Global Climate Surge Report
2024-2025

CLIMATE CRISIS & PAKISTAN'S VULNERABILITY

By

NATIONAL INSTITUTE OF DISASTER MANAGEMENT (NIDM)
National Think Tank

NATIONAL DISASTER MANAGEMENT AUTHORITY

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Acronyms

AJ&K	Azad Jammu & Kashmir
CCA	Climate Change adaptation
DDMA	District Disaster Management Authority Disaster
DM	Disaster Management
DRM	Disaster Risk Management
FFC	Federal Flood Commission
FFD	Flood Forecasting Division
GB	Gilgit-Baltistan
GBDMA	Gilgit-Baltistan Disaster Management Authority
INGO	International Non-Governmental Organization
JCMC	Joint Crises Management Cell
KP	Khyber Pakhtunkhwa
MoCC	Ministry of Climate Change
NDMA	National Disaster Management Authority
NDCs	Nationally Determined Contributions
NEOC	National Emergency Operation Center
NASA	National Aeronautics and Space Administration
NIDM	National Institute of Disaster Management
PDMA	Provincial Disaster Management Authority
PMD	Meteorological Department
SDGs	Sustainable development Goals
UN	United Nation

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Executive Summary

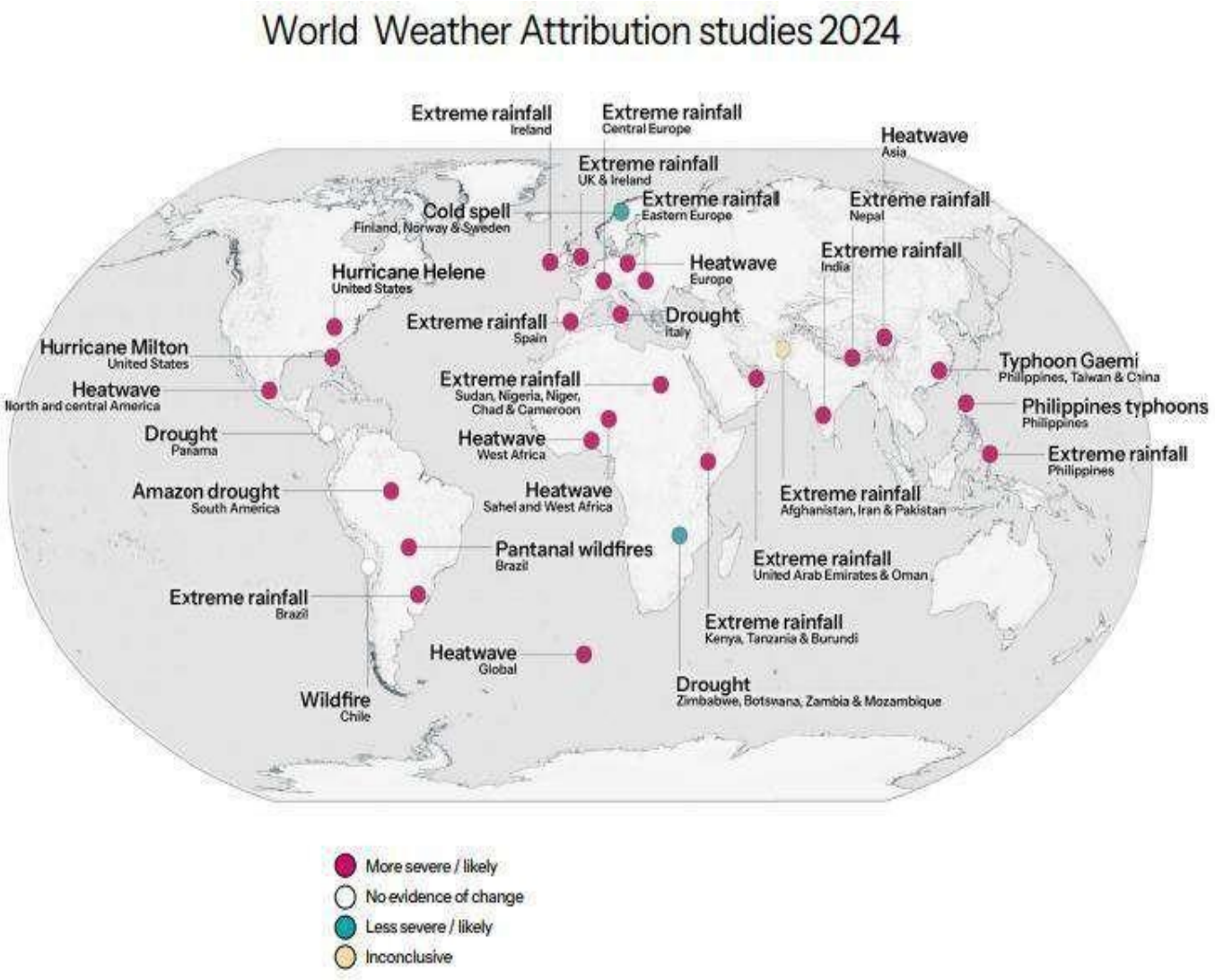
The Climate SURGE 2024-2025 report provides a comprehensive analysis of the escalating global climate crisis and its far-reaching impacts, with a particular emphasis on Pakistan's increased vulnerability. The report highlights unprecedented global temperature records, rising sea levels, and a surge in extreme weather events throughout 2024, underscoring the critical need for immediate and coordinated climate action. It stresses the importance of transitioning away from fossil fuels and advocates for enhanced financial support to developing nations, along with substantial improvements in early warning systems. Pakistan ranked as the 5th most vulnerable country to climate change. This report outlines the key challenges Pakistan faces due to climate change and recommends actionable strategies for integrating Climate Change Adaptation (CCA), anticipatory actions, and Disaster Risk Reduction (DRR) across multiple sectors. By adopting global best practices, these strategies aim to effectively mitigate the impacts of climate change and build resilience in the face of growing environmental threats. The year 2024 has seen an alarming increase in climate-related disasters, emphasizing the urgency for global intervention. The Global Climate Surge 2024-25 report offers a detailed assessment of these escalating climate trends, their socio-economic ramifications, and the policy measures needed to mitigate climate risks effectively. The unexpected return of winter in March 2025, driven by a western disturbance, brought heavy rainfall and snowfall to Pakistan, significantly impacting the agricultural sector. This climatic anomaly disrupted crop cycles, delayed planting seasons, and affected the growth of seasonal crops, particularly those sensitive to temperature fluctuations. The unseasonal weather patterns further underscored the vulnerability of Pakistan’s agriculture to the unpredictable shifts in climate, potentially leading to reduced yields and financial losses for farmers, while amplifying the need for adaptive strategies to mitigate such disruptions.

