NANGARHAR UNIVERSITY
INTERNATIONAL JOURNAL OF BIOSCIENCES
ORIGINAL ARTICLE
e-ISSN: 2957-9988
NUIJB Special Issue: 2024

Received: 25 Dec 2023 Accepted After Revision: 22 Jan 2024 Published Online: 10 Feb

Study on Problems Associated with Climate Change Vulnerability Under Nuristan Circumstances

Omari , Mohammad Gulab [1] Mohammad Ismail Sadat [1], and Rashad Ahmad Sherzad [1]
[1]Department of Horticulture, Faculty of Agriculture, Nangarhar University, Nangarhar, Afghanistan
*Corresponding author: gulabomari@gmail.com

ABSTRACT

Nuristan is among the top 34 most prone and highly vulnerable province experiencing intense and worsening extreme temperature weather conditions and natural disasters, including floods, landslide, mining, deforestation, human health, droughts, storms, avalanches and earthquakes. These disasters destroyed ecosystems and force people to leave their homes, displacement and provoke conflict over scarce natural resources. The populations reliant on agriculture to survive, small changes to the climate have enormous impacts on growth times and yields, making food shortages more likely. These issues are increasing in frequency as a result of climate change and years of environmental degradation, eroding future resilience, exposing people to critical losses in livelihoods and assets. The province is face a major climate change crisis, including unrelenting deforestation, losses of vegetative cover, overgrazing, and land and pasture degradation. Once-thriving communities are now losing their livestock and livelihoods, which worsens economic hardship. Nuristan most vulnerable and least equipped prepared to deal with the consequences adapt to climate change. As they have limited capacity to adapt to the changing conditions, often using outdated techniques that are no longer suitable or effective. Success in adapting to climate change depend on the availability of necessary resources including financially, technical capacity and institutional capacity all are critical constraints for Nuristan and more adequate institutional capacity is key requirements

Keywords: Climate Change, Livelihoods, Nuristan, Vulnerability, Shocks/hazards, Impact

INTRODUCTION

Nuristan (land of light) located in the eastern part of Afghanistan is highly vulnerable to the effect of climate change, with some of the most complex varied topography, more than a quarter of its territory having an altitude of 2,500 metres or more, has created a number of diverse habitat types, with temperature and precipitation changing considerably at different elevations. Their natural resources have significant ecological, economic, social and cultural value. Proper management, preservation and value addition of natural resources is vital for the present and future generation of this province. Climate change as a serious threat to natural resources and its effect on agriculture and livelihoods of the province and points the need for addressing adverse effects of climate change through awareness-raising and assisting local communities adapt to climate change (NEFA, 2010). Experiencing extreme low and high weather conditions and natural disasters, some of these disasters are increasing in an intensity and severity, exposing thousands of people to critical losses in livelihoods and assets.

Nuristan is inherently one of the more climate vulnerable province, and is likely to become even more vulnerable due to climate change impacts on one hand, and the lack of sustainable socio-economic opportunities on the other. At this juncture, development planning is expected to remain focused on basic human aspects of income and livelihood security (Long and Ziervogel, 2020). Nevertheless, from this perspective climate change and resource availability concerns are critically important as the population depends heavily on the natural resource base. For making decision, and other research techniques, the primary climate-related shocks/hazards that enhance exposure, and the sensitivity and adaptive capacity of rural areas. This search aimed to explore problems associated with vulnerability to climate change under Nuristan circumstances.

MATERIALS AND METHODS

The study used primary and secondary sources to gather information on climate change challenges focusing on rural settings. Surveys were employed, and questionnaires helped with the descriptive analysis of collected data. In other hand the methodology was include need assessment, publication, research journal, interviews and face to face meetings.

Samples Collection: The sample for these assessments of vulnerability are based on three parametric considerations: the degree to which a Nuristan all districts were exposed to climate change impacts, sensitivity of the area to these impacts, and the adaptive capacity of the community.

Statistical Analysis: SPSS Vs SAS was used for statistical data analyze there is both theoretical and empirical analysis in assessing test questions, frequency, and percentage were chosen as the research analytic methodologies.

