

Environmental Risk Integration Policy Frameworks of State Bank of Pakistan: A Case Study of Pakistan

Muhammad Mubashir¹, Dr. Muhammad Meraj², Maria Ijaz³

¹ Research Scholar, Alumni, SOAS University of London. Email: mubashir.soas@gmail.com

² Associate Professor, Alumni, Ritsumeikan Asia Pacific University, Japan, **Co-Author**. Email: mairu22@hotmail.com

³ Research Scholar, Alumni, Federal Urdu University of Arts Science and Technology, Islamabad, **Co-Author**. Email: mariyaijaz27@gmail.com

***Author's Note: this paper is extracted from my master's thesis.**

DOI: <https://doi.org/10.70670/sra.v4i2.2196>

Abstract

Climate change is most demanding concerns of the economies of the world in recent times. This study explores the integration of environmental risks into central bank policy frameworks, focusing on the State Bank of Pakistan (SBP). Given Pakistan's high vulnerability to climate change, the SBP has made significant strides by introducing initiatives like the Green Banking Specific Guidelines and Environmental and Social Risk Management (ESRM) Guidelines. However, gaps remain compared to global best practices. To address this, the study recommends expanding climate stress testing to more comprehensive, scenario-based frameworks and integrating climate risks into monetary policy to promote sustainable practices. It also suggests improving data collection and transparency, broadening green financing initiatives, and enhancing public and stakeholder engagement. Capacity-building efforts are crucial for equipping all financial institutions to manage environmental risks effectively. The research further examines green financial policies such as Green Basel-type capital requirements of the consumers, green public guarantees, and carbon-risk adjustments in credit ratings to mitigate climate risks while promoting financial stability. However, these must be balanced with broader climate mitigation strategies to avoid unintended economic consequences. The study concludes that a proactive, multi-pronged approach is needed for the SBP to align with global standards and strengthen its role in fostering a sustainable and resilient eco-friendly financial system in Pakistan, capable of withstanding climate-related unbearable challenges.

Keywords: Environmental Risk, Policy Framework, State Bank of Pakistan

JEL classification code: E58, H2, Q51, Q56

Introduction

In the 21st century, the global landscape of financial and economic systems is increasingly connected with environmental sustainability. The growing concern on the importance of addressing climate change, resource depletion, and environmental degradation has led to a

¹Corresponding author: Research Scholar, Alumni, SOAS University of London, London:714272@alumni.soas.ac.uk

²Co-author: Associate Professor, Alumni, Ritsumeikan Asia Pacific University, Japan: mairu22@hotmail.com

³Co-author: Research Scholar, Alumni, Federal Urdu University of Arts Science and Technology, Islamabad: mariyaijaz27@gmail.com

fundamental shift in how economic growth and development are perceived. Traditional economic measures often focused on short-term solutions. Economies are now increasingly focusing on exploring sustainable and long-term solutions to save the environment and precious resources for future generations. This shift is taken by the expansion in awareness related to environmental risks and the requirement of economic systems to support sustainable development goals (SDGs). For economies facing the unbearable challenges posed by climate change, biodiversity loss, and other environmental concerns, the integration of sustainability into financial systems has become imperative. This economic, financial and behavioral shift has encouraged economies to re-evaluate the roles and responsibilities of their key economic and financial institutions, including central banks. These institutions may play their significant role in finding sustainable solutions. In last few decades, significant changes have been observed in the climate including extreme temperature, decline in icecaps and raised sea levels (IPCC, 2014). According to the IPCC report, human activities are the significant contributors in raising global temperature and environment destruction (Lee et al., 2023). Moreover, countries in the south of Europe observed a higher potential challenges of climate change but have minimum potential capacity to absorb weather shocks (ESPON, 2011). To control global warming it is important to take effective measures to reduce carbon emission and restrict human activities which are exclusively contributing to climate change (Estella, 2018). There is a vast range of the consequences of climate change at social as well as economic level. The Paris Agreement considers climate change as a threat to society and for the whole planet. The agreement aims to raise the potential of nations to deal with the consequences of climate change. It can be possible by ensuring consistency in financial flows, and minimizing greenhouse gas emissions (Braun, 2021). The agreement shows a clear picture to the global financial sector that a profound transition in global investment is needed (Thwaites et al., 2018).

