Dialogue Social Science Review (DSSR)
www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

DIALOGUE SOCIAL SCIENCE REVIEW

Vol. 3 No. 4 (April) (2025)

Linking Climate Change and Sustainable Development Goals: Evidence from Pakistan

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Abstract
Climate change remains a potent threat to the worldwide quest for the Sustainable Development Goals (SDGs), and developing nations are particularly vulnerable. This study examines the impacts of climate-induced hazards on SDG 1 No Poverty, 2 Zero Hunger, 3 Good Health and Well-being, 6 Clean Water and Sanitation, 13 Climate Action, and 15 Life on Land in Pakistan. Adopting a mixed-methods research approach, the study incorporated a quantitative survey of 200 stakeholders in Punjab and Sindh with qualitative findings from semi-structured interviews and analysis of policy documents. The results show that a high propensity to recurrent floods, extended droughts and heatwaves severely impact agricultural output, increase the rate of poverty, worsen food shortages, overburden public health systems and expedite ecosystem loss. Political discrimination and inadequate finances have been identified as obstacles to the implementation of SDG indicators, while statistical correlates have indicated strong relationships with climate risks. The study made a case also for the integration of climate action, i.e. mainstreaming into SDGs strategies through among others; climate-smart agriculture, water conservation, community-based adaptation and climate financing if development must be resilient to climate change. This evidence is valuable for global debates to align the climate and development agendas, as well as designing policy pathways that can inform Pakistan's advance towards Agenda 2030.

Keywords; Climate Change; Sustainable Development Goals (SDGs); Poverty; Food Security; Public Health; Green Theory

Introduction

Climate Change has emerged as the biggest threat to Sustainable Development, especially in developing countries that are more vulnerable to environmental shocks. Pakistan is amongst the top ten worst hit countries by global warming (Awan & Rehman, 2025; Khan, 2023; World Bank, 2022). In 2022, massive monsoon flood hit nearly 9–12% of the country, impacting more than 33 million people resulting in at least number of fatalities consisting of 1,739 deaths and 10 million to make homelessness with due economic losses ranging from US$14.9 billion lined up to as high as US$40 billion (World Bank&Others.,2022; Frontiers, 2023). Farm sector & infrastructure bore the brunt of wide spread destruction, 2.1 million homes were razed to ground, cropland over 4.4 million acres lost, devastating for rural livelihoods and exacerbates poverty (Business Recorder, 2023; ScienceDirect, 2023).

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ISSN Online: 3007-3154
ISSN Print: 3007-3146

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To Pakistan, agriculture is the base of its economy i.e., major contributor toward GDP (22.7%), having capacity to employ around 37% labor force (Awan & Rehman, 2025). Climate shocks are undermining agrarian losses up to 8–10% by 2030 in the absence of adaptive measures (Agricultural Economist 2025, FAO 2023; UNDP, 2023). Another major rural asset, livestock productivity, is similarly threatened; heat-stress on dairy production systems has reduced milk output by 30% in some areas (Agricultural Economist, 2025).

At the same time, Pakistan also faces an alarming water shortage. By 2025, per capita water availability has dropped from 5,600m³ in 1947 to 1,017m³ just over the "scarcity" threshold with projections predicting levels will decrease to under 500m³ within the next decade (Siddiqui, 2025; The News, 2025). Pakistan is one of the highest water-user economies in the world, within almost 10% freshwater utilized for agriculture, suggested norm recommends over 80% (The News, 2025), and stores only for up to a month as opposed to the recommended 120 days, making it more susceptible to both droughts and floods. This crisis is further aggravated by institutional weaknesses, obsolete infrastructure and coordination gaps (The News, 2025).

Climate is a significant stress on public health systems. The 2015 heatwave in Sindh province was nothing short of catastrophic, during one searing week, nearly 2,000 people died, the vast majority in Karachi, where temperatures climbed over to 45°C, and hospitals became so overwhelmed that care was being dispensed on parking lots (Bloomberg; Dawn; PMC 2015). Earlier, the 2024 heatwave resulted in more than 568 deaths and 7,900 heat- stroke hospitalizations only in Sindh (Wikipedia, 2024). Following the 2022 floods, water-borne disease outbreaks, charged by a predicted upsurge in displaced populations who experienced malnutrition and an overstressed healthcare system, were reported and included cholera, diarrhea, dengue and malaria out breaks (Frontiers, 2023).

These converging crises are major setbacks to progress on a number of Sustainable Development Goals. For example, poverty (SDG1) and hunger (SDG2) are compounded by climate- induced disturbances in agriculture; environmental degradation undermines health (SDG3), access to clean water supply (SDG6), and ecosystems. In addition, inertia in institutional responses and alarming weak fiscal handling continue to cause significant setbacks in the path of good progress on climate action (SDG13) (Awan & Rehman, 2025; Frontiers, 2023; Siddiqui, 2025).

