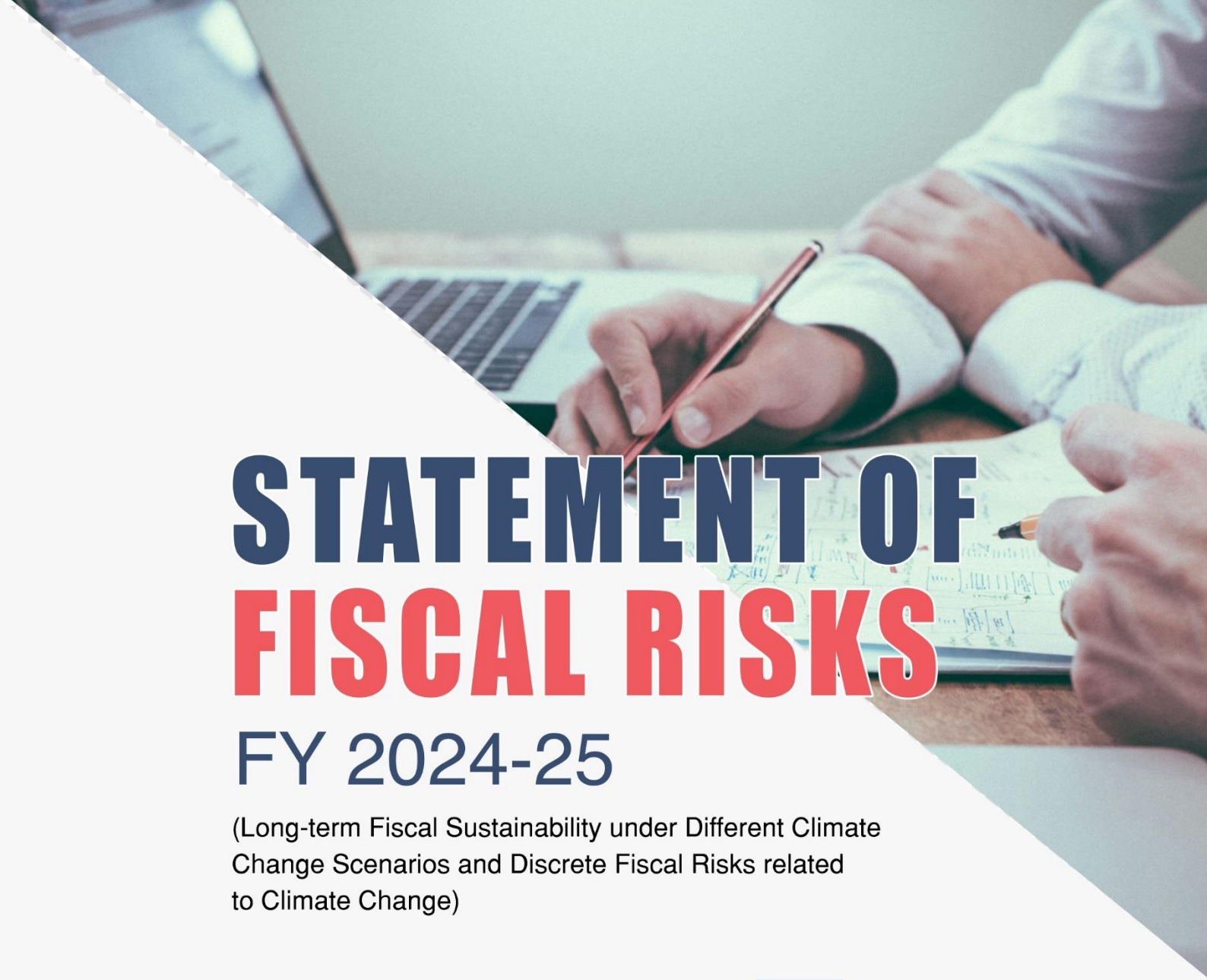

STATEMENT OF FISCAL RISKS

FY 2024-25

(Long-term Fiscal Sustainability under Different Climate Change Scenarios and Discrete Fiscal Risks related to Climate Change)

Economic Adviser's Wing
Finance Division
Government of Pakistan

Foreword

The preparation of the Statement of Fiscal Risks is carried out in compliance with Section 4, Sub-Section 3 (b) of the Public Finance Management Act, 2019, which mandates the inclusion of a statement of fiscal risks in the Annual Budget Statement. This document is vital in highlighting potential fiscal risks that could lead to significant deviations in fiscal indicators from the projections in the Medium-Term Budgetary Statement, as required under Section 5 of the Fiscal Responsibility and Debt Limitation (FRDL) Act, 2005. Extending beyond a medium-term perspective, this statement provides a comprehensive long-term analysis, with a particular focus on climate change as a major source of fiscal risk. It assesses long-term fiscal sustainability under various climate change scenarios and evaluates specific fiscal risks up to FY2050, addressing both broad fiscal modelling and discrete risks from State-Owned Enterprises and Public-Private Partnerships. The report provides recommendations for stakeholders to help mitigate these risks and ensure a more stable and sustainable fiscal outlook.

The diligent efforts of Dr. Imtiaz Ahmad, Economic Adviser have been critical in completing this report. I also commend the technical assistance Dr. Wasim Shahid (PFM-II) provided. Appreciation to Dr. Nazia Gul (Assistant Economic Adviser) and Syed Hafiz Muhammad Azeem (Assistant Economic Adviser) for their support in finalizing medium-term macroeconomic forecasts. The contributions of the Corporate Finance Wing, External Finance Wing, Budget Wing, Debt Management Office, Public Private Partnership Authority, and the Ministry of Climate Change have been instrumental in shaping a comprehensive Statement of Fiscal Risks. In particular, I would like to acknowledge Dr. Shahzada M. Naeem Nawaz, Director (Fiscal), for his hard work in technical analysis and preparing this comprehensive document. I hope this report will serve as a valuable resource for policymakers and other stakeholders.

(Imdad Ullah Bosal)
Secretary Finance

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1. INTRODUCTION

1.1 The Statement of Fiscal Risks is prepared in compliance with Section 4, Sub-Section 3 (b) of the Public Finance Management Act, 2019, which requires including a statement of fiscal risks in the Annual Budget Statement. Fiscal risks, if crystallized, cause fiscal variables to deviate from the forecasts, presented in the Medium-Term Budgetary Statement, prepared as a requirement of section 5 of the Fiscal Responsibility and Debt Limitation (FRDL) Act 2005. This Statement of Fiscal Risk extends its scope from medium to long term while focusing on climate change as a source of fiscal risk.

1.2 Climate change and natural disasters pose increasingly significant threats to global economic stability and fiscal sustainability. As these phenomena intensify, governments worldwide are compelled to reevaluate their fiscal strategies for managing the associated risks effectively. This report delves into the fiscal challenges posed by climate change and resulting natural disasters, exploring various scenarios to assess their long-term impact on the federal fiscal balance. By examining different trajectories of fiscal deficits and public debt under climate change scenarios, this analysis aims to provide a comprehensive outlook on the potential fiscal risks and underscore the importance of strategic management.

1.3 Along with analyzing long-term fiscal sustainability under different climate change scenarios, this statement of fiscal risks assesses discrete fiscal risks, covering a period of up to FY2050. As such, it carries the following two objectives:

1. Undertake modelling of long-term fiscal sustainability under different climate change scenarios.
2. Estimate discrete fiscal risks (e.g., from Public Private Partnership and State-Owned Enterprises) related to climate change.

1.4 To meet the first objective, the analysis begins with the baseline fiscal scenario, which assumes no change in climate change. This scenario serves as a comparative foundation against more dynamic models that incorporate varying degrees of environmental and economic intervention. This section introduces more complex scenarios, including RCP2.6, RCP8.5, and RCP2.6 coupled with improved revenues undertaken to minimize climate change. These scenarios are used to model potential future climate conditions based on different levels of greenhouse gas concentrations in the atmosphere. The scenarios reveal the fiscal implications of different climate futures and help understand the scale of potential fiscal adjustments needed. Moreover, three scenarios of natural disaster with two shocks in the forecasted period are analyzed. Table 1 depicts the sources of fiscal risk and defines scenarios of climate change and natural disasters.

Table 1*: Sources of Fiscal Risk Related to Climate Change and Natural Disaster*

Source of Fiscal Risk	Risk Exposure	Scenarios	Definition
Climate Change		RCP2.6 (Stringent climate change mitigation scenario)	Possibility to keep the increase in the global mean temperature below 2°C. Climate change mitigation expenditures are assumed to be partially contributed by the government, as envisaged in NDC 2021; economic activity and government revenues are increased due to improved climate.

Source of Fiscal Risk	Risk Exposure	Scenarios	Definition
	The rise in average degree temperature and its volatility.	RCP8.5 (Unmitigated emissions scenario)	The outcome is normally referred to as Business as Usual (BAU) if society does not make concerted efforts to cut greenhouse gas emissions.
		RCP2.6 & efforts to improve revenues	Against the baseline revenue projections, an improvement in tax collections is assumed every year, in the stringent climate change mitigation scenario.
Natural Disaster (ND)		ND Shock without the NDF	Among the climate-related Natural Disaster Events, Floods have been the most damaging for Pakistan. Flood 2022 contributed to a 2.2 percent GDP downturn and resulted in an estimated USD 16.2 billion in rehabilitation costs. Natural disaster Shocks are given in FY2030 and FY2040.
		ND Shock with NDF	
		ND Shock With the NDF and increased government revenues due to improvements in governance and tax policy changes.	

1.5 Under the second objective, the focus remained on the State Owned Enterprises (SOEs) in the Power and Infrastructure sectors given their direct implications on fiscal sustainability due to climate change. Moreover, the discrete fiscal risk associated with the Public Private Partnership (PPP) is also covered.

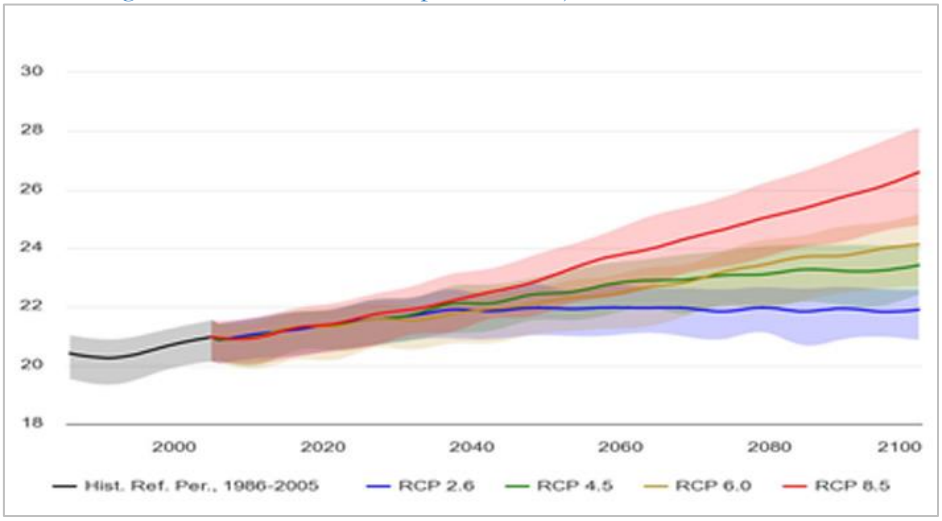
1.6 The report is structured into two broad sections, each ending with the proposed mitigation measures.

LONG-TERM FISCAL SUSTAINABILITY UNDER DIFFERENT CLIMATE CHANGE SCENARIOS

2. CLIMATE CHANGE AND PAKISTAN

2.1 The average temperature in Pakistan has already increased by 1.0 degrees Celsius since the 1980s and is projected to continue rising. Under RCP8.5[1] or 'unmitigated emissions scenario', Pakistan's average annual temperature is projected to rise by around 5.25 degrees above the 1990s average by the 2090−2100 decade (Figure 1). This would also be around 4.1 degrees higher than the RCP2.6 scenario where commitments under the Paris Agreement are met. Even under the more modest RCP6.0 scenario, the average annual temperature is projected to rise by around 3.0 degrees. Under the unmitigated scenario, the number of summer days is projected to increase substantially, by 2100.

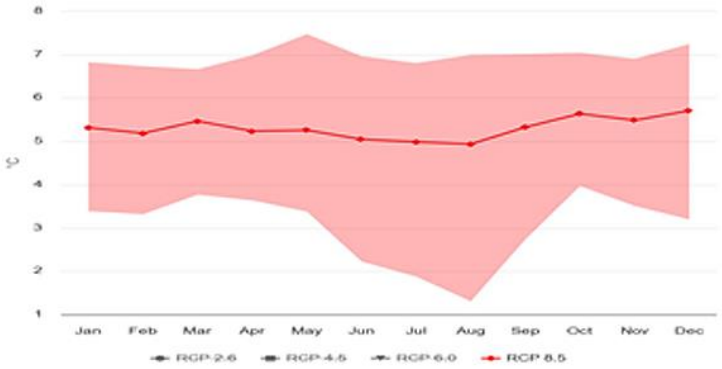
Figure 1: Annual Mean Temperature Projections for Pakistan



Source: World Bank Group, Climate Change Knowledge Portal

2.2 The impact of climate change on temperatures and precipitation in Pakistan is projected to be variable across seasons. Under the unmitigated scenario, the average summer temperature is projected to be 5.1 degrees higher in 2080-2099 compared to the 1990s, whereas the average winter temperature change is projected to be around 5.7 degrees (Figure 2).

Figure 2: Mean Temperature Anomaly Projections for Pakistan

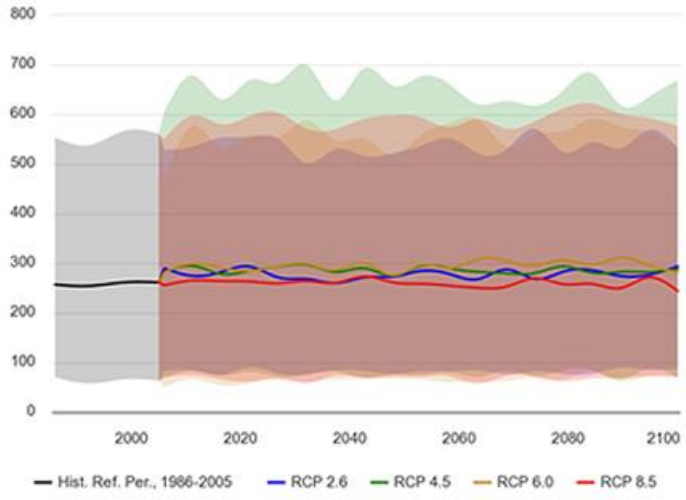


Source: World Bank Group, Climate Change Knowledge Portal

[1] A Representative Concentration Pathway or RCP is a GHG concentration trajectory that is published by the Intergovernmental Panel on Climate Change and used by climate change research and policy institutions. Different RCPs describe different climate futures, all considered possible depending on the volume of GHG emitted in the years to come. The RCP 8.5 scenario is considered an extreme emissions scenario which is associated with fast global economic growth and carbon-intensive energy use.

