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Climate change impacts on women in Ayodhya and Jaipur emphasize the need for sustainable development in India

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Abstract— *It has been acknowledged that the poor and the impoverished are the most vulnerable to climate change worldwide, and when we consider gender, women are more vulnerable to climate change than males, and as a result, they suffer the most. Because data collectors collect information from household heads, who are primarily men, these women are left out of the data collection process. According to the SDG Report 2022, this is one of the primary difficulties we are now dealing with. For the study, we selected the Indian cities of Jaipur and Ayodhya, and we conducted a qualitative survey of women from underprivileged families, including families Below Poverty Line. The impact of climate change on women's lifestyles, disease transmission, trends natural disasters, food consumption, daily work patterns, changes in traditional knowledge, and why it is important to take action for India's sustainable development are all discussed in this paper. This research will help raise awareness of the regional NGOs and give insight into how to frame policies and initiatives that support women. This research will also shed light on areas with comparable temporal patterns, such as Jaipur and Ayodhya, in other parts of the world.*

Keywords*— *Climate change, Sustainable development goals, Women, Jaipur, Ayodhya, food security

I. INTRODUCTION

Climate change refers to long-term shifts in temperatures and weather patterns. Climate change is happening, and the repercussions are discernible - glaciers are melting, deserts are becoming hotter and drier, frequency of extreme and violent weather events is increasing, early melting of frozen rivers and lakes (IPCC 2021), more extreme rainfall events (USEPA 2004), more and active wildfires (C2ES 2015) and changing weather and season patterns. Greenhouse gas concentrations are at their highest levels in 2 million years. As a result, the Earth is now about 1.1°C warmer than it was in the late 1800s. The last decade (2011-2020) was the warmest on record (https://www.un.org/en/climatechange/what-is-climate-change accessed on 15 November 22). Turning our greenhouse gas emissions to zero would help halt climate change. Between 3.3 billion and 3.6 billion people more than 40% of the world's population, live in places andsituations highly vulnerable to climate change (IPCC Report 2022- 6th AR). Women are not only first observers but also among the first victims of adverse impacts of climate change (Nelemann et al. 2011, Nwoke and Ibe, 2014). Women have gained special knowledge about the local environment and other natural resources by performing essential activities (e.g., Fetching water, growing food, gathering fuel wood, tending domestic animals, rearing children, and caring for elders) (Dankelman, 2001, Jara 2010). The impact of climate change leading to floods,droughts, etc, results in poor access to medical care and puts this gender at considerable health risk. Urban migration for employment mostly affects women since they face unhealthy situations, lack of sanitation, and unsafe drinking water.

People in all countries that depend most on natural resources for their livelihoods and/or are least equipped to deal with climate change-induced disasters are more

vulnerable to the effects of climate change. Since most of the world's poor are women, they frequently face additional risks and burdens from the impacts of climate change (UNFCCC 2021). Most people, even those severely affected by climate change, have no idea what it is or how it affects them. Adverse impacts of climate change threaten agricultural production, fuel wood supply, and water security (Piao et al. 2010; Wheeler and von Braun 2013). Many water-borne infectious diseases are on the rise as a result of water and drinking water scarcity. Climate Change is a growing and persistent driver of inflation. Women comprise over two-thirds of the labour force in emerging nations and over 90% in certain African countries. (UNWomenWatch:www.un.org/womenwatch accessed on 13 November 2022). Due to their disproportionate position in the labor and decision-making processes, women can usually not fully participate in planning, policy creation, and implementation linked to climate change. Women and girls can act as change makers in their communities, empowering them to lead resilient, local, and rights-based climate adaptation solutions. Heat and drought harm food security, water access, sanitation, and air quality, risking maternal and newborn health. (https://www.pathfinder.org accessed on 13 November 22). Women are essential to keep up with SDG goals. If we look at India's SDG 2022 profile, it is ranked 121- with the Climate Change goal in the Green category (SDG achieved), with all CO_2 emissions indicators improving while other categories influenced by climate change are deteriorating.

