



RESEARCH ARTICLE

Pathways to Resilience: Indigenous Community and Climate Change Adaptation in Pakistan

Ahmed, Luqman^{1*}, Malik, Aisha Anees², Abid, Saadia³¹Centre of Excellence in Gender Studies, Quaid-i-Azam University Islamabad Pakistan²Centre of Excellence in Gender Studies, Quaid-i-Azam University Islamabad Pakistan³Department of Anthropology, Quaid-i-Azam University Islamabad Pakistan**ARTICLE INFO****ABSTRACT**

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from Pakistan***Corresponding Author:**

ahmed.luqman@gmail.com

Natural resource conservation, bio-diversity, and climate change are all interrelated issues that stem from overuse of natural resources. Pakistan is no different, with the rapid depletion of natural resources, causing irreversible harm to eco-systems. Conservation is not a new concept, but rather one founded on a mutually beneficial relationship from earlier times. Indigenous communities can play a significant role in conservation activity, because of their close interaction with nature in everyday life. This study provides insights on the role of indigenous communities in Pakistan in conservation and adaptation activities in Pakistan. It discusses in detail whether this role is recognized in the climate change policies and projects in Pakistan. It also acknowledges that indigenous communities of Pakistan, such as the Kalash, suffer existential risks, making survival a constant struggle. The study also considers the possibilities for custodianship of territories where the indigenous communities live. On the policy front, the study suggests that indigenous practices of climate change adaptation be recognized and their contributions to preserving eco-systems need to be rewarded.

1. INTRODUCTION

Pakistan is ranked in the top 10 countries worst affected by climate change and natural disasters. The country faces many unprecedented extreme weather events due to the adverse effects of climate change (Ahmad et al., 2021), such as the heatwave and drought which is a huge toll on the life and agriculture in the country's central and southern parts and on the infrastructure in the northern parts, due to glacier melt down and the Glacial Lake Outburst Flood (GLOF), which is also contributed by the deposits of the anthropogenic deposits of carbon in the atmosphere (The World Bank Group, 2022). This triggers the heatwave, extended drought, and other extreme weather events including flash floods and floods. It affects eco-systems while also affecting the Indus River system, which impacts the country's economy and livelihoods of those involved in agriculture and other related occupations. Climate change impacts everyone, particularly those in agriculture, which, as the country's agri-based economy, is the most affected sector (Hussain, Hussain, & Hanif, 2013). The 2022 floods in Pakistan demonstrated adverse effects of climate change, causing destruction to human lives, livelihoods, and the country's economy.

To address the issues associated with global warming and climate change, which result in recurring extreme weather events, adaptation of local communities to climate change is widely acknowledged as a major response approach. The adaptation measures amount to a race against time, which the people have long tolerated, but modern-day issues and the detrimental effects of development have exacerbated the problem. Climate change adaptation includes people as different stakeholders and extends beyond the technical process. Local communities should have a voice in the development and implementation of adaptation policies. According to developmental literature, class, gender, social status, and culture all have a role in whether communities embrace or reject climate change adaptation strategies (Nielsen & Reenberg, 2010). The local community's insistence to live closer to their ancestral lands, their connection to the existential group identity, and their reliance on

specialized work associated with agriculture and pastoralism all pose barriers to climate change adaptation, as development projects rely on livelihood activities that focus on the local community's participation in development projects, such as cash for work interventions, construction activities, and off-farm labour.

Pakistan follows a top-down policy on climate change adaptation (Masud & Khan, 2023), which misses out on many fronts such as local ownership and participation, in the policy measures. Further, indigenous communities such as the Kalash are less represented in the policy space or climate change adaptation and, hence are not able to reap the benefit of the any environment protection and adaptation efforts. It is therefore vital to look at the most important climate-related risks, as well as the strategies for adaptation in the context of indigenous communities in Pakistan.

