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SOCIOECONOMIC IMPACTS OF NATURAL DISASTERS: IMPLICATION FOR FLOOD RISK MEASUREMENT IN DAMAS VALLEY, DISTRICT GHIZER, GILGIT-BALTISTAN, PAKISTAN

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ABSTRACT

The purpose of current research is to evaluate the impact of floods on the socioeconomic aspects of the population living in the Damas valley, district Ghizer Gilgit-Baltistan. The study area includes the Damas village of the Tehsil Punial of District Ghizer, Gilgit-Baltistan. The current study focused on the primary data using the questionnaire technique. According to the survey, the highest probability of climatic induced floods in June to August, which affected agriculture, shelter and water channels. Heavy rainfall with high probability damages the accommodation and crops in February, March, July, and August. Earthquake and Land sliding affect human life, shelter, and other infrastructure with medium and low probability rate. Results indicate that t 76 % of respondents are of the view that certain types of diseases have been increased after the mild attack of climatic induced floods, while 24 % are of the perception that there is no increase in the number of diseases. Furthermore, 56 respondents said that the temperature has increased in last 30 years, whereas, 36 % said that the temperature has decreased in this area. Results also showed that 90 % villagers get water from community taps, 8 % from hand pump and 2 % using pond water. The climate-induced flood usually causes a huge damage to forest, land, shelters, livestock, water channels and cultivable land.

KEYWORDS: Socioeconomic, Natural disaster, Probability, Community, District Chizer, Pakistan

INTRODUCTION

The importance of climate and disasters has been discussed by using the climate disaster resilience index (Shaw et al., 2009). The development of this index is on five resilience-based dimensions, which are natural physical, social, economic, and institutional. Corominas et al., (1990) described that the active landslides are as a result of climate change as compared to geological hazards. The climatic variables like temperature and rainfalls have used to analyze hydro-meteorological risks at the local level, and their results put impacts on streamflow patterns, soil degradation, and drought conditions occurred (Llasat et al., 2009).

Many studies have been conducted about the climate-induced floods which increased as a result of heavy rainfalls (Archer, 2001; Christensen et al., 2007; Abbs and Rafter, 2008; Abeysirigunawardena and Walker, 2008; Ganguly et al., 2009; Alexander et al., 2011; Hussain et al., 2018). The

extreme climate conditions in Hindukush Karakorum and Himalaya HKH negatively affects the infrastructure of peoples in the society. The interventions have brought considerable change in the physical environment and socio-economic development of the people (Christensen et al., 2007). Abbs and Rafter, (2008) stated that the primary source of livelihood is the cyclic use of natural resources, which is not enhanced due to a large population, which has a negative impact on the major sources of livelihood included; livestock and forest sector. *Hussain et al., (2018) indicated that the study area has a mixed crop pattern. So, a major part of the population depends on the agriculture sector. However, this area is becoming specialized in the perspective of the agriculture sector because it is the main source of livelihood. The cyclic use of the natural resource leads towards the sustained and enhanced the sustainable growth and development* (Qureshi et al., 2007).

Abbas et al., (2016a, b, c) exhibited that Karakoram High Way in Hindukush- Karakoram and Himalaya (HKH) completed in 1978. This highway connected with Pakistan through the Khunjerab pass with China on the north side border of Pakistan. Such development in the infrastructure declined the crop patterns that negatively affects the income level and livelihood in the investigated region of Ghizer valley near Khunjerab. Such changes intensify the temperature and pattern of rainfall in the village that is situated in the Hindukush- Karakoram and Himalaya as compared to away from HKH e.g., Baltistan District. Sheikh, (2000) stated that "In some areas of Baltistan, the forests have been so focused that the last remnants of Junipers excels are only located in such an area which are inaccessible. Hunzai (2003) reported that in G.B., forests and ranges are not separated, rather trifle patches of trees are scattered all around the range areas. The leading causes of depletion of land resources in G.B. have been reported as overgrazing (Sökefeld, 2012; Abbas et al., 2020b), overexploitation of forests followed by lack of regeneration (Zain, 2010) and the policies which were out-of-date to prevent degradation of resources (Wolf, 2016; Abbas et al., 2020a).