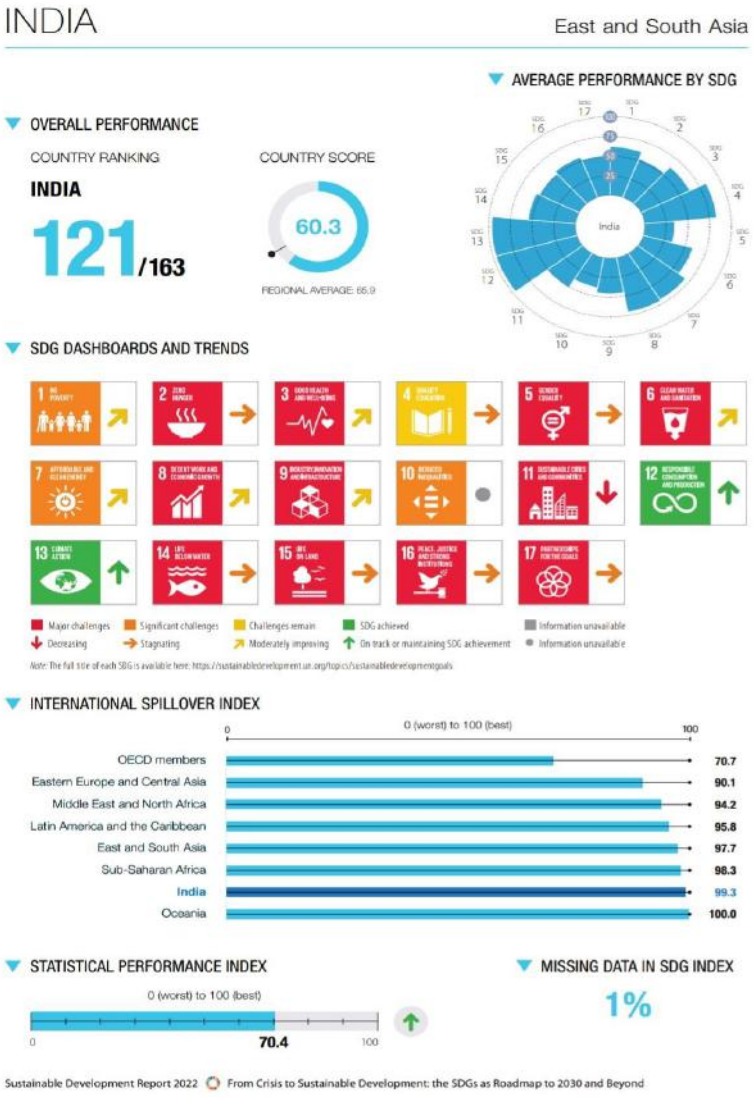

Fig.1 Showing overall performane of India in Sustainable Development Report 2022

Source – Sustainable Development Goals – India Profile According to which SDG 1 - Zero Poverty and SDG 10 - Reduced Inequality are in the Orange (Significant Challenges Remain) category, whereas SDG 2 - Zero Hunger, SDG 3 - Good Health

and Wellbeing, SDG 5 - Gender Equality, SDG 6 - Clean Water and Sanitation, SDG 8 - Decent Work and Economic Growth, SDG 10 - Reduced Inequality, SDG 11 – Sustainable cities and communities are classified as Red (major challenges remain). **(**https://dashboards.sdgindex.org/profiles/india - visited on 31/10/2022),

Impact of climate change in India –

According to studies, India is one of the largest agricultural countries in South Asia. It has a population of over 1.4 billion people and diverse geography, making it one of the world's most vulnerable regions to climate change. The Indian region is also susceptible to extreme weather conditions, such as tropical cyclones, thunderstorms, heat waves, floods, and droughts (Verma 2021). According to a report by the Ministry of Earth Sciences – "Assessment of Climate Change over the Indian Region", it has been stated that between 1901 and 2018, the average temperature in India increased by about 0.7°C. The temperatures of the warmest day and the coldest night of the year have increased by around 0.63°C and 0.4°C over the past 30 years (1986-2015). The tropical Indian Ocean's sea surface temperature increased by 1°C on average between 1951 and 2015, significantly over the 0.7°C global average. From 1951 to 2015, rainfall during the summer monsoon (June to September) over India decreased by about 6%, with substantial drops occurring over the Indo-Gangetic Plains and the Western Ghats.

Over the past few decades, there has been a change toward more frequent dry periods (27% more common over 1981–2011 compared to 1951–1980) and more severe rainy spells during the summer monsoon season. Between 1950 and 2015, the frequency of daily precipitation extremes in central India with rainfall intensities of more than 150 mm per day rose by around 75%. In India, droughts are becoming more frequent due to the decline in seasonal summer monsoon rainfall over the past 6–7 decades. From 1951 to 2016, droughts' frequency and geographic area greatly increased (S Chakraborty et al. 2022). These changes have also enhanced the environmental appropriateness for dengue transmission by 11.5% for Aedes aegypti and 12.0% for Aedes albopictus from 1951-60 to 2012-21, also increasing the length of transmission season (M Romanello et al. 2022) and *Aedes aegypti* being the species found in India the increase of threat against spread of diseases like Dengue and Chikungunya has been increased.

