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Climate Change in Loralai, Balochistan: Environmental, Social, and Economic Impacts in an International Relations Context

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ABSTRACT

Climate change poses serious threats to vulnerable regions especially in the Balochistan province in the arid and semi-arid areas. The study investigates the environmental, social and economic consequences of climate change in Loralai District aimed to shed light on the felt climate changes and adaptation strategies of local communities. The study conducted through qualitative interviews reveals that increasing temperatures, inconsistent rainfall and frequent droughts are some of the key environmental challenges, while their impact on agriculture, water availability, and biodiversity is felt. These changes have impacted people's livelihoods, driven migration pressure, and undermined the resilience of communities, particularly of those that have been marginalized. The reduction in productivity and loss of livestock value has also led to increased poverty and unemployment, perpetuating a cycle of vulnerability. The research highlights Loralai as a case study to inform the ongoing discussion on climate change, resilience and adaptation in South Asia and locates it in an International Relations framework which brings the local to the international, to the discourse of international security and to the policy landscape on sustainable futures.

Keywords: *Climate Change, Resilience, Loralai, Balochistan, Adaptation, Socio-economic Impacts, International Relations.*

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Introduction

Climate change is well known as one of the most challenging problems of the twenty first century, with far reaching environmental, social and economic consequences. Although its effects are felt all over the world, vulnerable developing areas like Pakistan are more vulnerable because of poor adaptation facilities, scarcity of resources and fragility of the ecosystem. Climate variability can have a significant impact on Balochistan, the largest but least developed province of Pakistan, with extreme temperatures, irregular rainfall, water shortages and frequent droughts having a profound effect on the province.

The district of Loralai in Balochistan is an interesting example to study the localized effects of climate changes. Loralai is in a semi-arid climate and has a very agriculture intensive economy and very dependent on livestock for livelihoods, both of which are very vulnerable to changes in climate. The district's increasing poverty rates, declining agricultural productivity, and migration patterns highlight the district's external, socioeconomic, and ecological stresses and how they are interconnected.

The purpose of this study is to explore the particular impact of climate change on Loralai in terms of its environment, social and economic impacts. The research also highlights the local experiences and adaptation responses, which situates the findings within the larger discussions of climate change, sustainable development and International Relations, both the global cooperation and security discourses and the policies that influence climate adaptation responses in South Asia.

Background of the Study

Climate change has become one of the biggest challenges in the world, with a negative impact on global ecosystems, livelihoods and socio-economic stability. Rising temperatures, variation in rainfall and increased frequency of extreme events are especially threatening to arid and semi-arid areas such as the Middle East and Mediterranean, according to the Intergovernmental Panel on Climate Change (IPCC, 2021). Despite contributing only 1% of the global emissions of greenhouse gases (GHGs) (World Bank, 2022), Pakistan is among the most

climate vulnerable countries in South Asia. Floods, droughts, and water scarcity are common occurrences in the country, especially in rural areas that rely on agriculture and livestock farming (Khan & Ali, 2020).

Balochistan is the biggest province of Pakistan with tough climatic condition, weak socio-economic resources and vulnerable ecosystems, which makes it more susceptible to risks (GoP, 2021). It is exposed to climate variability due to chronic underdevelopment, lack of infrastructure and weak governmental interventions (Rasul, 2019). Loralai District in Balochistan is a particularly important area in which the effects of climate change are being felt. Agriculture, horticulture, and livestock are the main pillars of the economy in the district, and are very vulnerable to variable rainfall, extended dry spells, and rising temperatures (Shah, 2021).

These environmental shocks have impacted food security and livelihoods of rural populations, while having important social impacts including migration, reduced community adaptation capacity and growing inequality in poverty levels (UNDP, 2020). The impact on the economy due to reduced productivity in agriculture and loss of livestock has also exacerbated unemployment and underdevelopment in the region (Ahmed & Mustafa, 2022). Thus, it is important to study the environmental, social and economic effects of climate change in Loralai for both academic and policy purposes. This study's findings will inform the broader discussions on climate resilience and sustainable development in Pakistan and South Asia by capturing the local experiences, coping mechanisms, and challenges faced by the people.