2.3 Climate change has exerted significant effects on the Indus River Delta, situated at the confluence of the Indus River and the Arabian Sea. The delta, reaching nearly sea level due to rising sea levels, is experiencing heightened salinity in inland creeks and streams, adversely affecting local ecosystems and diminishing freshwater resources, while also shrinking available agricultural land. The escalating sea surface temperature, witnessing a rapid increase from 29°C to 31°C within two years in the Arabian Sea, has led to the heightened formation of storms that are pushing seawater into coastal communities. Parts of Karachi, located near the delta, are already submerged in the Arabian Sea, and there are cautionary forecasts that numerous other areas may face a similar fate within the next 35 to 45 years (NAP, 2023). The precipitation projections for Pakistan highlight the significant challenges posed by climate change, particularly in terms of water management and agricultural productivity.

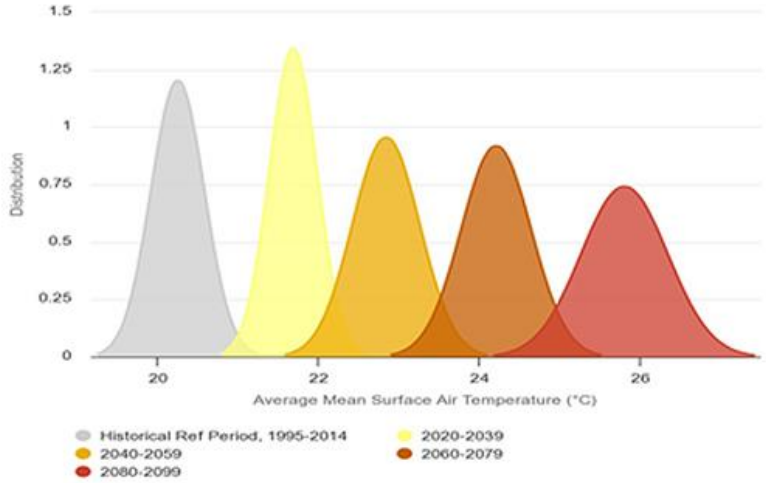
Figure 3: Precipitation Projections for Pakistan



Source: World Bank Group, Climate Change Knowledge Portal

2.4 Pakistan is one of the most susceptible countries to food-related challenges in the South Asian region. Floods, emerging as the most frequently occurring natural disaster since 2000, have become a recurring threat, manifesting in significant events nearly every year. The catastrophic mega-floods of 2022 shattered all preceding records. Notably, the forms of flooding vary across different regions of the country. In the north, glacial lake outburst floods (GLOFs) are prevalent, while the plains experience riverine flooding and flash floods. Coastal flooding linked to cyclonic events compounds the vulnerability, particularly impacting the low-lying plains of Sindh and Balochistan, encompassing urban areas like Karachi and Hyderabad. The year 2022 witnessed unprecedented devastation from floods, but the specific types of flooding pose distinct risks in various parts of the country. In June 2023, Cyclone Biparjoy, the longest-surviving cyclone in the Arabian Sea, unleashed storm surges and heavy rainfall, compounding the woes of Sindh, which was yet to recover from the 2022 floods. This underscores the diverse and ongoing challenges posed by flooding in different regions of Pakistan (NAP, 2023).

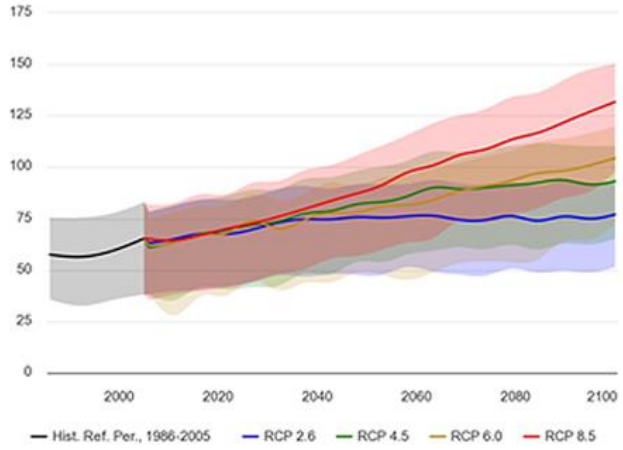
Figure 4: Projected change in distribution and average mean temperature of Pakistan



Source: World Bank Group, Climate Change Knowledge Portal

2.5 Yearly temperature variations in Pakistan are high as the variability appears to be rising over time. Temperature variability is an important predictor of income loss under climate change scenarios because this variability increases the likelihood of extreme events and makes it more difficult for firms and households to plan. Between 1995−2014 and 2080−2099, the mean of average annual temperatures along with variation are projected to rise.

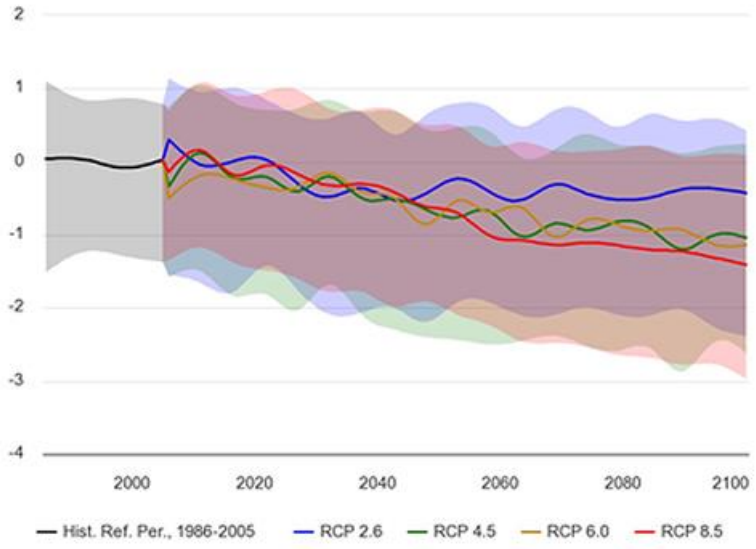
Figure 5: Number of Hot Days Projections for Pakistan



Source: World Bank Group, Climate Change Knowledge Portal

2.6 With increased temperatures and rising temperature volatility, Pakistan is expected to witness an increase in climate-related severities. The most serious effects of climate change in Pakistan are expected to be an increase in severe droughts and volatility in extreme precipitation events, leading to more mudslides and landslides. Under the unmitigated scenario, Pakistan is projected to become substantially drier, with the SPEI6 index reaching -1.5, heading towards severe drought conditions by the end of the century (Figure 6). The high and increasing year-to-year hot days will also likely lead to an increase in extreme weather events at the right tail of the distribution. It will also lead to increased health problems, reduced productivity, drought-related water and food shortages, infrastructure damage, and disruptions in supply chains.

Figure 6: Projected annual SPEI Drought Index for Pakistan



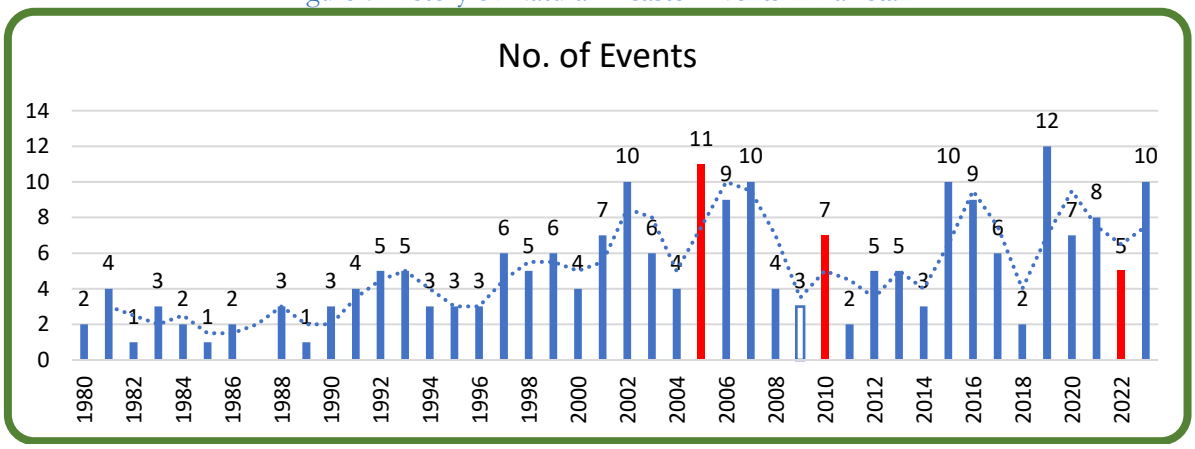
Source: World Bank Group, Climate Change Knowledge Portal

2.7 Global comparisons suggest that Pakistan is in the mid-to-high range of exposure to climate-related risks. The INFORM Report 2023, which shares evidence for managing crisis and disasters, ranks Pakistan as a high-risk country, while the Notre-Dame Global Adaptation Initiative Index (ND-GAIN) assigns a high vulnerability score and low readiness score to Pakistan and places it in the upper-left quadrant of the ND-GAIN Matrix. Pakistan is the 35th most vulnerable country, which is in dire need of investment and innovations to improve readiness and a great urgency for action.

3. NATURAL DISASTERS AND LOSSES IN PAKISTAN

3.1 The frequency of climate-related natural disasters has been rising in Pakistan (Figure 7). The most observed hazardous phenomena during the period 1980−2022 were floods, tropical cyclones, extreme temperatures, and occasional droughts. The floods of 2010 & 2022 and the earthquake of 2005 were disasters that created huge economic losses, casualties, infrastructure damage, and rehabilitation costs. It has been observed that the intensity of the floods has been increasing over the years which can be attributed to changes in global climate patterns (rising temperature and changing precipitation patterns), melting glaciers, deforestation, and urbanization. The poorly maintained infrastructure, inefficient water management, river-bed encroachment, and haphazard population density also play their part in massive flooding.

Figure 7:History of Natural Disaster Events in Pakistan



Source: EM-DAT, The International Disaster Database

Table 2: Natural Disasters and their Consequences in Terms of Human Life and Damages

Disaster Type	Disaster Subtype	Events Count	Total Deaths	Total Affected	Total Damages ('000 US$)
Drought	Drought	2	220	6,880,912	247,000
Earthquake	Ground Movement	30	75,124	7,420,276	5,345,500
Epidemic	Bacterial disease	2	105	10,028	
	Parasitic disease	1	0	5,000	
	Viral disease	3	130	59,066	
	Others	5	131	371	
Extreme Temperature	Cold Wave	3	18		
	Heat Wave	**13**	**2,741**	**80,574**	**18,000**
Flood	Flash Flood	**28**	**3,630**	**22,114,353**	**10,184,118**
	Riverine Flood	**42**	**6,329**	**34,967,357**	**9,727,030**
	Others	**35**	**4,600**	**43,124,841**	**1,510,230**
Mass Movement	Avalanche	13	580	4,460	
	Landslide	9	222	29,707	18,000
	Mudslide	2	16	12	
	Rockfall	1	13		
Storm	Convective Storm	**16**	**408**	**1,001,903**	
	Tropical cyclone	**5**	**1,106**	**2,189,940**	**1,710,936**
	Others	7	223	3,123	

Source: EM-DAT, The International Disaster Database

3.2 Climate change is contributing to prolonged drought episodes in specific regions of Pakistan. Insufficient rainfall and extended water scarcity throughout 2018 resulted in drought

conditions in Balochistan and Sindh. In September of that year, the Sindh government declared significant portions of southern Sindh as "calamity areas" due to deficient rainfall during the monsoon season. Drought, distinct from other natural disasters, has the characteristic of a gradual build-up over time, and its impacts can persist for several years after its occurrence.

Table 3: Decade-wise Analysis of Natural Disasters in Pakistan

Year	No. of Events	Total Death	Total Affected	Total Damages (000 USD)
1981 - 1990	20	997	1,234,977	8,000
1991 - 2000	44	6,747	21,116,721	1,360,166
2001 - 2010	71	79,195	37,917,618	17,134,648
2011 - 2020	61	6,189	24,345,290	10,248,000
2021 - 2023	23	2,379	33,195,098	14,910,000

Source: EM-DAT, The International Disaster Database

3.3 The 2022 floods have shown Pakistan's high susceptibility to climate change as the disaster has demonstrated vulnerability for the people of the country. One-third of the country went underwater, and 33 million people were affected. Nearly 8 million people were reportedly displaced. The scale of the disaster was unprecedented as damages exceeded that of the 2010 floods. In 2022 floods, the damage is estimated at USD 14.9 billion, the loss to the GDP at USD 15.2 billion, and the total need for rehabilitation at USD 16.3 billion. The sector that suffered the greatest damage is housing, valued at USD 5.6 billion, followed by agriculture, food, livestock, and fisheries, estimated at USD 3.7 billion, and transport and communications at USD 3.3 billion. The transport and communications sector has the highest reconstruction and recovery needs at USD 5.0 billion, followed by agriculture, food, livestock, and fisheries at USD 4.0 billion, and housing at USD 2.8 billion. The provinces of Sindh and Balochistan account for approximately 50 percent and 15 percent of recovery and reconstruction needs, respectively.