Although climate change knows no bounds, The Intergovernmental Panel on Climate Change (IPCC) highlighted the need for more specific information about climate change on regional and local scales. For a country like India, with diversity in geography and culture, more specific regional data is required to come up with the right solution. For this reason, we chose two states, Rajasthan and Uttar Pradesh, in the Performer category of the Sustainable Development Goals India Index 2020-2021 (https://www.niti.gov.in/reports-sdg - accessed on 1 December 2022). Both states have different climatic circumstances, and we picked a developed city in Rajasthan, Jaipur, and a developing city in Uttar Pradesh, to study the

influence of climatic and development factors on the impact of climate change on underprivileged women.

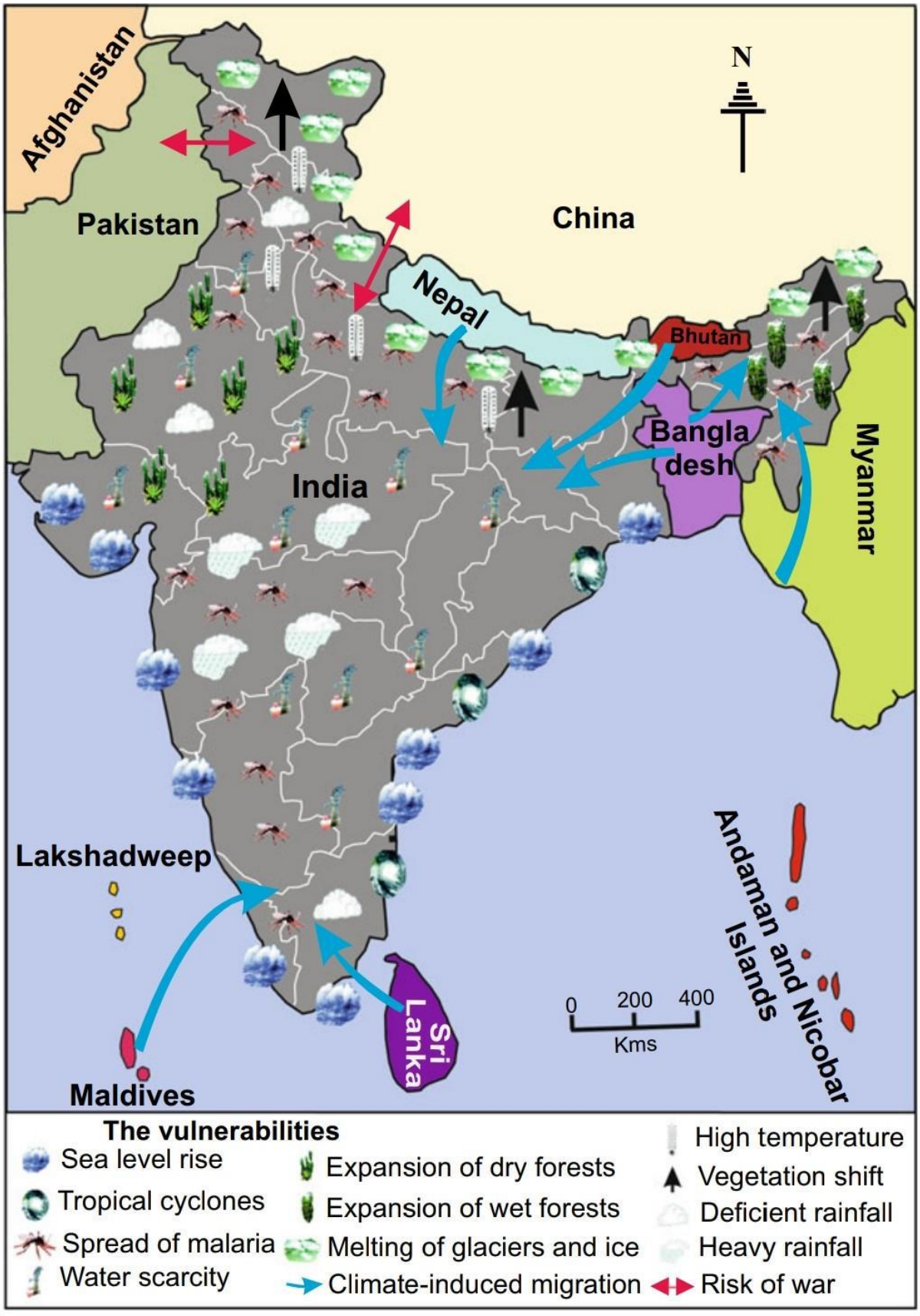

Fig.2 Map of India showing possible impacts of climate change based on multiple sources from 1988-2022

Source- Omkar Verma (2021)

II. METHODOLOGY

We carried out a literature review to understand the impact of climate change in both cities and its effects on the underprivileged women residing there. Following that, we marked the areas based on a preliminary field study. We used a simple random sampling method to select 50 families from both cities for the survey, including Below Poverty Line (BPL) families. Each family's woman was then given a questionnaire survey and interviewed; hence a total of 100 responses were received.

