



Vol. 4 No. 1 (January) (2026)

Understanding Pakistan's Deforestation Crises: Causes, Consequences, and Conservation Efforts

Muhammad Ihsan Arif

Department of Forestry & Wildlife Management, The University of Haripur, Haripur, Khyber Pakhtunkhwa 22620, Pakistan Email: muhammadihsanarif796@gmail.com

Muhammad Asif Khan

Department of Forestry & Wildlife Management, The University of Haripur, Haripur, Khyber Pakhtunkhwa 22620, Pakistan Email: asifkhan66544@gmail.com

Ejaz Ahmad (corresponding author)

Department of Economics, The University of Haripur, Haripur Khyber Pakhtunkhwa 22620, Pakistan. Email: ahmad@uoh.edu.pk

ABSTRACT

Deforestation in Pakistan is a pressing environmental issue with far-reaching ecological, social, and economic consequences. This study investigates the causes, consequences, and conservation efforts related to deforestation in Pakistan, focusing on the interplay between government policies, economic factors, population pressure, and conservation initiatives. Using a mixed-methods approach, data were collected from 500 university teachers and students across Khyber Pakhtunkhwa, Pakistan, through surveys and interviews. The findings reveal that deforestation is primarily driven by urbanization, agricultural expansion, and infrastructure development, exacerbated by weak enforcement of environmental regulations and lack of economic incentives for conservation. Population growth and poverty further intensify deforestation, particularly in rural areas where communities rely heavily on forest resources for livelihoods. Conservation efforts, such as the "Billion Tree Tsunami and other green initiative" have shown promise but face challenges due to corruption, lack of community involvement, and insufficient international support. The study highlights the importance of community-driven conservation, stricter government policies, and enhanced awareness to mitigate deforestation. The results underscore the urgent need for integrated strategies that balance economic development with environmental sustainability to address Pakistan's deforestation crisis effectively.

Keywords: Deforestation; Government Policy; Economic Factors; Population Pressure; Conservation Efforts; Carbon Credits; Pakistan.

Introduction

Pakistan's diverse geography, spanning from the Himalayan and Karakoram mountain ranges to expansive plains and coastal areas, renders it susceptible to climate change-related disasters. These include extreme weather events, glacial melting, and rising temperatures, with significant impacts on agriculture, water availability, public health, and socio-economic stability (Ali et al., 2023). Deforestation has detrimental effects from various perspectives. Trees play a crucial role in absorbing and storing carbon dioxide, so their loss contributes to global climate issues. In Pakistan, illegal exploitation and inadequate enforcement of forest legislation exacerbate deforestation. The consequences



Vol. 4 No. 1 (January) (2026)

are evident each year, including floods, soil erosion, heightened landslide risks, desertification, land degradation, urban heatwaves, air pollution, and the spread of bacterial and viral diseases (Sanjrani et al., 2023). Natural forests, plantations, and strategically planted trees serve as vital components in addressing the significant threats posed by climate change. Forests safeguard the top fertile soil layer by minimizing erosion through reduced runoff and improved seepage, percolation, and infiltration. Furthermore, these trees contribute to soil fertility by adding organic matter (Ahmad et al., 2023). Despite recognizing the current climate crisis and ongoing efforts to combat it, Pakistan's forest cover is deteriorating. Unfortunately, there remains a notable lack of preparedness to effectively address this issue, particularly in safeguarding the well-being of future generations (Khan et al., 2024). Pakistan ranks as the fifth most vulnerable country to climate change globally. The multifaceted environmental challenges, including pollution, deforestation, and biodiversity loss, extend beyond the scope of mere Climate Change (Ali et al., 2024). Ensuring fair development that promotes climate mitigation in an uncertain future remains a formidable challenge, especially for societies recovering from conflict (Muzamil et al., 2024).

Environmental security and the issue of climate change should be prioritized in Pakistan's security discourse, an area that has often been overlooked due to low politics. While previous Pakistani governments have implemented national policies for environmental protection, vulnerabilities persist. These vulnerabilities affect not only citizens but also livestock, agriculture, and the overall food web of the state, exacerbated by worsening climate change (Chaudhry, 2022). The Himalayas, a global hotspot for biodiversity and endemism, are experiencing rapid deterioration in the health of their natural ecosystems. Various drivers threaten these ecosystems, increasing the likelihood of endemic species extinction and ecosystem collapse (Dhyani, 2023). Forests, which sustain millions of people, particularly rural communities, face immediate consequences from deforestation. Fuel scarcity, reduced fodder supply, and loss of leaf-litter manure impact local populations (Chaudhary et al., 2023). Over the past few decades, Himalayan forests have suffered significant losses due to deforestation and degradation. Biodiversity loss drivers accelerate species extinction, potentially leading to the collapse of valuable natural ecosystems (Dhyani, 2024). The ecologically sensitive and biodiverse Himalayas confront environmental challenges such as climate change, deforestation, and land-use change. Balancing human needs with environmental sustainability is crucial for biodiversity conservation and human well-being in this critical region (Yadav & Singh, 2024). Rapid development affects biodiversity conservation, food security, and the livelihoods of rural and indigenous communities, leading to social and economic conflicts (Syaban & Appiah-Opoku, 2024).

The escalating levels of pollution, deforestation, climate change, and resource depletion pose unprecedented challenges for the global environment. Beyond ecological concerns, these issues significantly threaten human health worldwide (Hussain & Reza, 2023). Climate-induced migration has become a common phenomenon worldwide, and Pakistan is no exception. Migrants impacted by climate change not only face socio-economic implications and security risks but also suffer exploitation. In Pakistan, climate-induced migration presents challenges in every province (Nouman & Shams, 2024). The impacts of climate change are evident in various regions worldwide, manifesting as heatwaves, forest fires, changing weather patterns, heavy rainfall, and severe droughts (Khuhro et al., 2024). Climate-related disasters contribute to hunger, child malnutrition, and diarrheal diseases, posing significant health risks (Safi et al., 2024). In recent years, Pakistan has grappled with devastating floods, droughts, and



Vol. 4 No. 1 (January) (2026)

cyclones, underscoring its vulnerability to climate change impacts (Deeba & Nawaz, 2024). Climate change affects virtually everyone and every region globally, but its effects are particularly pronounced among rural marginalized communities heavily reliant on agriculture and fishing. These communities face numerous livelihood challenges, including risks posed by climate variability (Roy et al., 2024).

Deforestation refers to the purposeful clearing of forested land by humans to make it available for other uses. This process occurs when we clear land for farming, livestock, or use timber for fuel, construction, or manufacturing. Pakistan is one of the countries experiencing a high deforestation rate (Ullah et al., 2023). Global warming refers to the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning. This process increases heat-trapping greenhouse gas levels in Earth's atmosphere. As a result, solid-state water (such as snow, ice, glaciers, and permafrost) shrinks, leading to an increase in meltwater. This phenomenon has been linked to more frequent incidences of flash floods, landslides, livestock diseases, and other disasters. Additionally, the Hindu Kush Himalaya (HKH) region is often called the "water towers of Asia" because many high-altitude areas store their water in the form of snow and glaciers, which feed ten major rivers in Asia (Sharma et al., 2023). Pakistan's rich biodiversity faces severe threats. These include over-grazing, over-harvesting, water-logging, salinization, deforestation, land conversion, soil erosion, desertification, alien invasive species, and pollution. These factors contribute to the degradation of biodiversity resources in the country (Noor et al., 2023). The HKH region has experienced significant climate changes in recent decades, rendering mountain communities increasingly susceptible to hazards caused by climate change (Khan & Hussain, 2024). Global environmental degradation refers to the deterioration of the environment through resource depletion, such as air, water, and soil quality decline; ecosystem destruction; habitat loss; wildlife extinction; and pollution. It encompasses any change or disturbance perceived as harmful or undesirable for the environment (Lin & Ullah, 2024). Given the increasing impact of climate change, protected areas (PAs) are critical for conservation efforts. They serve as essential havens for biodiversity and play a vital role in safeguarding ecosystems (Siddique & Molinos, 2024).

Forests, essential components of ecosystems, offer a variety of ecological, economic, and social benefits. They also play a vital role in combating climate change. Integrated forest management (IFM), which balances conservation and development activities, ensures the long-term health and productivity of forest ecosystems (Rana, 2023). In 2014, Imran Khan initiated the "Billion Tree Tsunami Initiative" as a measure to combat climate change. However, the campaign faced scrutiny due to allegations of negligence, corruption, and its potential use for political purposes by PTI (Asif et al., 2023). Pakistan's enactment of the Climate Change Act in 2017 marks a crucial step in the nation's commitment to tackling the impacts of climate change (Khan et al., 2024). Poverty, a multifaceted issue, impacts millions globally. Despite numerous efforts, there remains a considerable journey ahead to alleviate poverty and enhance living standards for everyone (Hassan et al., 2024). Coastal communities worldwide encounter complex, interrelated challenges stemming from environmental, social, and economic factors. Human-centered coastal governance involves collaboration among diverse stakeholders, drawing on multidisciplinary expertise, participatory methods, and the co-creation of solutions through multi-institutional partnerships (Raha et al., 2024). Understanding ecological history plays a vital role in ecosystem restoration by helping identify and characterize suitable targets for restoration. Pakistan has enacted



Vol. 4 No. 1 (January) (2026)

laws and policies to promote forest sustainability and preserve biodiversity, aligning with global strategies for future water planning and management (Javeed et al., 2024).

Litreature Review

While it is widely recognized that global warming is primarily driven by the emission of greenhouse gases like carbon dioxide, the direct link between deforestation and carbon dioxide emissions is less well-known. According to the Forestry Sector Master Plan, the country incurs an annual loss of 2.3 billion rupees due to flooding, erosion of fertile soil from upland watersheds, and the siltation of reservoirs and irrigation systems. Despite having alarmingly low forest cover, deforestation and forest degradation have reached levels deemed unacceptable by society. Historical trends and the current state of forests indicate that extensive deforestation and degradation of natural forests have occurred.

Minhas (2023) examines the crucial role forests play in regulating temperature, climate, and carbon dioxide levels. However, industrial development and urbanization have significantly degraded forests, contributing to global warming. Uncontrolled deforestation has led to numerous environmental disasters. This research focuses on the impact of deforestation on climate change and natural production in Pakistan, a country highly vulnerable to climate change due to unplanned deforestation. The study aims to explore the relationship between deforestation and climate change, highlighting the ecological and climatic consequences. Ali et al. (2023) investigate the severe threat deforestation poses to Pakistan, particularly in the dry temperate forests of Chilas. Conducted from October 2021 to August 2022, this study aimed to identify the current state and main drivers of deforestation using a binary regression model. Ground measurements and surveys revealed that most trees are immature or sub-mature. The study identified four primary drivers of deforestation: unsustainable fuel wood extraction, unsustainable timber extraction, urban expansion, and uncontrolled livestock grazing. A secondary driver was the use of wood for energy needs. To combat deforestation, the study suggests that the government should provide alternative energy sources and economic opportunities to reduce reliance on forests. Ullah et al. (2023) concluded that Pakistan has a high deforestation rate, particularly in its northern regions. This study examines the socioeconomic factors driving deforestation and evaluates existing economic incentives to reduce it. While deforestation cannot be completely eradicated, it can be minimized through effective enforcement of forest policies and efficient forest policing. The study aims to support the implementation of appropriate policies and decision-making in forest management. It also provides a basis for future scenario analysis of deforestation potential and its environmental and human impacts. Zahra (2023) examines the link between rapid urbanization and socio-ecological issues, highlighting that urbanization is a major cause of current public problems. The development of new housing schemes has led to the loss of horticulture and greenery, sewage system crises, and poor drinking water quality. Unplanned urbanization also results in pollution. The research aims to provide recommendations to address these environmental problems, including deforestation caused by rural-to-urban migration. It emphasizes the need for policies to restrict such migration and improve the quality of life for urban inhabitants, the study offers insights into urbanization challenges and guides policymakers on necessary reforms. Saleem et al. (2024) examine that Pakistan, including Azad Jammu and Kashmir (AJK), is a significant contributor to greenhouse gas emissions. This study aimed to identify the main drivers of deforestation and forest degradation in Pallandri tehsil, district Sudhnoti, AJK. The results highlighted several key drivers: unsustainable timber extraction, infrastructure development, encroachment