Sheikh (2000) stated that natural resources are depleting due to the non-cyclic use of natural resources. Hussain and Javaid (2018) suggested the involvement of communities in planning and implementation of the conservation program to make the conservation programs sustainable like the sustainable forestry project of AKRSP in Gilgit-Baltistan, Malakand Social Forestry Program, and Kalam Integrated Development Program in KPK.

Hussain and Wang (2018) presented three principles for conservation of natural resources including evolution, ecological systems, non-equilibrium, and conservation. Human are a part of the natural world they must be included in conservation actions. Murphree (1993) found four basic

principles important for effective natural resource management that are focused value to natural resources for those who live in them, different inputs must result different benefits, a positive correlation between quality of management and the magnitude of benefits within ecology and socio-political constraints. The objectives of the study are to investigate the impact of climatic induced floods on the lives of the local community of Damas valley. Furthermore, identifying the Impacts of flood on socioeconomic aspects. The main goal of this research was to mitigate the negative impacts of climate oriented disasters.

MATERIALS AND METHODS

Study Area

Damas valley is geographically situated in the Tehsil Punial District Ghizer, Gilgit-Baltistan. Damas valley is located in the north of Gahkuch, the headquarter of Tehsil Punial with coordinates 36.12' 34.86" and 73.45' 57.22" East and 36.10' 52.31" and 73.43' 26.45" North.

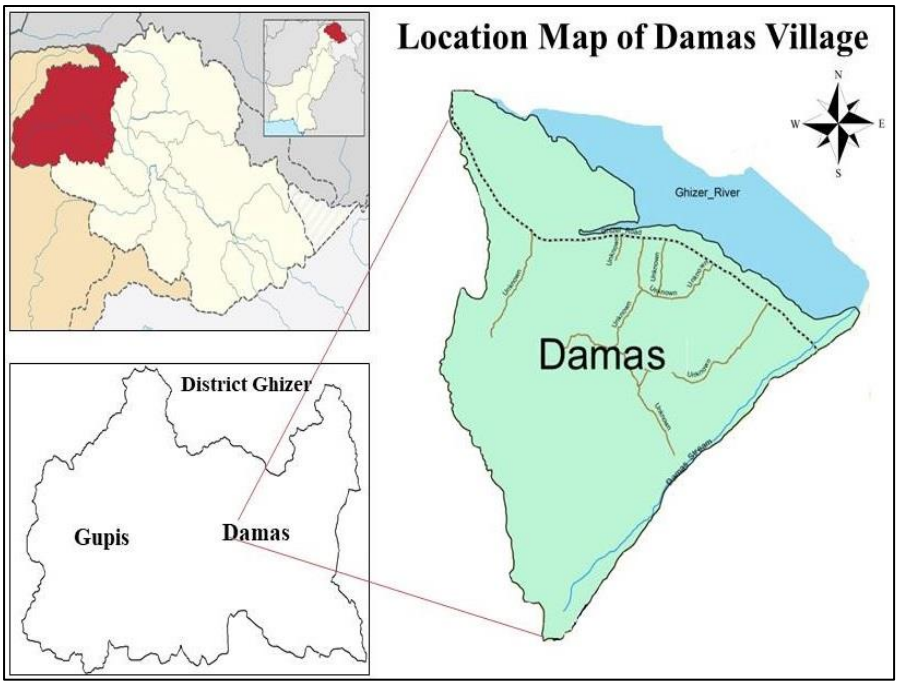

Fig. 1 Location map of Damas valley, District Ghizer, Pakistan

The altitude of Damas valley is 1950 meters. Gakuch is the capital of the Ghizer District. The landscape is different as well, Damas valley is famous for natural wealth, landscapes, beautiful mountains, natural beauty, wildlife, lush green foliage, fruits and beautiful meadows. The valley touches its borders with Chitral and Afghanistan. The investigated area

consists village of the tehsil Punial that lies in the Ghizer district in Gilgit-Baltistan named Damas village.

