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№ 6041

People's Perception about Weather Changes In Lucknow and How their Knowledge of Global Concerns such as Climate Change affect the Choices of a Sustainable Lifestyle

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July 11, 2021

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The International Conference on Infrastructure Development:

Theory, Practice and Policy (ICID-2021)

April 29-30, 2021

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Abstract

The sustainable development goal 13 states that the climate action highlights that there is no such country which is not experiencing the drastic effect of climate change. Global warming is causing long-lasting changes to our climate system which threatens irreversible consequences not just on a global but also on a local level if we do not act immediately. Climate change includes both global warming driven by human emissions of greenhouse gases, and the resulting large-scale shifts in weather patterns. Though there have been previous periods of climatic change, since the mid-20th century humans have had unprecedented impact on Earth's climate system and caused change on a global scale. India is one of the few countries which have faced the worst of the consequences. This makes it important to understand how and to what extent has this affected the perception of the people. Public opinion impacts on the issue of climate change because governments need willing electorates and citizens in order to implement policies that address climate change. Furthermore, when the perceptions of the populace and the government differ, the communication of risk to the public becomes problematic. This article attempts to analyze the various impacts of global climate change in the context of India and how the people of the north Indian city of Lucknow perceive it on a local level. The research finds out the role of environmental knowledge in how sustainable a lifestyle would people choose. The perception of respondents clearly aligns with the scientific data about the weather and climate change in Lucknow which has happened gradually. This research helps us understand as to how important it is to inform people about how their actions affect the well being of the entire world and how their informed choices can help the idea of sustainability to take shape.

KEYWORDS: Weather, sustainability, climate change, Lucknow, perception

1 INTRODUCTION

Climate change has been one of the humanity's biggest concern of the present age. With the rising development and the rapid urbanization paired with the fast-paced growth of industrialization all over the world and especially in the developing countries like India, the problem has become much more humongous than we realize. India is one of the few nations which has in the recent past focused more on the development factor and somewhat failed to take into account the impact it is making in the country's climate and the microclimate of the cities. The problem is worse in the metropolitans and excessively urbanized regions as is expected because of the increasing levels of populations as well as the lifestyle of the urban populace. According to the report named "Assessment of climate change over the Indian region": A report of the Ministry of Earth Sciences (MoES), Government of India, India's average temperature has risen by around 0.7°C during 1901–2018. This rise in temperature can be largely understood as a consequence of GHG-induced warming, partially offset by forcing due to anthropogenic aerosols and changes in Land Use and Land Cover. According to the current projections and estimates, by the end of this century India's overall temperature is expected to rise by approximately 4.4°C relative to the recent past (1976–2005 average). This may seem like a very small figure but if compared with the overall International standards and recommendations by various global climate agencies, this is a drastic variation. In this paper we have tried to analyze the perception of people of Uttar Pradesh state, India about what they feel regarding the weather and climate change of their city and the overall impact it has had on the city and the world at large. It also takes into account how much the citizens of the said city understand their environment and how much important they think laws relating to environment are and what all activities would affect the environment and how. This attempt has been made numerous times earlier by various researchers across the globe and it helps a great deal in understanding how widespread is the problem of climate change and how even on a micro

scale, the effect is being felt. This is not just the case with India as all across the globe, cities have started to feel how their unsustainable attitudes have affected the overall climate and weather of their cities and countries. It is imperative to say that the problem is not just the attitude of people towards environment and nature but also the political intent which has never shown a strong enough will to choose sustainability instead of wasteful methods of over exploitation of resources. Every nation in a race to become a world leader has focused more and more on the exploitation of their natural resources and establishment of industries by clearing off forests and pasturelands alongside pressing the pedal on urbanization harder and harder. These unsustainable and untenable methods started to show off their consequences in the early '60s so much so that during the 1970s the world leaders were forced to come together and prepare a strategy about how to move forward in the times to come. The Brundtland Report came into existence after it was realized that if the things kept on going the way they were, the world would become uninhabitable very soon. To some extent, the goals and suggestions set by the report were followed by the various countries in the nascent stages but the greed to become the biggest economy and the greatest nation ever made the leaders turn a blind eye towards the climate and environment.