Study Area-

Jhalana, VT Road Mansarover, and Aatish Metro station regions were studied in Jaipur, Rajasthan, which is located on the eastern edge of the Thar desert at an elevation of 0 feet above sea level and has a Subtropical steppe climate (Classification: BSh) (https://tcktcktck.org/india/rajasthan/jaipur- visited on 20/10/2022). In Ayodhya, Madhupur village, Saket colony, and Pura Bazar region were studied. Ayodhya, Uttar Pradesh, is located at 0 feet above sea level and has a Mediterranean, hot summer climate (Classification: Csa) (https://tcktcktck.org/india/uttar-pradesh/ayodhya#t1 - visited on 20/10/2022).

The listed regions in Jaipur are home to many migrants who have migrated to Jaipur and have lived there for over a decade. Women of these migrant families are responsible for household work and also for family income; every woman interviewed in Jaipur worked as a potter, utensil washer, labourer, horseshoe seller, a rag picker, balloon seller, toy seller, and Kalbelia dancer (a traditional dance). Whereas families in Ayodhya's listed regions rely on agriculture, labor, and animal husbandry, women interviewed in these regions were responsible for household work and worked in farms and animal husbandry. All of the respondents are between the ages of 20 and 82.

III. FINDINGS AND DISCUSSION

Respondents' views on climate change

When asked about climate change, no respondent knew what the term meant. However, when asked about changes they had noticed in their local climatic conditions over time—such as changes in rainfall patterns, changes in summer and winter temperatures, the frequency of sandstorms and extreme heat in the summer, the frequency of natural disasters, and the spread of disease—respondents could describe the changes they had noticed.

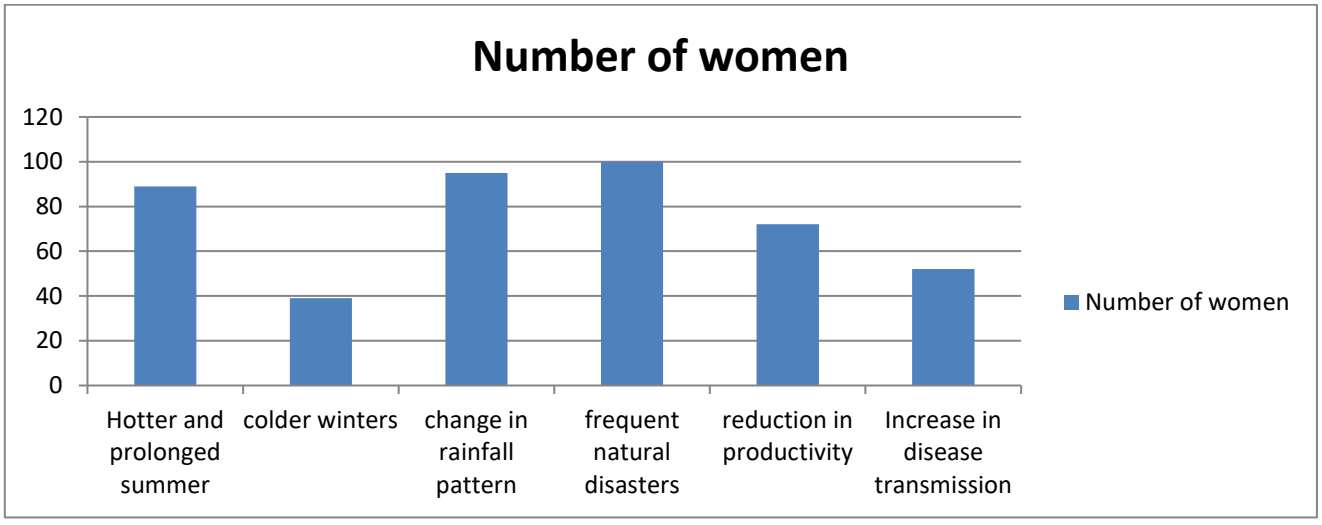

Fig.3 Number of women who observed changes in past 10-20 years

Change in temperature

Out of 100 respondents, 88 reported that summers had become hotter and longer than they had been 10- 15 years ago. After further discussion, this number included 49 respondents from Jaipur and 39 from Ayodhya. Women in Ayodhya explained how they used to have no fans and coolers and had to work outside in fields for longer periods, but with time they gained access to fans and agricultural tools that required fewer human resources in areas, which is why summers were hotter for them before.