Introduction

This section offers a concise overview of key findings, highlighting global climate trends, major disaster events occurring in 2024-2025, and the specific impacts of climate change on Pakistan, presented as a case study. It further outlines recommended strategies and policy actions for addressing climate challenges in 2025, emphasizing the adoption of global best practices to strengthen resilience and mitigate negative impacts.

Record-Breaking Temperatures

Global average temperatures have surpassed **1.5°C** above pre-industrial levels, resulting in a surge of heatwaves across Europe, North America, and Asia. Additionally, the frequency and intensity of extreme weather events, including typhoons, extreme rainfall, wildfires and floods, have markedly increased. These events have caused significant displacement of populations and substantial economic losses worldwide.



Glacial and Ice Sheet Melting

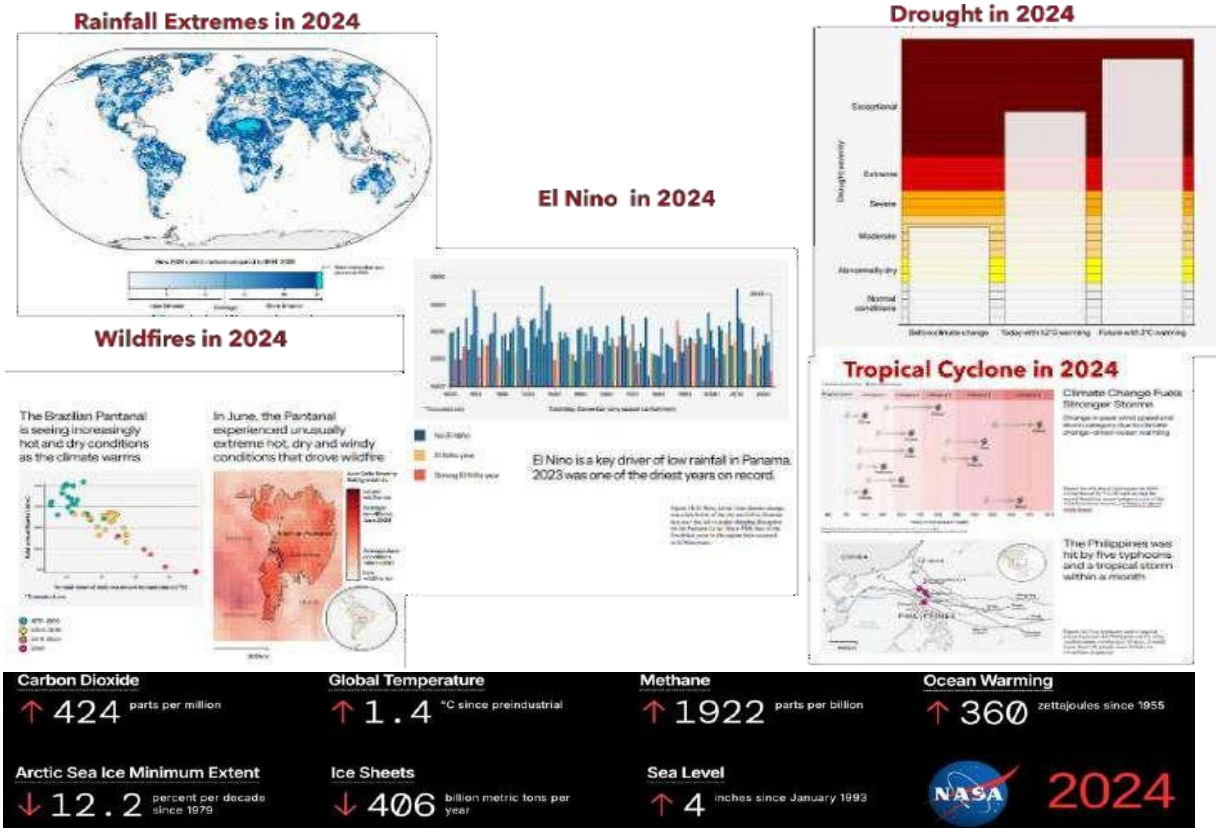
The rapid melting of ice in Greenland and Antarctica has significantly contributed to rising sea levels, posing a severe threat to coastal communities worldwide.