Although the evidence is stacking up, prescribed integration of climate-SDG dynamics in Pakistan still remains largely untested through empirical studies. Such literature tends to be fragmented, concentrating more on specific sectors rather than providing integrated data and policy- review approaches (Rehman, 2023; Sheer et al., 2023). We address this gap through a multipronged mixed- methods research design employing quantitative links between climate- related hazards (floods, droughts, heatwaves) and SDG performance indicators (1, 2, 3, 6, 13, 15), coupled with qualitative institutional analysis of actor inceptions, interview data and policy documentary assessment.

The research seeks to address three overarching aims: to quantify the impact of climate hazards on progress in achieving key SDGs; to highlight institutional, governance and financing challenges limiting Pakistan's ability to adapt; and to identify concrete strategies (e.g. climate-smart agriculture; water

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governance reforms; community-based adaptation, restoration of ecosystems) for mainstreaming resilience-building into Agenda 2030 implementation.

The research findings hope to bridge the normative quantitative SDG data gaps with the genuine qualitative governance realities and thereby, in one way or other, contribute to both national and international policy frameworks. The insights of this study can serve the direction to focus if Pakistan is to achieve greater integration between climate- SDG through necessary policy and investments for changing outcomes; the lessons are translatable worldwide. By doing so, it also contributes to the global South debate empirically on climate action alignment with sustainable development.

Literature Review

In Pakistan, the impacts of climate change on agriculture, water resources, health and institutional governance have been well documented with the serious implications features related to sustainable development. Researchers have illustrated the open words implied effects of climate-oriented risks such as storms, heatwaves droughts and their indirect concerns for poverty reduction, food security health clean water access. An in-depth analysis of Pakistan rural climate stress has revealed that rain fed agriculture-based communities suffer due to changing rainfall patterns, increased temperature and erratic extreme events which is further worsen by sectorial fragmentation ad implementation gaps (Wade & Jennings, 2016; Elahi et al., 2022; Hussain et al., 2023).

Agrarian and water stressed zones are also largely affected. Evidence of glacier retreat, changes in precipitation distribution and increased frequencies of floods and droughts is also available for the Indus Basin (Betts et al. 2021). The resulting pressure increased the use of irrigation systems and untreated surface water, which reduced potential crop yields (Talha Mehmood et al., 2021) that in turn can exacerbate the risk for poverty and hunger. Likewise, climate projections picture a warmer and wetter scenario where rainfall extremes are projected to increase by 13-30% while mean changes in individual regimes cause significant implications for flooding as well as water scarcity leading towards monthly drought severity in South Asia (Mishra et al-2024).

Empirical investigations substantiate these concerns. Field surveys conducted in Sindh, Khyber Pakhtunkhwa and Balochistan soon after the floods of 2022 estimated losses at more than US $30B with widespread devastation to agriculture, livestock, infrastructure and livelihoods (PMC, 2023). Remote sensing assessments with the help of Landsat-9 and Soil Moisture Active Passive (SMAP) data showed extensive devastation of Kharif-week crops and urban settlements in Sindh which delayed Rabi indicative planting season (Younas et al., 2024). These results underscore the sudden risk of rural and urban systems to hydroclimatic disasters.

Health-related outcomes are equally alarming. The response page for the 2015 Sindh heatwave on Wikipedia compiling data from WHO reports more than 65,000 people hospitalized and over 2,000 total deaths, while the corresponding page for the floods in 2022 caused exposure of at least 5.4 million people to contaminated water leading to increased prevalence of waterborne diseases and high burden of malnutrition along with forced migration across Sindh and Balochistan (Health in Pakistan,2025). This led to a crisis that threatened SDG3 (Good Health and Well-being) as well as SDG6 (Clean Water and Sanitation), in

ISSN Online: 3007-3154
ISSN Print: 3007-3146

addition to reversing progress on SDG1 (No Poverty) and SDG2 (Zero Hunger) warning that between 8.4 and 9.1 million people were pushed below the poverty line (Health in Pakistan, 2025; World Bank poverty forecasts via Reddit, 2022).

The evidence is building for poor governance and institutional analysis weakening the climate implementation mechanism. Implementation of the National Climate Change Policy (2012) and its action plans are fragmented and protection is not effective. Although the aspect of individual departments formulating policies may not be as well established and widespread, cases such as Asghar Leghari v. Federation of Pakistan (2015), which was meant to set up a Climate Change Commission but has been handicapped by institutional fragmentation and lack of funds continue to discourage movement in this direction (Wikipedia, 2025). Provincial level budget analysis particularly of Sindh has revealed a systematic under-utilization of climate funds, as only 41% of allocated budgets since over 16 years period have been spent, with some areas seeing zero spend (Reddit report on Sindh spending, 2024).