The Brundtland Report can be considered as the transition phase of our history when people's understanding and appreciation was growing about both the concept of environment and the concept of development. But even today, thirty-four years later, tensions, controversies, and gridlocks between development and environment still exist. They will keep on going unless and until we understand the notion of sustainability and understand in our heart of hearts that it is more important to preserve what we have for the future generations rather than stealing them away from the forthcoming generations just in the name of our own selfish benefits. The challenge of meeting the needs of present generations without compromising the ability of future generations to meet

their needs was molded by the Commission into the concept of sustainable development in 1987 when this was totally new.

- New was the notion of equity and justice within and between generations.
- New was the clear idea of developing a shared understanding of the long-term goals for human life on earth.
- New was the idea of new governance instruments and of building collective action.
- New was the resoluteness with which we advocated the need for leadership and building trust with others.

Under prevailing circumstances, all this is still a challenge today and the sad thing is that we are still failing to see the real extent of the damage it has already caused and what it would in the coming future. The generations to come will have to either live without half the resources we so explicitly waste or they will have to suffice without the entirety of them. The problem with the present-day world is that our economists somewhat neglect the environmental concerns when they devise economic plans and consider and present monetary growth as development which is to say that they neglect the entire natural capital that is being invested into the infrastructure and development which humanity has achieved as of yet.

Despite the scientific warnings of earlier decades, global warming did not become a significant public issue until 1988 - at that time the hottest year since the middle of the nineteenth century and the year in which Dr. James Hansen, director of the NASA Goddard Institute of Space Studies and a leading climate modeler, testified before the U.S. Congress that “the greenhouse effect has been detected and it is changing our climate now” (Christianson 1999:196). The Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal Ministry for international climate change negotiations under UNFCCC. The Climate Change Division of the Ministry looks after the

issues related to international climate change negotiations and related domestic policies and actions (Govt of India 2020)

Lucknow is the capital of the north Indian state of Uttar Pradesh. It is a landlocked city the distance of which from the sea provides it with a characteristic extreme type of continental climate with the prevalence of continental winds during most part of the year. As per the report of the Indian Meteorological Department, there are four broad seasons effective in the city. The winter season extends from December to February and is followed by the summer season which lasts till the first fortnight of June when monsoons arrive. The monsoons stay through September and are followed by two months of transition season from October to November. Temperatures in summers may go as high as 46 degree Celsius during summers with prolonged heat waves. Winters although not that extreme but the temperature may dip to as low as 3 degrees during the peak days. Rise and fall in temperature have direct impact on flora, fauna, health, water, etc. Uttar Pradesh shows a large spatial as well as temporal variability. Table below gives the summary of the temperature trends and statistics of the state of Uttar Pradesh.

Table 1: Temperature variability

Season	Statistics	Maximum Temperature (°C)	Minimum (°C)
Annual	Average	**31.4**	**18.4**
	Range - (OC)	**26.7-32.6**	**14.9 -19**
	Trend	-0.11	0.57
Winter (JF)	Average	23.5	8.9
	Range -Average (OC)	23.9-29.5	6.3-9.9
	Trend	-0.91	0.98
Pre Monsoon (MAM)	Average	36.1	20.2
	Range - Average (OC)	30-38.1	15.8-21.2
	Trend	0	0.56
Monsoon (JJAS)	Average	34.2	25.2
	Range -Average (OC)	30.2-35.8	21.4-26
	Trend	0.31	0.23
Post Monsoon (OND)	Average	28.3	13.7
	Range - Average (OC)	18.7-25.9	10.9-15.1
	Trend	-0.23	0.77

Source: IMD Gridded temperature data (1969-2005)

As climate change continues to affect the local weather patterns, it becomes utmost important to understand how people are experiencing such changes because personal experience may affect how we choose to mitigate and adapt to policy preferences and behaviors. Local weather conditions become and easily attainable source of information and aggregate over time enables people to detect and analyze long-term climate trends. It also helps them update their beliefs about global warming. However, motivated reasoning—the tendency to fit information to conclusions that correspond with a preexisting belief—may somewhat limit the accuracy of the perception of people about weather changes of a small region.