Vol. 4 No. 1 (January) (2026)

and mining, agricultural expansion for subsistence, unsustainable wood extraction, forest fires, and livestock grazing. The study also identified water scarcity, landslides, and wood shortages as general reasons for deforestation and forest degradation in Pallandri. Maqsood et al. (2024) address deforestation in flood-affected regions of Pakistan, focusing on the impact of climate change. It explores using remote sensing data and AI-based analysis to develop an unsupervised learning approach for detecting deforestation. Utilizing Sentinel-2 data, the study identifies deforested areas caused by floods, showing a reduction in forest cover from 3.9% to 3.41%. It also identifies potential reforestation areas, estimated to be 10.7% of Pakistan's total area. The findings highlight the urgent need for effective conservation strategies and reforestation efforts to mitigate forest loss and protect the planet's future. Hira et al. (2024) examine the serious environmental issue of forest depletion in Pakistan. To ensure forest sustainability, effective monitoring of deforestation is crucial. This study was designed to quantify changes in the Murree Forests, Pakistan, using Landsat Imagery for the years 2000, 2010, and 2019. The acquired images were inter-calibrated and classified using the maximum-likelihood classification. The findings revealed the distribution of the following classes in 2000, 2010, and 2019: pine forests (45%, 38%, and 35%), scrub vegetation (20%, 19%, and 19%), rangelands (11%, 8%, and 10%), settlements (8%, 20%, and 17%), agricultural lands (10%, 13%, and 12%), and barren lands (6%, 9%, and 12%) respectively. This study identifies extensive forest cover changes in the area due to anthropogenic pressures. The current findings highlight the urgent need to reduce deforestation through the implementation of appropriate forest conservation policies to ensure forest sustainability. Alam et al. (2024) concluded that in Malam Jabba, Pakistan, RS & GIS were used to analyze vegetation changes from 1980 to 2020, revealing an increase in deforestation rates from 0.7% to 1.93% per year, while the human population grew from 1.2 to 2.3 million. The decay model predicts a further increase to 2.5% per year due to a projected 11.6% annual population growth. The study highlights the threat of human activities to forest ecosystems and recommends reforestation, sustainable forest use, and long-term management plans to mitigate deforestation. Anwer et al. (2023) examine the relationship between development and the environment, a topic researched since the 1990s. A study on SAARC countries used linear and non-linear regressions to model the connections between economic growth and environmental degradation. The findings indicate that while economic growth improves the efficiency of using nonrenewable resources, this efficiency isn't sufficient to counteract the overall increase in resource consumption. Economic growth is significantly related to deforestation, air pollution, carbon emissions, and human capital. Ali et al. (2024) address the complex environmental challenges faced by Pakistan, such as pollution, deforestation, and biodiversity loss, which extend beyond the scope of "climate change." The study highlights that these issues are exacerbated by the continuous occurrence of extreme weather events, which undermine human and national security. Environmental degradation in Pakistan threatens all seven categories of human security and jeopardizes the achievement of all eight Millennium Development Goals. The qualitative analysis focuses on understanding environmental degradation as a non-traditional security challenge and evaluates the response of the current governance framework in Pakistan. Khan et al. (2024) examine the impacts of climate change on Pakistan's water resources, using secondary data from national and international reports, research studies, publications, and websites like the Climate Change Knowledge Portal. By analyzing temperature data with 5-year simple moving averages, the study reveals a rising trend in temperatures, indicating climate change primarily driven by greenhouse gas emissions.



Vol. 4 No. 1 (January) (2026)

The findings highlight that global warming is negatively affecting Pakistan's water resources, posing a threat to future development. The study emphasizes the need for timely and appropriate mitigation measures, including reducing greenhouse gas emissions and managing and conserving existing water resources. Jabbar et al. (2024) concluded that land use changes in Lahore, Pakistan, due to the removal of green cover and ecological disruption, have significant impacts. Using Landsat images from 1990, 2005, and 2020, analyzed with ArcGIS and Idrisi Selva software, the study found that the built-up area in Lahore increased by almost 100% over three decades, from 16.44% to 32.48%. This increase led to a significant rise in land surface temperatures (LST). Projections suggest a further 50% expansion of the built-up area by 2050, further encroaching on green spaces and increasing LST. The study concludes that Lahore is facing imminent threats from rapid land use changes and rising LST, risking the loss of a conducive and uniform thermal environment. To mitigate these effects, the study recommends strategically enhancing green cover to balance the increase in built-up areas and maintain a sustainable thermal environment. Akhtar (2023) explores the concept of climate justice by examining its relevance to Pakistan's demographic explosion and reactionary politics, particularly in the context of the 2022 floods. The commentary argues for an alternative development paradigm that addresses the global political economy in relation to demographic, environmental, and economic trends in postcolonial regions. It suggests that Pakistan's situation is representative of broader trends in postcolonial South Asia and sub-Saharan Africa, regions with rapidly growing young populations that are highly vulnerable to climate impacts. The commentary highlights the urgency of addressing climate justice in these vulnerable regions. Zaheer & Bano (2024) examine the relationship between Pakistani people's perceptions of climate change and their support for the New Ecological Paradigm (NEP), negative affect, and risk perception. Using an online survey with 200 educated respondents aged 16 to 36 and above, the study finds that perceptions of climate change reality, causes, and consequences are closely linked to NEP advocacy and risk anticipation. The findings highlight the need for subjective assessment to inform evidence-based policies and communication strategies. This approach aims to foster meaningful engagement and collective action to mitigate climate change effects in Pakistan. Naz et al. (2024) examine the significant food security challenges Pakistan faces due to climate change, which impacts agriculture, water availability, and livestock health. The qualitative research emphasizes the need for immediate action, recommending climate-resistant agricultural methods, improved water management, policy reforms, sustainable land management, decentralized renewable energy systems, and crop insurance. Adnan et al. (2024) investigate the disastrous floods Pakistan experienced in July and September 2022, caused by glacier melting, GLOFs, and extraordinary monsoon rainfall. Despite contributing less than 1% to global greenhouse gas emissions, Pakistan suffers significantly from climate change, exacerbated by industrialization, fossil fuel use, plastic use, and deforestation. The review highlights the benefits of reservoir management and dam development, and the need for integrating climate policies into socio-economic and political frameworks. It calls for comprehensive climate agreements in South Asia, increased funding for climate research, and innovative adaptation measures. Aligning with SDGs and addressing climate injustice are crucial for sustainable outcomes. Limiting global temperature increases to 1.5°C is essential to protect ecosystems, human health, and economic stability. Parveen et al. (2023) conclude that key environmental indicators like air and water quality, biodiversity conservation, renewable energy adoption, and waste management in India and Pakistan show



Vol. 4 No. 1 (January) (2026)

commonalities and disparities in implementing SDGs. The study examines geopolitical, economic, and cultural influences on policy effectiveness and explores the role of international collaborations in promoting sustainable practices. The research assesses current environmental sustainability and offers insights into future trajectories, contributing to the global discourse on SDGs and providing valuable perspectives for policymakers, researchers, and stakeholders in South Asia. Tahir et al. (2024) examine the REDD+ framework by UNFCCC, which focuses on sustainable forest management (SFM) and carbon pool intensification in developing countries. This study evaluates the effectiveness of REDD+ and forest sustainability in South Asian countries using a multi-criteria decision-making model with socio-economic, policy and governance, and environmental indicators. The analytic hierarchy process and additive weighted sum method assess the relative importance and performance. Findings show that the socio-economic indicator is the most important, with Nepal scoring highest and Pakistan lowest in sustainability scores. The study promotes policy-based indicators for SFM, carbon stock enhancement, and emission reduction in low–middle-income countries like Pakistan. Haq et al. (2024) examine the role of advanced technologies like IoT, AI, and remote sensing in monitoring, detecting, predicting, and preventing deforestation. These technologies provide real-time data and early detection to combat illegal logging, plant diseases, and forest fires. The review covers the advantages and limitations of IoT, satellite imagery, drones, and AI algorithms, highlighting their unique applications. It emphasizes the importance of these technologies in forest protection and biodiversity conservation. The findings aim to inform debates and guide further research, ultimately supporting practical interventions and policies for effective forest conservation. Abbas et al. (2023) concluded that the Billion Tree Tsunami Afforestation Program (BTAP), launched in 2014, aimed to restore forest ecosystems in Khyber Pakhtunkhwa, Pakistan, by afforesting 300,000 hectares and distributing 160 million plants. The study evaluated deforestation trends from 1990 to 2010 and assessed BTAP's impact using satellite images from 2014 to 2021. Results showed variable growth in forest regions: Southern (29%), Malakand (47%), and Northern (24%). Despite a 3.2% forest loss between 1990 and 2010, BTAP interventions increased overall forest cover from 14.5% to 16.5% between 2014 and 2018. Dhyani (2023) examines the surge in deforestation and forest degradation due to unsustainable harvesting, urbanization, tourism, pollution, and climate change, which severely impact natural ecosystems in Bhutan, China, India, Myanmar, and Pakistan. Wildlife trafficking and illegal trade further degrade sensitive alpine grasslands and timberline ecosystems. This review explores the drivers of ecological and social impacts across the Himalayas and beyond, highlighting the compromised health of Himalayan ecosystems. It emphasizes the need for data-driven decision-making using the RLE approach, as endorsed by the Kunming-Montreal Global Biodiversity Framework and the UN SESA. Waheed et al. (2023) examine the close link between environmental conditions and disaster propensity, emphasizing the need for environmental policy integration (EPI) in development and disaster management (DM) plans. Pakistan's vulnerability to climate-induced changes and disasters is reviewed through national policies and expert opinions. The study focuses on the China-Pakistan Economic Corridor (CPEC) under the Belt and Road Initiative (BRI). It finds that while environmental assessments (EA) are not conducted for DM policies, DM and EA are integrated into provincial protection acts and plans. The paper concludes that a regulatory framework is needed to guide EPI in DM for BRI and CPEC projects. Parveen et al. (2023) conclude that key environmental indicators like air and water quality, biodiversity conservation, renewable energy adoption, and waste management in India and Pakistan



Vol. 4 No. 1 (January) (2026)

show commonalities and disparities in implementing SDGs. The study examines geopolitical, economic, and cultural influences on policy effectiveness and explores the role of international collaborations in promoting sustainable practices. The research assesses current environmental sustainability and offers insights into future trajectories, contributing to the global discourse on SDGs and providing valuable perspectives for policymakers, researchers, and stakeholders in South Asia. Ullah et al. (2023) analyzed the Forest Department's efforts to enhance community participation in landscape restoration through household surveys and in-depth interviews. The study utilized descriptive statistics and a Poisson regression model, finding that increased participation in BTAP activities significantly improved forest cover, wildlife, and ecosystem services. Factors such as education and active Village Development Committees (VDCs) positively influenced household head participation in BTAP. However, obstacles like nepotism, irregular rainfall, lack of knowledge and skills programs, unattractive land tenure policies, poor communication networks, and delayed salary payments impeded participation. The study suggests that addressing these barriers and establishing effective incentive mechanisms are vital for the success of afforestation initiatives. Ghafran and Yasmin (2024) examined the participation strategies of an environmental NGO in community-based conservation (CBC) initiatives in Pakistan, focusing on local concepts like 'biradari' (kinship) and 'bharosa' (trust). The study highlights the role of gatekeepers in facilitating and supporting CBC efforts, stressing the need for NGOs to navigate complex cultural and social structures. The findings emphasize the importance of local knowledge in shaping participation strategies and suggest that engaging with 'elite' structures, despite potential drawbacks, is crucial for building community trust. The study underscores the necessity of culturally sensitive engagement for effective CBC and reveals the ethical complexities faced by NGOs in these projects, which can lead to both empowerment and subjugation.

Theoretical Framework

Political Ecology Theory

Political ecology is a multidisciplinary approach that examines environmental issues as inherently linked to political, economic, and social factors. It developed during the 1970s and 1980s, arising from the intersection of geology, anthropology, and history. Unlike apolitical ecological studies, political ecology emphasizes the political dimensions of environmental issues and phenomena. Banerjee et al. (2023) argue that the political economy of resource extraction is shaped by the interplay between capital, the state, and development, reflecting both the neoliberal governance strategies of governments and the developmental state's focus on control. Neoliberal reforms, intended to encourage private investment in the sector, are often justified under the guise of promoting regional and local development, particularly since much of the mining activity occurs in rural areas. Tornel (2023) explores the discourse around recognition in environmental justice, noting that while recognition aims to include diverse people, practices, and knowledge systems, it has played contradictory roles in environmental injustices. Misrecognition occurs when individuals are treated differently based on their identity, whereas the differences of certain groups can be overlooked when universal solutions are imposed in the name of environmental protection. Ide et al. (2023) examine how environmental factors and natural resources have influenced conflict dynamics in the post-Cold War era. The idea that both resource scarcity and abundance (e.g., oil or diamonds) contribute to social instability has bolstered the argument for policies addressing the environment-conflict nexus. Schroder & Moebus (2024) discuss how the historical pursuit of freedom has led



Vol. 4 No. 1 (January) (2026)

to structures of domination involving society, individuals, and nature, driven by the necessity of material exchange with nature. This perspective underscores the social science aspect of the ecological crisis and climate change, emphasizing that the analysis and resolution of these issues are not solely within the purview of the natural sciences. Sandig et al. (2024) highlight the prominence of political ecology perspectives, particularly in challenging environmental determinism. They argue that power imbalances and marginalization linked to global capitalist production, along with resistance to these forces, are key factors shaping environmental change and related conflicts.