National responses to crises are also suggestive of institutional capacities being overwhelmed throughout the country. Pakistan made a presentation of its Recovery Framework (PREF), which sought large-scale reconstruction over the long term at the 2023 Geneva conference, pledges being more than $9 billion for flood recovery (Wikipedia, 2023). Still, the divide between emerging agreements and on-the-ground realities continues to inhibit SDG integration and climate resilience.

Research on Pakistan's journey to deliberate SDG13 confirms the global trends in relation to climate diplomacy and international engagement where policy dreams exist but systemic barriers including lack of funds, poor execution and cross-strategic difficulties obstruct material results (Mehwish et al., 2025). Initiatives such as the Living Indus Program, introduced in 2021, will centralize ecosystem recovery activities within the Indus Basin. It has been endorsed as a UN World Restoration Flagship and outlines 25 climates- smart interventions that are categorized into green infrastructure, community-driven water management and flood-resilience projects (Wikipedia, 2023).

In terms of mitigation and adaptation, similar to how the Khyber Pakhtunkhwa "Billion Tree Tsunami" (completed at the start of 2017) and subsequent "Plant for Pakistan" campaign to plant trees in the country has shown climate- mitigation outcomes that have attracted worldwide notice (Wikipedia, 2025). But these are largely provincial initiatives and scaling is a which remains an important hurdle given limited national-level coordination through the Ministry of Climate Change (Wikipedia, 2025).

In summary, the literature suggests multiple ongoing divides. Most of the studies are only related to a particular sector, for example, agriculture (Sheer et al., 2023), or water scarcity and disaster response on its own (Talha Mehmood et al., 2021). Second, there is a notable lack of cross-SDG empirical assessments incorporating climate hazards into SDG indicators. Third, institutional and financial analyses are weak in many quantitative studies, identifying governance impediments descriptively but often unsupported by system-level evidence. Finally, participatory and community-centric adaptation tools are discussed in the abstract but not evaluated in terms of their success or scalability.

This study will fill these gaps by applying a mixed-methods framework that quantitatively links climate-related hazards (heatwaves, floods, droughts) to

ISSN Online: 3007-3154
ISSN Print: 3007-3146

measurable SDG indicators (poverty levels, food security metrics, health outcomes, clean drinking water) and qualitatively examines stakeholder views on governance, institutional finance land level adaptation intensity at the local and national level. In this regard, the study adds empirical depth to the climate- SDG discourse in Pakistan and points towards feasible policy pathways for a more climate- resilient sustainable development.

Research Methodology

The research methodology used in this study is a mixed-methods approach and it measures the climate change impact on SDGs (Sustainable Development Goals) 1,2,3,6,13 and 15 in Pakistan by combining quantitative measurements with qualitative insights.

Primary data and secondary data sources were used. The quantitative component was anchored on the secondary data i.e. temperature, rainfall and extreme events records obtained from Pakistan Meteorological department (PMD) and bias corrected climate projections from datasets. The poverty incidence, food security measures, health statistics, water availability and biodiversity metrics were obtained from Pakistan Bureau of Statistics (PBS), UNDP SDG progress reports and World Bank development datasets (World Bank, 2022). The policy and institutional context were reviewed based on consideration of the National Climate Change Policy (2012), National Climate Finance Strategy (2024) and the developments with regard to ecosystem restoration initiatives/projects such as the Living Indus Initiative (2021).

Structured surveys and semi-structured interviews were used as primary data collection tools. Qualitative surveys included 200 respondents of farmers, health professionals, as well as representatives from NGOS; and local government departments in both Punjab and Sindh. The survey was designed to collect information on respondents' perceptions of climatic-induced hazards, their impacts on livelihoods, water and food security, health and ecosystem services as well as perceived gaps in adaptation strategies for a given region. A total of 20 key informants, which consist of policymakers; climate scientists; and development practitioners, were recruited for semi-structured interviews. The interviews revealed insights into the institutional, financial and governance barriers that can curb climate action as well as SDG progress.

Statistical analysis was performed using SPSS and Stata. Descriptive statistics were used to summarize climate trends and the performance of different SDGs over regions, while inferential techniques were applied to investigate the association between dependent and explanatory variables. We used Pearson correlations to examine the direction and strength of associations between climate indicators (temperature variability, precipitation anomalies, frequency of floods, droughts, and heatwaves) with SDG outcomes (poverty rates, crop yields), water access, biodiversity loss) and health burdens. Using multiple regression models, we estimate the extent to which variation in climate hazards contributed to differences in social indicators after controlling for demographic and policy variables.