2 STUDY AREA

The study area taken into account for the preparation of this study is the city of Lucknow in the north Indian state of Uttar Pradesh. The city faces extremes of both the winters and the summers and the climate here ranges from extreme winters to extremely hot summers and also falls. The developmental projects that have been carried out in the city in the past two decades have really impacted the climate and weather of the city at a very large scale. The temperature shifts have become considerable in the past decade and the people are facing the consequences in the form of uncomfortable weather changes and rising seasonal diseases. The city has been chosen because of a wide variety of seasons and the big range of variations in the overall climate in the months. The sample population includes people spread out throughout the city and have been so chosen as to represent all corners of the city.

3 METHODOLOGY

3.1 Sample

A representative sample randomly selected from social platforms. Of the 200 questionnaires that were set out, 71 were returned giving a return rate of 35.5%. Some questionnaires contained considerable missing data and were excluded. Thus, only 43 responses which were complete in all sense were considered for the study. Out of the 43 respondents, 23 were male and 20 females reflecting an overall sex-ratio of 870:1000. This is somewhat close to the overall sex ratio of 928:1000 as per the census 2011 data. Out of the considered respondents, a majority i.e. 40.91% belonged to the age group of 20-25 followed closely by 38.64% belonging to the age group 25-35. Overall breakup of the age groups of respondents is as shown in the pie chart below:

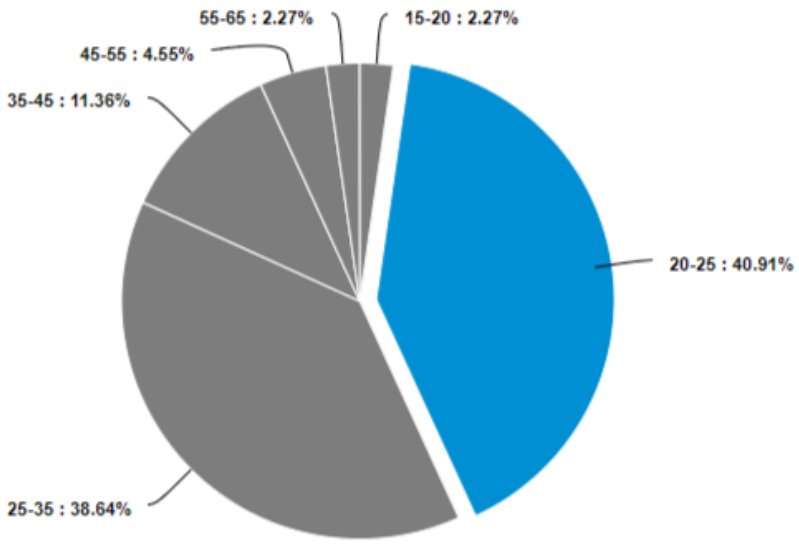


Figure 1: Age of the respondents

Source: Primary survey by author

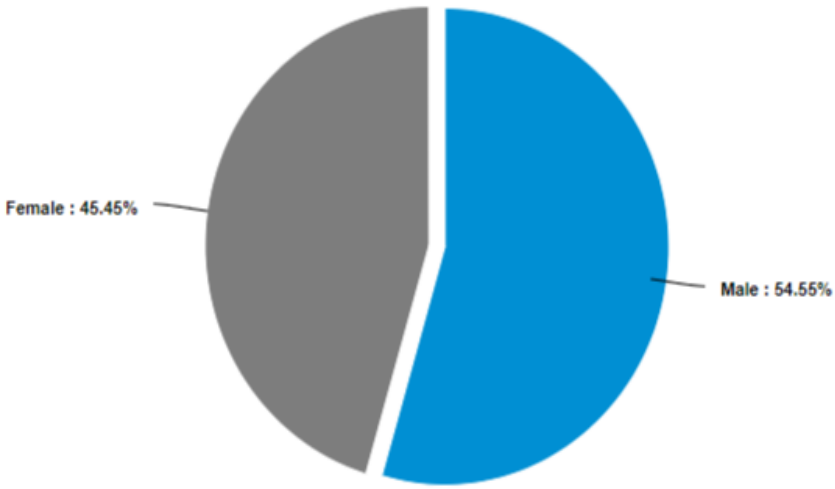


Figure 2: Gender-wise break up of the respondents

Source: Primary survey by author

The majority of respondents are of the age group 20-25 representative of the youth population of the city. Therefore, the data may be considered a little more reflective of the perception of the youth residing in the city of Lucknow.

