

# **Local Narratives of Climate Change**

A Case Study of a Village in Central Hunza



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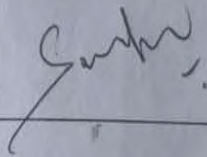
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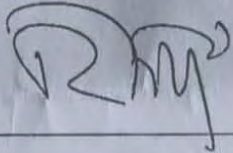
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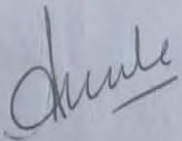
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## **Formal declaration**

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**Mr. Sajid Ali**

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## **DEDICATION**

I dedicate this work to my beloved wife and my ever loving mother.

## ABSTRACT

The climate change projections for the Himalaya-Karakoram-Hindu Kush (HKH) region suggest a significant increase in temperature and precipitation levels. These projections suggest intensification of climate change led anomalies, which will have dire consequences on social, economic, and environmental scales. Adding to the scenario, lack of resources and limited metrological data in the mountainous region can further amplify the challenges posed by climate change. This study was conducted in Hunza valley to explore the local narratives of climate change as perceived by its indigenous inhabitants. In order to understand the intensity of climate change events and their effects on ecology and livelihood pursuits, this study uses proxy indicators based on local knowledge categories.

To attain its objectives, the study adopted qualitative methodological tools. The data was collected during the 08 months' field work carried out between 2019 and 2020. A purposive sampling technique is adopted to collect the narratives from the respondents. The qualitative tools employed to collect the data include in-depth interviews, focus group discussions, and oral histories.

The findings of the study show mix manifestations of change in climatic variables over the period of 40 years. These include, rise in temperature around the year, decreasing trend in snowfall pattern, untimely rainfalls, prolongation of agriculture season, and variations in blossoming time. The local people associate these changes with global warming caused by carbon emission technologies. Whereas there are inevitably some who deny the existence of the climate change phenomenon and deem these changes as a part of the natural cycle. The variations in climatic variables as perceived by the local people are in congruity with the metrological records and other studies conducted in HKH region. Conversely, the findings also highlight that the changes in the farming patterns of the village are sometimes mistaken as manifestations of climate change, which, in actuality are caused by various other factors.

**Keywords:** Climate Change, Narratives, Perception, Local Knowledge

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# 1. INTRODUCTION

## 1.1 Background

According to studies, climate on the earth's surface has never remained static. Through archeological excavations and paleo-climatological research it has been found that, climate change, which is primarily driven by the forces of nature (e.g., volcanic eruptions, variations in solar atmosphere), has played a vital role in formation and collapse of ancient civilizations. These include collapse of Mayan civilization (Kennett, et al., 2012), abandonment of Ancestral Puebloans and downfall of Harappan civilization due to droughts (Marris, 2014). These records indicate an ever existing climate change phenomenon which has affected people around the globe since the evolution of humankind. But what distinguishes the contemporary climate change events that have got public attention around the globe, from those in the distant past? For instance, Greta Thunberg's social movement demanding prompt action on climate change issue was joined by approximately 1.6 million students from 120 different countries (Jung, Petkanic, Nan, & Kim, 2020).

In this regard, climatologists and experts from other disciplines working on the issue are of the view that, the contemporary climate change for the most part is induced by anthropogenic activities. The onset of 20<sup>th</sup> century which is marked by industrialization and use of mechanical technology led to the emission of various gases often called Green House Gas (GHG). These emissions have caused changes in the natural composition of atmosphere, consequently increasing the global temperature, variations in rain and snowfall patterns, deglaciation, and rise in sea levels. Apart from their effects on global ecosystems, the experts have cautioned about the impacts of climate change on human societies living around the globe.

Limited availability of the resources on social and economic scale, and a lack of reliable apparatus to cope with the ongoing challenges amplify the threats posed by climate change. On the basis of availability of resources, researchers have projected higher impacts in developing regions, owing to poor infrastructure, poverty, and high dependency on agriculture which is prone to climate change effects (Omambia, Shemsanga, & Gu, 2010;

Stern, 2007; Yanda & Mubaya, *Managing a changing climate in Africa: Local level vulnerabilities and adaptation experiences*, 2011). According to UNEP (2000) report on Pakistan, the increase in temperature and decreasing precipitation rates will adversely affect the agricultural growth. The report further predicted high occurrences of extreme weather events like, flooding in near future. It further indicated that the existing infrastructure was not adequate to address the challenges.

The communities living in the mountainous areas are way more vulnerable in the wake of climate change, as these areas are characterized by sensitive ecosystems prone to natural calamities (Schild & Sharma, 2011). For instance, due to rise in temperatures the Hindu Kush-Karakoram-Himalaya (HKH) region has observed various affects (Dongtao, Jianjun, Peng, & Ruren, 2004), like increase in frequency of GLOFs which have posed threats to the communities living in the area. Apart from climate change, there are manifold factors which have induced climate-led anomalies, including, population growth, economic development initiatives, and related activities initiated by human factor (Khanal, Mool, Shrestha, & Rasul, 2015).

The case in point being that the Hunza valley, located in western Karakoram range, which is a high altitude region, suffers from climate change anomalies which have been observed in the near past in the form of GLOFs, flooding, and deglaciation. For instance, the Shishper glacier surge, which has blocked the water flow of Hassanabad tributary consequently, formed a GLOF. According to experts, properties and people living in low lying areas are highly vulnerable. Along with this, high cost infrastructures are highly exposed to this glacial expansion which includes; a running hydro powerhouse, under construction powerhouse and a bridge on the Karakoram Highway. This glacial expansion is not the only event observed in the area, back in 2017, a similar kind of glacial movement occurred at Ultar meadow. This glacial movement has caused blockage of irrigation and drinking water for major villages of central Hunza. Apart from infrastructural loss, a whole array of cultural practices; livelihood routines, subsistence patterns, and agrarian practices are affected by climate induced events in Hunza.

The projections on the HKH region suggests significant increase in the warming trend by the end of 21<sup>st</sup> century, whereas, the precipitation levels are expected to be 40% higher towards the end of year 2098 (Kulkarni, Patwardhan, Krishna, & Ashok, 2013, p. 1). These

projections indicate an increasing trend in climate change events, which will indeed have dire consequences on social, economic, and environmental scale. Adding to the scenario, limited resources and poor infrastructure in the area can further amplify the impacts of climate change. However, under an increasing condition of stress, the existing strategies and resources are insufficient to tackle the challenges posed by climate change. In Hunza, there is only one metrological station which covers a geographical spread of around 7000 square kilometers. In such a scenario where metrological data is sparse, proxy indicators through local knowledge can be of high importance (Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019).

## **1.2 Statement of the Problem**

In the given context, where climate change induced events are on the forefront and metrological data is sparse, the local people are likely to rely on media reports. Adding to the existing situation the human environmental relations are complex, making it difficult to distinguish the accurate effects of climate change. In this regard, proxy indicators using local knowledge categories can be very helpful in determining the localized impacts of climate change.

It is imperative to emphasize on local experiences and cultural framing because the local people have adapted to the ecological conditions by developing cultural practices in centuries long process of direct encounters with their surrounding environment. Thus, the local narratives based on local knowledge and folk taxonomies must be known in order to understand how climate change variability is accounted for by the local people. So that the region's manifestations of climate change will be explained in a nuanced way.

With regards to above mentioned problems, this study attempts to explore local manifestations of climate change in terms of its effects on agriculture, horticulture, and changing cultural practices.

### **1.3 Research Questions**

In the light of research findings and existing literature, this study attempts to address the following research questions:

1. What are the effects of climate change on agriculture, horticulture, glaciers and biodiversity as observed by the local people?
2. How the local people perceive climate change using local knowledge?
3. To what extent climate related changes are effecting human-environmental relations?

### **1.4 Objectives**

Based on the research problem the study emphasizes on following objectives;

1. To document the local narratives of climate change.
2. To know the perception of local people pertaining to climate change.
3. To understand the changing human-environmental relation in the wake of climate change.

### **1.5 Significance of the Study**

There are a number of reasons why understanding local perceptions of change is important. Firstly, an insight into local perceptions can improve our understanding of climate change and its impact on regional populations. This will further be useful in policy related matters, as the findings and recommendations of this study will be a good source to inform climate related policy patterns. A policy informed by local realities is likely to be more relevant, thus more appropriate to solve the local climate related issues. Moreover, this study will contribute to the existing body of knowledge related to climate change and varying perceptions about climate change. The scarcity of information, which has been highlighted in this research as one of the major problems that a researcher faces while conducting perception-based researches, will be addressed through this research. Additionally, this research will be a reference for other researchers doing relevant work, particularly in

Hunza. Apart from this, by taking Hunza as a case study, this study highlights the key issues related to climate and their impact on local people in Hunza. The study is significant for the region as it brings the local issues into the attention of public and private sector policy makers in a nuanced way.

## **1.6 Operational Definitions**

### **Local knowledge**

According to FAO, local knowledge includes, facts, beliefs, perceptions and entire set of concepts that people in a specific area hold to interpret and see world around them. For instance, the way people measure and observe their surrounding environment to solve problems arising out of it. So in any given society it includes all those processes using which new knowledge is generated, applied, stored and further transmitted to others and upcoming generations. It is also important to theoretically distinguish between two synonymous terms i.e. Local Knowledge and Indigenous Knowledge. In this regard, the term Indigenous Knowledge refers to a specific or distinct set of knowledge that is generated in a specific area or culture without any external influences, while assuming the society to be static (FAO, What is Local Knowledge, 2004).

### **Narratives**

Narratives, also referred to as storytelling includes coherent plots connected to one another and with a beginning, middle, and end (Dodge, Ospina, & Foldy, 2005). Narratives are plotted around events, occurrences, or any sort of change from one state to another state (Huhn, 2013). Narratives always follow a temporal sequence that informs its listeners in terms of before and after of an event. To make sense of totality narrative character and events are always dwelled in time and space (Toolan, 2013). For this study, the term narratives will include oral histories, life experiences, historical events, and state of change in agro-ecological conditions as perceived by the local people over the period of more than two decades.



## **Human-Environmental Relation**

Since the beginning humans are dependent on natural resources to survive on the earth. In order to make their living possible and more comfortable they keep on exploiting the environmental resources like, digging channels for transporting water, cutting forests for wood, and exploiting land for farming, and many more. Thus, the human-environmental relation of any given area is defined as the interaction between its social system and ecosystem. According to Marten, (2001) both society and ecological system are complex and adaptive, because all elements of both systems are integrated to one another.

## **Climate Change**

The Climate of any area includes average of temperature, precipitation, snowfall patterns, rainfall patterns, and humidity across the seasons, years, and decades. In contrast to weather, climate data includes larger spatial and temporal scales. Whereas, Climate Change refers to considerable change in global temperature average, precipitation levels, wind patterns, and other such measures which occur over decades (NASA, 2020). For the current study, a time scale of more than three decades is considered to explore the various manifestations of climate change.

## **2. RESEARCH METHODOLOGY**

In order to know the local perception and collect narratives pertaining to climate change it was important to devise a sound research design. This chapter explains the research methodology adopted for data collection and analysis. Furthermore, various tools and techniques incorporated for the collection and analysis of the data are also elaborated in detail. Thus, this chapter will discuss the qualitative methodological approach which was selected to carry out the research. Along with this, it will also elaborate the various tools incorporated to collect the qualitative data from respondents, as well as a descriptive account of the respondent's demographic information.

### **2.1 Qualitative Research**

One of the major characteristic of qualitative research approach is that it focuses on connotative meanings within respondent's narrative (Hulme D. , 2007). It is important to adopt qualitative research methodology when treating complex phenomenon rooted in local context. Because it is a process of understanding and developing a holistic picture of research settings, through analyzing respondent's narratives while living in a natural setting (Creswell J. , 1998).

The qualitative methodological tools used in this study included, in-depth interviews, life histories from old age respondents, participant observation, and focus group discussions. These methodological tools were used to collect the data pertaining to local perceptions and narratives on climate change, local environmental and ecological knowledge categories, and agriculture and arboriculture practices. The reason for adopting qualitative approach was useful in many ways, that it enabled the researcher to participate in the local settings so to know that how people adapted to climate change using local knowledge. Along with this, it also facilitated the researcher in understanding how local knowledge categories are formed in response to human-environmental relation. It is concerned with meaning (i.e. the way people make sense of their daily living, and experiences) and is inductive in nature (i.e. researcher usually builds abstractions, concepts, hypotheses and theories from facts observed) (Creswell, 1994).

## 2.2 Narrative Inquiry

Narrative inquiry is a qualitative data collection process through storytelling. After collection of the narratives from the respondents the researcher retells the collected experiences in a chronological sequence (Connelly & Clandinin, 1990). During the field work narratives pertaining to changes in agro-ecological conditions and variations in climate were collected from the respondents. The narrative data was collected from the life histories of the respondents through in-depth interviews. The narratives collected during the field work were sequenced chronologically to project a 'before' and 'after picture' of the locale. The sequenced data is further analyzed to get the underlying themes pertaining to climate change.

## 2.3 Sampling

One of the many reasons for selecting the locale was its geographical location. As two of the major glacier tongues of Batura glacier, namely, Shishper and Muchuher are situated on the backside of the village on a distance of 3-4 kilometers towards North West. These glaciers are the major sources of drinking and irrigation water in central Hunza. In addition, there are various pastures like *Shishper tair*, *Burong tair*, and *Charsu* situated alongside the two glacier masses. These pastures are used for grazing during the summers by different tribes of central Hunza. Along with this, the village is considered as a role model for high quality fruit production throughout the district, which is indicative of transformation from traditional agrarian practice to arboriculture. Thus, the locale description gives an ideal picture to study climate change and changing human-environmental relationship.

The selection of respondents for conducting interviews and focus group discussions was carried out purposively. The respondents included, farmers, village headmen, and socially active members of the community who have spent their lives in the village. Depending on the data saturation, the number of respondent included in the sampling frame were 55. This sample size included both in-depth interview and focus group discussion respondents. To conduct studies on perceived climatic change a reference point of about three decades is considered suitable (Vedwan N. , 2006). For this reason, the age of respondents was restricted to above 40 years. Whereas, few of the respondents (07) were below 30 years, to

consider the perception of youth. While the gender segregation of respondents in sampling frame was not equal i.e. out of total respondents only 14 were women.

## **2.4 Data Collection Tools**

The primary data for the current study was gathered during the fieldwork of 6 months in 2019 and 2020. The qualitative data was collected by employing qualitative tools including participant observations, focus group discussions and in-depth interviews with mostly old age respondents. The respondents were farmers, social activists, and village head men, who have spent most of their lives in the village. The quantitative data was gathered through a structured questionnaire, which was adopted to construct the village profile. While, the secondary data for the study was collected from published and unpublished literature on the area.

### **2.4.1 Rapport building**

In a qualitative anthropological inquiry rapport building is of foremost importance. It enables the researcher to communicate effectively with the respondents and increases the trust and mutual respect, which in turn yields rich data (Zakaria & Musta'a, 2014; Youell & Youell, 2011). As the local of the research was my ancestral village, which facilitated the researcher to easily penetrate into the social settings. This affiliation was not enough to build the trustworthy environment. In order to build the rapport, the research involved himself in social gatherings like funeral prayers, praying areas, games, and continuous visits to tea shops (locally called Dhaba-also in Urdu: small teashop with few benches and tables). Initially, I had to go along with my relatives who were permanent residents, who introduced me to the people not known to me. It took a period of almost three weeks to gain the trust of local people so that they would feel comfortable in my presence.

### **2.4.2 Key informants**

Identification of a key informant is necessary in research work, as he/she by virtue of his/her position in the social settings, knows a lot about the area and any specific issue under consideration. Furthermore, he also points out those persons, who are having sufficient expertise and knowledge of the given topic (Stacey , 1969). For the study 03 key

informants were selected based on their expertise especially in agriculture and involvement in village matters, who further pointed out the relevant respondents having deep knowledge of topics under consideration. My key informants were, village chairman, village headman, and a retired educationist who has keen interest in farming.

### **2.4.3 Participant observations**

Participant observation is qualitative research technique through which the researcher actively participates in the activities carry out by the local people to enhance his understanding of his/her research subjects. The data collected through this technique enables researcher to have a deep insight of hidden process. Hence, this technique allows researcher to have a better understanding of the context under consideration (DeWalt & DeWalt, 2002). During the field work the researcher participated in various activities held in the village, like helping people in washing water channels, working with farmers in grafting and planting trees, and also getting involve in small discussions where the researcher only listened to their conversations without interfering. This helped to understand various local terms and taxonomies which were mostly used contextually during interviews and focus group discussions. These observations were also utilized during the analysis of the data.

### **2.4.4 Focus group discussions**

Focus group discussion is a data collection technique widely used in qualitative research, where several respondents are gathered to discuss a topic of mutual interest-both for the researcher and respondents. The benefits of focus group discussions over other qualitative tools is that it allows the researcher to collect multiple experiences of the research respondents in shorter period of time (Morgan & Margaret, 1984, pp. 258-260).

For the current study 06 focus group discussions were held from various stakeholders. In this regard, (02) FGDs were held from farmers, (02) from old age respondents, (01) from young age respondents below the age of 35, and one from women of the village. On average each FGD took approximately one hour to conclude. Whereas, the average number of respondents participated in the FGDs were 07. To conduct the FGD in a focused manner a guide was prepared, which included various discussion points like shifts in agrarian

patterns, changes in annual temperature, blossoming seasons, prolongation in agrarian activities etc. The FGD notes were taken through jotting down the major comments of the respondents, along with this; the discussions were also recorded using an electronic recording device which helped the researcher to moderate the discussion. The detailed electronic recordings were later on transcribed for the analysis.

#### **2.4.5 In-depth interview**

In-depth interviews in qualitative research is one of the foremost technique of collecting data from individual respondents, it provides deep insights on respondents experiences that how they interpret the social world around them (Creswell J. W., 2012).

For the current study, the researcher has conducted in-depth interviews from various respondents based on their understanding of the topic and experience. The in-depth interviews were conducted as a primary tool of data collection for two considerable reasons. First, because they give a deep insight for the exploration of local perception in regards to issue of climate change and secondly because by conducting interviews researcher can overcome the issue of limited response rate as in the case of surveys (Barriball & While, 1994, pp. 328-330). Total 45 interviews were conducted from various respondents using purposive sampling. 60 percent of the total respondents were above the age of 50, whereas, 09 female participants were selected for the interviews. Apart from the topic under consideration life histories from old aged respondents were also recorded. The interview notes were taken by jotting down the important points, along with this, the whole interview process was also recorded using an electronic recorder. The recordings of the interviews were later transcribed to get the detail narrative. The interview process was facilitated using an interview guide, where various questions pertaining to climate and environmental change were written. The questions in the interview guide were open ended with few semi-structured and structured questions to collect the demographic profile and socio economic status of the respondents.

#### **2.4.6 Household survey**

As a means of obtaining quantitative data a survey questionnaire was developed with close ended questions. The survey questionnaire was used to collect demographic and socio-

economic information of the respondents. Based on survey data a complete village profile is constructed, which apart from respondent's personal information helped to collect the important details like type of crops and fruit trees grown, amount of cultivable land, and number of livestock available in the area.

#### **2.4.7 Secondary data**

Desk review of secondary data involves a detailed literature review of both published and unpublished works in order to have a broader understanding of the research topic. As mentioned elsewhere, "no matter what your research topic is there is almost always a wealth of information hidden in a variety of sources" (Mikkelsen, 1995, p. 74). To improve the theoretical and contextual understanding of the study under consideration secondary sources were consulted which included, published papers in journals, articles, unpublished dissertations, books, news reports, data from websites, maps, old pictures, and most importantly reports produced by Governmental and Non-Governmental Organizations. The reports of NGOs were consulted regarding agricultural and horticultural development initiatives took place in the last 4 decades to improve the quality of life in the area. Moreover, the weather records of last three decades were collected from Pakistan Metrological Station at Gilgit as well as from published academic sources on climate change.

#### **2.5 Data Analysis**

The audio recorded data was transcribed and translated from the local language. Along with FGDs and interviews, notes from observations were also included to organize the data set. The transcribed data was categorized into different codes through systematic examination of different texts, so that meaningful phrases and sentences representing similar situations and meanings will be fractioned. Based on the underlying meaning, structure, and symbolism within text the codes were classified into different themes. The textual data in these themes were analyzed hermeneutically, that is, keeping in view the local knowledge categories and context. The aim was to understand the hidden and in-depth meaning of the responses, which were embedded in cultural and cosmological nuances. Whereas, the anecdotal narratives collected from oral histories were analyzed structurally.

The reliability of qualitative data pertaining to measurable indicators like precipitation level, glacier surge, temperature variation, and ripening time were checked against the metrological records to make the results more pronounced. Along with this, secondary data was also used to substantiate the argument.

## **2.6 Researchers Reflexivity**

It is important to note the researcher's personal inferences, based on field observations, which initially are influenced by his personal life experiences but keeps on changing with new experiences and encounters during the fieldwork. As these inferences directly impinge on the quality and reliability of the data. Hence it is imperative for the researcher to get aware of them before writing the argument.