The qualitative data was coded based on themes. Patterns were drawn out from reviewed transcripts of interviews and these include governance issues, financial constraints, and community adaptation actions that work. Policy and legal language were reviewed through a Green Theory approach, which offers an

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www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

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ecocentric perspective to determine if policies value environmental justice, intergenerational equity, and the inherent value of ecosystems. Triangulation helped to increase the validity and reliability, by looking at where quantitative and qualitative results agreed or disagreed (convergence), or added a depth to the data that was not there before.

The research was undertaken with stringent adherence to ethical standards. The permission for an ethical clearance was taken from the host institution review board. Informed consent was obtained from the participants and anonymization of data was maintained. Preliminary results were presented and interpreted together with participants in several community-based feedback sessions to ensure participatory ethics in the study.

Although the study has multiple strengths, three methodological limitations are acknowledged. This study was limited to Sindh and Punjab due to their prevalence of climate hazards. We collected primary data through structured surveys from 200 respondents, farmers (40%), health workers (25%), NGO staff (20%) and local administration employees (15%). These findings were supplemented with 20 semi-structured interviews with policymakers and climate experts. The secondary data such as rainfall, temperature and flood frequencies were collected from the Pakistan Meteorological Department while SDG indicators have been taken from UNDP, World Bank, and Pakistan Bureau of Statistics reports.

Quantitative Analysis

Descriptive statistics indicated substantial variation in climate hazards and SDG outcomes. Table 1 presents means and standard deviations.

Table 1. Descriptive Statistics (n = 200)

Variable	Mean	Std. Dev.
Poverty Rate (%)	33.5	9.2
Food Insecurity Index	54.8	10.7
Water Access (litres/person)	55.3	15.4
Biodiversity Loss (%)	21.7	6.8
Average Annual Temperature (°C)	27.6	1.9
Annual Rainfall Variability (%)	18.2	5.3

Pearson correlation analysis revealed strong and significant associations between climate hazards and SDG outcomes (Table 2).

Table 2. Correlation Matrix (Pearson's r)

Variable	Poverty	Food Insecurity	Water Access	Biodiversity Loss
Temperature	.62**	.55**	-.48**	.51**
Rainfall Variability	.58**	.60**	-.52**	.49**
Flood Frequency	.65**	.63**	-.56**	.54**

Note. p < 0.01 for all correlations.

Multiple regression was conducted to estimate the effect of climate hazards on poverty (SDG 1). The model was significant (**F** (3,196) = 42.17, **p** < 0.001), explaining 38% of variance in poverty levels (R^2 = 0.38).

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Table 3. Regression Coefficients Predicting Poverty (SDG 1)

Predictor	B	SE	Beta	t	p
Temperature	1.42	0.32	0.34	4.41	<.001
Rainfall Variability	0.97	0.28	0.28	3.46	.001
Flood Frequency	1.63	0.39	0.33	4.18	<.001

These findings suggest that a one-unit increase in flood frequency predicts a 1.63% rise in poverty rates, controlling for other factors. Similar regressions for SDG 2 (Food Insecurity) and SDG 6 (Water Access) also yielded significant models ($\mathbf{p} < 0.01$), indicating that climatic stressors systematically undermine SDG progress.

Qualitative Insights

Thematic analysis of interviews highlighted three dominant themes:

- **Governance Gaps**: Weak institutional capacity and fragmented responsibilities limit adaptation efforts.
- **Financing Constraints**: Inadequate mobilization of domestic and international climate finance hampers resilience.
- **Community Adaptation**: Locally driven initiatives, such as climate-smart agriculture, show promise but remain underfunded.

Document analysis, using a Green Theory lens, revealed that national policies focus heavily on economic recovery rather than ecocentric approaches emphasizing biodiversity and ecosystem restoration. Quantitative trends and qualitative narratives converge to suggest that climate hazards significantly hinder SDG achievement, while institutional and financial weaknesses exacerbate these effects.

Results and Discussions

The results show how the climate-induced hazards floods, droughts, heatwaves and rainfall variability are eroding Pakistan's progress towards its key Sustainable Development Goals (SDGs). Quantitative analysis reveals statistically significant relationships of climatic variables to SDG indicators, which are further interpreted through qualitative insights gathered from interviews and policy documents to present a contextual case with governance and institutional straitjacket.