Table 4: Flood Damages and Losses to Pakistan Economy

		Social Sectors	Infrastructure Sectors	Productive Sectors	Cross-Cutting Sectors	Total (PKR Billion)	Total (USD Billion)
2022	**Damage**	**1,345**	**843**	**996**	**18**	**3,202**	**14.906**
	Loss	**193**	**85**	**2,853**	**142**	**3,272**	**15.233**
2010	**Damage**	**115.451**	**102.469**	**330.120**	**4.133**	**552.173**	**6.496**
	Loss	**50.249**	**69.648**	**179.866**	**2.835**	**302.599**	**3.560**

Source: Ministry of Planning, Development and Special Initiatives, Government of Pakistan

3.4 In 2010, Pakistan experienced extraordinary rainfall that resulted in unprecedented floods affecting the entire length of the country. The rains/floods of 2010 affected over 20 million people. Additionally, flash floods and landslides triggered by the rain caused severe damage to infrastructure in the affected areas. Entire villages were washed away, urban centers were flooded, homes were destroyed, and thousands of acres of crops and agricultural lands had been damaged with major soil erosion happening in some areas. The Preliminary Damage and Need Assessment Report on Pakistan Floods 2010 presented estimates for (i) direct damage and indirect losses, estimated at approximately PKR 855 billion; and (ii) the cost of reconstruction needs ranging from PKR 578 billion to 758 billion.

3.5 The direct damage caused by the floods was estimated at PKR 552 billion (USD 6.5 billion) while indirect losses amount to PKR 303 billion (USD 3.6 billion). The agriculture, livestock and

fisheries sectors suffered the highest damages, calculated at PKR 429 billion (USD 5.0 billion). The report also provided a detailed breakdown of the total damage. Total reconstruction cost was provided across the range of three options with option one as the base case and option three as the recommended option. The reconstruction cost for the base case was estimated at PKR 578 billion (USD 6.8 billion) while the recommended option costs were estimated at PKR 758 billion (USD 8.9 billion).

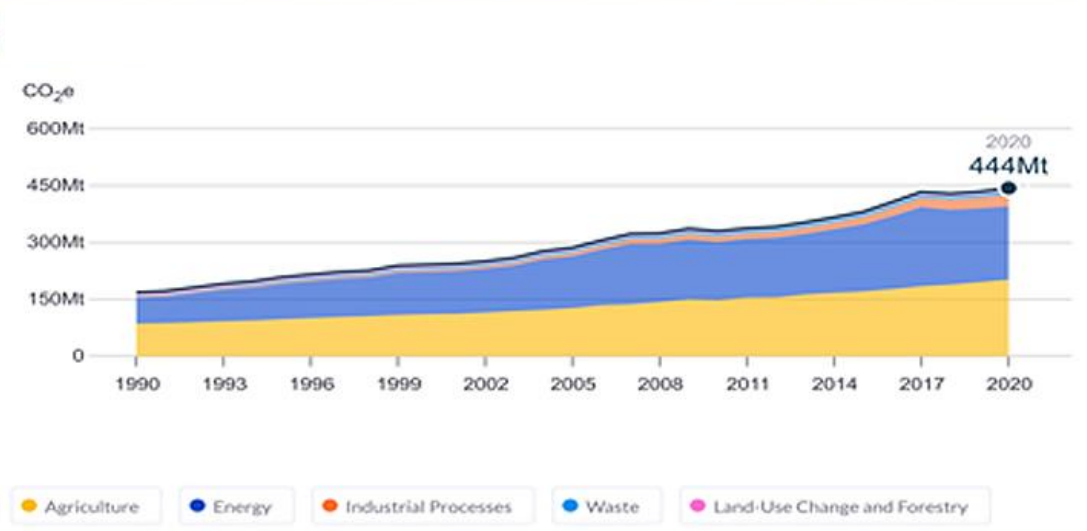
3.6 In Pakistan, the earthquake, that struck on October 8, 2005, left widespread destruction in its wake, killing at least 73,000 people, severely injuring another 70,000, and leaving 2.8 million people without shelter. AJK and eastern KPK (then NWFP) felt the most serious blow and have suffered extensive damage to public and private assets, and infrastructure, with social service delivery, commerce, and communications either debilitated or destroyed. In addition to the enormous human toll, the earthquake and its aftermath posed large financial costs to Pakistan. The total cost, associated with the earthquake, was estimated at approximately USD 5.2 billion, encompassing expenses for relief efforts, livelihood support for victims, and reconstruction.

3.7 The Preliminary Damage and Need Assessment Report on 2005 earthquake presents estimates for (i) the loss of public and private assets (direct damage at book value) in the eight most affected districts, estimated at Rs. 135.2 billion (USD 2.3 billion), and the loss in income (indirect loss), estimated at Rs. 34.2 billion (USD 576 million); (ii) the cost of short term (up to 18 months) and medium to long term (up to three years) reconstruction of private and public assets (at replacement costs), estimated at USD 3.5 billion; and (iii) the cost of a livelihood's restoration program, estimated at USD 97 million.

4. CLIMATE CHANGE COMMITMENTS AND FRAMEWORK

4.1 Pakistan, despite only accounting for 0.9 percent of global greenhouse gas (GHG) emissions, stands out as one of the nation's most susceptible to the repercussions of climate change. Going beyond its Nationally Determined Contributions (NDCs), Pakistan has exceeded mitigation efforts, resulting in 8.7 percent reduction in emissions between 2016 and 2018. The government, adhering to the GHG emissions trajectory outlined in Pakistan's NDC 2016, aims to limit emissions to 1603 million tonnes of carbon dioxide equivalent (Mt CO_2e.) by 2030.

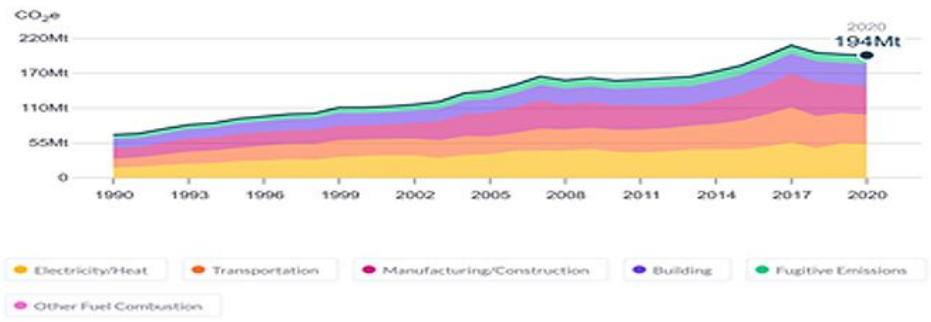
Figure 8: Historical GHG Emissions by sectors in Pakistan



Source: Climate Watch; Location: Pakistan; Sectors/Subsectors: Total Including LUCF; Gases: All GHG

4.2 Recognizing the imperative to curb GHG emissions further in line with the Paris Agreement's goal of limiting temperature rise to 1.5 - 2°C, the Government of Pakistan is unwavering in its commitment to achieving the maximum possible reduction. To this end, a series of transformative initiatives have been implemented. Consequently, Pakistan aspires to establish an ambitious cumulative target, aiming for a 50% reduction in projected emissions by 2030. This target includes a 15% reduction below business as usual (BAU) levels through domestic resources and an additional 35% reduction below BAU, contingent upon international financial support (15% unconditional, 35% conditional).

Figure 9: Historical GHG Emissions in Pakistan: Energy



Source: Climate Watch; Location: Pakistan; Sectors/Subsectors: Building, Electricity/Heat, Fugitive emissions; Manufacturing/Construction, Other fuel Combustion, Transportation; Gases: All GHG

4.4 The Pakistan National Adaptation Plan (NAP) provides a framework for implementing adaptation, promoting inclusivity, and facilitating collaboration among different stakeholders, serving as an effective tool for climate finance mobilization. It provides an overview of the country's climate risks and vulnerabilities, as well as the NAP process, vision, and principles. The plan lays out an adaptation strategy and priorities in seven key areas: the agriculture–water nexus; natural capital; urban resilience; human capital; disaster risk management; and gender, youth, and social inclusion.

4.5 Pakistan announced the National Adaptation Plan that showcases the government's dedication to creating a resilient and sustainable environment. This plan goes beyond reacting to existing risks; it represents a proactive step towards ensuring a solid future. However, it is worth noting that this plan is the beginning of a much larger journey. Addressing Pakistan's climate crisis requires more than a comprehensive plan. It requires the active involvement of stakeholders like NGOs and climate ministries. The next step is to develop a plan and mobilize domestic and international collaborative efforts to implement it effectively.

4.6 Despite being an almost negligible contributor to global warming, the costs of climate change to Pakistan are substantial and continuously increasing as the country faces severe economic challenges. The accelerated impacts of climate change have added a new layer of pressure on the economy, including the exogenous shock of severe climate disasters, which in 2022 exerted a drag of 8 percent loss on the Gross Domestic Product (GDP). Rising inflation, high indebtedness, low growth, currency depreciation, and depleted foreign currency reserves have exacerbated the scale and multitude of challenges.

4.7 A comprehensive multi-pronged strategy is required to mitigate climate change. Given the growing and cross-cutting challenges posed by climate change, Pakistan needs to build resilience and urgently prioritize adaptation. By proactively addressing climate risks and embedding adaptation strategies in its development and planning frameworks, Pakistan could reduce its economic losses, reduce some level of climate-induced risks, enhance business continuity, and pursue sustainable economic development.

5. QUANTIFYING MACROECONOMIC DYNAMICS, CLIMATE CHANGE, AND FISCAL RISKS

5.1 Climate change tends to affect different drivers of economic growth by creating vulnerabilities in the economy. A persistent rise in temperature, changes in precipitation patterns and more volatile weather events adversely affect labour productivity, slowing capital accumulation, and damaging human health (Kahn et al., 2021). Extreme weather events result in landslides, which create production input shortages, infrastructure degradation, deterioration in population health, and human life losses.

5.2 Gradual transformation of the environment results in land degradation with the reduction in agricultural potential, scarce land resources in some regions, faster depreciation of machinery equipment, reallocation of resources from productive capital to adaptation investment healthcare issues, reduced human performance due to higher temperature, resource reallocation to new technologies, loss of hours worked due to extreme temperatures, employment and social impacts of climate change policies, and resource reallocation (European Commission, 2020).

5.3 On the other side, the direct effects of climate change on public finances also materialize via increased public spending on subsidies, relief measures, and repairing or replacing damaged infrastructure. On the other hand, its indirect impacts occur via disruption of economic activity after a major disaster and materializing contingent liabilities affecting distressed (non-) financial public and private institutions.

5.4 The full-fledged climate change fiscal risk analysis should include long-term fiscal sustainability considerations. Ideally, climate change affects the ability of a government to sustain its spending and tax in the long run without threatening government solvency or defaulting on any of its liabilities.

5.5 This report has identified and modelled the scenarios to quantify the impact of climate change on the fiscal position of the government. This allows the fiscal authorities to establish a view on the scale of adjustment that might be needed under various climate change scenarios. The development of the approach starts with the design of a simplified long-run framework that is then gradually developed and refined. The analysis starts with developing the simple long-run fiscal baseline framework which means an assumption of no change in climate over time as well as public finance structure.

5.6 The report moves towards a 'stringent mitigation scenario', in the next phase. It incorporates high government spending in the form of investment in environment-friendly projects for six years, i.e., FY2025 to FY2030 to fulfill its international commitment of a 50 percent reduction in emissions wherein 15 percent drop below the baseline from the country's resources, and an additional 35 percent drop below the baseline subject to the international financial support; and an 'improved revenues' where the government would raise additional revenues due to improved governance measures or policy change to encourage the masses across the economy to play their part in reducing emissions.

5.7 The potential fiscal impact of climate-change-related natural disasters has also been analyzed. When natural disasters, such as flooding or drought, materialize, they tend to reduce

fiscal revenue due to lower tax collection resulting from the subdued economic activity while requiring higher government spending for post-disaster recovery and rehabilitation efforts. The potential impact is projected by analyzing the historical pattern of natural disasters, projected vulnerabilities, and estimated associated economic costs and government expenditures. Two natural disaster shocks are assumed to hit the country in FY2030 and FY2040, under three variant situations: without maintaining NDF, with NDF, and with NDF accompanied by improved tax collections.

5.8 NDF is a fiscal buffer suggested to be established by the federal government, with the support of organizations and the community, to provide assistance and support in the aftermath of natural disasters. These funds are typically used for emergency response efforts, including search and rescue operations, medical assistance, shelter, food, and rebuilding infrastructure. The purpose of this fund is to ensure that resources are readily available to respond efficiently to the needs of individuals and communities affected by crises.

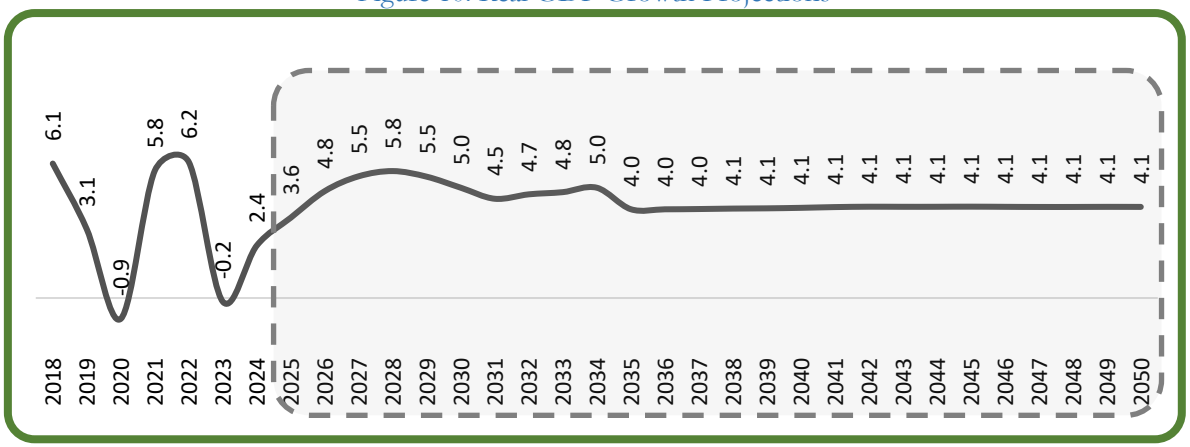
5.9 Funding for such NDF can come from various sources, including government allocations, donations from individuals and businesses, international aid, and insurance payouts. These funds should be managed and administered by the relevant government organization, in collaboration with local authorities and community stakeholders. Establishing and maintaining NDF are essential components of disaster preparedness and resilience-building efforts, as they help ensure that communities are better equipped to respond to and recover from natural disasters when they occur. Additionally, they contribute to the overall stability and safety of communities, by providing a financial safety net in times of crisis.