I was born in a family where both of my parents were hailing from the same village where this research is being conducted. Although I was born and raised up in Gilgit city but by ethnicity I am a Burushaski speaker of Hunza. As both of my maternal and paternal grandparents were residing in the village, so it was a sort of ritual to go there on summer vacations, which now I call it "My Locale". I still remember people coming to my maternal grandfather to solve the village issues as he was the village headman and this position was running in their family until the demise of my maternal uncle. I was looked upon with love and care by all the locals, because my father was the first officer of the village, who had passed away when I was two years old. As we were living in the joint family so our paternal uncle took care of us. It was a routine after the dinner to ask from the elders about past times or even I use to keenly hear their discussions about the village dynamics. These early year experiences have dubbed a strong image of the village in my mind, which I have carried with me when I first entered into the field as an anthropologist.

During the fieldwork I had to face various experiences which were connected with my past and family background. Owing to the achieved status of my father and other relatives who are serving in different organizations, I was always being asked by the respondents whether I am doing a white collar job or on a government position. Even I have also heard that I am not doing something substantial rather hanging around with a bag on my back. It was difficult for me to make them understand about the worth of my work, so I have decided to forego these talks. I had to encounter the subtle grudges which were originally



related to the decisions of my maternal grandfather. During one of the interviews, a respondent stated that my grandfather was not a gentle man rather was a selfish person, I had to undermine them while taking them in a pleasant way, to get the respondent back to the topic.

When I first started my field work in December the temperature was perpetually below zero degree, and the area had the highest level of snowfall of last thirty years. From the last week of December, the water in the washrooms got freeze thus causing shortage of water, hardly I was able to take a bath in a week. This at times was frustrating for me, but over the time I got to know that being casual was actually helping me to mingle with the locals as I was not looking as a gentleman to get them attentive. Along with harsh climatic conditions there was a sever shortfall of electricity, hardly available for three hours in a day or even for one hour. These factors hindered the data collection process. As per my fieldwork schedule I was supposed to finish my transcriptions on the same day, but hardly I was able to charge my laptop. Adding to this, I have found that laptops or any other electronic equipment exhausts within few minutes of turning them on, so I even tried to operate the laptop under my quilt but this smartness didn't work well. Along with this, I had to buy new batteries for each interview to make the recordings uninterrupted, as the battery life in winters loses it life expectancy. I remained mostly dependent on field notes to track the course of fieldwork till the onset of February, even relying on field notes alone is not considerable, as they were not the direct transcriptions of what the subjects have said, rather they are short sentences to make the sense of data. Apart from power shortage, there was also shortage of mobile signals to communicate and to use the crawling internet facility of SCOM which is the only available internet service in the whole Gilgit Baltistan. So in order to get connected with the world I had to visit the nearby town every week.

During the interviews I have found it almost impossible to conduct the interviews from elder respondents in a separate room. Because of cold weather people prefer to sit inside traditional home which is multi-purpose hall with hardly 7 feet high ceiling. Owing to its structural and architectural composition it remains warm throughout the winters and also feasible for cooking. So meals are usually cooked in traditional halls especially in winters, with a lot of kids around the fire. The elder people prefer to sit near fire and also sleep within the confines of this hall. During the interviews which were conducted inside the

traditional halls, I have always found the either spouse accompanying his/her partner. Thus, in line with the research standards I always found it a difficult situation which may interrupt the quality of the findings, owing to the harsh weather neither I can tell them to spare us a separate room. During most of such interviews I have to encounter the extra comments from the respondent's wife, especially, whenever he misses an event or a date. At first I have found it bit unwelcoming but later on I have found it an edge. Because whenever my respondent was forgetting a thing in his narration she supported and also told additional things. But the tonality of the women and their gestures in front of their husbands after being asked a question tells us about a harsh and strong patriarchal structure of society in the past. This is not the case with young couples. But later on I have made it a part of my methodology to include both partners especially in the case of old age respondents. Because you get an instant chance to counter check the reliability of the data. As whenever a respondent loses track his/her partner supports him, along with this I have also find it beneficial to extricate the false memories from the data, as there are a lot of possibilities of false memories with old age respondents which are most often corrected by the either spouse.

By the end of fieldwork in the month of March, the Corona pandemic has started to grow in Pakistan, which also put a pause on my fieldwork. As per media reports, initially the cases of Corona virus were coming through the pilgrims from Iran, and a lot of Zaireen tested were from Nagar District. The very village where I was doing my fieldwork is the gateway to Nagar which is one of the hard hit areas in Gilgit-Baltistan. Owing to these situations I have to pause few of my interviews and came back home to Gilgit. I took this lock down situation as an opportunity, and transcribed all my interviews which were left undone due to shortage of electricity. Apart from my research activities, I have also worked with a humanitarian assistance team under the portfolio of psychosocial support during the pandemic lockdown.

### **3. LITERATURE REVIEW**

#### **3.1 An Overview of Climate Change**

Global climate is the dynamic relation between the oceans, marine biospheres, atmosphere, and cryosphere (Chakraborty, Tiedemann, & Teng, 2000). The emission and accumulation of greenhouse gases (nitrous oxide, carbon dioxide, and methane) in the atmosphere of earth is effecting the climate system around the globe (Sivakumar, Das, & Brunini, 2005). Scientific researches on climate have shown that changes in the composition of atmosphere due to emission of gasses and other anthropogenic activities have caused increase in the global temperature (Yanda & Mubaya, 2011; Collier, Conway, & Venables, 2008). There are various schools of thought regarding the issue of climate change that whether it solely caused by changing human activities or is a natural phenomenon with no involvement of anthropogenic factors. The most deliberated answer by the scientific community in this regard is that the changes in atmospheric composition are mainly contributed by anthropogenic activities which in turn lead to increase in global temperature (IPCC, 2001; 2007; 2014). The reports of IPCC have shown an increase in emission of Greenhouse Gases especially CO<sub>2</sub> (78%) from 1970 onwards with a speedy increase after 2000. It has also posited in the reports that emission of these gases into earth atmosphere is caused by anthropogenic activities. (IPCC; 2001, pp 640; 2007 pp 639; 2014).

Recent studies have projected rapid changes in climate will cause manifold shifts in climate variables (Chaudhary & Aryal , Global Warming in Nepal: Challenges and Policy Imperatives, 2009) Various models of global climate have indicated an increasing trend in mean temperature by the end of 21<sup>st</sup> century, due to changes occurred in land-cover, increased use of energy, and exponential growth in population. In this regard, the reports of IPCC (2014) have indicated that the last three decades are considered as the warmest periods in last 1400 years. The increase in temperature may affect ecosystems and biodiversity (Chaudhary & Aryal , Global Warming in Nepal: Challenges and Policy Imperatives, 2009). The manifold effects of climate change which have been widely discussed among researchers and scientists are, rise in sea levels, frequents floods, untimely rainfalls, droughts, surging and retreating of glaciers, changes in migratory pattern of birds and increased snow melting rates (IPCC, 2001; 2007; 2014). The

increasing trend of global warming will have effects on precipitation levels, with a projected increase of around 20% in some parts. Similarly, the threats of droughts are also projected especially in African regions (Collier, Conway, & Venables, 2008; Hulme, Doherty, Ngara, New, & Lister, 2001). These changes in terms of increase in temperature and precipitation are supposed to initiate perpetual occurrences of extreme weather events like, floods, glacier surges and droughts. These occurrences may affect socio-economic condition of people in terms of scarcity of food, price hikes, water availability, and nutritional status (Omambia, Shemsanga, & Gu, 2010). As stated by (Heltberg, Siegel, & Jorgensen, 2009) the social and economic impacts of climate change are significant and will effect human population both directly and indirectly. Although, the adverse effects of climate change are supposed to be huge and manifold throughout the globe, with higher intensity in developing countries. The reason of intense projections for developing regions is due to limited resources, lack of infrastructures, and high dependence on agriculture grown, which is highly prone to climate change effects (Omambia, Shemsanga, & Gu, 2010; Stern, 2007).

### **3.2 Climate Change Perceptions**

Exploring the perceptions of people on climate change and its effects are considered to provide better solutions to the existing problem (Wolf & Moser, 2011). Various attempts have been made on global scale to address the adverse effects stemming from climate change. The first step taken in this regard is through reducing the carbon emission and second, by introducing various sanctions on states which do not meet the required figures of reducing in the emission of GHG, which is commonly known as Kyoto Protocol. Despite heavy efforts only few countries meet the standards (Leiserowitz A. A., 2005). This failure in meeting the required criteria and standards on part of different governments is because of lack of political will to endorse the protocols and reaction of industrial elites (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007)

The phenomenon of climate change is addressed long ago in 1827 when Fouries recorded an increasing trend in the emission and accumulation of CO<sub>2</sub> and other GHG (Leiserowitz A. , 2007). Since than many scientists kept working on climate change which didn't get much attention, until, Callendar made a distinction between climate change and

anthropogenic climate change in early 20<sup>th</sup> century (Hulme M. , 2009). At present there are various schools of thought deliberating on causes of climate change, in this regard, the most dominant proponents are anthropogenic who consider climate change is caused by human activity, and natural cause according to which climate change is a natural phenomenon. In 1980s the approach held by the proponents of anthropogenic school was discredited through various public campaigns in America, when researchers stated that the climate change is caused by the emission of CO<sub>2</sub> from industries (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). Such campaigns propagated by industrialists hindered the general public in understanding the scientific opinion about climate change.

Along with the disagreement between carbon emission industries and scientists, the information about climate change is disseminated through media and other external sources (Leiserowitz A. A., 2005). The mediatized image shown to the public does not address ground realities in detail, rather it includes various nuances that are not relevant to the subject under consideration (Leiserowitz A. A., 2005). The projections shown to the masses depicts that the climate change effects are happening in distant areas or will take place in far future (Wolf & Moser, 2011). The perception of rural people may differ in this regard, due to high human-environmental interaction for the sustenance of livelihood. This may include effects of climate change seen on the cropping pattern and prolongation of agricultural seasons, thus by making them more willing to accept the urgency of addressing the climate change issue (Benoit, 2015).

At present there are five schools of thought deliberating their point of views on climate change, which are agnostic, ice age, skeptics, natural, and anthropogenic school. On a lighter note these schools can be considered as different discourses with their own distinctive ideological underpinning. A detail overview of the five schools is as follow.

### **3.2.1 The Anthropogenic school**

The proponents of anthropogenic school claim that the climate change is influenced by increasing human activities after the boom of mechanization and industrial revolution during the last two centuries. As Isaksen (2013, p. 31) states that, the belief which adheres climate change is caused by human activities has put people into panic, thus encouraging people to be part of moments like green revolution and ecological modernism. The aim of

this school of thought is to reduce carbon and other GHG emissions. The stance of anthropogenic school is substantiated by various scientists, researchers, and other international organizations (IPCC, 2007; Leiserowitz A. A., 2005; Murray, 2011).

As Cook (Cook J. , 2010) states that, 97% of climatologists are of the view that anthropogenic activities are changing global temperatures. He further posits that, almost all of the papers published in the last decade of 20<sup>th</sup> century accept the consensus about global warming caused by human activity. In line with the findings of Cook and Murry (2011) also found similar stance of climatologists regarding the increasing trend in global temperatures and faster melting of ice bodies. Critiquing the industrialization, the proponents of this school held the start of industrialization responsible for anomaly of climate change (Weber & Stern, 2011). The scientists who hold the belief argued that the sources of energy for industrial processes like coal, and oil and the synthetic products made thereafter like fertilizers, plastics and pesticides are the major reason for changing climatic conditions (Benoit, 2015). It seems plausible to assume that the warming up of earth surface is primarily due to human activities which have increased the emission of GHG (Maibach, Nibsbet, & Weather, 2011). Owing to the reason this school (Anthropogenic) have got a lot of following among the scientific community (Cook, et al., 2013). Apart from the emission of GHG and increase in global temperatures, a lot of changes in weather patterns have been recorded, which have positive correlation with human lead global warming. In this regard, the reports of IPCC states that,

“Changes in many extreme weather and climate events have been observed since about 1950 and it is very likely that the number of cold days and nights has decreased and the number of warm days and nights has increased on a global scale, and it is likely that the frequency of heat waves has increased in large parts of Europe” (IPCC, 2013).

As a preventive measure and mitigation strategy the proponents of anthropogenic school have started various practical initiatives. These include introducing green technology, bane on deforestation, afforestation initiatives, and protocols to prevent the excessive emission of GHG (Lera & Valerie, 2008).

### **3.2.2 The Natural school**

Some of the narrative counter the arguments made by anthropogenic school and came up with different reasons regarding climate change and global warming. The followers of natural school think that climate change is a natural phenomenon with its own causes. For them climate change has nothing to do with anthropogenic activities rather it happens due to geological and environmental cycles occurring in the earth atmosphere since the beginning. The natural causes include shifts in ocean currents which changes dissemination of heat waves and precipitation around the globe, and volcanic eruptions which changes the composition of particles in atmosphere. These geological and environmental cycles which causes warming and cooling of earth surface are occurring since the beginning of time. The time scale of these cyclic occurrences may vary from hundreds of years to millenniums (Taylor, 2013).

During the period from 1400 to 1800 the earth atmospheric temperature was 10 Degrees Centigrade cooler than the current time, which shows that changes in global warming is a natural phenomenon rather induced by human activity (Akasofu, 2009). The proponents of this school also present hard core scientific facts to substantiate their argument. In this regard, Knut et al., (1999) while opposing the GHG narrative states that, methane gas was always in high concentration long before the industrialization. While making a comparison of GHG emissions with those of the past, they further add that, the estimated total emissions in last 10000 years is 1200-2000 GtC (Gigatonnes of Carbon), and more than 600 GtC in last 1000 years. These figures exceed the current emission rate due to human activity.

### **3.2.3 The Ice-Age School**

The belief hold by the proponents of Ice-Age is similar to those of Natural School in some aspects. They consider that, as a matter of natural facts earth atmosphere is shifting into a new ice age era, so, people cannot do anything about it and no level of human efforts can reverse this process. They emphasize that, it is imperative to know the extent and frequency of natural climate change in order to predict the future consequences (Mix, Bard, & Schneider, 2001, p. 627). As mentioned in the IPCC reports that there had been

temperature changes on huge scales during glacial periods, with an occurrence of maximum change in global temperature by 70C (IPCC, 2007).

### **3.2.4 The Skeptics' School**

The proponents of this school substantiate their argument by borrowing from all other schools. According to them, the issue of climate change is an exaggeration and does not deserve the very attention it has got. Like, they contend by supporting the argument of Natural School according to which industrial revolution has nothing to do with global warming rather it is matter of changes in the climate cycles which are shifting since the beginning and will keep changing in future too (Benoit, 2015). While supporting their argument the skeptics give examples of past catastrophes which were changes in climatic conditions. For instance, they give examples from the events that occurred during fourteenth and eighteenth century. According to the historical estimates hundreds of thousand people lost their lives during the All Saints Flood of 1570 (Soens, 2018).

Despite the support of scientific and empirical evidences within anthropogenic school, the skeptics oppose such claims and consider the issue of climate change as a propaganda disseminated by scientists (Krugman, 2009). A survey report published by Pew Research Center has shown that, Among the America public the perception of global warming as induced by human activity is decreasing from 71% in 2008 to 57% in 2009 (Pew, 2009). Similar trends are also recorded in UK and Germany (BBC, 2010). Although, the results of such surveys provide us a deeper insight on public perception, but they do not indicate the reason for abrupt change in the public opinion. In a research conducted by McCright and Dunlop (2011) it has been found that, the denial of anthropogenic climate change is considerably associated with political conservatism. Similarly, another research finding has shown that religious people are more likely to deny the phenomenon of global climate change and its consequences (Fusco, Snider, & Shanlong, 2012, p. 15). It is also believed by the skeptics that, by creating a situation of urgency with regards to consequences of global climate change, liberal environmentalists try to establish control over states, and states over the lives of its citizens. For skeptics doing nothing is in fact doing something for the issue of climate change, because only by not doing anything people will be able to save their money for future investment (Hoffman, 2011, p. 3).



Some scholars critique the skeptics, thinking that they want to earn profits and have no concern for the adverse effects of climate change. The views of Lahnsen as mentioned by (McCright & Dunlop, 2011) in this regard states that,

“Climate change became the cause celebre among conservatives even before the 1972 Earth summit, as exemplified by a 1989 column in Forbes magazine arguing that just as Marxism is giving way to markets, the politicians greens seen determined to put the world economic back into the red, using the greenhouse effect to stop unfettered market-based economic expansion”.

### **3.3 Situating Climate Change in Anthropology**

There is a growing body of anthropological knowledge pertaining to climate change in recent decades (Crate S. A., 2011). Anthropological tools of inquiry like ethnographic method have long been used by climate change researchers to understand the cognitive and cultural domains using which farmers make sense of climate and their surroundings for devising better adaptive strategies (Roncoli C. , Ethnographic and participatory approaches to research on farmers’ responses to climate predictions, 2006). Notwithstanding, various anthropological inquiries have also unveiled problems faced by local people which remained unheard, as stated by Orlove

The long-time horizons of the herders are hard to incorporate into such valuation as well. The herders’ concern for nonhumans also disappears from view within this framework; the animals, whose suffering is of concern to the herders, simply become an income source, and the mountain spirits vanish altogether, even though they matter a great deal to the herders (Orlove 2009, pp. 160–61).

One of the drawbacks of interdisciplinary research is that it puts too much emphasis on quantitative data collection tools adopted from the disciplines of natural science, which fails to account for the cultural specific meanings. According to Krauss,

From the perspective of climate science, localizing has a specific meaning. It is the procedure of downscaling from global climate models... to specific places. Thus, localizing is a calculation, the resultant of another model ...I argue that identifying climate change and localizing it though scientific expertise is an activity that is much more complex than “simply” calculating. A close examination of scientific practice makes clear that localizing is as much a problem for climate researchers as it is for ethnographers... Climate research offers an insight into a messy world of ramifications, surprising activities and unexpected “social” context (Krauss 2009, pp. 149–50).

Similar, Milton also emphasizes on anthropological inquiry and local understanding of climate change phenomenon, which may yield positive results:

If scientific predictions are to be believed, environmental changes are going to be more extreme, more frequent, and more widespread than previously experienced in human history. But there have always been floods, fires, famines, and conflicts, and there is already a wealth of anthropological knowledge on how people deal with these disruptions to their lives. Although these problems may not be new, the discourse of climate change, with its scientific, economic, political, and moral dimensions, is a relatively recent arrival in the global arena, and it is changing the way local events are framed and understood. For anthropologists to neglect it would be unthinkable (Milton 2008, p. 57).

In recent decades a huge body of data has been gathered about the consequences of climate change. The hard core scientific evidences have shown the proofs of ongoing global climate change, which is unlike the natural climate change cycles like ice-age and deglaciation, and is directly related to human activities. If all the answers to the issue of climate change is given by the science with plausible evidences than why anthropological inquiry is necessary? The answer lies in the cultural implications of climate change. As stated by (Roncoli, Crane, & Orlove, 2009, p. 87), the people perceive, experience, and respond to world around them using cultural lens. In this regard, the anthropological inquiry can better interpret, translate, and advocate cultural implications of climate change (Crate & Nuttall, 2009).

One of the newly emerging field dealing with the context specific implications of climate change is ethnoclimatology. Various researches have been conducted on climate change in the relation to place-based populations. For instance, Ben Orlove and metrological researchers conducted a study on traditional weather forecasting technique of central Andes and found that, the local farmers predict rainy and dry weather on the basis of bright and cloudy appearance of Pleiades star cluster. They further added that, the local farmers predict this forecast three months before the potato sowing. The traditional forecast technique of central Andes is also substantiated by meteorological readings, according to which the dim appearance of Pleiades star cluster is indicative of El Nino phenomenon which reduces precipitation in Autumn (Orlove, Chiang, & Cane, Forecasting Andean rainfall and crop yield from the influence of El Nino on Pleiades visibility, 2002).

### **3.3.1 Local knowledge**

Culture comprehends the way people perceive and experience the environment around them. The cultural framing is rooted in context specific meanings that mediate human-environmental relationship (Roncoli, Crane, & Orlove, 2009). Adaptations on both individual and collective level are framed by ideas that are feasible and acceptable to act upon (Rappaport, 1968). As discussed before, the edge for Anthropology over other disciplines is because of its methodological apparatus, which provides deeper insights and analyzes multi layers of cultural meaning, which otherwise are not possible (Roncoli, Crane, & Orlove, 2009).

The local knowledge categories are based on data gained through five senses, where the knowledge of something is synonymous to seeing. Similarly, the traditional knowledge and cultural practices are acquired and learnt by watching other members and actively participating in their activities (Barnhardt & Kawagley, 2005). Similarly, it is a common practice in traditional societies that authoritative knowledge remains with elders who have seen and experienced various things around them, like shifts in climatic conditions, surging and retreat of glaciers and such other changes (Cruikshank, 2005).

