

Sustainable Solutions to Mitigate the Negative Effects of Climate Change on Afghanistan

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ABSTRACT

One of the most important global issues that face all countries is climate change. One of the nations most impacted by the effects of climate change is Afghanistan. The nation is more endangered due to its geographic location, delicate ecosystems, and socioeconomic difficulties. This article explores Afghanistan's vulnerability to climate change and highlights sustainable solutions to lessen its effects on the nation. Online surveys were used as part of the study, which comprised 136 lecturers and current students from several Afghani universities. The results showed that the main effects of climate change on Afghanistan are an increase in average temperature, more frequent and severe droughts, flooding and increased water scarcity, loss of food security and agricultural productivity, melting of glaciers and depletion of water resources, and an increase in the frequency and intensity of natural disasters (such as storms and landslides). The main sustainable ways to lessen the effects of climate change are to promote renewable energy sources (solar, wind, and hydro), implement water management and conservation practices, improve agricultural practices for increased resilience, improve infrastructure for disaster preparedness, reforest and conserve forests, educate and raise awareness about the impacts of climate change, empower communities, create accountable policy and decision-making processes, and develop national strategies for sustainable development. Afghanistan.

Keywords: Climate change, Natural disasters, Sustainable solutions, Water scarcity

INTRODUCTION

Climate change is impacting ecosystems, energy, water levels, land temperature, and, most critically, drought situations (Rousta et al., 2020). Due to its extremely limited ability to mitigate the effects of climate change, Afghanistan is among the most vulnerable nations in the world (Ghulami, 2017). Afghanistan faces increased climatic hazards, particularly drought-related desertification and land degradation, with nearly all 34 provinces experiencing natural disasters like flooding, landslides, and extreme heat (Savage et al, 2009). The nation's food security, population growth, and agricultural productivity are all seriously threatened by the country's deteriorating drought circumstances, which might have long-term social repercussions (Daniel et al., 2022). Significant effects of climate change in Afghanistan include crop failure, starvation, drying up of water supplies, and food inflation (Sarwary et al, 2022). In Afghanistan, devastating droughts and floods are occurring more frequently as a result of climate change's impact on water resources (Nasimi et al., 2021). Afghanistan's farmers face insurgency-related challenges and climate change risks, requiring political, financial, and educational support to improve adaptation and resilience. Afghanistan is expected to encounter a variety of novel and increasing climate-related hazards (Khalily, 2022). This study aims to identify the major impacts of climate change on Afghanistan and suggest sustainable solutions to mitigate these effects. Specifically, it will address the questions: What are the key effects of climate change on Afghanistan? and What are the main sustainable solutions to combat the consequences of climate change?

MATERIALS AND METHODS

The study used primary and secondary sources to gather information on climate change challenges in Afghanistan. A survey instrument consisting of one set of questionnaires was constructed and sent to target respondents to collect information that would later be used for further study to determine the climate change effects on Afghanistan. The data collected through the questionnaires was analyzed descriptively, as well as, the data analyzed was used to support the study's desired results. The questionnaires have multiple choice questions and were constructed in the Pashto National Language of Afghanistan, so that

the respondents could better grasp the questions and correctly answer them. The questionnaire was reliable and consistent; therefore, every survey participant answered precisely similar questions. We obtained secondary data from publications, conference proceedings, and journals.

Samples Collection

136 lecturers and current students from various universities of Afghanistan received the survey questionnaire online between October 4 and 25, 2023. Since every survey respondent provided the same answers, the questionnaire can be trusted to be accurate.

Statistical Analysis

A descriptive analysis was performed on the data using SPSS 24. The study analytic methodologies of frequency and percentage were selected because of their suitability and efficiency for assessing test questions. Survey and questionnaire data can be analyzed using two common methods: the frequency method and the percentage method. The frequency (count) and percentage of respondents who chose each response option for each question are presented along with the distribution of responses for each question using these methods. Comparing results across questions or groups is made simpler by using the percentage method, which offers a standard way to present the distribution of responses. Both the frequency method and the percentage method are useful in reporting and analyzing survey data to gain insights and draw conclusions based on the responses collected.