BASELINE SCENARIO

5.10 In the context of the baseline scenario, the evolution of the fiscal situation unfolds within the confines of current policies and without the influence of climate change. This scenario is characterized by specific parameters that collectively shape its trajectory. Notably, the assumed population growth rate is set at 2.5 percent. Additionally, the labour share and the labour force participation rate are held constant at their current level of 60 percent. Within this framework, other critical factors contributing to the fiscal landscape are maintained at specific values: the depreciation rate is set at 4 percent, the growth in the human capital index at 0.7 percent, and the total factor productivity at 0.9 percent. Importantly, these assumptions are not arbitrary, instead, these are aligned with historical long-term trends and recent macroeconomic realities. This alignment is integral as these assumptions are anticipated to persist as far as the baseline is concerned.

5.11 The Solow Swan Growth model is employed to project long-term real GDP growth, using the production function of the form $Yt = A(t)K(t)^{1-\beta}\,(h(t)L(t))^{\beta}$. The economy of Pakistan witnessed boom-bust cycles, rendering the growth path volatile and unsustainable. However, since FY1995, the average GDP growth rate has been recorded at 4.1 percent. The model projects real GDP to grow at 3.6 percent in FY2025 (Figure 10). GDP growth exhibits a positive trend indicating a sustained recovery and expansion of economic activities over the medium term and stability over the long term.

Figure 10: Real GDP Growth Projections



5.12 The baseline projections for nominal GDP are derived by examining its decomposition, specifically considering the growth in real GDP and the GDP deflator. The GDP deflator and CPI inflation are assumed to stabilize over the medium term. The nominal GDP is anticipated to exhibit substantial growth of 26.4 percent in FY2024 followed by a gradual stabilization reaching 13.4 percent in FY2029. This suggests a sustained yet moderate pace of economic expansion over the long term.

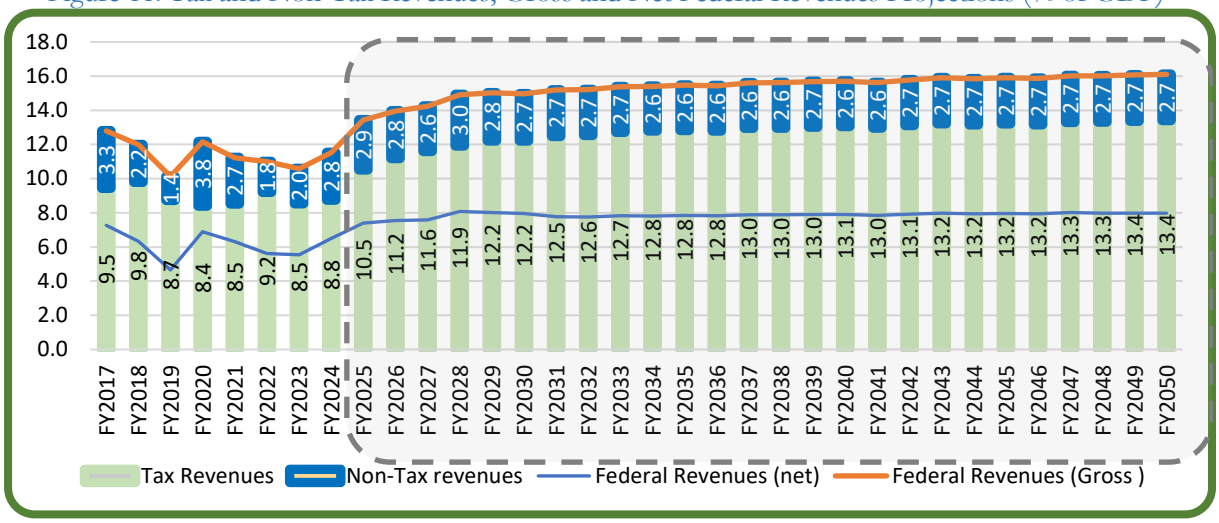
5.13 A careful approach is adopted to forecast key economic indicators in the projection process. Firstly, the agriculture value added is thoughtfully projected by segregating livestock and non-livestock components, encompassing crops, fishery, and forestry. This breakdown enables a detailed understanding of the diverse elements contributing to agricultural growth. Simultaneously, the estimation and forecasting of large-scale manufacturing employ a standard theoretical yet data-driven methodology, ensuring reliability and accuracy in predictions. Additionally, the projections extend to critical aspects such as imports, as well as the demand for High-Speed Diesel (HSD) and Motor Spirit (MS), providing a holistic view of economic dynamics.

5.14 Given the significance and robustness required in these forecasts, the Autoregressive Distributed Lag Model emerges as a predominant tool for predicting most macroeconomic aggregates. This model, recognized for its relevance and rigour, offers a comprehensive framework for forecasting, contributing to the overall coherence of the projections. Where precision demands a microeconomic perspective, specific parameters of interest are utilized to calibrate the long-run economic and fiscal paths, adding depth to the forecasting methodology. This strategic blend of macroeconomic and microeconomic approaches ensures a cohesive and thorough analysis, enhancing the reliability of the projections across a spectrum of economic indicators.

5.15 Long-term fiscal projections necessitate a comprehensive approach, relying on macroeconomic assumptions and forecasts as foundational elements. The estimation of both direct and indirect tax revenues entails the application of rigorous econometric methods. Within this framework, various revenue streams, including direct tax, customs duty, sales tax from imports and domestic production, as well as the Federal Excise Duty, are forecasted. These individual forecasts are methodically aggregated using the identity equation, providing a cohesive and systemic foundation. The resulting projections are integrated into an Excel-based analytical tool to integrate pieces of the model, enhancing the precision and reliability of the fiscal outlook. This

process ensures a robust and coherent basis for long-term fiscal planning and decision-making. Figure 11 shows a steady rise in FBR Revenues as a percentage of GDP, in the baseline scenario, from 8.8 percent in FY2024 to 13.4 percent in FY2050.

Figure 11: Tax and Non-Tax Revenues, Gross and Net Federal Revenues Projections (% of GDP)



5.16 The profit of the State Bank of Pakistan (SBP profit) and petroleum levy (PL) are significant contributors to non-tax revenues. The forecasting of SBP profit hinges on the call money rate as the benchmark variable, ensuring a methodical approach to projection. Meanwhile, the calculation of PL follows a distinct path, governed by existing policy that limits its application to diesel and petrol. This process starts with the demand forecasting of diesel and petrol. Another facet of non-tax revenues involves royalties on Oil/Gas, Gas Infrastructure Development Cess, Natural Gas Development Surcharge, and Windfall Levy against Crude Oil. These items, integral to the National Finance Commission (NFC) Award formula, are interconnected due to their relevance to the upstream petroleum sector and their relatively modest amounts. Consequently, they are amalgamated within the framework for a unified forecast over the specified period. Furthermore, the remaining items include Mark-up on credit to Provinces, PSEs and others, Dividends, Surplus Profit of Regulatory authorities including PTA, Defence Receipts, Passport Fee, Discount retained on Crude Oil, Petroleum Levy on LPG and Receipts of ICT Administration are forecasted separately given the historical data and their structural understanding.

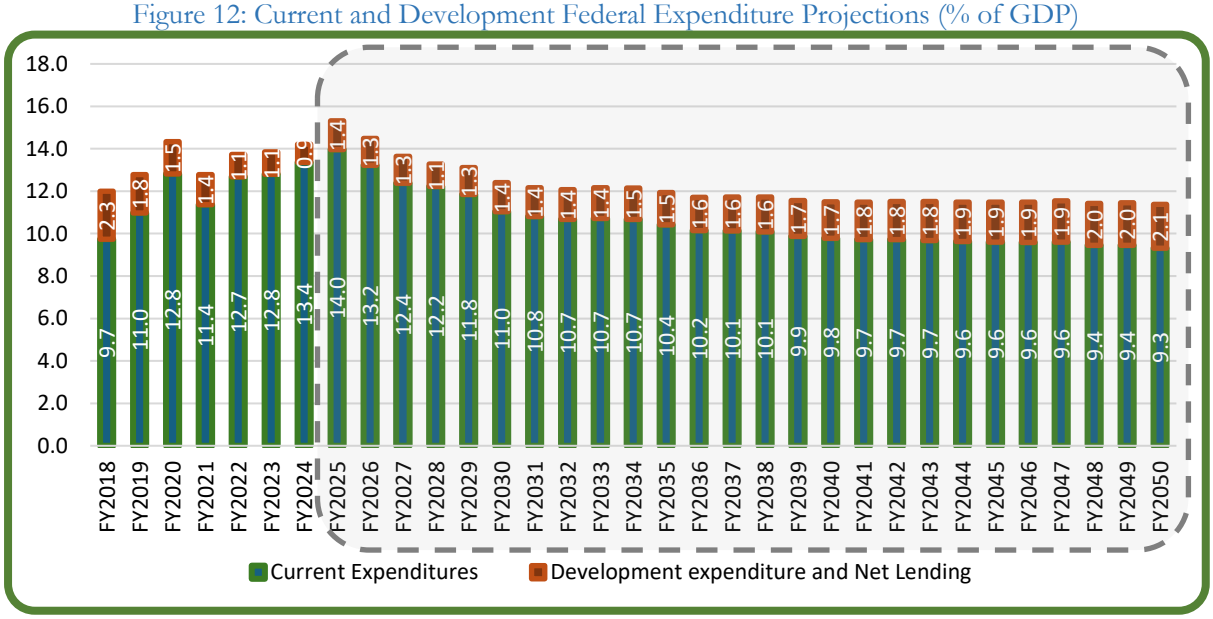
5.17 In Figure 11, the depiction of non-tax revenues as a percentage of GDP reveals a trajectory starting at 2.8 percent in FY2024 while converging to 2.7 percent by FY2050. Initially, this might seem to reflect a conservative outlook on non-tax revenues. However, a closer examination clarifies this perspective by considering the predominant contributors, namely PL and SBP profit. It is critical to acknowledge that the declining petroleum reserves in the country are expected to impact the share of concerned non-tax revenue receipts as a percentage of GDP. Nevertheless, any shifts in policy or the emergence of new avenues for the collection of non-tax revenues have the potential to alter this trajectory, potentially changing the overall share of non-tax revenues.

5.18 Gross revenue receipts, combining tax and non-tax revenues over the forecasting period, constitute a critical fiscal metric. Gross revenue receipts start at 11.5 percent of GDP in FY2023 and are projected to rise to 16.1 percent by FY2050 (Figure 11). This upward trajectory suggests a substantial growth in the overall fiscal inflows over the forecasting period. Following this, it

becomes instrumental to apply the resource distribution formula under the NFC award. Through this formula, the net revenue receipts of the Federal Government are meticulously calculated. In FY2050, these net receipts are computed at 8.0 percent of GDP.

5.19 Within the scope of current expenditures, distinct components contribute to the fiscal landscape, going beyond mere markup payments. Noteworthy inclusions comprise Defence Affairs and Services, Pension, Running of Civil Government, as well as Subsidies and Grants to Provinces and Others. Accurate forecasting of these components necessitates the employment of various assumptions and forecasting methods, considering the inherent limitations of available data. Furthermore, total development expenditures (PSDP and Development grants to provinces) and net lending (to provinces and others) are assumed to follow the historical average path. Figure 12 depicts total federal expenditures (current and development expenditures separately) which are projected to reach 11.4 percent of GDP in FY2050.

Figure 12: Current and Development Federal Expenditure Projections (% of GDP)



5.20 Fiscal consolidation requires federal and provincial governments to reduce fiscal deficit and stem the debt accumulation. The baseline scenario outlines a strategic approach wherein provincial governments are envisaged to maintain an overall fiscal surplus in the long run, aligned with the existing fiscal strategy. Concurrently, the provincial balance remains consistently positive, favouring the consolidated primary balance, which fluctuates around breakeven throughout the period. However, the Federal Fiscal Balance and Overall Fiscal Balance depict persistent deficits but remain within sustainable limits in the long term. Notably, the overall fiscal deficit is expected to decrease from 7.8 percent of GDP in FY2023 to 2.9 percent in FY2050, indicating a trend towards fiscal consolidation.

5.21 The Federal Fiscal Deficit is expected to follow an overall reduction path, shrinking from 7.9 percent of GDP in FY2024 to 3.4 percent in FY2050. As such, the strategic alignment of cohesive efforts by the federal and provincial governments toward fiscal consolidation would be an overarching goal, to remain within the quantitative limits defined in the FRDL Act (2005, amended 2022). Accordingly, the Total Debt of the Government will remain within sustainable limits and decrease to 49.1 percent by FY2050.

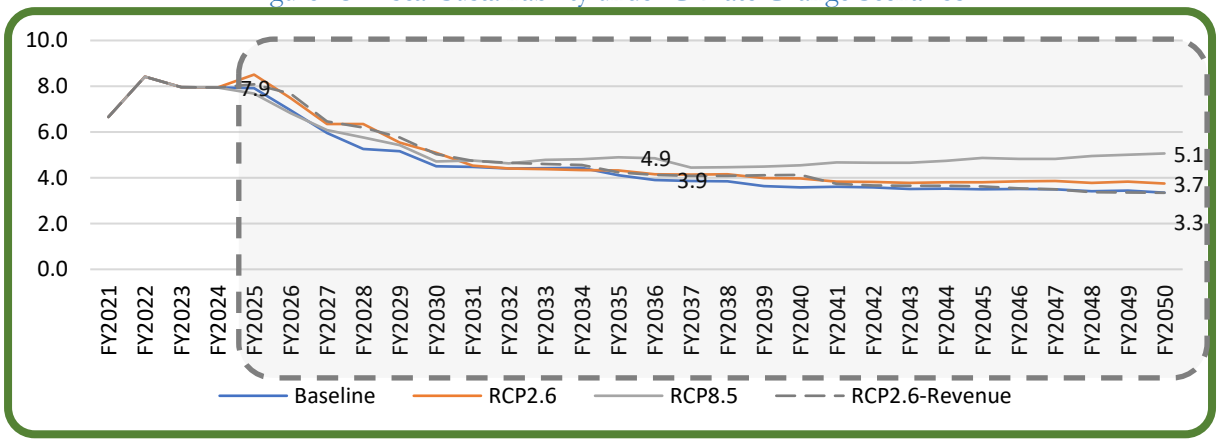
6. FISCAL RISK ANALYSIS UNDER DIFFERENT CLIMATE CHANGE SCENARIOS

6.1 The Federal Fiscal Balance presents varying degrees of fiscal risk across different scenarios, each with certain implications for the government's fiscal sustainability. Without accounting for climate change and in the absence of natural disasters in the baseline scenario, the deficit remains relatively stable over the years. However, under different scenarios related to climate change and natural disasters, the fiscal deficit gradually widens, reflecting increased fiscal strain attributed to climate-related challenges. The inclusion of NDF slightly moderates the deficits, albeit not entirely averting them, highlighting the persistent vulnerability to unforeseen events. Notably, the integration of improvement in tax collections due to governance and other measures alongside NDF shows potential for mitigating fiscal risks in the face of climate change and disasters, though the deficit remains considerable. These findings underscore the imperative for proactive fiscal management strategies to address the evolving risks posed by climate change and natural disasters on federal finances.

