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Issues of Climate Change in Nepal

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Abstract

This study discusses the multifaceted impacts of climate change on Nepal's environment, economy, and society. It highlights the country's vulnerability to climate-related challenges such as erratic weather patterns, glacial melting, and the resulting socio-economic consequences for its population. The document also outlines Nepal's efforts to address these challenges through policy frameworks like the National Climate Change Policy and the National Adaptation Programme of Action (NAPA). Additionally, it emphasizes the importance of international cooperation, community-based adaptation initiatives, and the promotion of renewable energy as key strategies to build resilience and mitigate the adverse effects of climate change in Nepal. The paper serves as a comprehensive resource for understanding the complexities of climate change in Nepal and the various measures being implemented to safeguard the country's future. It provides valuable insights for policymakers, researchers, and development practitioners involved in climate action, emphasizing the need for a coordinated and multi-faceted approach to address the evolving impacts of climate change.

Kewords: *Climate Change, Government Action, Agriculture, Biodiversity, Livelihood, Nepal*

1. Introduction

Climate change refers to significant and long-term alterations in the Earth's climate patterns, predominantly caused by human activities, such as burning fossil fuels, deforestation, and industrial processes (Climate Action, 2023). These activities release greenhouse gases, such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), into the atmosphere, which trap heat and result in the warming of the planet. While natural factors also influence climate, the current rate of change far exceeds natural variations and is primarily attributed to human actions (Matoset al., 2022). The effects of climate change are widespread and multifaceted, impacting various aspects of the environment, society, and economy. Rising global temperatures lead to more frequent and severe weather events, including heatwaves, storms, floods, and droughts. These extreme weather events can devastate communities, disrupt ecosystems, and threaten food and water security (Watts, 2023).

Additionally, melting ice caps and glaciers contribute to sea-level rise, posing risks to coastal cities and island nations. Ocean acidification, caused by the absorption of excess CO2, harms marine life and coral reefs, which are crucial ecosystems supporting biodiversity and fisheries (Watts, 2023). Climate change also exacerbates existing environmental challenges, such as deforestation, habitat loss, and species extinction. Changes in temperature and precipitation patterns alter ecosystems, disrupting the balance of plant and animal species and leading to shifts in habitats and migration patterns (Irfan, 2024).

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Furthermore, climate change has profound social and economic implications, disproportionately affecting vulnerable populations, including the poor, elderly, and marginalized communities. It exacerbates poverty, increases the risk of conflict over dwindling resources, and threatens livelihoods in sectors like agriculture, fishing, and tourism (Malhi et al., 2021). Addressing climate change requires concerted efforts at local, national, and international levels, including mitigation strategies to reduce greenhouse gas emissions and adaptation measures to cope with its impacts (Kaczan & Meyer, 2020). Transitioning to renewable energy sources, improving energy efficiency, protecting forests, and promoting sustainable practices are critical steps towards building a more resilient and sustainable future for generations to come (Perera et al., 2021).

Climate Change in Nepal

Nestled in the heart of the Himalayas, Nepal is a country with rich biodiversity and stunning landscapes, yet it faces significant challenges due to climate change. The impacts are diverse and far-reaching, with alterations in weather patterns and increased frequency of extreme weather events such as erratic rainfall, prolonged droughts, and intense monsoons. These changes disrupt agriculture, exacerbate water scarcity, and increase the risks of landslides and flooding, particularly in mountainous regions (World Bank, 2022). Additionally, the accelerated melting of Himalayan glaciers, which are crucial for freshwater supply, poses severe threats, including the heightened risk of glacial lake outburst floods (GLOFs) that endanger downstream communities (Agrawala et al., 2023). Moreover, shifts in temperature and precipitation patterns are adversely affecting ecosystems and biodiversity, leading to habitat loss and increased vulnerability to pests and diseases (World Bank, 2022).