Data Analysis

For achieving the objectives, the formal meeting held with the staff of WWF-Pakistan, Gilgit. This institute is an active institution working in the field of climate-induced floods. The main objective of the current study is relevant to the perception of communities about climatic induced floods, opinions of communities about the impacts of climatic induced floods and their associated hazards. The primary data was collected through the community-based fieldwork. A questionnaire was developed according to design research pattern. The questionnaire was based on the past knowledge and experience regarding the climate induced flood hazards.

Statistically, the questions were designed in open-ended phase. After this, the Random sampling technique was used. This sampling technique gives the equal probability of each selected sample. The sample size is 50 selected. These 50 respondents have above 30 years old. The selection of the respondent size depends on the population size of various status classes. Furthermore, the monthly climate data; minimum, maximum temperature and rainfall data during the period of 1980-2018 was collected from the Pakistan Meteorological Department, Lahore, at the station of Gupis. Simple regression is used to access the change of the minimum, maximum temperature and rainfall in the Daamas valley. This approach is used to investigate the linear relationship of the variables.

For further secondary data, different organizations were consulted such as AKRSP Gilgit-Baltistan, Gilgit-Baltistan Disaster Management Authority (GBDMA), Forests Department Gilgit-Baltistan, WWF Gilgit-Baltistan, DC Office District Ghizer, Agriculture Department Gilgit-Baltistan, Central Library University of Punjab, Library Centre for the Integrated Mountain Research University of the Punjab, Central Library Karakorum International University, Municipal Library District Gilgit, Conservation and Information Centre Gilgit, Books, Research Studies, News Letters, Pamphlets, Project Reports.

RESULTS AND DISCUSSION

Climate change induces flood, which may cause much destruction inland structure. Most of the respondents indicated that flood eruption is due to climate change. A number of villagers said that there is a change in the climate of the region, their number was 90 %, and 10% of villagers responded in negative response shown in figure 2b.

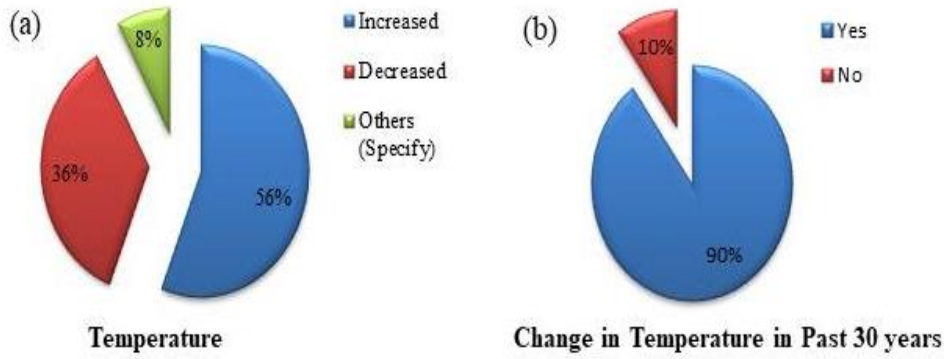

Fig. 2 Change in climate (a) Observed change in temperature (b) Change in temperature in last 30 years.

Accordingly, 56% of the respondents were of the view that there is a change in temperature of the region, 36% of the respondents said that there is decrease in the temperature of the area and remaining 8% respondents were of the other views shown in Figure 2a.

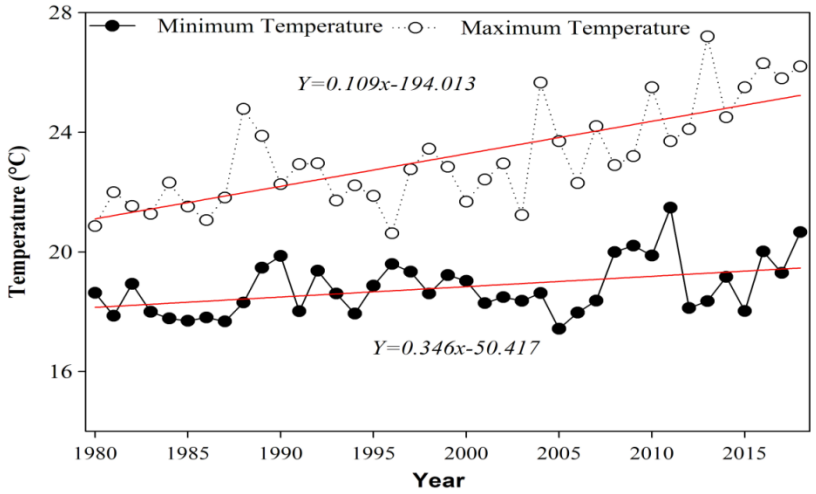

Fig. 3 Temperature Change in Damas Valley near Gupis station in Gilgit (1980-2018)