Fiscal Risk Analysis: Federal Fiscal Deficit under Climate Change Scenarios

6.2 The Federal Fiscal Deficit starting from 7.9 percent of GDP in FY2024, varies differently under all scenarios. For instance, under the RCP2.6 scenario (stringent mitigation), it starts increasing by 0.6 percent of GDP above the baseline of 8.5 percent in FY2025, following a higher trajectory with larger differences during the years of green investment. In the long run, this green investment to mitigate climate change leads to economic and environmental benefits that translate into increased GDP and an improved fiscal outlook. However, under the RCP8.5 scenario, the federal fiscal deficit in 2050 is higher amounting to 1.7 percent of GDP above the baseline of 3.4 percent of GDP. It points to the fact that climate change raises the risk for fiscal sustainability in the long term. It can also be expected that climate change may show more vulnerability to the fiscal stream toward the end of this century with a widening difference between RCP2.6 and RCP8.5. Moreover, it is important to note that with stringent climate change mitigation, if revenues are improved compared to the baseline scenario due to better governance or increasing the tax base, fiscal sustainability can be better ensured. As such, it cautions to deal with mitigating the risk related to climate change amicably and diligently.

Figure 13: Fiscal Sustainability under Climate Change Scenarios

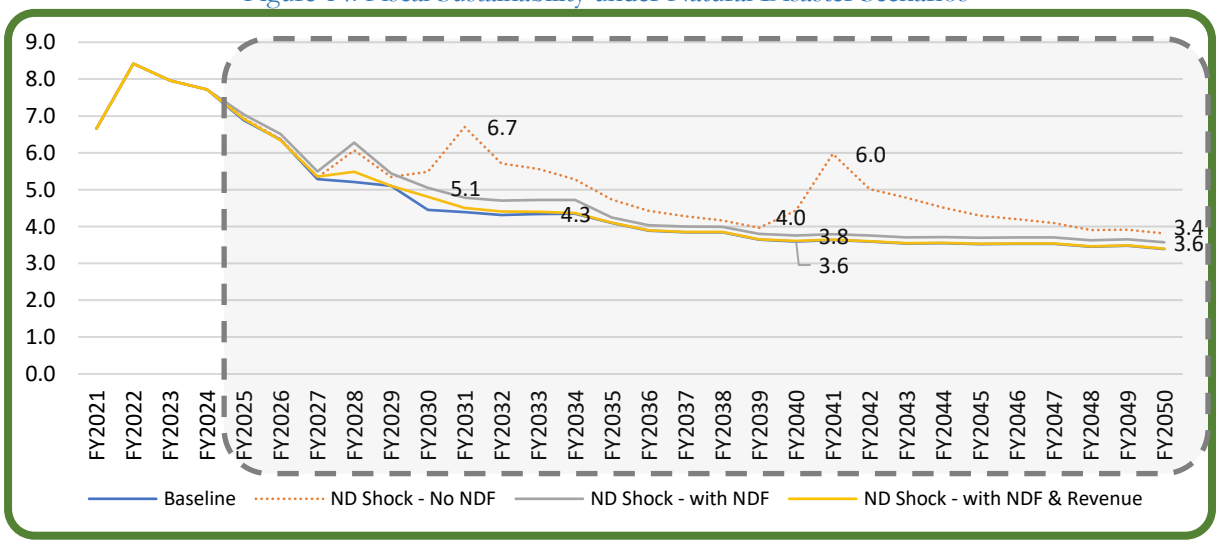


6.3 The federal fiscal deficit projections across different natural disaster scenarios also highlight significant fiscal risks and implications for fiscal sustainability. Under the "ND Shock - No NDF"[2] scenario, the fiscal deficit initially mirrors the baseline in FY2024 at 7.9 percent of GDP, but it reaches 5.5 percent in FY2030 compared to 4.4 percent under the baseline, indicating increased fiscal pressure due to natural disasters. The deficit then reduces gradually to 4.3 percent by FY2045 but remains above the baseline. This persistent higher deficit suggests substantial long-term fiscal risk, reflecting the need for additional government expenditure to cope with natural disaster impacts in the absence of a dedicated disaster fund. The scenario underscores the challenges of maintaining fiscal sustainability without proactive disaster risk management strategies, as the government faces increased expenditure to address disaster recovery and resilience-building without a specific financial buffer.

6.4 Conversely, the "ND Shock - with NDF"[3] and "ND Shock - with NDF & Revenue"[4] scenarios demonstrate more favourable fiscal outcomes. With an established NDF, the fiscal deficit remains relatively contained, peaking at 5.1 percent of GDP in FY2030 and gradually declining to 3.7 percent by FY2045, aligning closely with the baseline by FY2050. This scenario indicates that a dedicated fund can mitigate fiscal risks by providing financial resources for disaster response and recovery, thereby limiting the impact on the overall fiscal deficit.

6.5 The "ND Shock - with NDF & Revenue" scenario, which includes both the fund and additional revenue measures, shows even more robust fiscal sustainability. The fiscal deficit peaks at 4.8 percent of GDP in FY2030 and aligns closely with the baseline, thereafter, reaching 3.4 percent by FY2050. This suggests that combining a disaster fund with revenue-generating strategies can effectively enhance fiscal resilience, ensuring that natural disasters do not undermine long-term fiscal solvency and sustainability.

Figure 14: Fiscal Sustainability under Natural Disaster Scenarios



[2] This scenario refers to occurrence of natural disaster with no natural disaster fund available.
[3] This scenario refers to occurrence of natural disaster with a natural disaster fund available, which can be used for relief and rebuilding.
[4] This scenario refers to occurrence of natural disaster with a natural disaster fund available, which can be used for relief and rebuilding, while government remains active to mobilize revenues.

Table 5: Fiscal Sustainability Analysis: Federal Fiscal Deficit

Scenario	FY2024	FY2025	FY2030	FY2035	FY2045	FY2050
Baseline	7.9	7.9	4.5	4.1	3.5	3.4
Climate Change Scenarios						
RCP2.6	7.9	8.5	5.1	4.3	3.8	3.7
RCP8.5	7.9	7.9	4.7	4.9	4.9	5.1
RCP2.6-Revenue	7.9	8.1	5.0	4.2	3.6	3.3
Natural Disaster Scenarios						
ND Shock - No NDF	7.9	8.0	5.5	4.7	4.3	3.8
ND Shock - with NDF	7.9	8.1	5.1	4.3	3.7	3.5
ND Shock - with NDF & Revenue	7.9	8.0	4.9	4.1	3.5	3.4

6.6 There can be two possible explanations for this. First, there is a qualitative difference between both scenarios, as funds are more easily and readily available without any time lag to deal with the emergent needs of natural disasters if there is NDF. It may be noted that the quantum of funds, every year, is found using probability based on historical evidence. As such, 1/3rd of the average yearly damages (of USD 2 billion) is supposed to be borne by the federal government, partially through reallocations and mostly through dedicated expenditures to be invested in NDF.

6.7 The quantification of fiscal risk due to natural disaster shock, where there is NDF and measures are taken to improve revenues slightly, is a little more promising than the baseline scenario, with the fiscal deficit reaching 3.4 percent of GDP in FY2050. Second, the differences in fiscal deficit are more visible in the years of natural disaster shock which go down as the expenditure requirements for rehabilitation and infrastructure damages are diluted. However, it further necessitates the availability of NDF with an improved revenue structure to minimize the risk arising from natural disasters.

Table 6: Comparison of Federal Fiscal Deficit under Natural Disaster Scenarios

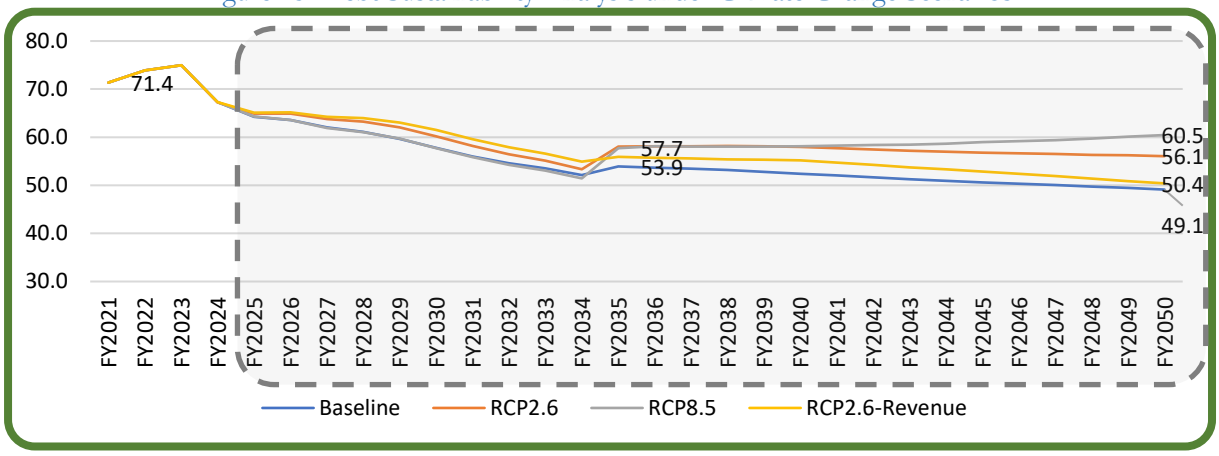
	Years\Scenario	Baseline	ND Shock – No NDF	ND Shock - with NDF	ND Shock – With NDF and Revenue
First ND Shock	**FY2030**	**4.4**	**5.5**	**5.1**	**4.8**
	FY2031	4.4	6.7	4.8	4.5
	FY2032	-4.3	5.7	4.7	4.4
	FY2033	4.3	5.6	4.7	4.4
	FY2034	4.3	5.3	4.7	4.4
	FY2035	4.1	4.7	4.2	4.1
Second ND Shock	**FY2040**	**3.6**	**4.4**	**3.8**	**3.6**
	FY2041	3.6	6.0	3.8	3.6
	FY2042	3.6	5.0	3.8	3.6
	FY2043	3.5	4.8	3.7	3.5
	FY2044	3.5	4.5	3.7	3.6
	FY2045	3.5	4.3	3.7	3.5

6.8 The Fiscal deficit demonstrates varying levels of fiscal risk across different scenarios, reflecting the potential impact of climate change and natural disasters on federal finances. Incorporating NDF helps mitigate deficits to some extent, but they remain significant. Furthermore, the inclusion of improved tax collections alongside NDF in certain instances shows promise in alleviating fiscal risks, resulting in slight improvements in deficit levels. Nonetheless, deficits remain considerable across all scenarios, highlighting the urgent need for proactive fiscal management strategies to address the evolving risks posed by climate change and natural disasters.

Analysis of the Public Debt

6.9 The analysis of Public Debt under different scenarios reveals significant implications for public debt sustainability. In the baseline scenario, public debt as a percentage of GDP ranges from 67.4 percent in FY2024 to 49.1 percent in FY 2050 (Figure 15), indicating a stable fiscal trajectory under the stable macroeconomic and fiscal environment. However, under climate change scenarios, it started increasing compared to the baseline wherein the risk increases as time passes. It escalates by 7 percentage points in FY2050 under RCP2.6 and 11.4 percentage points under RCP8.5 scenario. It reflects the increased fiscal burden attributed to climate-related challenges, which leads to higher public debt.

Figure 15: Debt Sustainability Analysis under Climate Change Scenarios



6.10 The integration of NDF helps mitigate the rise in debt ratios, yet they remain elevated compared to the baseline scenario. The more sustainable option is to improve the government revenues along with the formation of a dedicated fund. As such, the total public debt stands at 58.3 percent of GDP in FY2050 in the absence of NDF, 55.1 percent of GDP in the presence of NDF, and 54.1 percent if some measures are taken to improve revenue mobilization alongside the availability of NDF (Figure 16).

Figure 16: Debt Sustainability Analysis under Natural Disaster Scenarios

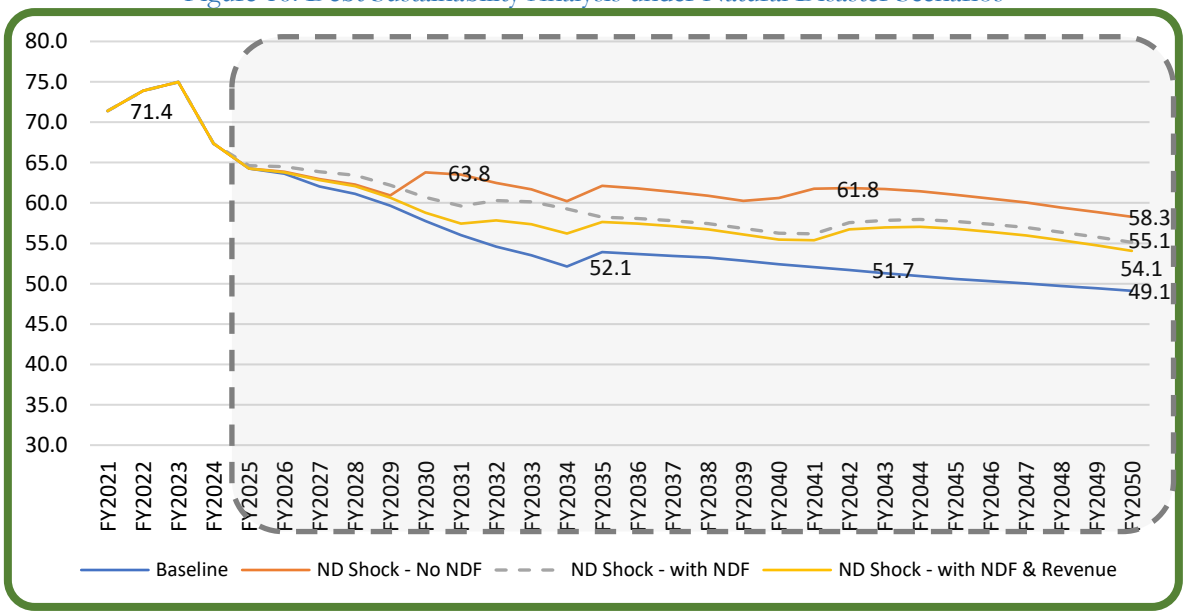


Table 7: Total Debt of the Government Under Climate Change and Natural Disaster Scenarios

Scenario	FY2024	FY2025	FY2030	FY2035	FY2045	FY2050
Baseline	67.4	64.7	57.8	53.9	50.6	49.1
Climate Change Scenarios						
RCP2.6	67.4	65.5	60.2	58.0	56.8	56.1
RCP8.5	67.4	64.7	57.7	57.7	59.0	60.5
RCP2.6-Revenue	67.4	65.9	61.5	55.9	52.9	50.4
Natural Disaster Scenarios						
ND Shock - No NDF	67.4	64.7	63.8	62.1	61.0	58.3
ND Shock - with NDF	67.4	65.0	60.7	58.2	57.7	55.1
ND Shock - with NDF & Revenue	67.4	64.7	58.8	57.6	56.8	54.1

6.11 In some years, the difference in public debt ratios between scenarios with and without improved taxes can be notable, emphasizing their role in fiscal risk reduction. Overall, these findings underscore the importance of proactive fiscal policies to manage public debt amidst the evolving risks posed by climate change and natural disasters.