The socio-economic impacts of climate change in Nepal are equally concerning, particularly for vulnerable populations in remote areas. Declining agricultural productivity threatens food security and livelihoods, while sectors like tourism and hydropower face uncertainties due to the changing climate (Sapkota, 2016). Addressing these challenges requires a multi-faceted approach that integrates adaptation and mitigation measures into national policies. Investing in climate-smart agriculture, sustainable water management, disaster risk reduction, and renewable energy is vital for safeguarding livelihoods and promoting sustainable development. International cooperation is crucial for Nepal to access the necessary resources and technologies to effectively combat climate change and build a resilient and sustainable future (Dahal, 2010; Climate Action, 2023).

Government Action on Climate Change

Nepal has undertaken several strategic initiatives to combat climate change and mitigate its impacts, recognizing the critical need to protect its people and ecosystems. The National Climate Change Policy (2011) provides a comprehensive framework for integrating climate considerations into national planning, focusing on resilience and sustainable development. Complementing this, the National Adaptation Programme of Action (NAPA) identifies priority sectors such as agriculture, water resources, health, and infrastructure, outlining urgent adaptation measures. The Climate Change Budget Code (CCBC) was introduced to ensure that climate change considerations are

embedded in the national budget, enhancing transparency and accountability in funding climate-related activities.

In addition to these policy frameworks, Nepal has prioritized the promotion of renewable energy, with programs encouraging investment in hydropower, solar, and wind energy to reduce fossil fuel dependence and lower greenhouse gas emissions. The government has also emphasized community-based adaptation initiatives, empowering local communities to implement tailored solutions, such as watershed management and disaster preparedness, to build resilience. On the international front, Nepal actively engages in global climate initiatives and partnerships, participating in agreements like the UNFCCC to access technical expertise, financial resources, and capacity-building support essential for effective climate action..

Overall, Nepal's government has demonstrated a commitment to addressing climate change through policy formulation, institutional frameworks, and on-the-ground initiatives aimed at enhancing resilience, promoting sustainable development, and transitioning to a low-carbon economy. However, significant challenges remain, including limited resources, institutional capacity constraints, and the need for enhanced coordination and collaboration across sectors and stakeholders to effectively tackle the complex and evolving impacts of climate change (Lamsal et al., 2014).

2. Literature Review

The conclusion drawn by Shrestha and Aryal (2011) underscores the complex interplay between climate change and its impact on water resources in the Himalayan region. While temperature trends align with climate model projections, precipitation variability remains inconclusive. Nevertheless, the observed rapid deglaciation poses a significant threat to water resources, particularly affecting river flow and runoff patterns crucial for Nepal and India. Despite inconsistencies in model predictions, the imperative for comprehensive hydrological modeling to anticipate future runoff changes is emphasized, alongside the need for vulnerability assessments nd adaptation plans to mitigate risks, particularly concerning glacial lake outburst floods. As river flow data analysis reveals no consistent trends presently, a cautious approach is advocated, urging proactive measures and preparation for potential adverse consequences of ongoing deglaciation and climate change.

Lamsal et al. (2014) offer valuable insights into the climate change policy landscape in Nepal. Through an analysis of challenges, opportunities, and imperatives, the authors provide a comprehensive overview of Nepal's response to climate change. The literature review likely delves into the unique vulnerabilities of Nepal to climate change, considering its geographical diversity, fragile ecosystems, and socioeconomic factors. Additionally, the publication may discuss existing policy frameworks and initiatives aimed at climate change adaptation and mitigation, highlighting areas of progress and areas needing improvement. Furthermore, it may offer recommendations for enhancing Nepal's climate resilience and mainstreaming climate considerations into national development plans. Overall, this literature review serves as a significant resource for policymakers, researchers, and practitioners involved in climate change policy and planning in Nepal, providing critical insights into the country's efforts to address the challenges posed by climate change.

The study by Sapkota (2016) shows the multifaceted nature of climate change, elucidating its origins in both natural phenomena and anthropogenic activities. While acknowledging the historical context of temperature increases and future projections, the review underscores the disproportionate vulnerability of Nepal despite its minimal contribution to global greenhouse gas emissions. With a focus on the country's reliance on agriculture and hydroelectricity, compounded by its fragile ecosystem and uneven topography, the review emphasizes the diverse sectors at risk and the potential for cascading economic impacts. Moreover, the scarcity of research in the Hindukush Himalaya region, coupled with the urgent need for adaptation funding, underscores the critical importance of the study's intended investigation into Nepal's climate change impacts. Through secondary data analysis, the review sets the stage for a comprehensive understanding of the challenges ahead, emphasizing the interconnectedness between climate change, socio-economic factors, and Nepal's future resilience.