Biodiversity Loss and Ecosystem

Habitat destruction and shifting climate zones have placed immense stress on species survival, leading to an alarming rate of biodiversity loss.

Global Climate Surge 2024-205

The Global Climate Surge 2024-25 report highlights the accelerating pace of climate change, surpassing previous projections and underscoring the urgent need for immediate, large-scale mitigation efforts to safeguard future generations. The report provides a comprehensive analysis of climate-related disasters, including statistical data on their frequency and regional distribution. For instance, heatwaves accounted for 84 recorded events, with 31 occurring in Africa. Additionally, the report details specific disaster events, their geographic locations, and associated human and economic losses.



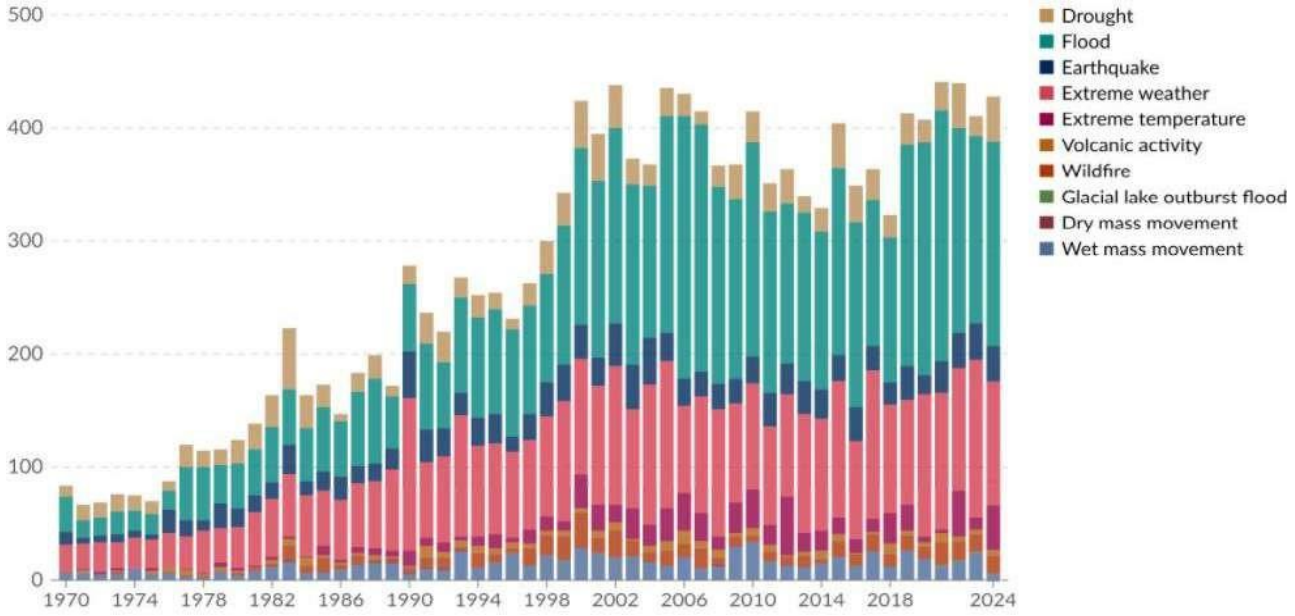
Global Natural Disasters 2024

Months	Disaster in Countries	Economic Losses
Jan	Earthquake in Japan	$50–70 billion
	Floods in Germany	$15–20 billion
	Cyclone Belal in France	$10–15 billion
	Storm in Mauritius	$1–2 billion
Feb	Wildfire in Chile	$3–5 billion
	Urban Flooding in Australia	$8–12 billion
Mar	Wildfire in Texas, USA	$5–7 billion
Apr	Earthquake in Taiwan	$20–30 billion
	Floods in Dubai, UAE	$5–7 billion
	Floods in Oman	$2–3 billion
	Floods in Kenya	$1–2 billion
	Floods in China	$30–40 billion
	Floods in Saudi Arabia	$4–6 billion
May	Floods in Brazil	$10–15 billion
	Floods in Afghanistan	$0.5–1 billion
	Mudslide in Indonesia	$2–3 billion
	Wildfire in Canada	$10–15 billion
Aug	Floods in Bangladesh and India	$20–30 billion
Sep	Hurricane Helene in Florida, USA	$50–70 billion
	Floods in Nepal	$1–2 billion
Oct	Hurricane in Florida, USA	$40–60 billion
	Flood in Thailand	$5–7 billion
Nov	Canada’s Wildfire	$15–20 billion
	Spain floods	$5-7 billion
	Indonesia Landslide	$1–2 billion
	Monsoon in Asian Countries	$30-40 billion
	Malaysia Flood	$3-5 billion
Dec	Cyclone in Mayotte	$0.5-1 billion
	Earthquake Vanuatu	$0.5-1 billion
	Australia Bushfire	$10–15 billion