Socio-Ecological Systems Theory

The ecological systems theory, also known as the social ecological model, is a framework in behavioral science and public health that examines the intricate relationships between individual, interpersonal, organizational, community, and societal factors that shape human behavior and health outcomes. Social-ecological systems view humans as an integral part of nature, highlighting the interconnection between people and the environment rather than seeing them as separate entities. Rodriguez & Redondo (2023) concluded that socioecological systems, which provide crucial ecosystem services for regional sustenance and regulation, are under significant threat. These systems include some of the world's largest intact forest tracts, boasting unique biodiversity, yet they face risks from deforestation and forest fires, which contribute up to 48% of total CO₂ emissions into the atmosphere. Golar et al. (2024) argue that essential ecological functions, which are vital for preserving natural resources, the environment, and human safety, are being destroyed by those prioritizing the wood industry over their responsibility to protect natural resources and promote sustainable development. White & Wulfing (2024) discuss the vulnerability of socioecological systems (SES) to unexpected and severe changes in both socioeconomic and environmental conditions. A key question in socio-environmental systems research is predicting how SESs will respond to such shocks and understanding which characteristics of a system, and of a particular shock, determine the system's resilience and recovery capacity. Abimubarok et al. (2024) explore how complex socioecological systems are capable of supporting a wide range of human-used resources. This capacity is due to the system's ability to identify various factors impacting the resource system and enhance its sustainability through policy interventions. Xu et al. (2024) examine the increasing complexity of the vulnerability of social-ecological systems in desertified regions (SES_{DR}), driven by climate change, human activities, global warming, rapid urbanization, industrialization, and large-scale ecological projects. This complexity poses significant challenges to regional ecological restoration and sustainable development efforts.

Tragedy of the Commons Theory

The tragedy of the commons is an economic theory suggesting that individuals often overuse shared resources, leading to demand exceeding supply and eventually rendering the resource unavailable to everyone. First introduced by William Forster Lloyd in 1833, the theory has been cited to support the establishment or expansion of property rights, privatization, and government regulation. Puteh et al. (2024) argue that the conclusions drawn are based on several questionable assumptions, such as the homogeneity and rationality of resource users, the lack of communication and cooperation among them, and the inevitability of resource degradation under common property. They also criticize Hardin's essay for overlooking the historical and institutional context of resource use and



Vol. 4 No. 1 (January) (2026)

management, as well as the diversity and complexity of common property arrangements worldwide. Kenwood (2024) examines the application of this concept to any system where humans draw from a shared resource pool, highlighting that Earth, on a large scale, is a limited space with finite supplies of water, soil, food, minerals, and other essential resources. Mondal et al. (2024) discuss how individuals often selfishly exploit environmental resources for personal gain, ultimately leading to environmental degradation. Khan et al. (2024) highlight the importance of forest management for reducing pressure on forests and promoting sustainable development in Pakistan. They note that habitat loss leads to decreased biodiversity and that deforestation is a major contributor to climate change. Unlawful deforestation, they argue, has caused catastrophic disasters in Pakistan's history.

Data Source and Methodology

Population of the Study

The study's population consists of university teachers and students who have a background or strong interest in forestry, environmental science, and related disciplines. These individuals are expected to have a deep understanding of environmental issues, particularly deforestation and its various impacts. By focusing on this specific group, the study aims to leverage their extensive knowledge and experience, making it highly relevant to the context of deforestation in Pakistan. University teachers, as experts and thought leaders in their fields, bring a wealth of theoretical knowledge, research experience, and critical thinking skills. Their involvement is crucial as they can provide in-depth analysis, draw on extensive literature, and offer insights based on years of research and observation. Many of these educators may have conducted their own research on deforestation or related environmental issues, giving them a unique perspective. Their contributions can help in understanding the broader implications of deforestation, including its ecological, economic, and social impacts, as well as the effectiveness of current policies and practices. University students, on the other hand, represent the next generation of environmental scientists, policymakers, and activists. Their participation is equally significant as they bring fresh perspectives, innovative ideas, and a passion for addressing environmental challenges. Students studying forestry, environmental science, or related fields are likely to be engaged with the latest research, trends, and technological advancements. They may also be more attuned to contemporary issues and challenges surrounding deforestation in Pakistan, especially in the context of climate change, sustainable development, and community-based conservation efforts. Additionally, their diverse academic and personal backgrounds can contribute to a more holistic understanding of the issue, as they may approach the problem from various angles, such as policy analysis, ecological impact assessment, or grassroots activism. Focusing on individuals with knowledge or interest in deforestation in Pakistan is particularly relevant given the country's ongoing struggles with forest degradation. Pakistan, with its unique ecological zones and biodiversity, faces significant challenges in managing its forest resources. The alarming deforestation rates are driven by factors such as illegal logging, land conversion for agriculture, urbanization, and population pressure. This has led to severe consequences, including loss of biodiversity, soil erosion, altered hydrological cycles, and increased vulnerability to climate change. By involving a population deeply knowledgeable or interested in these issues, the study aims to gather nuanced and informed perspectives that can contribute to a deeper understanding of the drivers of deforestation in Pakistan, as well as potential strategies for mitigation and sustainable management. Additionally, this population is likely to be familiar with the



Vol. 4 No. 1 (January) (2026)

socio-economic and cultural dimensions of deforestation in Pakistan, which are critical for developing effective solutions. Understanding the complex interplay between environmental degradation and human livelihoods, particularly in rural areas where dependence on forest resources is high, is essential for crafting policies that are not only environmentally sound but also socially equitable. Insights from university teachers and students can help identify gaps in current approaches and propose innovative solutions grounded in both scientific evidence and practical realities. In conclusion, selecting university teachers and students with knowledge or interest in forestry, environmental science, and particularly deforestation in Pakistan, as the population for this study, is strategic and deliberate. Their expertise, engagement, and diverse perspectives are expected to contribute significantly to the study's objectives, ensuring that the research findings are both relevant and impactful. This population will play a crucial role in advancing our understanding of deforestation in Pakistan and shaping future strategies for conservation and sustainable development in the region.

Sample of the Study

A purposive sampling technique will be employed to select 250 university teachers and 250 students from various universities across Khyber Pakhtunkhwa (KPK), Pakistan. This method is well-suited for the study as it allows for the deliberate selection of participants who possess specific knowledge, expertise, or interest in deforestation, environmental science, and forestry. By doing so, it ensures that the participants are likely to provide relevant and insightful data, contributing to a thorough understanding of the issues being explored. Participants will be drawn from several prominent universities in KPK, including the University of Peshawar (UoP), the University of Agriculture (UoA) in Peshawar, Gomal University in Dera Ismail Khan, the University of Malakand (UoM) in Chakdara, and the University of Haripur in Haripur. These institutions are recognized for their academic programs in environmental sciences, forestry, and geography, making them ideal sources for participants with the necessary background and interest in the study's focus. At the University of Peshawar, data will be gathered from the Department of Environmental Sciences, the Department of Geography, and the Institute of Management Studies. These departments are heavily engaged in environmental issues, including deforestation, making their faculty and students highly relevant to this research. Similarly, the University of Agriculture, Peshawar, with its Department of Forestry and Department of Environmental Sciences, is another key institution for this study. Its focus on agricultural and environmental sustainability ensures that participants from this university will have a strong understanding of the ecological and socio-economic aspects of deforestation in Pakistan. Gomal University in Dera Ismail Khan will also be included in the sampling process. The university's Faculty of Agriculture and Environmental Sciences offers programs that directly address environmental challenges, making it a valuable source of knowledgeable participants. Likewise, the University of Malakand in Chakdara and the University of Haripur in Haripur will provide access to students and faculty from departments such as Environmental Sciences and Forestry, where the curriculum and research activities often emphasize local and regional environmental issues, including forest management and conservation. Data collection will be conducted through a combination of physical visits and collaboration with contacts, including friends, colleagues, students, and teachers associated with these universities. Where physical access is limited, online surveys and interviews will be utilized to reach participants, ensuring a comprehensive and diverse sample. This approach not only enhances the representativeness of the sample but also



Vol. 4 No. 1 (January) (2026)

ensures that the data collected is rich in context and relevant to the specific environmental challenges faced in KPK, particularly deforestation. By focusing on these key institutions and departments, the study will draw on a well-informed and engaged population, thereby maximizing the quality and applicability of the research findings.

Data Collection Technique

In a single study, mixed methods research is a thorough strategy that blends qualitative and quantitative research approaches, methodologies, and data collection procedures. By utilizing the advantages of both qualitative and quantitative methodologies, this research technique enables a deeper and more complex comprehension of the study problem. When examining complicated phenomena, qualitative approaches are frequently employed because they offer rich, in-depth insights into the experiences, viewpoints, and environments of participants. These techniques, which could include focus groups, interviews, or observations, are especially helpful for comprehending the "why" and "how" of a research subject. For instance, qualitative research on deforestation can investigate local communities' perspectives in order to identify the sociocultural and economic elements that contribute to deforestation. Mixed methods research offers a more thorough understanding of the study problem than either method could on its own by combining these two methodologies. It enables researchers to corroborate findings from many data sources, improving the accuracy and legitimacy of the findings. For example, quantitative data may indicate a relationship between specific economic activity and deforestation, but qualitative data may offer the contextual information required to explain the existence of this relationship. When tackling intricate, multidimensional research topics that are impossible to completely comprehend through a single methodological lens, mixed methods research is very helpful. It helps researchers to overcome the shortcomings of each approach, including the shallow contextual depth of quantitative data or the restricted generalizability of qualitative findings.

Mixed Methods Research

A mixed methods research design integrates both qualitative and quantitative data gathering and analysis approaches into a single study, offering a more thorough knowledge of a research subject. Studying groups that are changing or in flux might also benefit from it because the researcher can track and examine these changes as they take place. The goal of transformative research design is to question and alter conventional wisdom. It is distinguished by an emphasis on empowering and equipping people to make changes and advance social justice in their communities. In order to hone the study topic and methodology, a multi-phase mixed methods research design collects and analyses both types of data at different stages (Sharma et al., 2023).

Open-Ended Questions

Respondents are free to react in their own words to open-ended enquiries as they are not limited to predetermined possibilities or answers. Open-ended questions allow more in-depth and broad responses, in contrast to closed-ended questions, which usually only accept a simple "yes" or "no" response or the selection of an option from a predetermined list. When gathering rich qualitative data, exploring difficult themes, or delving into the subtleties of a respondent's perspective are the main objectives of research and interviews, this kind of inquiry is especially helpful.



Vol. 4 No. 1 (January) (2026)

What do you believe are the primary causes of deforestation in Pakistan?

In Pakistan, mining, encroachment, infrastructure development, and unsustainable timber extraction were the main drivers of deforestation. Livestock grazing, unsustainable wood extraction, forest fires, and agriculture expansion for subsistence were the primary degradation drivers that were given priority. On the other hand, major indirect drivers or underlying causes of deforestation and forest degradation along the areas where population is dwelling included population pressure, poverty, weak governance and law enforcement, lack of alternative livelihood options, land hunger, and lack of awareness. The research area's primary prioritized drivers of deforestation were mining, encroachment, unsustainable timber extraction, and infrastructure development. Livestock grazing, unsustainable wood extraction, forest fires, and agriculture expansion for subsistence were the primary degradation drivers that were given priority. On the other hand, major indirect drivers or underlying causes of deforestation and forest degradation were found to be population pressure, poverty, weak governance and law enforcement, lack of other livelihood options, land hunger, and lack of awareness (Saleem et al., 2024).

How do you perceive the environmental and social consequences of deforestation in your region?

The evidence that has been provided amply supports the presence of climate change and the wide range of effects it has on the environment, society, and economic systems. considerable events include the observation of rising global temperatures, a considerable rise in sea levels, harsh weather, and ecosystem destruction. Furthermore, climate justice must be given top priority in order to ensure that marginalized groups receive support and empowerment in the face of climate-related hardships. With a united global effort, we can mitigate the worst effects of climate change and strive towards a sustainable and resilient future for future generations. Urbanization, logging, and agricultural growth are the main causes of deforestation, which contributes significantly to climate change. Greenhouse gases are mostly released by industrialization. Because agriculture and waste management release pollutants like heavy metals and micro plastic, they exacerbate climate change. Water is severely impacted by these problems, and water scarcity is impacted by climate change. There are numerous economic effects of climate change, including the potential for large financial losses due to damage from extreme weather events, increasing sea levels, and disruptions to agriculture. Pakistan is an agricultural nation, and a lack of water leads to economic losses, urbanization, and a host of other socioeconomic issues.