2. METHODOLOGY

The study is based on data collected by the researchers during the field visit in the Kalash valley of Bamburet in 2023 and later discussion and consultation with the Kalash community members from the Bamburet and Birir valleys in 2024, and documentary evidence in the secondary sources. The lead researcher visited the Kalash valley in Chitral in the spring of 2023, and then met with some of the key informants from the Kalash community in Islamabad along with the co-researcher, when they were here to participate in a Lok Mela (Folk festival) in 2024. In addition to the main theme covered in this study, numerous additional topics of interest were looked at in informal talks and sessions with men, women, and Kazis (Kalashamon: Village elders) from the Kalash community. The transect walk through the Kalash homes, small market places, and roads and alleys raised many questions about how the indigenous community responds to the challenges of climate change, as well as the everyday effects of this change on agriculture produce, orchards, and raising animals, which are the local community's primary sources of income.

The study reviewed several development reports, evaluation studies, and research studies on the theme of climate change adaptation in Pakistan. The study used the interpretive research methodology to understand the phenomenon first and then to frame questions based on the literature review, and then find the answers to these questions through the development reports, and utilizing the researcher's interaction with the indigenous community, and their living conditions. The study is in line with the similar context research conducted in Pakistan such as the one by Masud and Khan (2023), based on the policy analysis framework by Moser and Ekstrom (2010).

The methodological approach has remained helpful in gathering information about the dynamics of climate change in Pakistan within the context of local culture and gaining insight into the differences in approach between policymakers and beneficiaries of development projects focusing on climate change adaptation.

3. RESULTS

3.1 The Climate Change Landscape of Pakistan

A significant contribution to the country's economy is through renewable natural resources such as rangeland, forests, fisheries, etc. However, the biodiversity is fast depleting in Pakistan causing maximum loss to those dependent on the natural resource. The damages have also been done by the overgrazing, and rapid urbanization drive, which quickly exhaust the agricultural land, in the same fashion as the forest land has been used for agricultural purposes (Ahmad et al., 2021). Rangeland and forests cover approximately 65% of the land in Pakistan and have been depleted by overgrazing and overharvesting. Also, the rising temperatures have a long-term impact on the natural resource in terms of deforestation, and forest depletion. A significant impact of the change in climate conditions is the loss of the local eco-system. Extreme weather events also pose existential threats to the education and health infrastructures such as the schools, dispensaries, and hospitals, in the affected areas, which are already resource scarce. This could potentially disrupt the education of hundreds of thousands of children and put health at risk for the local population.

The immediate and long-term threats due to climate change in the northern areas of Pakistan include the melting of glaciers due to the rise in temperature which results in extreme floods. The glacier melt led to the Glacial Lake Outburst Flood (GLOF) phenomenon also presents a major challenge to the northern areas of Pakistan.

3.2 Policy Interventions

Pakistan recognized the threat of climate change as one of the major challenges to its development (MPDR, 2014). The country has initiated several policies on climate change adaptation. The earliest of these policies goes back to 2002, and the most recent in 2023; indicating the government of Pakistan's expanding efforts on the climate change adaptation front.

Pakistan's national adaptation plan of 2023 acknowledges women as part of the most vulnerable segment of society are far more susceptible to climate change and natural disasters. The poor people living in the low-lying area are more prone to floods and their lives remain at stake in the wake of floods or earthquakes. The plan also acknowledges that the poor, women, and people with disabilities are disproportionately susceptible to natural disasters (MCCEC, 2023).

International donors such as the United Nations Development Programme (UNDP) have exerted their efforts in the northern areas of Pakistan to mitigate the effects of the Glacial Lake Outburst Flooding (GLOF) to develop early warning system to safeguard against the threat, support in small-scale projects, such as tree plantations, and mini dams, and installation of weather monitoring systems, and river discharge monitors.

Some of the Development Finance Institutions (DFIs) such as The World Bank Group mention the term indigenous communities but very briefly in the context of land use regulations, and to protect the customary land use rights of these communities. However, these provide policy support in the context of peri-urban and urban areas. Little research has been done on the contribution of indigenous communities in the preservation of eco-systems.

