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### **ABSTRACT**

It is one of the most widely accepted that this year's rainfall was higher than normal, but very few will agree that the major reason behind it is climate change. Mountains have always played a significant role in the rainfall during the monsoon. In this context, another question arises: did all the water come only from the rainfall only... And next question is why so much damage occurred to due this phenomenon... Are there no shortcomings or deficiencies on our part as human beings... again if such rains occur again, what role can we play to minimize the damage caused by such heavy calamities... the study is an attempt to discuss to find answers of these questions while staying limited to Khyber Pakhtunkhwa regions. This study is primarily focused on examining the reasons extreme reactions from the Mother Nature such as droughts or flash floods, and their lasting adverse effects and shall further explore the coping mechanisms and adaptive strategies and legal response from the Government of Khyber Pakhtunkhwa.

**Key Words:** Environment, Climate Change, Floods, Agriculture, KP Environmental Protection Laws.

## Introduction

This is an undeniable fact that the rainfall was higher than normal. In Pakistan, the average rainfall from July to September is approximately 140.8 millimeters. However, we have noticed that in 2022, the rainfall was up to 385.8 millimeters. This increase is more than 190% higher than normal (Waseem and Rana 2023). This increase in rainfall is attributed to the prolonged wave of heat during the months of March and April, during which a significant amount of moisture began to accumulate in the atmosphere. According to UN reports, glaciers started melting due to this heat wave. Near three hundred glaciers have changed in Khyber Pakhtunkhwa. Forty of the glaciers were declared dangerous. Glacial melting and the inclusion of rainwater are associated with climate change, which has led to an increase in the volume and flow of water accordingly. A comparison of the shows that the flood volumes in 2022 as compare to the 2010 flood was much higher. After the 2010 floods, protective embankments were built from Mingora to Batkhela on the Swat River, which saved many villages (Nanditha, Kushwaha et al. 2023). Nevertheless, despite the construction of buildings along the banks of the Swat River in the upper mountainous regions, obstacles were created in the path of water, causing further damage. This is true as the recent rains and floods have affected mostly those living in vulnerable areas and plain localities of the region.

However, no distinction was made in mountainous areas between whether the houses were mud or concrete. Due to the steep slopes in mountainous areas, water flows with greater force, carrying away everything in its path. Moreover, there are still many mud houses in Pakistan that are susceptible to floods. According to UN-Habitat, more than 56% of people in Pakistan live in Katchi Abadis, with rural mountainous areas being prominent (Otto, Zachariah et al. 2023). In Pakistan in general and Khyber Pakhtunkhwa in particular, lack adequate housing facilities, sanitation, and proper public toilets and solid waste management systems. This leads to insufficient public health and exacerbates the effects of natural disasters, including floods, storms, dust, and heat, making it difficult to cope with high-speed winds. Such disasters affect their health and economy.

This universal truth that mountains are considered to be the 'water towers' of the world, supplying 70-85% of all means of fresh water to our planet. The minimum half of the world's population relies on mountainous ecosystems services to survive—not only for water but also for food and clean energy. Mountains cover 27% of the earth's surface area, where 18% of the world's population resides (Jamil, Elahi et al. 2022). Sixty percent of Pakistan's total area comprises mountains, with 7,273 glaciers present in the northern mountain ranges of Pakistan. From this perspective, mountains present a beautiful sight. However, on the other hand, they are also associated with natural disasters such as storms, rainfall, snowfall, low temperatures, movement and transportation in the mountains, avalanches, and countless other disasters (Chen, Xiong et al. 2024).

According to a recent report by the BBC, thirty four thousand glaciers in Pakistan have melted, forming lakes (Khan, Gong et al. 2023). Out of these, 38 have been declared dangerous. If these 38 lakes burst, seven million people could be at risk. Meanwhile, there is also financial damage. This means that dangerous floods can occur from the 2022 rainfall and floods. One theory is that it is possible that in the coming winters, these lakes will freeze again into snow and become safe for us. And it is also possible that they freeze again in the coming summers but become a threat by turning into water. In the context of current climate changes, it is also

possible that the melting of glaciers is an ongoing process, and from time to time, one or more glaciers keep coming down in the form of water. In the past few decades, relations between the sea and the mountains in Bahrain and Kalam areas have not been good. This has caused significant damage on two occasions: in 2010 and this time in 2022. If we had learned a little from the floods of 2010, then this damage would not have occurred in 2022, or it would have been much less. We still have time to learn from 2022 and, God forbid, if such situations arise in the future, how we can reduce human and financial losses.

