

**Jagriti Mehta, Anil Kishore Sinha and Maninder Kaur**

## **EMIC VIEW OF CAUSAL NEXUS BETWEEN CLIMATE CHANGE AND LIVELIHOOD: A MICRO LEVEL ANALYSIS OF A MACRO LEVEL PHENOMENON**

### ***Abstract***

*Climate change is one of the most discussed topics, given its present and future impact on the humanity. One of the most eminent impacts of climate change can be seen in the mountain areas with sensitive ecosystem. The livelihood of vulnerable regions has been affected by the climate change and vice versa, because a causal nexus exists between the climate change and livelihood. The present study deals with the perception of the people from the villages Bhawana, Kiari, Kufar Bag and Jashla of Kotkhai Tehsil, Shimla, which are categorised on the basis of their altitude. The paper encompasses of micro level analysis of the qualitative first-hand data collected with the help of snowball sampling in the form of case studies of individuals of two different generations indicating the varying perception over the time. A change in climate has been observed over the time by the people, which are supported by the data collected from the Meteorological Centre (IMD), Shimla, Himachal Pradesh, India. The changes in climatic conditions are attributed to various reasons such as unprecedented deforestation, burning of fossil fuel, and punishment by God. A bidirectional impact has been observed where anthropogenic activities like deforestation has affected the climate and the change in climate has impacted the livelihood by affecting the cash crop economy, natural resources such as soil and water, cattle rearing and daily household chores.*

**Keywords:** *Ecosystem, bidirectional causality, anthropogenic activities, water scarcity, cash crop economy.*

### **Climate Change**

Climate is the weather conditions of an area which has been prevailing for a long time. Climate change is directly or indirectly attributed to human activities [United Nations Framework Convention on Climate Change (UNFCCC) 2011: 2]. According to Inter-governmental Panel on Climate Change

---

**JAGRITI MEHTA**, Research Scholar; **ANIL KISHORE SINHA**, Professor and **MANINDER KAUR**, Assistant Professor, Department of Anthropology, Panjab University, Chandigarh, Email: jagriti7@gmail.com.

(IPCC 2007: 6) climate change 'refers to any change in climate over time, whether due to natural variability or as a result of human activity'. It refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. These properties can be variables like precipitation, temperature, humidity, wind, and severe weather events. According to Hingane et al. (1985), based on data from 73 meteorological stations, mean temperature in India has shown a substantial increase in warming amounting to 0.4°C over the last 100-year period.

The present rate of change of climate has increased manifolds due to anthropogenic activities which have been prominent to such an extent that there has been debate between geologists and environmentalist to designate the present times as Holocene or Anthropocene. According to Steffen et al. (2011: 741), the changes are evident and empirical scientific studies prove that the global environmental change is due to humanity and this has given rise a new geological epoch- the Anthropocene.

The scenario in developing nations and island countries is the cause of concern for the respective national and various international organisations. For instance, in developing nation like Bangladesh, a densely populated country with a history of vulnerability to unrelenting weather conditions, frequently occurring disasters like floods, cyclones and droughts can explain the ongoing poverty (Ahmed 2006). In Island countries like Indonesia, much of the population is vulnerable to increase in the sea level and flooding due to climate change (Jellema and Noura 2012).

In India, with majority of its population dependant on agriculture for livelihood, climate change will impact the agricultural practices in various direct and indirect ways besides affecting the lives and livelihood of millions of Indians (Ninan and Bedamatta 2012:1). As per the 6th Assessment report by IPCC (2021), there might be serious impact on India's political economy, especially sector of agriculture. India is already feeling the impacts of climate change with increase in heat waves, heavy rainfall but declining mean precipitation, water scarcity and rising sea level along the coast (Picciariello et al. 2021).

Although climate change is a universal problem, its impacts vary from region to region, country to country, and community to community (Adger et al., 2004). For instance, in India, the regions of West Bengal and Odisha are witnessing devastating cyclones which can be attributed to global warming over the past thirty-five years (Chaudhury and Ramhota 2019: 305-306). The changing climate have led to changing pattern of rainfall in the North-Eastern states of India which has led to drying up of spring water and land degradation thus having a negative impact on the livelihood practices, especially in the mountainous regions (Sangomla 2021).

### **Livelihood**

Livelihood is a mean to secure the necessities of life, means of gaining a living (Chambers 1995: 174), the mode of subsistence can be viewed and used differently depending on the meaning it has for the people. Livelihood may mean natural resources to some and money to others. According to Scoones (2009: 172), livelihood is a flexible term which can be used along with the topic under study, for instance, rural and urban livelihood or sustainable and resilient livelihood. The variables like land/ property, food, knowledge, social, economic and political institutions in a community are intrinsic to the concept of livelihood (Islam and Ryan 2016). For the present study, the livelihood connotes as ‘the capabilities, assets (including both material and social resources) and activities required for a means of living’(Scoones 1998: 5).

### **The causal nexus between the climate change and the livelihood**

The causal nexus between climate (nature) and livelihood (humans) exhibits bidirectional causality, where the climate change has affected the livelihood and the livelihood practices have contributed to climate change. As per the **Climate Change 2014 Synthesis Report Summary for Policymakers (IPCC, 2014: 2)**, ‘human influence on the climate system is clear, and recent anthropogenic emissions of green-house gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems’. The World Meteorological Organisation (WMO) has described ‘the build-up of greenhouse gases in the atmosphere during the 20<sup>th</sup> century results from the growing use of energy and expansion of the global economy’ (UNFCCC2011: 1). Climate change is transforming the lives of people everywhere and these transformations may be swift or slow depending on the way climate change manifests itself.