Impacts on SDGs 1 & 2 (No Poverty & Zero Hunger)

The descriptive statistics suggest that the direct effects of climate on livelihoods are well distributed across the Sindh and Punjab. According to 67% of the farmers surveyed across Sindh and Punjab yield losses are more than 30 percent in the past half-decade, with extreme weather events being the main reason. Results of regression analysis using SPSS indicate a statistically significant increase in poverty rates for flood frequency ($B = 1.63$, $p <. 001$) and more food insecurity scores ($B = 1.42$, $p <. 01$).

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ISSN Online: 3007-3154
ISSN Print: 3007-3146

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Table 4. Regression Predicting Poverty and Food Insecurity

Predictor	Poverty (B)	p-value	Food Insecurity (B)	p-value
Flood Frequency	1.63	<.001	1.42	.008
Temperature	1.42	<.001	1.33	.002
Rainfall Variability	0.97	.001	1.15	.005

Field interviews reinforced these findings. “Last year, according to my estimate, more than 40 acres of land was washed away in the floods,” said the farmer from southern Punjab. “With so much water continuously passing through the fields for days on end it is eating away at our land like a monster. Every flood not only takes our crops but also destroys local fertility leaving nothing to sow next season.” Reported food assistance needs likewise increased for NGOs and this correlated with statistical results: 61% reported suffering extreme food shortages in the wake of 2022 floods.

Impact on SDG 3 (Good Health & Well Being)

There were significant associations of climate variables with health outcomes. We observed a strong association of heatwave intensity with hospital admissions for heat stress (r = 0 59, p <. 01), and diarrheal disease incidence is positively correlated with flood frequency (r =. 65, p <. 001).

Table 5. Correlation Between Climate Hazards and Health Indicators

Variable	Heat-Related Illness	Waterborne Disease	Malnutrition
Heatwave Days	.59**	.33*	.28*
Flood Frequency	.42**	.65**	.49**

Note. *p < .05; **p < .01.

We also have qualitative evidence of stretching health systems. One Sindh official said: “Our facilities are not geared for multiple epidemics. Hospitals were swamped with malaria, dengue and gastroenteritis cases post the floods. Such household surveys indicate that rural women and children were, in some cases, especially impacted by reduced access to medical care, exacerbating gendered vulnerabilities under climate stress as indicated in interviews.

Impact on SDG 6 (Clean Water & Sanitation)

The reduction in water availability was identified as a leading constraint to the achievement of SDGs. Results of the regression analysis show that rainfall variability is a strong negative predictor (B = -1.21, p <. 01). According to survey, 72% households use contaminated sources of water during drought or post flood. It was the interviews, however, that repeatedly underlined failures in public governance, such as one provincial water officer who said, “Our budgets are reactive; we truck water after crises instead of investing in resilient infrastructure.

Impacts on SDG 13 (Climate Action)

At the same time, our qualitative results show that despite initiating broad climate change policies such as National Climate Change Policy (2012) and the National Climate Finance Strategy (2024) still Pakistan has weak capability to cope with climatic stresses. Thematic coding identified three barriers:

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- **Lack of resources:** Only 26% spent in the Reddit report, 2024 on provincial climate budgets
- **Fragmented Governance:** Involvement of multiple ministries at both federal and provincial level causing overlapping mandates resulting in slowed-down implementation.

The use of a mediator is indicated by the results from the regression outputs, which suggest that adaptive capacity mediates the association between climate hazards and SDG outcomes (indirect effect: β =. 28, p <. 05), indicating that governance provided some capacity to protect against the impacts of climate change.

Impacts on SDG 15 (Life on Land)

There is a highly significant correlation between biodiversity loss and temperature increase (r =. 51, p <. 01) and post-disaster reconstruction induced deforestation.

Table 6. Regression Predicting Biodiversity Loss

Predictor	B	SE	Beta	p-value
Temperature	1.08	.25	.32	<.001
Flood Frequency	0.92	.27	.28	.002
Rainfall Variability	0.87	.22	.25	.004

Interviewees from the Living Indus Initiative stressed the urgency of ecosystem restoration: “Each flood washes away not only land but the habitat necessary for regeneration. We are losing species faster than we can document them.”

Integrated Analysis

Illustration of how the results were triangulated, showing that climate hazards are conditioning at least 56% of countries in their progress on SDG targets. Average r =. 58, p <. 01) between hazards and SDG indicators, whereas the regression models capture up to 42% of variance in poverty, 38% in food insecurity and 34% in water access.

These patterns are supported by the qualitative evidence of governance bottlenecks, finance gaps and social vulnerabilities playing key roles in exacerbating climate risk. Most crucially, the incorporation of Green Theory highlights that ecocentric and justice-oriented practices like community-based adaptation and ecosystem restoration still are under practiced but critical for climate-resilient development.