A large body of anthropological studies has documented the significance of local knowledge in agriculture and environmental management (Roncoli, Crane, & Orlove, 2009; McCorkle, 1989; Rhoades & Bebbington, 1995). The assessment report of IPCC 2007 has put lot of emphasis on local knowledge for climate forecasts and adaptive strategies (IPCC, 2007). Notwithstanding, only few researches have been conducted on local knowledge pertaining to climate change (Roncoli, Crane, & Orlove, 2009). Different approaches have been adapted by cultural anthropologists to explore the local knowledge pertaining to climate. In this regard, Ethno scientific studies have tried to explore local knowledge categories as a peculiar system of taxonomies and classifications (Roncoli, Ingram, & Kirshen, 2002; Sillitoe, 1996; Posey, 1984) have tried to document how farmers distinguish between different clouds, winds, and rainfall patterns using various ethnographic techniques like, ranking, sorting, and free listing. While exploring these indigenous typologies they revealed principles and assumptions which underlie local notions of climate. For instance, the Sahelian farmers categorize rainfall events on the basis of duration and precipitation timing. This attitude posits that, for Sahelian farmer's

rainfall is understood as a process. Furthermore, it has also been noted that, for local's rainfall that occurs during the night is much appreciated, as it penetrates deeper into the soil where it remains for longer period of time (Roncoli, Ingram, & Kirshen, 2002). Another study on Irish farmers use of local knowledge has revealed that, to make decisions pertaining to application of farm manure during extreme weather conditions, the farmers rely on personal experiences and implicit knowledge of their lands (Buckley & Shortle, 2015). Similarly, in southern Cameroon, the sale of cocoa is major source of income for local farmers, the locals use local plant extracts to control the attack of pests which damage the cocoa plants. Most of the farmers use this traditional way of pest control, as the properties of hemp plant extract is known to them through years long personal experiences. One of the major reasons for shifting to traditional pesticides is that synthetic products are not affordable due to their high prices (Sonwa, Weise, & Coulibaly, 2009). In a research conducted on apple growers of western Himalaya, Vedwan (2006) found that, On the basis of local knowledge locals appreciate the early snowfall as it favors the apple production. It has also been found that, rainfall in late summers help apples to gain color.

Coming of different seasons is the basic element through which local people make sense of time, which is attached with the seasonal availability of resources like food items around them, this in turn ignites adaptive responses. While making a comparison of data collected from 28 different languages, Orlove (2003) has found that, all the languages have attributed names for the seasons, based on environmental and atmospheric indicators. Similarly, in a research conducted on ethno-metrology in equatorial regions, it has been found that, there are rich folk taxonomies for the year round climatic events where there are least seasonal shifts (Sillitoe, 1996). In agro-pastoral societies, where livelihood routines are shaped by seasonal shifts, climate change events are considered as deviation from normal calendar. In ethnographic research these seasonal calendars are often used to understand local knowledge pertaining to climate change. In this regard Vedwan and Rhoades (2001) emphasizes that these seasonal calendars should be considered as conceptual models rather than climate change facts.

### 3.4 Climate Change in HKH Region

There is a growing body of research and knowledge production with regards to climate change in HKH region (Vedwan & Rhoades, 2001; Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019; Bhatta, et al., 2019; Bacha, Hayat, Mohammad, & Nawab, 2018). Except few, rest of these studies have adopted quantitative techniques like structured questionnaires to explore the perception of local people regarding climate changes. Most of the findings of these studies are found to be in congruity with metrological records (Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019). For instance, in a study conducted on local based knowledge of climate change in Rakaposhi valley, Bhatta, et al (2019) reported increase in temperature, change in the precipitation, and increased occurrences of avalanches and floods. The study further suggests that, increasing trend in annual temperature and precipitation change are in line with the metrological data. Similarly, in an another study conducted on a Tibetan village found that, changes observed by local people in terms of declining snowfall in winters and year around temperature increase are similar to those of scientific observations. They further suggest that, apart from climate change other factors such as village history, induction of machinery and subsistence activities also play a vital role (Byg & Salick, 2009). Studies conducted on wider scale in Himalayan regions states that, local perception pertaining to climate change in terms of various indicators like warming trends, reduction in snow cover, early arrival of monsoon supports the scientific indicators (Chaudhary & Bawa, 2011; Basannagari & Kala, 2013).

The study findings which do not coincide with scientific records are reasoned on the basis of visual salience of specific indicators. For instance, in a study conducted in rural Nepal, Piya and colleagues found that, almost half of the participants responded negatively against temperature variability, whereas, the nearby metrological station records have shown a considerable warming trend. The researchers argued that, the incongruity between the two data sets may be because of low visual salience of the perceived indicator on the part of respondents (Piya , Maharjan, & Joshi, 2012). Similarly, in another study conducted in Mountainous regions of Nepal, the respondents narrated a decrease in winter temperatures, on the other hand the weather station records suggested a warm trend in winters. The

researchers further argued that, the mismatch maybe because of overestimations recent weather events (Aryal, Cockfield, & Maraseni, 2016).

Various studies conducted in Himalayan region suggests that, perception of local people regarding rainfall appears to be least reliable as compared to perception of temperature (Macchi, Gurung, & Hoermann, 2017; Sharma & Shrestha, 2016). In this regard, a study conducted in Sikkim area of Himalayan region, the researchers observed that more than 50 percent of the study respondents suggested decrease in rainfall, whereas, this perception of local people is denied by the readings of weather station data, according to which no considerable trends (Sharma & Shrestha, 2016).

Apart from supporting the scientific facts on climate change, perception studies on local people can also provide considerable insights pertaining to the impact of climate anomalies on people and how they evaluate these threats and adopt strategies to cope. As the people living in rural areas are in continuous contact with environment around them, so they develop higher understanding of ongoing natural processes-environmental change. Owing to the reason, scientists and climate experts have also emphasized on integration of local knowledge in climate research (Reedy, Sayo, & McClatchey, 2013).

Mountain populations in Himalayan regions have perceived manifold ecological impacts of increasing temperatures like, early melting of snow, early onset of blossom, speedy growth of the greenery in meadows, and appearance of new flora (Chaudhary & Bawa, 2011). Along with this, local people in HKH region have observed adverse effects of climate change on agricultural activities and livelihood patterns in rural areas like, prolongation in dry season, abrupt changes in weather, melting out of glaciers, and increased cases of pest attacks (Bhatta, et al., 2019; Byg & Salick, 2009; Macchi, Gurung, & Hoermann, 2017).

Apple producers in Himalaya have reported huge losses in production of apple due to increase in the temperature during winters and changes in traditional weather calendar (Vedwan & Rhoades, 2001). It is imperative to understand here that, these variations and visual effects are also influenced by manifold active processes in the field like social, economic, and cultural changes. For instance, Macchi and colleagues have found local farmers pointing at the increased pest attacks as adverse effects of synthetic urea and single cropping (Macchi, Gurung, & Hoermann, 2017). Similarly, the adaptive measures taken by

local people cannot be linked to climate change alone, because they also take into consideration other factors connected to their livelihood routines (McDowell & Hess, 2012). Owing to these reasons, the perception of climate change must be addressed within the given context i.e. local level practices and human-environmental interactions on wider scale (Vedwan N. , 2006).

Fowler and Archer (2006) analysed trends in climatic conditions across the Karakoram on the basis of weather data of last four decades of 20<sup>th</sup> century. The findings of the study have shown warming trends during winter months, whereas a decrease in temperature during summers was also noted. In a dendrochronological study conducted in Bagrot valley, it has been found that, there has been an increase in average temperature after the mid-decade of 20<sup>th</sup> century, the results also suggested that, there has been an average temperature rise of 1.9°C after 1850's (Asad, et al., 2017). Using similar scientific method (Treydte, et al., 2006) have taken records of oxygen in four other areas across the Karakoram and found increase in the precipitation after 1950's. This anomaly in the climate across Karakoram region i.e. increase in precipitation with ascending altitudes and decrease in temperature during summers substantiates the peculiar phenomenon called Karakoram anomaly. This anomaly is also perceived in glaciers found across the Karakoram, where against the global trend of melting glaciers the overall glacial mass is recorded to be stable (Farinotti, Immerzeel, de Kok, Quincey, & Dehecq , 2020; Bolch, 2019). Responding to this anomaly across the region, where metrological stations are sparse in number Bocchiola & Diolaiuti (2013) emphasized on the importance of proxy data for the pronounced explanation of the phenomenon.

Few studies on local perception of climate change have been conducted in Karakoram region. In a study conducted on manifestations of climate change in Nagar valley, Spies (2019) finds a considerable change in local climate especially in recent decades of 20<sup>th</sup> and 21<sup>st</sup> century. The findings further suggest a temperature increase during winter and spring seasons. These manifest changes are perceived by the local people from decreasing snow cover and prolongation in agricultural season. Another survey research conducted on herders of upper Hunza finds an increase in the winter temperature in last 3 decades. Along with this, prolongation in summer season, abrupt changes in weather, and occurrences of heavy snowfall events are also observed by the study respondents, consequently decreasing

the productivity in pastures (Joshi et al. 2013). Similarly, another survey on local perception conducted in the areas of Hunza and Yasin states that, more than 70% of respondents in both areas perceived cooling trends across the seasons. The findings further suggests an increasing trend in precipitation around across the seasons (Gioli, Khan, & Scheffran, 2014). Contrary to these findings, the metrological data from the nearby weather stations does not complies with the perceived trends (Bocchiola & Diolaiuti, 2013). The findings of (Gioli, Khan, & Scheffran, 2014) pertaining to precipitation change also does not coincide with the results reported by (Joshi, et al., 2013). The contradiction between the two data sets regarding precipitation i.e. increase on the behalf of local respondents and no considerable change recorded by the weather station data maybe a deception of memory. As in 2010, there were heavy rainfall occurrences across the upper Indus basin causing incidents of floods and landslides (Ullah, 2010). The fresh memory of these incidents may have caused the overestimation in precipitation trends. Similarly, in a climate change perception study conducted across HKH regions of Pakistan, almost all of the study respondents perceived that. Climate induced events like floods have increased in the last ten years (Hussain, Rasul, Mahapatra, & Tuladhar, 2016). The reliability of this research is questionable, as climatic trends requires a timeline of at least three decades to investigate.

### **3.5 Theoretical Framework: The Cultural Interpretive Perspective**

The development of interpretive and symbolic anthropology can be traced back to famous anthropologists of 20th century Clifford Geertz and Victor Turner. The focus of interpretive anthropology is to give accounts of other cultures from an emic perspective. It also emphasizes on epistemological grounds of emic accounts (Teague, 2010). This approach is developed against purely behaviorist and statistical approaches to human understanding. It emphasizes on the negotiation of meaning, and degeneration and growth of symbols in cultures, while stressing on ethnographic method as a process of interpretation (Fischer, 2010).

According to Clifford Geertz, "culture is not a model inside people's heads but rather is embodied in public symbols and actions". There are two major premises in symbolic anthropology. The first premise suggests that, unintelligible beliefs can only be understood



and interpret by taking into consideration the cultural system of meaning. The second premise tells that; actions are primarily driven by interpretations (Teague, 2010). Interpretive anthropological approaches are built on the existing anthropological tools of inquiry. They prefer emic perspective for interpreting the symbols used in narratives, which prefers to interpret the symbols in their own cultural context, as opposed to etic perspective (Teague, 2010). Some of the methodological tools provided by symbolic and interpretive anthropology are Thick Description, and Hermeneutics.

The hermeneutical approach is the science of interpreting text while focusing on both content and what is being interpreted. This approach is based on the principal that meaning of a statement can be understood in terms of underlying discourse or world view. Geertz adopted this approach to understand different actions of the people in social, economic and religious gatherings (Woodward, 1996)

According to Geertz, an outsider cannot think like natives but he can interpret their thinking with the help of anthropological theory. To demonstrate his method of inquiry Geertz uses Gilbert Ryle's example of difference between a blink and a wink. He states that, a blink is an involuntary movement of muscles around the eye, which requires thin description of eye movement to interpret, whereas, a wink is an intentional signal to a person with a hidden meaning which can be described through thick description. On a physical level both acts are identical but with different meaning, thus it creates higher chance of misunderstanding. He further argues that, the purpose of thick description is to give a description of the specific form of communication and to interpret the hidden meaning (Clifford, 1973).

### **3.5.1 Cultural Interpretive Perspective in Climate Change**

The proponents of cultural interpretive perspective view culture in terms of perceptions and interpretations held by the people in a particular environmental setting (Milton, 1996). The studies conducted on climate change using cultural interpretive lens emphasize on Local Knowledge categories. This perspective takes its stance from the earlier anthropological works on small scale societies, during which, emic world views were gathered under the thematic area of local knowledge ( Baer & Singer , 2014). Although, the local knowledge pertaining to climate recognizes the impacts of climate change, but for

those societies which are living in urban centers the climate change phenomenon is least of a concern. In a broader perspective, those anthropologists who employ cultural interpretive approach try to convey distinct experiences of a society to those who are living in a different place with their own worldviews (Strauss , 2009). In a study conducted on Swiss Alps, Strauss (2009) explores the perception of local people regarding deglaciation in the vague of climate change, which serve as a natural reservoirs of storing water. She found, although seemingly they were capable of handling variabilities in their surrounding environment, but at same time they were fearful of future consequences, thereby living the rising scenario on Gods will. This tells us about a fatalistic sense prevalent among the local inhabitants that nothing substantial can be done to address the changes (Strauss , 2009).

David Lipset (2011) in his work on Murik people living in Papua New Guinea explores relationship between climate change and masculinity. The villages in Murik are located alongside the coastal line between Pacific Ocean and mangrove forests. These villages situated along the coastal line are eroded by tides. Lipset found that, some people perceive the high tides in the sea are caused by global warming, which has restricted the mobility of men to perform subsistence activities. Some other men talked about the occurrence of similar events in the past and associated these events with angry sea-spirits. Murik people believe that, it is important to appease the angry sea spirits by throwing food into sea. Lipset also found local people attributing the recent tides to angry sea-spirits enraged by the shift from traditional lifestyles like using motor boats (Lipset 2011: 39–40).

Using a cultural interpretive perspective, gives a deep insight into people's cultural construction of world and environment around them. It tells us about perception of local people regarding changing ecological and environmental conditions around them. The insights can be used to construct contextually sensitive climate change policies.

## 4. AREA PROFILE

### 4.1 Gilgit Baltistan at a Glance

Nestled between the snowcapped mountains of Karakoram, Hindu Kush, and Himalaya is the glaciated region of Gilgit-Baltistan. It is constituted of small valleys scattered over an area of 72000 Square kilometers (Mehmood, 2017), physically separated from each other by high mountains. Owing to its physical geography the region is famous for hosting some of the highest peaks in the world.

The area of Gilgit Baltistan, borders multiple national and international entities. On its western border lies the Khyber Pakhtunkhwa province, the Southwestern border connects the area with Azad Kashmir region, Afghanistan lies on northwestern side, and in extreme north it shares the border with Xinjiang province of China.

The earliest human records found in the area dates back to pre-historic time. Little is known about these early settlers except few rock arts. Later on the area remained under the influence of different races and dynasties like Tibetans, Sakas, Sytho-Parthians, Kushans, Huns, and Patolashahi up till the advent of Islam in medieval era (Dani, 2001, pp. 163-164; Robert, 2003, p. 87). Historically the area of Gilgit Baltistan never remained as a single political entity. There existed dozens of independent principalities like Hunza, Nagar, Gilgit, Baltistan, Yasin, Shigar, and Khapulo to name few. These principalities were in war with each other but remained united against external foes. (Zain, 2010, p. 183). These autonomous principalities started to come under the influence of colonial administration after the British invasion of Gilgit in 1848, whereas, the total colonial control over the entire area of Gilgit-Baltistan formed only after the invasion of Hunza and Nagar principalities in 1892 (Zain, 2010, p. 183).

After the partition of 1947 the area came under the administrative control of Pakistan. Administratively it is divided into three divisions and fourteen districts. Each district is further subdivided into its respective tehsils. Gilgit is the largest commercial hub of the area, which is also provincial capital of the region. All administrative units are controlled from Gilgit city. Urdu is lingua franca of the region, which is spoken by all ethnic groups, whereas, for the purpose of official communication English language is used.

The total estimated population of Gilgit Baltistan is 1.9 million (UNPO, 2017), which is composed of various ethnic and lingual groups. The major ethnic groups living in the area are, Shin, Yashkun, Burusho, Wakhi, and Balti. Shin and Yashkun ethnicities are mostly found in Diamer and Gilgit divisions, whereas, the Burusho are mostly populated in Hunza, Nagar, and Ghizer districts. Similarly, Baltistan division is resided by Balti people who are racially Tibetan, with few exceptions in lower parts. Based on ethnic belonging each ethnic group has its own distinct language. The Yashkun and Shin people speak Shina, which is also widely spoken language in the region. Five major languages are spoken throughout the Gilgit-Baltistan. Apart from ethnic classifications, the people of Gilgit Baltistan are Muslims, who follow different sects of Islam, namely, Sunni, Shia, Ismaili, and Nurbakhshi.

Figure 1: Administrative Map of Gilgit Baltistan



(Source: alamy.com)

## 4.2 Hunza District

This study is conducted in a village of Hunza District, which is located in north of Gilgit-Baltistan, Pakistan. The area borders Wakhan corridor of Afghanistan and Xinjiang province of China. Before its annexation with Pakistan it remained as an independent

principality governed by the then Mirs of Hunza. The centuries old monarchic rule came to an end in 1972, when Zulfikar Ali Bhutto the then prime minister of Pakistan devolved the Hunza state (Kreutzmann, 2020). Since then referendums are being held after every five years, where the local populace choose their representative for Gilgit Baltistan Legislative Assemble. In 2015, Hunza was established as new district of Gilgit-Baltistan. Aliabad is its administrative head quarter, which is also commercial hub of Hunza district. Administratively the district is supervised by a deputy commissioner.

The total covered area of Hunza district is 11,806 square kilometer, situated at an average elevation of 2438 meters above sea level (Kreutzmann, 2020). It is consisted of three regions, Lower Hunza (Shinaki), Central Hunza, and Upper Hunza (Gojal). On ethno-lingual basis the area is composed of three major groups, Burushaski speakers who call themselves Burusho mostly resided in central Hunza, Shina speakers mostly situated in lower areas of the district who identify themselves as Shins, and Wakhi speakers mostly populated in upper Hunza or Gojal. The population is also classified on the basis of caste. There are three caste divisions on the basis of occupational specialization. These caste divisions are; Ayshkutz who are the ruling elites, Burusho referred to general public who form 90 percent of the total population, and Baricho the black smiths and musicians. The Baricho have their own distinct language spoken by hardly few thousand people. Although, the caste character is not that much strong nowadays in Hunza, neither there are strict rules of caste endogamy. On similar lines, each caste is further divided into different tribes. The major tribes of central Hunza are, Diramiting, Khurukutz, Burong, Barataling, Ganishkutz, Hakalkutz, and Hussainkutz. Historically, these tribes were living in three oldest forts of Ganish, Baltit, and Altit, who over the time expanded to new settlements of Aliabad, Murtazabad, Haiderabad and Hassanabad.

### **4.3 Physical Geography**

Located in extreme north of Pakistan, Hunza valley encompasses northwestern Karakoram mountain ranges. The great ranges of Hindukush, Karakoram, and Himalaya converge here to form a network of highly concentrated snowcapped mountains, glaciers, and small valleys fed by glacial melt water (Sidky, 1994). It hosts largest glacial concentration outside Polar Regions, like Shishper, Muchuher, and Batura. Because of the geographic

barriers in the form of high mountains it was a hard to reach area before the construction of Karakoram Highway. Earlier, the travelers had to cross the high mountain passes of Kilik, Mintika, Khunjerab and Irshad to reach the area, which were only negotiable after the onset of summers. The area is also famous for providing the scenic view of snowcapped mountains above 6000 meters, like, Rakaposhi, Diran Peak, Golden peak, Ultar Peak, Lady Finger, and Passu Cones.

#### **4.4 Climate**

Situated in western Karakoram, Hunza, features a cold desert climate with a varying degree of mean temperature difference of 25 °C between the months of January and July-August. The average precipitation records at Gareth weather station is of 194 mm, whereas, in month of November it drops down to 2 mm. The level of precipitation increases in upper areas with a maximum precipitation record of 2000mm at an altitude of 5000-meter and above (Kreutzmann, Hunza Matters: Bordering and ordering between ancient and new Silk Roads, 2020, p. 252). This precipitation slope well explains the presence of glaciated area in upper regions and desert condition in valley bed (Kreutzmann, Hunza Matters: Bordering and ordering between ancient and new Silk Roads, 2020). Winters in the area are much harsh with average temperature below zero degree centigrade from last week of November to first week of February. The decrease in temperature during winters puts a halt to all agrarian activities till the onset of spring season. The snow cover area in winters is almost 80 percent, which decreases to 30 percent by the onset of summer.