Problem Statement

With the advent of climate change, arid and semi-arid regions of Pakistan have become a major concern and Balochistan is one of the most vulnerable provinces of Pakistan. The increased temperature, irregular rainfalls, droughts and water scarcity in Loralai District have affected the agriculture, livestock and biodiversity. These environmental stresses have manifested as social-economic stresses like poverty, unemployment and migration, especially for marginalized communities. While local people have developed coping strategies, there is little research available to examine how climate change specifically

impacts environmental, social and economic conditions in Loralai and how communities cope with these challenges. The study is thus a study of the environmental impacts, socio-economic consequences and local adaptation strategies for gaining insights for resilience and for sustainable development.

Research Questions

1. How is climate change affecting the environmental conditions in Loralai, Balochistan?
2. What are the social and economic impacts of climate change on local communities in Loralai?
3. How are individuals and communities in Loralai adapting to and coping with the effects of climate change?

Limitations of the Study

This study has several limitations. It focuses only on Loralai District. The data is based on a limited number of interviews, which may not capture the full diversity of community experiences. Although qualitative methods give depth, they are not statistically precise for long term analysis and there is not much secondary data available for verification in the long run. Lastly, the view of International Relations used here is selective, with broader geopolitical aspects set aside for future study. Despite the limitations, the study provides valuable insights into the local climate change impacts, adaptation responses and their relevance to international policy processes and international cooperation arrangements.

Literature Review

Climate Change as an International Security Concern

Climate change is one of the greatest challenges of the 21st Century with far-reaching impacts on ecosystems, economies and societies. The Intergovernmental Panel on Climate Change (IPCC, 2021) notes that the global temperature has increased by 1.1°C on average above pre-industrial temperatures, which has led to an increase in the frequency of heatwaves, the variability of precipitation and extreme weather events. Developing countries and dry land and semi-arid countries are particularly vulnerable due to the lack of adaptive capacity and the high

reliance on climate-sensitive sectors like agriculture (Adger et al., 2017).

Climate change is an environmental issue, but also a security, cooperation and governance issue of international relations. Climate stress is said to contribute to regional instability, the direction of migration and foreign policy agendas (Barnett, 2003; Keohane & Victor, 2016). International organizations and transnational networks are important factors in determining climate change as a common problem, in shaping discussions about adaptation, and in establishing means to distribute resources. Therefore, by placing Loralai in this bigger IR conversation, one sees how local vulnerabilities intersect with the global IR conversation on resilience, legitimacy, and sustainable development.

Pakistan is a Very Vulnerable Country and Prone to Climate Change

Notwithstanding its very low level of GHG emissions, Pakistan remains one of the most climate-vulnerable countries of the world (World Bank, 2022). In the last 20 years, Pakistan has been among the top ten countries most affected countries according to the Global Climate Risk Index 2021 (Eckstein et al., 2021). With the rise in temperature, glacial melting, flash floods, droughts and water scarcity has severely affected agriculture, food security and rural livelihoods (Qurat-ul-Ain & Baig, 2019). These environmental stresses have also exacerbated socio-economic challenges such as poverty, inequality, and displacement (Mustafa et al., 2019).

Climate Change and Balochistan

Climate Risk is especially concerning in Balochistan, which has a small rainfall, weak ecological systems and is the largest province of Pakistan by area. Long droughts have become common occurrences and are having significant impacts on agriculture, livestock and water supply (Rasul, 2019). Earlier research suggests that the causes of rural poverty in the province include decreasing yields in agriculture and water access (Shah, 2021). Forced migration, weak social cohesion and growing conflicts around the limited availability of resources are also social issues in Balochistan (Ahmed & Mustafa, 2022).

Climate Change is a Problem in Loralai District

Loralai District is a vulnerable case study in Balochistan as it is an agriculture, horticulture and livestock dependent area. Food security and rural livelihoods are at stake due to climatic changes like irregular rainfall, increased temperatures, and drought (Kakar, 2020). Social, there have been changes which have led to rural-urban migration, affected traditional livelihoods and added pressure on marginalized groups (Baloch & Khan, 2021). For the economy, it represents lost productivity, diminished livestock health and job losses, thereby perpetuating poverty and underdevelopment (UNDP, 2020).