What role do you think government policies play in either exacerbating or mitigating deforestation in Pakistan?

Create long-term educational initiatives to guarantee that future generations have the highest level of environmental awareness, climate literacy, and conservation ideals possible, promoting a persistent dedication to forest preservation. Assure the implementation of forest policies that improve the economic well-being of rural communities and lessen the demand on forests by allowing them to diversify their sources of income and live less dependently on forest resources. Create extensive, long-term afforestation programs with an emphasis on reforestation and growing forested regions, aimed at degraded landscapes and underutilized territories. By fortifying legal frameworks, lowering corruption, and encouraging community involvement in decision-making, you can ensure transparency and good governance in the restoration of forest



Vol. 4 No. 1 (January) (2026)

landscapes. Encourage global cooperation and partnerships to get access to resources, know-how, and financing for long-term afforestation initiatives that will maintain momentum for forest protection (Khan et al., 2024).

In your opinion, how effective have conservation efforts been in addressing deforestation in Pakistan?

Community social cohesion has greatly benefited from reforestation conservation initiatives, which have turned rivalries over forest resources into mutual support. FLR promoted community mobilization, collaboration, shared responsibility, and the creation of VDCs and JFMCs. The FLR activities were reinforced by the active participation of community volunteers and each family in decision-making processes. Restoration of biodiversity through the appearance of new plant species and the resurgence of extinct species is one aspect of ecosystem restoration achieved by FLR programs. Moreover, the application of FLR in the FGDs was linked to the recovery of animal populations and health, soil health, and water quality, highlighting its significance in ecosystem restoration (Ullah 2024).

What strategies would you suggest to enhance the effectiveness of deforestation mitigation efforts in Pakistan?

The government was tasked with restoring the nation's greenery through a reforestation initiative without interfering with the social dynamics of the area. In order to plant seedlings throughout the Khyber Pakhtunkhwa Province in the first phase and the entire country in the second, hundreds of nurseries were created. In addition to the government's planting, private landowners in the study region received free seedlings to encourage them to cultivate and safeguard their own resources. The entire Hindukush belt was subjected to extensive areal seeding. Commercial harvesting of wood was outlawed with certain restrictions. The community's response to this project is significant to note here because it ultimately contributed significantly to its success (Haq et al., 2024).

List of Variables and Their Likert Scale Questions

Dependent Variable: Deforestation Rate (DR)

Deforestation is a significant environmental issue in Pakistan.

The rate of deforestation has increased in recent years.

Efforts to reduce deforestation have been insufficient.

This carbon is released back into the atmosphere as carbon dioxide when trees are burned. Carbon dioxide builds up in the atmosphere and speeds up global warming when there are fewer trees to absorb it. The biodiversity of the planet is also threatened by deforestation.

Independent Variable 1: Government Policy (GP)

Government policies have contributed to deforestation in Pakistan.

The government has implemented effective policies to combat deforestation.

There is a lack of enforcement of environmental regulations.

Profitability incentives frequently conflict with sustainable forest management and forest conservation, making them ineffective strategies to stop the loss of forests.

Independent Variable 2: Economic Factors (EF)

Economic development has driven deforestation in Pakistan.

The demand for agricultural land is a major cause of deforestation.

Economic incentives for conservation are lacking.



Vol. 4 No. 1 (January) (2026)

Economic reasons that prioritize short-term economic rewards over long-term environmental sustainability, such as agriculture, logging, and infrastructure development, are the main causes of deforestation. Government policies and other economic incentives, such as worldwide market demand, aggravate the loss of forests.

Independent Variable 3: Population Pressure (PP)

Population growth has led to increased deforestation in Pakistan.

Urbanization is a significant factor in deforestation.

Population pressure exacerbates land use changes leading to deforestation.

People depend on forest land for shelter, fuel, and agriculture, low population pressure can lessen deforestation and increase the preservation of natural ecosystems. This can lessen land conversion caused by humans, preserving biodiversity and the amount of forest cover.

Moderating variable (Independent Variable 4): Conservation Efforts (CE)

Conservation efforts have been effective in reducing deforestation.

Community involvement in conservation is essential.

International support is crucial for successful conservation efforts.

STATISTICAL TECHNIQUES

For Qualitative survey:

One of the most popular types of analysis in qualitative research is thematic analysis. It focusses on finding, evaluating, and deciphering meaning patterns (sometimes known as "themes") in qualitative data. While most other qualitative analytic approaches, like grounded theory, discourse analysis, narrative analysis, and interpretative phenomenological analysis, can be described as methodologies or theoretically informed frameworks for research, thematic analysis is typically understood as a method or technique. These approaches specify guiding theory, appropriate research questions, methods of data collection, and procedures for conducting analysis. The majority of qualitative data sources, such as those gathered through focus groups, surveys, requested diaries, visual aids, fieldwork and observation, action research, memory work, vignettes, narrative completion, and secondary sources, can be analyzed using theme analysis. Data sets can be anything from a few brief, cursory answers to a survey question with no restrictions to hundreds of pages of transcripts from interviews. Both small and large data sets can be analyzed using thematic analysis. The theoretical flexibility of thematic analysis (TA) makes it a more clear choice than techniques with specific embedded theoretical assumptions, which is why it is frequently utilized in mixed-method designs. Thematic analysis has a long history of use in phenomenological research, and it is sometimes stated to be compatible with phenomenology since it can concentrate on participants' subjective experiences and sense-making. The primary focus of a phenomenological method is on the experiences, feelings, and perceptions of the participants. Phenomenology, which has its roots in humanistic psychology, emphasizes the importance of giving voice to the "other" in qualitative research as a whole. With this method, respondents are able to talk about the subject in their own terms without being constrained by the fixed-response questions that are present in quantitative research.

For Quantitative Analysis

Frequency Distribution and ANOVA

A statistical test called analysis of variance (ANOVA) is used to determine how different the means of more than two groups are from one another. Fundamentally, an ANOVA lets you compare arithmetic means between groups at the same time. You can ascertain



Vol. 4 No. 1 (January) (2026)

whether the discrepancies you've noticed are the result of pure coincidence or if they actually represent significant, real distinctions. One independent variable is used in a one-way ANOVA. There are two independent variables in a two-way ANOVA. In a regression research, analysts employ the ANOVA test to ascertain the impact of independent factors on the dependent variable. To people who are unfamiliar with statistics, this may seem mysterious, however there are a wide range of significant uses for ANOVA. ANOVA has developed into a vital tool for comprehending complex systems and making data-driven decisions, with applications ranging from marketers analyzing consumer preferences to medical researchers examining the effectiveness of novel treatments.

Questionnaire Reliability and Validity with the Chronbach's Alpha and KMO test

A measure of internal consistency called Cronbach's Alpha shows how closely connected a collection of objects is to one another. It is frequently employed to evaluate a survey's or test's dependability. Higher levels of Cronbach's Alpha, which range from 0 to 1, denote more internal consistency. The KMO test evaluates how well samples were chosen for factor analysis. It assesses the percentage of variation between variables that may constitute common variation. Higher values of the KMO value, which goes from 0 to 1, suggest that the data is better suited for factor analysis.

Correlation Analysis

One statistical method for determining the link between two variables is correlation analysis. It aids in the comprehension of the degree to which changes in one variable are linked to changes in another by researchers. This approach is frequently applied in commercial and data analytics settings.

Factor Analysis

A statistical method called factor analysis can be used to determine the underlying structure of a collection of variables and explain them in terms of fewer common underlying factors¹. It aids in the exploration of hidden correlations between variables that are visible.

Regression Analysis

A statistical modelling method called regression analysis aids in identifying the variables that matter and their relationships with one another. It is a method for logically prioritising and ignoring a number of variables by mathematically sorting them. To assist you in creating more accurate business plans, projections, and decisions, regression analysis assesses the degree of relationship between two variables. It is a collection of statistical procedures used to calculate the correlations between one or more independent variables and a dependent variable.

Moderation analysis

A statistical method called moderation analysis is used to investigate whether the existence of a third variable, referred to as the moderator, affects how an independent variable affects a dependent variable. It assists in ascertaining whether the moderator has an impact on the relationship between the independent and dependent variables



Vol. 4 No. 1 (January) (2026)

Results and discussions

Qualitative outcomes

What do you believe are the primary causes of deforestation in Pakistan?

Most of the respondents highlight in Pakistan, infrastructure development, agricultural growth, and urbanisation are the main causes of deforestation. Urban expansion has been driven by rapid population increase, resulting in the conversion of forested regions into zones for residential, commercial, and industrial use. Due to their substantial growth, cities like Karachi, Lahore, and Islamabad now need more land for utilities, roads, and housing. In addition to consuming forest area, this urbanisation strains neighbouring ecosystems, which further depletes natural resources and lowers biodiversity. Deforestation in Pakistan is also largely caused by the construction of infrastructure. Large-scale construction projects like power plants, dams, and highways frequently need destroying enormous areas of forest. For example, the building of new roads and railroads through forested areas, such as the northern parts, allows people to access inaccessible locations, which can result in illegal logging and the conversion of land to other purposes. Infrastructure is necessary for economic growth, but it has a negative influence on the environment, especially when planning ignores the preservation of forests and sustainable land use. An important contributing factor to Pakistan's deforestation is agricultural expansion. In order to make way for more farms, forests are being cleared as the need for food, cattle, and cash crops like wheat and sugarcane rises. This is particularly common in regions like Punjab and Sindh, where the primary industry is agriculture. But this clearing of forest area for farming exacerbates the environmental catastrophe by causing soil erosion, water scarcity, and the loss of important habitats. The primary drivers of deforestation in Pakistan remain to be urbanisation, infrastructure development, and agricultural growth. These factors pose a threat to the nation's long-term sustainability and natural environment. Pakistan's forest cover has been drastically diminished as a result of infrastructure development, agricultural growth, and urbanisation. Pakistan has one of the greatest rates of deforestation in the world, losing thousands of hectares of wooded area year, according to numerous environmental studies. Given the nation's susceptibility to climate change, this loss is especially worrisome because forests are essential for retaining water cycles, reducing soil erosion, and sequestering carbon. The enduring deterioration of forest ecosystems intensifies the consequences of calamities like floods and droughts, which are already common in Pakistan.

How do you perceive the environmental and social consequences of deforestation in your region?

Most of the respondents highlight the environmental and social consequences of deforestation is loss of biodiversity, soil erosion and climate change. The loss of biodiversity is among the most concerning effects. Numerous plant and animal species depend on forests for their survival, and their loss endangers a vast array of these species. Pakistan's woods, especially in the north, are home to a variety of rare plants and animals, many of which are currently in danger of disappearing because of deforestation. Ecosystems are disrupted by dwindling habitats, which puts species in jeopardy or extinction and upsets the ecological balance needed to preserve biodiversity. Soil erosion is one of the main effects of deforestation. In order to stabilise the soil and stop landslides and surface flow, forests are essential. Large-scale deforestation has exposed the soil to wind and rain, especially in hilly and mountainous regions like the Hindu Kush and Himalayas. This has resulted in increasing soil erosion, negatively harming



Vol. 4 No. 1 (January) (2026)

agriculture, lowering soil fertility, and jeopardising the livelihoods of local farmers. It gets harder to maintain crops as the rich topsoil is washed away, which leads to poverty and food insecurity in many communities. Additionally, deforestation locally and worldwide contributes to climate change. By absorbing carbon dioxide from the atmosphere, trees function as carbon sinks. This capacity to absorb carbon has been diminished by the extensive clearance of forests in Pakistan, increasing greenhouse gas emissions. Furthermore, local weather patterns have been affected by deforestation, making issues like heatwaves and droughts worse. Since Pakistan is already at risk from the effects of climate change, deforestation makes matters worse by raising temperatures and upsetting rainfall patterns, which in turn leads to an increase in extreme weather occurrences. Equally alarming are the social ramifications of deforestation. Pakistan's rural and indigenous inhabitants mostly depend on forests for their fuelwood, timber and non-timber forest products. Many of these communities are forced to travel to urban regions in pursuit of employment as a result of the increasing deforestation, which threatens their main sources of income and resources. Urban infrastructure is strained, social inequality is heightened, and as a result, cities become overcrowded and resources like housing and water are put under more strain. Furthermore, the decline of traditional forest-based industries contributes to the disintegration of cultural identities that have long been inextricably linked to forest ecosystems.

What role do you think government policies play in either exacerbating or mitigating deforestation in Pakistan?