The nexus of climate change and livelihood can be the repercussion of any natural disaster or gradual changes over the time due to climate change on the income and subsistence of the affected geographies, especially agriculture related. This interaction can be a catalyst for the migration and relocation of people, thereby affecting the labour market in host geographies. On the other hand, in a positive context, climate change may lead to job generation in climate adaptation and mitigation sector(JustJobs Network Inc 2015:2-3).

### **Climate change and anthropology**

The socio-economic consequences of climate change, due to degradation of ecosystems, are because climate determines human culture, an example of environmental determinism as have been suggested in the work of Ratzel (1896-1898) and Meggers (1957). Even though anthropogenic climate change has been the talk of the town in the recent times, a discourse of climate and culture has been vividly discussed in human society for millennia and anthropology has

played a central role in this discourse (Dove 2014: 1-2). In fact, relationship between nature and culture has been there ever since the development of anthropology as a field, for example, the climate theory, which refers to idea of how climate determines human character, culture, and the rise and fall of civilizations as observed by Hippocrates (fifth century), Zimmermann (1988), Ratzel (1896-1898), Weiss and Bradley (2001) (as cited in Dove 2014). Though not in scientific way, but humans have always been aware of their environment. They have always had an opinion about phenomenon of climate, about seasons, the changes therein. As per Jankovic (2007), the traditional and folk theories were replaced by scientific theories from 19<sup>th</sup> century onwards. Anthropologists have been taking keen interest in the climate related study throughout 20<sup>th</sup> century to till date. Classic studies in environmental anthropology by Steward (1955), Mauss (1979 [1950]), and Conklin (1957) delved deeply into emic or native views of climate (as cited in Dove 2014: 2). Margaret Mead (1977: xix–xxiv) is one of the first anthropologists to talk about climate change. Anthropological work on climate change as the field of ‘climate anthropology’ (Nelson and Finan 2000), is important as it uses the anthropological tool of participant observation by being there and recording the emic view of the people.

### **An emic view of climate change and livelihood: An anthropological approach**

An emic view is the perspective, belief, perception and understanding of the affected person or population and comprises of the knowledge at the regional and local level. Views may differ from person to person or place to place, for instance, degradation is defined in different ways depending on the context or the place of occurrence (Huber-Sannwald et al. 2006:). It is important to understand the degree and impact of climate on livelihoods and indirectly, adaptive capacity at regional and local scales as almost 50% of the earth’s natural ecologies face similar challenges (Barnosky et al. 2012). The anthropological approach of participant observation by being there and recording the emic view of the people has been used to understand the following: How has the climate change impacted the livelihood of people of study/field area and vice versa? Is there a causal nexus between the climate change and livelihood in the field area? What is the perception of the people of the field area about the climate change, and its cause and impact? How has the perception changed over the time, i.e., for the two generations?

### **Research methodology**

An exploratory research design has been used to conduct the study to understand the view of people about the ongoing climate change and its impact on their livelihood. The universe of the study is the four villages of Kotkhai tehsil of Shimla district of Himachal Pradesh. Kotkhaih as a mountain topography and ecosystem and is situated in the sub-Himalayan range. The

mountains are important and early indicators of climate change and its impact on ecosystem and livelihood (Singh et al. 2010). It was highlighted by Gentle and Maraseni (2012) that the changing variables of climate such as precipitation patterns, and warming have serious consequences on mountain ecosystem and people. Hence, it is important to study the impact of the ongoing global climate change on such a sensitive ecosystem at a micro level.

The unit of study are the people of the selected villages, viz., villages Bhawana, Kiari, Kufar Bag and Jashla. These villages are selected based on their relative altitude and are categorized into lower, lower middle, upper middle and higher altitude villages as per the heights measured by the researcher during fieldwork from the approximated centre of the villages with the help of the mobile application, GPS Tools 3.0.2.4 (Designed and Developed by Virtual Maze). The village Jashla which lies at an altitude of around 2438m is categorized as the high-altitude village, as area that reaches at least 2400 m from sea level is considered as high altitude (Resource Library, National Geographic). In comparison to Jashla, Bhawana (1825m) lies below 2000m and has been considered as a lower altitude village, Kiari (2224m) is considered as lower middle altitude village, and Kufar Bag (2362m) is above Kiari, therefore categorized under upper middle altitude village.

The villages were selected after conducting pilot survey in the month of May-June, 2017 during which it was found that the villages at different altitude had varying impact of changes in climate conditions. Ethical clearance was taken from Institutional Ethics Committee, before conducting the fieldwork.

Members from alternative houses were selected as the sample of the study. The respondents above 30 years were selected by purposive sampling, as climate change is inferred from observation of at least three decades. Rapport with the key informants in all four villages was established and with the help of these informants, more respondents were reached out to by using snowball sampling as they had an idea about all the households and whether they were residents of the villages or not.

Qualitative data, the primary data, have been collected through participant observation, by using unstructured interview schedules and collecting case studies. For the analyses of the data collected, an emic approach has been used and micro analyses (Fig. 1.) of case studies is done. The secondary data (precipitation and rainfall data) have been collected from the Meteorological Centre (IMD), Shimla, Himachal Pradesh.