3.3 Drivers of Vulnerability in the Kalash Valleys

The Kalash community is spread into 15 villages of the three valleys in the Ayun Union Council of District Chitral in Khyber Pakhtunkhwa province. These valleys are: Bamburet, Rumbor and Birir. The Kalash community has been fast shrinking as their number of approximately 4,000. The majority of the Kalash community relies on traditional livelihoods, such as agriculture, livestock, and wage labour. However, their traditions and culture are at the brim of extinction due to migration, unplanned development, tourism, and conversions. The tourism industry has supported their indigenous economy to an extent, where the local people have established grocery shops, travel inns, and hotels. However, there are many issues highlighted such as ill practices of tourists affecting the eco-system in which the indigenous population is living. Women in the Kalash have the freedom to choose their life partners, which according to the elders in the Kalash community is a long tradition, but becomes an issue when it comes to suitors from other faiths and ethnicities. The Kalash have been dependent on forests for their livelihoods and other needs. The forest produce has been a source of their income and survival as they get the much-needed firewood to run their kitchen, and protect their homes from cold winters. Many of the Kalash rituals and ceremonies consist of ancestor worship based on polytheistic religious practices. Oak trees play an important part in these rituals and ceremonies. Nature plays a central role in their rituals and beliefs. Though the Kalash tend to protect the forest areas, the logging activities are there in these valleys. Deforestation due to overgrazing and logging could lead to climate-induced disasters in the area, such as GLOF, and floods which result in the loss of infrastructure, life, and livelihoods (Zaman, 2020).

Gender, Indigenous Community and Adaptation: The Kalash claim that their women are empowered. It appears to be true at the outset. However, the researchers and ethnographers have looked at it from different perspectives. The pastures in the highlands are out of bounds for women, and so are some of the ceremonies which are led by the men. There is a customary practice of Kalash women secluded in the Bashali, a community building reserved for pregnant women for their delivery, and for the women and girls having their menstruation cycle. Women are put up in a place away from their families, where their food is served from a distance. Men and other members of their families are not allowed to interact with the women while they have their stay at the Bashali. The indigenous communities are sensitive toward these kinds of practices which have been there for ages. However, this practice is not easily comprehensible for the development models. The Kalash women termed Bashali as a pleasant space shared by women, a woman-to-woman contact, where they share their highs and lows of life, and maintain their us-time.

The Bashali has many facilities and is comfortable than even our houses, so we prefer to spend time there. (A woman; FGD with Kazis and Kalash community)

For most Kalash women it is not confinement, but a way out from their daily routine, and bonding together as women only activity. It is thus difficult to imagine this space from the urban point of view which will consider this in view of seclusion of women from the mainstream society during the menstrual cycle and last trimester of pregnancy. The Kalash treat men, nature, rivers, mountains, and trees Onjesta (pure), but pregnant and menstruating women as Paragata (impure), who have to spend the period of their impurity in the Bashali before getting back to the day-to-day life (Maggi, 2001; Mohyuddin, Sheikh, & Chaudhry, 2015). It is not that these women are left without any protection, they are under the protection of Dezalik, one of the deities, during their stay at the Bashali. The Dezalik pattern, carved out of Deodar wood is kept in the Beshali to protect women during child birth.

The Kalasha Dastoor has the concept of Onjeseta (Kalashamon: pure) and Paragata (Kalashamon: impure). Among other things, mountains, juniper, holy Oak and men are pure (Onjesta), while women are Paragata including other things such as Bashali and the graveyards. According to the Kazi (Kalashamon: head of the village) of Birir, in Bamburet women also join in most of the rituals, while in the remaining two valleys of Birir and Rumbor, most rituals are joined in by the men. On a similar note, women from indigenous communities have little chance to participate in mainstream development activities, except for beneficiaries of interventions like kitchen gardening, and training on rudimentary skills. It is believed that women from indigenous communities are underrepresented in most mainstream development work because of their gender and ethnicity. Most development literature does not mention of indigenous women, as a group with a distinct identity. Hence, they are missing from the interventions, except for the projects that focus on the indigenous communities as beneficiaries of their interventions. This is despite the growing space for women in the public arena. Local women from the Kalash community run their small grocery shops, where they have kept the handicrafts made by other Kalash women for display and sale to tourists.

