

Community-Based Adaptation to Climate Change in Water Sector: Engaging Local Knowledge and Practices in Achin District, Nangarhar, Afghanistan

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ABSTRACT

Climate change involves persistent changes in global temperatures and weather patterns, predominantly attributed to human activities that release greenhouse gases into the atmosphere. This study specifically focused on community-based adaptation in the water sector, exploring local knowledge and practices within Achin district. Through this investigation, we gathered detailed insights into the effects of climate change within Achin district and assessed the knowledge and local practices adopted by its residents. Primary water sources in the area, such as protected wells, springs, and boreholes, are highly relied upon by residents who generally express satisfaction with their reliability and quality. However, there is a prevalent lack of awareness regarding Household Water Treatment and Safe Storage (HWTS) among most residents. Climate change effects within Achin district include drought, groundwater depletion, surface water decreasing for irrigation, and shifting precipitation patterns. Despite these challenges, the residents lack knowledge about community-based adaptation. Local strategies employed within the district encompass dams, plantation initiatives, mobilization efforts, awareness campaigns on water usage, underground water recharge, and irrigation projects. Additionally, improved irrigation practices and effective conservation methods are identified as vital adaptation strategies. This study thoroughly assesses the impact of climate change on the water sector in Achin district, emphasizing local adaptation strategies. Through field visits, interviews with the residents of Achin, and the implementation of a Google Form survey from environmental and WASH specialists, we meticulously cataloged the effects of climate change and illuminated the indigenous responses adopted by the district's residents.

Keywords: Community-Based Adaptation, Climate Change, Local Knowledge, Water Sector

INTRODUCTION

Adaptation involves modifications in both natural and human systems as a reaction to the consequences of climate change (Ayers & Forsyth, 2010). Furthermore, the implementation of development initiatives labeled as 'adaptation' has seen substantial growth in the past decade (Scoville-Simonds *et al.*, 2020). Nonetheless, this is frequently carried out to alleviate issues stemming from specific hazards or perceived risks, such as climate change or extreme weather events (Ahmed *et al.*, 2021). Climate change poses one of the most significant challenges to humans and the natural world (Nugroho *et al.*, 2022). Furthermore, mounting evidence indicates that we can already observe the effects of climate change, such as increasing temperatures and shifting patterns of precipitation, and these effects are projected to become more severe in the years and decades to come (Dodman & Mitlin, 2011). Water serves as the primary conduit through which climate change exerts its influence on the Earth's ecosystem and all its inhabitants (Nugroho *et al.*, 2022). Additionally, it is estimated that by the year 2050, anywhere from 0.5 to 3.9 billion individuals across the globe will confront water scarcity on a heightened scale due to the impacts of climate change (Singh *et al.*, 2020). Climatic adaptation is described as the process of adjusting to the real or anticipated climate and its resulting impacts (Piggott-McKellar *et al.*, 2019). Additionally, a significant obstacle to the integration of local-level climate change adaptation and development arises from the deficiency in capacity and the absence of sustainable institutions capable of coordinating and spearheading local initiatives (Simane, 2016). Furthermore, there is an urgent and essential need to take action in implementing climate change adaptation (Owen, 2020). The phrase 'community-based adaptation' was first introduced in 2006 (Piggott-McKellar *et al.*, 2019). Also, its objective is to tackle the underlying sources of vulnerability present within communities (Aslany & Brincat, 2021). However, an