#### **4.5 Flora**

The temperate climate after the onset of spring season makes the area feasible for the production of various fruit trees. The area produces some of the finest quality fruits like, cherries, apricots, peaches, apple, mulberry, walnut, pomegranate, grapes, and pears which are exported to other regions of the country. Apart from fruits, various varieties of cereal crops and vegetables are also cultivated especially in central and lower parts of the District. Some of the crops species cultivated in the area are; wheat, corn, buckwheat, sorghum, millets, cucumber, potatoes, tomatoes, onion, spinach, and barley. Along with this, the high alpine pastures of the area are home to some the rare species of wild bushes and flowers

including, Wild thyme, Esfand, Caper bush., Indian globe Thistle, Banafsha, Jointfir, Phaedra, Tamarisk, Artemisia and Safflower (Noor, Ali, Khan , & Rehman, 2013, pp. 65-67). These wild bushes are mainly used. for the consumption of cattle during grazing season, and medicinal use. The increase in precipitation above the valley floor enables the growth of juniper and cedar forest belt, the elevation profile of juniper and cedar forest ranges from 2800 meters to 3000 meters (Goudie, 1984, pp. 375-376; Sheikh & Aleem, 1975). The land above the alpine forest area is comprised of grassy patches of wheatgrass, tall fescue, meadow-grass, and Bromus (FAO, 1978 Middle East Grassland Education and Training With Special Reference to Iran, Pakistan and Agghanistan, 1978). This grassy patches goes up to snowline at approximately 4000 meters (Sidky, 1994, p. 46).

#### **4.6 Fauna**

The HKH region with its alpine grazing lands, temperate forests, and sub-alpine scrubs provides habitable sanctuaries for wildlife. Some of the wild animal species found in the area are, snow leopard, Wolf, Himalayan Ibex, Blue Sheep, Marco Polo sheep, Snow partridge, rock pigeon, and Golden eagle. As these natural sanctuaries are not accessible, hence, most of the species are found in reasonable numbers. Although, few of the species declared endangered and put a band on their hunting by various public and private organizations. Apart from indigenous species of birds and animals, migratory birds also visit the area by the end of autumn. The species of migratory birds that come to the area include Common Duck, Siberian duck, Swan, and Eurasian Eagle Owl. The indigenous bird species which found in the valley bed are magpie, crow, sparrows, rock pigeon, and goose hawk. Due to recent shifts in agriculture patterns there has been a reduction in the population of local bird species. Apart from wild animals, the people in the area practice animal husbandry since the beginning because of its high importance for agriculture as the animals provide organic manure for the fields and also because of its high nutritious value (Muhammad, 2015).

#### **4.7 Economy and Subsistence Pattern**

Traditional there was a subsistence economy in Hunza, which includes cultivation of crops, fruit trees, vegetables, along with transhumant pastoralism and animal husbandry to complement the agriculture (Sidky, 1994, p. 20). Agriculture remained as a principal

economic activity throughout the Hunza state. The land with access to possible source of melt water was a symbol of wealth and prosperity. In old days the production of food from arable land required arduous labor work and human energy. As according to Lorimer, in Hunza to win the food from soil is not an easy task, you cannot lie back and leave nature to go on with it, due to destructive processes of nature. Therefore, the land requires the labor of all family members. Despite these efforts the people face food shortage during late spring (Lorimer, 1979:28). After the construction of KKH in 1978, this situation has changed, which paved the path for import of food items and other products from down country markets.

Although, agriculture is still deemed to be laborious and time consuming activity in Hunza (Sidky, 1994, p. 20). Nowadays, the farmers in Hunza cultivate cereal crops and vegetables on a smaller scale, which satiates household nutritional demand during summers. Similarly, animal husbandry was another major source of subsistence economy in early days, which is still in practice. On average each household carries two to four cattle to meet the demand of dairy products. The production of dairy products on household level does not even meet their year around demand, consequently making them dependent on market dairy product.

Arboriculture is one of the major sources of income because fruits are found in abundance throughout the Hunza. Some of the famous fruit varieties found in the area are apricot, cherry, pear, peach, apple, mulberry and walnut. In early days' fruits were dried and preserved to be consumed during winters when other sources of fresh agricultural produce were scarce. The area produces some of the finest qualities of cherry, apple, and apricots which are sold in down country markets. Although, apricots have remained as a major source of income from long ago, but recent trends indicate higher earnings from cherry business which are newly introduced in the area. On average, one kanal of land produces cherries of worth 90000 PKR (Business-Recorder, 2014).

After the devolution of Hunza state in 1974, there has been a huge economic transformation in the valley. Nowadays, people prefer to do jobs and business instead of undertaking laborious work of agriculture. A substantial amount of educated people are serving in private and public sector organizations in down country as well as in international market. These people working outside the area are contributing in the local



economy in the form of foreign remittances to support their families and relatives back at home.

Tourism industry is the backbone of local economy in the region. Owing to scenic views of nature provided by the valley and historical sites like Altit and Baltit forts located in the area, there is an increase in the influx of domestic and foreign tourists. The tourism industry serves as an additional nonagricultural source of income to large number of local people (Hermann, 1989, p. 1). The generation of new economic activities and opportunities after tourism boom in the area can be understood from abrupt increase in the number of hotels, restaurants, recreational areas, and local employment rates. As a rough estimate there are more than two hundred hotels both small and big operational in the Hunza district. Apart from this, a lot of people have also transformed their dwellings into temporary guest houses to accommodate the influx of tourists. Another favorite activity of earning is through selling of local items and gems. Although, mining in the area is not established on a large scale due to restriction by government, but locals sell these items to the tourists after buying them from other areas of Gilgit Baltistan.

#### **4.8 Family Structure and Household Dynamics**

Everything available in the household is shared by all of its members, which includes cooking utensils, agricultural tools, and food items. Moreover all members of the household cook and eat together in a single traditional house (Ali, 1982, p. 218). Most of the households in the Hunza are composed of patrilineal extended families. On average each household has seven members, including, parents, sons, unmarried daughters, daughter in laws, and their children. The lineage is traced through patrilineal affiliation. In early days it was very common to have more than 10 members in each household. Owing to patriarchal structure prevalent in the area, the authority over the family matters and important decisions rests upon senior male member of the household usually father. In case of deceased male parent, the elder son holds the office. This patriarchal system is never an indicative of zero women participation in family matters. The senior female member, usually mother is responsible to take care of domestic expenditure and important utensils of household, traditionally known as *Ruli Gus* in Burushaski language, which means female in-charge. The opinion of *Ruli Gus* also matters in important decisions, especially

in the case of selecting spouse for her sons. As stated by Lorimer (1979, p. 156) the female in-charge of household has complete authority over all the women in the family. The happiness and prosperity of a household depends upon the managerial skills of *Ruli Gus*.

The traditional household structure is changing now. Young people prefer to opt for nuclear family system after marriage. Similarly, the selection of spouse has no more remained a choice of their elders, most of the young boys and girls chose their own life partner, and comparatively boys are more independent in deciding their choice. Unlike old family system, where girls were supposed to perform household chores only, nowadays, girls are also free in deciding their career choice.

#### **4.9 Tribal Affiliation**

The political integration within the local populace is based on tribal affiliations, locally known as *Rom*. The *Rom* is made up of different clans locally known as *Guti*. For a tribe it is not mandatory that all of its *Guti* will share a single known ancestor. Much of clans within tribes are included later to increase their strength. In central Hunza, there are four major tribes namely, Diramiting, Khurkutz, Barataling, and Burong, these tribes sprouted out from the old settlement of Baltit are collectively referred to as Madaltalenumsho. Whereas, in Ganish there are different tribes, which are Barchakutz, Shishkin, and Diramkutz collectively called Ganishkutz. Similarly, in Altit there are three tribes other than those exist in Ganish and Baltit. The four tribes of Altit are Hussainkutz, Hakalkutz, Shushroting, and Harikindaro, collectively referred to as Altikutz. Traditionally, in old settlements of Altit, Baltit, and Ganish each tribe was headed by a headman known as *Trangfa*, who was responsible to manage and administer the internal affairs of tribe member and also to solve the issues and conflicts with other tribes. The headman of each tribe was answerable to the Mir of Hunza. Apart from tribal headmen, each village was governed by a village headman, who was responsible to collect the taxes for Mir and also acted as judge on village level. More severe issues were taken to the court of Mir the headman. Although this tribal affiliation still exists, the bonds are not strong enough among the various members of tribe.

Table 1: Tribes of Central Hunza

Burusho of Hunza	Subjective Classifications	Tribes
Burusho (Burushaski speaking people of central Hunza)	Madaltalenumsho	Diramiting
		Khurkutez
		Burong
		Barataling
	Ganishkutez	Barchating
		Shishkin
		Diramkutez
	Altikutez	Hussainkutez
		Hakalkutez
		Shushroting
		Harikindaro

**Note:** Data pertaining to tribes is taken from Kreutzmann Book “Hunza Matters“, whereas, Subjective Classification is researcher’s own work, which indicates, how Hunzukutez refer to each other.

### 3.10 Caste System

In Hunza the population is classified on the basis of caste, much like other South Asian regions i.e. on the basis of occupational specialization, but not as prevalent. There are three castes in Central Hunza, Ayashkutez, Burusho, and Bericho. Traditionally, Ayashkutez which means Sky Born in Burushaski are the ruling elites of Hunza and were deemed to have control over the forces of nature, which gave legitimacy to their throne. Next to ruling class are the Burusho-the general public. Traditionally, they were farmers, defenders of the land, and managers/administrators of the state by virtue of the positions like *wazir* and *trangfa*/headman. Last in the hierarchy are Bericho, who were traditionally blacksmiths and musicians. There was a strong caste endogamy with almost no chance of upward mobility. This situation has changed to a great, an instance of which is the adoption of the profession of music by Burusho people. There are two reasons for this transition, firstly,

music is a lucrative profession these days as opposed to the previous era, secondly, the Ismaili religious doctrine puts a positive emphasis on acquiring of art and music.

#### **4.11 Religious Belief**

The propagation of Islam in the area started by various preachers from Central Asia and Baltistan region. Before the advent of Islam in the region, the people had shamanistic beliefs which are still remnant in the form of prophecy tellers and ritualistic expressions.

The people of Hunza are followers of Islam. There are three groups on the basis of sectarian affiliation- Ismaili, Shia, and Sunni. The majority of the population belong to Ismaili sect-the followers of Aga Khan, whereas, Shia (5%) and Sunni (less than 1%) are in minority. The majority of Shia people live in Ganish and Murtazabad, whereas few houses of Sunni sect are in Karimabad, Aliabad and Murtazabad. All the three groups live in harmony, except few recent clashes between Ismaili's and Shias on Muharram Congregation route. The people from different sects although having same caste and ethnic affiliation don't encourage marrying in other sect. There are however exceptional cases of inter-sect marriages.

#### **4.12 Rites of Passage**

Owing to prevalence of Islamic values in the area the rites of passage are performed in the light of Islamic traditions. On structural level these rites are in total congruity with Islamic values, but their parole manifestations have got cultural nuances of the area.

**Birth rites:** Birth of a child is considered as a gift of God, and is celebrated with enthusiasm. On the third day of child's birth a religious priest locally known as *Khalifa* or *Mukhi* calls Azaan in child's ear and afterwards gives him/her an Islamic name, already decided by parents. The mother has to take care of her hygiene, as during post-partum period she is considered impure. Owing to the norms of patrilineal society where decent is traced through male, the birth of a child is celebrated with more happiness and joy especially among the orthodox families, whereas, educated couples hardly distinguish between girl and boy. After the birth, close relatives visit with gift items both in cash and kind. A traditional dish made from flour is cooked for the guests.

**Marriage rites:** Traditionally all marriages in Hunza were performed in December called 'Thumishaling Garaing'. There is a caste endogamy in Hunza, at the same time there is a strict exogamy, which discourages marrying paternal cousins or marrying within same clan. Because the girls of the same clan are considered as sisters to a boy, thus this restriction pushes him to marry outside his own clan. The most preferable relations for a boy to marry are his matrilineal relatives and daughter of father's sister.

After finding a desirable match for their son, the parents ask for the hand of girl from her parents, usually this is initiated through a third party who is mutually known to both families. Traditionally, the final decision rests with the father. After getting the consent of girl's father a short ceremony called *Sartak* is performed during which the close relatives and parents of the boy visit her home with various gift items. The actual marriage ceremony is celebrated for three days, during which guests are entertained with meals, instrumental folk music and lively dance. On the day of marriage, the groom along with his relatives go to the Jamat khana (community pray area) near girl's residence, where religious priest/*Mukhi* performs the Nikkah under the Islamic rules and doctrines. After signing the Nikkah pact he recites verses from Quran and prays for the new wed couple. Afterwards, the groom along with the bride goes to girl's home where meal is served to all his relatives. On way back to groom's home, the relatives of bride also pay visit to grooms home where they are served with a meal.

The traditional practice of selecting spouse for children is hardly in practice now. Most of the marriages are performed after the consent of both male and female, whereas, there is also growing trend of love marriages in the area.

**Funeral rites:** As per Islamic rules, when a person dies, the close relatives give bath to the body of deceased and wrap it in a white cloth called *Kafan*. Afterwards, the people perform funeral prayer, which is usually led by a Khalifa. Cooking of food in the deceased's home is restricted until the third day. It is the duty of neighbors and relatives to serve food from their own homes. On the third day a huge meal is cooked and served it to the village people who gather at deceased person home. On the third day night, a special ritual of Chirag Roshan is performed, where people recite verses from Quran and a religious book called Chiragnama written by an Ismaili missionary of Central Asia. During the recitation of

verses, a lamp is kindled which is moved around the house until the oil in the lamp is consumed by the fire.

#### **4.13 Festivals and Rituals**

There are various festivals and rituals celebrated in the area mostly linked with the agrarian and religious calendar. Traditionally, coming of each season was celebrated with zeal and fervor. Each ritual was indicative of certain tasks to be carried out in upcoming season. In this regard, the first celebration of a year was performed by the first week of February locally called *Bophao*-sowing of seeds in Burushaski, which was symbolic initiation of agrarian activities. Afterwards, in the month of June the festival of *Ginani* was celebrated for the initiation of seasons first harvest. In the month of December, the ritual of *Thumishaling* was performed by lighting the fire lamps made from juniper bushes at night. This ritual was performed in the commemoration of cannibal king Shiri Badat who once ruled the area, and was burnt in his castle by the local people to get rid of his tyranny. For details see chapter 5. Due to transition in locally economy and social organization, these rituals and festivals have lost their essence and are no more celebrated in the area. Although, for the sake of fun some people still perform the ritual of *Thumishaling*.

Other than traditional festivals, there are various celebrations performed in the area, which are mainly linked with the religious affiliation of the local people. These festivals and celebrations include, Novroz, which is celebrated on 21<sup>st</sup> March throughout the world, Birth celebration of His High Highness Aga Khan locally called *Shini-mo Salgirah*, Imamat Day celebration of Aga Khan locally called *Bai-mo Salgirah* which is performed in commemoration of the day when the current Imam of Ismaili community first sits on the throne of Imamat. These celebrations are performed by decorating the Jamat Khanas and fireworks on mountains.

#### **4.14 Education System**

Hunza holds the highest figures of literacy rate in the country. All of the young generations are literate and well educated. Education is the first priority of the local people for their children without any gender discrimination. The importance of education among the local people is the result of their religious preaching. The spiritual leader of Ismaili community

has put a lot of emphasis on quality education and has started a vast array of quality education services in the entire region of Gilgit Baltistan. These resources include initiation of Diamond Jubilee schooling system, Higher Secondary Schools, Early Childhood Development Centers, and Curriculum development initiatives. Along with this, there are need-based scholarship programs for both primary and higher education. Apart from the initiatives of Aga Khan Development Network, there are numerous private and public organizations which are running various schools in the area. At present, there are two Government Degree colleges and a campus of Karakoram International University established in 2016.

#### **4.15 Health System**

Unfortunately, health system in Hunza is not well equipped despite the initiatives of public and private organizations. At present, there are six health care units operational in the entire District. Out of six, two are secondary care hospitals located in Aliabad. One of the secondary care health unit is run by Aga Khan Health Services, whereas the other unit is administered by Government. There is a lack in medical facilities both in terms of specialist doctors and diagnostic machinery, which is why; people with severe cases are referred to Gilgit and down country. The department of gynecology and child care is comparatively satisfactory in the area. This is due to various campaigns lodged by Aga Khan Health Services, with an emphasis on the vaccination of new born babies and antenatal and postnatal checkup of mothers.

#### **4.16 Electricity and Communication**

There are two hydropower stations installed in central Hunza, one in Hassanabad (1.2 MW) and another one in Ahmadabad (500 KW). However, the total capacity of these stations is 2 MW, which do not suffice the electricity demand in the area. In winters the shortfall of electricity increase due to freezing of water in rivers, consequently causing power outtages of 22 hours daily (Dawn, 2020). In winters diesel powered generators are also used to overcome the power shortfall.

Communication is the foremost desired facility of the 21<sup>st</sup> century. In Hunza, there is a telephone landline system which is being operated under Pakistan Army. Along with this,

various telecommunication networks like, Telenor, Warid, and Zong are also operational in the area to facilitate the populace. However, due to physical geography of the land which is not stable and densely populated mountains in the area constricts the mobile signals. The internet facility in the entire region of Gilgit Baltistan is provided by SCOM which is owned by Pakistan Army. Other private and corporate sector organizations are not allowed to operate their own internet services due to security measures.

#### **4.17 Transportation and Accessibility**

The area is connected to the other regions of Gilgit Baltistan through Karakoram Highway. This road runs along the Hunza River and connects the country with China at Khunjerab top in upper Hunza. There is a network of metaled roads which connects different villages of the area. There are various transport companies operating in the District which carries people to different parts of the country. The transportation system often faces problems due to landslides and heavy snowfall which halts the movement of vehicles. Currently, there is no airport facility available in the entire district. The only nearby runway available is situated in Gilgit city which is 100 kilometers or an hour and half drive away.

#### **4.18 Description of Locale**

The locale selected for the field work was Murtazabad village which is located in central Hunza at an elevation of 2438 meters. The village shares the boundary with Nasirabad village of Lower Hunza to its west, the Nagar districts lies on the southern side across the Hunza River, and Hassan Abad village on its northeast. The water channel which feeds the village is transported from Shishper and Muchuher glacier tongues situated in the Hassanabad Nullah. The Karakoram Highway runs across the village which connects it with other parts of central and lower Hunza. Different areas within the village are connected through a network of non-metaled and metaled link roads.

The major town or commercial area near the village is Aliabad which is 9 kilometers away. Although there are few shops in the village where grocery, poultry, and baked items are easily available from where locals purchase the items of daily use. But, local people prefer to buy their monthly household items from Aliabad where variety of domestic and other items are available.



The electricity is supplied from nearby hydro power station installed in Hassanabad. Owing to overall shortfall of electricity in Hunza district, the area gets the light for 12 to 14 hours in summers, whereas, in winters the availability of light is limited to only 3 hours per day. Along with this, there is a shortage of mobile signals as there are no mobile towers installed in the village. A limited and weak network signals are available from the transmitters installed in Aliabad and Nagar.

Currently two educational facilities are available in the village, a government high school and a campus of Aga Khan Higher Secondary School where local parents send their children up to secondary schooling. For higher secondary education students have to travel to Aliabad where various private and government colleges are operational. At present all of the children in village get education at least up to 10<sup>th</sup> grade. Along with this, there is one primary care health facility available in the whole village which is supervised by a male nurse. For secondary care people go to Aliabad where two tertiary health care facilities are available.

Figure 2: Satellite Imagery of Locale



(Source: Bing Imagery, legends are added using MS Paint)

#### **4.18.1 Population and tribal composition**

The total estimated population of the village is 3500 with an ethnic composition of 100 percent Burushaski speaking people. The village is divided into two halves based on tribal affiliations i.e. Murtazabad Paeen and Murtazabad Bala. In Murtazabad Paeen the population is composed of clans of the four tribes of *Madaltalenumsho* or Baltit namely *Khurkutz*, *Barataling*, *Diramiting*, and *Burong*. The upper region or Bala is populated by the clans of *Ganish* and *Czil Ganish* tribes. On the basis sectarian affiliation, the people residing in Murtazabad Paeen are almost Ismaili with only 2 Sunni households. While in Murtazabad Bala, 60 percent of the population belongs to Shia Muslims and rest of 40 percent are Ismaili Muslims.

#### **4.18.2 Settlement pattern**

Houses in rural areas are built according to surrounding environment and climatic conditions. Traditional houses in the village are composed of a multipurpose hall locally known as *Ha*, it includes a cooking area, multiple spaces for storage of stock and other utensils, and separate spaces for elders, children, and eating purpose. Traditionally, same spaces were utilized for sleeping of all family members under single roof. The walls of traditional *Ha* are made from stone and clay plaster, with an eight feet high wooden roof. This vernacular composition makes it cooler during summers and warmer in winters. The traditional houses are hardly preferred by locals, most of the houses in the village are built on modern designs. But owing to harsh winters locals prefer to build wooden roofs instead of concrete ones. On average each house in the village have 03 rooms with attached toilets, a separate kitchen, and a hall to entertain guests. The front side of the houses is mostly used as lawn; this trend is recently adopted by the locals. While a portion beside lawn is used to grown kitchen garden in which vegetables like spinach, tomatoes, onions, and cucumber are grown. Along with this, as a recent development whole of the village has central sewerage system. The construction cost for sewerage system was funded by USAID in 2017. Similarly, the traditional system of storing drinking water in open pounds called *Gulq* is replaced by tape water, which is directly syphoned from Hassanabad Nullah using PVC pipes. The details of construction pattern are given in the chart below.

