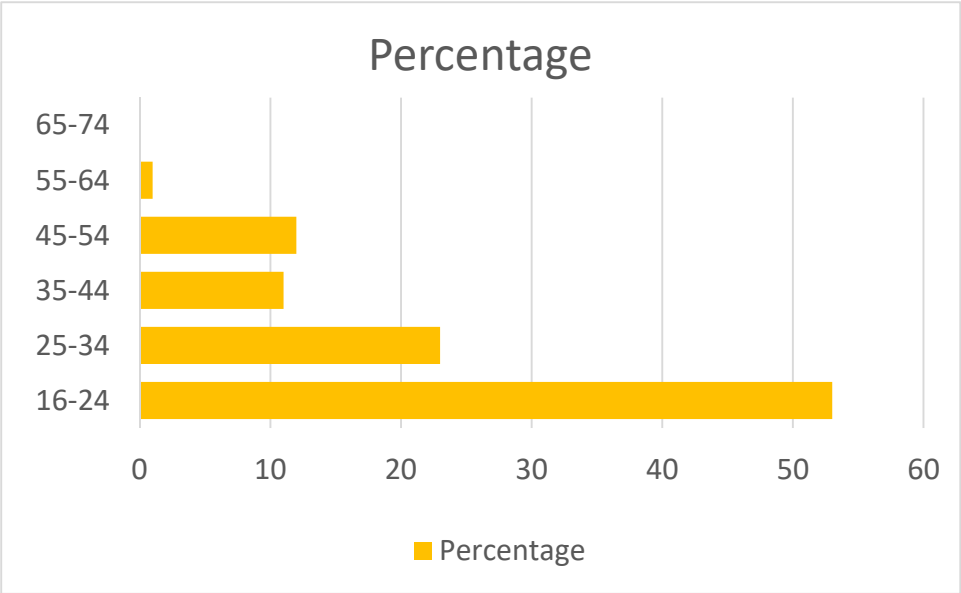


Figure 6: Age distribution

4. DISCUSSION

According to the results obtained from the survey the analysis of the perception of the people is analysed.

4.1 PUBLIC CONCERNS AND ATTITUDE TOWARDS CLIMATE CHANGE

The majority of respondents (76.4%) either disagree or strongly disagree with the notion that human activities have no significant impact on global temperatures. 7.5% of respondents strongly agree and 11% agree but not strongly. 5.2% neither agree nor disagree. A significant portion, 40.4%, disagree that human activities have no significant impact. The majority of respondents (88.5% combined) agree or strongly agree that measures should be taken to reduce energy consumption for mitigating climate change. There is a divided opinion on personal responsibility, with 49.1% (17.2% (strongly agree) + 31.9% (agree))of respondents indicating they would only act if others did too, while 38.9% (27.9% (disagree) + 11% (strongly disagree) express a willingness to act independently shown in figure 7. The study shows that the public have concern for the environment and about the impending climate change as 68.3% strongly agreeing and 28.4% agreeing that there is a climate change and that they should take steps and measures to reduce the impacts.