3.2 Tools

The survey e-forms were sent out to the chosen sample through social media platforms and they were requested to voluntarily fill the form using a laptop/mobile/PC. Their entries were recorded by the survey platform for analysis at a later stage.

3.3 Scope and Limitations

The pandemic and lockdown scenario restricted physical access and somewhat acted as a hurdle in the research. To counter the physical access limitation, e-forms generated on a survey platform Question Pro were sent out to the participants of the survey and the data thus collected was virtually analyzed. The entire procedure was carried out using mobiles and a laptop.

3.4 Data Collection

The respondents were sent an e-form to which they were provided a deadline for reply. Their responses were recorded on the platform Question Pro over which the form was developed and then the data was analyzed and compiled using requisite software to arrive at conclusions. The trend analysis was done and data collected for every question was analyzed statistically to arrive at conclusions. The entire data-set used for this paper is primary and collected by the author himself depending upon the responses of the sample. All the respondents were literate and it was somewhat more than the actual figure as per the census data of 2011 for the city of Lucknow. About half of the respondents were graduates whereas 30% of them were post graduates. 5% of the people who responded had a doctorate to their name.

4 ANALYSIS

India was the seventh most-affected by the devastating impact of climate change globally in 2019 according to the Global Climate Risk Index 2021. The report by Germanwatch, a Bonn-based environmental organization stated that India was preceded by Mozambique, Zimbabwe, Bahamas, Japan, Malawi and Afghanistan in the list of countries which were most affected by the impacts of extreme weather events in 2019.

Between 2000 and 2019, over 475,000 people lost their lives as a direct result of more than 11,000 extreme weather events globally and losses amounted to around US $2.56 trillion (in purchasing power parities). The report was released just ahead of the Global Adaptation Summit hosted by Netherlands wherein UN secretary general Antonio Guterres is likely to call upon developed countries and donor agencies to increase funding to adaptation measures of developing countries.

Table 2: The 10 most affected countries as per Global Climate Risk Index, 2019

The 10 most affected countries in 2019

RANKING 2019 (2018)	COUNTRY	CRI SCORE	FATALITIES	FATALITIES PER 100,000 INHABITANTS	ABSOLUTE LOSSES (IN MILLION US$ PPP)	LOSSES PER UNIT GDP IN %	HUMAN DEVELOPMENT INDEX 2020 RANKING
1 (54)	MOZAMBIQUE	2.67	700	2.25	2.25	12.16	181
2 (132)	ZIMBABWE	6.17	347	2.33	2.33	4.26	150
3 (135)	THE BAHAMAS	6.5	56	14.7	14.7	31.59	58
4 (1)	JAPAN	14.5	290	0.23	0.23	0.53	19
5 (93)	MALAWI	15.17	95	0.47	0.47	2.22	174
6 (24)	ISLAMIC REPUBLIC OF AFGHANISTAN	16	191	0.51	0.51	0.67	169
7 (5)	INDIA	16.67	2267	0.17	0.17	0.72	131
8 (133)	SOUTH SUDAN	17.33	185	1.38	1.38	0.74	185
9 (27)	NIGER	18.17	117	0.5	0.5	0.74	189
10 (59)	BOLIVIA	19.67	33	0.29	0.29	0.76	107

Source: Global Climate Risk Index report by Germanwatch

The Global Climate Risk Index (CRI) analyses quantified impacts of extreme weather events both in terms of the fatalities and economic losses. It doesn't however consider slow-onset events like rising sea levels, glacier melting or ocean warming and acidification. The index is based on data from the Munich Re NatCatSERVICE. The most recent data available for 2019 and from 2000 to 2019 was taken into account.