According to the data recorded, there are normal changes in the temperature of the region. A rise in average temperature can be seen in the year of 2002 and afterwards, there is not so much change in temperature of the villages. We observed from the detailed investigation that due to the flood in 2006 the temperature of the area has been increased and then decreased in the next year. After the flood in 2010, the temperature of the area has been constantly declining, and then in the year 2012, pretty depression in slope can be seen, causing a decrease in

temperature in 2012, and then the average temperature has been rising afterward a bit (Figure 3). When the villagers were asked about changes in terms of rainfall for last 30 years, Different views were observed. 80 % of villagers said that there is a change in patterns of rainfall.

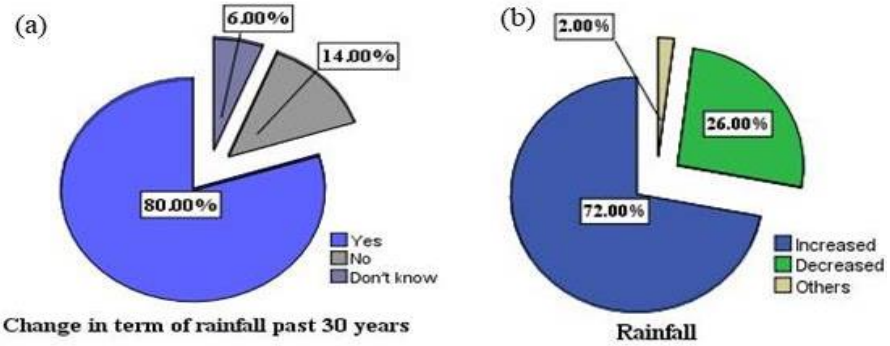

Fig. 4 Change in climate (a) Observed change Rainfall (b) Change in Rainfall in last 30 years

14 % of respondents claimed that there is no change in the climate. 6.00% did not know about climate change in the region, which can be seen in figure 4. The general perception of 72% of the respondents was that there is increase in rainfall of the region, 26% said that there is a decrease in the rainfall in the region, and the remaining 2% were of the other opinion in figure 5. In the survey, when the villagers were asked about the changes in the seasonal pattern of rainfall. 50 % of respondents were of the view that there is a change in the seasonal pattern of rainfall. 36 % of the respondents replied in negative. 14 % were unaware of changes in the seasonal rainfall pattern shown in figure 5a. Results are showing a gradual decrease in rainfall in the years of flood and successive years. But before the year of the flood. There is heavy rainfall in the station of Gupis. From the survey and scientific rainfall data of Gupis station, we see that there is a prominent contradiction between the survey data and data which has been taken from the source of MAAD Office.

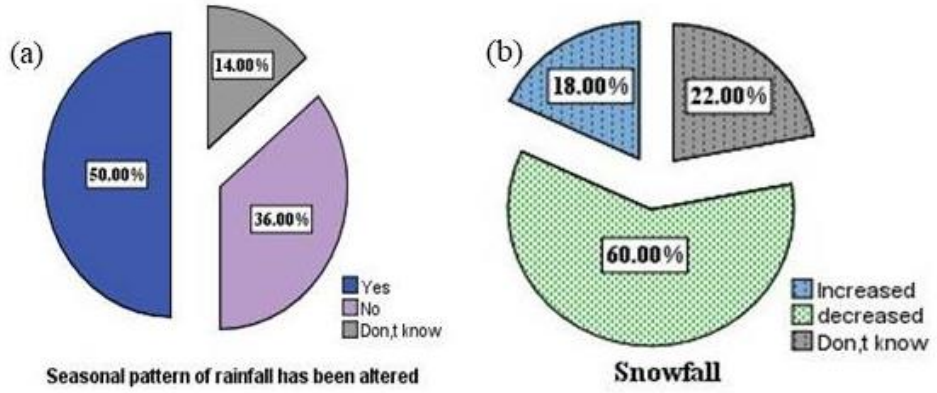

Fig. 5 Change in climate (a) Seasonal Pattern of Rainfall (b) Snowfall has been changed

According to a survey, we have observed that there is a gradual decrease in rainfall in the villages Damas but in the scientifically recorded data, there is a decrease in rainfall in the past 30 years.