Most of the respondents highlights that reduce corruption, Awareness and reforestation are play role in mitigating deforestation in Pakistan . Corruption is a major factor that prevents efficient governance in the management of forests. Political meddling, a lack of accountability, and corrupt practices among local officials provide openings for illicit logging and the mismanagement of forest resources. Unchecked, these activities cause a considerable loss of forest cover. In order to improve openness, guarantee proper enforcement of the law, and develop a more sustainable method of managing natural resources, it is imperative that corruption in forest governance be reduced. Fighting deforestation requires spreading knowledge about the value of forests. Many communities in Pakistan depend on trees for livelihood, although there is often insufficient understanding of the long-term environmental repercussions of deforestation. Campaigns to raise awareness among locals, decision-makers, and corporations can encourage a better understanding of the ecological advantages of forests, including their capacity to sequester carbon, protect biodiversity, and manage water cycles. Communities may take an increased interest in sustainable practices and forest conservation by becoming more environmentally literate. The impacts of deforestation in Pakistan must be lessened, and this requires intensive reforestation. Drives to restore damaged forest lands have been spearheaded by government and non-government organizations through tree-planting initiatives like the "10 Billion Tree Tsunami" project. Through the creation of jobs, these initiatives hope to improve the local economy by increasing the amount of forest cover. But without appropriate management of the already-existing forests and laws to stop additional deforestation, replanting cannot address the issue on its own. The need for improved governance is directly related to the role that awareness and replanting play in reducing deforestation. Progress can be hampered by corruption and lax enforcement of environmental rules, even in the case of successful forestry initiatives. Institutions that are transparent and accountable are essential for controlling the usage of forests, keeping an eye on deforestation operations,



Vol. 4 No. 1 (January) (2026)

and punishing illegal loggers. Enhancing governance in conjunction with a strong civil society participation helps guarantee the long-term viability of reforestation initiatives.

In your opinion, how effective have conservation efforts been in addressing deforestation in Pakistan?

Most of the respondents highlights awareness, policy framework and involve NGO's to addressing deforestation issues in Pakistan. Increasing awareness is an essential first step in addressing Pakistan's forestry problem, which calls for a diverse strategy. Although many populations, particularly those in rural regions, depend on forests for agriculture, fuel, and subsistence, it's possible that they are unaware of the long-term environmental effects of deforestation. Public awareness of the critical role woods play in preserving ecological balance can be raised through education, media campaigns, and community involvement. Communities are more inclined to take up sustainable practices and participate in conservation initiatives when they recognize the value of forests for biodiversity, climate regulation, and water management. As important as a strong legislative framework is in combating deforestation. Pakistan need clear regulations that support sustainable land use while simultaneously safeguarding the country's forests. Strict enforcement of the current laws and regulations is required to stop illicit logging and land clearing for urbanisation or agriculture. Policies should also promote sustainable activities like community-led forest management and agroforestry. To ensure that development and ecological preservation are balanced, the government must incorporate forest protection into more comprehensive environmental and economic strategies. Robust policies furthermore furnish a legal structure for the prosecution of violators and halting additional deforestation. In order to combat deforestation, non-governmental organisations (NGOs) are essential, especially when it comes to forming connections between local communities, the government, and global players. Reforestation projects, wildlife conservation, and community development initiatives are already being carried out in Pakistan by non-governmental organisations (NGOs), including the World Wildlife Fund (WWF) and regional environmental groups. They possess the knowledge and connections necessary to organise funds, spread awareness, and carry out conservation plans locally. Engaging non-governmental organisations (NGOs) in policy deliberations and field operations can enhance cooperative endeavours, guaranteeing that conservation and reforestation programs are inclusive and long-lasting. Additionally, the engagement of non-governmental organisations (NGOs) can offer technical support and capacity building to local people, enabling them to better manage their natural resources. NGOs can encourage sustainable forest use, lessen the strain on forest ecosystems, and develop non-deforestation alternative livelihoods by collaborating directly with people who live in or close to wooded regions. By using a community-driven strategy, conservation activities are made sure to reach those who are most impacted by deforestation as well as those at the top.

What strategies would you suggest to enhance the effectiveness of deforestation mitigation efforts in Pakistan?

Mostly respondents highlights the following factor like monitoring and penalties, community engagement, awareness and strict govt rules to enhance the effectiveness of deforestation mitigation efforts in Pakistan. Penalties and monitoring are crucial tactics to improve the efficacy of Pakistan's deforestation mitigation initiatives. Authorities can identify illicit logging operations, trace down deforestation activities, and stop unapproved land removal with the use of effective monitoring. Improved surveillance



Vol. 4 No. 1 (January) (2026)

technologies, such as satellite tracking and ground patrols, can more effectively stop deforestation. Strict fines or jail time for infractions serve as a deterrent, guaranteeing that those who engage in illicit forest operations will suffer the repercussions. The rate of deforestation can be considerably decreased by implementing strict fines in conjunction with a well-organised monitoring system. Getting the community involved is another important deforestation prevention tactic. Local people frequently rely on forest resources for their livelihoods, particularly those that live close to forests. Engaging these people in forest management and conservation can help minimise deforestation while providing sustainable alternatives. Communities can be involved in reforestation initiatives, forest monitoring, and the adoption of sustainable agriculture practices by using participatory methodologies. Active participation by the local populace makes them environmental stewards who make sure that forest conservation initiatives are upheld. In order to lessen the effects of deforestation, awareness-raising is also essential. Public awareness of the ecological and economic benefits of forests, especially in rural areas, can influence public opinion and result in behavioural changes. Campaigns to raise awareness can emphasise the benefits of forests for water management, climate regulation, and biodiversity protection, which will increase support for their preservation. People are more inclined to support reforestation projects and adopt eco-friendly behaviours when they are aware of the long-term advantages of forest protection, which helps to mitigate deforestation. Strict government laws and regulations are necessary to ensure that deforestation is kept under control. Strict government controls are needed to prevent unregulated land use, illicit logging, and the conversion of forest area. These rules need to include specific guidelines for sustainable forestry practices together with penalties for disobedience. By establishing a strong legal framework, the government can ensure that businesses, people, and communities abide by forest protection rules. Effective enforcement is necessary to maintain the forest cover and promote appropriate land use.

Quantitative outcomes

Table 1 shows that 49% of respondents identifying as male and 51% as female, the demographic profile of respondents demonstrates a virtually equal gender representation. Indicating a largely early-career population, the majority are in the 20–30 age range (89%), with lesser percentages in the 31–40 range (9%) and over 40 (2%). A well-educated sample is suggested by the fact that the majority (67%), followed by those with a Master's degree (30%) and a PhD or higher (3%), have a bachelor's degree. The largest category in terms of roles is postgraduate students (59%), followed by academic professors (10%) and officials from the forest department (15%), with instructors and environmental NGO officials making up the remaining 8%. According to the younger age group, the majority of respondents (87%), have 0–5 years of experience in the industry; fewer have 6–10 years (7%) or more than 10 years (6%). 77% of those surveyed have a university affiliation, compared to 10% from the forest department, 8% from environmental NGOs, and 5% from government agencies. This sample offers a solid basis for understanding the data, especially from an academic and early-career perspective, as it is primarily made up of young, highly educated, early-career individuals with university affiliations.



Vol. 4 No. 1 (January) (2026)

Table 1. Demographic Survey

Demographic Variable	Category	Percentage (%)
Gender	Male	49.0
	Female	51.0
Age	20-30 years	89.0
	31-40 years	9.0
	More than 40 years	2.0
Education Level	Bachelor's Degree	67.0
	Master's Degree	30.0
	PhD or higher	3.0
Role/Position	Academic Professor	10.0
	Instructor	8.0
	Postgraduate Student	59.0
	Forest Department Official	15.0
	Environmental NGO Official	8.0
Years of Experience in the Field	0-5 years	87.0
	6-10 years	7.0
	More than 10 years	6.0
Affiliation	University	77.0
	Forest Department	10.0
	Environmental NGO	8.0
	Government Agency	5.0

Source: Field Survey

According to the data in Table 2, deforestation is widely recognized as a serious problem, with contributing factors including population pressures, economic drivers, government policy, and a lack of conservation measures. With 58% strongly agreed and 22% agreed, the majority of respondents acknowledge deforestation as a significant environmental issue in Pakistan, according to data on the dependent variable, the Deforestation Rate (DR). Likewise, 36% agree and 42% strongly agree that the rate of deforestation has risen recently. There is disagreement among respondents, though, with 42% agreeing that attempts to prevent deforestation have not gone far enough and 30% strongly agreed.

Opinions indicate scepticism over the efficacy of government policies in Independent Variable 1: Government Policy (GP). While just 16% strongly agree that effective strategies to combat deforestation have been enacted, with 30% disagreeing, a sizable



Vol. 4 No. 1 (January) (2026)

portion (32% agree, 20% strongly agree) feel that government actions have contributed to deforestation. Furthermore, a significant majority of respondents (47% agree, 28% strongly agree) believe that environmental regulations are not being enforced.

According to data on Independent Variable Economic Factors (EF), 21% of respondents strongly agree and 50% agree that economic development is a major cause of deforestation. Although opinions are more divided, 37% of respondents agree, 11% strongly agree, and 17% disagree that the demand for agricultural land is a contributing factor. Additionally, 17% strongly agree and 49% believe that financial incentives for conservation are lacking, indicating perceived financial barriers to conservation.

41% of respondents agreeing and 29% strongly agreeing that population increase has led to deforestation, responses to Independent Variable 3: Population Pressure (PP) show that urbanization and population growth are important contributors. Similarly, 47% of respondents concur that population pressure makes land use changes worse, and 39% agree and 35% strongly agree that urbanization is a significant effect.

Lastly, respondents' opinions on the success of conservation efforts are divided when it comes to Independent Variable 4 conservation efforts (CE), with just 18% strongly agreeing and 35% agreeing. The perceived significance of group action in conservation is highlighted by the majority's belief that international assistance (43% strongly agree, 29% agree) and community involvement (48% strongly agree, 32% agree) are essential for effective conservation initiatives.

Table 2. Item's Frequency Distribution

Variables	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Deforestation Rate	Deforestation is a significant environmental issue in Pakistan.	15.0	0	5.0	22.0	58.0
	The rate of deforestation has increased in recent years.	7.0	5.0	10.0	36.0	42.0
	Efforts to reduce deforestation have been insufficient.	9.0	9.0	10.0	42.0	30.0
Government Policy (GP)	Government policies have contributed to deforestation in Pakistan.	11.0	9.0	28.0	32.0	20.0
	The government has implemented	9.0	30.0	28.0	17.0	16.0



Vol. 4 No. 1 (January) (2026)

Variables	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	effective policies to combat deforestation.					
	There is a lack of enforcement of environmental regulations.	2.0	5.0	18.0	47.0	28.0
Economic Factors (EF)	Economic development has driven deforestation in Pakistan.	11.0	7.0	11.0	50.0	21.0
	The demand for agricultural land is a major cause of deforestation.	9.0	17.0	26.0	37.0	11.0
	Economic incentives for conservation are lacking.	6.0	4.0	24.0	49.0	17.0
Population Pressure (PP)	Population growth has led to increased deforestation in Pakistan.	6.0	6.0	18.0	41.0	29.0
	Urbanization is a significant factor in deforestation.	6.0	4.0	16.0	39.0	35.0
	Population pressure exacerbates land use changes leading to deforestation.	3.0	6.0	24.0	47.0	20.0
Conservation Efforts (CE)	Conservation efforts have been effective	9.0	15.0	23.0	35.0	18.0



Vol. 4 No. 1 (January) (2026)

Variables	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	in reducing deforestation.					
	Community involvement in conservation is essential.	2.0	2.0	16.0	32.0	48.0
	International support is crucial for successful conservation efforts.	2.0	7.0	19.0	29.0	43.0

Table 3 presents the results of the factor analysis. Five components that contributed to the explained variance and each had an eigenvalue greater than one were extracted, according to the Total Variance explained in table. The biggest percentage of the variance is explained by Component 1, which has an eigenvalue of 5.259 and accounts for 35.06% of the total. An extra 11.92% is explained by the second component, and 9.10% is added by the third. A significant amount of the volatility in the data is captured by these factors, as seen by the fact that the five components account for 71.29% of the variance and these three components together explain 56.07% of the cumulative variance. The data provided by (Khan et al., 2024) indicates that Pakistan's average forest cover is around 5.372%. Initiatives aimed at afforestation have led to an average forest cover increase of approximately 23.123%. The average population growth rate is 2.265%, while the Government Regulatory Quality demonstrates an average decline of 0.644, with minimal variability. The results show a comparative alignment in explaining variance, with our study capturing 71.29% across five components, while (Majeed et al., 2022) highlights 78.65% cumulative variation in four axes, indicating differences in data structure and dimensional emphasis. While the study of (Ullah et al., 2023), analyzed data from 602 respondents using descriptive statistics, logistic regression, and a Likert scale to assess socioeconomic factors driving deforestation and incentives to mitigate it. The majority of respondents were male (65.9%), aged 21–25 years (46%), with an average age of 24. Most had a family size of 5–8 and primary education (56.1%), while farming was the primary occupation for 50.4%. Average major and minor incomes were 25,000 and 15,500 net, respectively. Logistic regression revealed that socioeconomic factors significantly influenced deforestation at ($p < 0.05$). (Ali et al., 2021), utilized data from 1975 to 2020, analyzing variables like forest stock and events threatening human life in Pakistan. Using unit root tests, ARDL, and Engel-Granger techniques, the findings confirmed both short- and long-term relationships among the variables. The results indicated a positive correlation between deforestation, environmental degradation, and climate change in both the short and long run.