7. FISCAL RISK MITIGATION ASSOCIATED WITH CLIMATE CHANGE SCENARIOS

7.1 To effectively mitigate the fiscal risks associated with climate change and natural disasters, there is a need to adopt a multifaceted strategy that incorporates both short-term and long-term measures. This strategy should focus on enhancing fiscal sustainability, improving adaptive capacities, and fostering economic resilience.

7.2 Priority should be given to the establishment and continuous funding of a dedicated NDF. This fund would serve as a financial buffer to absorb the immediate fiscal impacts of disasters and facilitate rapid response and recovery efforts. By allocating a fixed percentage of annual revenues to this fund, based on historical damage assessments and the probability of occurrence of natural disasters, it can be ensured that sufficient resources are available without compromising other fiscal obligations.

7.3 Incorporating improved taxes and incentives into the fiscal framework can significantly contribute to risk mitigation. The improved tax revenues can be earmarked for financing green infrastructure projects, renewable energy initiatives, and other climate resilience programs. This approach not only helps in managing fiscal deficits but also aligns with sustainable development goals.

7.4 Moreover, enhancing revenue streams through improved tax collection mechanisms is critical. The government should invest in modernizing tax administration, employing technology to reduce leakages and increase efficiency. Strengthening governance around tax collection can broaden the tax base and improve compliance rates, providing the government with greater fiscal capacity to address climate-related challenges and disaster preparedness.

7.5 The government must also focus on economic diversification to strengthen fiscal resilience. Supporting sectors less vulnerable to climate impacts and promoting new industries that contribute to a greener economy makes the fiscal base more robust and less susceptible to climate-related disruptions. Investments in research and development for sustainable technologies can also spur economic growth, create jobs, and reduce dependency on sectors prone to climate risks.

7.6 Pakistan must vigorously advocate for international climate justice by promoting equitable distribution of emission reduction commitments under the Paris Agreement. This entails lobbying for binding international agreements that mandate higher greenhouse gas emitters to undertake more substantial reductions, aligned with the Agreement's imperative to constrain global temperature rise to below 2°C and strive for 1.5°C. Ensuring that major emitters shoulder greater responsibility can effectively mitigate the disproportionate impact on nations such as Pakistan. Furthermore, Pakistan should actively pursue increased financial assistance and technological support from developed countries, as stipulated in the Paris Agreement's climate finance provisions. These resources are indispensable for bolstering climate adaptation and mitigation initiatives in developing nations.

7.7 On the domestic front, Pakistan should fortify its climate policies by integrating principles of climate justice into national frameworks, harmonizing with its Nationally Determined Contributions (NDCs) under the Paris Agreement. This approach guarantees prioritized assistance

to the most vulnerable population and ensures an equitable allocation of resources, safeguarding communities most susceptible to climate change impacts. Moreover, cultivating public awareness and engagement through educational campaigns is paramount. By fostering awareness about climate justice, Pakistan can empower its citizens to actively participate in climate decision-making processes, thereby nurturing a culture of accountability and collective responsibility toward achieving inclusive and effective climate action.

7.8 The government should engage in continuous risk assessment and scenario planning to stay ahead of potential fiscal challenges. This involves regularly updating climate and disaster risk models to reflect new data and trends and adjusting fiscal policies accordingly. Collaboration with international bodies, such as the IMF and World Bank, can also provide valuable insights and financial support in implementing these strategies.

7.9 By implementing these measures, the government can enhance its fiscal stability while effectively managing the risks posed by climate change and natural disasters, ultimately securing a more sustainable economic future.

Discrete Fiscal Risks (from SOEs and PPPs) related to Climate Change in Pakistan

8. STATE OWNED ENTERPRISES

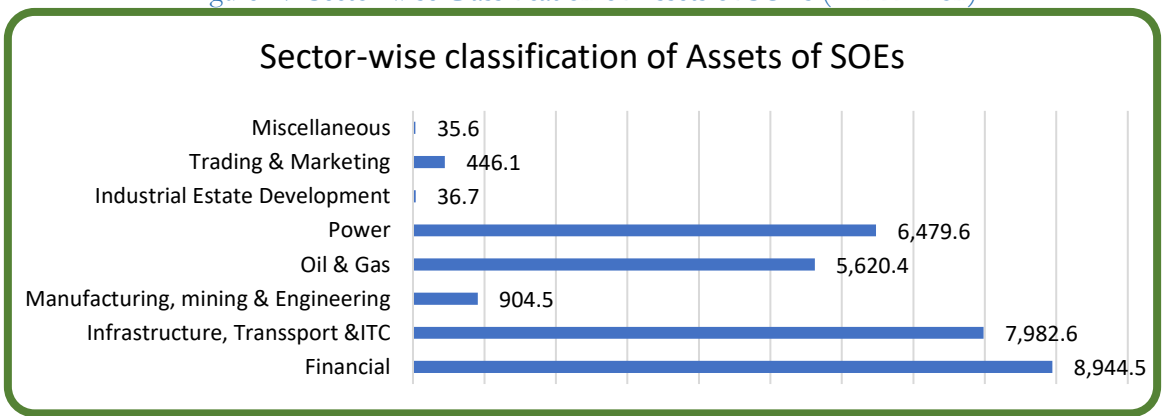
8.1 Pakistan's state-owned enterprises (SOEs) are pivotal for socio-economic development by providing essential goods and services to the public in areas where private sector investment was hindered due to various factors, such as significant capital requirements, limited profitability, trade restrictions, market size constraints, and a lack of competitive market dynamics. However, the financing requirements of SOEs and the interplay between the Federal government and its SOEs render fiscal accounts at risk.

8.2 The SOEs can be broadly categorized into primary industries, manufacturing, infrastructure, and services. Primary industries include mining and oil & gas extraction, which are crucial for their natural resource extraction capabilities. The manufacturing, mining and engineering SOEs encompass activities, which are pivotal for producing consumer and capital goods. Infrastructure SOEs provide services such as transport & ITC (Information, Technology, and Communication), power, and industrial estate development, critical for supporting economic activities and connectivity. Finally, the services SOEs cover financial services, trading & marketing, and other miscellaneous activities facilitating commerce and financial transactions. Together these sectors form the backbone of a dynamic economic landscape, each having the potential to contribute to growth and development.

8.1 Overview of SOEs' Fiscal Risk

8.3 During FY2022, 88 commercial SOEs generated revenues of approximately PKR 10,366.26 billion whereas their assets were valued at PKR 30,450.03 billion. However, the same fiscal year saw the Government of Pakistan extending assistance to SOEs through domestic loans, subsidies, and equity injections, amounting to PKR 97.67 billion, PKR 78.98 billion, and PKR 2.16 billion, respectively. This distribution of assets and the extent of government assistance highlight the fiscal risks associated with SOEs, as presented in Figure 17.

Figure 17: Sector-wise Classification of Assets of SOEs (PKR Billion)



Source: Federal Footprint State Owned Enterprises (SOEs) Consolidated Report FY2020-22, Finance Division

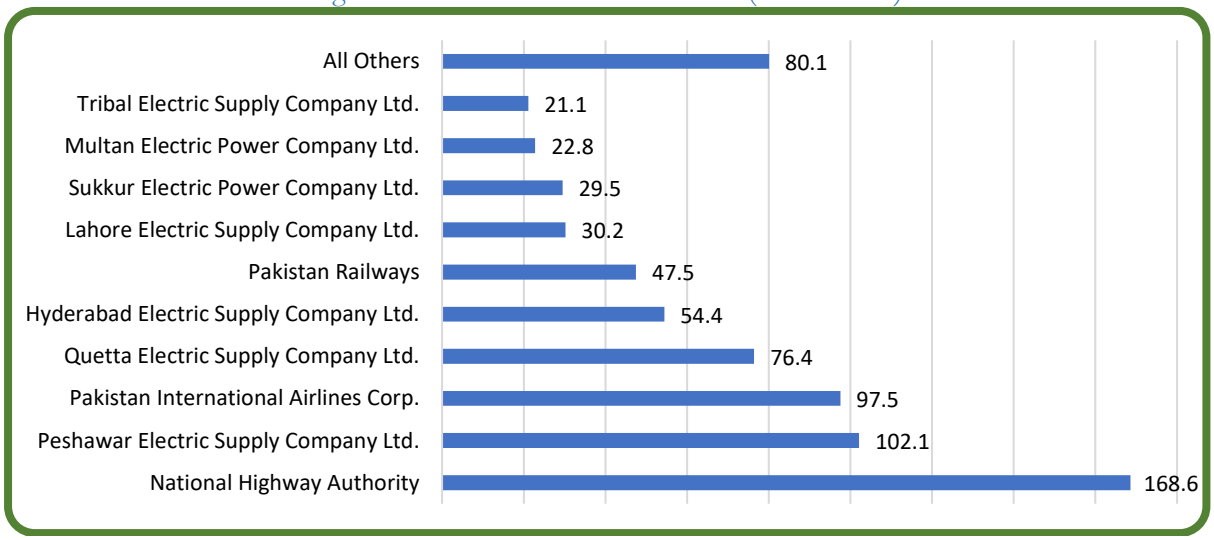
8.4 The financial SOEs' risk stands at 29.4 percent of the sector's assets in an indirect way through the investments made in other sectors, which will be directly affected through physical assets exposed to extreme weather days and the transition of the economy from fossil fuels to renewable energy sources. Specifically, the Infrastructure, Transport, and ICT sectors, with 26.2 percent of total assets, face direct physical susceptibility in the assets because of climate change

and transitional risks emanating from the changes in technology, such as the replacement of fossil-fueled cars by electric vehicles. Increased temperatures impacting efficiency and a change in the regulations, which increasingly favour green energy, put the Power sector, with 21 percent of assets, at physical and transition risk. At the same time, it offers the incentive to invest in renewable sources. The Oil & Gas sector having 18.5 percent of all SOEs' assets, is exposed to depreciation on account of clean energy policies, and operation disturbances on account of extreme weather. Meanwhile, the Manufacturing, Mining & Engineering sector, having just 3 percent of assets, deploys natural resources and energy and is exposed to regulation change with a sustainability emphasis.

8.5 Smaller sectors' SOEs including Industrial Estate Development, Trading & Marketing, and Miscellaneous, which hold 5 percent of total assets, can still fall victim to local market risks due to the physical impacts of climate and market demand changes. This demonstrates areas of considerable economic activity and underscores the potential fiscal risk under climate change scenarios that move towards strategic planning including diversification, infrastructure investment, and alignment with global climate objectives to contain possible losses and leverage new opportunities.

8.6 In FY2022, SOEs encountered substantial losses across multiple sectors. Infrastructure, Transport & ICT, Power, and Miscellaneous sectors suffered losses of PKR 294.5 billion, PKR 320.778 billion, and PKR 0.517 billion, respectively (Figure 18). Notably, the top ten loss-making SOEs, including entities like the National Highway Authority, Pakistan Railways, and electricity distribution companies (DISCOs), highlight inefficiencies in Infrastructure and Power sectors. Roads and Highways, with assets worth PKR 5,892.2 billion, and DISCOs, holding assets of PKR 2,733.5 billion, emerge as major subsectors carrying substantial fiscal risks. It is critical to note that Road and Highways alone booked a loss of more than PKR 168.4 billion in FY2022 whereas it was PKR 375.6 billion for DISCOs. As such, the total losses of SOEs, during this year, have been PKR 730.3 billion. These losses point to systemic issues such as operational inefficiencies, financial mismanagement, and infrastructure challenges, necessitating urgent reforms to ensure fiscal solvency, and sustainable development in Pakistan.

Figure 18: Losses of SOEs in FY2022 (PKR Billion)



Source: Federal Footprint State Owned Enterprises (SOEs) Consolidated Report FY2020-22, Finance Division

Public Sector Obligations (PSO) Framework

8.7 The Public Sector Obligations (PSO) framework, as outlined in the State-Owned Enterprises (Governance and Operations) Act, 2023, is important for the twin roles of SOEs, namely the commercial rationality, and socio-economic obligations of the government. The Act outlines and defines the responsibilities of SOEs, including their capacity to engage in public service delivery without negatively impacting their ability to remain financially responsible and maintain the competency of their function. Further, it provides flexibility to the Federal Government to prescribe PSOs, which may conflict with the SOEs' core goal of profitability, thus embracing the social role of SOEs for growth and development efficiency as well as considering other social interests.

8.8 The Act envisions operational restructuring, privatization, or divestment to address the inefficiencies, such as system losses in the energy sector, highlighting fiscal risk alongside a systematic debt management plan. To effectively manage fiscal risks, it is important to focus on external sources such as quasi-fiscal activities and SOEs' inefficiencies, while frequently shifting attention to the solutions outlined in the legislation. Minimizing fiscal risks, therefore, requires actions to address inefficiencies in SOEs since the fiscal risks arise from losses in the physical system and expenditure controls, lack of approvals for expenditures, and poor governance that compromises the performance of SOEs.