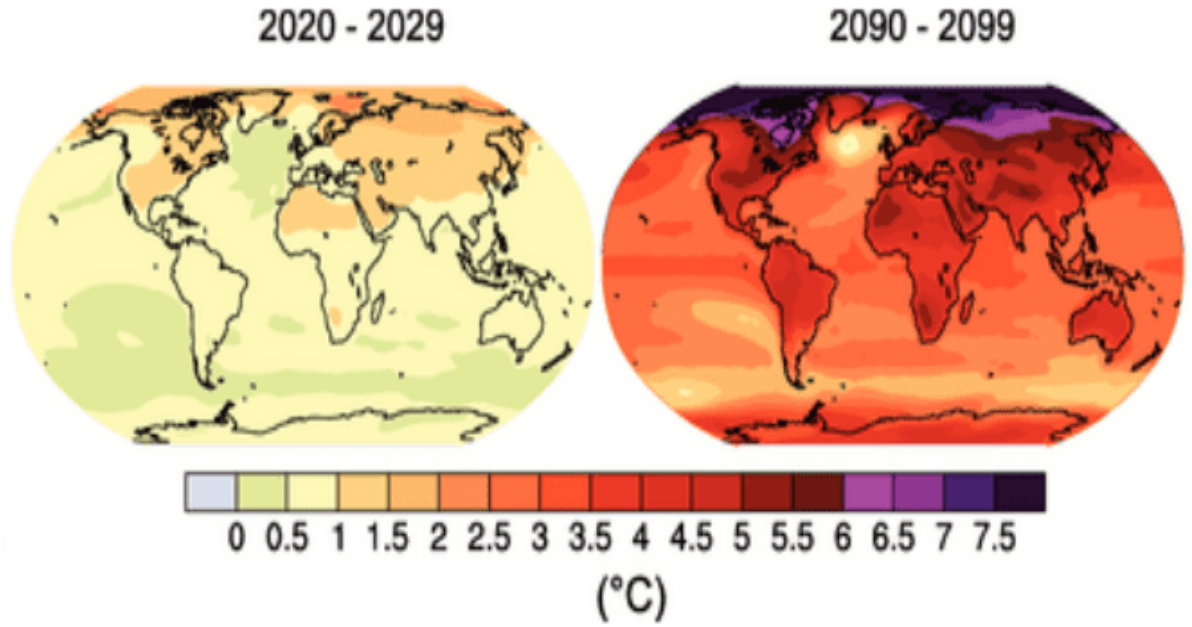
Global Natural Disasters 2025

Disaster	Location	Description	Estimated Economic Losses in USD
Winter Storm	Northeastern USA	Severe blizzard disrupts transportation and damages infrastructure.	$20 billion
Floods	Malaysia, Thailand	Monsoon rains cause flash floods and destroyed agricultural land.	$15 billion
Earthquake	Japan	Magnitude 7.2 earthquake damages buildings and disrupts manufacturing hubs in Osaka region.	$40 billion
Wildfire	Los Angeles	Caused major property and capital losses	$95 to $164 billion
Heatwave	Southern Africa	Unseasonably high temperatures lead to drought conditions, impacting agriculture and water supply.	$8 billion
Tornado	Southern USA	Series of EF3 tornadoes destroys homes, schools, and businesses across multiple states.	$12 billion
Wildfires	Australia (Victoria)	Prolonged heatwave and dry conditions fuel wildfires, burning hectares of land.	$18 billion
Landslides	Peru	Heavy rainfall triggers landslides, destroying villages and blocking major highways.	$7 billion
Storm Surge	Philippines	Typhoon-induced storm surge floods coastal areas, damaging homes and fishing industries.	$14 billion

Global Natural Disasters 1970 to 2024



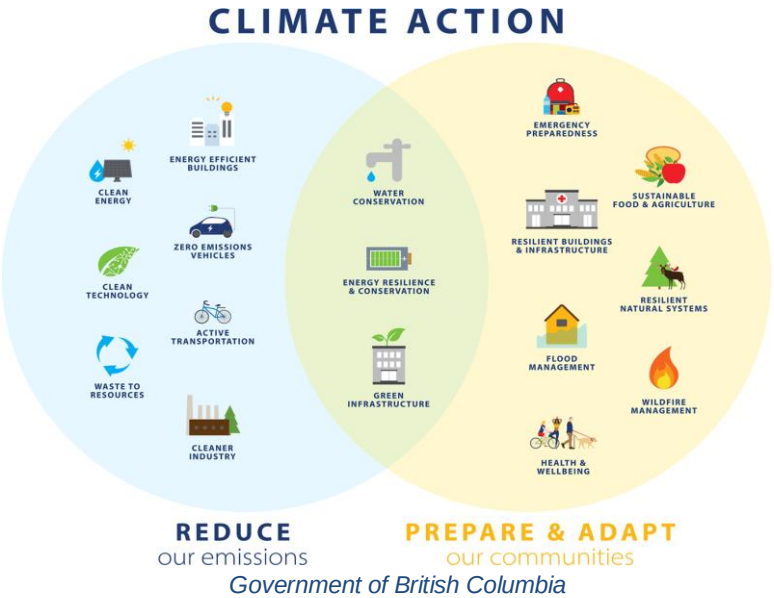
The future of climate change is a continuation of global warming and more severe weather events, according to NASA.



Future of climate change (NASA 2024)

Global Response

The global response to climate surge has intensified in recent years, driven by the urgent need to address the escalating impacts of climate change on ecosystems, economies, and communities. International agreements such as the Paris Agreement have established frameworks for countries to commit to reducing greenhouse gas emissions and limiting global warming to well below 2 degrees Celsius above pre-industrial levels. Nations are increasingly adopting national climate action plans, known as Nationally Determined Contributions (NDCs), which outline specific targets and strategies for mitigating climate change. Additionally, global initiatives such as the United Nations Sustainable Development Goals (SDGs) emphasize the importance of climate action in achieving sustainable development and resilience against climate-related disasters.