The study of (Ali et al., 2022) found that strategic, local, and communication-level management factors collectively explain 65.3% of the variance in sustainable forest management quality. With an R^2 value of 0.653, the model demonstrates a moderate predictive strength, surpassing the threshold for a moderate classification ($R^2 \geq 0.50$).



Vol. 4 No. 1 (January) (2026)

Table 3. Factor Analysis

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.259	35.062	35.062	5.259	35.062	35.062
2	1.788	11.917	46.979	1.788	11.917	46.979
3	1.364	9.095	56.074	1.364	9.095	56.074
4	1.278	8.517	64.592	1.278	8.517	64.592
5	1.005	6.699	71.290	1.005	6.699	71.290
6	.861	5.737	77.027			
7	.768	5.118	82.145			
8	.631	4.207	86.353			
9	.510	3.400	89.753			
10	.372	2.477	92.230			
11	.315	2.100	94.330			
12	.273	1.822	96.152			
13	.258	1.720	97.873			
14	.192	1.280	99.153			
15	.127	.847	100.000			

Extraction Method: Principal Component Analysis.

Each item's loading on these extracted factors is indicated in the Component Matrix. Component 1 is heavily loaded by items DR2 (.757) and DR3 (.819), suggesting a major grouping associated with perceptions of deforestation. Economic factor-related items, such as EF1 (.633) and EF3 (.674), also load heavily on Component 1, indicating a connection between deforestation and economic factors in this sample. Component 2's GP2 (.582) and CE3 (.541) load heavily, suggesting a secondary grouping that may be connected to national or international conservation initiatives as well as governmental regulations. Component 3 displays moderate loadings for GP1 (.604) and GP3 (.596), which most likely reflect opinions regarding the efficacy and implementation of governmental policies. Component 4's high loadings for CE1 (.602) imply that it might concentrate on the efficacy of conservation measures, whereas Component 5 records some overlap between variables with mixed loadings, like GP2 (.503) and DR1 (.406). With these five derived components successfully summarizing underlying trends in the data, these results suggest that respondents' opinions on deforestation are strongly related to economic, governmental, and conservation aspects (see, Table 4).

Table 4. Component Matrix

Component Matrix ^a					
	Component				
	1	2	3	4	5
DR1	.413	-.537	.106	.316	.406
DR2	.757	-.418	.020	.237	.069
DR3	.819	-.329	-.193	-.045	.070
GP1	.321	.200	.604	.214	-.034
GP2	-.027	.582	.222	.406	.503
GP3	.489	-.117	.596	.115	-.313



Vol. 4 No. 1 (January) (2026)

Component Matrix ^a					
	Component				
	1	2	3	4	5
EF1	.633	-.198	-.315	.182	-.218
EF2	.605	.250	-.021	-.301	.248
EF3	.674	.277	-.082	-.353	-.213
PP1	.725	.344	.049	-.300	.186
PP2	.663	.109	.402	.026	-.242
PP3	.737	.274	-.126	-.272	.253
CE1	.294	.342	-.409	.602	.012
CE2	.799	-.176	-.183	.084	-.054
CE3	.222	.541	-.243	.335	-.405
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

The impact of several independent and demographic factors on the dependent variable, the deforestation rate, is examined by the regression analysis shown in Table 5. With an Adjusted R² of 0.262, the model's R² of 0.329 indicates that the predictors account for 32.9% of the variance in the deforestation rate. The model's overall statistical significance is confirmed by the ANOVA F-test result (F = 4.910, p < 0.001), which also emphasizes the independent variables' combined impact on deforestation rates. Economic factors are the predictor that most strongly contributes to deforestation rates. This result is consistent with that of (Angelsen & Kaimowitz, 1999) who point to economic endeavours like the growth of agriculture as the main causes of deforestation. Similar to this, (Geist & Lambin, 2002) highlight how economic development pressures contribute to the loss of forests, citing the growth of infrastructure and commodities markets as important variables. These observations align with those of (Rudel et al., 2009), who talk about how the global economy increases land conversion for commercial interests, which worsens deforestation. According to the most recent research, strategies that target economic drivers—like encouraging sustainable agriculture and controlling industrial growth—may be crucial in reducing deforestation. Deforestation is also significantly positively impacted by population pressure. This association is consistent with research by Lambin et al. (2001), which links the spread of settlements and the destruction of forests for agriculture to population growth. Additional support is offered by (Jha and Bawa, 2006) who point out that growing population needs cause resource extraction and changes in land use, which harm forest ecosystems. The findings emphasize that in order to combat deforestation in a sustainable manner, land-use planning and population management must be combined. Affiliation and Government Policy are two more factors that show marginal significance. These findings imply that although institutional ties and policy changes may have an impact on deforestation, economic and population considerations have a greater impact. (Wunder, 2001) contends that unless policy initiatives are vigorously enforced and supported by financial incentives for sustainable practices, structural economic drivers frequently overwhelm them. The lack of statistical significance for demographic variables like gender age education position and experience indicates that these factors do not significantly influence the rate of deforestation in this model on their own. According to this regression analysis, population pressure and economic reasons are the main important drivers to the rate of deforestation, with other variables having little to no effect. The moderate R² score indicates that this model does not account for all of the factors driving deforestation.



Vol. 4 No. 1 (January) (2026)

Table 5. Regression Analysis

Variables	Standardized Coefficients Beta	t-value	Sig.
Deforestation Rate		1.065	.290
Gender	-.061	-.633	.528
Age	.090	.676	.501
Education	.062	.626	.533
Position	-.101	-1.073	.286
Experience	-.030	-.239	.812
Affiliation	.161	1.692	.094
Government Policy	-.184	1.732	.087
Economic Factors	.381	3.142	.002
Population Pressure	.271	2.175	.032
Statistical Tests			
R ²	.329	ANOVA F-Test	4.910
Adjusted R ²	.262	Prob. F-value	.000 ^b

The findings in Table 6 evaluate the moderating impacts of particular conservation initiatives as well as the impact of conservation-related variables on the Deforestation Rate. The model fits the data well, explaining 48.3% of the variation in the rate of deforestation ($R^2 = 0.483$) with an Adjusted R^2 of 0.466. Together, the conservation-related variables have a statistically significant impact on deforestation, according to the ANOVA F-Test ($F = 29.850$, $p < 0.001$). The greatest positive predictor of less deforestation is community involvement. This result is consistent with research that highlights how important community involvement is to effective conservation efforts. For instance, (Agrawal and Gibson, 1999) point out that because local stakeholders are directly involved in decision-making and resource management, community-managed forests are frequently more sustainable. In a similar vein, (Ostrom, 2009) examines how locally developed regulations and enforcement strategies improve forest governance and lower rates of deforestation. This finding is further supported by research like Pretty and Smith (2004), which shows that involving communities improves conservation outcomes by encouraging stewardship, accountability, and a sustained dedication to sustainable practices. Together, these results highlight how important it is to enable local communities to actively participate in conservation. Deforestation is significantly impacted negatively by international support). This implies that although foreign assistance can contribute to conservation, its efficacy might be constrained in contrast to domestic initiatives. The difficulties of foreign-led initiatives are highlighted in studies like Barrett et al. (2001) and Redford and Adams (2009). These difficulties include short project cycles, problems with funding, and a lack of alignment with local needs. Sometimes, through inefficient governance or dependency, poorly organized international assistance may unintentionally contribute to deforestation. Furthermore, Adams and Hutton (2007) contend that international conservation initiatives frequently put the objectives of global biodiversity ahead of regional socioeconomic issues, which may lessen their influence on deforestation. According to these research, international



Vol. 4 No. 1 (January) (2026)

assistance must be in line with regional interests and incorporate sustainability and accountability measures in order to be successful. Although there is some belief in the effectiveness of conservation efforts, this belief alone does not have a strong statistical effect on deforestation outcomes, as evidenced by the positive but non-significant relationship between the variable Conservation Efforts Have Been Effective and the rate of deforestation. The significance of community participation in conservation as a key moderating element in lowering deforestation is highlighted by this investigation. As evidenced by the greater beneficial impact of community involvement on the pace of deforestation, international help does play a part, but it seems to be less effective than local, community-driven initiatives.

Table 6. Moderator Analysis

Variables	Standardized Coefficients Beta	t-value	Sig.
Deforestation Rate		3.053	.003
Conservation efforts have been effective in reducing deforestation.	.131	1.650	.102
Community involvement in conservation is essential.	.682	8.997	.000
International support is crucial for successful conservation efforts.	-.236	-2.967	.004
Statistical Tests			
R ²	.483	ANOVA F-Test	29.850
Adjusted R ²	.466	Prob. F-value	.000 ^b

Conclusion

Deforestation in Pakistan is a multifaceted issue driven by a combination of economic, social, and political factors. The study identifies urbanization, agricultural expansion, and infrastructure development as the primary drivers of deforestation, with population growth and poverty exacerbating the problem. Weak enforcement of environmental regulations, corruption, and lack of economic incentives for conservation further hinder efforts to combat deforestation. While conservation initiatives like the "Billion Tree Tsunami and other green initiatives" have shown potential, their effectiveness is limited by inadequate community involvement, insufficient international support, and poor governance. The findings emphasize the critical role of community-driven conservation efforts, as local communities are often the most affected by deforestation and have the most to gain from sustainable forest management. Strengthening government policies, enhancing enforcement mechanisms, and promoting economic alternatives to forest-dependent livelihoods are essential steps toward reducing deforestation. Additionally,



Vol. 4 No. 1 (January) (2026)

raising awareness about the ecological and social consequences of deforestation is crucial for fostering a culture of conservation among the general public. This study underscores the need for a holistic approach to deforestation mitigation, integrating economic development with environmental sustainability. Policymakers must prioritize long-term strategies that address the root causes of deforestation, such as poverty and population pressure, while promoting sustainable land-use practices. International collaboration and support are also vital for scaling up conservation efforts and ensuring their success. By adopting a multi-stakeholder approach that involves governments, communities, NGOs, and international organizations, Pakistan can work towards preserving its forest ecosystems for future generations.

Recommendations

To effectively address deforestation in Pakistan, a multi-tiered approach is necessary, encompassing short-term, medium-term, and long-term strategies. These recommendations aim to mitigate the immediate impacts of deforestation, strengthen institutional frameworks, and promote sustainable forest management for future generations.

Short-Term Recommendations

Strengthen enforcement of forest legislations to prevent illegal logging and land encroachment.

Launch nationwide awareness campaigns to educate the public about the importance of forests.

Accelerate tree-planting initiatives, focusing on degraded and deforested areas.

Engage local communities in forest management through participatory approaches.

Develop early warning systems for deforestation-related disasters like floods and landslides.

Medium-Term Recommendations

Introduce financial incentives for sustainable forest practices, such as subsidies or tax breaks.

Build the capacity of forest departments through training and improved governance.

Align forest conservation efforts with national climate change policies.

Develop and enforce land-use policies that prioritize forest conservation.

Seek international support for large-scale reforestation and conservation projects.

Long-Term Recommendations

Implement integrated forest management practices to balance conservation and economic activities.

Address population growth and poverty through education, healthcare, and economic development.

Enact comprehensive forest conservation laws aligned with international standards.

Invest in research and education to develop innovative solutions for forest conservation.

Restore degraded ecosystems through large-scale reforestation and habitat rehabilitation.

