

Climate Change in Literature: A Literary and People-Centered Perspective of Change in Rainfall Patterns in District Swat, Khyber Pakhtunkhwa Province

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Abstract

Pakistan and its Northern areas including district Swat are vulnerable to extreme weather events caused by climate change. Like other climate-affected regions in the country, district Swat has also been experiencing shifts in rainfall patterns due to supposedly increasing temperature, anthropogenic activities, deforestation, Greenhouse Gases (GHGs), and pollution. Intermittently, the district experiences periods of both rainy spells and extended dry spells. In both cases, the imbalance in natural patterns is directly affecting the rain-dependent agriculture

in the district—a major source of livelihood for the locals. Owing to its gravity, the issue has grown multi-disciplinary. Like the disciplines of environmental sciences, the discipline of environmental humanities, in particular, American Environmental Literature also reflects on the issue. This study evaluates the elements of change in rainfall patterns in the select texts of American Environmental Literature (Parable of the Sower and The Water Knife) and validates them with the relevant scientific published data, and the views of (voluntarily chosen age 18 or above male/female) local respondents to genuinely establish the causes, effects, consequences, and remedial strategies of the issue in the district. The findings reveal that a rich texture of change in rainfall patterns is mirrored across the select literary texts whose validity is cross-founded both in the relevant published scientific data and local respondents' views. As predicted through supposed critical assumptions, the findings mark increasing temperature, anthropogenic activities, deforestation, GHGs, and pollution as the core causes of change in rainfall patterns in the district. In addition to raising awareness about the phenomenon of climate change in general and changing rainfall patterns in particular, the study urges the concerned authorities and national/international stakeholders to pay considerable attention to the issue. The devised sustainable remedies—such as the control of the population, deforestation, GHGs, anthropogenic activities, etc.—bear the potential to save the district from further environmental calamities. Apart from its local and national impact, the study also corresponds to UN Sustainable Development Goals (SDGs) No. 13: Climate Action and 15: Life on Land.

Keywords: Literature, Cli-Fi, Climate Change, Rainfall Patterns, Swat

1. Introduction

The severe impacts of climate change have been emerging across the globe. The changing climate has been increasing global warming which leads to extreme weather events such as heat waves, droughts, seasonal imbalances in a change in rainfall patterns, etc. (Hussain, 2010; Mahmood et al., 2019). In the same way, the intensity and frequency of such extreme weather events have also been increasing (Sipayung et al., 2018). Likewise, Pakistan is also exposed to threats of climate change, ranging from heatwaves, and environmental and economic issues to long droughts, melting glaciers, and unprecedented rainfalls (Ishaque et al., 2022) Alterations in rainfall patterns represent a significant consequence of climate change. The drastically increasing

global warming enhances the water-holding capacity of the atmosphere along with the high rate of evaporation which consequently affects the rainfall patterns (Trenberth, 1998). The changing climate along with other ecological aspects has particularly affected the natural rainfall patterns in Pakistan (Salma et al., 2012; Kazi et al., 1951). Similar to various ecological regions in the country, district Swat is witnessing increasingly noticeable and devastating impacts of shifting rainfall patterns.

The phenomenon of rainfall patterns refers to the distribution of rain in accordance with the geographical areas and seasons. Various mechanisms including atmospheric pressure, global warming, rate of evaporation, and ocean temperature affect rainfall patterns (Martin et al., 2021). As a result of this change in rainfall patterns, certain regions may experience unusually heavy rainfalls while others can face alarming droughts (Farooqi et al., 2005). Pakistan is among the top-affected countries by climate change (Rahman and Khan, 2011). This changing rainfall pattern has been severely affecting its different regions, especially its Northern areas. Being a mountainous region, most of the agricultural region of the district depends on rain which serves as a major source of livelihood (Bacha et al., 2021). Unfortunately, the district has been experiencing unusual and unpredictable rains, specifically in the last two decades. It has not been receiving rain at a suitable time and amount which directly affects the water and agriculture sector (Salma et al., 2012). It does not rain for a long period of time but when it does, it is so heavy that it causes flooding and completely smashes all the crops causing a huge loss to the local economy (Shah, 2008).

Owing to its significance, the issue of climate change in general and changing rainfall patterns, in particular, has become multi-disciplinary. Like other disciplines of human knowledge, the discipline of environmental humanities more specifically American Environmental Literature or American Climate Fiction (Cli-Fi) also brilliantly reflects on the issue. It effectively highlights the issue of climate change, its causes, stressors, consequences, and remedies. Hence the present study has been designed with the aim to investigate the issue of change in rainfall patterns in the select texts of American Cli-Fi, —*Parable of the Sower* (1993) by Octavia E. Butler, and *The Water Knife* (2015) by Paolo Bacigalupi,—and cross-validates it with the relevant published scientific data and the select local respondent's views to genuinely establish the causes, effects, consequences, and remedial strategies of the issue. The selected

literary texts not only portray the hazards of climate change and changes in rainfall patterns but also make the human race realize the horrible future of Mother Earth if the situation continues like this for a longer period of time without initiating any serious behavioral and remedial steps.