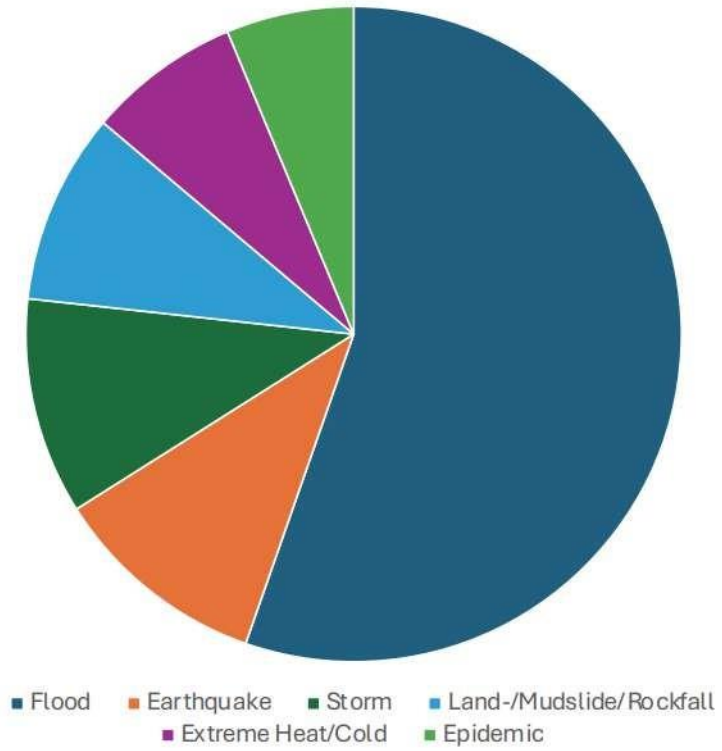
Government of British Columbia

Transition to a low-carbon economy, enhancing resilience to climate impacts, and provision of support to the most vulnerable countries

In parallel, there has been a surge in funding and investment aimed at enhancing climate resilience and adaptation efforts worldwide. Financial mechanisms, including the Green Climate Fund, provide support to developing countries for projects that address climate vulnerabilities and promote sustainable practices. Collaborative efforts among governments, non-governmental organizations, and the private sector are fostering innovation in renewable energy technologies, sustainable agriculture, and disaster risk reduction strategies. Furthermore, grassroots movements and community-led initiatives are gaining momentum, advocating for climate justice and equitable solutions that empower vulnerable populations. This multifaceted global response reflects a growing recognition of the need for collective action to combat climate surge.

Pakistan Climate Surge 2024-2025

Pakistan is ranked **5th most climate vulnerable** country in the Global Climate Risk Index. Pakistan is experiencing a **significant climate surge**, marked by rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events. This surge is exacerbating challenges such as droughts, floods, and heatwaves, which have profound impacts on agriculture, water resources, and public health. The country's vulnerability to climate change is heightened by its geographical location, with the Himalayan region experiencing rapid glacier melting and the coastal areas facing threats from sea-level rise and seawater intrusion. As a result, Pakistan is witnessing more frequent and intense natural disasters, including cyclones and floods, which strain the country's infrastructure and economic resources. Addressing these climate-related challenges requires a comprehensive approach that includes sustainable development strategies, climate-resilient infrastructure, and enhanced disaster preparedness and response mechanisms.



Natural Disasters in Pakistan (2000-2024)

Climate change has significantly altered weather patterns, leading to increased environmental hazards such as cyclones, extreme heat, shifting precipitation trends, rising sea levels, and warming sea temperatures. These changes pose serious threats to coastal infrastructure, agriculture, public health, and ecosystems. More frequent and intense cyclones are causing widespread devastation, while rising temperatures intensify heatwaves, wildfires, and glacial melt. Unpredictable rainfall patterns contribute to both flooding and drought, exacerbating water scarcity and disease outbreaks. Additionally, sea-level rise and ocean warming further endanger coastal communities and marine ecosystems. Urgent adaptive measures and disaster preparedness strategies are essential to mitigate these growing risks.

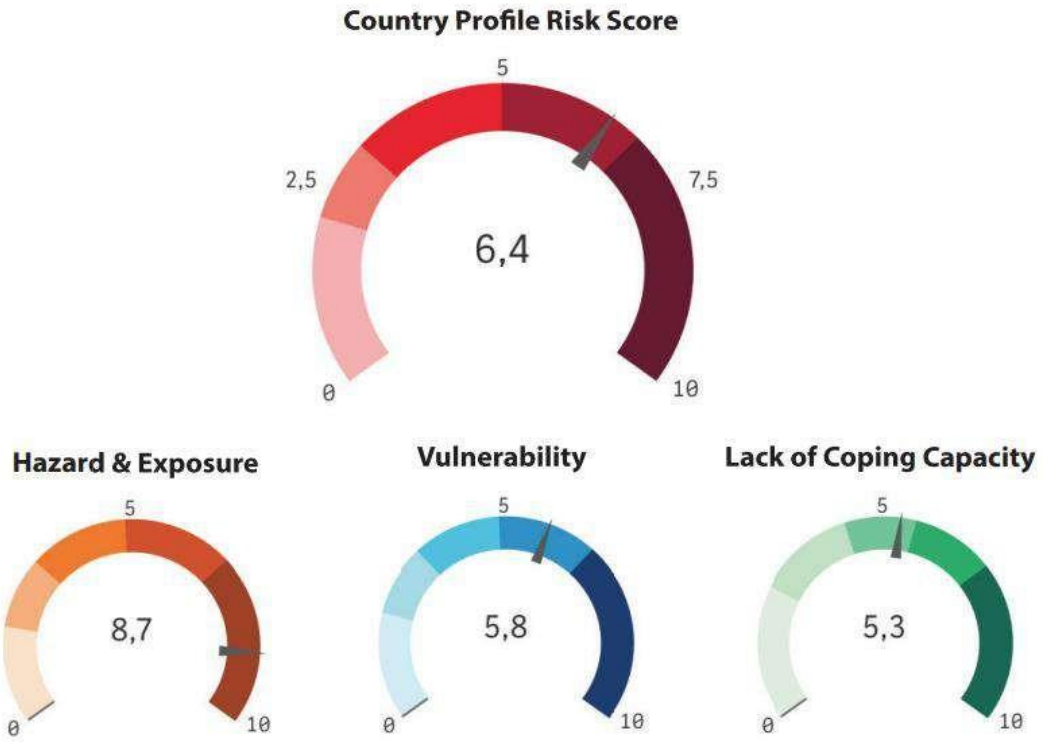
Between 1900 and 2025, seven tropical cyclones affected 2.8 million people, with increasing frequency and intensity due to climate change. Future cyclones will be more severe, causing greater damage to coastal infrastructure and livelihoods, particularly for fishing and farming communities. Urgent measures are needed to enhance disaster preparedness and resilience.