Table 2: Number of households and construction pattern in Murtazabad

<b>Construction Pattern</b>	<b>Number</b>
Pakka houses single story (cemented walls and concrete roof)	14
Pakka houses double story (cemented walls and concrete roof)	06
Semi-Kacha Houses (Cemented walls and wooden roofs filled with sand and clay)	598
Kacha Houses (Mud walls and wooden roofs filled with sand and clay)	02
Total households	620

(Source: Socioeconomic survey of village)

## **5. CHANGING HUMAN-ENVIRONMENTAL RELATIONS**

It is important to know the previous agrarian dynamics of the village in order to understand the recent shifts that have occurred in human environmental relations. One of the major reasons to investigate the previous agricultural and ecological conditions is to understand the reference points, especially when the respondents are trying to make sense of climate change while comparing the recent shifts with those used to happen in early days. The reference points made by the respondents most often include, the traditional agrarian and religious calendars, which were markers of shift in the seasons. Thus, this chapter includes, the ritualistic manifestations of seasonal shifts, assemblage of agriculture, animal husbandry, and two major developments occurred during 1970's i.e. the construction of Karakorum Highway, which paved the path for free market system. And second one was the demolition of princely state of Hunza, which detangled the local populace from traditional laws pertaining to governance of agrarian society.

### **5.1 Ritualistic Manifestations and Agrarian Calendar**

The Mir's control over Hunza's hydraulic works not only gave him command over land and water, the principal productive resources of his state, but also enabled him to acquire managerial powers over the agro-pastoral production of his subjects. All phases of agricultural production (as also pastoral production) were coordinated by a series of rituals, over which the Mir presided in his role as provider of fertility. The state deemed such coordination crucial, since delays either in the initiation or completion of critical farming operations could disrupt the water-disbursement cycle and the sequential planting and harvesting timetables (Sidky, 1994, p. 121).

The locals had various ritualistic expressions to celebrate the arrival of each season. These rituals were celebrated after the onset of each season. The data pertaining to each celebration depicts a set of different chores locals had to perform in the upcoming seasons which were mostly related to agrarian practices, water management, animal husbandry and other related activities.

#### **5.1.1 Bophao**

The start of the new season agriculture activities were celebrated through a seed sowing ritual between the first and second week of February. This ritual is locally known as Bophao which, in Burushaski language, means scattering seeds. According to Sidky

(1994), the actual date for celebrating Bophao was determined by the Mir of Hunza based on the then prevailing climatic conditions like, seasonal temperatures, and availability of glacial meltwater in channels. The festival of Bophao involved various ritualistic expressions. Usually these include; dance celebrations, sacrifice of a cattle, spilling and rubbing of flour on ceiling and roof beams in houses<sup>1</sup>, and rubbing flour on the body of ritual initiator-called *Botro*. The task of the *Botro* was to carry the bag containing barley seeds from Mir's palace located in Baltit to the nearby village Altit. By the virtue of tradition supported by a myth, the ritual initiators would always be from *Diramiting* tribe. After reaching Altit village, the ritual initiator symbolically used to spread barley seeds in a field. Afterwards, the ritual initiator used to plough some of the field beds where seed were sown. This step of ritual was also imitated by the Mir. The ritual spectators gathered from all the villages used to recite versus along with prayers headed by a Khalifa-who is head of religious rituals among Ismaili Muslims of Northern Pakistan.

This ritualistic manifestation according to the respondents was a formal and symbolic expression for the commencement of the new year agricultural activities. The local people used to start their activities a week after the *Bophao* ceremony, because, the frost in the field beds used to melt only after the mid of February. The harvest from the fields ploughed during this season is locally known as *Gamulikiyangh*. The major activities carried out during this season were; desilting of water pounds, cleaning the water channels, and repairing the damaged sections of irrigation channels.

### **5.1.2 Ginani**

Barely was the first harvest of the year, celebrated with a special ritual called *Ginani*. Alike *Bophao*, there was no fix date for *Ginani* celebration. The dates of *Ginani* celebration depends upon the seasonal temperatures. A cooler season with little sunny days may have delay the date of celebration by a week, while a warmer season with frequent sunny days could advance the date by a week. After confirming the crops maturity, the Mir could have order the shepherds to bring the cheese from pastures a day before the initiation of ritual celebrations. On the actual day of ritual, people used to go to their fields and pray for high yields from new agriculture grown, and eat a special bread called *Apishuro* with the cheese

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<sup>1</sup> As defined by Sidky, the use of flour in Bophao ritual seems to be associated with the concept of fertility

brought a day before from the pastures. Afterwards, three handful bunches of barley were plucked and used to tie them on the roof beams. Whereas, a portion of barley beans from these bunches were roasted and consumed after adding them with the buttermilk. Traditionally, each member of the household was supposed to have a spoonful of this mixture, which was served in a single container for all members of the house. On the same day, a special meal was cooked from newly grown spinach. Before serving this to the household members, a handful bunch of this meal was first thrown out of the house by an elder female. This gesture was a symbolic act of throwing out the spring hunger from the house. The harvesting in each village used to be started after cutting the crops from Mir's field. It was prohibited to cut the crops before the Ginani ritual. Whereas, in each village, it was considered more appropriate to start it from Diramiting clan.

### **5.1.3 Gurganey Harki – Ploughing for Wheat**

Traditionally it was customary throughout Hunza to plough the fields for next year harvesting by the last week of October or first week of upcoming month. According to the respondents, this boosted the earlier growth of crops soon after the onset of spring season. The earlier growth of crops in upcoming season was in turn prolonged the second cropping season.

Traditionally the first season crops were preferably wheat and barley, which was ploughed and sowed before the onset of winters. According to most of the respondents, in order to plough the fields for the next season, people used to irrigate their fields by the time of Salgirah ceremony<sup>2</sup>. Irrigating the fields after the onset of November was discouraged, the reason of which according to the respondents, was that it caused the moisture in the ground to frost, thus making it impossible to plough the lands which was traditionally done with pulling oxen. This phenomena of freezing of moisture in the land is called *Gili Niyas* in local language. One of the respondent while sharing his childhood memory said that,

Once, my father was irrigating the fields a bit late-November. When he started to drive the oxen for ploughing, the wooden blade didn't stick well due to formation

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<sup>2</sup> Since 1960, every year local people commemorate the first visit of His Highness Aga Khan to Hunza i.e. on 23 – 26 of October, this religious celebration is locally called Datu-mo Salgirah.

of frost in the soil. He had to set fire all over the field using sea buck throne bushes to defrost the ice. (Respondents Narrative)

It was not necessary to plough all the fields during the time of *Gurganey Harki*, a portion of land was also held unsown only by ploughing it. This portion was later being re-ploughed after sowing the seeds by the onset of spring season; this type of harvest is locally called *Gamulikiyangh*. One of the respondent gave the reason for this, living the fields unsown only by ploughing them was helpful to dry out the extraneous weeds. *Gurganey Harki* according to locals was the last agrarian activity of a year. After the completion of winter ploughing all villagers were supposed to migrate from their summer settlements locally known as *Giram* to a central fort called *Khun*. The only task after the migration from their summer settlements was to fill the water in the communal ponds to utilize it throughout the winters. According to the older respondents, there were three communal ponds in the village, one in each fort and another one which was built to store the water for irrigation purpose. Out of the three ponds two of them are still operational, whereas, the third one is demolished. A woman while sharing her childhood memories said that,

When I was being asked by my elders to bring water from the pond, I used to go along with my fellows and play *Tola* (a local game) over the frozen water of village pond. The boys used to skate over it. We had to dig a hole in the ice using an axe to get the water from beneath. (Respondent: Ms. Sahib Numa)

#### **5.1.4 Thumishaling**

During the harsh and long winters few social activities and ritual celebrations were performed in the month of December. It is a tradition throughout Gilgit Baltistan to slaughter cattle by the third week of December, locally called *Ushayas* or *Nasalo*. The meat of *Ushayas* is consumed throughout the winters after drying it. The highly nutritious meat and fat obtained from the cattle helped them bear the cold and harsh weather, besides this, it was the only source of nutrition for survival when all other sources of food were exhausted. This tradition of *Ushayas* was carried out a week before the celebration of Thumishaling, which was conducted on the 21<sup>st</sup> of December. Two important social activities took place in the Thumishaling celebration i.e. all marriages throughout Hunza

were performed a day before Thumishaling celebrations, locally called Thumishaling *Garaing* (*Garaing* means marriages in Burushaski). The second event was the celebration of *Taleno*, during which all villagers gathered and danced throughout the night while holding specially costumed fire torches in their hands. This ritual was performed in the commemoration of killing the cannibal king named Shiri Badat who once according to the local legend, ruled the area. Although, the tradition of *Yushayas* is still observed in the area, whereas, the ritual of Thumishaling has lost its significance.

## 5.2 Water Channels and Irrigation System

The Murtazabad village is located on the southern side of Shishper and Muchuher Glaciers, with an average gradient slope of 200 feet from their tongues (Google-Earth, 2020). The agricultural development in the village is made possible from the melt water of these glaciers. The water is transported to the village through two gravity fed water channels. According to the local narratives, the area was barren with zero access to water until the construction of *Yarum goczil*, which means, lower water channel in Burushaski. Due to lack of any immediate water source or glacier in the area it remained barren for centuries, which is why the village was also known as *Nerey Das*, which means petty barren land in Burushaski language.

As narrated by an elder respondent, *we had very little to eat, there were no basic amenities that the people are enjoying now. We have spent our lives in utmost poverty.* The reasons given by the respondents for high poverty were unfavorable geography hardly feasible for cultivation, harsh climatic conditions and scarcity of water. The challenges posed by the environment during the early settlement of the village can be explained by structurally analyzing the historical narratives collected during the field work. According to a respondent,

After getting disappointed from water shortage and pertinent droughts one of the first dwellers left his land and went back to his parental village. After sometime he went to a shaman and told him about his decision, who told him that, in future there will be enough water in the village that it will even slued down a horse calf. (Respondents Narrative)



Empirically, it will be irrational to justify the comments made by the Shaman, but compared to other villages of central Hunza; Murtazabad is now one of the water abundant places. It is imperative to carry out a detailed investigation of historical developments pertaining to irrigation channels, which caused water abundance in the village.

There is a lack of written records regarding the developments that took place during village settlement. The historical narratives collected during the field work states that it was developed in the reign of Mir Muhammad Ghazanfar Ali Khan in 1870's, the then king of Hunza state. According to Kreutzmann the Murtazabad water channel was developed between 1865 to 1886, under the leadership of Wazir Asadullah Beg (Kreutzmann, 2000, p. 101). According to locals, the village was first given to the different clans of Altit, but it was given back to the then Mir of Hunza. As during the construction of water channel from Hassanabad Nullah, eleven of the early settlers from Altit died due to a landslide. Later on the village was developed by the tribesmen from Ganish, Haiderabad, and Aliabad, who succeeded in making a 4.5-kilometer-long water channel through mountain gorges of Hassanabad Nullah. In the absence of iron and mechanical tools the water channel was made using the horns of ibex and other stone tools. The first water channel locally known as *Yarum Goczil*, was built on *Chosh*, which is a small tongue of Muchuher glacier on western bank of Shishper glacier. This 4.5-kilometer-long lower water channel has a declining gradient of almost 300 feet from the source to the point where it reaches the village (Google-Earth, 2020). According to the respondents, this channel kept on collapsing over the time due to landslides, which caused droughts during agricultural seasons. As one of the respondent stated that,

This village has seen three droughts due to the shortage of water caused by damages happened to the water channel over the time. I don't know about the previous two droughts but I have clear memory of third one, during which I used to take meal for my father who was reconstructing a damaged part (Respondents Narrative).

In order to overcome the issue, initially few of the village men started to construct another water channel on Shishper Glacier, which is comparatively on lower elevation of 7410 feet (Google-Earth, 2020). As narrated by the respondents, initially the majority of the village men were not in the favor of new water channel owing to tedious labor and seemingly

impossibility of directly syphoning the water from the tongue of Shishper glacier, and also because of glacial movements. Later on after few breakthroughs all the village men agreed and constructed it in the second decade of 20<sup>th</sup> century. This water channel helped the village people to get plenty of water to irrigate the barren lands, and also to overcome the issue of late start of irrigation activities, as the water from the first channel was available only after the mid of April. Whereas, the new channel locally called *Yarum Goczil* or lower channel carries the water throughout the year, unless the water in the channel gets froze in winters. Even the *Yarum Goczil* kept on damaging due to landslides, but was easier to rebuild due to lower elevation. Later on this channel was cemented with the help of Norwegian Aid, when a 1.2 MW hydro power project was approved to build over the same channel (Jensen, 1990). Under this scheme all of the channel was cemented and covered with concrete slabs along with the widening of channel. According to the project details, it was designed to carry 65 cusec water. Out of total carrying capacity, 10 cusec of the water was granted to the village as per agreement. After this development project the village hardly gets short of water.

The main water channel from the Shishper glacier is also shared with the adjacent village of Hassanabad on various points depending on the number of clans holding the land parallel to the channel, who have made sluices adjacent to their lands. As this water channel was solely built by the village men of Murtazabad, so they have the sole right over its water. Traditionally, sharing of water with Hassanabad village is after the mid of May when water from the melting glaciers starts to increase. The water sharing calendar as set by the locals was the arrival of migratory bird locally called *Pupo*, which usually migrates to the area by the mid of May. Although, this water sharing calendar is no more in use after the widening of water channel by hydro power project.

The point where the channel touches the village is called *Gash*, where the main water channel is diverted to different areas of the village through two slightly smaller sluices of two feet in width. The water in the smaller channels is usually driven by the declining gradient of the land, which carries water to the terraced fields. The first channel which is at an elevated height of 100 feet from the second channel is mostly used to feed the meadows cultivated near the range lands above the village orchards. Sometimes the water from the upper channel is also used to irrigate the fields especially if a damage occurs to the *Yarum*

*Goczil*, but currently the upper channel is damaged and out of order from few years due to a landslide.

Before the construction of *Yarum goczil*, there was severe shortage of water in the village. In order to manage the scarcity of irrigation water, the water to each clan was given on turns, with an equal amount of time for each clan irrespective of their land holding. It is stated by the respondents that, even sometimes people use to irrigate their fields after every third week.

Owing to the perpetual threats to the water channel by landslides, two of the village men are kept on duty to monitor the water channel locally called as *Ilguin*. It is the duty of *Ilguin* to promptly report the village men about the untoward situations. As per data readings 06 of the *Ilguins* have lost their lives while monitoring the channel. In past days the *Ilguin* was paid in food items, whereas, now he is paid in cash, which is 50 Rupees per household for each month.

### **5.3 Distribution and Classification of Land**

The village was distributed among the different clans of Ganish and Aliabad by the then Mir of Hunza, Shah Ghazanfar. As per tribal character of Hunza all the clans and tribes living or migrated from Ganish village are collectively called *Ganishkutez* to differentiate them from those migrated or kinship extensions of Baltit village referred to as *Madaltalenumsho*. On the basis of this political differentiation the whole village is divided into two territories. The land on the north-eastern side of the village is held by the clans of Ganish called *Dalkhan/Bala*, whereas those living on western side are clans from Aliabad and Haiderabad called *Khakhan/Paeen*. Each territory is further subdivided into 24 smaller plots with an estimated area of almost 60 to 70 kanal for each land owner.

Apart from the main cultivable land in the village, there are two range lands one for each territory of *Dalkhan* and *Khakhan*. The range land given to the people of *Dalkhan* is not distributed further among the clans rather its ownership is communal and mostly used for herding purpose. Whereas a portion of range land given to *Khakhan* is cultivated with trees and alfalfa and is distributed among the clans residing in the village, while rest of the portion is collectively used for herding.

### 5.3.1 Classification of Land

The main village plots, called *Gishi* in Burushaski, held by each clan is further classified into three types; *Harkish*, *Basikish*, and *Toq*. As well defined by Kreutzmann, *Harkish*, requires regular irrigation as cereal crops are produced on it, and is given priority over other types of land for irrigation (Kreutzmann, *Water Management in Mountain Oases of the Karakoram*, 2000, p. 100). In Murtazabad, the average size of a single cultivable field in *Harkish* area, locally called *Mal* is not more than 2 kanal with few exceptional fields which are bit bigger. *Mal*/field is irrigated through cultivable beds of not more than three feet. Although few of the cultivable fields are also kept for producing vegetables usually onion, tomatoes, and spinach. *Basikish*, which is the local term for orchard is given second priority, as it provides an additional source of nutrition from the fruit trees. In *Basi*/orchard fruit trees like apricots, mulberry, peach, grapes, walnut, almond and apples are grown. The *Basikish* land is composed of small terraced fields of hardly 20 feet in width, called *Goos* in Burushaski language, with narrow cultivable beds where mostly alfalfa is grown for cattle. The last priority is given to irrigated meadows locally called *Toq*, usually built on sloppy areas over the village. On average 20 to 30 percent of the land held by each clan is composed of terraced fields /*Harkish*, whereas, almost 40 percent of the land is used as orchards/*Basikish* and rest is irrigated meadows mostly filled with sea buck throne bushes and wild trees like Russian olives and willows.

According to the respondents, people in early days harvested cereal crops in all their fields, whereas, in rest of the lands orchards were grown for fruit, and fire wood. Planting trees in *Harkish* area was strictly prohibited with especial exception for Mulberry trees, which is discussed in detail in a later paragraph. During the research it was noted that, there are very few fields where villagers still grow cereal crops, rest of the fields are filled with cherry and other fruit trees.

### 5.4 Cultivation and Cropping Patterns

As discussed above traditionally the two ploughing patterns were followed for the cultivation of first season crops i.e. *Gurganey Harki* and *Gamulikiyagh*. In former pattern land was ploughed before the onset of winters in which a local variety of barley and wheat were grown. Some of the fields were also held for *Gamulikiyagh* crops, which were

cultivated after Bophao ceremony. In the second pattern a special variety of fast maturing wheat called *Naltarai* were sown along with barley. According to the respondents, the seeds sown during the first cropping pattern used to ripe a week earlier than those sown in February. One of the respondent also explained the reason for following two patterns and stated that, the first pattern i.e. *Gurganey Harki* was followed to get animal fodder as wheat sown during the first pattern yields low grain but high straw, whereas, in the second pattern/*Gamulikiyangh* it was vice versa.

The harvest of first season crops used to start by the first week of July. A week or few days before the actual reaping of crops it was symbolically initiated with a ritual celebration called *Ginani*. The ploughing for second season crop cultivation was carried out by the mid of July. The second season cropping is locally called *Datuki Harki*. During the second season, traditional varieties of buckwheat, millets, maize and sorghums were sown. It is further added by a respondent that, there were two local varieties of buckwheat called *Cheeski Baru* and *Gaqau Baru*. The second variety i.e. *Gaqau Baru* was sown especially in those areas where second season ploughing get delays for a week or two. Because they used to ripe earlier, almost in a month and half. Although *Gaqau Baru* was not preferable for consumption as a routine diet, as they have bitter taste. Which is why it has got its name from the very characteristic of being bitter, in Burushaski language *Gaqau* stands for bitter. On asking about its utility a respondent said that, they were mostly given to animals especially to those which were kept to be slaughter as a *Ushayas* in winters. Owing to its high nutritious value its consumption was helping the cattle to gain more fat, which was consumed as an alternative to cooking oil. Whereas, in those fields where barley was grown as first season crops, usually maize, sorghum and millets were grown, because maize don't grow on the harvest of wheat.

As a set rule, traditionally, planting trees and long bushes in the *Harkish* area was strongly discouraged and fined with penalties. The reason told by the respondents was that, the roots of the tree and its shadow hinders the growth of cereal crops in the neighboring fields. There was defined distance for each tree to be planted from neighboring border, which are given in the table below.

Table 3: Local rules for plantation of various tree species

Sr. no	Tree Specie	Distance from neighboring border
1	Peach	40 Yards
2	Walnut	40 Yards
3	Apple	24 Yards
4	Apricot	24 Yards
5	Almond	12 Yards
6	Mulberry	40 Yards as per rule, but given exception.