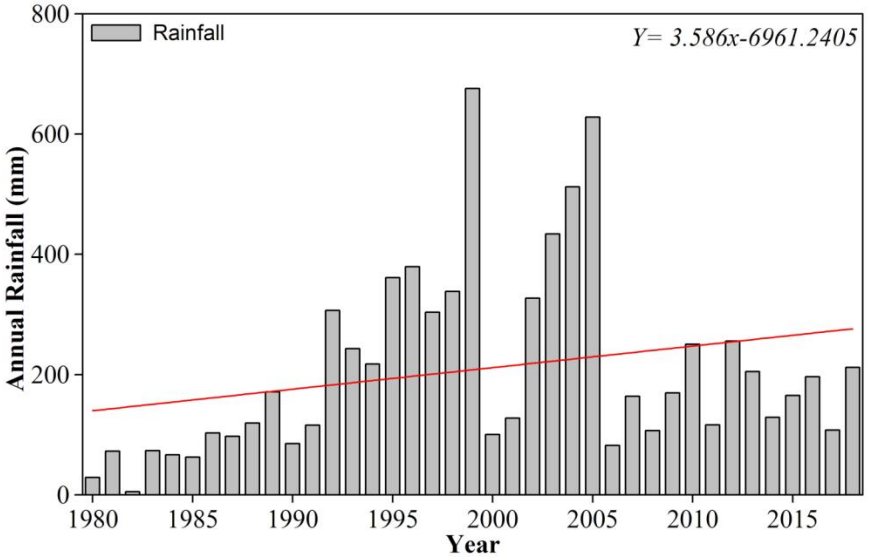

Fig. 6 Annual rainfall change in Damas Valley near Gupis station in Gilgit (1980-2018)

The reasons behind the contradiction of data are as under: To villagers, there is an eye illusion in experiencing the climate and rainfall changes, lack of parameters in villagers which must be observed during the observation of changes in rainfall and climate, villagers are incompetent to have basic knowledge about climatic changes and change in terms of rainfall, scientifically deforestation causes the reduction in air moisture in mountainous areas which may be the reason for reduction in rainfall,

scientifically pollution is the cause for the reduction in terms of rainfall, air pollution is dominative of all type of pollutions tiny particles in air pollution are suspected to be the leading cause, scientifically global climatic changes are the normal reasons for changes in terms of rainfall and flood has caused and deforestation hence causing the reduction in rainfall. When the respondents were questioned about the increase or decrease in snowfall for the last 30 years 18% of the respondents were agreed that there is increase in the snowfall for last 30 years, 60% respondents said that there is a decrease in snowfall for last 30 years and remaining 22% had no opinion about the change in terms of snowfall (Figure 6).

Socioeconomic Impacts of Natural Disasters

During the survey, various questions in a questionnaire were made available to the respondents, and this questionnaire was all relevant to the field of climate-induced flooding. The villagers said that health status, which was affected by the climatic induced floods and it was quite a more considerable element. About 76 % of respondents have the view that certain types of diseases have been increased after the mild attack of climatic induced floods. 24 % of respondents are of the perception that there is no increase in the number of diseases shown in figure 7a.