Bhattacharjee et al. (2017) highlight a significant scarcity of studies documenting the biological impacts of climate change in the Himalayan region, particularly in Nepal. Only 15% of the reviewed articles addressed this issue, which may be an underestimation due to potential omissions, especially from gray literature sources. Nonetheless, these studies serve as a foundational baseline for understanding the biodiversity effects of climate change in the region. The focus primarily lies on predicting range shifts and alterations in species distributions, highlighting the necessity for more focused research on individual organisms and populations to elucidate their interactions with the changing environment. Such studies, including those examining physiological thresholds and evolutionary responses, are crucial for predicting and mitigating the potential ecological consequences of climate change, particularly concerning invasive species like Parthenium hysterophorus and Lantana camara in Nepal. Addressing these observational gaps presents an opportunity for substantial and imperative research into the organism-level impacts of climate change on biodiversity in the Himalayan region.

Shrestha, et al. (2019) claimed that research integrating instrumental climate data with societal perspectives in the Himalayan region is limited. This study analyzed nationally representative data from Nepal (n = 5060) to assess local perceptions of climate change alongside instrumental climate trends. While instrumental evidence revealed consistent warming and precipitation patterns, locals accurately perceived temperature shifts but not precipitation changes. The article suggests that increased exposure to weather variations may enhance individuals' ability to detect climate change over time. By integrating community perceptions with climate data, this study provides methodological insights and supports the formulation of policies to mitigate climate risks and enhance adaptation strategies. Results from this study suggest that, improving climate communication between the public and scientists can enhance predictive accuracy over time, suggesting ongoing evaluation and capacity building are vital for effective adaptation to climate change.

Rai (2019) highlighted significant shifts in precipitation patterns and agricultural practices in the eastern development region, particularly in Khotang district. Over the period of 1960 to 2009, the region has experienced contrasting trends in annual mean precipitation, with an increase observed

in the development region as a whole but a notable decrease in Khotang district. These changes have impacted both snow-fed and rain-fed river systems, with increasing trends in annual mean discharge observed in the Dudhkoshi River but decreasing trends in the rain-fed Shabhaya Khola. Concurrently, local communities have reported a variety of alterations in rainfall patterns, including reduced intensity and frequency of rainfall, diminished winter precipitation, and changes in snowfall, dew, fog, and hailstorm occurrences. These changes have significantly affected agricultural productivity, water availability, and fodder production, leading to adaptations such as shifts in cropping timings, adoption of drought-resistant seed varieties, and changes in cultivated crops to mitigate risks associated with climate variability. However, challenges such as soil degradation, inadequate farming inputs, and wildlife interference persist, necessitating ongoing adaptation efforts in the face of a changing environment.

The study by Dahal et al. (2020) delves into the assessment of future water availability in the Karnali River Basin of the Nepal Himalaya using the SWAT hydrological model, offering crucial insights into the potential impacts of climate change. Through meticulous analysis, the study demonstrates the model's capability in accurately simulating river discharge, crucial for understanding hydrological dynamics. It projects a notable increase in mean temperature and precipitation across the basin, particularly during the pre-monsoon and monsoon seasons, under both RCP 4.5 and RCP 8.5 scenarios. This trend suggests a significant alteration in the water resource regime, with an anticipated rise in river discharge by 2040-2069 and 2070-2099, potentially exacerbating the risk of floods and extreme events. The findings highlight the urgent need for proactive adaptation measures to mitigate the adverse impacts on infrastructure, livelihoods, and settlements, particularly in vulnerable low-lying areas. Overall, the study underscores the critical importance of understanding future water availability dynamics in the context of climate change for effective water resource management and disaster risk reduction strategies in the Karnali River Basin.