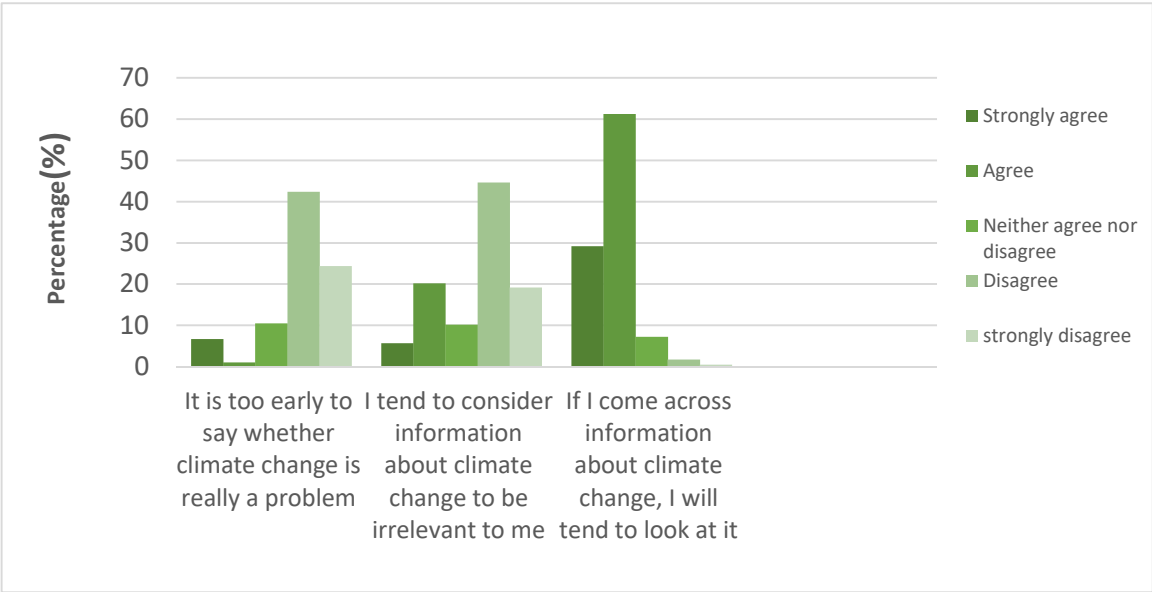


Figure 7: Public attitudes on individual action to cope with climate change.

4.2

4.3 PUBLIC ATTITUDES TOWARD GOVERNMENT CREDIBILITY AND POLICY INFLUENCE IN RESPONSE TO CLIMATE CHANGE

A significant portion (58.6%) either agrees or strongly agrees that such claims are exaggerated, indicating scepticism or disbelief in the extent of human influence on climate change. A notable percentage (34.4%) either agrees or strongly agrees that the evidence for climate change is unreliable, suggesting doubts about the scientific consensus on climate change. A majority (80.8%) either strongly

agrees or agrees with this statement, indicating widespread support for government intervention to promote environmental stewardship. While a significant portion (32.2%) believes it is already too late to take action, a majority (40.2%) disagrees or strongly disagrees, suggesting a mix of optimism and pessimism about the potential for mitigating climate change(fig8).