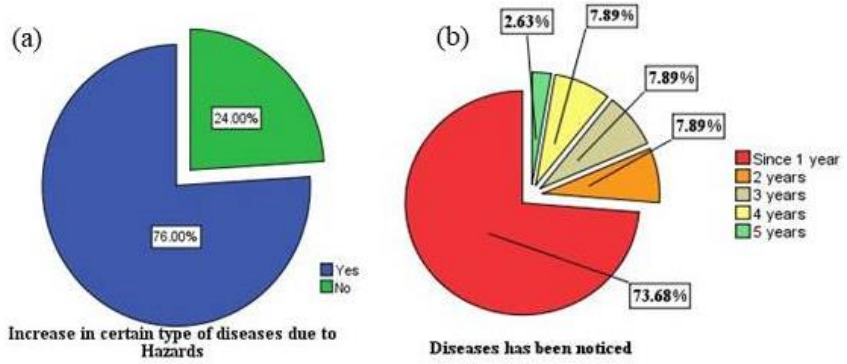

Fig. 7 (a) Increased types of Diseases due to Hazards (b) Disease have been noticed

According to Figure 7b, the communities of area linked the diseases with the climatic induced flood hazards. 73 % of respondents purported that diseases may prolong after the flood up to 1 year. 7.89 % of respondents were of the perception that diseases may prevail after the flood up to 2 years. 7.89 % unsupported the diseases tenure up to 3 years, also 7.89 % purported the conditions tenure up to 4 years, and 2.63% was of the view that diseases may prevail up to 5 years after the climati- induced flood. The diseases which may be caused by the climatic induced floods are

number of skin diseases, respiratory problems, stomach infection and may other diseases, but the above-mentioned disease are prominent to mention.

Villagers of village Damas were inquired about their economic status. A number of results had been found after the analysis of all the collected data. The area under consideration is not so affluent and is lying under the average level. 8.33% of families have a monthly income of Rs. 5,000-7,000, 16.67% families are earning a monthly income of Rs. 7,001-10,000, 68.75% of families are having their income of more than Rs. 10,000 and 6.25% does not respond, as shown in figure 8a.

Most of the villagers are eking out their subsistence by farming, their percentage is about 28.00%, 30.00% are serving in government and private sector, 20.00% are carrying on their own business, 12.00% of villagers enrolled in laboring, 78.00% villagers depend upon wild produced gathering, and 2.00% villager's income source is fishing as shown n figure 8b.

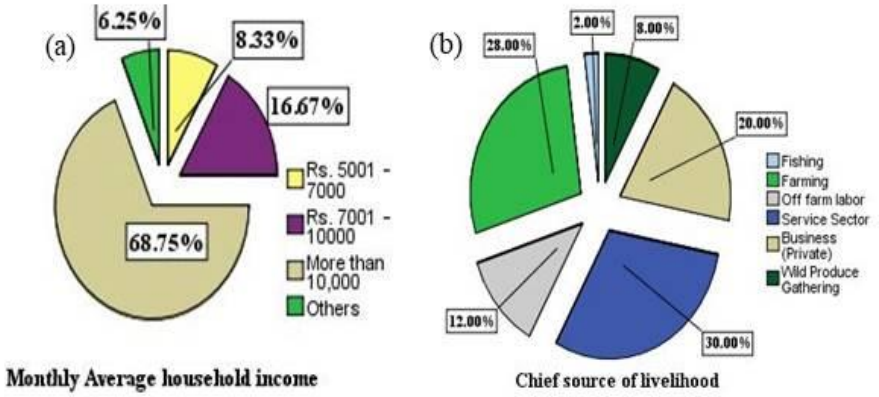

Fig. 8 (a) Monthly Average Household Income (b) Source of basic Livelihood

Water is a basic need of humankind; 90 % of villagers are using water from community taps; 8.00% of villagers are using a hand pump. 2 % are using pond's water described in figure 13. As shown in figure 14, the majority of the families depend on the source of agriculture. 91.84% of families have land to cultivate, and they are eking out their subsistence by the source of agriculture. 8.16% does have any fertile land to cultivate and sow crops.

The number of losses have been observed during the survey, the damages which were caused by the climatic induced floods were of different level. The type of events, outcome risk, and number of affected properties are given in the below table1.