The Paris Agreement 2015 and the agenda of sustainable development by the United Nation are markup points for the international community to join hands and launch effective policies and programs to limit temperature raising and transform into decarbonized economies. This transition of the economy entails structural changes affecting the activities of all sectors and requires enough financial resources to implement the effective measures. The participation of the financial sector in this way can play a significant role in transformation as it can make the process of funds transfer from savers to investment projects smoothly.

Green Banking Practices

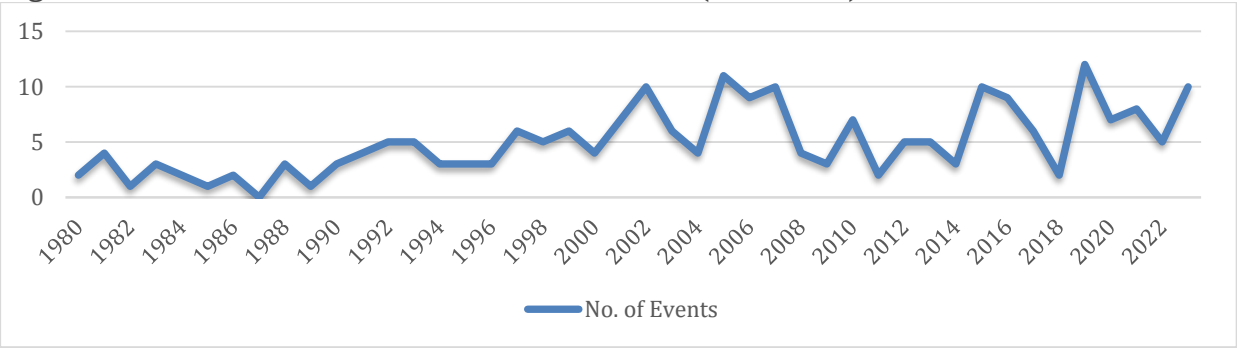
There is no comprehensive definition of green banking available in the previous literature (Alexander, 2016). Description of green banking differs depending on area and financial and environmental health of the country. However, some researchers tried to make a wholesome definition. An Indian Institute for Development and Research in Banking Technology (IDRBT) was initiated by the Reserve Bank of India, which referred to green banking as practical guidelines to empower banks and financial institutions and make them sustainable in environmental, social and economic terms (IDRBT, 2013). The term ethical banking and green banking are nearly similar, having objectives related to promoting and saving the environment. It includes environment related safety and social responsibility in promoting banking services (Bihari, 2011). The State Bank of Pakistan (SBP) also explains green banking as measures to promote eco-friendly practices to help banks as well as consumers in reducing their participation in carbon emission activities (SBP, 2015). Some researchers also claim that green banking is also called socially responsible banking. As it entails the social responsibility of financial institutions in protecting the environment and various social issues. A term social banking can be defined as solving the most pressing current issues aiming to have significantly positive impact on the overall society (Kaeufer, 2010; Weber & Remer, 2011). Moreover, responsible banking includes focused

commitment by financial institutions towards sustainable development. Green Banking can be considered as a significant subset of a sustainable banking system which incorporates various environmental and social dimensions (Dufays, 2012). The United Nations Environment Program (UNEP) defines green finance as a tool to address environmental issues and in broader terms it leads towards climate finance. The paper only targets the banking activities directly related to climate change adaptation and mitigation. Therefore, climate finance and green banking are interrelated terms according to the United Nations Framework Convention on Climate Change (UNFCCC). In this paper green finance refers to the financing activities by financial institutions having an objective of mitigation of greenhouse gasses and increasing sustainability of the economy by considering sustainable development goals including gender equality, green growth and job creation. Sustainable finance incorporates sustainability in financial decision-making for environment, social and governance (ESG) affairs. It includes various activities including promotion of green finance, sustainable investing strategies, issuance of green social bonds and aims of getting socially and environmentally responsible outcomes (Kumar et al., 2022, European Commission, 2021).