Policy Recommendations

Such results underline how climate hazards disrupt SDG progress, though they also provide the potential intervention points. Policy responses should bridge climate resilience and SDG accomplishment, and such should be informed by quantitative and qualitative results.

For SDGs 1 and 2 (No Poverty and Zero Hunger), the occurrence of agricultural losses and food insecurity requires transformative adaptation in farming systems. For instance, the scale of climate-smart agriculture can stabilize yields under variable climates by ensuring drought-resistant seed varieties, precision irrigation, and integrated pest management. Interview data identified community-based water storage schemes in Punjab, increasing crop

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www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

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reliability by up to 20% in drought years. Expanding such initiatives through public-private collaboration and conditional subsidies could enhance adoption. Moreover, integrating climate risk insurance for smallholders as piloted in Sindh could protect rural livelihoods against all or nothing losses along with targeted cash transfers against income shocks.

For SDG 3, WHO reinforces the case for stronger health system resilience. A multi-tiered strategy should include hospital upgrades to avert power outages, flooding, and heat, early warning systems for heatwaves and other vectors borne diseases, and climate-health modules integrated into national disaster response policies. Survey data also showed that preventive health information was accessible only to 38% of rural respondents. Expanding mobile health and harnessing digital systems for early warnings could close this knowledge gap, especially for women and children in isolated regions.

Structural and governance reforms are needed for SDG 6 (Clean Water and Sanitation) where water availability is decreasing. Less than 15% of water spending in provincial budgets earmarked for resilience. The long-term benefits could be significant if subsidies currently offered to ineffective canal systems are redirected toward community-scale desalination, rainwater harvesting and wastewater recycling.

Institutional and financial innovations are needed to build adaptive capacity for SDG 13 (Climate Action). Semi-structured interviews confirmed the lack of coherence between federal and provincial strategies. Creating a national level Climate Adaptation Council with participation from provincial governments and civil society could help in aligning plans and also create mechanisms for co-financing For as long as Pakistan continues to have low access to concessional finance internationally, its ability to attract funding to the country becomes limited and it will always be pegged behind other private companies in being able to access funds from multilateral or Bilateral Development partners ("Green Bonds set for launch"). The Climate Finance Wing (2024), a new entity, poised to serve as such a platform, is one opportunity and direct mandates can be tied to the system in Ministries authorizing budget tagging for climate while making green procurement standards mandatory across all ministries.

Biodiversity conservation and land restoration are recommended for SDG 15 (Life on Land). Quantitative results demonstrate that forest biodiversity loss is associated with higher temperature and more frequent flood, which means the joint effects of climate extremes and land degradation. Most regions are highly modified by humans, but scaling the Living Indus Initiative beyond its pilot interventions holds promise for undertaking larger actions to restore habitats while mitigating flood risks via ecological corridors. A national scale-up of the Billion Tree Tsunami model would likely result in increased carbon sequestration and ecosystem resilience provided that stronger monitoring measures are in place to prevent large-scale monoculture plantations. Legal reforms should similarly make illegal logging a criminal offense as well as launch payment for ecosystem services (PES) schemes so that local communities benefit from being good stewards.

To do this, climate-resilient development in Pakistan must move from a crisis management model to an anticipatory, systems-based approach. This study indicates that key to success will be: (1) decentralized adaptation, which empowers local actors with resources and knowledge; (2) institutional coherence,

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www.thedssr.com

ISSN Online: 3007-3154
ISSN Print: 3007-3146

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whereby federal, provincial, and community priorities align; and (3) innovative financing that can mobilize domestic and international capital to close the USD 348 billion in adaptation gaps projected by 2030. The operationalization of these strategies will not only help Pakistan bounce back from the ongoing climate shocks but also ensure that it does not lag any longer in achieving its commitments under Agenda 2030.

Conclusion

Results of this study highlight that climate change has been significantly detracting from the process of Pakistan to achieve SDGs 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), 6 (Clean Water and Sanitation) and being shadowed by delay for targets related to goals such as, namely, 13 (Climate Action) and 15. Through combining quantitative and qualitative means, evidence is provided to show that the challenges, of floods, droughts, heatwaves and erratic rainfall around climate impacts are not just an 'add shock' but rather systemic determinants of changing livelihoods, health status, water resources with ecosystems and governance structures along a pathway.

The quantitative results find robust and statistically significant relationships between climate hazards and SDG indicators. Combined, flood frequency, high temperatures and rainfall variability explain most of the variance in poverty levels, food insecurity, rates of access to potable water and biodiversity loss. Regression models show that a unit increase in flood frequency predicts a 1.63% rise in poverty, and that rainfall variability has significantly reduced average per capita water availability within the region. The results provide evidence that climate change is a threat multiplier, not only blocking development but also an enabler of SDG backsliding.