Table 1. Climatic Induced Flood Hazards and level of Risk

Event Risk	Outcome Risk	No. of affected properties		
		High	Medium	Low
Glacier and storm surge	1.1 Damage to protective walls	04	3	2
	1.2 Damage to homes and properties	09	6	5
	1.3 Income loss due to out migration	10	06	03
Flooding events increased	2.1 Damage to homes and properties	22	25	29
	2.2 Agricultural crops damaged	9	25	32
	2.3 Damage to water channels	9	12	10
	2.4 Pollution of waterways	3	5	6
Increased of drought	3.1 Water shortage	11	7	5
	3.2 Agricultural crops (low yield)	3	4	2
	3.3 Biodiversity loss	14	10	7

Table 2. Major Climatic Induced Flood Hazards in the Valley

Hazard	Cause	Frequency	Duration	Areas affected	Magnitude	Respondents
Flooding	Extreme Rainfall	3-4 (Jun - Aug)	2-4 hours	Water channels, Agriculture Land, Shelters, Cattle	High	50

According to the observations, 55% of family persons pointed out that flood-damaged infrastructure. The high magnitude in rainfall patterns occurred from June to August, and this is mainly due to changes in climate in this region. This heavy rainfall enhanced the flood. The 45 % of respondents said that heavy rainfalls, creeks and riverbank erosion are the major types of the hazards that further caused damages to roads, shelters, bridges, crops, and water infrastructures. The primary cause is the heavy

rainfall with a high magnitude rate, whereas prolonged clouds and magnitude of thunderstorms are in the range of medium and low (Table 2).

SUMMARY AND CONCLUSION

The data regarding the induced flood hazards on the social and economic conditions of human life were collected through interviewing the local community. Each respondent under consideration was having different ideas about the climatic induced flood hazards. We involved every individual respondent. Many respondents agreed that climate-induced flood hazards have been occurring for the last few decades. The climate-induced flood hazard is a big threat to the valleys.

The local community believes in community-based climate change adaptation ideas to minimize these impacts. A few numbers of local communities of the valleys responded regarding climate-induced flood hazards and their effects on the local community. These impacts were due to lack of awareness about flood hazards and land use planning, capacity building, knowledge, natural resources, and modern climate change adaptation. The recommendation that would be conducted to decline the impacts of temperature and rainfall are included; It should be provided awareness programs regarding climate-induced flood hazards in village Damas District Ghizer. Prepare the land use plan of the area to face the future socioeconomic problem. Professional training should be provided to the local community to establish an alternate source of income. There should be community-based induced hydro-meteorological hazards adoptions ideals and training regarding first aid.

REFERENCES

Abbs, D., and T. Rafter. (2008). the Effect of Climate Change on Extreme Rainfall Events in the Western Port Region. CSIRO Marine and Atmospheric Research, Aspendale, Australia, 23 pp.

Abeysirigunawardena, D.S. and I.J. Walker. (2008). Sea level responses to climatic variability and change in northern British Columbia. Atmosphere-Ocean, 46 (3), 277-296.

Alexander, L.V., X.L. Wang, H. Wan, and B. Trewin. (2011). Significant decline in storminess over southeast Australia since the late 19th century. Australian Meteorological and Oceanographic Journal, 61(1), 23-30

Abbas, S., Khan, K., & Kasour, S. (2016a). SWOT Analysis For Green Economic Development as a Preamble to Local Community and Sustainable Tourism Development, HKH Region, Pakistan. Science International, *28* (3), Pp.2979- 2985.

Abbas, S., Khan, K.., & Ali, Z. (2016b). Green economic growth: an opportunity for sustainability and poverty alleviation, HKH region, Pakistan. Science International, 28 (4), Pp.3715- 3721.

Abbas, S., Khan, K.., & Ali, A, K. (2016c). REED Plus and their impact on green economic growth: Implication for sustainable forest development, Swat Valley Khyber Pakhtunkhwa, Pakistan. Science International, 28 (5), Pp.3472-3478.

Abbas, S., Shirazi, S. A., Hussain, M. S., & Khurshid, M. (2020b). Assessment of Physiographic features and changing climate of Kabul river catchment area in Northwestern Pakistan. Pakistan Journal of Science, 72 (2), 112-118.