Temperatures have risen by 0.63°C in the past century, with projections of up to 6.0°C by 2090. Extreme heat days (above 35°C) are increasing, worsening heatwaves, water demand, and agricultural losses. Rising temperatures also intensify wildfires, disease spread, and glacial melt, heightening disaster risks. Climate adaptation is essential.

Rainfall has increased by 25% since 1901, with more extreme events since 1960. While coastal areas face declining rainfall, other regions see increases. Changing patterns heighten flood and drought risks, disrupt agriculture, and spread waterborne diseases. Improved water management and flood control are critical.

The Indus Delta faces a projected sea level rise of 30–80 cm by 2024, causing salinization, coastal erosion, and displacement of low-lying communities. Intensified storm surges will increase flood risks. Coastal resilience measures, flood defenses, and sustainable planning are urgently needed.

The Arabian Sea has warmed by 2°C in two years, fueling stronger, more frequent cyclones with higher wind speeds and heavier rainfall. This threatens coastal infrastructure and marine ecosystems, affecting fisheries. Enhanced disaster preparedness and early warning systems are crucial to mitigate impacts.



Inform risk index Pakistan 2025

Disaster Risk = (Hazard × Vulnerability) / Capacity

Classification	World Risk Index	Exposure	Vulnerability	Susceptibility	Lack of Coping Capacities	Lack of Adaptive Capacities
very low	0.00 - 1.84	0.00 - 0.17	0.00 - 9.90	0.00 - 7.17	0.00 - 3.47	0.00 - 25.28
low	1.85 - 3.20	0.18 - 0.56	9.91 - 15.87	7.18 - 11.85	3.48 - 10.01	25.29 - 37.47
medium	3.21 - 5.87	0.57 - 1.76	15.88 - 24.43	11.86 - 19.31	10.02 - 12.64	37.48 - 48.04
high	5.88 - 12.88	1.77 - 7.78	24.44 - 33.01	19.32 - 34.16	12.65 - 39.05	48.05 - 59.00
very high	12.89 - 100.00	7.79 - 100.00	33.02 - 100.00	34.17 - 100.00	39.06 - 100.00	59.01 - 100.00

World Risk Report Classification Matrix

The Lack of Adaptive Capacity score, Pakistan (64.18) and Afghanistan (69.60) score well above Bangladesh (48.54), India (50.49) and Iran (12.17) in a reflection of failures to undertake long-term strategies and processes to anticipate and mitigate future negative impacts.

Disasters in Pakistan 2024-2025

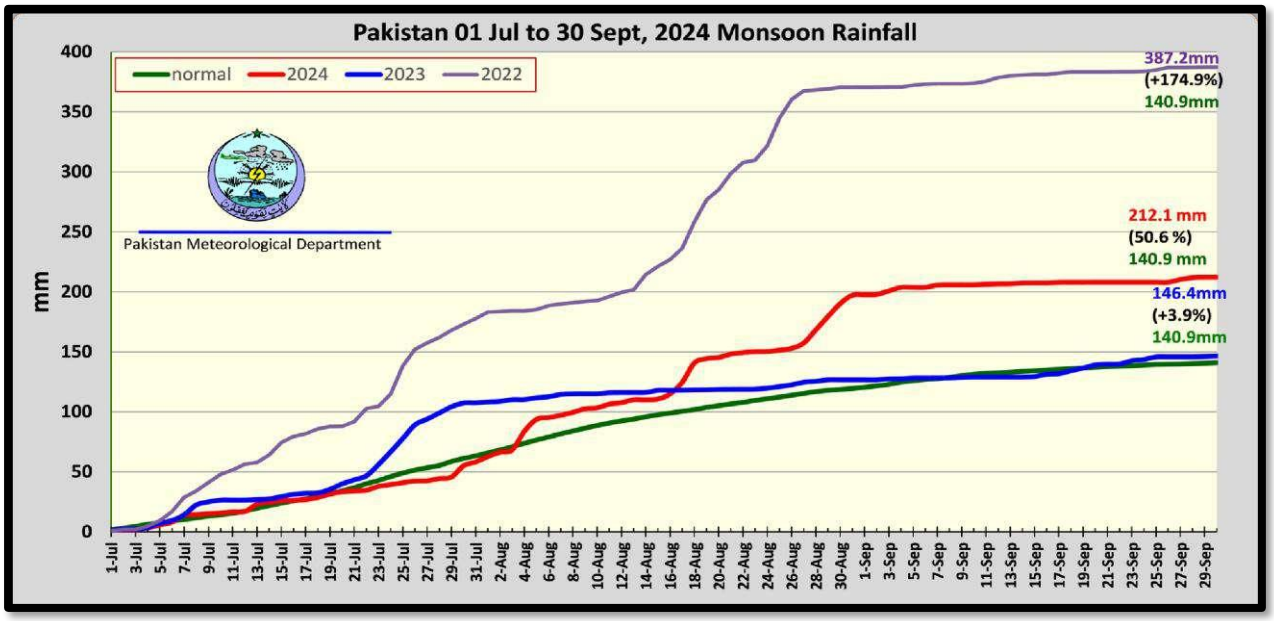
Heavy rains and strong winds began on 27 February 2024. The heavy weather affected Gwadar and other areas of Balochistan Province. The downpour caused flooding, particularly in Gwadar, Jewani, and Ormara, where high waters damaged infrastructure, displaced residents, and prompted emergency responses from government and military teams. Heavy rains continued through March and April, and there were reports of floods, landslides, and hailstorms across KP, Balochistan, Punjab, and Gilgit Baltistan. Over 5,800 homes and 464 schools were damaged alongside widespread infrastructure destruction. At least 117 people died, and 139 people were injured. Relief efforts, including evacuation, rescue, and water decontamination, were organized by PDMAs and NDMA. Long-term impacts include disrupted education, loss of livestock, and widespread displacement affecting 1.5 million people, with flood risks persisting.