8.2 SOEs' Fiscal Risk Assessment

8.9 Table 8 emphasizes the fiscal risk exposure of SOEs in Pakistan. Severe weather conditions due to climate change led to shifts in water availability and energy generation, while major precipitation events, extreme temperatures, and wildfires disrupted transportation infrastructure and transmission systems. SOEs like GENCOs, WAPDA, DISCOs, and other power sector entities face significant exposure. Such risks include hydropower and thermal plant risks, transmission risks and infrastructure risks, which all require strategic management based on risks due to climatic change. However, the implication of these climatic conditions extends far beyond having a financial impact, as evident from the table highlighting various socio-economic effects mechanized through climate change on the infrastructure of Pakistan, along with the public services. For instance, interrupted energy supply hinders access to basic public services such as health facilities and schools. Addressing these issues requires a strategic management plan that integrates climate change considerations and enhances infrastructure and community readiness.

8.10 SOEs play a vital role in the country's economy. Their vulnerabilities can strain public finances through increased expenditure on repairs, subsidies, and compensations for service disruptions. A mitigation strategy is imperative to mitigate these risks. It may involve comprehensive risk assessments, investment in climate-resilient infrastructure, adaptive management practices, and integrating climate change into fiscal planning and policy frameworks.

Table 8:Climate Change Risk Exposure of SOEs at sectoral/sub-sectoral Level

Climate Impact	Sectors	Exposed SOEs Sector/Sub-Sector	Exposure
Implications on water flow in rivers and lower reservoirs	**Energy:** Hydropower plants (low water levels and flows) Thermal and Nuclear Power Plants due to limits on cooling capacity **Water:** Reduced availability of water for domestic and agricultural use	GENCOs, WAPDA CPPA	SOE Assets (GENCOs): PKR 2,190.3 billion (3.3% of GDP) Capacity Charges (CC) WAPDA Hydel (PPA/EPA): PKR 100.2 billion (0.12% of GDP; FY2023) CC (Thermal): (PPA/EPA): PKR 678.3 billion (0.8% of GDP; FY2023)
Events of precipitation, floods, landslides, and mudslides	**Energy:** Changes in rainfall patterns can lead to compromised hydropower generation, Transmission system (Power, gas, and oil) damages **Transportation:** Infrastructure (Roads and Railways) damages	GENCOs, WAPDA DISCOs and Transmission (Power Sector) The transmission system of two Sui Gas Companies and oil marketing companies Roads and Highways (NHA), Pakistan Railways	GENCO, WAPDA Assets: PKR 2,190.292 billion (3.3% of GDP) Capacity Charges (CC) WAPDA Hydel (PPA/EPA): PKR 100.2 billion (0.12% of GDP; FY2023) CC (Thermal): (PPA/EPA): PKR 678.3 billion (0.8% of GDP; FY2023) DISCOs and Transmission (SOE) Assets: PKR 3,287.80 billion (4.9% of GDP) Marketing and Distribution Assets: PKR 2,965.285 billion (4.4% of GDP) SOE Assets: PKR 6,301.7 billion (9.5% of GDP)
Increasing temperature and extreme temperature events	**Energy:** Thermal power efficiency falls, transmission lines compromise **Transportation:** Infrastructure (Roads and Railways) damages	GENCOs, Transmission Roads and Highways (NHA), Pakistan Railways	SOE Assets: PKR 2744.642 billion (4.1% of GDP) DISCOs and Transmission (SOE) Assets: PKR 3,287.80 billion (4.9% of GDP) SOE Assets: PKR 6,301.7 billion (9.5% of GDP)
Wildfire Events	**Energy:** Transmission lines' damages	Transmission	SOE Assets: PKR 554.349 (0.8% of GDP)

8.3 Contextualizing Discrete Fiscal Risk Related to Climate Change

8.11 Regarding the fiscal risks affecting infrastructure, climate change poses several threats, including natural disasters, like floods, storms, and extreme heat waves. Lack of adequate adaptation and risk management, especially in the development of infrastructure projects, heightens these risks, thus raising costs. Likewise, electricity generation and operations can be affected by climate change events like changes in rainfall affecting hydropower generation and high temperatures damaging thermal power plants.

8.12 DISCOs may be at a higher risk of experiencing a rise in operational costs as they may suffer disruptions in electricity distribution infrastructure because of climate change-related natural disasters. Moreover, SOEs observe more significant threats, due to the depreciation of assets or

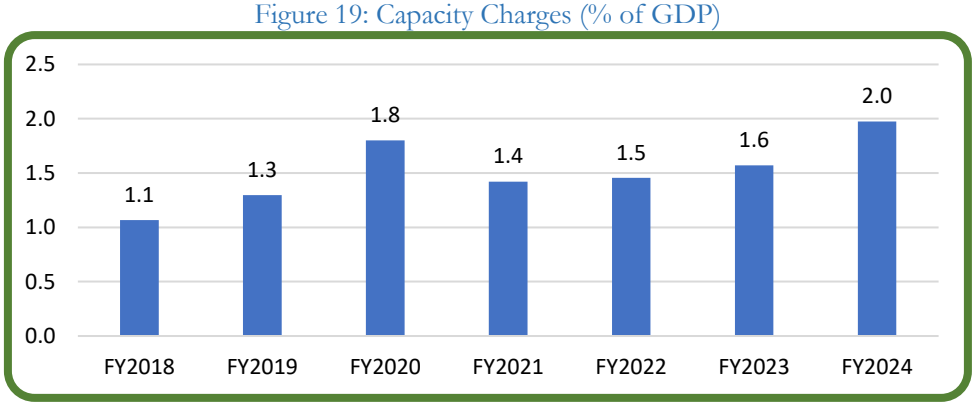
the assets becoming stranded because of policy shifts or even physical loss due to climate change. Therefore, mainstreaming climate fiscal risk assessments of SOEs is necessary to plan to offset the negative impact of climate change on fiscal sustainability and sustain fiscal resilience in Pakistan's economy.

8.13 The past floods have primarily impacted roads, railways, bridges, and telecommunication infrastructure. Initial estimates of 2022-floods damages show that around 8,330 kilometres of roads, equal to 3.2 percent of all in-service roads, and 3,127 kilometres of railway tracks, making 40 percent of all operational railways, were subject to varying levels of damage (Pakistan Floods 2022: Post-Disaster Needs Assessment[5]). The railway sector, struggling with a significant maintenance backlog before the floods, had been hit the hardest. Telecommunication infrastructure has also suffered considerable damage to, for instance, fibre optic transmission lines, feeder cables, and transmission towers.

8.4 Analysis of the Power Sector

8.14 The fiscal sustainability of Pakistan's energy sector is under considerable stress, evidenced by the significant rise in capacity charges from 1.1 percent of GDP (PKR 417.65 billion) in FY2018 to 2 percent of GDP in FY2024 (PKR 2,112 billion) as projected in the State of Industry Report 2023 (Figure 19). Though the incidence of increased capacity charges is primarily on consumers, there is also a potential fiscal risk for the government, if the increased cost is not fully passed on to the consumers and may consequently increase the circular debt. It is primarily driven by substantial investments in energy infrastructure and the high costs associated with long-term financing. As the unutilized generation capacity places a financial burden on electricity consumers, who end up paying for unused electricity, the impact of increased capacity payments can be mitigated by boosting electricity sales.

Figure 19: Capacity Charges (% of GDP)



Source: State of Industry Report (2022; 2023), NEPRA

8.15 Balancing grid stability and fair compensation for part-load operations is a complex challenge, requiring careful policy considerations and innovative solutions. Surplus capacity exacerbates the issue of circular debt in the power sector, creating a revenue-expenditure mismatch that financially strains distribution companies. This deficit hampers their ability to pay to the Central Power Purchasing Agency (CPPA-G) and invest in system upgrades, further compounding the sector's challenges.

[5] https://www.pc.gov.pk/uploads/downloads/PDNA-2022.pdf

8.16 Capacity Charges are based on declared capacities, established through Dependable Capacity tests, and conducted according to Power Purchase Agreements (PPAs) or Energy Purchase Agreements (EPAs). It is crucial to perform these tests within the stipulated period and manner. Retiring generation capacity that has exceeded its licensed lifespan and low-efficiency GENCO power plants is essential. The widespread adoption of electric vehicles, which reduce pollution and cut oil imports, is expected to generate electricity demand, optimizing under-utilized generation capacity, thereby projected to lower capacity charges per kilowatt-hour and reducing consumer tariffs. However, it will depend on the net-metering and off-grid solar power generation for self-consumption by households and industry.

8.17 The underutilization of power plant capacity necessitates the payment of Part Load Adjustment Charges (PLAC) to generation companies, increasing the per unit cost of electricity. These charges are stipulated in PPAs when plants operate below full capacity. Operating baseload plants at part load reduces efficiency and raises generation costs, impacting consumers through higher monthly fuel price adjustments. In FY2023, PLAC payments amounted to Rs. 46.59 billion, up from Rs. 38.20 billion in FY2022 (State of Industry Report, 2023).

8.18 During the last few years, Pakistan's economy has faced unprecedented multifaceted shocks including international commodity price shock, Balance of Payments crisis, demand shock and Floods 2022. It resulted in below-average economic growth, significant depreciation in domestic currency, high inflationary pressures, and high interest rates. When translated into electricity prices, these factors contributed to lower electricity demand and increased the unutilized capacity of power plants. Resultantly, it escalated the capacity charges on the one hand and substantially increased the cost of electricity for the consumer on the other. Costly electricity increases the cost of production of businesses, reducing their potential to pay tax, and further increasing the fiscal risk.

8.19 Analyzing the fuel-wise capacity charges as a percentage of GDP reveals critical trends. WAPDA Hydel's contribution to these charges has decreased from 0.32 percent of GDP in FY2018 to 0.12 percent in FY2023 (Table 9). In this regard, it is paramount to note that the total installed capacity of WAPDA Hydel power increased by 12.6 percent in FY2019 and remained constant afterward. The electricity generation from this source has recorded an overall increase of 12.8 percent over the last six years. It reflects the consistent rise in reliance on these power plants to produce electricity. Moreover, these power plants are not linked to the international fuel prices.

8.20 The installed capacity of thermal power plants increased by 19.8 percent whereas, generation from these sources decreased by 20.8 percent over the last six years, which signifies the increase in excess capacity. On the other hand, capacity charges of coal, RFO, and RLNG/Gas/HSD power plants have recorded an increase from 0.39 percent of GDP to 0.77 percent. Thermal energy's capacity charges have decreased from 0.15 percent to 0.03 percent. More specifically, the coal's capacity charges have surged from 0.10 percent to 0.51 percent of GDP (PKR 37.37 billion in FY2018 to PKR 431.78 billion in FY2023). It indicates a significant increase in the installed capacity of coal-based energy, though the generation remained low due to an enormous surge in coal prices.

Table 9: Fuel-wise Capacity Charges (% of GDP)

Fuel Type	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023
WAPDA Hydel	0.32	0.37	0.23	0.17	0.18	0.12
Thermal	0.15	0.14	0.08	0.06	0.05	0.03
Coal	0.10	0.19	0.42	0.37	0.34	0.51
Nuclear	0.17	0.16	0.20	0.16	0.30	0.33
IPP Hydel [1]	0.03	0.03	0.19	0.09	0.14	0.13
RFO	0.13	0.13	0.18	0.17	0.09	0.08
RLNG/Gas/HSD [6]	0.16	0.25	0.28	0.23	0.17	0.18
Baggasse	0.01	0.00	0.00	0.01	0.01	0.01
Wind	0.00	0.01	0.18	0.14	0.14	0.14
Solar	0.00	0.00	0.04	0.03	0.03	0.04
Import	0.00	0.00	0.00	0.00	0.00	0.00
Mixed	0.00	0.01	0.00	0.00	0.00	0.00
Total	**1.1**	**1.3**	**1.8**	**1.4**	**1.5**	**1.6**

Source: State of Industry Report (2022; 2023)

8.21 Over the past six years, the generation capacity of nuclear energy has experienced a notable rise, increasing the capacity charges from 0.17 percent to 0.33 percent of GDP. This indicates a growing emphasis on investments in this sector. These changes reflect a trend towards a more diversified energy mix in Pakistan. However, they also signify a greater reliance on coal and nuclear power, leading to higher associated capacity charges.

8.22 Several economic factors have contributed to the increase in capacity payments. Over the years, Pakistan's nominal GDP has grown significantly, rising from PKR 39,189.81 billion in FY2018 to PKR 106,045 billion in FY2024. However, the growth in capacity charges has outpaced the growth in nominal GDP, leading to potential fiscal strain. The depreciation of the Pakistani Rupee against the US Dollar, from an average of 109.84 (PKR/USD) in FY2018 to 283 in FY2024, worsened the situation by raising the cost of imported fuels and equipment. Moreover, high and fluctuating interest rates, exemplified by the Karachi Interbank Offered Rate (KIBOR) peaking at 23.27 percent in FY2023, have increased borrowing costs, adding to the financial burden. During the last few years, low economic growth also resulted in lower electricity demand growth, leading to increased capacity charges.

8.23 Fuel prices add another layer of complexity to the tariff structure and Pakistan's fiscal sustainability. Global coal prices have been historically volatile, impacting capacity charges. For instance, the average annual sale price of coal increased to around USD 296.5/MT in FY2023 from USD 64.44/MT in FY2020. The monthly average price of coal peaked at USD 430.81/MT in September 2022 from USD 50.14/MT in August 2020. Such large fluctuations in the imported coal prices have consequences for the cost of electricity generation and increased capacity charges if the coal power plants do not operate at capacity. Similarly, RLNG (re-gasified liquefied natural gas) costs are also subject to global market conditions and geopolitical tensions, making them

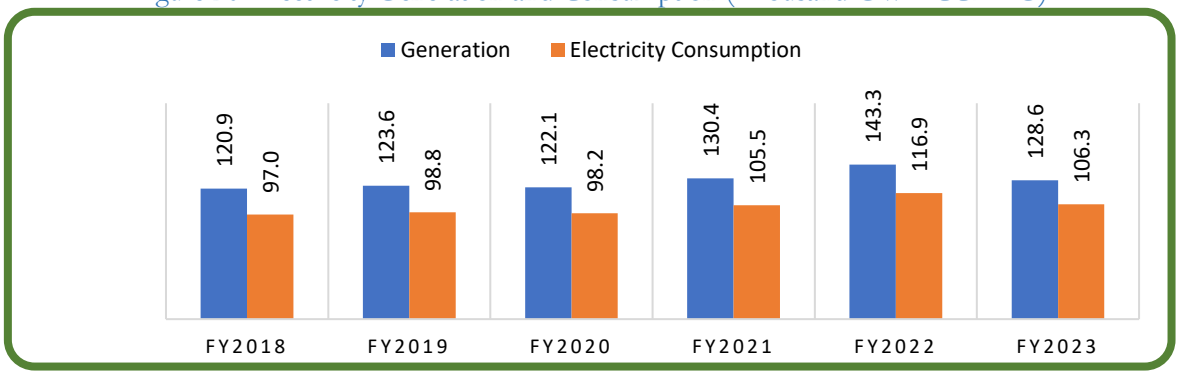
[6] RLNG, HSD and RFO stand for Regasified Liquified Natural Gas and High Speed Diesel and Residual Fuel Oil, respectively. Gas means Natural Gas, extracted and available domestically.

volatile and unpredictable. Pakistan's reliance on imported fuels portrays fiscal risk arising from these volatilities due to uncertain capacity payments.