RESULTS

Nuristan ranks first that are most vulnerable to climatic hazards include floods which occur annually, mainly either as flash floods or gradual excess precipitation floods. They are often caused by snowmelt. Flooding incidence has a high degree of correlation with the quantity of rainfall and snow in winter and early spring (NEFA, 2017). The threat of flooding is often reinforced by anthropogenic activities such as overgrazing and unsustainable livestock management. The overgrazing of cattle, goats denudes the top layers of soil cover, leaving them open to erosion during times of heavy rainfall. As livestock populations increase, more pressures are exerted on available green cover (Dara, 2020).

The reasons for landslides are broadly twofold: the lack of vertical vegetative cover, and the incidence of rains, especially in loess - as demonstrated in the landslide in Nuristan. Loss is characterized by low levels of cohesion, and the relative to total absence of vegetative cover over loss can cause landslides, often with fatal results. The trigger is almost always snowmelt or heavy rains that lead to the mass movement. Landslide, it was a combination of heavy rainfall in the last days prior to the disaster, which added to snowmelt water from the mountains (Saleem *et al*., 2018).

Extreme winter conditions and avalanches are a recurrent feature in the mountainous parts of Nuristan, while there is debate on exact reasons for the occurrence of avalanches, the broad spectrum of causes include the following new snow and/or rain, causing accumulated snow to move downward. This is one of the common reasons for an avalanche, the incidence of avalanches is increased by the lack of vegetation, which points the finger of causality to overgrazing and deforestation. Due to lack of any obstacle in its course, the accumulated snow finds no resistance and hurtles down, picking up more snow and causing an avalanche.

Earthquakes are also identified as potential causes for an avalanche. Since they are not directly attributable to climate change (UNDP., 2020).

Nuristan is prone to **d**roughts and the related, more gradual phenomenon of aridification, although the nation does receive precipitation in the forms of snow. The most potent and immediate cause of aridification is the removal of vegetation. This could be driven by a number of factors such as lack of precipitation, climatic shifts, overgrazing and deforestation for fuel. In Nuristan, overgrazing by large herds of livestock and deforestation to meet energy needs for rural population, especially for space heating, have played a major role in the destruction of vegetation (Nembilwi *et al*., 2021).

The mining and processing of mineral resources usually have a considerable impact on land, water, air and biological resources, they also have a social impact because of the increased demand for housing and services in mining areas. The impact degradation of land adverse impact on the growth of vegetation, physical changes in the land (ICIMOD., 2020).

Figure 1. District of Nuristan

Figure 2. Nuristan province, Afghanistan

Table: 1 Climate change hazards/shocks vulnerable and highly prone districts of Nuristan

No	Climatic hazard/shocks	Districts	Population
1	Avalanche, landslide	Parun	15,546
2	Deforestation, Avalanche	Wama	12,707
3	Flood	Waygal	22,575
4	Flood	Kamdesh	29,064
5	Mining/mineral extraction	Bargi matal	17,843
6	Drought/aridification	Du ab	90, 57
7	Drought/aridification	Mandol	22,710
8	Drought/aridification	Noorgram	37,174

Table: 2 vulnerable spots in the Province from a climate change vulnerability perspective

Climate Change Impact	Intensity	Affected districts	Susceptible Sectors
Diminishing surface water level	Low	All districts	Agriculture, water availability
Land degradation / Soil loss	High	All districts	Agriculture, livelihoods
Decreasing agricultural productivity	High	All districts	Agriculture, livelihoods
Desertification / Aridification	Medium	All districts	Agriculture, water availability
Deglaciation	Low	All districts	Agriculture, water availability
Human health	Medium	All districts	
Water Scarcity	High	All districts	Agriculture, water availability
Food insecurity	High	All districts	Agriculture, livelihoods
Extreme Events	Medium	All districts	Agriculture, water availability
Forest & Biodiversity Loss	Medium	All districts	Agriculture, water availability

DISCUSSION

Climate change impacts had emerged as a credible threat in Nuristan, with numerous evidence already apparent, changes in precipitation and temperature regimes, adversely affecting agricultural productivity, prolonged and more frequent extreme events such as droughts, floods; and higher incidence of desertification, mining and aridification in Nuristan as a result of lower levels of precipitation, coupled with their erratic patterns and concentration within a short span of time, leading to increased runoff and lower surface water availability (AVA., 2015).