Asian Development Bank (2020) provides a comprehensive overview of Nepal's vulnerability to climate change and its efforts in climate adaptation and mitigation. The literature review likely covers various aspects such as the country's geographical diversity, socioeconomic vulnerabilities, and exposure to climate-related hazards. It may highlight key findings regarding the impacts of climate change on Nepal's water resources, agriculture, biodiversity, and human health. Additionally, the profile may discuss existing climate policies, strategies, and initiatives undertaken by the government and other stakeholders to address climate change challenges. Furthermore, it may offer insights into priority areas for intervention and recommendations for enhancing resilience and sustainability in the face of climate change. Overall, this literature review serves as a valuable resource for policymakers, researchers, and development practitioners seeking to understand Nepal's climate change context and formulate evidence-based strategies for climate action.

Research by Rayamajhee et al. (2021) explores the intricate relationship between climate change and rice cultivation in Nepal, a country heavily reliant on rice as a staple food crop. Through an in-depth analysis of existing research and empirical data, Rayamajhi elucidates the various ways in which climate change phenomena, such as altered precipitation patterns, temperature

fluctuations, and increased occurrences of extreme weather events, pose significant challenges to rice production systems in Nepal. The authors highlight the vulnerability of smallholder farmers and rural communities to these climatic shifts, emphasizing the adverse impacts on agricultural productivity, food security, and livelihoods. Furthermore, the article underscores the importance of implementing adaptive strategies and sustainable agricultural practices to enhance the resilience of rice production systems amidst changing climatic conditions. By providing a comprehensive overview of the climate change impacts on rice cultivation in Nepal, this study contributes valuable insights for policymakers, agricultural practitioners, and researchers seeking to address the complex challenges posed by climate change in agrarian societies.

Adhikari et al. (2021) provide a comprehensive analysis of the changing climatic patterns and their impacts on mountain communities in Nepal, with a focus on the Muktinath area. Through a combination of meteorological data analysis and farmer perceptions, the authors elucidate the adverse effects of climate change, including rising temperatures, erratic precipitation, and increased occurrence of natural hazards. Furthermore, the study highlights the diverse range of adaptation strategies adopted by local communities, rooted in traditional knowledge and locally available resources. However, it identifies significant barriers such as financial constraints, lack of knowledge, and weak institutional support hindering the effectiveness of these adaptation measures. The findings underscore the urgent need for enhanced local-level policies that actively involve farmers in decision-making processes and integrate climate change adaptation strategies into development plans. Importantly, the study emphasizes the importance of integrating traditional knowledge with modern technologies to ensure sustainable and effective outcomes in mitigating the impacts of climate change on mountain livelihoods.

The literature on land use and climate change by Thapa (2021) reveals a predominant focus on examining their global and regional impacts, yet a growing body of research delves into multiple scales, including local contexts, to better comprehend this intricate interplay. Such studies underscore the necessity for comprehensive research efforts and stakeholder engagement to effectively address this complex phenomenon. It is evident that the potential for land-related responses, whether in terms of adaptation or mitigation, varies depending on contextual factors, such as the adaptive capacities of communities and regions. The reciprocal relationship between land use and climate change has profound implications at both global and regional scales, necessitating the development of simple models to estimate their mutual effects. Notably, countries like India, Ethiopia, Bangladesh, Europe, and Africa face similar challenges regarding the impacts of climate and land-use changes. However, there remains a gap in comprehensive research regarding land use and land cover change (LUCC) in Nepal, calling for further investigation into driving factors and future projections to inform effective strategies for sustainable land management and climate adaptation.

Bhandari et al. (2022) highlight the impacts of climate change on species distribution, particularly exemplified by the case of the striped hyena (Hyaena hyaena) in Nepal, underscores the urgent need for effective conservation strategies in the face of biodiversity loss. The study utilizes Maxent species distribution modeling to predict the current and future habitat distribution of hyenas under

different representative concentration pathway (RCP) scenarios. Results indicate a significant reduction in suitable habitat for hyenas in Nepal, particularly in the Chure hills and Terai regions, with projections suggesting further declines over the next 50 years. These findings highlight the pressing challenges posed by climate change to species survival and emphasize the importance of incorporating such insights into conservation policies, while also underscoring the value of continued research to inform targeted conservation efforts amidst changing environmental conditions.