Electricity Demand and Supply

8.24 The installed capacity of Pakistan's power sector has grown 5 percent per year from 33,233 MW in FY2018 to 42,362 MW in FY2023 (Figure 20). On the other hand, electricity generation has increased by only 1.2 percent per year while electricity consumption has grown by 1.8 percent per year, resulting in higher capacity charges. Despite the increased capacity and generation, the gap between generation and consumption suggests inefficiencies and potential losses in the system. However, owing to increased demand on account of above-average economic growth, electricity generation peaked at 14,3316.6 GWh in FY2022 while electricity consumption reached 11,6902.21 GWh. This growth in energy demand reduced capacity payments, masking the effect of currency depreciation, increased circular debt due to underpricing energy in the domestic market, and fiscal pressure emanating from subsidies.

Figure 20: Electricity Generation and Consumption (Thousand GWh: CCPA-G)



Source: State of Industry Report (2022; 2023), NEPRA

8.25 To mitigate these costs, efforts may be focused on operating efficient and cost-effective thermal plants with steam turbines as baseload while utilizing gas turbines with flexible characteristics for part load operations. This approach minimizes generation costs and enhances system efficiency. Implementing Time-of-Use tariff structures to flatten demand curves can also significantly reduce PLAC costs, promoting a more efficient and cost-effective energy system (State of Industry Report, 2023).

Climate change and Fiscal implication for the Power Sector

8.26 According to the Indicative Generation Capacity Expansion Plan (IGCEP) 2022, no new power plants based on imported fossil fuels will be installed. Existing fossil fuel plants, particularly those using furnace oil, are expected to be phased out by 2031. The share of electricity from hydel, wind, and solar sources is projected to rise from 28 percent, 4 percent, and 1 percent, respectively, to 39 percent, 10 percent, and 10 percent, increasing the total share of green electricity in the generation mix to approximately 59 percent.

8.27 Under the RCP2.6, which assumes strong mitigation measures and lower global temperatures, Pakistan would benefit from reduced reliance on fossil fuels. This could lead to lower long-term capacity charges, given sustainable economic growth, improved energy mix and slow increase in fossil fuel-based power generation capacity. Additionally, it will mitigate exchange rate risks due to decreased dependence on imports. Moreover, favourable climate policies under

RCP2.6 could attract international funding and technological support, enhancing fiscal sustainability.

8.28 In a high emission-based scenario like RCP8.5, there is a reasonable expectation that reliance on fossil fuels will continue to be high. This could further expose the industry to a potentially volatile global fuel price regime, increased exchange rate risk and higher fiscal pressures arising from an upward trend in capacity charges. Further, the climate extremes under RCP8.5 may put pressure on the expenditure aspect by raising the cost of infrastructure maintenance and power generation which requires more fiscal resources.

8.29 The structure of the electricity market in Pakistan includes PPAs with power stations relying on centralized procurement through a single buyer system. These aspects involve more fiscal risks, as the government gets into more expensive contracts. Long-term PPAs are typically provided with capacity payments that guarantee high fixed-cost recovery even without utilizing the physical infrastructure for electricity generation. Moreover, it can also limit competition since electricity procurement is carried out by a single buyer, resulting in high costs.

Climate Change Impacts on Hydropower Generation

RCP2.6 (Low Emissions Scenario): Less severe impacts on water availability and generation capacity.
RCP8.5 (High Emissions Scenario): More severe impacts, leading to greater fluctuations and potential reductions in generation capacity.

FY2030:

RCP2.6: Moderate risk exposure with stable hydropower generation and low fiscal risks.
RCP8.5: Higher risk exposure due to increased climate impacts, requiring significant resilience measures.

FY2050:

RCP2.6: Lower risk exposure with continued mitigation efforts, stable generation, and minimized fiscal risks.
RCP8.5: Substantial risk exposure with severe impacts on hydropower generation, high fiscal risks, and the need for extensive adaptation and resilience investments.
In both scenarios, proactive investments in technology, infrastructure, and sustainable practices will be essential to mitigate the potential risks, effectively.

8.5 Analysis of Road and Railway Infrastructure

8.30 After 2010, the NHA took the following loans to meet its flood-related infrastructure rehabilitation needs.

- Flood Emergency Rehabilitation Project: On 14th April 2011, the Asian Development Bank (ADB) signed a loan valuing USD 204.731 million, against which the National Highway Authority (NHA) utilized USD 170.506 million. The loan was closed on 25th September 2015.
- Post-Flood National Highway Rehabilitation Project: On 23rd January 2017, ADB signed a loan valuing USD 112.209 million, against which NHA utilized USD 111.882 million. The loan was closed on 30th April 2023.
- Emergency Flood Assistance Programme: On 15th December 2022, ADB signed a loan valuing USD 147.750 million, against which NHA has utilized USD 15 million. The loan's closing date is 30th June 2026.

8.31 Road infrastructure is directly exposed to climate change/natural disaster risk, especially due to floods. As climate change leads to more frequent and intense weather events, the damage to infrastructure increases, necessitating extensive and costly repairs. For instance, the Flood

Emergency Rehabilitation Project required over USD 170 million, and the Post Flood National Highway Rehabilitation Project needed about USD 112 million.

8.32 Additionally, damage to roads and bridges leads to transportation problems that would disrupt the supply chains thus slowing economic growth. Also, the long horizons of infrastructure loans, some of which could take several years, may require considerable commitments of resources, shrinking fiscal space and taking a toll on public service delivery. This borrowing may escalate the government's debt. consequently, it may deepen fiscal strain. It also creates bottlenecks for resources to be put for other more critical development projects.

8.33 Natural disasters are unpredictable, which introduce uncertainty in fiscal planning. The most significant challenge of maintaining fiscal sustainability is the requirement for the government to fund emergencies that occur outside the planned budget to address pressing repair needs. This makes it difficult to balance the budget, and the borrowing cost increases the fiscal risk. The recent floods of 2022 in Pakistan also had a disastrous effect on the transport and communication sector, including various SOEs such as the National Highway Authority (NHA), Pakistan Railways, Sui gas companies and transmission companies. This sector has recorded damages of PKR 701 billion (USD 3,264 million) and losses of PKR 60 billion (USD 281 million). The recovery and reconstruction needs were assessed at PKR 1,073 billion (USD 4,994 million)**.** This highlights the significance of a climate change disaster for fiscal risks to SOEs and the government. The extensive damage causes them to shut down. It requires a great deal of money to rebuild, especially during the subsequent reconstruction stages, creating pressure on government coffers and channelling resources away from other important service delivery and development initiatives.

8.34 Climate change and natural disaster events call for the need to mitigate climate change. Had it been implemented and operationalized to interlink with current and future innovations in line with the RCP2.6, which sets lower GHG emissions and a more stable climate, it could significantly lower the number and intensity of the natural calamities that hit today. Conversely, RCP8.5 would also mean higher emissions and high climate variability, increasing the number and severity of catastrophic events and fiscal risk implications for SOEs. It thus becomes incumbent for governments to invest in climate resilience and mitigation.

9. PUBLIC PRIVATE PARTNERSHIP

9.1 In Public Private Partnership (PPP) contracts, the formation of commercial risk sharing is generally where private sector organizations assume most of the project's risks for the delivery of public infrastructure assets or related services. This conforms with global best practices, as to how the risk should be shared in PPP projects. Indeed, these private entities wish to be rewarded fairly for their investment in developing and maintaining these assets. Under the Public Private Partnership Authority Act 2017, (as amended), the Public Private Partnership Authority (P3A) is mandated to advise and facilitate federal Implementing Agencies (IAs) in developing PPP projects.

9.2 In this Act, the P3A Board is mandated to approve the transaction structure of qualified projects, the projects that invoke any of the qualification criteria, as prescribed by the law, including financial support in the form of Project Development Facility (PDF), Viability Gap Funding (VGF), sovereign guarantee or direction from Central Development Working Party (CDWP) for project implementation on PPP basis. For projects that do not fit these criteria, an implementing agency can undertake such PPP projects with the administrative approval of the respective Principal Accounting officer (PAO).

9.3 The P3A Board also endorses the financial profile of 'listed' projects, including parameters such as key financial ratios, VGF mechanism, and governmental risk mitigations. In addition, the Risk Management Unit (RMU), based in the Ministry of Finance, assesses project risks as well as financial exposures and responsibilities to guarantee accountability on matters of budgets and responsibilities on projects' financial risks. Other procedures include procurement through competitive bidding before the actual construction process starts. It involves tendering by Implementing Agencies (IAs) for the selection of a private partner. Once the Implementing Agency has signified interest in a certain private party, the parties enter into a PPP agreement that defines the scope of activities to be undertaken by each party in the project.

9.4 Although PPPs transfer project risks to the private sector, uncontrollable events like Force Majeure incidents may lead to project termination, obligating IAs for debt service and equity repayment. The P3A, established in 2018, has facilitated various projects, albeit macroeconomic conditions causing delays in implementation. As such, there is only one project, Sialkot – Kharian Motorway having a VGF of only PKR 10.94 billion, which is under construction phase. Moreover, there is no liability on the part of the government under this PPP project that can be materialized because of any climate change-related event. However, there is a valid sovereign guarantee of PKR 6.9 billion, which has been issued against the operational VGF of this project. The guarantee will expire on the completion of the debt service period which is 10 years starting after 2 years of construction period.

9.5 Compliance with environmental and social management is mandatory under PPP agreements, with IAs monitoring and reporting deviations to private parties for redressal. The P3A Board's approval of the Environmental and Social Management System (ESMS) policy underscores the commitment to sustainable project development across all stages.

10. DISCRETE FISCAL RISK MITIGATION MEASURES

10.1 The following strategic measures must be focused on to mitigate the fiscal risk related to the power sector.

- Diversifying energy sources by accelerating the transition to renewable energy can reduce dependency on imported fuels and mitigate exchange rate and price volatility risks.
- Implementing energy efficiency measures can help control overall demand and capacity charges. Utilizing financial instruments to hedge fuel prices and exchange rate volatility can provide more predictable cost structures.
- Strengthening regulatory frameworks and incentives for private sector investment in renewable energy is crucial to reducing the fiscal burden and ensuring sustainable energy development.

10.2 Investing in climate-resilient infrastructure is another key measure to reduce the frequency and severity of damage to essential infrastructure like roads and bridges, which are highly susceptible to floods and other climate-related events. This can be achieved by implementing engineering solutions such as elevated roadways, enhanced drainage systems, and the use of flood-resistant materials. These investments should be guided by comprehensive climate risk assessments and aligned with future climate scenarios to ensure they are effective in the long term. This proactive approach not only lowers maintenance costs but also minimizes economic disruptions by ensuring that key supply chains and services remain operational during and after disasters. Moreover, expanding new financing instruments such as public-private partnerships and specialized infrastructure funding sources can reduce the government's financial burden. These sources of financing decentralize risks and dependencies, reducing reliance on international credits and thereby strengthening fiscal sustainability.

10.3 Enhancing revenue mobilization and diversification is critical for maintaining a stable and robust fiscal base. Strengthening tax administration, broadening the tax base, and exploring new revenue sources, such as environmental taxes, are vital steps. Improving tax compliance and reducing evasion is also essential to ensure the availability of sufficient revenue to support disaster response and recovery without compromising fiscal health. This approach increases fiscal resilience, enabling the government to fund immediate disaster responses and long-term adaptation measures effectively.

10.4 Promoting green finance and climate investments is another key strategy for building resilience against climate risks. Encouraging the development of green bonds and other financial instruments that attract investment in sustainable projects helps fund necessary infrastructure improvements. Furthermore, establishing policies and incentives for private sector investment in renewable energy and energy efficiency aligns fiscal policy with environmental goals. This reduces long-term climate risks and attracts international funding and expertise, supporting broader economic and environmental sustainability goals.

10.5 The establishment and strengthening of a dedicated NDF is critical which serves as a financial buffer, providing the necessary resources to manage immediate and long-term costs related to natural disasters. The NDF should be well-capitalized through budgetary allocations,

international grants, and low-interest loans, structured for swift disbursement during emergencies. This would reduce the need for sudden borrowing, thereby minimizing fiscal risk and ensuring that funds are available for urgent infrastructure repairs without diverting resources from other critical development projects. The government can ensure its ongoing effectiveness in disaster response by maintaining and replenishing this fund over time.

10.6 Improving coordination and collaboration among various stakeholders ensures efficient use of resources and effective implementation of disaster response and climate adaptation measures. Strengthening institutional frameworks to facilitate collaboration (between government agencies, local authorities, and international partners) and ensuring transparent and accountable funds management) is crucial. This enhances the efficiency and effectiveness of initiatives aimed at mitigating the impacts of climate change and natural disasters, ensuring that resources are allocated where they are most needed without duplication of efforts.

10.7 Making the performance-based budgeting process more effective can significantly contribute to fiscal risk mitigation. This approach ties budget allocations to specific performance outcomes and objectives, ensuring that funds are used efficiently and effectively to achieve desired results. By focusing on measurable outcomes, performance-based budgeting can help prioritize investments that yield the highest returns in terms of reducing climate risks and enhancing resilience. It encourages accountability and transparency in resource allocation, ensuring public funds are directed towards initiatives that offer maximum benefit in mitigating fiscal risks associated with climate change and natural disasters.

10.8 It would be critical to undertake a Climate Public Investment Management Assessment (CPIMA). This evaluation would ensure climate risk management is embedded in public investment processes. Key actions include mandating environmental and social impact assessments at the feasibility stage of projects to consider both climate risks and the project's impact on national climate goals. Implementing CPIMA will help prioritize investments that enhance resilience and sustainability, reducing long-term fiscal vulnerabilities.