To survive the adverse conditions due to extreme weather events, people resort to negative coping strategies, which disproportionately affect women. In the absence of any education facility or otherwise disruption in enrolment to a skill development program, most of the women from local communities will be deprived of economic development opportunities, perpetuating a cycle of poverty, gender discrimination, and further vulnerability. This is in the wake of the existent gender disparities in labour, or education.

The idea of custodianship of the natural resource used by indigenous communities has the potential to produce desired results in Pakistan, where natural resource conservation is achieved through policy and practice by designating a territory as a conservation park, which prohibits local ownership. These parks restrict use of natural resources by the local people but at the same time serve the vested interests of encroachers and rent seekers. The idea of entrusting some rights and obligations to indigenous communities has been tried in numerous countries and may be replicated, to help and maintain eco-systems. The tourists should also be entrusted with their rights and obligations in coordination with the indigenous people to protect the environment, local culture, and traditions. The Kalash community in doing their efforts to exercise this through engaging with the local stakeholders including forest department.

Our Kazis have conveyed to the Forest department, that in the Kalash valleys, the holy Oak trees belong to the Kalash, while the Deodar trees belong to the government, this is how we have distributed trees in the forest. (A Kalash man; FGD with the Kazis and the Kalash community)

Non-Government Organizations such as the Sarhad Rural Support Programme (SRSP) have different views about development issues like poverty, and lack of adequate facilities, and would term modern development as a panacea for the local people and bringing technology and communication means to the doorsteps of the community a great achievement (Vidal, 2015). On the other hand, the anthropologists or ethnographers would also see the community view in terms of cultural perspective and see how the issue is accepted by the community itself, and how they respond to the development issue so dear to the outsiders but have a different context for the local community (Rose, 1992).

Indigenous Adaptation Techniques: Indigenous communities have traditionally practiced a variety of activities that can be readily converted into adaptation techniques.

The Kalash observe *Suri Jagek*, meaning “observing the sun” which enabled them to forecast the weather. This must have existed for a long time in order to prepare for sowing and harvesting activities, livestock keeping, and preparation for year-round festivities and celebrations. Through this age-old tradition, according to the Kazis and community members of the Kalash, they are also able to foretell about natural calamities such as excessive rains and floods. The Kazis shared that the tradition also helps them in maintaining the Kalasha calendar of the year round significant religious and social events. This may be made into a climate change adaptation strategy by integrating it with early warning systems. The Kalash have historically used the *Dhajji Dewari*, or quilt patchwork wall, building technique, which allows the structure to be earthquake resistant. This must have been passed on from generation to generation, given that they live in an earthquake-prone zone. Furthermore, in the event of floods, the indigenous people in the Kalash valleys have incurred fewer losses as compared to other parts of the Chitral, partly because of their sense and perception to gauge the flashflood, based on indigenous knowledge, and partly because they consider the oak trees as sacred and only use the fallen branches in the construction and firewood, resulting in these trees being intact and saving the valleys from the flood. Due to the sacred nature of the holy Oak, it survives the logging activity, and hence plays a significant part in protecting the local community from the natural disasters such as floods.

We rely on the use of wood from the jungle trees for our cultural and religious rasoomat (Kalashamon: traditions). The Saros (Kalashamon: the holy Oak), and Baloot (Kalashamon: Shah Baloot) otherwise are the most essential wood used in ost of our rituals and ceremonies. (Kalasha man; FGD with the Kalash Kazis and community, 2024)

Similarly, the walnut trees are also important as during the Joshi festival, the walnut branches are collected by young boys and girls. At a time during the Joshi festival, the women are allowed to the most sacred place for the Kalash community, on highland with their new borne babies for purification. The Kalash believe the fairies also visit them during the last day of Joshi festival.

Because of the significance of nature, forests, and trees in the life of the Kalash, they have been watchful in reporting any logging activity in the area to the forest department and the police (Eco-Business, 2024).