2. Research Objectives

The current study explores and analyzes the issue of change in rainfall patterns in district Swat through fictive depictions and cross-validate them with the relevant published scientific data and the select local respondents' views. It manifests how change in rainfall patterns impacts human lives and agriculture in the district, and how the phenomena could be mitigated or controlled. The study explores the root causes, contemporary position, impending consequences, reliable predictions, and potential preventive measures to attract the attention of the concerned local, national, and international stakeholders to take serious notice of the issue. The findings of the study would be beneficial for both the regional and international communities enabling them to adopt the required behavioral/practical steps and sustainable remedies to mitigate or control the roaring impact of the issue.

3. Methodology

Besides the selected literary texts and reviewed research articles, the researcher purposefully conducted semi-structured interviews of randomly selected 105 (age 18 or above male and female) volunteer local respondents (15 from each of seven tehsils) of the district Swat. All seven tehsils are equally impacted by the phenomenal change in rainfall patterns; therefore, an equal number of participants were chosen from them. These respondents include 95 (83 male and 12 female) community members (such as farmers, orchard farmers, pastoralists, teachers, community health workers, social workers, etc.) and 10 (seven male and three female) environmental experts from either the University of Swat or other universities (with permanent residency in Swat) to cross-validate the literary and scientific claims about the issue. Although we tried for an equal number of female and male interviews, the district's strict patriarchal culture proved an obstacle. The nature of these semi-structured interviews was open and group discussions, which allowed the respondents to freely and generously confess their opinions about the background, causes, effects, consequences, and remedial strategies of the issue. These interviews were conducted in local languages such as Pashtu (the major local language as the

majority of the population is Pashtu speaking on the mainland), Gojru, and Kohistani with the help of the local guides which were later transcribed and translated into English with the help of the same selected volunteer local guides. Verbal consent for the publication of these narratives for research purposes was taken to meet the ethical considerations of the study.

3.1 Need for a People-centered Approach

Active participation of local stakeholders especially those exposed to this hazard is fundamental in the process of decision-making and planning related to the issue of climate change and its varied stressors (Ajani and Geest, 2021). The views, attitudes, experiences, and behavioral responses of the local respondents to climate change specifically the changing rainfall pattern and its varied impacts are significant for developing resilient communities (Oakes, 2019). The views of local residents and their narratives can provide a novel and unique perspective in analyzing phenomena like climate change (more specifically change in rainfall patterns), as compared to other forms of data collection in mixed-method research studies. These narratives have the ability to provide deep insights, into experiences, beliefs, misconceptions, and observations which may normally exist but not systematically acknowledged. The stories of the respondents coupled with their life experiences regarding climate change, its impacts, and long-lasting effects bear the potential to connect the diverse stakeholders to initiate collective and collaborative remedial strategies (Moezzi et al., 2017). Furthermore, it highlights the unrepresented narratives of locals from under-developing regions/countries to provide a more vivid picture of climate change, its different stressors, and impacts to formulate adaptation strategies in various contexts (Ajani and Geest, 2021). The impacts of climate change vary from context to context. Thus, this people-centered approach plays a significant role in fostering understanding and collaboration in such policy development.

3.2. People-Centered Analysis

Table 1. As per seven study sites/tehsil/divisions, the responses of 105 participants about the background, causes, effects, consequences, and remedial strategies of change in rainfall pattern in district Swat.

1	Location	Study Site/Tehsil/ Division	District and Province	Number of Respondents	Causes, Volume, Consequences, and Remedial Measures of Change in Rainfall Patterns
2	Matta	Matta	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:
3	Khwazakhela	Khwazakhela	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:
4	Bahrain	Bahrain	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:
5	Kabal	Kabal	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:
6	Charbagh	Charbagh	Swat, KP	15	Causes:

					Volume: Consequences: Remedial Measures:
7	Mingora	Mingora	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:
8	Barkot	Barkot	Swat, KP	15	Causes: Volume: Consequences: Remedial Measures:

4. Literary, Scientific, and People-Centered Analysis

The trilateral analysis of the study first explores the reflections of climate change in general and changes in rainfall in particular in the select literary texts. Then it cross-checks and validates the select fictive claims with the relevant published scientific data and the local respondents' views to establish the background, existence, causes, effects, consequences, and remedial strategies of the phenomenon specifically in district Swat and the whole country/world at large.