Six of the 10 countries most affected from 2000 to 2019 belong to the low to lower-middle income category. Climate impacts affect people in developing countries disproportionately, threatening lives and livelihoods, the report highlighted, adding that international climate financing has remained inadequate. In 2018, a total of US $78.9 billion was provided and mobilized. But the goal to mobilize US $100 billion annually from 2020 onward, which, in 2009, developed countries agreed to provide for developing countries to finance mitigation and adaptation efforts remains unfulfilled.

Although industrialized countries with the help of advanced technologies and a better understanding of the consequences, have to a certain degree been able to de-link the Sulfur dioxide emissions from economic growth i.e. to say that their emissions have fallen even as their national income has managed to rise. When it comes to Carbon dioxide emissions, these countries have failed miserably and the per capita CO_2 emissions remain closer to what they were earlier. Per capita CO_2 emissions are closely related to a country's level of economic development, and thus the overall standard of living of its populace. It is therefore evident that as long as the world economy is carbon-based viz. driven by energy from coal, oil and natural gas – overall growth cannot be de-linked considerably from the net CO_2 emissions. As a matter of fact, the only way climate change can be brought to a halt is by reducing these emission rates substantially but things in the real world are not that simple.

The dependency on fossil fuels for energy and industrial development is very much closely related to the economic growth of a majority of countries and the lifestyle of their citizens. It is important to state that every human being has a carbon footprint but their individual lifestyle decides as to how small or big this carbon footprint will be. A very interesting fact which can be mentioned here is that a cheeseburger adds about 3 kg of Carbon dioxide to the environment. Meat has a way bigger carbon footprint than vegetables and thus the choice of a lifestyle affects the footprint of an individual on a global scale considerably. The more prosperity a country has managed over time; the more its economy has grown over time, higher would be its fossil fuel consumption, resulting in higher greenhouse gas emissions. Industrialized countries owe their current prosperity to years of 'historical' emissions, which have accumulated in the atmosphere since the start of the industrial revolution. They still emit more to sustain this growth. Developing countries have only recently started to run towards the glamorous dream of industrialization. That is the reason why their per capita emissions are still considerably lower than the developed countries.

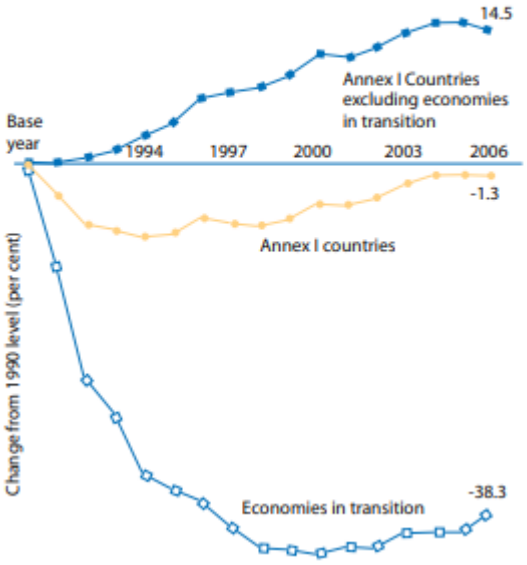


Figure 3: CO_2 emissions of countries with economies in transition vs those excluding economies in transition

Source: World Bank data

It might well be considered ironic that even though the scientific fraternity keeps on recommending extreme reductions in the overall emissions, the countries are still not talking about their emissions. India made development and poverty eradication as their primary targets towards the end of the twentieth century but in the 21st century when the focus should have shifted to climate change and environment, we still kept on focusing upon the developmental aspect and thus have created a dire situation for the generations to come.