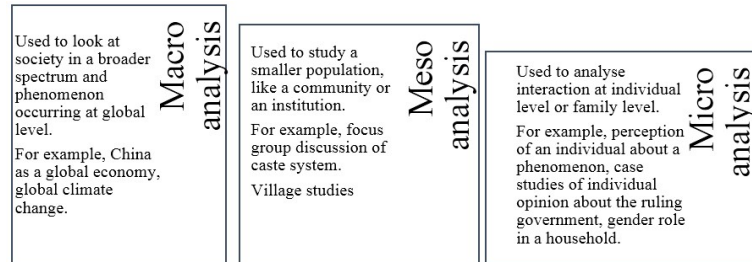


Fig. 1. Level of Analysis

### Data interpretation

Himachal Pradesh lies in the temperate zone and as per the Intergovernmental Panel on Climate Change (IPCC 2007a), the temperate and tropical areas are 'likely to have increased exposure to many extreme events, including the possibility of glacial melts, floods and landslides, rising sea levels, large scale inundation, recession of flat sandy beaches, increased fire risk, water stress, typhoons and tropical storms, and vector-borne diseases' (as cited in Gentle and Maraseni 2012).

As the human civilization evolved during the course of time, people around the world developed means of livelihood best suited to the climate of the place they inhabited (Kulkarmi and Leary 2007). In convergence to this view, earlier the people of Kotkhai Tehsil used to grow potato (*Solanum tuberosum*), bajra/pearl millet (*Pennisetum glaucum*) and had a non-vegetarian diet. This was mainly due to the fact that there were no transport facilities and the climate was harsh, and it was reasonable to grow these crops in such conditions and create a self-sustaining mode of subsistence, and also, the meat could be stored easily during long winter spells. Over the time, people of Kotkhai Tehsil shifted the means of livelihood to apple production, a cash crop, which was sustainable in the type of environment Kotkhai had. With time it has emerged as a major apple producing belt of Himachal Pradesh. This cash crop means of livelihood has been assisted by the development of roads, which was primarily responsible for deforestation and consequently climate change. But with development of roads, it became easier to access markets and procure material for day-to-day activities and requirements, and thus a need to carry on with self-sustaining mode of subsistence waned. Cash crop economy in the form of apple production led to an increase in income and thus raised the bar of overall economic condition for instance, nearly all the households in the area owns a car. But, as the climate is changeable, non-conformities due to change can be unsettling (Toulmin et al. 2000:59). The people of Kotkhai residing in villages at different altitudes have suffered the brunt of changing climate at a different level. During the research it has been observed that due to changing pattern of precipitation, and decreasing rainfall and increasing temperature, the villagers have been dealing with a major decline in apple economy at lower

and lower middle altitude villages, viz., Bhawana (1825m) and Kiari (2224m). However, people in villages like Kufar Bag (2362m) and Jashla (2438m), the upper middle altitude and high-altitude villages have not faced dire consequences as Bhawana and Kiari, but are facing troubles due to erratic rainfall and increasing hail precipitation during recent times, which is impacting the apple economy.

### **Analysis of case studies**

To evaluate the emic view of local people about the climate change, ten case studies of males and females of older (65 years of age and above) and subsequent generation (above 30 years of age) from the study area are mentioned.

Respondent I (Male, 80 years old, from upper middle altitude village) observed a drastic difference between the amount of snowfall and rainfall over the years. Snowfall now is not as much as it used to be and rainfall is erratic and unlike the continuous rainfall during his childhood. According to him, this is because of the change in men's nature/behaviour with the progress of cash economy over the years which have made them greedy and arrogant. People misuses nature for their selfish interests, thus making the Gods angry, who are punishing people for their arrogant behaviour. The new generation especially has lost faith in the rituals and does not know the importance of those rituals.

Respondent II (Male, 82 years old, from lower middle altitude village) have witnessed a drastic change in the snowfall and rainfall pattern over the time. He has observed that the temperature has also increased. The summers are harsher now. According to him the onset of cash crop economy led to unplanned and unprecedented deforestation for apple production. *Ghasaniyan* (the grasslands) were also converted into apple orchards, thus putting land under more pressure. During deforestation many trees like *mohru* (*Quercus dilatata*), and *baan* (*Quercus leucotrichophora*) were cut, which used to maintain the moisture in the surroundings. Due to deforestation, loss of such fauna led to more dry conditions and along with the erratic and low rainfall due to climate change made the situation worse by creating water deficit and unsuitable for apple production, which is their main source of income.

Respondent III (Male, 46 years old, from lower altitude village) have noted a major decline in snowfall as well as rainfall and an increase in temperature since his childhood. It used to snow around 1 to 2 ft earlier, while there is no snowfall at all now. The rainfall is so meagre that the natural sources of water have all dried up in the surrounding areas. Rainwater harvesting is being tried, but that too is only successful if it rains. According to him there has been an increase of 2-3°C in temperature over the years. This decline in precipitation and increase in temperature has made it hard to carry

on with apple production as requirements for apple cultivation (freezing period and water requirement) are not being met. According to the respondent, the on-going climate change is a global phenomenon caused by the anthropogenic activities which are detrimental but needed, for instance, the construction of roads by cutting down the forests to make the area accessible to outside world and better facilities, or burning of wood to keep themselves warm during long winter and when there is no electricity. He also believes that change in social structure, like nuclear family instead of joint family has put more pressure on the resources as land is being divided and exploited for more benefits. Though the accountability of developing nations in climate change is not as much as of the developed nations, but unplanned development such as random urbanisation has contributed to it, which is nothing but formation of concrete jungles.

Respondent IV (male, 55 years of age, from lower middle altitude village) believes that the climate is changing due to anthropogenic activities like burning of fossil fuel and deforestation, the role of their deities cannot be avoided. According to him, people are selfish and will do whatever benefits them without thinking about the collateral damage. The people of the area can be stopped with the help of *dev niti*, i.e., by involving the deities as people are ardent worshippers of the local deity. He along with other members of the temple committee has led afforestation drive, so as to restore the balance of nature, as per the wishes of their deity. The people also avoid cutting trees out of the fear of being punished, such is the power of faith and religion.