(Source: Research Data)

## 5.5 Orchards and Irrigated Meadows

According to Kreutzmann, Orchards or *Basikish* is second important type of land in Hunza, which provides an additional amount of nutrition for the populace from the fruit grown on the trees. As one of the respondent has explained the importance of *Basikish*,

A cropland is only possible if one has Basi/orchard, as it provides necessary things required to cultivate a cropland or Harkish in Burushaski. It provides fodder for animals throughout the season, from which the Harkish gets the animal manure. So it is important to maintain both Harkish and Basi. It is not possible to have cropland alone. (Respondents Narrative)

Spies in his book written on Nagar valley which shares same environmental and cultural patterns with Hunza narrates that, Orchards are mostly cultivated on sloppy terrains on village borders where ploughing is difficult. He further adds that, in orchards fruit and nut trees like apricot, walnut, mulberry, apple, and cherry are found in abundance (Spies, High Mountain Farming and Chaning Socionatures, 2019, p. 163). In Murtazabad the pattern is almost similar to the one found in Nagar, but cheery trees being newly introduced species in the area are hardly found in *Basikish* area. As per researcher's observation, roughly 50 percent of fruit trees found in meadows are apricot trees, followed by apple, pear, walnut, almonds, and Mulberry. It is not necessary that all of the *Basikish* area is dedicated to fruit trees alone, rather a big proportion is composed of willows, Russian olives, and sea buck throne bushes. As according to Spies, these non-fruit trees are used for firewood and

construction of houses (Spies, High Mountain Farming and Changing Socionatures, 2019, p. 163). Apart from the use of its wood, in summers the branches of Willow and Russian olives are also used as animal fodder. The left over branches of willow tree after consumed by the animals are further used as supporting columns for cucumber and bean plants. In some of the *Basikish* area, small terraced fields of hardly 20 feet are also found, these small fields within the *Basikish* area are called *Goosho*. On these small fields fruit trees are grown along with alfalfa to feed the animals.

There is no strict rule that differentiates an orchard from a meadow, as fruit trees can also be found in meadows. But unlike orchards, in meadows, the population of water resistant trees like, Sea Buck Thorn bushes, Russian Olives, and willows are found in abundance. The reason that meadows are not given much preference during irrigation in spring when water resources are scarce. On the basis of topographic features, meadows are mostly composed of sloppy grass lands with few exceptional patches where alfalfa is grown. It is mostly used to get fire wood for winters, especially, sea buckthorn bushes. Along with this, the willow trees grown in the meadows is traditionally used for construction purpose. In Autumn season, the dried leaves from these meadows are collected and used as animal fodder after mixing them with wheat straw and dried alfalfa. Whereas, it is also spread over the animal manure in the cattle barns to make the beds dry and comfortable during winters.

### **5.5.1 Fruit Trees**

Fruit trees have been a major source of nutrition throughout Hunza. All of the *Basikish* land is especially allocated for fruit trees. The fruit trees found in the area are; apricot, apple, pear, peach, grapes, mulberry, walnut, almonds, and cherries, which are recently introduced in the area. Among these varieties more than 50 percent of the fruit trees are local varieties of apricots, which are widely produced all over the region. Traditionally, apricots and mulberries were given more importance as an essential item of their diet. As one of the respondents has explained their importance in terms of their time of ripening and usage.

If I ever get a chance, I will make two statues one of Mulberry and another one of apricot. As Mulberry was the only fruit that ripened on time when we were left with

almost zero food stock during spring. Apart from the seasonal fruit we used to eat dried apricots and its kernel throughout winters, which reduced the burden on the stored stock of staple crops. These two sources of food have made our survival possible. (Respondents Narrative)

It was a long practice to dry out the surplus fruits to consume later on in winters, as before the advent of KKH there was no concept of market throughout the region, the locals were heavily dependent on local production. Traditionally, apricot kernel oil was used as an alternative to cooking oil. In addition, apples are also of great importance in the area. Similar to apricots, there are also various local varieties of apples differing in varying degrees depending on their ripening time, which usually starts from mid-July till the onset of autumn. In Murtazabad, the proportion of apple trees to other fruit trees is almost 15 percent, this also includes newly introduced foreign varieties by various development projects. Whereas, peach and pear trees are relatively lower in number as compared to other fruit trees. Walnut and almonds are also found in sufficient number, as per researcher's observation almost each *Gishi* has at least three to four walnut trees, whereas the proportion of almonds is relatively large.

In the past wine yards of Hunza were famous throughout the region of Gilgit-Baltistan. It has been stated by the respondents that apart from their usage as a fresh fruit, grapes were largely produced to make red wine which is also famously referred to as: "The Hunza Water." The data from the fieldwork suggests that hardly a few wine yards exist in the village now. The reasons of which are the restrictions imposed by the Government of Pakistan after the demolition of princely state and the increasing emphasis on alcohol as a sign of religious and moral degradation. Traditionally, grapes were also preserved using local techniques to consume them in winter and spring. One of the respondent said that, "on first June 1989 my elder brother passed away, on his third day ritual my mother presented fresh grapes of last season to the guests who came to pay their condolences."

## **5.6 Animal Husbandry**

Domestication of animals has remained an integral element of agro-pastoral societies. Apart from their high nutritious value, these animals were domesticated to get various other benefits, like use of farm manure for cultivation of crops, making shoes and clothing



from their skin, and other by products like ropes and traditional carpets from their wool. Owing to their high economic value, in past, the practice of slaughtering domestic animals was discouraged unless it is done on a special purpose or on a specific event like religious ritual or traditional custom of *Nasalo*. It is a local practice throughout Hunza that, the domestic animals kept to be consumed on these events are given more importance. *Nasalo* is fed with cereal crops to get higher amount of fat and meat, which is discussed in an earlier paragraph. While the one kept to be slaughtered on Qurban Eid and other such occasions locally called as *Dawati*, is considered as sacred, as it is offered to the God as a symbol of reverence. Keeping in view the scarcity of resources to feed their livestock the locals have developed a set pattern for herding the cattle with an utmost level of management.

Pastures are in abundance throughout Hunza. The greatest portion of which is located in Hassanabad Nullah; *Shishper*, *Charsu* and *Broung Tair* which are communally owned by different tribes. In summers these pastures are used as grazing grounds by the tribesmen of Aliabad, Hassanabad, and Murtazabad. Traditionally, by the first week of May sheep and goats are taken to the pastures, whereas, cows and oxen are taken a month later. Because, by the first week of May the grass in the pastures grows very little that can only satiate the need of small animals. At least two shepherds for each pasture are allocated to look after these animals and to milk them. As per tradition there is a set rule pertaining to the share of dairy products that shepherds are collecting throughout the period of their stay at the pastures. For each milking goat one kilogram of butter is given to the owner after their return, whereas, remaining portion is kept by the shepherd. Although milking cows are rarely taken to the pastures, but if a cow gives birth after being taken there, the owner is immediately informed, which he then takes it down.

All the animals are taken down from the pastures by the last week of September. After being brought back they are fed on irrigated meadows to stock the alfalfa for winters. As a customary law, by the second week of October, after the harvest cattle should usually be set free in the village fields to graze the crop offcuts up until February. This practice of free grazing is locally called *Heting* (which means free lands in *Burushaski*). The practice of *Heting* is no more encouraged throughout Hunza. Owing to high demand in down country

markets, almost all of the fields are now planted with cherry trees, which are prone to be eaten or damaged by free grazing cattle. As narrated by one of the respondent,

Now we have a lot of cherry trees in our fields, so the village committee has put a ban on this practice. We initiated this practice of banning the free grazing animals after observing the people of other villages earning more income from selling of cherries. Because, goats usually eat new cherry plants, whereas other animals like sheep cause damage to tree trunks by rubbing their horns against them. (Respondents Narrative)

By the onset of winters, when all the vegetation in the village fields withers away, the animals are fed on the range lands, which are mostly abundant in wild herbs locally known as, *Moing*, *Chharey*, *Sapanz*. According to locals they are highly nutritious and also have medicinal properties. As per customary practice, villagers were only allowed to graze their animals on these herbs but they were not allowed to take these herbs to home. One of the respondent Ms. Sahib Numa stated that,

Once, I was taking my livestock to these range lands for grazing, I collected few of these bushes in my basket for one of my goat which was at home. On my way back one of village elder stopped me and inspected the basket. After finding the herbs he taunted me by saying, what other animals will eat if you will take them to your home as well. (Respondents Narrative)

According to the older respondents, in early days on average each household used to have more than 30 domestic animals usually goats, sheep, cows, and oxen. As these animals apart from being a source of nutrition were also domesticated to get organic manure for croplands along with other by products like wool which was used to make ropes, winter clothes like gabardines and traditional carpets called *Sharma*. According to one of the respondent Mr. Khan, “the households that had little number of cattle, the women of those households had their back skins scratches, as they had to carry sand on their backs to the fields from far away in order to increase soil fertility.” As the high level of fertility is directly proportional to high yields, organic manure was of higher importance for locals. As stated by another respondent, “on our way back home after herding the cattle in rangelands and meadows we used to collect dried out dung of animals to spread it in the

fields.” The practice of husbandry is getting out of practice, as most of the village people and children are either busy doing jobs or studying to secure their future, so it is hard for a household to find a free person to take care of its domestic animals. According to Mr. Ehsan,

Comparative to early days, we do little hard work, we do little harvesting and horticultural activities. Reason being, earlier, there was no concept of giving education to children, now everyone has got quality education. At that time, when a child was getting into the age of herding the parents used to get relax. Now it is finished! Now a person only gets satisfied when his child gets a master’s degree. Now our activities are education and rest of the time is given to health related issues as there are a lot of new diseases. Which is why we bother least about land and animal husbandry, so automatically we have gone away from such practices, resultantly getting little yield from our lands. Even I have two daughters-in-laws, whom I have sent for higher education. Else in early days when someone was bringing in a wife, she has been taught to herd the cattle and other house chores. (Respondents Narrative)

Nowadays, almost each household preferably has only one cow for milking purpose. And usually it is the responsibility of the women to take care of it. As per data statistics, more than 45 percent of households have got only one cow, whereas, only 15 percent of households have got more than 4 cattle and a cow, usually looked after by household head or his wife, who have spent their life in farming. After cows, preference is given to goats for its milk and also for meat in winters, sheep are hardly being kept, as according to locals it gives little milk, and also the local tradition of making woolen products has got out of practice, due to advent of markets where everything is available.

The value of organic manure is taken over by synthetic urea introduced in the market in early 1970’s, which apart from its easy availability requires little labor and gives high yields. Adding to this, the youth have also shifted their occupational orientation towards service industry and business. Traditional practices pertaining to farming are no more in fashion among the local youth. The practices pertaining to farming are mostly done by Balti labors, who do it on daily wage of 1000 PKR. During the early spring season of 2020 there were 17 Balti laborers working in the village, who were working on daily wage of

1000 PKR. According to them, they hardly get a day off from work, as they have to take turns working in the fields of all village people. Reason being the shortage of young people in the village. Those who are old cannot carry out the burdensome work of agriculture anymore. According to an old age respondent,

Earlier it was necessary for the people to rear livestock. Each household had at least 30 cattle. They were giving them enough organic manure to fertile their lands. Now people have hardly one cow or two. All got busy in their jobs and studies, they don't have enough time to look after them. Earlier there used to be hundreds of cattle in the pastures, now you hardly find very few of them (Respondents Narrative).

## **5.7 Development Interventions and Changing Farming Practices.**

According to a respondent, “after the first visit of Aga Khan in 1960, all the issues gradually started to vanish.” His religious affiliation aside it is imperative to look critically into the development initiatives which took place after the arrival of AKDN (Aga Khan Development Network). In this regard, it is also important to keep in mind the two major developments that took place within the same decade, i.e. the advent of KKH (Karakoram Highway) in 1978 and demolition of princely state of Hunza in 1973.

Aga Khan Development Network (AKDN) is actively working in the area for the last five decades with its primary aim being the reduction of poverty. Among its various initiatives Aga Khan Rural Development Program (AKRSP) remained in the limelight for development practitioners. Initially, the aim of AKRSP was to enhance the local production via introducing new varieties of high yielding crops and fruit trees, giving financial and technical support in building micro infrastructures like new water channels and widening existing ones, and establishing Village Organizations/VO's as a participatory development practice.

Although foreign varieties of cereal crops were long being introduced by the British colonial administration to meet the nutrition demand of their troops in 1925, and later on by the government of Pakistan under the Green Pakistan revolution (Husain, 1992, p. 275; kreutzmann, 2006, pp. 335-336). These initiatives didn't penetrate into side areas due to

lack of proper roads, but by the time when AKRSP started its activities in 1984 the KKH was already established. To fully exploit the agricultural and horticultural potential of the area, based on the recommendations of agricultural experts, it has disseminated various high yielding species of cereal crops, potatoes, and fruit trees especially apple and cherries (Spies, High Mountain Farming and Changing Socionatures, 2019, p. 205). In this regard, two nurseries in Murtazabad were established on the land of village headman Abdul Latif. In these nurseries foreign varieties of apple and cherries were introduced along with some other varieties of pear and peach. While referring to sixth annual report of AKRSP Spies states that, it has distributed 49000 tree plants of apple, and 1800 cherry trees across the Gilgit region, which includes Gilgit, Nagar and Hunza. Over the year, AKRSP has further disseminated the imported varieties of fruit trees. As a part of project initiative, local farmers from all over the region were also trained in orchard management like equipping them with new grafting techniques. The farmers were also sent to urban markets of Rawalpindi and Lahore to build linkages with the down country. By the mid of 1990's people who had planted new fruit tree species started to earn high profits from their sales (Spies, High Mountain Farming and Changing Socionatures, 2019, pp. 205-206). By observing the high profit margins, the other locals who initially resisted the plantation of new species began to plant the foreign varieties of apple and cherry trees as well. One of the respondents stated that,

When we saw other people getting high profits from the sale of cherries, we also imitated our fellow farmers. Now you will not see a single Harkish area without a cherry tree, people have turned every area into orchard (Respondents Narrative).

It becomes evident after comparing a picture of village fields taken in 1980's with a recent one, anyone can easily point out the higher number of trees in the fields, which can hardly be seen in earlier pictures of the village. The rapid expansion of markets after the advent of KKH further encouraged the people to cultivate more profitable items.

As per data readings, on average each household in the village was getting 6 to 7 Munds of wheat each year from their fields, whereas, by selling cherries they earned enough money to get the same amount of flour in less than half of the money they had earned from cherry business. Along with its high profitability, orchard management is less laborious than crop cultivation, which requires continuous labor work. These factors lead to the transformation

of fields into orchards. The initiation of new agricultural trends also leads to the adaption of new practices, which in turn effected the previous agrarian dynamics. As mentioned above, animal husbandry is an integral part of agricultural practice as it provides farm manure to increase the soil fertility. The use of synthetic urea instead of farm manure was promoted by AKRSP to boost the production of new species (AKRSP, 1989, p. 50). This new practice was further complemented by the advent of new market system after the construction of roads which connected the whole region with down country Pakistan. According to Hussain (1992, p. 275), the synthetic urea was introduced in Gilgit in 1960's but owing to its higher cost of transportation it became economically feasible only after the construction of KKH. This new practice of using synthetic urea has significantly affected the value of livestock and farm practices. During the field observation it has been noted that, most of households have got one or two cattle usually a cow, to get the dairy products like butter, which is available in market for 2000 PKR per Kg. Even, this practice of having one or two cattle is discouraged by young and educated house wives, who prefer to buy it from the market. According to the sales report of the grocery stores available in the village, the worth of monthly sales pertaining to dairy products are around 500000 PKR.

Another factor which popped out during the field work was shortage of labor to perform agrarian practices. It was observed during the field work that there are five different groups of Balti laborers working on daily wages in Murtazabad. In each group there are 3 to 4 men, who are working on a wage rate of 1000 rupees per day. The tasks usually carried out by Balti laborers are extracting farm manure, ploughing the small fields for kitchen gardens, cutting alfalfa for animals and other related activities. Apart from this, there are very few retired local men who get themselves entertained working in their fields.

As per findings the shortage of labor is directly linked with the attainment of education. Although, schooling system was started long ago in Hunza, when the first Diamond Jubilee Schools were established in 1945 under the direct instructions of Aga Khan 3<sup>rd</sup>. Whereas, this trend further boomed after the demolishing of Hunza state. Before 1974 there was only one middle school in Karimabad Hunza, which is 13 Kilometers away from the village. One of the respondents said that,

We use to go to Karimabad school bare feet, which was two hours' journey on each side. We had to woke up early in the morning before the dawn to start our journey.

We had no clocks to check the time. Many times it used to happen that we mistook the time and reached school even before the dawn. (Respondents Narrative)

After the devolution of state and construction of KKH, a new trend of getting higher education from the institutions of down country started. Before the demolition of state only the children of elite families were allowed by the Mir of Hunza to get higher education. Even, people had to ask permission from the Mir to go out of Hunza. This trend of getting higher education further increased, when young graduates after returning to home started to get jobs in public and private sector organizations. As stated by a respondent,

Now everyone is doing job and earning enough to satiate his/her needs, which is why both boys and girls don't go for farming practices. From farming I can only earn few Munds of wheat and some fruit, whereas, a person doing job can easily get all these things from market. (Respondents Narrative)

This new trend lead to the shortage of labor force for crop farming which required extensive labor work and time. Owing to the shortage of labor, farmers have shifted their preference from crop farming to orchard management, which is more profitable and requires little labor work. As one of the respondent stated that,

You only need to irrigate the field if you grow fruit trees, whereas for cereal crops there are a lot other things which requires constant labor throughout the year. Apart from this, growing fruit trees is more profitable than crop production. (Respondents Narrative)

The data taken from local cherry dealers who are selling the cherries in down country market after buying from local orchards, the average sale of cherries of one year is three crore PKR. Apart from cherries, dried apricots and apples are also being sold but they have comparatively lower sales volume.

Owing to these factors, most of the youth are either doing business in nearby town of Aliabad or migrated to other cities in search of a better future after completing their education. All over the village hardly young people can be seen during day time. Usually one or two person from each house have migrated to different cities, who visit the village once in a year, especially in summers. So, these people hardly know about traditional

practices and previous village dynamics. Although the physical geography of the village is still the same as it used to be, but much has changed in its social fabric, which has direct bearing on the surrounding environment.

Figure 3: A Balti Labourer spreading organic fertilizer in a cherry orchard



(Source, Author, 2020)

Figure 4: A village lady sharing her bread with her favourite goat “Serio”



(Source, Author, 2020)



Figure 5: An abandoned threshing machine on road side showing zero utility.



(Source: Author)

Figure 6: A young boy grafting foreign varieties of cherry in his field



(Source: Author)

Figure 7: A village lady carrying sea buck thorn bushes in her basket to use them as firewood



(Source, Author, 2020)

Figure 8: Newly grown cherry trees in village fields



(Source, Author, 2020)

## 6. LOCAL NARRATIVES OF CLIMATE CHANGE AND ITS VARIOUS MANIFESTIONS

### 6.1 Perception of Climate Change and Local Categories of Knowledge

Most of the respondents irrespective of age, gender and profession have shown in their stance that, they have observed various effects of climate change. Although it is imperative to note here that, in local language there is no word for the term “Climate”, due to which the researcher has to operationalize the concepts to make the respondents understand the questions with more clarity. Thus, the questions asked from the respondents were about observed changes in the timings of blossom and ripening of fruits, changing patterns of snow and rainfalls, glacial melting rates, surging of glaciers, year round temperature changes in different seasons, and other sub questions for relevant data collection.

Apart from perceived changes, it is also important to understand the local concepts and knowledge categories to comprehend the emic perspectives pertaining to climate change, that how locals make sense of various environmental and ecological phenomena. In this regard, the data collected during the field work shows that, the locals have created rich knowledge categories around the various phenomena pertaining to the geographical, agro ecological and climatological conditions.

#### 6.1.1 Making Sense of Climate

In local language (Burushaski) there is no vocabulary for the terms “Climate” and “Weather”. In order to make sense of variability in weather and climate patterns locals instead play between the binary opposites of *Chagurum* and *Garurum* i.e. “Cold” and “Hot”. It has been further explored during the research that the binary opposites of *Chagurum* and *Garurum* are not the only categories that explains the temperature change, rather each binary opposite is further sub-categorized into smaller yet more pronounced categories. For the locals the term *Chagurum* is the general category of Cold. The local epistemologies show that, the locals can easily differentiate between varieties of “Colds”. Although it sounds less appropriate to write the term “Colds” on the basis of alien semantics and scientific episteme. But in order to comprehend the emic perspectives and

local knowledge categories it seems more appropriate to write “Colds”. Thus treating the term Cold as a single category may lose the essence of emic perspective and it will wither out the purpose of this research.

The data collected during the fieldwork suggests that changes in climatic conditions over the years, and short term weather variability are seen in terms of their effects on agriculture, horticulture, and other livelihood routines. The variability in weather and prevailing climatic conditions are assessed using temperature sensitive proxy indicators. For instance, for local people the persistent sunny days and warmer climate after the onset of spring is indicative of a good year. One of the respondent Mr. Mazhar stated that, *we call it a good year, if it happens to have persistent sunny days after the onset of blossom season*. Frequent sunny days in early spring and upcoming months is important for two reasons. Firstly, it helps in prolongation of the cropping season by expediting the maturing of crops and other plants. Secondly, the availability of glacial melt water in the streams for irrigation and drinking purpose is bolstered by the temperature increase in spring season.

In an area classified as cold desert zone, where irrigation is totally dependent on glacial meltwater, the rise in temperature after the onset of spring matters a lot for the local people. As the temperature starts to increase in early spring the months long cessation of agrarian activities starts to resume. The salience of warm weather after the onset of spring can be estimated by harsh winters that have just passed, during which the barometer remains below zero degree freezing all kind of livelihood routines. One of the interviewee Ms. Sahib Numa while explaining the winter idleness stated that, *Spit on these winters, neither we can do anything, nor we can get relax even, all the time you have to sit redundant near fire*. Although, the agricultural activities remain suspended during the winters, but locals have a nuanced understanding of each season in terms of its effects on upcoming seasonal agriculture. As narrated by a respondent, *Cold weather is also important, if it didn't happen enough cold in winters than their will be no snow on mountains neither there will be any glacier, so how we can't irrigate our lands*.