Perception of winter temperature showed extreme variations for both cities; out of 100 respondents, only 38 reported cooler winters than 10-15 years ago, while others felt no change; all of these respondents live in Jaipur,

whereas women in Ayodhya had a contradictory observation; all 50 respondents reported that winters are warmer than before, and the duration of the winter season has been reduced from before.

Change in Rainfall pattern

95 out of 100 respondents observed changes in rainfall patterns, including all 50 women in Ayodhya, many of whom claimed that due to changes in rainfall patterns, their field's productivity has been decreasing over the years, which is why their family members, particularly men, began working for daily wage labour jobs. These women also mentioned a significant change, which is excessive rain in October, responsible for destroying their rice fields. Whereas 45 respondents from Jaipur stated that the rainy season is arriving later than it did 10 to 12 years ago, causing water shortages. Additionally, when the rain does come, it pours excessively and creates flood-like circumstances.

Frequency of Natural Disasters

All 100 respondents stated that there has been an increase in the frequency of natural disasters. Fifty respondents from Ayodhya claimed that the frequency of floods has significantly increased from 15 to 20 years ago and now occurs yearly during the monsoon season due to excessive rainfall. They also mentioned the water shortage problem they experience each year due to the late monsoon. Women in Jaipur, however, have experienced heat waves, an increase in the frequency of sandstorms, a shortage of water due to drought-like conditions before the monsoon, and water logging following rainfall.

Reduction in Productivity

Out of 100 respondents, 72 stated that they had noticed a decline in productivity, of which 50 women in Ayodhya reported that their agricultural yield had decreased so much due to changes in rainfall patterns that their family members were forced to look for other sources of income. These families had owned agricultural lands for more than 50 to 60 years. In contrast, 23 respondents in Jaipur reported a decline in productivity. Among these respondents were women from families who had left their agricultural lands in other cities decades earlier due to low productivity, insufficient water, and lesser resources. Older women in Jaipur also attributed rising food prices to climate change as it led to less production.

Disease spread

51 of the 100 respondents said they had noticed an increase in disease cases and attributed it to climate change. Thirty-nine women in Ayodhya indicated that they had seen a marked rise in dengue and malaria cases in and around their homes during the rainy season due to the breeding of mosquitoes in standing water. The remaining 11 respondents also reported a rise in typhoid, jaundice, and kidney stone cases in the area, possibly related to contaminated water. Six respondents also claimed that dengue caused the deaths of senior members of their families. Twelve respondents in Jaipur reported a larger number of dengue and malaria infections, as well as a high number of fever cases in their families, but they were unable to identify the sickness that caused the fever; they blamed delayed weather, heat waves, and mosquitoes in stagnant water after rainfall.

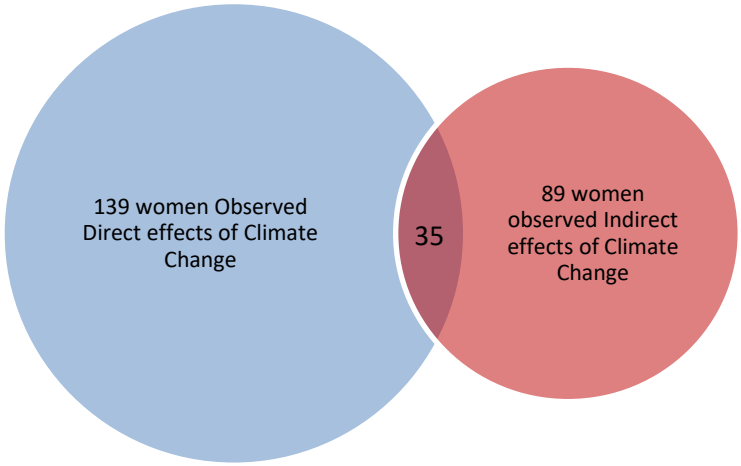

Fig.4 Number of Women that observed Direct, Indirect, and both the impacts of Climate Change in Ayodhya