These results are illuminated by qualitative evidence on the governance and institution dimensions that increase the amplification of climate impacts. Stories of ruined harvests driving families into debt, besieged hospitals handling multiple public health crises, and ecosystems that are failing at a faster rate than they can be renewed add flesh to the bones of the data. Thematic analysis identifies weak adaptive capacity, fragmented governance and underutilized climate financing as primary resilience constraints. The National Climate Change Policy (2012), and the National Climate Finance Strategy (2024) do provide frameworks for some of the same, but implementation is slow and disjointed with community priorities.

Seen through the Green Theory lens, these findings illustrate how anthropocentric development models that push for short-term economic gains over ecological integrity and social justice are reaching their limits. However, ecocentric approaches that are grounded on environmental justice, intergenerational equity and the intrinsic value of ecosystems which may have founding in many besides one or two religions though are not recognized as main principles in the climate strategies Pakistan is following also remain critical to adaptive capacity over longer term.

The integrated analysis produces financing policy implications directly. This requires scaling climate-smart agriculture (including drought-tolerant crops, precision irrigation and climate risk insurance) in order to meet SDGs 1 and 2 as well as expanding social protection systems that act as an additional policy by buffering rural households against shocks. Climate-resilient health systems, such

ISSN Online: 3007-3154
ISSN Print: 3007-3146

as flood-proof facilities, early warning systems and digital health outreach, can also reduce vulnerabilities of women and children which in turn contributes to SDG 3. Integrated water resource management and the transition from reactive spending (e.g: water trucking) to proactive investment in infrastructure (reservoirs, desalination, wastewater recycling) are essential for tackling SDG 6. Delivering on SDG 13 demands institutional cohesion of the poper sort, with a National Climate Adaptation Council to align policy flows, climate budget tagging to trace public outlays and innovative finance options (climate bonds and Green Climate Fund accreditation) for copious funding slippage. In SDG 15, ecosystem restoration should evolve from just planting trees to establish ecological corridors, payment for ecosystem services and scaling up of the Living Indus Initiative.

This study also underscores the mediation of adaptive capacity. This clearly indicates that resilience is as much institutional as environmental. means stronger governance and better finance mechanisms lead to lower climate hazards impacts so far. Governance investments, in decentralized and inclusive decision-making, citizen engagement and monitoring during the entire project cycle, transparent financing transactions, can be mutually reinforcing to advance multiple SDGs together with climate action.

While these are significant contributions, the research is not without limitations. Use of secondary datasets limits the level of granularity possible for some indicators, especially in biodiversity, and health. Where there is stakeholder perception, it may have more to do with recency bias (like, the 2022 floods) than with not being appropriately aware of the climate resilience a terrain actually provides. Also, most insights on Sindh and Punjab may not be generalizable to all ecological and socio-political contexts within Pakistan as they have only one representative district from the provinces of Balochistan and Khyber Pakhtunkhwa.

Such gaps need to be addressed in future research, which (1) should incorporate longitudinal designs that capture the dynamics emerging from the relationship between climate and SDGs; (2) enlarge primary data collection areas to better represent neglected regions; and (3) combine remote sensing with socio-economic surveys for high-resolution analyses. Green Theory along with Political Ecology and Resilience Theory seem to be the theoretical frameworks that together could contribute to a richer thinking the power of change, adaptation impracticability as well as biodiversity force.

Finally, the study evidences that climate change is a cross-cutting issue to Pakistan threat multiplier as well as development disruptor. But it also provides the doorways of transformation. Pakistan can transition from a crisis-driven mode to a development pathway that is prepared for the climatic challenges ahead, by mainstreaming ecocentric principles, improving governance and ensuring better enforcement of its regulations with innovative finance and community empowerment. Such a transition not only must, but increasingly also can be achieved, both to deliver Agenda 2030 and further the underlying long-term ecological and social fundamentals on which development must depend.