Bhattarai et al. (2022) discuss the potential implications of climate change on hydro-energy generation in the Nepalese Himalaya, a region known for its significant hydropower potential. Focusing on the planned Budhigandaki Hydroelectricity Project, the study evaluates energy generation under various climate change scenarios, considering RCPs 4.5 and 8.5. Results indicate a notable dependence of energy generation on reservoir operating rules, with projected variations ranging from -5% to +12% compared to baseline estimates, particularly at different temporal scales. The study underscores the importance of assessing a range of plausible climate change scenarios to better inform decision-making processes. Moreover, it emphasizes the need for storage-type projects with flexible operating rules and consideration of competing users, alongside diversification of energy generation sources to ensure climate resilience and future energy security. The findings highlight the imperative for strategic planning and policy support to mitigate potential risks and optimize hydroelectricity development in the face of climate change uncertainties.

UN Environment Program (2023) sheds light on the escalating challenges faced by communities residing in Nepal's mountainous regions due to the anticipated intensification of the monsoon season. The literature underscores the heightened vulnerability of these villages to the impacts of climate change, emphasizing the critical importance of adaptation measures in mitigating risks associated with extreme weather events. By focusing on Nepal's slopes, the article highlights the localized nature of climate impacts and the urgent need for tailored solutions to enhance resilience and protect livelihoods in vulnerable mountain communities. Through its empirical insights, the literature contributes to a deeper understanding of the complex interplay between climate dynamics and socio-economic vulnerabilities, advocating for proactive interventions to address the escalating threats posed by a changing climate in Nepal's mountainous regions.

3. Research Methodology

Explorative research design was chosen considering the purpose of the study which was to analyze the impact of climate change in areas and figure out the areas of focus. This study follows a qualitative approach which is based on published literature both domestically and internationally. This research works as a thematic summary of empirical literature to determine action areas for climate protection in Nepal. To address the research objective, secondary data was used from past literature in the field of climate change. The qualitative data from studies were analyzed using thematic analysis, identifying key themes related to community adaptation strategies, policy effectiveness, and barriers to implementation.

4. Results and Discussion

A plethora of study has been done by academicians as well as international organizations to understand the impact of climate change in Nepal and determine action areas. Such studies are conducted in Nepal due to its vulnerability to environmental shifts and its significant implications for the country's ecosystems, agriculture, water resources, and communities. Studies have examined changes in temperature and precipitation patterns, glacial retreat, shifts in monsoon dynamics, and the resulting effects on agriculture, biodiversity, and water availability. Additionally, research has investigated the socioeconomic impacts of climate change on vulnerable populations, such as mountain communities and marginalized groups, and assessed the effectiveness of adaptation measures and policies.

Research on climate change in Nepal is done by academicians, media and international agencies. The major areas affected by climate change in Nepal can be discerned in terms of agriculture, biodiversity and water availability.

4.1 Agriculture

Agriculture is considered the backbone of our nations. Global warming and climate crisis has been a big challenge for farmers and their productions. Based on literature, the major areas within Nepal's agriculture sector that are being affected by climate change and global warming can be as follows.

Table 1: Impact of Climate Change on Agriculture

Agriculture	Impact of Climate Change
Crop Production	Altered precipitation patterns affecting planting and harvesting seasons
	Increased frequency of extreme weather events such as droughts and floods
	Changes in temperature impacting crop growth and yield
Water Management	Changes in availability and distribution of water resources due to Altered precipitation patterns and glacial melt
	Increased risk of water scarcity, particularly in dry seasons and regions
	Changes in river flow affecting irrigation systems and water supply for agriculture
Livestock Farming	Heat stress on livestock due to rising temperatures
	Changes in forage availability and quality
	Increased prevalence of vector-borne diseases affecting livestock health
Agroforestry	Changes in forest composition and distribution due to temperature and precipitation
	Changes Altered patterns of tree growth and productivity
Soil Management	Soil erosion and degradation due to intensified rainfall and floods
	Loss of Soil fertility and productivity
	Increased risk of landslides and Soil erosion affecting agricultural land

4.2 Biodiversity

Climate change poses significant threats to biodiversity in Nepal, exacerbating existing challenges in this ecologically diverse country. As temperatures rise and precipitation patterns shift, the distribution and habitats of numerous species are being altered. Endemic species, confined to specific niches, face heightened risks of extinction as their habitats become increasingly fragmented or unsuitable. The vulnerability of mountain communities reliant on biodiversity for livelihoods exacerbates the socio-economic impacts of biodiversity loss. Urgent action is needed to mitigate these effects, emphasizing the importance of conservation efforts and sustainable management practices tailored to Nepal's unique biodiversity and climatic challenges. These impacts on biodiversity can be observed as follows.