Water resources availability over the past century, increased fluctuations in climatic patterns has made water availability a tricky proposition and crucial for agricultural production, livestock, sanitation and human health, as well as for some industrial processes and hydroelectric power. Declining or uncertain availability is particularly difficult for the majority of Nuristan's population which relies on agriculture and livestock for livelihoods (Nasimi *et al.*, 2021).

Food security is clearly affected by reduced and irregular availability of water supplies, which reduces food production and livelihoods. This also considers the impacts of land degradation, extreme events, and increased incidence of weeds, pests, and diseases (Rousta, 2020).

Land degradation and food production, Nuristan's total land area being arable protection of the topsoil is important to preserve and enhance agricultural production. Climate change and floods have contributed to erosion of topsoil, which have been exacerbated by local practices such as overgrazing of cattle. As average temperatures rise over time, is more likely that it will become difficult to sustain certain varieties (sub species) of crops (Environment., 2016).

Increased incidence of pests, weeds and diseases, climate change is expected to increase the range or 'invasion niche' of pests and weed species. As temperatures increase, new species and sub-species could be added to any climatic zone, from the nearest warmer zones. These species could have drastic impact on croplands, as crops in cooler regions are unaccustomed to weeds native to warmer climate (Abdullah *et al.*, 2019).

Extreme events and food security, The link between extreme events and food security in the context of Nuristan has been explored in some detail, including through examination of specific occurrences such as the numerous droughts Similarly, according to secondary sources, over thousand Nuristani were rendered food

insecure as a result of drought conditions due to such extreme events, crop losses are compounded by loss of pasture and escalating prices of fodder, which affect livestock populations (FAO., 2021).

Forest Resources, the viability and growth of forests is adversely affected changing temperature and rainfall patterns, as well as aridification, as noted above. Forest resources have also been sharply reduced by human logging and, especially, demand for firewood at local levels. So, climate change impacts accelerate the process of deforestation and land degradation, and delay afforestation (Singh *et al*., 2011).

Biodiversity, there is a dearth of secondary information linking climate change with biodiversity, that biodiversity 'appears to be declining at an accelerated rate throughout Nuristan.' Broadly, the report identifies rise in population as a primary cause behind the loss of biodiversity. Population rise leads to increased pressure on the natural support base, leading to deforestation and over grazing. These are further compounded by drought and water management issues, climate change impacts, war and hunting as reasons for steady loss of biodiversity in the province (Mongabay, 2020).

Human Health, Climate change impacts human health both directly and indirectly. Indirect impacts to health stem from increased food insecurity, extreme events and lack of water availability. Direct impacts of climate change on human health are generally in the form of higher incidence of diseases, primarily vector-borne diseases such as malaria and dengue fever (CSO., 2016).

Gender Dimensions, there has been relatively little formal analysis of the gender dimensions of the impacts of climate change in Nuristan. Nevertheless, it is clear that these are vitally important, given the precarious situation of women in the target area, women are under pressure of heavy load of regular works, to increase the opportunities available to them, in general, women have much relatively limited access to financial resources and other assets, education and employment opportunities, freedom of movement, and a voice in shaping decisions. All of these characteristics leave women highly vulnerable to the impacts climate change and extreme events, and less able to adapt. This is particularly the case in rural areas, which are most exposed to climate change impacts (Jimoh et al., 2021).

CONCLUSION

From the above results it can be concluded that, the people of Nuristan need urgent support for agricultural development and climate adaptation. Each time they are hit by disaster, their ability to cope worsens and any progress they had made is wiped out. Nuristan communities have always displayed remarkable resilience. However, facing the current crisis on top of natural disasters, climate change and food shortages, rural Nuristan communities need to be supported to protect their livelihoods, adapt to the changing conditions and grow more food. Loss and damage fund, land-use planning, public awareness, develop early warning systems rural based management and understanding pre and post disaster management practices. It also needs to finance reforestation, land reclamation and adaptation technologies regarding floods, landslide, mining, deforestation, human health, droughts, storms, avalanches and earthquakes, required to reduce hunger and poverty, and to ensure sustainable food production for Nuristan's future generations.