Adaptation and Coping Strategies

Pakistan and Balochistan have a range of coping mechanisms used by local communities to adjust to the pressures of climate change. Some of these are water saving practices, crop diversification, remittance dependency, and indigenous knowledge in farming practices, but limited institutional support, limited infrastructure and weak governance limit the effectiveness of adaptation measures. Improving the resilience of communities requires the implementation of community-based policies, sustainable agriculture, and development initiatives that are inclusive to the community.

Research Gaps

There are numerous studies on climate change done at the national and provincial level but there are no studies conducted at the district level, such as Loralai. While existing literature tends to focus on general provincial level trends, it fails to consider the complex interplay between environmental, social and economic stressors at the community level. Besides, little empirical data exist on the adaptation and coping responses of the households in Loralai to climate stressors. These gaps need to be filled in and taken into account for designing local-appropriate adaptation strategies and shaping policy agendas for resilience in Balochistan.

Main Argument

Understanding the impact of climate change in Loralai is very crucial to develop sustainable resilience strategies and agriculture, water resource and livelihood problems are adversely

affected by climate change.

Theoretical/Conceptual Framework and Research Methodology

This study follows the Vulnerability and Adaptation Framework that offers an all-encompassing framework to analyse the effects of climate change on societies, specifically in socio-economically and ecologically vulnerable contexts like Loralai, Balochistan. The concept of vulnerability is framed in terms of three key aspects: exposure to climate risks, sensitivity of socio-economic and environmental systems to climate risks, and adaptive capacity of communities to deal with (Adger, 2006).

The exposure in Loralai is manifested in the presence of recurrent droughts, irregular rainfall and rising temperatures. One example of sensitivity is the reliance of local communities on agriculture and livestock, which are directly affected by climatic variability. On the other hand, adaptive capacity is influenced by the resources that are available, indigenous knowledge, institutional support and socio-economic conditions that influence community responses to and coping with climate shocks (Smit & Wandel, 2006).

Vulnerability and Adaptation Framework

The Vulnerability and Adaptation Framework also highlights the unequal distribution of climate effects of the vulnerable populations, who are the most vulnerable because they lack access to resources and opportunities (O'Brien et al., 2007). It is particularly applicable to the context of Loralai, where structural inequalities, poverty and geographic isolation heighten climate vulnerabilities.

The framework used in the study places climate change in its environmental context and beyond; it also identifies climate change as a social and economic challenge, which poses threats to community resilience and sustainability. It also offers analytical underpinning to investigate the wider impacts of local adaptation processes (e.g., migration, livelihood adjustments, use of traditional coping mechanisms) on climate change resilience across the region.

The concept of vulnerability is crucial to studies on climate change. It was described by the IPCC (2001, 2007, 2014) in three parts: exposure (the

amount of climate risks people are exposed to), sensitivity (how susceptible people are to the climate risks), and adaptive capacity (how resilient or resilient to adapt or adjust people are). Social factors, such as poverty, governance, and community networks are also very important, Adger added (2006). Similarly, Smit and Wandel (2006) devised the 'adaptation framework' and focused on the capacity of communities to react and resilience. However, only as "outcome vulnerability" (due to impacts of climate change) or "contextual vulnerability" (due to social and economic factors), O'Brien (2007) added. These ideas emphasize that vulnerability is not only environmental risk – it is social and institutional risk environments in which people live.

Main Assumptions of the Framework

There are three ways of understanding vulnerability to climate change: exposure, how much climatic stressor (drought, temperature increase, etc.) a system is subjected to; sensitivity, how a system is affected; and adaptive capacity, the capacity of communities to cope and recover from climate change through indigenous knowledge, migration, and institutional support; Loralai is highly vulnerable because of its dependence on agriculture. Vulnerability is location specific, socio economic and cultural factors mean that the impact of climate change on different regions and groups is different. Adaptation is not a one-off but continuous process in response to the environmental and social context. Furthermore, vulnerability has strong interlinked with poverty, governance and inequality, making climate change an ecological and socio-political issue, and one that needs long-term local, national and international responses.