approach centered on community-based adaptation empowers individuals to prepare for and deal with the effects of climate change (Rankoana, 2020). Nevertheless, it distinguishes itself from other climate change adaptation approaches by actively involving disadvantaged and highly vulnerable individuals, enabling them to recognize and contribute to shaping responses for mitigating the risks associated with climate change (Forsyth, 2013). Moreover, its initiatives aim to enhance access to water and energy within contemporary development societies. These efforts encompass a range of practices, from traditional and modern water harvesting techniques to water conservation and storage, as well as improved recycling and reuse of water (Rankoana, 2020). Climate change, a global crisis affecting every developing nation, poses an imminent threat to humanity and the environment. Its multifaceted impact includes disruptions to human health, social dynamics, and ecosystems. Our nation, influenced by emissions from major industrial countries, faces the challenge of mitigating climate change. This study, focusing on the water sector in the Achin district of Nangarhar province, aims to offer practical insights into community-based adaptation strategies. By exploring local practices, it seeks to contribute actionable knowledge for policymakers and practitioners engaged in climate resilience efforts. This research is not only a scholarly pursuit but also a crucial step toward shaping adaptive strategies that are contextually relevant and resilient in the face of ongoing climate challenges. Also, it aims to assess groundwater levels in the Achin district, evaluate the impacts of climate change, and gather insights into community-based adaptation knowledge. Additionally, it seeks to understand local practices and knowledge related to climate change effects, proposing strategies based on this understanding for adapting to climate change impacts in Achin. The ultimate goal is to contribute to public awareness of climate change and its effects on human health, the environment, and social life, fostering informed and resilient communities in Achin district.

MATERIALS AND METHODS

Study Area

This study utilizes a descriptive research approach conducted through field visits and interviews within Achin district, situated in the southern region of Nangarhar province.

Samples Collection and Statistical Analysis

We employed purposive and snowball sampling methods in Achin District to comprehensively investigate community-based adaptation to climate change in the water sector, along with local knowledge and practices. Interviews were conducted with Achin district residents across various villages, supplemented by data collection from professionals and academics familiar with climate change's impact on the local water sector through field visits, interviews, and Google Forms. For statistical analysis, we used MS Excel program, employing these tools to analyze data and generate graphs and diagrams.

RESULTS AND DISCUSSION

Household Water Sources

We conducted field visits and interviews across Achin district to gather data on climate change's impact on the water sector and to study local knowledge and practices in combating climate change adaptation. A Google Form survey, field visits, and interviews were conducted by various community members, including villagers, leaders, farmers, teachers, engineers, agriculture officers, doctors, vaccine coordinators, and social workers. Notably, 92% of the data stemmed from Achin's residents, with the remaining 8% gathered from professionals working in the area.

In our investigation of climate change's impact on the water sector in Achin district, our findings align with existing literature on the importance of protected wells, boreholes, and springs as primary water sources in similar contexts (Dodman & Mitlin, 2011; Singh et al., 2020). Achin district primarily relies on protected wells, boreholes, and springs for drinking water, serving as reliable sources even in varying climate conditions. While these sources are widely used for household water supply during droughts, there's a lack of awareness among most residents regarding Household Water Treatment and Safe Storage (HWTS). Figure 1 illustrates the residents' knowledge of HWTS.

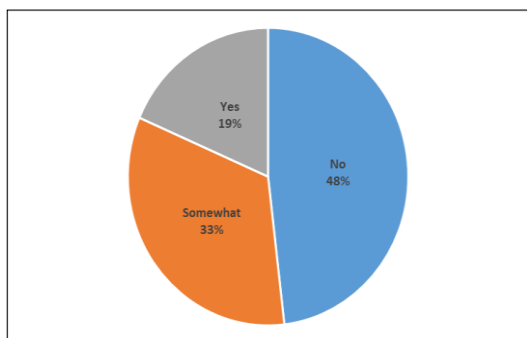


Figure 1. Knowledge of Residents about (HWTS)

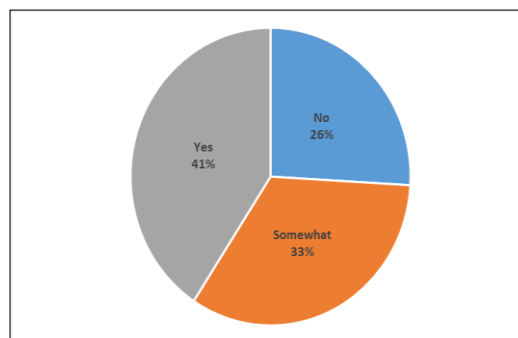


Figure 2. Awareness About Climate Change Effects

Awareness and Knowledge of Climate Change Adaptation and the Water Sector in Achin District

The residents and community members of Achin district possess an understanding of the potential impact of climate change, particularly its effects on local water resources. However, despite their awareness, the district has faced challenges such as droughts, groundwater depletion, and altered precipitation patterns due to climate change. Regrettably, the residents' awareness regarding these impacts on their water resources remains somewhat limited. This resonates with literature highlighting the challenges communities face in fully grasping the implications of climate change and the need for tailored awareness campaigns (Forsyth, 2013; Westoby et al., 2019). Figure 2 illustrates the percentage of Achin residents aware of the effects of climate change.