References

Abbas, S., Qamer, F. M., Ali, H., Usman, M., Ahmad, A., Salman, A., & Akhter, A. M. (2023). Monitoring of large-scale forest restoration: Evidence of vegetation recovery and reversing chronic ecosystem degradation in the mountain region of



Vol. 4 No. 1 (January) (2026)

- Pakistan. *Ecological Informatics*, 77, 102277
- Abimubarak, A., Hikmat, A., & Solihati, N. The Representation of The Ecological Crisis in Indonesian Novels: How Does The Social-Ecological System Occur?. <https://doi.org/10.26858/eralingua.v8i1.60659>
- Adams, W. M., & Hutton, J. (2007). People, parks and poverty: political ecology and biodiversity conservation. *Conservation and society*, 5(2), 147-183.
- Adnan, M., Xiao, B., Bibi, S., Xiao, P., Zhao, P., & Wang, H. (2024). Addressing current climate issues in Pakistan: an opportunity for a sustainable future. *Environmental Challenges*, 100887. <https://doi.org/10.1016/j.envc.2024.100887>
- Adnan, M., Xiao, B., Bibi, S., Xiao, P., Zhao, P., Wang, H., ... & An, X. (2024). Known and Unknown Environmental Impacts Related to Climate Changes in Pakistan: An Under-Recognized Risk to Local Communities. *Sustainability*, 16(14), 6108. <https://doi.org/10.3390/su16146108>
- Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: the role of community in natural resource conservation. *World development*, 27(4), 629-649. [https://doi.org/10.1016/S0305-750X\(98\)00161-2](https://doi.org/10.1016/S0305-750X(98)00161-2)
- Ahmad, I., Asif, M., Rashid, H. U., Ahmed, S., Ahmad, S., Jabbar, A., ... & Adil, Z. (2023). Forestry a Way Forward for Disaster Risk Reduction in Agriculture. In *Disaster Risk Reduction in Agriculture* (pp. 335-360). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-1763-1_16
- Akhtar, A. S. (2024). Climate Breakdown in Pakistan:(Post) Colonial Capitalism on the Global Periphery. *Journal of Contemporary Asia*, 54(3), 523-536. <https://doi.org/10.1080/00472336.2023.2279952>
- Alam, N., Ullah, Z., Ahmad, B., Ali, A., & Syed, K. (2024). Population growth poses a significant threat to forest ecosystems: a case study from the Hindukush-Himalayas of Pakistan. *bioRxiv*, 2024-04. <https://doi.org/10.1371/journal.pone.0302192>
- Ali, E., Azhar, M. F., Alam, E., Rehman, Z., Ullah, S., Ahmad, A., ... & Mittal, P. (2023). Deforestation perspectives of dry temperate forests: main drivers and possible strategies. *Frontiers in Environmental Science*, 11, 1151320. <https://doi.org/10.3389/fenvs.2023.1151320>
- Ali, N., Majeed, A., Saeed, S., Zulfiqar, N., & Ashraf, M. J. (2023). Climate Change in Pakistan and its Resilience Efforts. *Al-Qantara*, 9(4).
- Ali, S., Ali, H., & Raza, K. (2021). Environmental Implications of Deforestation: A Time Series Study of Pakistan. *Pakistan Journal of Humanities and Social Sciences*, 9(2), 174-186. <https://doi.org/10.52131/pjhss.2021.0902.0131>
- Ali, S., Brohi, A. A., Kakepoto, H., & Shah, N. (2024). A Thematic Analysis Based Study Of Environmental Degradation As A Non-Traditional Security Challenge & Governance Repose In Pakistan. *Kurdish Studies*, 12(4), 438-454. <https://doi.org/10.53555/ks.v12i4.2972>
- Ali, S., Brohi, A. A., Kakepoto, H., & Shah, N. (2024). A Thematic Analysis Based Study Of Environmental Degradation As A Non-Traditional Security Challenge & Governance Repose In Pakistan. *Kurdish Studies*, 12(4), 438-454. <https://doi.org/10.53555/ks.v12i4.2972>
- Ali, S., Wang, D., Hussain, T., Lu, X., & Nurunnabi, M. (2021). Forest resource management: An empirical study in Northern Pakistan. *Sustainability*, 13(16), 8752. <https://doi.org/10.3390/su13168752>
- Angelsen, A., & Kaimowitz, D. (1999). Rethinking the causes of deforestation: lessons from economic models. *The world bank research observer*, 14(1), 73-



Vol. 4 No. 1 (January) (2026)

98.<https://doi.org/10.1093/wbro/14.1.73>

- Anwer, R., Sheikh, M. R., Naveed, T., & Mushtaq, M. I. (2023). Reassessing the Linkage between Economic Growth and Environment through the Lens of Deforestation, Pollution and Carbon Emission. *Journal of Contemporary Macroeconomic Issues*, 4(1), 123-136.
- Asif, M., Nisar, M., & Malik, S. (2023). Analyzing Imran Khan's Billion Tree Tsunami Initiative from Ecolinguistic Perspective: Assessing its Environmental Implications for Pakistan. *Panacea Journal of Linguistics & Literature*, 2(2), 1-17.<https://doi.org/10.59075/pjll.v2i2.270>
- Barrett, C. B., Brandon, K., Gibson, C., & Gjertsen, H. (2001). Conserving tropical biodiversity amid weak institutions. *BioScience*, 51(6), 497-502.[https://doi.org/10.1641/0006-3568\(2001\)051\[0497:CTBAWI\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2001)051[0497:CTBAWI]2.0.CO;2)
- Bobby Banerjee, S., Maher, R., & Krämer, R. (2023). Resistance is fertile: Toward a political ecology of translocal resistance. *Organization*, 30(2), 264-287.<https://doi.org/10.1177/135050842199574>
- Chaudhary, R. P., Uprety, Y., Acharya, H. R., & Rimal, S. K. (2023). Deforestation in Nepal: status, causes, consequences, and responses. In *Biological and Environmental Hazards, Risks, and Disasters* (pp. 277-318). Elsevier.<https://doi.org/10.1016/B978-0-12-820509-9.00003-4>
- Chaudhry, K. T. (2022). Environmental Policy Analysis of Pakistan: A Theoretical Perspective. *Journal of Development and Social Sciences*, 3(4), 507-521.[https://doi.org/10.47205/jdss.2022\(3-IV\)48](https://doi.org/10.47205/jdss.2022(3-IV)48)
- Deeba, F., & Nawaz, K. (2024). Confronting Climate Chaos: Socio-Economic Strategies for Climate Resilience in Pakistan. *Pakistan Journal of Society, Education and Language (PJSEL)*, 10(2), 129-138.
- Dhyani, S. (2023). Are Himalayan ecosystems facing hidden collapse? Assessing the drivers and impacts of change to aid conservation, restoration and conflict resolution challenges. *Biodiversity and Conservation*, 32(12), 3731-3764.<https://doi.org/10.1007/s10531-023-02692-x>
- Dhyani, S. (2023). Are Himalayan ecosystems facing hidden collapse? Assessing the drivers and impacts of change to aid conservation, restoration and conflict resolution challenges. *Biodiversity and Conservation*, 32(12), 3731-3764.<https://doi.org/10.1007/s10531-023-02692-x>
- Dhyani, S. (2024). Impact of drivers of biodiversity loss on mountain ecosystems: assessing the need for ecosystem health assessments in Indian Himalayan Region. In *Biodiversity and Bioeconomy* (pp. 25-46). Elsevier.<https://doi.org/10.1016/B978-0-323-95482-2.00002-X>
- Geist, H. J., & Lambin, E. F. (2002). Proximate causes and underlying driving forces of tropical deforestation: Tropical forests are disappearing as the result of many pressures, both local and regional, acting in various combinations in different geographical locations. *BioScience*, 52(2), 143-150.[https://doi.org/10.1641/0006-3568\(2002\)052\[0143:PCAUDF\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2)
- Ghafran, C., & Yasmin, S. (2024). Participation Strategies and Ethical Considerations in NGO Led Community-Based Conservation Initiatives. *Journal of Business Ethics*, 1-17.<https://doi.org/10.1007/s10551-024-05665-4>
- Golar, G., Muis, H., Irun, I., Simorangkir, W. S., Fadhliah, F., Ali, M. N., & Basir-Cyio, M. (2024). Deforestation as a catalyst for natural disaster and community suffering: A cycle in the socioecological system. *Folia Forestalia Polonica*, 66(2), 72-88.<https://doi.org/10.2478/ffp-2024-0007>



Vol. 4 No. 1 (January) (2026)

- Haq, B., Jamshed, M. A., Ali, K., Kasi, B., Arshad, S., Kasi, M. K., ... & Ur-Rehman, M. (2024). Tech-Driven Forest Conservation: Combating Deforestation With Internet of Things, Artificial Intelligence, and Remote Sensing. *IEEE Internet of Things Journal*.<https://doi.org/10.1109/JIOT.2024.3378671>
- Haq, F., Mark, B. G., Shum, C. K., Zeballos-Castellon, G., & Rahman, G. (2024). Effectiveness of Billion Trees Tsunami Afforestation Projects in restoration of forests in Pakistan. *Environment, Development and Sustainability*, 1-16.<https://doi.org/10.1007/s10668-024-04573-x>
- Hassan, M. U., Ahmed, B., Awan, M. S., & Malik, M. N. (2024). Breaking the Chains of Poverty: Lessons from an Integrated Approach to Sustainable Development. *Journal of Social Service Research*, 1-18.<https://doi.org/10.1080/01488376.2024.2349799>
- Hira, N. E., Siddiqui, M. T., Abd-Elrahman, A., & Javed, M. A. (2024). Spatio-temporal monitoring of forest cover change, triggered by anthropogenic activities, in the Himalayan moist temperate forests of Pakistan using Landsat imagery. *Journal of Spatial Science*, 1-18.<https://doi.org/10.1080/14498596.2024.2333754>
- Hussain, S., & Reza, M. (2023). Environmental damage and global health: understanding the impacts and proposing mitigation strategies. *Journal of Big-Data Analytics and Cloud Computing*, 8(2), 1-21.
- Ide, T., Johnson, M. F., Barnett, J., Krampe, F., Le Billon, P., Maertens, L., ... & Vélez-Torres, I. (2023). The future of environmental peace and conflict research. *Environmental Politics*, 32(6), 1077-1103.<https://doi.org/10.1080/09644016.2022.2156174>
- Jabbar, M., Nasar-u-Minallah, M., & Yusoff, M. M. (2024). Predicting the impact of land use changes on thermal environment in Lahore, Pakistan: Implications for urban planning. *Geography, Environment, Sustainability*, 17(1), 95-109.<https://doi.org/10.24057/2071-9388-2023-2862>
- Javed, B., Huang, D., Shangguan, D., Ahsan Mukhtar, M., Sajjad, W., Banerjee, A., ... & Butt, A. Q. (2024). Assessing the effectiveness of national park's policies and laws in promoting biodiversity conservation and ecological development in Pakistan. *Frontiers in Environmental Science*, 11, 1333650.<https://doi.org/10.3389/fenvs.2023.1333650>
- Jha, S., & Bawa, K. S. (2006). Population growth, human development, and deforestation in biodiversity hotspots. *Conservation Biology*, 20(3), 906-912.<https://doi.org/10.1111/j.1523-1739.2006.00398.x>
- KenWood, L. (2024). *Against the Tragedy: The Role of Meaning Making in Sustainable Commons*.
- Khan, A. A., Khan, E. U., & Khan, K. (2024). Investigating Climate Change and Its Effects on Water Resources of Pakistan.<https://doi.org/10.13189/ujg.2024.110101>
- Khan, M. A., & Hussain, W. (2024). Climate Change Impacts on Pakistan's Mountain Agriculture: A Study on Burusho Farmers' Adaptation Strategies Towards Livelihood Sustainability. In *Traditional Knowledge and Climate Change: An Environmental Impact on Landscape and Communities* (pp. 21-45). Singapore: Springer Nature Singapore.https://doi.org/10.1007/978-981-99-8830-3_2
- Khan, M. A., Ali, S., Anser, M. K., Nassani, A. A., Al-Aiban, K. M., ur Rahman, S., & Zaman, K. (2024). From desolation to preservation: Investigating longitudinal trends in forest coverage and implications for future environmental strategies. *Heliyon*, 10(4).<https://doi.org/10.1016/j.heliyon.2024.e25689>
- Khan, M. A., Ali, S., Anser, M. K., Nassani, A. A., Al-Aiban, K. M., ur Rahman, S., &



Vol. 4 No. 1 (January) (2026)