RESULTS

The questionnaire aimed to assess public awareness, significant climate change effects, challenges faced by Afghanistan, sustainable solutions, and the Afghan governments and international organizations' ability to address these issues. Table (1) shows the survey findings:

Table 1: Responses of the questionnaire

Questions	Parameters	Survey responses participants	
		Frequency	Percentage
Respondents Gender	Male	131	96.3
	Female	5	3.7
	Total	136	100.0
Respondents Education level	a) Current student of university	55	40.4
	b) Undergraduate	35	25.7
	c) Master	40	29.4
	d) PhD	6	4.4
	Total	136	100.0
Public awareness about the effects of climate change in Afghanistan.	a) Very familiar	43	31.6
	b) Somewhat familiar	89	65.4
	c) Not familiar at all	4	2.9
	Total	136	100.0
The most significant effects of climate change on Afghanistan. (Select all that apply)	a) Increase in average temperature	62	45.6
	b) More frequent and severe droughts	82	60.3
	c) Flooding and increased water scarcity	85	62.5
	d) Loss of agricultural productivity and food security	61	44.9
	e) Glacier melting and water resource depletion	80	58.8
	f) Increased frequency and intensity of natural disasters (e.g., storms, landslides)	64	47.1
The biggest challenge Afghanistan faces due to climate change. (Select all that apply)	a) Water scarcity and droughts	120	88.2
	b) Agricultural losses and food security	44	32.4
	c) Increased risk of natural disasters	61	44.9
	d) Environmental degradation	70	51.5
The most important sustainable solution for Afghanistan is to mitigate the effects of climate change. (Select all that apply)	a) Promoting renewable energy sources (solar, wind, hydro)	68	50
	b) Implementing water management and conservation practices	107	78.7
	c) Improving agricultural practices for increased resilience	79	58.1
	d) Enhancing infrastructure for disaster preparedness	50	36.8
	e) Reforestation and forest conservation efforts	86	63.2
	f) Educating and raising awareness about climate change and its impacts	77	56.6
The ability of the Afghan government and international organizations to address the challenges of climate change in Afghanistan.	a) Very confident	20	14.7
	b) Somewhat confident	82	60.3
	c) Not confident	34	25.0
	Total	136	100.0

DISCUSSION

Table (1) shows that 2.9% of survey participants were not familiar at all with the implications of climate change on Afghanistan, while 65% of respondents were just slightly familiar with them. UNEP (2019) states that raising public knowledge and comprehension of climate change through educational initiatives can enable people to take sustainable activities and strengthen Afghanistan's resilience as a whole. As indicated in Table 1, the main effects of climate change on Afghanistan are as follows: higher average temperatures, more frequent and severe droughts, flooding and increased water scarcity, decreased agricultural productivity and food security, melting of glaciers, and depletion of water resources, and higher frequency and intensity of natural disasters (such as storms and landslides). Afghanistan's rising temperatures, resulting in longer, hotter summers, are causing significant negative impacts on public health, agriculture, water availability, and energy demand (World Bank, 2011). Droughts have been more often and severe in Afghanistan in recent decades, impacting food security, agricultural output, and water availability (Abdullah et al., 2019). Climate change intensifies Afghanistan's flooding, causing infrastructure damage and population displacement while melting glaciers in the Hindu Kush-Himalayan region exacerbate water scarcity issues (Dara, 2020). Climate change threatens Afghanistan's agricultural sector, affecting crop yields and food security due to irregular rainfall, drought, and heatwaves (FAO, 2021). The melting of glaciers in Afghanistan's mountainous regions is causing water resource depletion, impacting agricultural irrigation, drinking water availability, and hydropower generation (Saleem et al., 2018). Climate change in Afghanistan intensifies natural disasters like storms, landslides, and avalanches, causing loss of life, infrastructure damage, and population displacement. (ICIMOD, 2020). Promoting renewable energy, implementing water management, improving agricultural practices, enhancing disaster preparedness infrastructure, reforesting forests, and raising awareness about climate change are key sustainable solutions for Afghanistan. According to Haidari et al (2020), encouraging the adoption of renewable energy sources such as solar, wind, and hydro can reduce Afghanistan's dependency on fossil fuels and decrease greenhouse gas emissions. Developing and implementing effective water management and conservation strategies can help mitigate water scarcity issues and enhance water availability for agriculture, domestic use, and industry (World Bank, 2017). Promoting climate-smart agriculture techniques like crop diversification, precision farming, and efficient irrigation can enhance resilience and adaptability to changing climatic conditions (CIMMYT, 2019). Investing in early warning systems, robust infrastructure, and disaster risk reduction strategies can lessen the effects of natural disasters and improve Afghanistan's readiness (UNDP, 2020). Initiatives for replanting and planting trees can improve water retention, lessen soil erosion, sequester carbon, and lessen the negative effects of climate change (Mongabay, 2020). Mitigating the severe repercussions of climate change requires integrating climate change, community empowerment, national sustainable development initiatives, and accountable policy into economic planning (Savage et al, 2009).