Abbas, S., Shirazi, S. A., Hussain, M. S., Yaseen, M., Shakarullah, K., Wahla, S. S., Khurshid, M. (2020a). Impact of Climate Change on Forest Cover: Implications for Carbon Stock Assessment and Sustainable Development in HKH Region-Pakistan. Journal of Pakistan Vision*, 21(1), 66-81.*

Archer, D.R. (2001). The climate change and hydrology of northern Pakistan with respect to assessment of flood risks to hydropower schemes. Report by GTZ/WAPDA

Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gau, I. Held, R. Jones, R. Kolli, W. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C. Menéndez, J. Räisänen, A. Rinke, A. Sarr, and P. Whetton (2007). Regional climate projections. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, UK, pp. 847-940

Corominas et al. (1990). Risk mapping in the Pyrenees area: a case study Geotechnical Engineering Department, Technical University of Catalunya, JordiGirona Salgado 3108034 Barcelona, E- Spain. http://iahs.info/redbooks/a194/ iahs_194_0425.pdf

Ganguly, A. R., Parish, E. S., Singh, N., Steinhaeuser, K., Erickson, D. J., Marcia Branstetter III, A. W. K., & Middleton, E. J. (2009). Regional and decadal analysis of climate change induced extreme hydro-meteorological stresses informs adaptation and mitigation policies. *Science*, *314*, 5804..

Hunzai, I. (2013). *Conflict Dynamics in Gilgit-Baltistan*. Washington, DC: United States Institute of Peace.

Hussain, M., Liu, G., Yousaf, B., Ahmed, R., Uzma, F., Ali, M. U., ... & Butt, A. R. (2018). Regional and sectoral assessment on climate-change in

Pakistan: social norms and indigenous perceptions on climate-change adaptation and mitigation in relation to global context. *Journal of Cleaner Production*, *200*, 791-808.

Hussain, T., Li, B., & Wang, D. (2018). What factors influence the sustainable tour process in social media usage? Examining a rural mountain region in Pakistan. *Sustainability*, *10*(7), 2220.

Hussain, Z., & Javaid, U. (2018). Situating Gilgit-Baltistan in growing China Pakistan Interdependence: Post 9/11 Scenario. *Journal of Political Studies*, *25*(2), 291-310.

M SHIEKH, K. A. S. H. I. F. (2000). *Ecological Studies of Avifauna in the Naltar valley, Northern Pakistan with a conservation perspective* (Doctoral dissertation, Quaid-i-Azam University Islamabad, Pakistan).

Llasat, M. C., Llasat-Botija, M., Barnolas, M., López, L., & Altava-Ortiz, V. (2009). An analysis of the evolution of hydro-meteorological extremes in newspapers: the case of Catalonia, 1982-2006. *Natural Hazards and Earth System Sciences*, *9*(4), 1201.

Murphree, M. W. (1993). *Communities as resource management institutions* (pp. 1-15). London: IIED.

Qureshi, R. A., Ghufran, M. A., Sultana, K. N., Ashraf, M., & Khan, A. G. (2007). Ethnomedicinal studies of medicinal plants of Gilgit District and surrounding areas. *Ethnobotany Research and Applications*, *5*, 115-122.

Santer, B.D., C. Mears, F.J. Wentz, K.E. Taylor, P.J. Gleckler, T.M.L. Wigley, T.P. Barnett, J.S. Boyle, W. Bruggemann, N.P. Gillett, S.A. Klein, G.A. Meehl, T. Nozawa, D.W. Pierce, P.A. Stott, W.M. Washington, and M.F. Wehner. (2007). Identification of human-induced changes in atmospheric moisture content. Proceedings of the National Academy of Sciences, 104(39), 15248-15253

Shaw, R., & Team, I. E. D. M. (2009). Climate disaster resilience: focus on coastal urban cities in Asia. *asian Journal of environment and disaster Management*, *1*, 101-116.

Sökefeld, M. (2012). The Attabad landslide and the politics of disaster in Gojal, Gilgit-Baltistan.

Wolf, S. (2016, June). The China-Pakistan Economic Corridor: An assessment of its feasibility and impact on regional cooperation. In *SADF Comment, South Asia Democratic Forum (SADF), Brussels, Belgium*.

Zain, O. F. (2010). A Socio-Political Study of Gilgit Baltistan Province. *Pakistan Journal of Social Sciences (PJSS)*, *30*(1).