Conflict of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding: Not applicable

Acknowledgments: The authors are grateful to the staff and colleagues at national environmental protection agency and directorate of environment protection and ANDAMA, Nuristan for their direct and indirect support.

Authors Contributions: Authors' contributions: Mohammad Gulab Omari wrote the abstract, discussion, conclusion, recommendation, edited references; Mohammad Ismail Sadat provided figure, Rashad Ahmad cooperate in preparation of tables on climate change adaptation.

REFERENCE

Abdullah, A., Ghosh, S., Ahmad, F., & Rahman, S. (2019). Climate change vulnerability, adaptation potenti and recommended actions for sustainable rangeland ecosystems in Afghanistan. Sustainability, 11(14), 3805.

Afghan Voice Agency (AVA). (2015). "Afghanistan is one of the most vulnerable countries to the impact of climate change". https://www.avapress.com/fa/news/133746/

CSO, MoPH, & ICF International. (2016). Afghanistan Demographic and Health Survey 2015: Key Indicators, p. 15.

Dara, A. (2020). Flooding in Afghanistan: Causes, impacts and remedial measures. Natural Hazards, 100(3), 1353-1370.

Environment & WFP. (2016). Climate Change in Afghanistan: What Does it Mean for Rural Livelihoods and Food Security

FAO. (2021). Afghanistan Climate Change Profile. Retrieved from http://www.fao.org/afghanistan/knowledge- center/accessdata/en/

ICIMOD. (2020). Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People. Retrieved from https://lib.icimod.org/record/36191

Jimoh, M.Y.; Bikam, P.; Chikoore, H. (**2021)**.The Influence of Socioeconomic Factors on Households' Vulnerability to Climate Change in Semiarid Towns of Mopani, South Africa. *Climate 9*, 13.

Long, D., Ziervogel, G. (**2020).**Vulnerability and adaptation to climate change in urban South Africa. In *Urban Geography in South Africa*; Springer: Berlin/Heidelberg, Germany, pp. 139–153.

Mongabay. (2020). Afghanistan: Reforestation Projects Aim to Aid Both Environment and Economy. Retrieved from https://news.mongabay.com/2020/08/afghanistan-reforestation-projects-aim-to-aid-both-environment-and-economy

Nasimi, M. N., Sagin, J., & Wijesekera, N. T. S. (2021). *Climate and Water Resources Variation in Afghanistan and the Need for Urgent Adaptation Measures*. *July*. https://doi.org/10.26855/er.2020.02.009

National Environmental Protection Agency (NEPA). (2017). "Second National Communication under the United Nations Framework Convention on Climate Change (UNFCCC)". pp. 97

Nembilwi, N., Chikoore, H., Kori, E., Munyai, R..B., Manyanya, T.C. (2021). The Occurrence of Drought in Mopani District Municipality, South Africa: Impacts, Vulnerability and Adaptation. *Climate*, 10 (2), *9* -61.

NEPA. (2010). National Environmental Action Plan. Kabul: National Environmental Protection Agency.

Rousta, I., Saberi, M. A., Abdul, S., Mahmood, R., & Mansour, M. (2020). Climate change impacts on vegetation and agricultural drought in the basin of Panjshir River in Afghanistan. 1(4), 77–88. https://doi.org/10.30488/CCR.2020.253624.1029

Saleem, U., Iqbal, A., Khattak, M. N. K., & Hanif, M. (2018). Climate change in Afghanistan: Historical trends, current impacts, and future projections. Renewable and Sustainable Energy Reviews, 82, 1539-1550.

Singh, S.P., Bassignana-Khadka, I., Karky, B.S., & Sharma, E. (2011). Climate Change on Hindukush-Himalayas: The State of Current Knowledge, p. 4.

UNDP. (2020). Afghanistan. National Disaster Risk Management Funded (NDRMF). Retrieved from