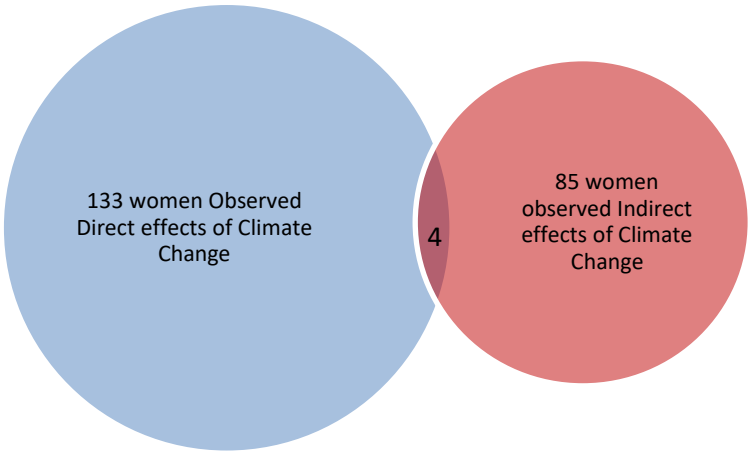

Fig.5 – Number of Women that observed Direct, Indirect, and both the impacts of Climate Change in Jaipur

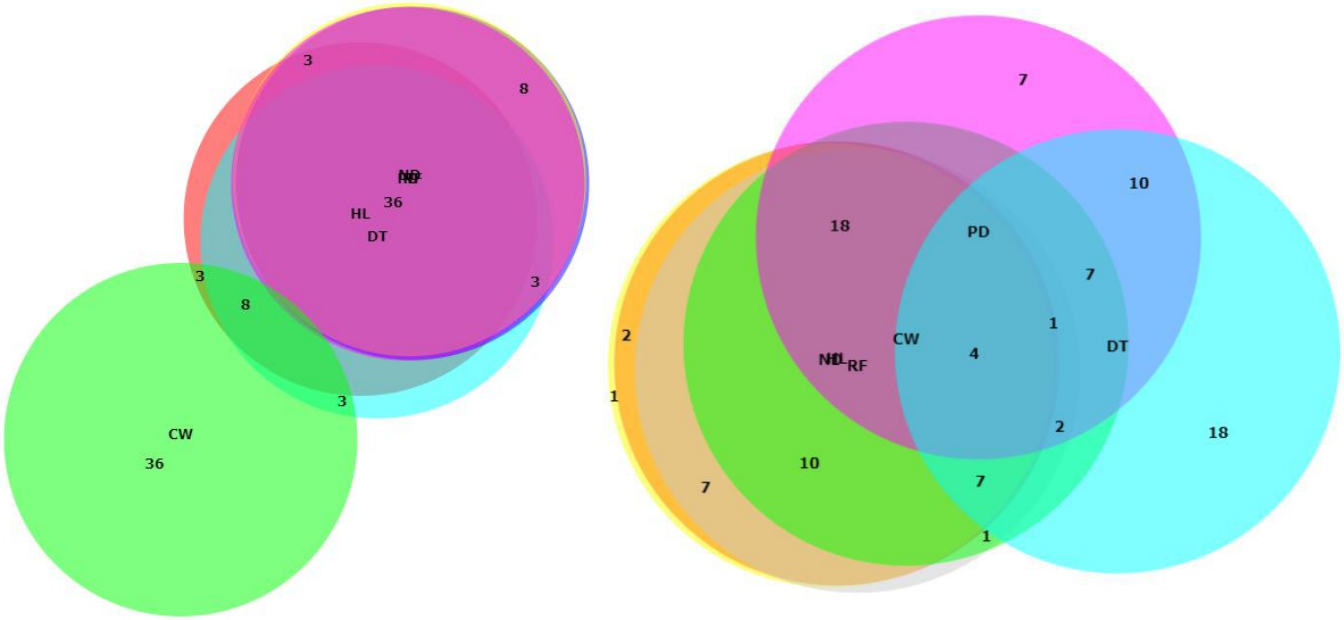

Fig.6 – These two 6-way Venn diagrams show the number of women who witnessed all six effects of climate change: "HL" stands for hotter and longer summers, "CW" stands for colder winters, "RF" stands for change in rainfall pattern, "ND" stands for frequency of Natural Disasters, "PD" stands for reduced productivity, and "DT" stands for disease transmission. In Ayodhya, 34 women could witness all six impacts, but just 4 women could observe the changes in Jaipur.

After the data was collected, it was discovered that women had experienced both the direct consequences of climate change, such as temperature and rainfall, and the indirect effects, such as natural disasters, a decline in productivity, and the spread of disease. Some of these women had even been able to see both. If we look at the numbers for Ayodhya, we can see that women involved in agricultural practices had to suffer from both the effects of climate change, whereas, in Jaipur, where most of the women were migrants, there were very few observers of both. This observation illustrates how migration affects observations.