Community-Based Adaptation Knowledge, Practices and Strategies

Our study identifies a knowledge gap among Achin residents concerning community-based adaptation strategies, mirroring broader discussions on the challenges faced in effectively communicating these strategies at the community level (Piggott-McKellar et al., 2019; Scoville-simonds et al., 2020). The residents of Achin district lack exposure to information about community-based adaptation, unaware that the challenges they face stem from climate change. However, they strongly believe in the efficacy of community-based adaptation strategies to mitigate climate impacts. To address these challenges, residents employ local practices such as dams, plantation drives, irrigation projects, mobilization efforts, and water usage awareness campaigns, focusing on recharging underground water resources in response to the impacts of climate change in the water sector. The tables below present the key findings of our study.

Table 1. The Most Effective Strategies To Adapt The Effects Of Climate Change On Water Resources		
Efficient Water Conservation Methods (%)	Improved Irrigation Practices (%)	Community-Driven Initiatives (%)
59	30	11

Table 2. Strategies Used for Public Awareness to Reduce Negative Effects of Climate Change			
Education Programs (%)	Community Engagement (%)	Policy Changes (%)	Education Programs & Community Engagement (%)
63	22	4	11

Table 3. Rainwater Collection Methods	
Commonly Practiced Methods	Obtained Result (%)
Rainwater Collection from Ground Surfaces	74
Rainwater Collection from Roofs	4
Both Are Practiced Equally	15
None of These Methods Are Commonly Practiced	7

Table 1 outlines the effectiveness of adaptation strategies employed in Achin district to mitigate the impact of climate change on water resources. Notably, effective conservation methods and improved irrigation practices play a crucial role in enhancing the water table and promoting water reuse, and recycling. Despite these efforts, 60.7% of residents face water supply challenges during droughts. Education programs and community engagement are identified as key strategies to address these challenges, as highlighted in Table 2. Additionally, boreholes, rainwater collection, and springs prove effective during droughts. The importance of enhancing water source resilience against flooding is emphasized, with rainwater harvesting identified as an eco-friendly method for sustainable water conservation. Although some residents are familiar with water reclamation and reuse concepts, the implementation of water safety plans is yet to be realized. The comprehensive set of adaptation strategies includes measures such as dams, flood-retaining walls, check dams, plantation initiatives, terraces, water harvesting structures, household water treatment and safe storage (HWTS), forestry practices, irrigation techniques, and rainwater collection dams. These strategies collectively aim to ensure a consistent and safe water supply during extreme weather events or climate fluctuations in the area.

CONCLUSION

After analyzing the gathered information from the residents of Achin district, several key conclusions emerge. The inhabitants are presently contending with the tangible impacts of climate change, encompassing challenges such as drought, groundwater depletion, and alterations in precipitation patterns. Their reliance on protected wells, boreholes, and springs for daily water needs is apparent, with a prevailing satisfaction regarding the quality and dependability of these sources. However, a notable gap in awareness is identified concerning Household Water Treatment and Safe Storage (HWTS). While the majority of residents acknowledge the effects of climate change on their water sector, there exists a significant knowledge deficit regarding community-based adaptation strategies. Despite grappling with these challenges, the residents employ localized strategies, such as the construction of dams, plantation initiatives, irrigation projects, mobilization efforts, and water usage awareness campaigns. In essence, the people of Achin district are navigating the complexities of drought, often resorting to inefficient water usage practices, and simultaneously face a broader lack of specific information about the impacts of climate change and viable community-based adaptation measures.

Acknowledgment: We express our sincere gratitude to the residents of Achin district for their invaluable contributions to this research. Special gratitude goes to advisors for their instrumental role in organizing the 2024 International Climate Change Conference at Nangarhar University, Afghanistan.

Conflict of Interest: All authors express no conflict of interest in any part of the research.

Funding: This research received no external funding.

Authors Contributions: All authors contributed equally to the study's conception, data collection, analysis, and manuscript preparation.

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