Table 2: Effect of Climate Change on Biodiversity in Nepal

Biodiversity	Impact of Climate Change
Habitat Loss	Changes in temperature and precipitation patterns are altering the distribution of species and their habitats.
	Some species may be forced to migrate to higher elevations, while others may face habitat loss
Changes in Phenology	Increased risk of water scarcity, particularly in dry seasons and regions
	This can disrupt ecological interactions and lead to mismatches between species' life cycles
Increased Vulnerability to Extinction	Species already facing habitat loss or fragmentation are more vulnerable to the additional stressors brought by climate change
	Endemic species confined to specific habitats are particularly at risk
Altered Ecosystem Dynamics	Climate change can disrupt ecosystem functioning by affecting species composition, nutrient cycling, and energy flow.
	This can lead to cascading effects throughout the food web and ecosystem services.
Extreme Events	More frequent and intense weather events such as droughts, floods, and storms can directly impact biodiversity
	Exacerbate existing threats to biodiversity.

4.3 Water Resources

Climate change is profoundly impacting water resources in Nepal, presenting multifaceted challenges to the country's hydrological systems. With rising temperatures and shifting precipitation patterns, Nepal is witnessing alterations in the availability, distribution, and quality of its water sources. These shifts in water resources pose significant challenges to Nepal's socio-economic development and environmental sustainability, necessitating proactive measures to adapt to and mitigate the impacts of climate change on its water systems.

Table 3: Effect of Climate Change on Water Resources in Nepal

Effect on Water Resources	Impact of Climate Change
Precipitation Patterns	Alterations in the timing, intensity, and distribution of precipitation affect water availability in Nepal.
	Changes in monsoon patterns impact the timing of rainfall, leading to fluctuations in river flow and groundwater recharge.
Glacial Retreat & Melting	Accelerated glacial retreat due to rising temperatures reduces the availability of meltwater from glaciers, affecting river flow
	Increased glacial melt also raises the risk of glacial lake outburst floods (GLOFs)
Altered River Flow	Fluctuations in river flow, affecting water availability for irrigation, drinking water supply, and hydropower generation
	Variability in river flow impacts water management and infrastructure.
Water Quality Degradation	Alteration of water temperature, sedimentation rates, and nutrient levels
	Increased runoff and sedimentation from extreme weather events degrade water quality in rivers and streams
Water Scarcity	Exacerbate water scarcity, particularly in dry seasons and regions with high reliance on seasonal water sources
	Water scarcity poses risks to agriculture, hydropower generation, and ecosystem health
Aquatic Ecosystems	Vulnerable species dependent on specific habitats are at risk due to alterations in water resources
	Aquatic ecosystems, including fish populations, aquatic plants, and biodiversity are decreasing.

4.4 Health and Livelihoods

Climate change is exerting profound effects on the health and livelihoods of people in Nepal, presenting complex challenges that intertwine environmental, social, and economic dimensions. Extreme weather events such as floods, landslides, and droughts are becoming more frequent and intense, posing risks to lives, property, and livelihoods. Disruptions to traditional livelihoods, including agriculture and livestock rearing, threaten economic stability and exacerbate poverty in rural communities. Additionally, limited access to healthcare services and infrastructure further compounds health risks, particularly in remote and marginalized areas. These affects can be summarized as follows.