Respondent V (Male, 37 years of age, from high altitude village) is of the view that climate change is a global phenomenon and has led to decline in amount of snowfall and rainfall and an increase in temperature, reasons being burning of fossil fuels, carbon emission by industries. This decline in snowfall and increase in temperature in the higher reaches of his village has however, opened up the road to cash crop production. Apple plant, which was earlier not able to survive in the area due to long winter and snow cover, has started showing production as the snowfall has declined, thus not exceeding the amount of chilling period which was required for the plant to grow. But according to the respondent, the unprecedented change in climate may soon turn detrimental for them as well, as can be seen in case of the low altitude villages.

Respondent VI (Female, in her late 80s, from lower middle altitude village) has observed a decline in precipitation which is almost negligible now. The water scarcity is to such an extent that water supply from the provided source by government is once or twice in a fortnight. As, her children have left for city for better education and employment opportunities, she is alone most of the times and depends on neighbours help for carrying on the chores related to her orchards. The production of apple, major means of livelihood, has faced a major hit due to scarcity of water and negligible snowfall. According to her, the climate will change to an extent that there will be no water for drinking and orchard management. The decline in apple production and overall economy



is a punishment of Gods for the generations after her for not taking good care of their parents and their ancestral land.

Respondent VII (Female, 80 years of age, from lower middle altitude village), has recorded the change in the climatic conditions and feels that the weather is worse in the recent times. She believes that this is an act of God and this is one of the ways in which the world will come to an end. She is of the view that the present time, *kaliyug* (last stage out of the four stages that the world goes through in Hinduism) is about to come to an end. The sudden excessive rainfall and random drought like conditions, harsh summers, etc., are the signs that the people are being punished for their atrocities against each other and nature. She is saddened that the women are being punished more as they have to suffer more. Managing day to day activities without water is getting difficult for them, beside that they have to listen to scolding and bickering of their spouse and sons. She further elaborated that the unexpected weather conditions hamper the crop production and this has affected the behaviour of the men of the house, which has indirectly impacted the women.

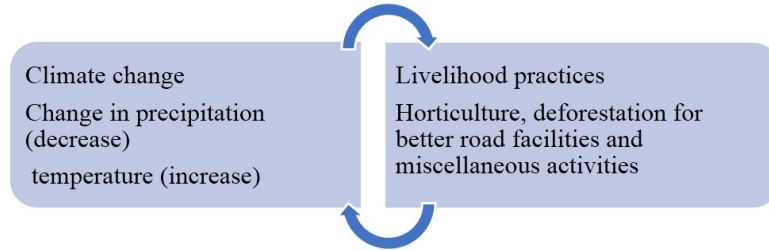
Respondent VIII (Female, 54 years of age, from upper middle altitude village) believes that climate change is the change in snowfall occurrence and erratic rainfall instead of continuous rainfall. Earlier, there was full supply of *chashme ka paani* (natural source of water in the form of aquifers and spring water), but now the water scarcity has led to feuds between the villagers. Rain water harvesting is being done, but that is not fit for household chores like washing utensils and clothes as well as for drinking for their cattle. Even the soil has lost its fertility as the production of vegetables has declined. According to her the major cause of climate change is the deforestation and forest fire, which is very prominent in their area.

Respondent IX (Female, 42 years of age, from lower altitude village), who is a teacher in the primary school of the area showed concern over the ongoing climate change. She said that the debates and discussions about this global phenomenon have made her aware enough to be scared about it. She also believes that being a woman it will be more difficult to deal with the problems like shortage of water arising from negligible seasonal rainfall. For instance, the household chores are affected and it is difficult to manage proper regime (from both hygiene and cultural point of view) during their periods. She has been a victim of wildfire in the recent past, when her house got caught in fire, though an early warning from the villagers saved her from excessive destruction. According to her such fire was common in summer as due to dry conditions the dry grass in the area frequently caught fire.

Respondent X (Female, 75 years of age, from high altitude village) has seen a change in snowfall and increase in heat intensity in summer. During earlier times, it used to snow to an extent that they could not even go outside

from their houses, and this is one of the reasons why in old houses, the cowshed was right below the houses and accessible from within the house. In spite of her observation regarding changing weather conditions, she does not know any specific reason behind it. According to her it is nature, and one can never know what will happen.

A bidirectional causal nexus between climate change and livelihood has been observed as shown in Fig.2. While the change in amount of precipitation and increased temperature has affected apple production which is the main source of income and other daily activities, the livelihood practices such as horticulture, burning of fossil fuel, and development activities such as deforestation for development of roads has contributed to the change in the climate at large. Respondents from both the generations have observed these changes and have their own perception as is depicted in Table 1.