### **6.1.2 Local categorization of Cold**

The data suggests that, the harsh climatic conditions, with little glacial irrigation water possible only after the melting of snow in late April, and low land holding hardly favorable

for agriculture as discussed in the previous chapter, has made local people highly conscious about the importance of every season around the year. In order to understand the shifts in environmental conditions where even a minute variation may have bigger consequences especially in terms of food security, the locals have developed rich knowledge categories. In this regard temperature change is most efficient indicator to predict any upcoming situation. Although the weather forecast is a recent facility of scientific inventions, but for the people who lived here centuries ago, had their own ways to calculate the temperature change. As I have previously discussed that there are multiple categories of Cold, it is these cultural nuances which worked as the tools for understanding different temperatures. As it has been noted during the field work that there are three variations of Cold in terms on their effects on agricultural activities. These categories are; *Chagurum*, *Barch*, and *Khoos*.

***Chagurum*** in local language is general category of cold i.e. any degree of low temperature which can be felt in any season. People in their daily parlance most often use the word *Chagurum* to describe the cold or low temperature, whereas it is also used to define winter times, which they call it *Chaguruming*.

***Barch*** is another category of Cold which is used to define the effect of extreme cold weather on vegetation in late autumn. *Barch* according to the local people falls from the sky when it gets too cold at the end of autumn season and the leaves on the tree gets frosted by extreme cold. As per respondent's narratives it signals the start of winter cycle. Symbolically it is also used to define a cold place which gets unbearable. Mostly this category is used in terms of its effects on agricultural grown and fruits in late Autumn.

***Khoos*** according to locals is a condition of cold formed due to lack of sunlight in any specific location. This category according to few of the respondents is similar to general category of Cold/*Chagurum*. The difference identified by the respondents between the two categories is that, *Khoos* is spatially limited to specific locations with zero sunlight, unlike its general category which remains persistent throughout a village or area. Further data pertaining to this category has shown that it is possible to for the *Khoos to exist* in any specific location where rest of the area has moderate temperature. The locals also use this category as an apparatus to understand why the fruit, vegetables, and crops don't grow on time or get effected in specific areas. So, based on the prevalent condition of *Khoos* in

certain areas they also priorities the time of ploughing for specific regions i.e. a bit earlier. When a farmer was asked to differentiate it from general category of Cold/Chagurum, he explained that, Khoos exists in shadowy places. There are different Colds, like one which is cold air, which makes us feel good it is not Khoos. It causes trees and plants to grow at slower pace or the fruit don't ripe properly in those locations. It also happens to exist even in spring and summers.

### 6.1.3 Local categorization of Ice

The locals have developed detailed understanding about frozen water bodies. The translations of data show that, people predict the onset of winters and intensity of cold weather using the natural phenomenon of frosting. Based on the hardness, density and color of ice the locals can easily differentiate between three different types of ice namely *Xeeli*, *Burum Gamu*, and *Shiqam Gamu*. **Gamu** in burushaski language is general category of ice.

Based on the local categories of knowledge *Xeili* refers to thin layer of ice crystals which forms on the top of water bodies usually in the start of November. Thus, the formation of *Xeili* is taken as the sign of starting of winters. As locals state it like, *The Xeeli has formed, thus winters have arrived.*

The second type of ice is called *Burum Gamu*, **Burum** in local language is the word for white color. This type of ice according to local inhabitants has harder density, and also referred to as fresh ice of the season. According to local traditions, this type of ice easily melts after few sunny days, and it is dangerous to walk over pounds with Burum Gamu, as it can break easily.

The last in this category is that of *Shiqam Gamu*, **Shiqam** in burushaski language is the word for Green color. So the green ice/Shiqam Gamu according to locals has more density than any other type. Sometimes it is also referred as old ice which is most often found in the inner most layers of glaciers after pilling up there for years. It is not necessary that this type is found only in old glacial reservoirs. The old age respondents above 60 years have narrated that, on communal pools there use to form green ice with a layered thickness of more than one feet. According to a respondent who was in his 70's while narrating his

childhood memories stated that, *we use to go to communal pounds to fetch water as we didn't have any tap water. There we use to skate on ice, whereas women and girls of the village also use to play a traditional game-tola on it.*

Based on the formation of ice and its density, locals predict the temperature decrease during the winters.

### **6.3 Anecdotes about Glacial Formation and Surges**

The respondents have shared various narratives pertaining to glacial formation, characteristics and reasons for its surge. According to the historical narratives, Shishper glacier came into being due to negligence of early dwellers, who were settled in the same area where the glacial mass is situated now. As stated by a respondent Mr. Hamiya,

In the beginning there was a tribe called *Diram Thapkiyancz* during their reign there was no glacier in the Hassanabad Nullah, rather those areas were their summer settlements. Above those settlements called *Khaubul* there is a mountain, on which there use to have snow in winters. By the start of summers there use to remain little snow equal to the height of traditional bucket. So, the tribes' men of *Diram Thapkiyancz* before initiating their agrarian practices in their summer settlements use to clean the remaining snow on the top of the mountain to avoid the chances of any untoward incident. After their massacre by another tribe no one took care of the snow on the mountain top. Over the time it kept on increasing and gradually started to falling in the Shishper Nullah ravine. This perpetual phenomenon over the time formed the Shishper glacier. (Respondents Narrative)

The estimations and years long observation of the locals pertaining to reduction and increase in their size shows a complex picture, which at times also contradicts the scientific readings of global deglaciation due to climate change (WGMS, 2020, updated and earlier reports). The views held by local people have strong religious connotations for glacial retreat and surge. Out of total responses collected during the research, 60 percent of the respondents attribute the glacial movements to the will of God. As the following response of a participant demonstrates,

Few years back there was a news that all the glaciers will melt away and the life will not be possible. Now look at this year snow and glacier expansion in Hassanabad Nullah, they were wrong and it was a wild guess. Listen! God has said this in Quran that, till dooms day He will be responsible for the food of all humans. So how is it possible that water sources will dry out. (Respondent's Narrative)

For the locals, the glacial surge is not a new phenomenon, there are local narratives regarding glacial movements. These narrations are handed down through inter-generational transmission from the elders who have witnessed such events in their lives. According to a famous local narrative, the Shishper glacier was extended up to Shayar village of Nagar district, which is across the Hunza river and on a distance of almost 7.5 kilometers (Google., n.d.) from its current position. As stated by Mr. Ameer Mehdi,

One of their forefather was serving in the court of Mir of Hunza and used to have frequent visits to Kashgar which is located in Xinjiang province of China. During one of his visits he met an old lady, who was married off there long ago when she was a young girl. While talking to her countrymen she also asked him about the Shishper glacier of Hassanaabad Nullah. There she told them that before her marriage the tongue of the glacier was embedded in Shayar village, they had to cross the glacier by walking over it in order to travel to different areas. (Respondent's Narrative)

According to another version of the same narrative, the pilgrims from China while travelling through Hunza used to cross the Hassanabad Nullah glacier, which at that time was connected with the Shayar village. Adding to this narrative, few of the FGD respondents also mentioned that, some of the mounds in the village are formed by the glacier surges. Substantiating their argument further, they stated that, at that time the course of glacial melt water was traversing from the village center, the sedimentation remains are still found under the upper layers of soil. Derbyshire and Fort while explaining the glaciation processes and formation of lands in Kanjut valley (Hunza-Nagar) state that, glacial erosions have formed the valleys, altered the shape of mountain ridges, repositioned debris on which some of the villages are located currently (Derbyshire & Fort, 2006, p. 85).



There is a widely known glacier grafting technique all over the Karakoram and Himalayas. This centuries old technique of grafting glaciers is meant to facilitate the areas which have no direct access to natural glaciers. According to locals, like humans and other living things glaciers are also classified in to male and female categories, those glaciers with debris and rocks on their beds which apparently look darker are identified as male. Whereas, the white and clean glaciers are supposed to be female. As per local narratives, if 35 kg of ice from each glacier is put together in a dry ravine, they will start to breed in a decade, resultantly expanding the size of glacier, and will start to feed villages from its melt water. This technique is also used by AKRSP in various areas of Gilgit-Baltistan with 80 percent of success rate (Faraz, 2020).

Based on the sexual representation of glaciers, a comparatively larger number of respondents (45%) have stated that, Shishper glacier surges to mate with Muchuher glacier after every three or four decade and then retreats back. Although there is no consensus on the exact sex category of any of the glacier. Owing to prevalent masculine social structures and value system both tribes *Diramiting and Burong* have their own claims of their glacier being the male one, because the color of both glaciers is darker.

From a structural point of view, one thing is common in all narratives, for any of the aforementioned reasons the glaciers kept on surging in the past times as well. But it is clear within these narratives that the amount of glacial surge has decreased, which shows considerable decrease in the size of glaciers over the centuries. As most of the respondents who were denying the cause of glacial surge being the climate change have explained it that, the movement of glaciers is a sign of increase in its quantity rather than being melting or breaking of ice due to warmer climate. As narrated by an interviewee,

When there happens to have heavy snowfall in winters, the frozen snow over the time keeps on accumulating on the mountains above the glaciers, these snow gradually falls on glaciers in the form of avalanches, which in turn increases the pressure on glacial bodies thus making it to move forward. The breaking of ice due to this pressure can easily be heard in pastures, it moves forward with huge and loud sounds.

Although, there this claim may have some reality, but keeping in mind the historical narrative of stretching of Shishper glacier down to Shayar village, no such surges are recorded at least in near past. The narratives regarding the Shishper glacier which feeds the village fields, shows no substantial decrease. Whereas, when the respondents were asked about the glacier located in the Faker Nagar across the Hunza river, they stated a substantial decrease in their size, and also reported decrease in snowfall on the mountain top above the Faker. Specs (2019, pp. 299-301), has also mentioned similar responses from the respondents of Faker village.

Responding to the events of recent past, especially before and soon after the advent of KKH, few of the old respondents also pointed at dry ravines on the *Chikas* mountain situated between Murtazabad and Nasirabad, where glacial avalanches used to surge and block the road, but the respondents below the age of 50 years had no such memory.

Amid the variety of responses, it becomes difficult to situate the perception of locals pertaining to effects of climate change on glaciers. But a structural analysis of these narratives shows a significant decrease in glaciers size, as already pointed in the previous paragraph.

## **6.4 Changing Snowfall Patterns**

The exploration of climate change perception among the local people become more interesting when despite their negation of deglaciation supports other related effects of climate change. Changes in snowfall was the more recurring answer when asked about the climate change. The answers given by all respondents were persistent in this regard. All of the respondents stated a considerable decrease in snowfall over the period of last three decades.

Before proceeding further, it is much imperative to note that the current winters<sup>3</sup> had the highest snowfall of last three decades, during which this data is collected. According to personal measurements of the researcher there was 12 inch of snow cover formed by a single snow spell, but according to the readings of local metrological station it was 14

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<sup>3</sup> The data is collected from November 2019 to March 2020.

inches. Along with this, it was also observed that a single snow spell remained for 48 hours without any pause. The current year snowfall was the very bench mark which almost all of the old age respondents referred to, in order to compare it with the early days. The most recurring statements were *Yar key akhilatey giyachichum*, which means, it also happened to snowfall like this in early days.

It is also noted during the discussions held with old age respondents that, they make a distinction between recent years snow and earlier ones. The distinction was made on the basis of consistency in snow spell and composition of snow. For them, earlier there was a set pattern in snow spells, where it used to snowfall for few inches i.e. 3 to 4 inches each week or after every second week throughout the months of January and December. It was also pointed that, there used to be no abrupt and persistent snow spells for longer time, like the one they have seen in the current year snowfall. As mentioned by a respondent,

Each time there happens to fall a few inches of snow from the second or third week of December usually. The first snow after settled on the ground were later being added by another layer of snow from second spell within the time of two weeks. This pattern of snowfall used to remain persistent till the end of January. Thus by making a layer of snow above a feet or more. We have never seen a perpetual snowfall which remained for two days. This is something very different.

Another major distinction was made on the basis of the quality and composition of snow. For them the current snow was like little granules, with no cohesion between the particles. While making a comparison they were symbolizing the old snow with the palm of their hands, called *Dapaing* in Burushaski, which means woolen wadding. As narrated by one of the respondent,

These snow are like sugar grains, if you scratch the outer layer you will find grains inside, they don't stick at all, causing the snowballs to break after two or three rolls. Although this year there is a lot of snow but it is powerless, it will melt after few sunny days in February. I told you they are sugar grains. In early days there used to be snow in shady places till the Novroz, I used to get it for my grandmother from Qier area.

Traditionally throughout the Hunza people make wooden roofs which is topped with different layers of mud and dry grass. As this vernacular architecture provides necessary insulation during the cold winters. Owing to the structural composition of these roofs, it is a common practice that people usually clean their roof tops by making snowballs after every snow spell. This practice protects them from water seepages caused by melting of snow on the roofs. During the winters this method of cleaning snow from the roofs was hardly observed by the researcher. Apart from this, throughout the village there was only single group of children who were rolling the snow on the road side to make snowballs, but they were hardly able to make one with the diameter less than one feet. Another reason for putting this practice of making snowballs into oblivion may be lack of proper snowfall for decades. As these cultural practices are transmitted inter-generationally through personal involvement of upcoming generations in it. Along with this, another major prediction by old age respondents pertaining to power of snow remained correct. As the snow in all areas of the village melted away by the third week of February. Apart from lack of power in the new snow to remain for longer period of time, few of the respondents also mentioned the abrupt increase in the temperatures soon after the onset of February which causes faster melting of snow.

The highly tuned perception of local people pertaining to variations in snowfall patterns, is directly related to its higher importance in upcoming agricultural season. According to (Vedwan & Rhoades, 2002, p.113) Snowfall can be a good indicator among the local populace to indicate the perceived climate change, because of its higher relevance for agrarian practices in upcoming spring season. According to the narrations collected from the respondents, the timely and sufficient snowfall in winters is also important for soil fertility. Because the melt water from snow over the agricultural fields helps to regain the moisture till the start of new year irrigation, which in early days was only possible by the start of April. As mentioned by a respondent, Timely snowfall in winters has equal importance for the land fertility as spreading organic farm manure in spring season.

One of the reason highlighted by the respondents about the decrease in snowfall was the building of Karakorum Highway in 1978. Elder respondents emphasized that they have observed the gradual decrease in snowfall since the advent of KKH, except the current year. As it paved the path for carbon emission technologies like vehicles, generators, and

also electricity. According to a respondent Mr. Ehsan, *in early days there was nothing like carbon emission of vehicles. Now we use to buy gas from outside for heating and cooking, also via using electricity people ignited heaters, and started their warehouses/workshops.* While few of the interviewees, also stated that, the weather is unpredictable with its own ways, we can't trace its exact course of action. As defined by a respondent, *the weather is much like a madman, sometimes it will get distress and sometimes it will calm down. You don't know where and when it will change. It is like this since the beginning.*

## **6.5 Effects of Climate Change on Agriculture**

The questions asked about the effects of climate change observed on the agriculture had variety of responses, with a considerable congruency in answers respective to their age and occupation of the respondents.

Responding to the question of climate change effects on agricultural grown most of the farmers stated that they are observing various effects of climate change on crops and vegetables. It is imperative to note here that, during the field work the researcher has seen very few of the fields spared for the production of cereal crops. There are only few fields in Murtazabad Bala where very small number of farmers still grow wheat and sometimes corn, else all of the fields are now filled with cherry trees, reason for which is already discussed in the previous chapter.

One of the major perceived changes as addressed by the farmers was prolongation in harvesting seasons due to increase in temperatures. According to the respondents, the increase in temperature and fewer snow spells in winters have made the earlier start of agrarian activities possible, thereby shifting the harvesting activity to an earlier time. This in turn has resulted in the prolongation of the second season crops. Talking about the prolongation in agrarian calendar and fast maturing of crops a respondent stated that,

When I was a high school student in Gilgit I used to get envied from the growth period of crops and trees, as there the period of growth is almost six months, whereas in our area it was hardly few months. Trees used to grow like junipers in the high pastures, with a slower growth rate. But now the growth period is prolonged for a month or more, like that of Gilgit.

As Murtazabad is located in an intermediary zone where double cropping is partially possible only if the early ripening local variety of buckwheat and corn are sown as second crops. What Spies has said about Nagar District is also true for Murtazabad as both villages lie across the Hunza river on a relatively same altitude. But unlike Nagar, where most of the farmers still grow buckwheat and maize, in Murtazabad, the farmers hardly grow any second season crops. Assuming the possibility of second season crops, one of the farmer has said that, *we can easily grow maize as a second crop, but people don't give much time to farming.*

Another perceived indicator of temperature increase as reported by most of the older farmers was changes that have occurred in the autumnal ploughing season, locally called Gurganey Harkiching. As mentioned in the previous chapter, in old days' people used to plough their fields by the last week of October. Because moisture in the fields used to freeze with the onset of November, making it almost impossible for the wooden blades attached with the oxen to plough the land. Nowadays this phenomenon of moisture frosting is hardly observed by the locals. In contrast to these narratives few of the respondents also reported lower yields and wilting of cereal crops. As one of the farmer mentioned that, *last year I had sown wheat in my fields after the first irrigation in the month of April I went to Gilgit, when I came back after a week I found that all of my crops were wilted due to some uncertain reasons.* Without knowing a scientific reason to back this claim up, it seems inappropriate to merge the issue of crop wilting with that of climate change.

Climate change was not the sole reason given by the respondents about the earlier growth of crops and high yields. Most of the respondents also blamed the excessive use of synthetic urea, which was introduced in the area in 1980's. This according to locals, has expedited the growth process and also helped the farmers to get high yields from their little lands, as discussed in the previous chapter. Along with this, few of the respondents also mentioned the side effects of using synthetic urea in the form of land degradation and hazardous effects on humans, as narrated by a respondent, *the use of synthetic urea has grown cancer in our lands causing the crops to wilt and droop. People hardly use farm manure as no one is ready to do painstaking job of spilling organic fertilizer after extracting them from cattle shed.* This causal factor sufficiently addresses the issue of crop wilting and drooping, which is otherwise perceived as an effect of climate change. Here it

is also important to look at other factors which may have caused the earlier growth of crops and prolongation of agricultural activities.

In this regard, it is important to point out the changes that have occurred in the agrarian dynamics after the development initiatives started by AKRSP and various other agencies which introduced new semi-dwarf varieties of early ripening crops after 1960's. This has resulted in the extinction of old varieties of crops like, wheat, barley, buckwheat, corn, millet, and sorghum. The new varieties of crops according to local farmers cannot survive on organic farm manure. As reported by Whiteman, The new varieties of crops although give higher yields but are not fully adopted to the local conditions (Whiteman, 1985). In line with these findings, it has also been indicated by the respondents that, the shift in cultivation patterns of cereal crops is directly linked with the introduction of new fruit varieties like, cherries which are introduced later in the area by AKRSP because of its high demand in down markets. The new fruit varieties require little labor time to look after and also have high profit margins. As explained by a respondent,

Earlier we use to get high yields from the cereal crops in our fields, but because of cherry plantation in the fields its productivity has decreased. In early days it was strictly prohibited to plant a single tree in their fields, because it syphons the energy and lefts nothing for crops to grow. The shadow of trees also hinders the sunlight to reach the ground, thus causing the crops to droop. Look these fields look more like orchards.

As mentioned in the beginning, hardly a few village fields are used for cultivation of cereal crops, owing to the higher demand of fruits, all the fields have been converted into orchards. Thus, factors such as, the introduction of new crop varieties, decreasing trend in agricultural practices especially in cultivation of cereal crops, use of synthetic urea, and shift from agriculture to arboriculture may apparently have played a big role in forging the perception of local people pertaining to the effects of climate change on agriculture. Although, a considerable change has occurred in the temperature over the last three decades (which can also be verified by the reading of local metrological station) but, unlike what spies says about Nagar, it will only be an assumption in the case of Murtazabad. Because, here the harvesting of cereal crops account for very small substrata of all agrarian practices in the village. According to elders of the village it is still possible to harvest

cereal crops but no one is free to do the burdensome job of farming. One of my respondent stated that,

In past our survival was dependent on these crops, but import of wheat and other products after the advent of KKH has made us dependent on market products. Now everyone has got education and striving to get an employment which in turn makes us careless to take care our lands.

Although, it is not possible to extricate the accurate effects of various factors contributing into changing agrarian dynamics, but it is important to consider two important factors as identified by the data, that are, adoption of new agrarian practices and introduction of new crop varieties for the changes sought in terms of high yields and faster maturing rate of crops, which otherwise considered by locals as manifestations of climate change.

## **6.6 Effects of Climate Change on Horticulture**

In order to know the effects of climate change on horticulture, the respondents were asked about the observed changes in blossoming of trees and ripening of fruits. In this regard, various responses were recorded with both negative and positive effects.