It was also discovered that most women in Ayodhya could observe all six effects of climate change, whereas only four women in Jaipur could do so. This finding suggests that the women from families relying on agricultural yield for income play a significant role in their observations.

Impact on lifestyle, daily work pattern, and food consumption

Respondents in Ayodhya asserted that the previous 15 to 18 years had seen a significant increase in their hardship and working hours. These women stated that as a result of a drop in agricultural productivity, the men in their households

started working in the city to meet their families' food and other needs, and some of them moved to other cities, forcing the women to work longer hours in the fields and spend more time caring for their cattle. Additionally, they asserted that when a family member becomes ill, they must work even harder and travel great distances to receive medical care. Particularly the women in the Madhupur village region complain about this. Furthermore, they mentioned that most of the vegetables and rice they consume come from their land; however, because of the flood, their crops were destroyed, necessitating even more labor for the subsequent harvest. They eat less to reduce consumption due to lower productivity and higher food product prices, and women in the family make the most sacrifices and consume less food than men. They added that they believed new agricultural techniques, such as adding fertilizers, had diminished food products' nutritional value and flavor. These women also claimed that because of housework and working outside, they are the ones who get up first to prepare food for the men and children in the family, and they go to bed last after completing house chores every day, leaving them with little or no time for self-care.

The same problem affects women in Jaipur because they put in the most effort and take care of household tasks before going to work to support their families. Many of these respondents face the threat of migration because they live in temporary tents damaged during sandstorms and are occasionally destroyed by the government, forcing them to work even harder. They also claim that in the last 10-15 years, they have begun to experience water logging due to excessive rain, and they have had to travel further to get water from distant government water facilities than before because rainfall is now delayed, causing water shortages in their area. These women also stated that climate change-induced inflation made it difficult to provide food for their children, which made them fearful for their children. After discussing all the changes they had seen, we asked if they thought they were caused by climate change. Out of 100 respondents, 61 blamed climate change, 21 were unsure, and the remaining 18 denied that climate change was to blame instead, they blamed factors such as governance and lack of opportunities.

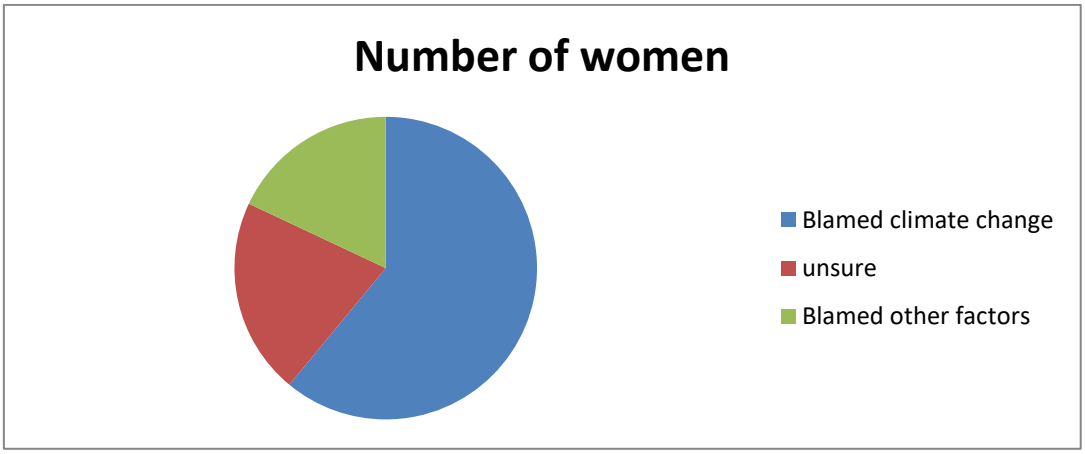

Fig.7- Number of women who blamed changes on 2) Climate change b) other factors, and c) unsure about it

Changes in traditional activities

Observed respondents mention various activities that have declined in the last 10 to 15 years, includingcow dung on the walls of their homes to help cool down during the summer, which no longer works. They also mentioned reduced use of thatch sheds due to increased fire cases during the summer and increased damage from excessive rainfall. They also stated that they can no longer use traditional "Chulhas" during the scorching summer season. Practices such as using wet jute bags, handmade hand fans, pots to store water, and burning dung cakes to eliminate mosquitoes have also declined because they believe they are no longer efficient. They also stated that they rely more on government water supplies because traditional hand pumps do not provide water when the monsoons are delayed. Women in Kalbelia (a traditional dance in Rajasthan) said they don't want to pass this dance form to their children because it never helped them to escape poverty, and they see no future in the profession. Out of 100 respondents, 53 blamed climate change, 6 were unsure, and 41 blamed factors such as brick house construction, fewer trees, technology, and people having lower tolerance power than before.