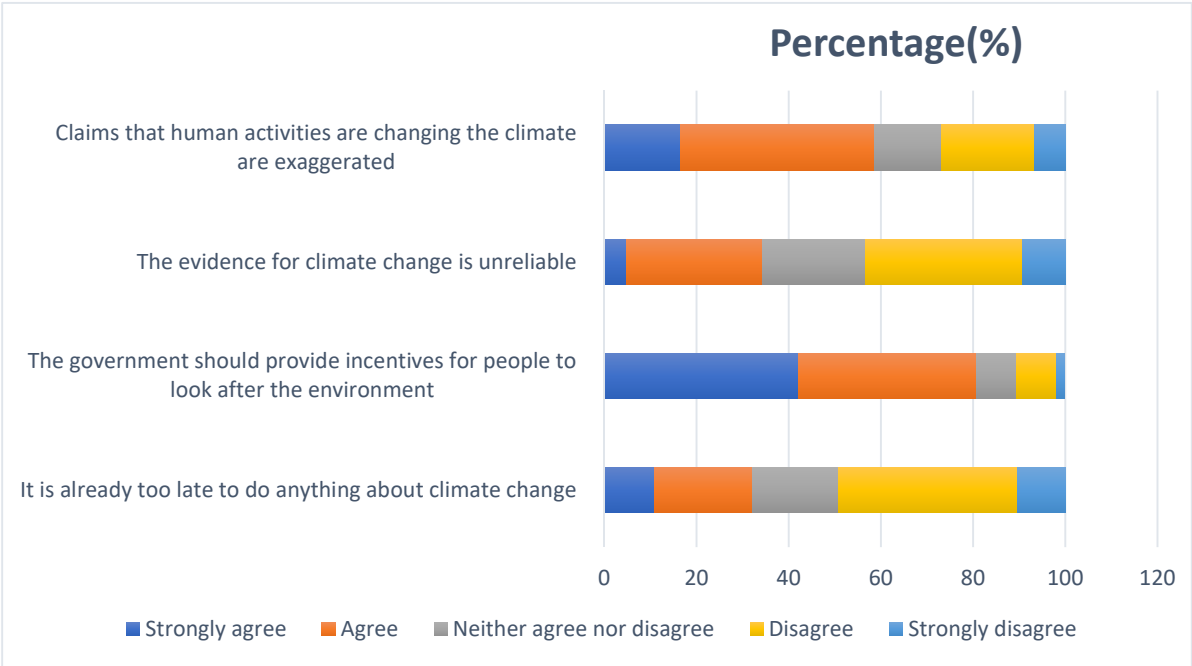
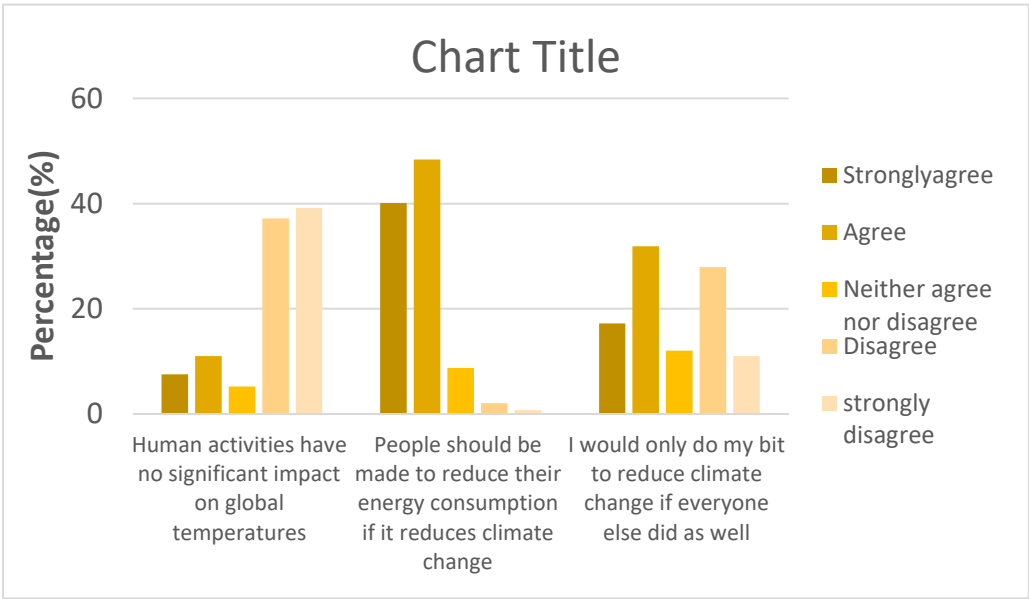


Figure 8: Public attitudes toward government credibility and policy influence in response to climate change.

4.4 PUBLIC ATTITUDES ON INDIVIDUAL ACTION TO COPE WITH CLIMATE CHANGE

A significant proportion (66.8%) either disagrees or strongly disagrees with the notion that it is too early to determine whether climate change is a problem. The majority of respondents (63.8%) either disagree or strongly disagree with this statement, indicating that they do not perceive information about climate change as irrelevant. However, a notable proportion (23.4%) agree or strongly agree with the statement,



A vast majority of respondents (90.5%) either strongly agree or agree with this statement, indicating a high level of interest or willingness to engage with information about climate change (fig 9).

Figure 9: Public attitudes on individual action to cope with climate change.

4.4 KNOWLEDGE GAPS

The study also shows that the present climate events are just a change in temperatures of the environment and not a human caused effect where about 16% strongly agree and 28.2% agree to this notion. As this study is carried out on a youthful, well-educated sample with young adults making up to 53% of the sample concludes that the awareness about climatic variations and the environment are not sufficient to bring forth the understanding how critical the scenario have come to.

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