### **6.6.1 Variations in the blossom timing**

About 60 percent of the interviewees stated change in the blossoming time of fruit trees. Before proceeding it is important to know that, different fruit trees have different blossoming time. According to the locals, almond trees are the first to sprout, preceded by, peach, apricot, apple, pear and cherry trees respectively. Cherry trees are recently introduced in the area by AKRSP in late 1980's (AKRSP, 1989). So, the blossoming of cherry trees cannot be considered as a good indicator to make a comparison with earlier times.

Most of respondents have narrated that, by the time of Novroz festival on 21<sup>st</sup> of March, there used to have apricot blossom in early days. As mentioned by (Spies, 2019, p. 6) in his article on Nagar valley which lies across the Hunza river, The flowering of apricot trees was considered a meaningful indicator due to several reasons: (1) its high visual salience, (2) its proximity to the Nauroz festival celebration around March 21 which served as a



temporal reference during the interviews. Similar to what Spies has said about Nagar, District, a respondent while sharing her childhood memories said that, *on Novroz we used to swing on apricot trees to celebrate the arrival of new year, at that time apricot blossom reaches to its climax. The owners of the orchards kept scolding us that the swings on trees are shedding off the flowers grown on it.* This according to the respondents mostly elder people has delayed, whereas, few stated that it comes earlier now. Although, some of the elder respondents also mentioned that, in early days there too used to have variations in blossoming time, depending upon the frequent sunny days before the onset of spring season. As per researcher's observation during the field work, the first tree in the village was sprouted on 14<sup>th</sup> of March, it was an almond tree beside the KKH. But didn't see any single apricot tree sprouted even on 21<sup>st</sup> of March. The buds on apricot and cherry trees were not mature enough to sprout even after a week.

#### **6.6.2 Spatial and temporal variations in the ripening of fruits**

Mulberry is one of the favorite fruits of local people, which is also the first fruit to grow in new season. The high importance given to mulberry among the elder people is because of its ripening time when all other stocks of food got scarce, especially in those days when there was no market to buy things from outside. Which is why according to traditional law of Hunza, people were not allowed to plant trees in the fields with an exception for mulberry tree only. According to local knowledge, there is a coherence in the arrival of migratory bird Eurasian Hoopoe and ripening of mulberry i.e. between the last week of May and first week of June, which also predicts the onset of summers. This according to most of the elder respondents matures bit early, whereas, few of the respondents said that it has delayed. One of the respondent Mr. Hamiya while explaining the cause of delay stated that,

Nowadays the temperature after the spring do not increases gradually as they used to be in early times, rather there are abrupt changes in temperature. Like sometimes there will be cold till the end of April or even in May, and all of a sudden it will increase, thus causing changes in the ripening pattern of fruit trees.

Furthermore, the respondents also talked about spatial variations in maturing of fruit and crops across the Gilgit region. As narrated by a respondent, *When I was teaching I often*

*had official visits to Misgar valley. I still remember that, I used to count Apricots on the trees to make fun of locals. At that time, apricots hardly used to ripe by the end of August. But now one of my wife's sister who is married off there sends us fine quality dried apricots.* Similarly, the fruit dealers in the village also reported the ripening of different fruits in far flung areas of upper Hunza with an elevation of about 8000 feet above sea level, where it was not possible to grow any fruit in early days. These spatial variations must be treated with caution, as there are also other factors apart from climate change which can add into the pace of fruit growth, like introduction of foreign varieties, and use of chemical fertilizer.

### **6.6.3 Variations in rainfall patterns and its effects on fruit orchards**

The respondents, when asked about the observed changes in quality and production of fruit, most of them said that, due to untimely and persistent rainfall and increase in temperature in summers have most often effected the quality of various fruits, especially, peaches, apricots and apple. Along with this, cases of pest attacks and new diseases are also reported by the farmers. According to elder respondents, they are observing black and red dots on apricots from last ten years or more, which makes the fruit undesirable to eat or sell. As explained by a Ms. Hayati, *few years back there happened a lot of rainfall in spring season which destroyed all of our apricots, we couldn't be able to taste them at all.* While supporting her argument her husband who is a famous farmer but now paralyzed from last 4 years after falling from a tree stated that, *I kept on asking them to bring some apricots but there was nothing up on the trees as all were damaged by a heavy rain in late spring. They even didn't yield in the next year.*

Apart from apricots and cherries, peach trees are also in abundance throughout the village. Owing to their high taste and quality they are famous throughout the Hunza. But hardly these are available nowadays, as most of these trees don't bear fruit at all. According to most of the respondents, due a heavy and persistent rainfalls some years ago all of the peach trees are damaged. As reported by respondent, *earlier we had so much of peach, that we were not even able to consume them all, now hardly you will find any peach tree bearing fruit.* The most recurring reason explained by the respondents for sudden decrease in the quality and production of peach was untimely rainfall patterns. As narrated by Mr. Amir Hayat, *four to five years ago due to continuous rainfall for many days in the month of*

*April, it damaged all of the peach trees. Now, look at those rotten peaches on the tree, although they grow but get rots before ripening.*

The changing weather patterns in terms of heavy rain falls was not the sole reason given by the respondents for the decline in the production of peaches. There were also considerable number of responses, where locals have mentioned the excessive use of synthetic urea as a casual factor for decline in their production. Which according to them dries out the balanced fertility of the land feasible for traditional crops and trees. As explained by Mr. Mubarak Shah that, *the roots of peach tree are very delicate and can easily be damaged due to excessive use of synthetic urea, which are more powerful.* According to data statistics, peach production in the village didn't decline over the years, rather it happened abruptly in a single year. Thus, arguing on the basis of this record is seemingly less considerate to declare the use of synthetic urea a good reason for the decline in the production of peaches. According to the records of a local news agency, all of the Gilgit Baltistan has received heavy rainfall in the April, 2016 causing road blocks and landslides (Passutimes, 2016).

Like apricots, apple trees are also grown in abundance. In addition to local varieties some of the foreign species are later introduced in the area by AKRSP in 1980's (AKRSP, 1989). The newly introduced imported varieties are comparatively bigger in size with deeper hues of red and yellow as compared to indigenous ones. The ripening time of all varieties including imported ones is not same. Few of the indigenous species locally called *Mamu Balt* and *Shini Balt* use to ripe earlier in the months of July and early august, whereas, rest of the varieties start to ripe from the start of September. According to the translations of local records two things directly effects the quality and production of apples i.e. rainfall during blossom and hot weather in late summers. According to locals the color of apples grows reddish if it happens to rain in the month of August. The gradual fall in the temperature caused by rainfalls after the august supports the healthy growth of apples, which requires chills in temperature (Whiteman, 1985). Whereas, the decline in the quality of apple is reported due to delayed and persistent hot summers even after august. Few of the respondents also reported about the pest attacks, which requires regular spray of pesticides. On further probing it has been found that, the specific varieties of apple being attacked by pests were those introduced later in the area by various development

organizations. Although, the records of untimely rainfall in the month of April is already stated elsewhere, which also adversely effects the quality of apples and other fruits.

#### **6.4 Entomological and Ornithological Variations**

Apart from fruit trees, various accounts of pest attacks on non-fruit trees like poplar are reported by the farmers. These pests according to the respondents are new predators in the area, causing skin rashes when touched incidentally, possible case of Tent caterpillar. According to farmers they have started to show up from last ten years, which fed on poplar leaves. Along with this, it has also been reported that, earlier there used to be a lot of butterflies during spring season which can hardly be seen in the fields now. Apparently, there seems no connection of climate change with the introduction of new insect species or disappearance of existing ones. But, equally possible that, due to increase in the temperature these new insects have found feasible conditions for inhabiting in the new area, which otherwise was not possible. Likewise, making the existing habitat less feasible for older species. To not to be a part of discourse of climate change to find the answers in the same stream, it is important to look into other development matters which may be factors for the introduction of new species. In this regards, the excessive use of pesticides can be a major casual factor for diminishing of local insects. According to seventh annual review of AKRSP, it has started to distribute pesticides in all areas of intervention to the farmers on lower rates to enhance the production of crops and fruits (AKRSP, 1989).

Few of the hunters also mentioned the decrease in number of migratory birds, especially in the population of the house sparrows, locally called Hari Chin. According to the respondents there used be a lot of common sparrows in village fields during the harvest time, which can hardly be seen now. Along with this, early arrival of other migratory birds is also observed by the locals. The decrease in the population of house sparrow and early arrival of migratory birds is perceived as a cause of climate change, especially with annual rise in temperature. This can be scientifically viable factor, as mentioned by (Abraham, Lloyd-Evans, Primack, & Satzinger, 2008, p. 507; Chaudhary, et al., 2011) Birds in recent decades are arriving earlier to their breeding grounds due to increase in global temperature. Whereas, the habitat loss may also be a considerable factor for decreasing population of house sparrows and other migratory birds. According to Cornell University Ornithological

laboratory, usually house sparrows eat grains and seeds of cereal crops like, wheat, sorghum, oat and corn, whereas, in summers they eat insects to feed their juveniles (Cornell University, 2019). Thus, another considerable factor for decrease in population of migratory birds like house sparrow can be the decrease in the production of cereal crops after the boom of fruit production in early 1990's which is discussed in a previous paragraph. Although, it can also be deduced that, decrease in the population of summer migratory birds have made it feasible for insect colonies to grow rapidly, as these migratory birds during their breeding time shift their diet from grains to insects, which otherwise solely perceived as an effect of climate change.

Figure 9: A small cattle shed sustaining heavy snowfall of the winters



(Source: Author)

Figure 10: Melting of snow in the village fields



(Source: Author)

Figure 11: Almond buds ready to sprout in late March.



(Source: Author)

Figure 12: A Stranded boat in frozen Atta abad lake.



(Source: Author)

## 7. DISCUSSION AND CONCLUSION

The analysis of data shows considerable change in the climate, as perceived by the local people. The perception of change in the climate is manifested through various indicators using local knowledge categories entrenched in historic and religious narratives along with direct observations and information gained from media reports and other sources such as NGO staff. As indicated by Orlove et al. (2010), while dealing with climate changes local people mostly refer to, historical patterns, religious symbolism, actual weather observations, and media reports. The proxy indicators used by the locals were mostly linked with shifts in timing of blossom, freezing of water bodies in late autumn, growth and maturing time of fruits and cereal crops, glacier surge and retreats, snowfall patterns and extreme weather events like untimely rainfalls, along with some minute variations observed in terms of migratory birds and pest attacks.

The proxy indicators used by the locals shows an abrupt increase in the temperature, as well as decrease in the annual snowfall during winters. The increase in average annual temperature is manifested on the basis of ice density and late formation of ice in water bodies in winters, faster melting rate of snow, decrease in snow cover on mountains, and prolongation in agriculture season. Whereas, abrupt increase in temperature after spring is marked by delays in blossoming time. These various manifestations of climate change as observed by the locals are mostly in line with the findings of research conducted in Nagar, District across the Hunza river, sharing same physical geography and culture area. The findings presented by (Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019) indicates increase in temperature during the winter and spring seasons, which are indicated by decrease in the snow cover and extension of agricultural season. As rightly claimed by Spies (2019) that these findings can be generalized for Hunza and other nearby settlements.

Contrary to the rest of the findings the data pertaining to glaciers, particularly, Shishper and Muchuhar, shows no considerable change in glacial mass. Which is in congruency with scientific research conducted on glaciers in Karakoram region, that project increase in the size of glaciers (Shah, et al., 2019; Farinotti, Immerzeel, de Kok, Quincey, & Dehecq , 2020). This increase in the size of Karakoram glaciers is found to be in contrast with the



global trends which account for decrease in the mass and covered area of various glaciers across the globe, owing to which it is also called Karakoram anomaly (Farinotti, Immerzeel, de Kok, Quincey, & Dehecq, 2020). Whereas, it has also been found that, the perception about glaciers is not formed solely on the basis of visual observations, instead, the translations of data show nuances of religious and historical narratives. These anecdotal narratives are used by the locals to make sense of the changes observed in their physical environment. With the advent of free market, the locals are becoming less and less dependent on the natural resources from their immediate environment, there has been a great shift in agrarian and pastoral practices, as discussed in the previous chapters. Consequently, there has been a reduction in the human-environment interaction. This is more relevant in the case of glaciers above the village, where direct visual contact is not possible. Thus this particular perception pertaining to changes occurred in the glaciers above the village are mostly influenced by the media reports and second hand information rather than direct visual contact. As stated elsewhere about Evettes Cirque glacier, the claims about changes in glacier position depends upon preconceptions rather than formed by direct observations, because of lack of evidence of the earlier glacier positions to calculate the exact spatiotemporal changes occurred in glacial retreat (Moreau, 2010).

In contrast to the findings pertaining to glaciers, most of the respondents have narrated decrease in snowfall over the period of last three decades. The findings bear testimony to the results of other researches and metrological data in HKH region, which indicates decrease in the snowfall over the period of last few decades (Bacha, Hayat, Mohammad, & Nawab, 2018; Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019). The trend in changing snowfall patterns were observed on the basis of decreasing snow cover on the mountains, intensity and frequency of snowfall, depth of snow spells, and composition of snow flaks and crystals in terms of their retention power for longer period of time as explicitly pointed by elder respondents. The decreasing trends in snowfall patterns and faster melting of snow is also pointed in the studies conducted across the HKH region (Hussain, et al., 2018; Hussain S. S., Mudasser, Sheikh, & Manzoor, 2005; Raza, Hussain, Rasul, Akbar, & Raza Ghulam, 2015). This highly tuned perception especially of elder people in terms of calculating even miniature changes in snow is related to its high salience for agriculture (Vedwan & Rhoades, 2001). For the locals snowfall in early winters increases the soil

fertility via providing moisture to the soil till the start of irrigation activities in early April (Spies, 2019; Vedwan & Rhoades, 2001). The high importance of snowfall for soil fertility is exclusively reported by elder respondents, whereas, young respondents lack this understanding. As the basis of local knowledge is highly contextual and generated via interaction within a particular agro-ecological and socio economic context (Sumane, et al., 2017; Beckford & Barker, 2007). The centuries old water scarce condition of the village has changed after reconstruction of village water channel which now carries water throughout the year. This in turn has reduced the importance of moisture from snowmelt which otherwise was considered as a highly valued natural resource for agricultural activities in early spring. Thus, this varying degree in importance of snowfall among different age groups can be understood in terms development initiatives.

As a functional indicator of climate change, locals most often referred to observed changes in cropping patterns, due to extreme weather events, like, abrupt temperature increase after spring, and increase in temperature around the year. Furthermore, the findings also suggest the prolongation in agriculture seasons, and faster maturing rate of plants. These findings are in line with other studies conducted on high mountain farming communities of Pakistan that show prolongation in cropping season and faster growth rate due to increase in average annual temperature (Hussain S. S., Mudasser, Sheikh, & Manzoor, 2005; Hussain & Mudasser, 2007; Spies, 2019). These perceived effects of climate change on cropping patterns cannot be generalized for several reasons. First, the cropping is done on very little level in the village nowadays, as farmers have shifted their priorities from crop production to arboriculture because of its higher economic salience. Secondly, the existing crops cultivated in the area are fast maturing foreign varieties introduced later in the area, whereas, existing species of cereal crops are almost extinct. Adding to the scenario, the introduction of synthetic urea is another considerable factor which fuels the growth of plants. Thus, the local's perception of climate change in regards to its effects on agriculture is informed by the collective contribution of all these factors. So, it is imperative to look into the phenomenon with more care and caution. As indicated elsewhere by (Spies, Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan, 2019) "*the perception of climate change is a function of agricultural practices and conditions.*"

Other meaningful indicators of climate change as manifested in the local's narratives were about variations in timing of blossom and ripening of fruit. The findings pertaining to variations in blossoming time show delays from last two decades, these findings are not in congruity with other research findings conducted across HKH region (Spies, 2019), this variation in findings may be a possible cause of visual deception, as apricot trees once composed the major portion of fruit trees in the village are now replaced by cherry trees which have late blossoming time in comparison to other trees. Along with the effects of temperature anomalies, it has also been pointed that, persistent and untimely rainfall in late spring and summers also effects the quality of fruit. The reason for developing such a finely tuned perception is linked with the effects of climatic variations during the growth period of fruit crop. As mentioned by (Vedwan & Rhoades, 2001), the apple producers in western Himalayas are keen in noticing climatic shifts that are meant to effect the apple production and quality, like, the amount of sunshine in the month of August supports the apple crop to gain color. Thus, it is more obvious that, even minute changes in the climatic conditions will be noted by majority of famers. Hence the perception of local farmers in response to climate change is informed by two visually salient indicators, the blossoming time and fruit quality.

Although, the increase in average annual temperature may help to increase the production of crops, but it is equally possible that, this may lead to other adverse effects. According to data readings there has been a considerable increase in the occurrences of pests and diseases on plants. These results are also shown in other researches conducted in the HKH region (Bhatta, et al., 2019; Spies, 2019; Vedwan & Rhoades, 2001). This increase in the occurrences of pests is not solely linked with the climate change, another factors indicated by the findings is introduction of new species which are not acclimatized well in new ecological settings. As mentioned by (Abbas, Syed, & Moosa, 2018), the introduction of new varieties of crops against the traditional ones in Gilgit-Baltistan has in turn increased the pest infestation, like, late blight, nematodes, early blights, and other diseases effecting vegetables and various fruit species. The increase in occurrence of pests may adversely affect the cash crops especially cherries and apricots in the village which constitute the major portion of income, as reported elsewhere by (Bhatta, et al., 2019).

Although, the study findings suggest a considerable change in the climate since the construction of KKH, and its effects are manifested in various livelihood patterns. These local manifestations of climate change are not solely effected by a single factor i.e. climate change, rather these variations added with other anthropogenic factors have led to the changes in the biodiversity of the area. As the data translation shows early arrival of migratory species and also indicates decrease in the population of some of these species. As in the case of house sparrows which according to locals have decreased substantially. The decrease in their population cannot be answered from a unilateral perspective of climate change, rather it is also fair to treat in the light of habitat loss caused by multiple factors mostly anthropogenic in nature. In this regard, the shift from cultivation of cereal crops to arboriculture particularly in the case of farmers, and disenchantment of youth from traditional occupations like farming and animal husbandry to get higher economic gains can be considered as a significant factor in pushing the phenomenon of habitat loss. Which otherwise are perceived as adverse effects of climate change. This significant decline in the importance of agriculture is persistent throughout the HKH region (Benz, 2014; Hussain, Rasul, Mahapatra, & Tuladhar, Household food security in the face of climate change in The Hindu-Kush Himalayan region., 2016; Malik & Piracha, 2006; Spies, 2019).

The scenario projected by the study findings show multitude of actors and factors in play, which are impinging on the social fabric as well as biophysical environment of the village. Thus, a more systematic investigation is required to understand the emerging climate change anomalies. Lacking in pronounced understanding of these anomalies, the locals more often try to find their answers in the light of overarching discourse of climate change, mostly influenced by media reports. Because, it takes time for local knowledge categories to syncretize and contextualize the emerging problems, especially, those identified and amplified in the light of scientific episteme. As Orlove et al. (2010) has demonstrated in his research paper that, local people play between different epistemologies while interpreting the climate change events. He found an openness in selecting the information given by different epistemic views.

## 7.1 Conclusion

The local narratives have shown various effects of climate change on the agro ecology, bio diversity and physical environment of the village, whereas, these perceived climate change effects cannot be held responsible as a sole agents of change. There are also other socio economic and political factors in play, that have significantly contributed in changing the centuries old human-environmental relations. As indicated by the finding, this shift in human-environment relation has begun after two major developments that took place in 1970s i.e. construction of KKH and devolution of Hunza state. The construction of KKH has paved the path for capital market system, resultantly, reducing dependency on natural resources, whereas, with the devolution of Hunza state, the old governance system has lost its grip. Complemented by these developments, new agricultural practices have been promoted by various development agencies like AKRSP. Due to which, the local practices like, animal husbandry, agriculture, horticulture, and water management that played vital role in the regulation of scarce resources are abandoned. Thus it is not an easy task to assume that the overall change in the environment is caused by the single factor of climate change.

Owing to the influence of multiple factors which have complemented the change in human-environmental relation, the local knowledge pertaining to these categories is gradually eroding in the village. This erosion in traditional knowledge has left knowledge vacuum for new generation, resultantly making their understanding culturally less nuanced, which is why the perceptions of youth are mostly based on new epistemic knowledge usually gained from media.

Furthermore, understanding of local's perception and knowledge is of utmost importance for devising a more informed and contextually viable climate change policy. Because the local populace holds encompassing knowledge of their surrounding and they are the ones more vulnerable and always on the front in the cases of climate change led catastrophes. Hence their participation in policy measures is of great importance. Further researches in climate change perception across the HKH region is necessary, which can significantly contribute in enhancing the knowledge of Global Climate Change, and can also be a valuable source of information especially where metrological data is limited.

Based on the uniformity and frequency of development initiatives across the region, the findings of the study can be generalized over the region of Hunza District. They can also be generalized over other districts of Gilgit Baltistan but with slightly lower reliability.

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