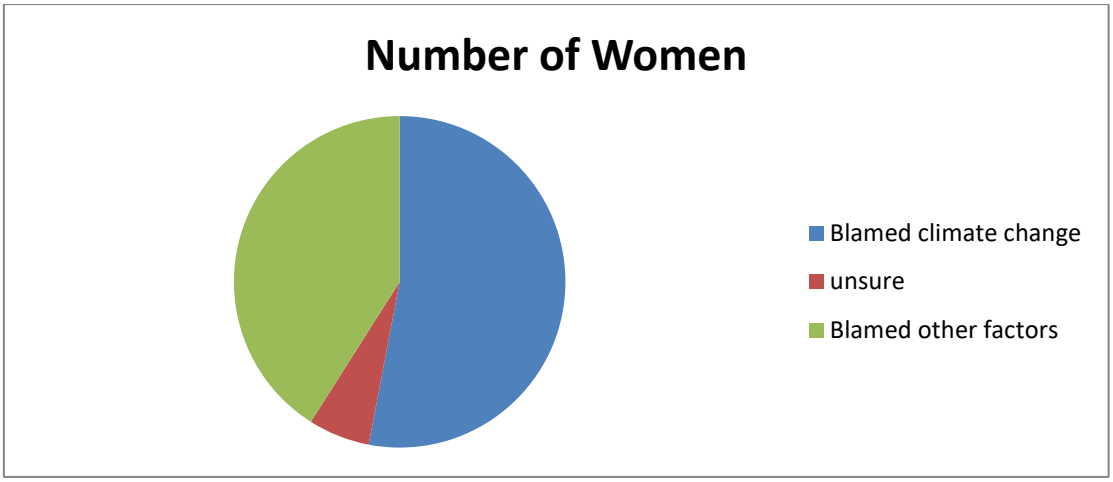

Fig.8 - Number of women who blamed the changes on a) climate change b) other factors, and c) are unsure of it

Gender and data collection

During the discussion, these women also mentioned that they approach the men first if someone comes to the house for a survey or from an NGO. It was also stated that if the data collector or NGO worker is a man, the men in the family do not include women in the discussion. Women in Jaipur stated that they were approached by NGOs that provide them with sanitary products and that they do receive medical benefits from the government, but they said that they want opportunities for themselves. Women in Ayodhya, on the other hand, claim that they do not receive any government support because they are illiterate and unaware of their rights, and no one approaches them to assist them.

IV. CONCLUSION

No respondents in either city knew what the term "climate change" meant, even though it has been established in reports and papers that underprivileged women are vulnerable to it. However, they could feel the changes impacting their lives directly and indirectly. The data revealed that the impact of climate change is heterogeneous based on geography, but it also revealed similarities, such as in the frequency of natural disasters; 100% of respondents felt an increase in natural disasters due to climate change in the past 10-20 years. It was also revealed that these women face gender biases in data collection which is very concerning; even SDG 2022 report mentioned the concern. To progress, we must raise awareness about climate change and how to address it. We require a stronger framework for implementing gender-sensitive climate policies, and women with the majority of information on mitigation and adaptation should have an equal voice in policymaking at the community level (Gupta 2015). Under the environmental policy, these women should be given opportunities such as tree planters and caretakers. If they work on agricultural farms, they should be given advanced technical tools to protect their yield from conditions like waterlogging and need agricultural plans to avoid losses, if not individually, then on a community level. There is also a need to monitor groundwater quality in these poor areas where disease frequency has increased significantly, and awareness about diseases such as dengue and malaria should be spread throughout these regions so that people can take precautionary and responsive actions. It was also discovered that the majority of these families, approximately 63%, owned at least one Smartphone and had internet access, and women in the Kalbelia profession also owned a Smartphone and had internet access. Keeping this in mind, we must encourage greenfluencers to create short videos that can raise awareness about climate and agricultural solutions in various languages. We need to create more climate change-related online programs in local languages, similar to how The University of Edinburgh offers online courses in Bengali. Agricultural solutions that can be made at home, such as Mahadev Gomare's natural pesticide and fertilizer developed in collaboration with Art of Living, should be shared and promoted via the Internet. Climate and agricultural experts should collaborate with companies like YouTube and Instagram to create more content that raises awareness and offers solutions.

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