**Fig. 2: Bidirectional causal nexus between climate change and livelihood**

**Table 1: Comparison of most cited perception of different generation**

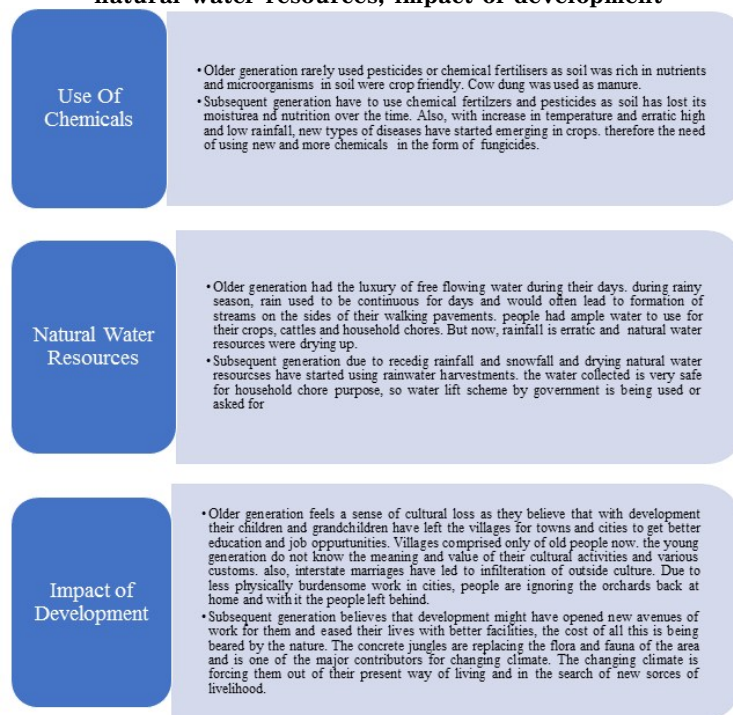
Respondents	What is climate change	Most cited cause of climate change	Impact of climate change on livelihood
Older generation (65 years of age and above)	Less snowfall and rainfall, hotter summers, late winters.	Being punished by God for misusing nature and being greedy Unprecedented deforestation Individual's fault	Rural to urban migration, Culture loss
Subsequent generation (30 to 65 years of age)	Decrease in snowfall and rainfall, erratic pattern, increasing temperature, shift in seasons	Deforestation for road construction and personal/miscellaneous reasons, burning fossil fuels and firewood. Global phenomenon	Change in income (market value of apple may have gone up but so has the expenditure) Overall decline in apple economy. Bleak future in cash crop industry.

Other than the perception differences as cited in Table 1, the older generation people felt that there used to be no feuds earlier among the people of village, but now the younger generation can be seen fighting with each other over petty matters like duration and timings for use of water resources. However, the subsequent generation was of the view that in earlier times there was no shortage of water, so there were no issues for the same. But today with the natural resources being depleted, it is difficult to manage even daily chores. So, it was natural that people fight over water. Thus, one can say that the social solidarity is being affected by the climate change. This finding concurs with the one of the four problems raised by Guha (2000: 6-7) from the

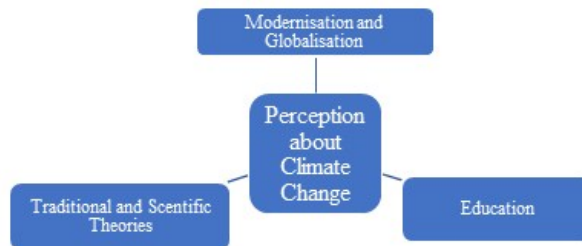
ecological research which points at the conflicts over natural resources (as cited in Chaudhury and Ramhota 2019: 302).

There has been a change in the pattern of use of various kinds of resources over the time. Fig 3 portrays this change in pattern as perceived by different generation over the time. The factors affecting the perception about climate change can be broadly divided into three categories as shown in Fig 4.

**Fig. 3.: Observation by different generation regarding the use of chemicals, natural water resources, impact of development**



**Fig. 4. Factors affecting the perception about climate change**



1. **Modernisation and Globalisation:** Given that in today’s time, almost everyone in the field area were using mobile phones, television and some were also using social media and internet, and climate change

being the debatable topic that it has become over the time, people were aware about the term climate change. They had felt the impact at personal level as their livelihood was affected in some way or the other.

2. Education: Respondents with higher education were of the belief that climate change was due to on-going human activities such as burning of fossil fuel, deforestation for development and personal use. While the respondents with less or no educational qualification blamed changing dynamics between the man and nature for unpredictable climatic conditions. Though not every respondent who was illiterate believed that the climate change was the result of punishment by God. These people were aware about the scientific reasons behind the climate change due to the ongoing debates on television and other social platforms.
3. Traditional and scientific theories: The older generation believed that good crop and weather was reliable on rituals followed on *Saaja* (Sankranti), the younger generation believed that climate of an area rules over the crop production which had little to do with God. The people losing interest in cultural activities such as *Saaja*, and *Bishu ka mela* (organised on the day of Baisakhi), have not only led to cultural loss, but also made the local deity angry, so they are being punished. The traditional theories are based on the folklore related to their *isht gram devta* (the deity of the village), according to which when certain rituals are performed on *Saaja* of the months January, April, July and August, their deity protects them from any inauspicious event, and aids in prosperity of the villagers. Also, conducting *pooja* (prayer) in front of the natural water resource, i.e., *chashme ka paani* (aquifers and spring water), would prevent it from drying. The new generation neither believe nor perform these rituals, thus leading to unpredictable events and drying of natural water resources in the recent times. *Bishu ka mela*, which was celebrated with much compassion during older days to welcome warmer weather conditions and signified flowering phase of apple, was not celebrated with the same zest anymore, the major reason being the outward migration of the people with their children for better job, education and opportunities.

#### **Impact of climate change on people's livelihood:**

1. There is a decline in apple production in lower belts as there has been little to no snowfall in that area. At the budding stage apple production requires 1200 to 1500 hours of continuous temperature below 7°C between the months of January and February, but it is not met. A decline in rainfall has led to shortage of water to an extent that the daily requirement of an apple tree has become difficult to meet. The people have shifted to other means of livelihood such as jobs in other

sectors. However, the youth who are still interested in their ancestral work are trying to come up with the solution, such as High-Density Crops in lower belts.