Because the community is not homogeneous, various households exhibit different levels of adaptation. So, when it comes to climate change, a community, regardless of its distinct character, has varying degrees of adaptability (Coulthard, 2008). If the community is not willing to embrace adaptation strategies, development initiatives by international donors will encounter significant obstacles in implementation (Patt & Schröter, 2008). The cultural barriers to climate change adaptation are manifold (Nielsen & Reenberg, 2010). If the community is not willing to let go of the age-old practices close to their heart, it becomes a daunting task to convince them to try new methods, of conserving natural resources and adaptation measures.

Kalash are heavily dependent on natural resourced for their survivals, So, are the development efforts whether construction activity or inviting more tourists into the valleys. Deforestation exacerbates the impact of floods and landslides on the local community, causing damage to agriculture, livestock, lives, and livelihood. If it goes beyond the carrying capacity of the environment, it may also cause irreversible damage to the eco-system. For instance, the 2018 floods have damaged the houses of Kalash community in the Bamburet valley (The World Bank Group, 2019).

4. DISCUSSION

The constitution of Pakistan does not mention the term indigenous people, hence in the absence of any clear definition around the term itself, it cannot guarantee the rights of the indigenous communities in particular however they are covered in the generic sense as part of other population groups. This also suggests the lack of clarity around the term itself, finding it difficult to decide a claim to be part of an indigenous community in Pakistan. This also means that no law that particularly protects the rights of indigenous communities as a distinct group in Pakistan (The World Bank Group, 2019). However, the constitution of Pakistan also considers all citizens as equal before

law, and have equal entitlements, according to article 25(1) of the Constitution of Pakistan. Articles 28 and 36 respectively protect the minority's language and culture and the rights of minorities.

Pakistan has not ratified the International Labour Organization's Indigenous and Tribal Peoples Convention, 1989 (No. 169). However, it has ratified Indigenous and Tribal Populations Convention, 1957 (No. 107). Pakistan has ratified many international conventions and treaties that provide a basis for the protection of indigenous communities, such as the International Covenant on Civil and Political Rights, 1966, which Pakistan did ratify except its article 3, which mentions the equality of men and women (The World Bank Group, 2019), as women did not have equal right to testimony in Pakistan according to Islamic law.

Kalash community relate to personal, economic, communal, social, cultural, and identity-oriented issues. Personal issues highlighted are poverty and lack of education. The economic issues such as the lack of livelihood opportunities in the Kalash valleys, led to some community members especially Kalash women's conversion to Islam, and vulnerability to extreme weather events, floods, and flash floods. Communal issues related to grazing rights to pastures, land tenure, and family feuds, were mostly resolved by the Kazi. Social issues related to not being able to find suitors among the cousins due to the prohibition of marriage in close and distant relations, leading to conversions, and the converted woman's acceptance in the in-laws, her own family, and the Kalash community, and acceptance of outsider men in the family, and land entitlement to the women.

The cultural issues are rooted in the Kalash community's relation with nature and natural resources, the use of natural resources for rituals, and annual events. It is their belief system that encourages them to blend in the eco-system. They believe that humans, deities, fairies and animals were also living together in the distant past, portraying the oneness with the eco-system but they later separated, and now they remember and draw this during the Chawmos festivities. During the same festival the ritual is Goshnik is performed for the rites of passage to the boys of seven years and girls of four years where they become members of the Kalash society.

Cultural shock by the tourist influx, and the threat to the survival of rituals such as community graveyards at risk due to pilferage of deceased belongings, infringement of personal space, by intruding into the privacy of the local culture and practices, such as taking photographs of the girls and women without permission, and not giving due respect to the Kalash festivals which are of spiritual value to the locals than the tourist attraction. Identity oriented is the claim to the entitlement such as minority quota based on indigenous community and minority. The community's interest is to safeguard this identity from external influence and conversions. Teaching separate syllabus in the schools has long been the demand of the indigenous community, which had traditionally been taught the mainstream syllabi of subjects like Islamic Studies, at the public schools.

The organizations like Sustainable Tourism Foundation Pakistan (STFP) promote responsible tourism in Kalash valleys which through information and communication material (STFP, n.d.). Though they implemented donor-funded projects, in which there has been a mention of how tourist actions in the Kalash valleys will have a long-lasting impact on the environment, and how their responsible behaviour could save the eco-system from further damage.