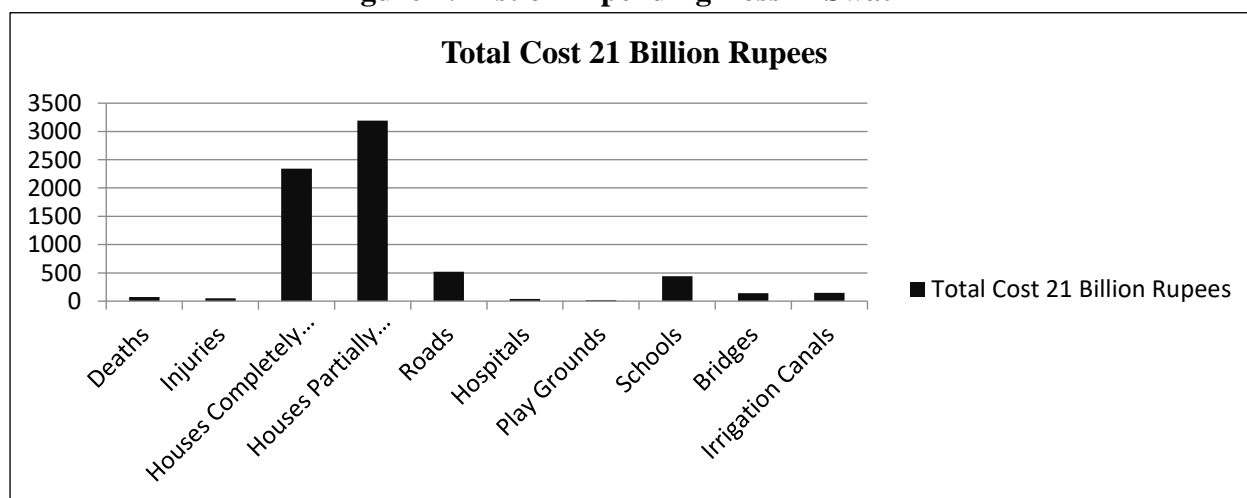
**Most Adversely Affected Areas in KP**

Bahrain and Kalam are considered to be the most vulnerable areas of Khyber Pakhtunkhwa though they are not urban centers. There should be more grass here, there should be more trees. It is essential for hotels to be located at a considerable distance from the rivers. But this does not mean that hotels and shops should be everywhere. Moreover, the waste from the hotels is directly dumped into the river, which not only harms aquatic life but also affects human health. The press conference of Commissioner Malakand has been quite encouraging in terms of removing encroachments. If possible, this could significantly reduce both human and financial losses (Ali, Mohammed et al. 2022).

If we haven't learned a lesson from the floods of 2010 and 2022, then in the near future, we have to worry about more significant damage from the current floods. We need to understand the sensitivity of natural, social, and cultural heritage and determine our path accordingly. Because mountainous regions are highly sensitive areas, particularly the Swat Valley, which is the center of hundreds of glaciers. Balancing the use of resources while promoting long-term development is essential for all countries in mountain tourism. We have just partially recovered from heavy floods of 2010 and then the pandemic of the coronavirus have greatly affected tourism. After the floods of 2010, we were struggling when the coronavirus crisis hit (Yaseen, Saqib et al. 2023). And ordinary people suffered significant financial losses. We need to redefine the tourism sector in the light of such situations and their impacts, and strive to save both tourist and non-tourist destinations.

**1. Damage Caused from the 2022 Floods**

**Figure 1: List of Impending Loss in Swat**



The list of impending losses for Pakistan as a whole is extensive. In Swat alone, there were 66 deaths, 44 injuries, 2,336 houses completely destroyed, and 3,189 suffered partial damage. Additionally, 517 roads, 35 hospitals, 13 playgrounds, 438 schools, 141 bridges, and

183 irrigation canals have been damaged. Overall, Swat has suffered a loss of 20 billion rupees (Manzoor, Ehsan et al. 2022). This can mean either 20 billion rupees have been lost or more than 20 billion rupees will be required to restore the mentioned infrastructure, which will take five to ten years. In other words, the rate of return on investment will remain low in this area for five to ten years. If we estimate for the rest of the country, the figure will reach trillions. Therefore, we can say that the rate of return on investment in Pakistan will remain low for at least five years. As a developing country, Pakistan cannot afford to bear such massive losses. Therefore, significant decisions need to be taken so that the capital invested in mountainous and remote areas can be saved from being wasted. Living in mountainous regions and the development of tourism also include the challenge of health and safety issues, as natural or man-made hazards such as floods, landslides, earthquakes, and conflicts can block access and services for months or years and can destroy land assets. There, residents and tourists' lives may be at risk.

### **Impact of Tourism in Swat**

Pakistan's mountainous regions, especially the valleys located in the north, are not only important for tourism within the country but also hold significance in the global tourism context. Swat holds a unique position in this regard. The tourist attractions here, due to their natural beauty, captivating sites, and rich cultural heritage, attract tourists towards themselves. Tourism serves as a beautiful source of income for rural areas. It can also help revitalize local traditions and food systems. According to a cautious estimate, around 2.57 million people visit Swat for leisure and recreation every year (Shahid and Venturi 2022). Especially during Eid, hundreds of thousands of tourists head towards the northern areas for sightseeing. In 2022, around 1.07 million people visited Swat for leisure and recreation during Eid, leading to the entry of almost 320,000 vehicles into Swat. According to the district administration of Swat, tourism contributes to 47% of the economy (Ali, Ullah et al. 2023).