- Zaman, K. (2024). From desolation to preservation: Investigating longitudinal trends in forest coverage and implications for future environmental strategies. *Heliyon*, 10(4).<https://doi.org/10.1016/j.heliyon.2024.e25689>
- Khan, M. A., Ali, S., Anser, M. K., Nassani, A. A., Al-Aiban, K. M., ur Rahman, S., & Zaman, K. (2024). From desolation to preservation: Investigating longitudinal trends in forest coverage and implications for future environmental strategies. *Heliyon*, 10(4).<https://doi.org/10.1016/j.heliyon.2024.e25689>
- Khan, M. A., Ali, S., Anser, M. K., Nassani, A. A., Al-Aiban, K. M., ur Rahman, S., & Zaman, K. (2024). From desolation to preservation: Investigating longitudinal trends in forest coverage and implications for future environmental strategies. *Heliyon*, 10(4).<https://doi.org/10.1016/j.heliyon.2024.e25689>
- Khan, R. U. A., Idrees, R. Q., & Shahid, A. (2024). PAKISTAN'S CLIMATE CHANGE ACT: EVALUATING IMPACTS, EFFICACY, AND PROSPECTS FOR FUTURE PROGRESS. *International Research Journal of Social Sciences and Humanities*, 3(1), 332-348.
- Khuhro, M. R., Mirani, A. R., & Jokhio, M. A. (2024). ENVIRONMENTAL DEVASTATION IN SINDH AND THE PURSUIT OF JUSTICE FOR ITS SUSCEPTIBLE POPULATIONS AMID CLIMATE CRISIS. *International Research Journal of Social Sciences and Humanities*, 3(1), 693-714.
- Lambin, E. F., Turner, B. L., Geist, H. J., Agbola, S. B., Angelsen, A., Bruce, J. W., ... & Xu, J. (2001). The causes of land-use and land-cover change: moving beyond the myths. *Global environmental change*, 11(4), 261-269.[https://doi.org/10.1016/S0959-3780\(01\)00007-3](https://doi.org/10.1016/S0959-3780(01)00007-3)
- Lin, B., & Ullah, S. (2024). Evaluating forest depletion and structural change effects on environmental sustainability in Pakistan: Through the lens of the load capacity factor. *Journal of Environmental Management*, 353, 120174.<https://doi.org/10.1016/j.jenvman.2024.120174>
- Majeed, M., Khan, A. M., Habib, T., Anwar, M. M., Sahito, H. A., Khan, N., & Ali, K. (2022). Vegetation analysis and environmental indicators of an arid tropical forest ecosystem of Pakistan. *Ecological Indicators*, 142, 109291.<https://doi.org/10.1016/j.ecolind.2022.109291>
- Maqsood, M. H., Mumtaz, R., & Khan, M. A. (2024). Deforestation detection and reforestation potential due to natural disasters—A case study of floods. *Remote Sensing Applications: Society and Environment*, 34, 101188.<https://doi.org/10.1016/j.rsase.2024.101188>
- Minhas, W. DEFORESTATION IN PAKISTAN AND ITS INFLUENCE ON NATURAL PRODUCTION.
- Mondal, H., Barman, A., Alam, S., & Garai, T. Embedding Topsis Method in Generalized-Spherical Fuzzy Environment and its Application to Select Best Policy Measures for 'The Tragedy of the Commons'. Available at SSRN 4681224.<http://dx.doi.org/10.2139/ssrn.4681224>
- Muzamil, M. R., Boruff, B., Shahbaz, B., Khan, N. A., Sattar, R. S., & Hafeez, M. (2024). Climate futures and development pathways: A journey from terrorism to tourism in the Khyber-Pakhtunkhwa Province of Pakistan. *Futures*, 158, 103344.<https://doi.org/10.1016/j.futures.2024.103344>
- Nasution, P. P., Ketaren, A., Rangkuty, R. P., Rizki, D., & Hidayat, H. (2024, January). The Tragedy of the Commons in Aceh: An Anthropological Reflection on the Post-Tsunami Development of Aceh: 00026. In *Proceedings of International Conference on Social Science, Political Science, and Humanities*



Vol. 4 No. 1 (January) (2026)

- (ICoSPOLHUM) (Vol. 4).<https://doi.org/10.29103/icospolhum.v4i.400>
- Naz, S., Iqbal, Z., & Begum, S. (2024). Climate Change's Impact on Food Security in Pakistan: Challenges and Mitigation Strategies. *Pakistan Social Sciences Review*, 8(2), 426-438.[https://doi.org/10.35484/pssr.2024\(8-II-S\)37](https://doi.org/10.35484/pssr.2024(8-II-S)37)
- Noor, R., Pande, C. B., Zahra, S. M., Maqsood, A., Baig, A., Misaal, M. A., ... & Anwar, M. (2023). Review of Various Impacts of Climate Change in South Asia Region, Specifically Pakistan. In *Climate Change Impacts on Natural Resources, Ecosystems and Agricultural Systems* (pp. 269-296). Cham: Springer International Publishing.https://doi.org/10.1007/978-3-031-19059-9_10
- Nouman, B. S., & Shams, M. N. (2024). Pakistan's Climate Conundrum: Revealing the Nexus Between Climate Change and Internal Migration. *Journal of Development and Social Sciences*, 5(2), 257-266.[https://doi.org/10.47205/jdss.2024\(5-II-S\)26](https://doi.org/10.47205/jdss.2024(5-II-S)26)
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419-422.<https://doi.org/10.1126/science.1172133>
- Parveen, T., & Qazi, B. D. M. N. A. (2023). Sustainable Environmental Development Goals: A Comparative Analysis of India and Pakistan. *Shnakhat*, 2(4), 80-111.
- Pretty, J., & Smith, D. (2004). Social capital in biodiversity conservation and management. *Conservation biology*, 18(3), 631-638.<https://doi.org/10.1111/j.1523-1739.2004.00126.x>
- Raha, D., Davies-Vollum, K. S., Hemstock, S. L., Boateng, I., Islam, M. T., & Pierce, C. A. (2024). We need collaboration and co-creation to address challenges facing coastal communities. *Nature Human Behaviour*, 1-9.<https://doi.org/10.1038/s41562-024-01875-y>
- Rana, S. (2023). THE EFFECTIVENESS OF CURRENT NATIONAL POLICIES ON INTEGRATED FOREST MANAGEMENT AND CLIMATE CHANGE: SYSTEMATIC LITERATURE REVIEW (SLR). *Pakistan Journal of Social Research*, 5(03), 15-19.<https://doi.org/10.52567/pjsr.v5i03.1323>
- Redford, K. H., & Adams, W. M. (2009). Payment for ecosystem services and the challenge of saving nature. *Conservation biology*, 23(4), 785-787.
- Rodríguez, E. M. C., & Redondo, J. M. (2023). Prospective analysis of deforestation determinants in the Amazonian landscapes. *World Development Sustainability*, 3, 100076.<https://doi.org/10.1016/j.wds.2023.100076>
- Roy, A., Kumar, S., & Rahaman, M. (2024). Exploring climate change impacts on rural livelihoods and adaptation strategies: Reflections from marginalized communities in India. *Environmental Development*, 49, 100937.<https://doi.org/10.1016/j.envdev.2023.100937>
- Rudel, T. K., Schneider, L., Uriarte, M., Turner, B. L., DeFries, R., Lawrence, D., ... & Grau, R. (2009). Agricultural intensification and changes in cultivated areas, 1970–2005. *Proceedings of the national academy of sciences*, 106(49), 20675-20680.<https://doi.org/10.1073/pnas.0812540106>
- Safi, L., Mujeeb, M., Sahak, K., Mushwani, H., & Hashmi, S. K. (2024). Climate change impacts and threats on basic livelihood resources, food security and social stability in Afghanistan. *GeoJournal*, 89(2), 85.<https://doi.org/10.1007/s10708-024-11077-8>
- Saleem, W., Manan, P., Ghufuran, M. A., Aziz, M., & Nawaz, A. (2024). Assessment of Deforestation and Forest Degradation drivers in Pallandri Azad Kashmir.<https://doi.org/10.21203/rs.3.rs-4295609/v1>
- Saleem, W., Manan, P., Ghufuran, M. A., Aziz, M., & Nawaz, A. (2024). Assessment of Deforestation and Forest Degradation drivers in Pallandri Azad



Vol. 4 No. 1 (January) (2026)

- Kashmir.<https://doi.org/10.21203/rs.3.rs-4295609/v1>
- Sändig, J., Dalmer, N., Ide, T., & Vogler, A. (2024). From climate conflicts to environmental peacebuilding: Exploring local dimensions. *Environment and Security*, 2(1), 3-20.<https://doi.org/10.1177/2753879624123109>
- Sanjrani, M. A., Thebo, G. M., & Ghaffar, F. (2023). FOREST MANAGEMENT'S FUTURE STRATEGY FOR GREEN RESPONSE TO THE ENVIRONMENT. *Priority-The International Business Review*, 2(1), 206-218.
- Schröder, J., & Moebus, S. (2024). The (re) production of health in climate change. *Frontiers in Sustainable Cities*, 6, 1359930.<https://doi.org/10.3389/frsc.2024.1359930>
- Sharma, L. R., Bidari, S., Bidari, D., Neupane, S., & Sapkota, R. (2023). Exploring the mixed methods research design: types, purposes, strengths, challenges, and criticisms. *Glob Acad J Linguist Lit*, 5.<https://doi.org/10.36348/gajll.2023.v05i01.002>
- Sharma, U. C., Datta, M., & Sharma, V. (2023). Climate and Biodiversity. In *Soils in the Hindu Kush Himalayas: Management for Agricultural Land Use* (pp. 27-57). Cham: Springer International Publishing.<https://doi.org/10.1007/978-3-031-11458-8>
- Siddique, M. T., & Molinos, J. G. (2024). Risk from future climate change to Pakistan's protected area network: A composite analysis for hotspot identification. *Science of The Total Environment*, 916, 169948.<https://doi.org/10.1016/j.scitotenv.2024.169948>
- Syaban, A. S. N., & Appiah-Opoku, S. (2024). Unveiling the Complexities of Land Use Transformation in Indonesia's New Capital City IKN Nusantara: A Multidimensional Conflict Analysis.<https://doi.org/10.3390/land13050606>
- Tahir, F., Rasheed, R., Mahmood, S., Chohan, K., & Ahmad, S. R. (2024). REDD+ framework and forest sustainability in Pakistan versus other South Asian countries: a multi-criteria-based analysis. *Environment, Development and Sustainability*, 26(3), 6471-6492.<https://doi.org/10.1007/s10668-023-02971-1>
- Tornel, C. (2023). Decolonizing energy justice from the ground up: Political ecology, ontology, and energy landscapes. *Progress in Human Geography*, 47(1), 43-65.<https://doi.org/10.1177/03091325221132561>
- Ullah, A. (2024). Forest landscape restoration and its impact on social cohesion, ecosystems, and rural livelihoods: Lessons learned from Pakistan. *Regional Environmental Change*, 24(1), 26.<https://doi.org/10.1007/s10113-024-02198-4>
- Ullah, A., Bavorova, M., Shah, A. A., & Kandel, G. P. (2023). Community participation in development programs: Key lessons from the billion trees afforestation project (BTAP). *Environmental Science & Policy*, 150, 103581.<https://doi.org/10.1016/j.envsci.2023.103581>
- Ullah, S., Wu, Y., & Khan, A. I. (2023). Evaluating the socioeconomic factors on deforestation in northern Pakistan: a study on existing economic incentive tools for reducing deforestation. *Sustainability*, 15(7), 5894.<https://doi.org/10.3390/su15075894>
- Ullah, S., Wu, Y., & Khan, A. I. (2023). Evaluating the socioeconomic factors on deforestation in northern Pakistan: a study on existing economic incentive tools for reducing deforestation. *Sustainability*, 15(7), 5894.<https://doi.org/10.3390/su15075894>
- Waheed, A., Fischer, T. B., Kousar, S., & Khan, M. I. (2023). Disaster management and environmental policy integration in Pakistan—an evaluation with particular



Vol. 4 No. 1 (January) (2026)

- reference to the China–Pakistan Economic Corridor Plan. *Environmental Science and Pollution Research*, 30(48), 105700-105731. <https://doi.org/10.1007/s11356-023-29310-1>
- White, E. R., & Wulfing, S. (2024). Extreme events and coupled socio-ecological systems. *Ecological Modelling*, 495, 110786. <https://doi.org/10.1016/j.ecolmodel.2024.110786>
- Wunder, S. (2001). Poverty alleviation and tropical forests—what scope for synergies?. *World development*, 29(11), 1817-1833. [https://doi.org/10.1016/S0305-750X\(01\)00070-5](https://doi.org/10.1016/S0305-750X(01)00070-5)
- Xu, D., Wang, Y., & Wang, J. (2024). A review of social-ecological system vulnerability in desertified regions: Assessment, simulation, and sustainable management. *Science of The Total Environment*, 172604. <https://doi.org/10.1016/j.scitotenv.2024.172604>
- Yadav, A., & Singh, A. (2024). The Himalayas in the Anthropocene. In *The Himalayas in the Anthropocene: Environment and Development* (pp. 1-31). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-50101-2_1
- Zaheer, L., & Bano, S. A. (2024). Public Perceptions and Attitudes toward Climate Change in Pakistan. *Pakistan Social Sciences Review*, 8(2), 439-450. [https://doi.org/10.35484/pssr.2024\(8-II-S\)38](https://doi.org/10.35484/pssr.2024(8-II-S)38)
- Zahra, G. E., & Rehman, N. (2023). Analysis and Impacts of Deforestation on Housing Settlements. *Southern Journal of Engineering & Technology*, 1(02), 1-9.