The Vulnerability and Adaptation Framework is a useful tool for understanding climate impacts, but it has its share of criticism. It tends to include a description of vulnerability, rather than clear adaptation solutions (Kelly & Adger, 2000), and important concepts such as exposure and adaptive capacity may be ambiguous (O'Brien et al., 2007). It is also often neglectful of the role of politics, governance and power (Eriksen & O'Brien, 2007) and many models are of a western origin that may not necessarily be in keeping with local context (Bankoff, 2001). Despite these constraints, the framework is suitable for assessing the climate

change situation in Loralai where communities are vulnerable to drought, climate variability and climate extremes in terms of temperature. As the agricultural sector and livestock are especially vulnerable to these changes, and adaptive capacity is constrained by the poverty and fragility of institutions, this framework will provide an understanding of both the environmental and socio-economic impacts and how people respond to these changes by relocating or through local options.

Research Methodology

The approach of this study is qualitative which has been designed to explore the impacts of climate change at the environmental, social and economic level in Loralai District of Balochistan. Use of a qualitative method is appropriate because the research aims to understand the lived experiences of the community, their perceptions, and how they adapt in their communities, rather than measure climate impacts statistically (Creswell, 2014). This study uses case study methodology, where Loralai is considered as a representative case of being vulnerable to climate in Balochistan's arid and semi-arid region. This enables a context-specific and focused analysis of the local community experience and response to climate change.

Data Collection Methods

Semi structured interviews, using purposive sampling, were used to gather primary data. The decision to use this method was made so that it would be flexible to allow for questioning, but also allow the participants to tell their detailed stories of experiences (Bryman, 2016).

The interviews were complemented by field observations, which aimed to capture physical evidence of the impacts of climate change such as water scarcity, land degradation and agricultural decline. In addition to this, secondary data like Government reports, NGO publications and academic literature were reviewed, to triangulate findings.

Sampling Technique and Respondents

Purposive sampling was used to select those who were knowledgeable about the issue of climate change and experienced in Loralai. The respondents were farmer, herder, local elders, women from the rural households, local leaders

and officials of local government and NGOs involved in the area. A total of 20–25 respondents were interviewed to gain diversity of views and to achieve data saturation.

Data Analysis/Results

Environmental Impacts on Loralai

Significant changes in the environment in Loralai in response to climate change was indeed a recurring theme of the respondents. Haji Wahab AKhunzada and Abdul Jabbar observed that there has been a significant reduction in rainfall over the last few decades (Akhwandzada & Jabbar, 2025). The intensity of the heat rises, there are longer dry periods, and less snowfall to support the local ecosystem. Loss of tree cover, dry soils and a decrease in natural water sources like springs or underground wells were cited by respondents. This has had a direct impact on agriculture, vegetation and biodiversity. The ecological situation is bad, said Zafar Ali, saying that “the weather is very bad” and now “very difficult to get water” (Ali, 2025).

Social and Economic Impacts of Climate Change on Local Communities

Climate change has significantly affected livelihoods, social structures, and the local economy. Many respondents (e.g., Abdul Kakar, Lal Khan) emphasized how the agriculture sector, main source of income, has been hit hardest. Crop yields have fallen due to water scarcity and changing weather patterns, making farming unsustainable for many households. This has led to rising unemployment and increased poverty, especially among rural communities. Those dependent on livestock also face difficulties as pastureland has shrunk. Meanwhile, some wealthier groups with government jobs remain

relatively stable, creating economic disparities. Respondents also mentioned migration pressures as families seek better living conditions elsewhere (Kakar & Jabbar, 2025).