4.1. Literary Analysis of *Parable of the Sower* and *The Water Knife*

Like other branches of human knowledge, American Environmental Literature in particular American Cli-Fi also reflects on the issue of climate change (more specifically changes in rainfall patterns) highlighting its causes, effects consequences, and remedial strategies. The study picks on the select literary texts of American Cli-Fi, *Parable of the Sower* (1993) by Octavia Butler, and *The Water Knife* (2015) by Paolo Bacigalupi for their vivid depictions of climate change

specifically changes in rainfall patterns. After contextualizing/translating the relevant fictive elements of changes in rainfall patterns in district Swat, the study cross-validates them with the relevant published data and local respondents' views to establish the actual presence, causes, effects, consequences, and remedial strategies of the issue in the district.

Parable of the Sower is a Science Fiction (Sci-Fi) and Cli-Fi novel that effectively predicts the dire environmental consequences caused by different stressors of climate change. Besides other stressors of climate change like global warming, floods, etc., the *Parable of the Sower* richly portrays the impacts of climate change on rainfall patterns which results in long droughts or heavy rainfalls. The text depicts changes in rainfall patterns as a significant aspect of its dystopian world-building. The novel is set in the near future in the United States where society has collapsed due to environmental degradation and economic inequality. One of the central themes in the novel is the scarcity of resources, specifically water. The protagonist, Lauren Olamina, through her diary entries, presents a world where water is scarce and unpredictable due to the changing climate and erratic rainfall patterns. Butler states, "It only rains once every six or seven years" (Butler, p. 61). These words symbolize that climate change coupled with environmental negligence has caused a lack of rain. Butler artistically highlights how environmental factors, including changes in rainfall patterns, can contribute to social and economic unrest and the annihilation of our civilization. The novel draws global attention to the rapidly emerging climate changes. It also urges us to initiate essential remedial measures and develop behavioral and scientific strategies to mitigate as well as control the rapid growth of these climate changes in question to avoid horrible future consequences.

The Water Knife is a Cli-Fi novel that depicts a future dystopian world suffering from a severe shortage of water due to climate change. The world is completely destroyed by extreme changes in temperature and scarcity of water. The extreme shortage of water leads to wars and arms battles. The great river of Colorado is left with the least amount of water. Every regional stakeholder claims its rights over the left volume of water. The novel artistically manifests the consequences of these changes, focusing on the struggle for control over water resources in the Southwestern United States. The characters grapple with the effects of reduced rainfall and the resulting water shortages, which have led to social and political instability. The narrative delves into themes of environmental degradation, resource conflicts, and the human impact on the

planet's natural systems. In sum, *The Water Knife* is a speculative Cli-Fi work that highlights the lethal consequences of altered rainfall patterns for a region (Bacigalupi, 2015).

4.2. Factors Affecting Rainfall Patterns: Review of Relevant Scientific Published Data and the Local Respondents' Views

This section analyzes the relevant scientific published data and views of the local respondents to establish the historical background, causes effects, consequences, and remedial strategies of factors affecting rainfall patterns in the district such as global warming, anthropogenic activities, deforestation, GHGs, pollution, etc. This twofold analysis aims to cross-check and validate, as well as contextualize the select fictive claims about the changes in rainfall patterns in district Swat in particular and the whole country/world at large.

4.2.1. Global Warming: Climate change experts are of the view that world temperature has been increasing both in terms of frequency and magnitude (Farooqi et al., 2005). In the same way, district Swat has also been experiencing a rapid increase in temperature (Bacha et al., 2021). The increasing temperature catalyzes the process of evaporation as the warm temperature has the potential to hold water vapors in more quantity (Benestad and Haugen, 2007). In district swat, June and July are comparatively the hottest, and December and January are the coolest months of the year, which experience this issue the most (Rahman and Khan 2013). The high and cool temperatures in these months increase the rate of imbalance evaporation and freezing in the river (and its estuaries) which impacts the natural precipitation system.

The majority of the community members and environmental experts attest to the fact that a gradual temperature rise has been noticed in the region. Increasing temperature appears a prominent and most apparent stressor of climate change which they have observed through their life-span experiences. With the perspectives of their past observation and scientific findings, they believe that the increasing global warming has been stimulating regional warming which is consequently affecting the entire natural climate cycle of the region more specifically change in rainfall patterns in the district.