Viewing tourism from an economic perspective, it is indeed a promising aspect. However, there is a downside in terms of environmental impact. Like the rest of Pakistan, Swat's population is rapidly increasing. Along with that, industries, agricultural machinery, solid waste, and transportation increase significantly, adversely affecting the environment in these areas. Moreover, the waste generated from hotels and restaurants adds to this degradation. Swat is a mountainous region, and managing waste disposal is not easy. Additionally, deforestation and water pollution further exacerbate environmental issues. To promote mountain tourism, it is essential to diversify income and rejuvenate products and services, especially those less impacted by water and weather-sensitive means. New and modern amenities can transform mountainous regions into attractive tourist destinations, particularly for areas with lower temperatures. Many people have reconsidered tourism initiatives or created new opportunities, aiming to benefit local communities while enhancing the preservation of unique mountain heritage.

We cannot ignore the potential negative impacts on the environmental system due to tourism. Pollution and loss of biodiversity, especially in forested areas, can occur. Climate change is one of the biggest challenges for mountainous areas, with effects including reduced snow periods and increased risks of extreme weather events. Considering tourism from an environmental perspective, it is essential to consider the sensitivity of a mountainous region.

### **Response from the Legal System**

One of the major things which can make a huge difference is the legal system and legal machinery of a state; when it come into action it can make a big difference. The starting point in a legal system is the constitution of a state which might and might not be in a written form, but nonetheless it is considered as one of the most sacred document from which the whole governmental institution derives there power and every law derive its validity. If it is provided in the constitution then the end can easily be achieved by making policies, creating various departments and putting governmental machinery into motion.

Unlike other countries even the neighboring country we did not had environmental protection in our priorities hence there we no word environment found in the 280 articles of the constitution of Pakistan 1973. A later on thing started by 1984 and then moved in 1997 with the enactment of Pakistan Environmental Protection Act 1997; but by then sufficient damage was done to the Environment. With passing 18<sup>th</sup> constitutional amendment this subject was transferred to the provinces and now we have KP Environmental Protection Act 2014 and Climate Change Policy 2022 and Climate Action Plan 2022 accordingly.

### **Role of Institutions in Flood Mitigation**

At the moment, there are separate national and provincial institutions in Pakistan for sustainable tourism promotion. Their job is to promote tourism. However, when we look at the tourism map of Swat, their role is not visible. It seems like they have created a separate domain for themselves, and they have no connection to this non-traditional tourism. On the other hand, there are provincial and district offices present for the environment. Laws and regulations related to the environment and ecology have also been enacted. However, they remain silent on waste generated from hotels and restaurants. In 2019, some action was seen from Swat's environmental authorities, where notices were issued to 167 hotels. However, no significant result was achieved (Rehmat, Ahmad et al. 2023).

Similarly, there is also a Building and Housing Authority present. Since 2002, there has been a separate law for river conservation. According to this law, constructing any building within two hundred feet of the riverbank is illegal. Moreover, according to the second part of this law, dumping any type of waste into the river is a legal offense

### **Possible Role of Universities**

At present, in the province of Khyber Pakhtunkhwa, Seven universities are conducting research along with experts to deal with environmental pollution and negative impacts related to climate change. The University of Peshawar, in particular, and its Department of Environmental Sciences, holds a key position in reducing climate change and environmental pollution in Pakistan. Additionally, five different universities are training in the field of environmental sciences and pollution control. These include the University of Swat, Haripur University, University of Malakand, Kohat University, and Sheringal University. Each of these institutions produces an average of 250 plus environmental experts annually.

### **Concluding Thoughts**

Pakistan is a land of beautiful valleys, with mountains playing a crucial role. These mountains not only add to the beauty of Pakistan but also hold key importance in the national economy. However, all these mountains are suffering from degradation. We are cutting down trees in these mountains, which not only intensifies the effects of climate change but also leads to severe floods. We need to protect our mountains, make them safe for the future, so that the impacts of climate change can be minimized.

### **Some Important Recommendations**

- We need to promote tourism in mountainous areas considering their sensitivity to climate.
- We must ensure regular monitoring of tourism and its impacts in mountainous areas.
- There is a need that every hotel should be responsible for proper disposal of generated waste. It is necessary to have their waste disposal points away from the population.
- Empowering local residents in mountainous areas for the development of tourism and implement national and provincial laws so that they can play their positive role effectively.
- Strengthening public-private partnerships to enhance and develop year-round tourism offerings.
- Invest in infrastructure in remote mountainous areas and work on alternative routes.
- Populate the mountains and replant the trees that have been removed from them.
- Remove encroachments from rivers and give water its proper course.
- Start a program for the proper collection and disposal of waste from hotels

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