Community Adaptation

Despite limited resources, communities have developed practical coping strategies. Multiple respondents (e.g., Abdul Jabbar, Lal Khan, Tahir Khan) mentioned tree planting, building small dams, and collecting and managing water resources as key community responses (Khan, Khan, & Jabbar, 2025). Some farmers are experimenting with drought-resistant crops and improved irrigation systems such as drip irrigation (Kakar, Community Adaptation, 2025). People also rely on collective action; villagers often work together to conserve water and appeal to the government for infrastructure support. Awareness about tree planting among youth also indicates a growing environmental consciousness as part of adaptation (uLLAH, 2025).

Findings of the Study

The respondents showed that they are concerned about the environmental condition of Loralai due to climate change as it has been discussed in the Interviews. Many noted that this is an area that formerly received regular rainfall/snowfall and this was beneficial for agriculture and water. But in recent years, there has been a decrease in precipitation, an increase in temperatures and an increase in drought. These changes were associated by participants with wells getting dry, our loss of vegetation, tree cover, and soil fertility, among others, as shown in the quotes below: This has led to greater water scarcity and hence less agricultural productivity making the rural livelihoods more vulnerable.

Research Question	Key Findings	Respondent Examples
Adaptation Strategies	Tree planting, small dams, drip irrigation, water collection, community cooperation	Abdul Jabbar, Lal Khan, Bakiullah
Environmental Impact	Less rainfall, hotter climate, loss of trees, reduced snowfall, water scarcity, poor agriculture	Haji Wahab, Abdul Jabbar, Ruzila
Socio-Economic Impact	Declining agriculture, unemployment, poverty, migration, inequality	Abdul Kakar, Lal Khan, Zafar Ali

The interviews also reveal that climate change has brought significant social and economic issues in Loralai, which are strongly associated with environmental deterioration. The agricultural sector is the main source of livelihood and as per the respondents' comments like Abdul Kakar and Lal Khan, rainfall and availability of water have decreased ultimately impacting on crop production and income. With many families being pushed to migrate or find other employment, and the remaining families in secure government jobs being less affected, there is further economic inequality. These pressures have exacerbated poverty, unemployment and food insecurity in particular, particularly for vulnerable, resource-poor rural communities unable to cope with the changes.

Communities in Loralai have taken several measures to adapt to the effects of climate change in the local environment, also to better prepare for environmental stress. Abdul Jabbar and Tehraman among the respondents mentioned planting of trees, making small water dam, and community water collection to control the less availability of water. Abdul Kakar also mentioned the move by farmers to drought-tolerant crops and water-saving methods such as drip irrigation. Awareness campaigns are being carried out by local youth groups to promote environmental conservation. All these are good indicators of the resilience of the community but are clear evidence of the importance of expanded institutional and governmental funding and support to scale up regional climate adaptation efforts.

In turn, communities have started to implement local adaptation strategies, including tree plantation, planting small water dams, drip irrigation and water management by communities. Youth groups raise awareness on conservation and farmers adopt drought-resistant crops. These are acts of resilience but are only possible in part

without institutional and governmental support. Loralai's experience is part of the wider conversations on climate security, migration, and governance, and points to the importance of linking local adaptation to national governance and international cooperation frameworks.

Conclusion

The findings from this study indicate that the environmental, social and economic conditions of Loralai, Balochistan, are changing due to climate change. Agriculture and water resources have been negatively impacted by a reduction in rainfall, increased temperatures, frequent droughts, and the loss of vegetation, leading to unemployment, migration, and inequality. Local communities are resilient in plantings, water saving, small dams and drought resistant crops. However, they are not going to be effective unless there is increased institutional support. Climate change in Loralai is thus a development and human security problem as well as the environment problem. The case also illustrates the local dimensions of global climate security, governance and cooperation discussion, pointing to the importance of both community-based action and international agreements to create a sustainable future.

Recommendations

Water management and promotion of climate resilient farming, along with active participation of communities, is needed for climate adaptation in Loralai. It is crucial to have institutional support in the form of local policies, enhanced research cooperation and livelihood diversification using microfinance and skills. In the context of global cooperation and security, the application of these local strategies can enhance security and resilience with the aim of securing a sustainable future.

Conflict of Interest

The authors showed no conflict of interest.

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