There have been many practices among the Kalash communities used to safeguard against earthquakes and floods. This indigenous knowledge can be further explored and replicated. For instance, the Kalash have long been using Suri Jagek method, to forecast weather and prepare for activities like sowing, harvesting, livestock keeping, and celebrations. The local construction in the Kalash valleys is also based on Dhajji Dewari building technique for earthquake resistance. The Kalash communities have incurred fewer losses in floods due to their knowledge of flash floods and the religious value of forests and oak trees. They are also vigilant about logging activities. While the traditions like Suri Jagek show the significance of nature to the Kalasha community in their everyday life, however the practice remains largely oral. It is also important to see how these traditions survive the age of technology, where the younger age boys and girls have access to mobile phone, and how the older generation are able to transfer the knowledge to the younger ones. However, no document is available only oral tradition to transfer the meteorological and astronomical knowledge and traditions to hold key social events and life and livelihood practices by the indigenous Kalash people from one generation to another (The World Bank Group, 2019). This is where further research is

required to see what sort of practices support the eco-system, and environment of the Kalash community.

While men's role is predominant in the traditions like Suri Jagek, women do engage in the observing the moon and shadows, and play their part in predicting the weather patterns for the festivals. They are also involved in the folk stories and songs based on the traditions. However, men remain the main actors in the tradition, hence the tradition is Suri Jagek, observing the sun and not observing the moon. The binary opposites of Onjesta (pure) and Paragata (impure) remains vital in the traditions, where women considered as Paragata are not visible enough in deciding about the social and religious events. Interestingly during one of the festivals, called Chawmos it is said that the Kalash shift from Paragata (impure) to the Onjesta (pure) state. Nevertheless, it is also not possible for Kalasha women to frequently visit the Suri Jagaekain (Kalashamon: observatories) to observe the sun rise and sunset. Another issue that was quite important in this aspect, that dates of some Kalash festivals are fixed in advance, which downplay the importance of the oral tradition of Suri Jagek. This fixing of the festivals in advance are done to manage the tourist influx and holding various rituals and events on different dates.

The Kalash depend on the nature to decide about the time of crop yield and fruit production. However, with the climate change, the timing of ripping off of the fruit also varies, or the fruit is destroyed due to the snowfall, resulting in not being able to celebrate the rituals and remain in fear of a havoc by the deities, as during certain months' fruit picking is forbidden, and allowed in certain time. This time also changed with the climate change.

There are many good practices emerging out of the development projects in Kalash valleys, one such intervention was the concept of Integrated Tourism Zones (ITZs) in a geographically delimited area, closely linked in terms of history, culture, and nature and multiple partners from public and private entities to run and manage the tourist sites, including tour operators, tour guides, transport companies, airlines, and shops. The concept of carbon credits be then embedded into the ITZs to give a share in the enterprises supplying handicrafts, local food, or cuisine to the ITZs. Local inhabitants if using the alternative to firewood need to be given credit. Along with it, the tourists need to remember by heart the slogan "Take nothing but the photographs, and leave nothing but the footprints".

Any development intervention tends to change power structures at the local level and introduce new structures. The Kalash communities follow the system of Kazis, who are their spiritual leaders to decide about any issue or conflict at the community level. The development interventions need to engage the Kazis. However, a new project may affect the existing system. Usually, the development projects have the built-in risk assessment mechanism to identify and mitigate the potential risks to the local community. But for a community already in synch with nature and natural resources for the day-to-day activity, they also have the cultural, social, and spiritual significance of the rituals of the community. This delicate balance needs to be fully grasped by the development project and their implementing teams. This way, despite its importance to the local community, there need to be measures to for the minimum harm to the local dynamics and structures, and on Kalash land and natural resource, used by the community.