	01 Jul to 30 Sept, 2024 Rainfall		
	normal (mm)	actual (mm)	Deviation (%)
Pakistan	140.9	212.1	+51
Azad J&K	389.5	306.5	-21
Balochistan	58.3	122.9	+111
Gilgit-B	39.7	40.5	+2
Khyber-PK	256.3	242.6	-5
Punjab	231.9	344.0	+48
Sindh	133.7	278.4	+108

Monsoon 2024 Rainfall (mm)

The 2024 monsoon season in Pakistan began on June 29, slightly ahead of its usual start date of July 1. Rainfall in July and September was somewhat below average. However, August witnessed an exceptionally high volume of rain, offsetting the earlier deficit. Rainfall in August not only compensated for months of July and September but pushed the total monsoon season rainfall above the seasonal average. Post Monsoon Report 2024 To sum it up, Pakistan experienced excessively above-average rainfall during the entire monsoon season with a +51% deviation from the normal and ranked 8th wettest monsoon rainfall during the past 64 years (record is 387.8mm in 2022). On

a regional scale, Balochistan and Sindh had excessively above-average rainfall (+111% & 108% respectively), while Punjab had also above-average rainfall (+48%). The Khyber Pakhtunkhwa (KP) and Gilgit Baltistan (GB) (with -5% & +2% respectively) received nearaverage rainfall, whereas, Azad Jammu and Kashmir (AJ&K) (with -21%) was the only region to receive below-average rainfall. Figure shows the spatial distribution seasonal (JAS) rainfall and gives the comparison of cumulative monsoon rains this year and the previous two years.



Pakistan 01 Jul to Sept,2024 Monsoon Rainfall

Key Challenges

Resource Limitations:

The demand for additional rescue equipment and personnel was evident, especially in hard-to-reach areas. Limited resources strained the capacity to conduct timely rescues across all affected regions.

Communication Barriers:

In flood-hit districts, damaged infrastructure and network failures hindered effective communication between rescue teams, local authorities and affected populations. This delayed the coordination of efforts and the dissemination of emergency information.

Accessibility and Terrain Challenges:

Flooding created significant accessibility challenges in remote areas, particularly at higher altitudes where landslides posed an ongoing threat. Landslides had blocked roads and the limited availability of heavy machinery delayed deployment to affected areas. Blocked or submerged routes had hindered rescue teams from reaching certain communities promptly, necessitating the use of air and river-based resources for timely assistance.

Data and Coordination Gaps:

Limited access to real-time data made it challenging to track flood progression and predict high-risk zones accurately. This slowed coordination efforts among various agencies, affecting the deployment of resources and planning for evacuations.

Preparedness and Community Awareness:

In some districts, a lack of disaster preparedness and community awareness on flood response measures led to delays in evacuations, putting more people at risk. Increased efforts in pre-emptive community education and preparedness drills could mitigate this in future events.

Misinformation and Fake News:

The rapid spread of misinformation and fake news on social media created additional challenges during the monsoon season. False information regarding flood severity, evacuation orders and available resources led to confusion among affected communities, complicating rescue operations. This diverted critical resources and delayed response efforts, emphasizing the need for effective communication strategies and reliable information channels to combat misinformation during future crises.

Climate Induced Disasters Initiatives Pakistan

National Disaster Management Authority (NDMA)

Pakistan is increasingly vulnerable to climate-induced disasters, including floods, heatwaves, droughts, and glacial melt events. In response, the National Disaster Management Authority (NDMA) continues to lead initiatives to mitigate the challenges posed by climate change. Through proactive disaster preparedness measures, NDMA is enhancing response capabilities to address floods, cyclones, and heatwaves while fostering climate resilience across the country.