2. Change in mode of transportation of apples was observed. While earlier trucks were hired to transport apples to the market, due to decline in apple production people use vehicles like utilities. This has helped them in saving money of transport and also given employment opportunity at local level.
3. Loss of soil moisture and new types of diseases of plants has led to increase in the use of insecticides and pesticides. For instance, use of chemicals like Captan, Dodine, Carbendazim for disease like Scab, and Chlorpyrifos and Spiromesifen for pests like Woolly Apple Aphid and Mites respectively. Due to climate change (less rainfall, higher temperature, erratic weather), people are using chemicals to sustain apple production and therefore increased expenditure. Also, in this way climate change is not only impacting livelihood, but also may have negative effect on human health as well as soil productivity and organisms living in it.
4. Parts of higher altitudes where apple production was not feasible before have now become the perfect grounds for apple production. During the earlier times, the region used to stay under snow cover for a long period of time, exceeding the chilling period needed for plant growth, and thus making it impossible for the apples to grow there. Now, due to lesser snowfall and increase in temperature comparatively to the earlier days, the optimal conditions for apple production are possible.
5. Climate change has resulted in erratic weather conditions. Sudden rainfall during the setting period or no snowfall during chilling period has been a problem. A shift in seasons has been observed which makes it difficult for people and crop to adapt.
6. The precipitation is not the same anymore and as villagers are dependent on natural water resources, they are facing the brunt of shortage of water. Water shortage for daily activities was found to be common in the area and females felt the major burden of it as they were responsible for daily household chores.
7. Cattle rearing, which was a common practice in older times, is rare now as people are moving out for jobs and education. Also, there has been scarcity of fodder which used to be easily available before and drinking water shortage for cattle is also an issue. This has led to increase in expenditure in the form of milk and *ghee* (clarified butter). Earlier the cow manure, used as fertiliser, was available at home. But now people have to buy manure.

8. According to people, when there is proper rainfall and chilling period requirement is achieved due to snowfall and low temperature during winter, the apple production is satisfactory. But in erratic weather conditions, there is a decline in apple production. So, depending on the amount of snowfall, rainfall and temperature, apple production may be good or poor, which has a direct impact on the livelihood. For instance, recently in June-July, 2020, due to sudden hailstorm, almost 50% of apple crop was damaged, which resulted in lower price in market and lesser crop for sale. According to people, while there were good winter conditions initially and an estimate of 5000-6000 boxes of apple was there during season, due to sudden hailstorm, the destruction was to an extent that only 2000-3000 boxes of apples could make it to the market.

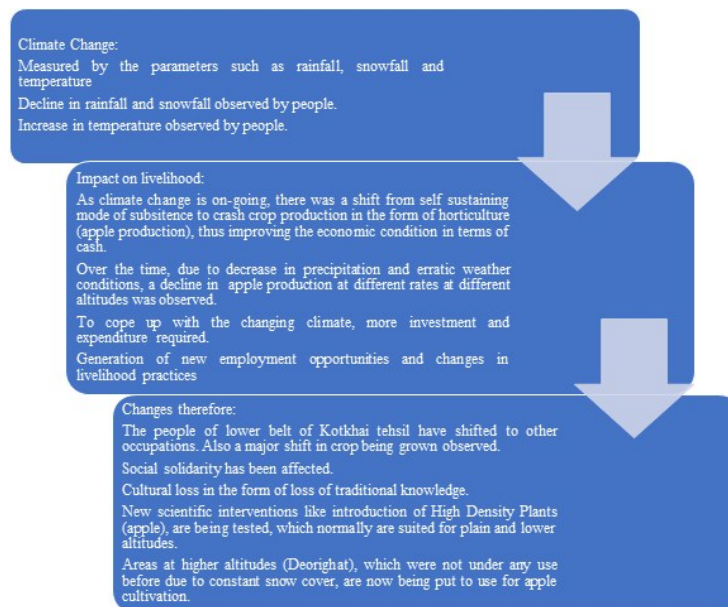
From the data collected during the fieldwork, it could be inferred that overall, a change in climate was observed by the people. Though the perception about the cause of changing climate was observed to be different in different generations, the impact on everyone's livelihood was witnessed.

The cause-and-effect relationship between the climate change and livelihood is summarized in Fig. 5. The perception of the local people regarding decline in rainfall in general can be correlated with the data provided by the Meteorological Centre (IMD), Shimla, Himachal Pradesh, India, where it can be deduced that there has been a decline in rainfall in the last two decades, which are, 1991-2000 and 2001-2010.

### **Conclusion**

Climate change has led to decline in apple production, the main source of livelihood, in lower and lower-middle altitude villages, while it has led to problem of water scarcity in all the villages. In case of high-altitude village, the higher reaches are now available for apple production, thus increasing the source of livelihood. On the other hand, clearing of forest area for road construction and apple cultivation, and burning of fossil fuels has acted as an aid in climate change. A bidirectional causal-nexus has been observed between the climate change and livelihood in the field area.

A difference in opinion and perception of different generations is a result of factors like globalization, education and media. The people of older generation, who were not educated, were God fearing and did not question the nature and changes therein. The cause of climate change and its impact on their lives was an act of God for them. While it is true that the natural disasters are forces of nature and not under human control, it is anthropogenic activities that have acted as a catalyst in these cases. The subsequent generation was aware of this, given they were more in tune with the worldview and were in constant touch with the global phenomenon that climate change has become.

**Fig. 5. The causal nexus between the climate change and livelihood**

Also, a difference in impact on the means of livelihood was seen when gender was put under the microscope. The women were facing more trouble in day-to-day activities as shortage of water meant less water for household chores. Men were not concerned with the issues of this level and were more troubled by the impact on the economy. Also, women were more hesitant in moving far from their homes for a longer period for attaining new means of livelihood, like job in a different state, while men were at ease with the option. The finding is similar to observation by Kelkar (2009), according to which women were more vulnerable to the detrimental impact of climate change due to gender-based inequalities in access to resource and opportunities.