Back in the 1990s, the government attempted to build a roof structure to protect the Kalash community's ceremonial activities and festivities from rain. When the people attempted to dismantle the building, as it was viewed as an impediment to their rituals and connection with nature. The locals were detained on a charge of violating the law. This is a classic example of a fatalistic development intervention that, rather than aiding the community, has resulted in a dispute between the local community and the government itself. Earlier the Kalash community in one of the three valleys, i.e., Rambur filed a case on the royalty of the forests in the area which were allowed by the government to log. The Muslim community in the Ayun area, which is the entryway to the three valleys, also filed for a share in the Royalty. After the continued struggle for many years in the courts, the Kalash won the case, dis-favouring the people of Ayun, whom the court disallowed the royalty in the Kalash forests. This is yet another example of how the external development agenda and fight for natural resources instigate the intra-conflict among the communities hitherto living peacefully with each other (Rose, 1992). These conflicts become rough and at times very violent, causing the situation to become volatile among the communities.

Similarly, the regular influx of tourists into the valleys where the Kalash dwell, is promising as well as determinantal to the local customs, and traditions of Kalash community. Since Kalash women are prominently visible in the community festivals, as against the traditions followed by other ethnicities, this needs to be dealt with care and respect by the tourists to these valleys.

In mainland Chitral, there is a system of trophy hunting with the collaboration of the local community, where the forest guards are appointed from the community. The system ensures that no illegal hunting activity takes place except for authorized hunting which gives a major share to the community. A similar intervention can support responsible wildlife management in the Kalash valleys, benefiting the local community besides control over unauthorized hunting activity in the area.

5. CONCLUSIONS

Despite several policies and initiatives, Pakistan faces tremendous challenges in its enforcement and implementation. Several factors contribute to vulnerability, including poor infrastructure, weak governance, economic situation, and poverty. People in Pakistan rely on agriculture as one of the main livelihood sources. Pakistan is characterized by fast depletion of natural resources. The study found that the indigenous people of Kalash valleys in the Chitral district of Khyber Pakhtunkhwa have historically used several adaption methods that may be supported and replicated in other regions of the country. Some of these practices are deeply rooted in their religious and cultural traditions. However, these practices vary across gender. However, these indigenous communities, are mostly absent from Pakistan's climate change adaptation policies. Indigenous methods, along with new approaches such as the custodianship of areas where indigenous populations dwell and the transfer of carbon credits to these communities, could all contribute to the long-term preservation of eco-systems.

5.1. Policy implications

The policymakers in Pakistan need to know what it means by the term indigenous people, as due to lack of clarity, it is clubbed together with the tribal people and religious and ethnic minorities. This will help in devising concise policies for the benefit of the indigenous communities and planning the resources to implement these.

The study found that indigenous communities in general and women from these communities, in particular, are missing from the policy space and research on climate change adaptation in Pakistan. Women from indigenous communities are neglected on multiple fronts, on account of gender as well as belonging to the indigenous community.

The policy on climate change adaptation should highlight the custodianship of indigenous communities in the conservation activity. This can be extended to visitors to cultural and heritage places, as well as natural areas to emphasize their role, obligations, and adherence to local traditions and cultural norms. These protective mechanisms might also apply to indigenous people's religious and cultural practices.

Reforestation based on the plantation of those trees which have been significant for the indigenous population such as the Oak trees for the Kalash communities should be encouraged. This will assist in increasing the vegetative cover of the local area, mitigating the impact of climate change to some extent. Other indigenous methods, can be explored and evaluated and local inhabitants rewarded for continuing to practice these climate adaption skills, which is also an appropriate manner of knowledge transfer to the next generation. Payment for preserving the eco-systems can be a policy measure to support the indigenous communities that will reduce the level of marginalization for these communities. There is a need to devise a system of awarding carbon credits to the indigenous communities in Pakistan recognizing their services to preserve the natural resources and eco-system.

5.2. Future research prospects

Research is needed to investigate indigenous practices such as Suri Jagek, for upscaling in regions where climate induced disasters pose a potent threat.

There is also a need to document and transfer the local climate change adaptation practices to the young generations, as at present most of the traditions are oral, and would be extinct if not revived.

Further research is needed to see how the local knowledge, traditions, and practices of indigenous communities assist in climate change adaptation in Pakistan.

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