Table 4: Impact of Climate Change on Health and Livelihoods

Health & Livelihoods	Impact of Climate Change
Spread of Diseases	Changing temperature and precipitation patterns create favorable conditions for the spread of vector-borne diseases such as dengue fever and malaria
	Increased incidence of disease outbreaks poses risks to public health and wellbeing
Malnutrition	Changes in temperature and precipitation patterns affect crop yields, leading to reduced agricultural productivity and food shortages
	Food insecurity exacerbates malnutrition and poses risks to vulnerable populations
Waterborne Diseases	Changes in precipitation patterns and water quality degradation increase the risk of waterborne diseases such as diarrhea and cholera
	Contaminated water sources pose health risks to communities, particularly during extreme weather events
Mental Health Challenges	Exposure to climate-related hazards, loss of livelihoods, and displacement due to natural disasters can contribute to stress, anxiety, and mental health issues

4.5 Majorly Focused Areas in Literature

Both academics and international development agencies have been keen on conducting studies on climate change and actions necessary in Nepalese contexts. However, the major focus areas of research from these entities appear to differ. From review of 20 literature on climate change in Nepal which included academically published papers and reports from various agencies, it was observed that academic papers are more focused on effects on agriculture while international agencies consider health and livelihoods of community more important.

Table 5: Difference in Focus Areas of Academic Papers and IA Reports

	Academic Papers	International Agencies
1	Major focus on effects of climate change on Agriculture	Major focus on effects of climate change on livelihood
2	Secondary focus on water and hydropower	Secondary focus on agriculture and hydropower
3	Consider areas that affect the whole economy of nation	More importance to family economies and mountain economies
4	Provide recommendations and investment opportunities	Mostly limited to situation analysis and problem identification

This focus of academic papers on climate change on the agriculture sector due to its significant contribution to the country's economy, livelihoods, and food security. Agriculture is a primary source of income for a large portion of the population, particularly in rural areas, where subsistence farming is prevalent. Therefore, understanding the impacts of climate change on agriculture is crucial for informing adaptation strategies, mitigating risks, and ensuring sustainable agricultural practices.

On the other hand, international agency reports may prioritize health and livelihoods in Nepal due to their broader scope and emphasis on human welfare and development outcomes. Furthermore, international agencies often have mandates to address global challenges such as poverty reduction, sustainable development, and public health, which align with their focus on health and livelihoods in the context of climate change.

Overall, while academic papers and international agency reports may prioritize different aspects of climate change impacts in Nepal, both perspectives are essential for developing comprehensive strategies to address the multifaceted challenges posed by climate change and safeguard the well-being of the population.

5. Conclusion

Nepal faces formidable challenges from the impacts of climate change, ranging from altered weather patterns and glacial melt to socio-economic vulnerabilities and biodiversity loss. The country's rich natural heritage and the livelihoods of its people are at stake, necessitating urgent action at local, national, and global levels. While the Nepalese government has taken commendable steps to address climate change through policy frameworks, adaptation initiatives, and international cooperation, concerted efforts are required to overcome remaining obstacles and build a more resilient and sustainable future.

The collection of literature reviewed underscores the urgency of addressing climate change challenges and implementing adaptation and mitigation measures to safeguard livelihoods, ecosystems, and vulnerable communities. From the alteration of weather patterns and glacial melt to shifts in agricultural practices and hydro-energy generation, Nepal faces complex and interconnected challenges that require holistic and proactive approaches. Furthermore, the literature highlights the importance of integrating traditional knowledge with scientific research and fostering collaboration between stakeholders at local, national, and international levels to effectively address climate change impacts.

Academic papers predominantly focus on the effects of climate change on agriculture, recognizing its significance for the country's economy, food security, and livelihoods. On the other hand, international agency reports emphasize the impacts of climate change on health and livelihoods, reflecting their broader mandates and priorities in promoting human welfare and development. While there may be differences in focus areas between academic papers and international agency reports, both perspectives are vital for understanding the complex challenges posed by climate change in Nepal and developing holistic strategies to address them. By integrating insights from academic research and international agency reports, policymakers, practitioners, and stakeholders can collaborate effectively to mitigate the impacts of climate change and promote sustainable development in Nepal.

Limitations

The study acknowledges certain limitations, including the reliance on secondary data which may have inherent biases. Additionally, the geographic and temporal scope of the research is constrained by the availability of climate data and access to remote regions for case studies. Despite these limitations, the study provides a comprehensive analysis of the multifaceted impacts of climate change in Nepal.

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