4.1 Study

4.1.1 Perception of the respondents' family

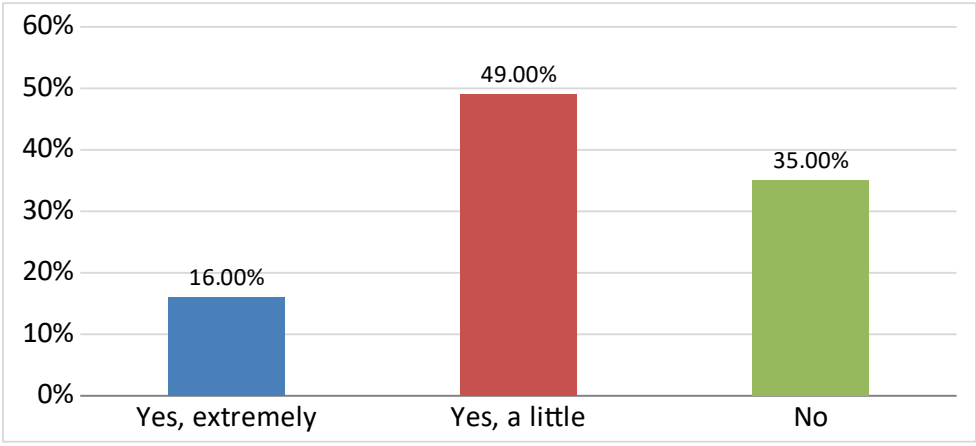
When asked about the perception of the families of the respondents about how many of the family members suffered from any kinds of seasonal illnesses and whether the they would consider the climate shifts of the city in the recent past to be the aggressor, 12 out of the 43 considered respondents strongly agreed and stated that there were at least one such members(8 respondents) and 4 of the respondents said that there were 2 cases of seasonal illnesses in their family and that they would consider the climate shifts of Lucknow over the past decade as the prime reason for this.

On the basis of the analysis of respondents' replies, 44.44% members of their households consider the climate of Lucknow city to be uncomfortable throughout the year.

4.2.2 Perception of the respondents about weather changes in the city

The ultimate aim of this study was to analyze how the respondents felt about the city's weather and climate change. A few questions which identified the opinion of the respondents on the observed weather and climate of Lucknow city were asked and following are the analyses of the data received:

On being asked if the weather at their locality of residence varied from that at their workplace, 49% of the respondents stated that it somewhat differed and 16% of the respondents firmly stated that the weather difference in both the areas was considerably significant. 35% people stated that there was no difference at all which brings us to the inference that even in Lucknow, the weather of various localities differs from each other. This reflects the effect of climate change on even such a micro scale that it is observable to a normal resident. Following is the statistical summary of the responses to his question:



Mean : 2.186 | Confidence Interval @ 95% : [1.977 - 2.395] | Standard Deviation : 0.699 | Standard Error : 0.107

Figure 4: Variation in the weather of the respondents' place of residence from that at their workplace

Source: Primary survey by author

100% of the respondents felt that Temperature rise, temperature drop and seasonal shift were the major concerns for the city of Lucknow and that the effect has been more significant over the past one decade. This is concerning because temperature extremities and seasonal shift so significant over such a short span of time and that too so much so that all the respondents felt it considerably means that the effect of climate change on the city of Lucknow has been undeniably strong. Such great impact on such a micro level climate means that climate change is a globally drastic phenomenon and it is happening as we speak.

The respondents were then asked to rate the various issues which according to them were the most concerning to the city of Lucknow. Options provided for each issue were: Very Important, Fairly Important, Important, Slightly Important and Not Important at all. 77% respondents considered air pollution to be of the utmost importance while 19% considered it fairly significant and 5% outright rejected it to be of any importance at all. 67% respondents believed that the pollution of rivers and seas was a major concern for the city and 16% rated it to be fairly significant. 7% respondents believed that it was of no concern. This perception aligns with the facts and figures as provided by various ministerial reports on this subject. Flash flooding was considered important by 52% of the respondents while 48% considered it of little to no significance at all. Littering was considered of high significance by 63% of the respondents while 26% considered it to be somewhat important and 11% of the respondents considered it of little to no significance at all for the city of Lucknow. Poor waste management such as the overuse of landfill sites was considered highly important by 62% of the sample while 26% consider it to be fairly important. About 12% of the respondents considered it of very little significance in the context of the city of Lucknow. Traffic congestion was considered to be an important issue for the city by 96% of the respondents while 4% said it had no significance. 49% respondents believed that temperature rise and drop significantly concerned the city while 44% considered to be slightly important. 7% said that it was of no concern at all. Noise pollution was considered as very important by 44% and fairly important by 49% whereas 7% respondents allotted

it very little or no importance at all. Weather extremes were believed to be of utmost importance by 82% of the respondents while 14% said it was of slight importance. 5% believed it to be of no consideration at all.