CONCLUSION

Increased heat, droughts, flooding, agricultural losses, and water scarcity are just a few of the many issues that climate change has brought Afghanistan. Sustainable approaches, on the other hand, provide viable ways to lessen these effects. Examples of these include encouraging the use of renewable energy, water management plans, resilient farming methods, catastrophe preparedness, tree planting, and education. To guarantee that these sustainable solutions are implemented and scaled up to provide a more resilient future for Afghanistan, cooperation between the Afghan government, international organizations, and local people is essential. There are certain limitations that need to be considered when conducting research on sustainable ways to lessen the negative effects of climate change on Afghanistan. These include data availability, generalizability, socioeconomic considerations, and long-term monitoring. Future studies should focus on resolving these issues, including stakeholders, and enhancing communication in order to create thorough and practical plans for successfully reducing the detrimental effects of climate change on Afghanistan.

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Authors Contributions: Hizbullah Rahmani collected the data on climate change effects in Afghanistan, prepared the questionnaire, conducted an online survey, data analysis and drafted the manuscript, discussed the

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REFERENCES

- Abdullah, A., Ghosh, S., Ahmad, F., & Rahman, S. (2019). Climate change vulnerability, adaptation potential, and recommended actions for sustainable rangeland ecosystems in Afghanistan. *Sustainability*, 11(14), 3805.
- CIMMYT. (2019). Climate-Resilient Agriculture in Afghanistan. Retrieved from <https://www.cimmyt.org/climate-resilient-agriculture-in-afghanistan/>
- Dara, A. (2020). Flooding in Afghanistan: Causes, impacts and remedial measures. *Natural Hazards*, 100(3), 1353-1370.
- Daniel, D., Lucía, L., & Toni, T. (2022). *Afghanistan : A Multidimensional Crisis* (Vol. 34). <https://doi.org/10.1080/10402659.2022.2023428>
- FAO. (2021). Afghanistan Climate Change Profile. Retrieved from <http://www.fao.org/afghanistan/knowledge-center/accessdata/en/>
- Haidari, A. H., Saho, F. S., & Noori, M. (2020). Climatic response to the renewable energy transition in Afghanistan. *Renewable Energy*, 157, 766-775.
- ICIMOD. (2020). Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People. Retrieved from <https://lib.icimod.org/record/36191>
- Khalily, R. (2022). *Evaluation of Climate Change on Agricultural Production in Afghanistan*. 2, 91–100.
- Matthew Savage, Bill Dougherty, Mohammed Hamza, Ruth Butterfield, S. B. (2009). *Socio-Economic Impacts of Climate Change in Afghanistan A Report to the Department for International Development*.
- Meraj Sarwary, Senthilnathan Samiappan, Venkatachalam Saravanakumar, Tamilarasu Arivelarasan, V. S. M. (2022). *Climate Risks, Farmers Perception and Adaptation Strategies to Climate Variability in Afghanistan*. 33(12), 1038–1046.
- Masoud Ghulami. Assessment of climate change impacts on water resources and agriculture in data- scarce Kabul Basin, Afghanistan. Other. COMUE Université Côte d'Azur (2015 - 2019); Asian institute of technology, 2017. English. NNT: 2017AZUR4135. tel-01737052
- 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>
- Omerkhil, N., Chand, T., Valente, D., Alatalo, J. M., & Pandey, R. (2020). *Climate change vulnerability and adaptation strategies for smallholder farmers in Yangi Qala District, Takhar , Afghanistan*. 110(October 2019).
- 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.
- UNDP. (2020). Afghanistan. National Disaster Risk Management Fund (NDRMF). Retrieved from <https://www.pakistan.undp.org/content/pakistan/en/home/projects/NDRMF/afghanistan.html>
- UNEP. (2019). Afghanistan National Adaptation Plan. Retrieved from <https://www.climate-laws.org/geographies/afghanistan/documents/national-adaptation-plan-for-afghanistan>
- World Bank. (2011). Climate Change Increasing the Risks to Afghanistan's Poor. Retrieved from <https://www.worldbank.org/en/news/press-release/2011/09/18/climate-change-increasing-the-risks-to-afghanistans-poor>
- World Bank. (2017). Afghanistan Water Sector Resilience Nexus for Results. Retrieved from <https://www.worldbank.org/en/results/2017/11/14/afghanistan-water-sector-resilience-nexus-for-results>