NDMA's Proactive Approach to Climate Disaster Management

NDMA is focusing on developing advanced early warning systems and collaborating with provincial governments to implement climate-resilient infrastructure projects. These initiatives include the construction of flood-resistant housing and green infrastructure projects aimed at reducing environmental vulnerabilities. Additionally, NDMA is promoting Community-Based Disaster Risk Reduction (CBDRR) programs to equip local communities with essential skills for disaster preparedness and response planning.

To further strengthen Pakistan's climate resilience, NDMA is actively engaging with international partners to secure technical assistance, scientific expertise, and research support for climate-related projects. These efforts reflect NDMA's commitment to developing a comprehensive disaster risk reduction (DRR) strategy aligned with global best practices.

National Emergency Operations Centre (NEOC) – A Strategic Initiative

The National Emergency Operations Centre (NEOC) is a pioneering initiative of NDMA, established to transition Pakistan's disaster management approach from reactive to proactive, NEOC stands as a model of innovation and preparedness.

Equipped with state-of-the-art facilities and real-time satellite feeds, NEOC has the capability to anticipate disasters up to three months in advance. A multidisciplinary team of experts employs Geographic Information Systems (GIS), Remote Sensing, Climatology, Meteorology, Seismology, Hydrology, and Data Sciences to monitor and analyze global and local hazards. This enables early detection of emerging disaster patterns and trends, ensuring timely interventions and effective response strategies.

NDMA's Role in Disaster Response

The timely activation of NEOC significantly strengthens Pakistan's resilience against monsoon floods by enhancing coordination, response efficiency, and community preparedness. The key roles NDMA in disaster risk management include:

Centralized Coordination

NEOC serves as a hub for coordination among government agencies, NGOs, and local authorities, facilitating real-time communication and information sharing.

Risk Assessment

The center employs advanced early warning systems to monitor weather patterns and assess flood risks, enabling timely alerts to vulnerable communities.

Resource Mobilization

Early activation allows for the pre-deployment of essential resources, ensuring rapid logistical support to affected areas.

Community Preparedness

NDMA organizes public awareness campaigns and training programs for local disaster management committees to enhance community readiness for potential disasters.

Emergency Response

NDMA coordinates the activation of rapid response teams and integrates health, rescue, and relief services, minimizing response times and mitigating disaster impacts.

Data Collection and Analysis

The center gathers and analysis data during and after flooding events to improve future preparedness and response strategies.

International Collaboration

NDMA fosters partnerships with international agencies to secure additional resources and funding, enhancing overall disaster response capabilities.

Integration of Global Best Practices and Anticipatory Action

NDMA is committed to integrating climate change adaptation strategies and anticipatory action into disaster risk reduction. By aligning with international frameworks such as the Sendai Framework for Disaster Risk Reduction and the Sustainable Development Goals (SDGs), NEOC aims to strengthen preparedness at all levels. Additionally, NDMA conducts trainings under the International Search and Rescue Advisory Group (INSARAG) and organizes simulation exercises (SimEx) to enhance response efficiency. NEOC represents a transformative step in Pakistan's disaster management landscape. By leveraging cutting-edge technologies, fostering community engagement, and strengthening international collaboration, NEOC are proactively addressing climate-induced disasters. These efforts are instrumental in safeguarding lives, minimizing economic losses, and building a resilient Pakistan capable of withstanding future climate challenges. NEOC invite collaboration with national and international stakeholders to further bolster disaster preparedness and response efforts, ensuring a safer and more secure future for all.

Key initiatives included:

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- Government of Pakistan, Pakistan Climate Change Act, Islamabad, Pakistan, 2017.
- National Disaster Management Authority (NDMA), National Disaster Risk Reduction Policy (NDRRP), Islamabad, Pakistan, 2013.
- United Nations Development Programme (UNDP), Glacial Lake Outburst Floods (GLOF) Project: Mitigating Climate Risks in Northern Pakistan, Islamabad, Pakistan, 2022.
- Ministry of Climate Change, Government of Pakistan, Billion Tree Tsunami Project: Reforestation for Climate Resilience, Islamabad, Pakistan, 2021.
- National Emergency Operations Center (NEOC), Strengthening Early Warning Systems for Climate Resilience, Islamabad, Pakistan, 2023.
- Pakistan Urban and Infrastructure Development Authority, Climate-Resilient Infrastructure Development Strategies, Islamabad, Pakistan, 2023.

Way Forward

Moving forward, Pakistan needs to adopt a multi-faceted approach to address the challenges posed by climate surge. This includes strengthening its policy framework to integrate climate resilience into all sectors, particularly agriculture and water management. Investing in climate-resilient infrastructure, such as flood-resistant housing and green infrastructure, will be crucial for mitigating the impacts of extreme weather events. Additionally, enhancing early warning systems for floods, cyclones, and heatwaves will help in timely evacuations and emergency responses. Collaboration with international organizations can provide access to advanced technologies and funding for climate-related projects, further bolstering Pakistan's resilience against climate change.

Future Perspective

Future research in Pakistan should focus on developing more accurate climate models that can predict extreme weather events with greater precision. This will enable better planning and preparedness for climate-related disasters. Studies on climate-resilient agricultural practices and efficient irrigation systems can help improve crop yields and reduce water stress. Moreover, research into innovative technologies for renewable energy and green infrastructure can support Pakistan's transition towards a more sustainable and climate-resilient economy. Community-based research initiatives can also help understand local perceptions and adaptation strategies, ensuring that climate policies are tailored to meet the needs of vulnerable communities. By pursuing these research directions, Pakistan can develop effective solutions to mitigate the impacts of climate surge and ensure sustainable development for future generations:

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