Just as Jankovic (2007) suggested replacement of traditional theories with scientific theories, it was observed during the study that traditional practices like *Saaja* and *Bishu ka mela* had lost their meaning amongst the younger generation with the rituals losing their meaning. All the discussion regarding emission reduction amid government and private sectors has lost the focus from livelihood and actual people as it is more oriented towards industries, government and non-government sectors than towards people. This paper is an attempt to understand how people perceive the change in climate and the reasons behind it.

The perspective of the people changes over time and the dynamics of perspective can be seen being created at the juncture of environmental and social processes. For instance, during older generation's time with simple belief

system, it was nature and God that ruled and were the source of everything happening. Next generation came in contact with the world, science showed headway in climate studies and with the help of media and global hue and cry over climate change, the next generation could relate the changes in climate to their activities for development's sake, like shift to cash crop economy, deforestation for development of roads, burning of wood for household activities, which now is mostly replaced with gas heater, etc. This is a result of processes like globalization and urbanization. However, one cannot ignore the cultural aspect of adaptation of the older generation that is being lost with the advent of modern technology. The people are often found reminiscing the tea and food cooked in *chulha* and how harsh winters were bearable before because of firewood. A cause-and-effect relationship between the climate change and their livelihood could be observed by reviewing how, to increase the economy, people exploited the nature in the name of development and, then over the time, how this exploitation led to scarcity of the most important natural resource, water, due to decline in precipitation and increased temperature, which is the direct impact of climate change, and as a result led to decline in apple production and an increase in expenses to combat the impact of climate change.

While conducting the study it was observed that be it God/ nature or anthropogenic activities, climate change has been unpredictable. During a good year, i.e., the year when there is timely and sufficient amount of precipitation and suitable temperature conditions, people had easier time. While during harsh years without snow or rain, and absence of right temperature for their crop, people had to suffer. What one needs to realise is that a sustainable approach is required towards use of resources, so that even when the resources are in bounty or shortage, one is able to live through it without depriving the coming generation of it.

Climate change is a global phenomenon. Any damage to nature anywhere will have an impact everywhere. The present accelerated climate change does not act in isolation, but in nexus to the livelihood related anthropogenic activities.

### ***Reference***

Adger, W. N., N. Brooks, G. Bentham, M. Agnew and S. Eriksen.

2004. *New Indicators of Vulnerability and Adaptive Capacity (Vol 7)*.  
Norwich: Tyndall Centre for Climate Change Research.

Ahmed, A. U.

2006. *Bangladesh Climate Change Impacts and Vulnerability: A Synthesis*.  
Bangladesh: Climate Change Cell, Department of Environment.

Barnosky, A. D., E. A. Hadly, J. Bascompte, E. L. Berlow, J. H. Brown, M. Fortelius, W. M. Getz, J. Harte, A. Hastings, P. A. Marquet, N. D. Martinez, A. Mooers, P. Roopnarine, G. Vermeij, J. W. Williams, R. Gillespie, J. Kitzes, C. Marshall, N. Matzke, D. P. Mindell, E. Revilla and A. B. Smith.



2012. "Approaching a State Shift in Earth's Biosphere", *Nature*, Vol.486, pp 52–58.
- Chagutah, T.
2010. *Climate Change Vulnerability and Preparedness in Southern Africa: Zimbabwe Country Report*. Cape Town: Heinrich Boell Stiftung.
- Chambers, R.
1995. "Poverty and Livelihoods: Whose Reality Counts?", *Environment and Urbanization*, Vol. 7, No. 1, pp 173-204.
- Chaudhury, Sukant K. and Pavitranand Ramhota.
2019. "Ecology, Climate Change and Global Warming: Some Issues", *The Eastern Anthropologist*, Vol. 72, No. 3 & 4, pp 301-312.
- Dove, M. R. (ed.).
2014. *The Anthropology of Climate Change: An Historical Reader*. UK: John Wiley and Sons, Inc.
- Gentle, P. and T. N. Maraseni.
2012. "Climate Change, Poverty and Livelihoods: Adaptation Practices by Rural Mountain Communities in Nepal", *Environmental Science & Policy*, Vol. 21, pp 24-34.
- Hingane, L. S., K. R. Kumar and B.V. R. Murthy.
1985. "Long-term Trends of Surface Air Temperature in India", *Journal of Climatology*, Vol. 5, No. 5, pp 521-528.
- Huber-Sannwald, E., F.T. Maestre, J.E. Herrick and J.F. Reynolds.
2006. "Ecohydrological Feedbacks and Linkages Associated with Land Degradation: A Case Study from Mexico", *Hydrological Processes*, Vol. 20, pp 3395-3411.
- IPCC.
2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution to the Working Group II to the Fourth Assessment Report of Intergovernmental Panel on Climate Change. [M. L. Parry, O. F. Canziani, J. P. Palutik, P. J. van der Linden and C. E. Hanson (eds.)]. Cambridge: Cambridge University Press.
- IPCC.
2014. *Climate Change 2014: Synthesis Report*. Contribution of Working Group I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Core Writing Team, R. K. Pachauri and L. A. Meyer (eds)]. Geneva: IPCC
- IPCC.
2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B.

Zhou (eds.]). Cambridge: Cambridge University Press.

Islam, T. and J. Ryan.

2016. "Mitigation in the Private Sector", In T. Islam and J. Ryan (eds.) *Hazard Mitigation in Emergency Management*. U K : B u t t e r w o r t h - Heinemann.