The respondents were then asked to rate on a scale of one to ten(one being the least and ten being the most) their opinion about how much they thought that the climate change threatened their personal health and safety. About 77% of the respondents rated it as high as 8-10 while 100% of them rated it at least 5 to at most 10.

4.2.3 Perception of the respondents about global concerns like climate change

To understand and analyze how informed were the respondents about climate change, a few questions were asked to them for which they had to reflect their level of agreement. They were given five choices viz. Completely disagree, Somewhat disagree, Neutral, Somewhat agree and Completely agree.

On being asked whether or not they believed climate change posed a serious threat to the people around the world, 79% of them showed strong agreement while 10% somewhat agreed to the fact, 7% stayed neutral on the subject and 4% entirely disagreed to the fact. Next they were asked whether they felt that climate change had direct effects on them or their family or not. 68% strongly agreed and 22% somewhat agreed. 5% chose to stay neutral and another 5% disagreed to the fact strongly. 63% of the respondents believed that human activities were the major cause of climate change happening across the globe while 24% somewhat agreed to it. 7% chose to stay neutral and 6% stated that they strongly agreed to this fact. When asked whether or not they thought that climate change was happening at the moment they were answering the survey, 83% strongly agreed, 7% totally disagreed and 12% chose to be neutral on the matter. 94% of the respondents agreed that they understood the phenomenon of climate change and its ghastly effects on the world, 3% strongly disagreed and 3% chose to stay neutral.

From the responses, it can be very well inferred that the respondents have a wide understanding of the subject of climate change as almost all the responses in the questions of this section align perfectly with the scientific facts and reports.

4.2.4 Sustainable lifestyle choices

Questions in this section were asked to understand whether or not the respondents' level of understanding of the subject of climate change and how they perceived the effects of it on their city of Lucknow would affect their personal lifestyle choices. Since they had a good understanding of the concept of climate change it was expected that their personal choices would align with sustainable lifestyle methods.

On being asked whether they were ready to reduce their energy usage to tackle the phenomenon of climate change, 55% of them completely agreed while 35% agreed to some degree. 7% chose to stay neutral while 3% were reluctant to make sustainable lifestyle choices. This is similar to the levels of knowledge the respondents had shown in the previous segment of the survey. 86% of them are ready to switch to either cycles or walk to work instead of using their motorized vehicles just for the sake of protecting the environment. 57% respondents are read to reduce their electricity consumption for the sake of the environment. 63% are ready to switch to public transport and 88% are ready to switch to organic food because it helps the environment. 88% of the respondents are ready to participate in environmental campaigns for the protection and conservation of the environment and all the respondents are unanimously ready to participate in plantation drives to help improve the environment. 94% of the respondents agreed that they are likely to recommend the promotion of sustainable and greener lifestyle approaches to their friends and family.

5 CONCLUSION

It can be understood from the people's perception of the micro climate of Lucknow city that the weather of the city has been to a great extent been affected by climate shifts and changes in the previous decades and these changes are so significant that they are observable to the common residents of the city.

It is evident from the responses of all three sections that the chosen random sample of Lucknow city's population has a wide understanding of the global impacts and concerns of climate change and how harmful it is to them and their family. Their perception about the local weather changes and the seasonal shifts reflects that the overall understanding and knowledge about the subject of climate change has helped them observe the variations in the local weather and climate more closely. It is rather satisfying to know that a majority of the youth population of the city is ready to choose a sustainable lifestyle for the protection and conservation of the environment and that they will voluntarily participate in environment protection drives.

One of the aims of the study was to understand how much the knowledge of the climate change phenomenon affects peoples' perception and choices. It is clear from the study that not only does the amount of knowledge one has on environmental concerns affects their personal choices but also enables them to observe and analyze the weather changes happening in their micro climate. Thus it can be inferred from the study that educating the masses about the environment and global concerns such as climate change would enable them to become more understanding of their environment and would ensure that they choose a healthier, greener and more sustainable lifestyle pattern.

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