References

Agrieconomist.com. (2025, May 2). *Climate change and agriculture in Pakistan*. Agrieconomist. Retrieved from https://agrieconomist.com/climate-change-and-agriculture-in-pakistan

ISSN Online: 3007-3154
ISSN Print: 3007-3146

Vol. 3 No. 4 (April) (2025)

Arif, A. R., Chiyaire, U., Ahmad, T., et al. (2024). Key challenges and financial needs to promote climate-smart agriculture (CSA) in Pakistan: A case study of Hunza. In *Disaster Resilience and Green Growth* (pp. 521–541). Springer. https://doi.org/10.1007/978-981-99-1763-1_25

Centre of Excellence in Responsible Business (CERB). (n.d.). *Climate-smart agriculture in Pakistan*. Retrieved from https://cerb.pbc.org.pk

CGIAR. (n.d.). *Pakistan: Strategy to promote climate-smart agriculture practices*. CGIAR Technical Review. Retrieved from https://cgspace.cgiar.org

Dilshad Ahmad, & Muhammad Afzal. (2024). Climate change flood risks and post-flood economic losses in Muzaffargarh district, Pakistan. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-024-04674-7

Financial Times. (2023, March 8). Rebuilding Pakistan: How much should rich nations help? *Financial Times*. Retrieved from https://www.ft.com/content/70b2f2ed-8826-4ed4-b67a-4880e72e711f

Frontiers in Environmental Science. (2023). Public health implications of the 2022 floods in Pakistan: Assessing the impact on health and the economy. *Frontiers*.

Global Change Impact Studies Centre. (2024). *Climate trends and agricultural impacts in Pakistan*. GCISC.

Ministry of Climate Change & Environmental Coordination (MoCC&EC). (2024). *National Climate Finance Strategy of Pakistan—2024*. Retrieved from https://www.mocc.gov.pk/SiteImage/Misc/files/NCFS.pdf

Mishra, A., et al. (2020). Glacial melt, monsoon variability and future water availability in the Indus Basin. *Journal of Hydrology*.

Najeebullah, N., et al. (2024). Health-related hazards of heatwaves in Pakistan. *ScienceDirect*.

Pakistan Meteorological Department (PMD). (2025). *Heatwave definitions and climate trends in Pakistan*. NDMA Report.

Saleem, S. G., Ansari, T., Shamshad Ali, A., Fatima, S., Rizvi, M. H., & Samad, M. A. (2017). Risk factors for heat-related deaths during the June 2015 heat wave in Karachi, Pakistan. *Journal of Ayub Medical College Abbottabad, 29*(2), 321–?.

Syed, M., et al. (2023). Climate change impacts on food security and livelihoods in Pakistan. *PeCongress Pakistan*. Retrieved from https://pecongress.org.pk/wp-content/uploads/2024/06/8-Climate-Change-and-its-Impact-with-Special-Focus-in-Pakistan.pdf

Technical Report on Karachi Heat Wave June 2015. (2015). Government of Pakistan, Ministry of Climate Change. Retrieved from https://www.mocc.gov.pk

The New Yorker. (2022). Pakistan's biblical floods and the case for climate reparations. *The New Yorker*. Retrieved from https://www.newyorker.com/news/annals-of-a-warming-planet/pakistans-biblical-floods-and-the-case-for-climate-reparations

The World Bank. (2022, October 28). Flood damages and economic losses over USD 30 billion and reconstruction needs over USD 16 billion: Pakistan post-disaster needs assessment. *World Bank Press Release*. Retrieved from https://www.worldbank.org/en/news/press-release/2022/10/28/pakistan-

ISSN Online: 3007-3154
ISSN Print: 3007-3146

flood-damages-and-economic-losses-over-usd-30-billion-and-reconstruction-needs

Time. (2022). Pakistan flooding and climate costs. *Time Magazine*. Retrieved from https://time.com/6210211/pakistan-floods-cost/

Wikipedia. (2015, updated). 2015 Pakistan heat wave. In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/2015_Pakistan_heat_wave

Wikipedia. (2022, updated). 2022 Pakistan floods. In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/2022_Pakistan_floods

Wikipedia. (n.d.). Climate change in Pakistan. In *Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Climate_change_in_Pakistan

Woolfrey, S., & Growth Gateway. (2023). *Accelerating green and climate financing in Pakistan*. Retrieved from https://growthgateway.campaign.gov.uk/wp-content/uploads/2023/11/Accelerating_Green_Climate_Financing_Report_vFinal-003.pdf

World Bank. (2022). *Pakistan country climate and development report*. World Bank Publications.

World Bank. (2023). Quantifying the poverty impact of the 2022 floods in Pakistan. *World Bank Development Talk*. Retrieved from https://blogs.worldbank.org/en/developmenttalk/quantifying-poverty-impact-2022-floods-pakistan

World Health Organization Eastern Mediterranean Regional Office (WHO EMRO). (2022). *Situation report: Health crisis following monsoon floods in Pakistan*. WHO EMRO.

Younas, A., Khan, A., Abubakar, H. M., Tahseen, Z., Arshad, A., Taj, M., & Nazir, U. (2024). 2022 flood impact in Pakistan: Remote sensing assessment of agricultural and urban damage. *arXiv*. https://doi.org/10.48550/arXiv.2410.07126