Jankovic, V.

2007. "Gruff Boreas, Deadly Calms: A Medical Perspective on Winds and the Victorians", In M. R. Dove (ed. 2014) *The Anthropology of Climate Change: An Historical Reader*. UK: John Wiley & Sons, Inc.

Jellema, J. R. and H. Noura.

2012. *Protecting Poor and Vulnerable Households in Indonesia: Main Report*. Washington, DC: World Bank Group. Accessed from <http://documents.worldbank.org/curated/en/2012/02/15879721/protecting-poorvulnerable-households-indonesia>

JustJobs Network Inc.

2015. *The Changing Climate of Livelihoods: Case Studies from Bangladesh, India and Indonesia*. Accessed from: [https://www.justjobsnetwork.org/wp-content/pubs/reports/the\\_changing\\_climate\\_of\\_livelihoods.pdf](https://www.justjobsnetwork.org/wp-content/pubs/reports/the_changing_climate_of_livelihoods.pdf)

Kelkar, G.

2009. *Climate Change and Vulnerability of Indigenous Women. Adivasi Women Engaging with Climate Change*. New Delhi: UNIFEM South Asia Office.

Kulkarni, J. and N. Leary.

2007. "Climate Change and Vulnerability in Developing Country Regions", In *Draft Final Report of the AIACC Project, a Global Environmental Facility Enabling Activity in the Climate Change Focal Area, Project No GFL - 2328-2724-4330*. Nairobi, Kenya: UNEP. Accessed from <http://www.aiaccproject.org>

Mead, M.

1977. "Preface", In William W. Kellogg and Margaret Mead (eds.) *The Atmosphere: Endangered and Endangering*. Bethesda, MD: Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health.

Meggers, B. J.

1957. "Environment and Culture in the Amazon Basin an Appraisal of the Theory of Environmental Determinism", In Michael R. Dove, (ed. 2014) *The Anthropology of Climate Change: An Historical Reader*. UK: John Wiley & Sons, Inc.

Nelson, D. R. and T. J. Finan.

2000. "The Emergence of a Climate Anthropology in Northeast Brazil", *Practicing Anthropology*, Vol.22, No. 4, pp 6–10.

Ninan, K. N. and S. Bedamatta.

2012. "Climate Change, Agriculture, Poverty and Livelihoods: A Status Report", *Working Paper 277*. Bangalore: The Institute for Social and Economic Change.

Picciariello, A., S. Colenbrander, A. Bazaz and R. Roy.

2021. "The Costs of Climate Change in India: A Review of the Climate-Related Risks Facing India, and Their Economic and Social Costs", In *ODI Literature review*. London: ODI. Accessed from [www.odi.org/en/publications/the-costs-of-climate-change-in-india-a-review-of-the-climate-related-risks-facing-india-and-their-economic-and-social-costs](http://www.odi.org/en/publications/the-costs-of-climate-change-in-india-a-review-of-the-climate-related-risks-facing-india-and-their-economic-and-social-costs).

Ratzel, F.

- 1896-1898. "Nature, Rise, and Spread of Civilization", in M. R. Dove (ed. 2014) *The Anthropology of Climate Change: An Historical Reader*. UK: John Wiley & Sons, Inc.

Sangomla, A.

2021. "Climate Crisis in North East India: What is Behind Water Scarcity in the Region", *Down to Earth*. Accessed from <https://www.downtoearth.org.in/news/climate-change/climate-crisis-in-north-east-india-what-is-behind-water-scarcity-in-the-region-78910>.

Scoones, I.

1998. "Sustainable Rural Livelihoods: A framework for analysis", *IDS Working Paper 72*. Brighton, UK: IDS.

Scoones, I.

2009. "Livelihoods Perspectives and Rural Development", *The Journal of Peasant Studies*, Vol. 36, No. 1, pp171-196.

Singh, S. P., V. Singh and M. Skutsch.

2010. "Rapid Warming in the Himalayas: Ecosystem Responses and Development Options", *Climate and Development*, Vol. 2, No. 3, pp 221-232.

Steffen, W., A. Persson, L. Deutsch, J. Zalasiewicz, M. Williams, K. Richardson, C. Crumley, P. Crutzen, C. Folke, L. Gordon, M. Molina, V. Ramanathan, J. Rockström, M. Scheffer, H. J. Schellnhuber and U. Svedin.

2011. "The Anthropocene: From Global Change to Planetary Stewardship", *Ambio*, Vol.40, No. 7, pp739-761. Accessed from <https://doi.org/10.1007/s13280-011-0185-x>

Toulmin, C., R. Leonard, K. Brock, N. Coulibaly, G. Carswell and D. Dea.

2000. "Diversification of Livelihoods: Evidence from Mali and Ethiopia", *IDS Research Report*, Vol.47, pp 59. Brighton, UK: Institute Development Studies, University of Sussex.

UNFCCC.

2011. *Fact Sheet: Climate Change Science - The Status of Climate Change Science Today*. Accessed from [https://unfccc.int/files/press/backgrounders/application/pdf/press\\_factsh\\_science.pdf](https://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_science.pdf)

RECEIVED: 04<sup>TH</sup> JULY 2021

REVISED: 30<sup>TH</sup> DEC 2021

ACCEPTED: 09<sup>TH</sup> JAN 2022



This document was created with the Win2PDF "print to PDF" printer available at <http://www.win2pdf.com>

This version of Win2PDF 10 is for evaluation and non-commercial use only.

This page will not be added after purchasing Win2PDF.

<http://www.win2pdf.com/purchase/>