4.2.2. Anthropogenic Activities

Natural forces and calamities were once considered the major reasons behind climate change but for the last couple of centuries, anthropogenic activities have been counted among the main drivers of emerging climate change. As a result of rapid industrialization, the over-burning of fossil fuels, oil, and coal for generating energy eventually increases the temperature of the world (Benestad and Haugen, 2007). Apart from this, the population in Pakistan and more specifically in district Swat is increasing at an alarming speed. Hence with the increasing population, the demand for life necessities like food, shelter, and infrastructure also increases. Thus, people have been encroaching on river basins, and deep forest mountains engaging in deforestation for land utilization, agriculture, and sale, which, in return, is damaging the balance of local ecology. Places that were once covered in thick forests are now either populated or aggrandized. Unfortunately, these activities are adding more harmful pollutants to the environment and damaging the ecological balance which surely affects rainfall patterns in the district (Rahman and Khan, 2013).

Almost all the respondents actively participated in the discussion regarding rapid industrialization, increasing population, and deforestation. They linked the changing rainfall patterns with rapid industrialization, increasing population, and deforestation. They also included the emission of increasing numbers of motor cars and mills in the district—because of the region's free-tax status¹—as one of the core causes of damaging the natural cycle of rainfall fall patterns and other natural/ecological activities in the district.

4.2.3. Deforestation

Forests play a significant role in maintaining the balance of ecosystems. The KP province including district Swat has experienced rapid deforestation in almost all the catchment riverine areas, especially in the last couple of decades (Ali 2007; Rahman and Khan 2013). In district Swat, a nearly 36% decrease in forest has been observed in lowland areas while 69% in high elevations (Bacha et al., 2021). Forests act as an absorber for greenhouse gases which significantly contribute to global warming (Mahmood et al., 2019), which eventually affects the rainfall patterns. Moreover, they also act as air conditioning units in nature but unfortunately, they are being cut down ruthlessly.

¹ Article 246 and 247 of the 1973 Constitution of Paksitan declare Malakand division (Swat, Shangla, Buner, Dir, Chitral, Malakand, and Kohistan) as a tax-free zone. Retrieved from <https://www.dawn.com/news/1600649>

Before 1969, Swat was an independent princely state that later merged with Pakistan (Sultan-i-Room, 2008). Till 1969, the laws of the Swat State preserved the forests and encouraged more forestation on the barren lands. Contrary to that, after the merger, the district witnessed rapid deforestation. According to the respondents' views, the ruthless deforestation has ruined the beauty and ecology of the district. As a result, since then, the district has remained subjected to different climate calamities such as (wild and medicinal) plant distinction, floods, changes in rainfall patterns, etc.

4.2.4. GHGs and Pollution

The burning of fossil fuels and the emission of GHGs cause air pollution. Though Pakistan has no significant share in the emission of greenhouse gases but is vulnerable to its severe impacts more than any other country (Salma et al., 2012; Ishaque et al., 2022). The greenhouse gases (i.e., CO₂, CH₄, N₂O, etc. [GHGs]), (preferably used as a single term rather than individual gases) are held responsible for causing air pollution and increasing regional temperature. The mountainous communities of district Swat are comparatively more vulnerable to environmental impacts that are affecting the overall weather system including the rainfall patterns (Bacha et al., 2021).

Compared with the scientific research studies, the local respondents also regarded pollution as an active agent behind changing rainfall patterns, though the majority of them were not aware of the scientific background of the issue. They referred to the issues with different implying names and labeled it the core cause of many climate stressors and the distinction of local medicinal and fruit plants/trees. Owing to the tax-free zone status², Swat hosts a huge number of non-custom paid cars, and different manufacturing industries/factories. Referring to the very phenomenon, almost 70% of the respondents held anthropogenic activities responsible for pollution and changes in rainfall in Swat.

5. Conclusion

Literary claims cross-checked and –validated with relevant scientific data and the local respondents' views, the findings of the study conclude that like the other climate stressors (such as global warming, rising temperature, GLOF, etc.), changes in rainfall patterns in the district Swat

² Ibid.

in particular (the whole country/world in general) are severely affecting the local climate, agriculture, water-table, and lives of individuals. The trilateral analyses mark global warming, anthropogenic activities/interventions, deforestation, GHGs, and pollution as the core causes of the issues. The study suggests the concerned local, national, and national stakeholders must pay serious attention to the control or mitigation of the target causes in time to save the target community/communities from the impending hazards of future climate change—more specifically changes in rainfall patterns on which the socio-economic and agrarian survival of the locals depend. The trilateral findings of the study urge if the remedial strategies (fostering mass-scale awareness campaigns on different socio-cultural and academic fronts, transforming the locals' behavior, controlling illegal anthropogenic activities, plantation drives, and control of GHGs, etc.) were not taken in time, these rapid emerging climate changes (precisely changes in rainfall patterns) may cause irreversible losses to the essence of our ecology/Mother Earth. The trans-cultural, trans-geographical, and trans-disciplinary nature of the study enables it to generalize its findings to other climate-affected regions across the globe and claim its global significance.

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