Climate Change in Pakistan
Rising Frequency and Intensity of Natural Disasters

Pakistan is highly susceptible to the adverse effects of climate change (Eckstein et al., 2021) as it witnessed a concerning increase in the frequency and intensity of natural disasters over recent decades. Since 1980, the country has encountered a series of catastrophic events, including floods, tropical cyclones, extreme heat waves, and occasional droughts (Figure 1). The devastating floods of 2010 are a stark example, impacting over 20 million people across the country. According to the latest Economic Survey of Pakistan (2024), these floods resulted in direct damages estimated at Rs. 552 billion (US\$6.5 billion) and indirect losses amounting to Rs 303 billion (US\$3.6 billion), with the agriculture, livestock, and fisheries sectors suffering the most. The subsequent floods of 2022 surpassed the 2010 disaster in scale and impact, submerging one-third of Pakistan’s land area and displacing approximately 8 million people (Rehmat et al., 2023). The economic damages from these floods were estimated at US\$14.9 billion, with a GDP loss of US\$15.2 billion and a total rehabilitation requirement of US\$16.3 billion. Such disasters not only destroy infrastructure but also disrupt livelihoods, intensify poverty, and challenge the country’s ability to recover and rebuild (Mahmood et al., 2019).

Figure 1: Number of Natural Disasters in Pakistan (1980-2023)



Source: Economic Survey of Pakistan (2024)

Prolonged Droughts and Economic Implications

In addition to frequent flooding, Pakistan has faced severe droughts that have significantly impacted water availability and agricultural productivity (Hermans & McLeman, 2021). The

drought conditions of 2018, driven by inadequate monsoon rainfall, led to acute water shortages in Balochistan and Sindh, prompting the Sindh government to declare large areas as "calamity areas." Unlike sudden floods, droughts develop gradually and their effects can persist for years, exacerbating existing water scarcity issues and putting additional strain on agricultural sectors dependent on consistent water supply. This prolonged lack of rainfall has led to reduced crop yields, livestock losses, and heightened food insecurity, further compounding the economic challenges faced by rural communities (Hina et al., 2023).

Transition Risk in Pakistan

Pakistan faces similar challenges as it heavily relies on fossil fuels, which make up about 61% of its energy mix, while renewables contribute only 6% (Durrani et al., 2021). Emissions from the energy sector are expected to rise from 185.97 Mt CO₂ in 2015 to 898 Mt CO₂ by 2030 (NDC, 2021). This reliance on fossil fuels strains the economy through trade deficits and inflation and contributes to environmental degradation. In 2022, oil imports represented nearly 29% of Pakistan's total import bill, up from 20% in 2021. To address these issues, Pakistan aims to increase the share of renewables to 20% by 2025 and 30% by 2030 under the Alternative and Renewable Energy (ARE) Policy (NDC, 2021). The study conducted by Choudhary & Salman (2023) concludes that there is a negative relationship between carbon tax and carbon emissions, while a positive relationship exists between carbon tax and economic growth in the case of Pakistan. The Impulse Response Function (IRF) indicates that raising the carbon tax by 2% annually would lead to a significant reduction in carbon emissions and a notable increase in economic growth (Choudhary & Salman, 2023). Consequently, the development of comprehensive carbon mitigation strategy to lower carbon emissions is the need of the time for the Pakistan's economy. This transition will also have a devastating impact on the financial sector.

Economic and Fiscal Risks from Climate Change

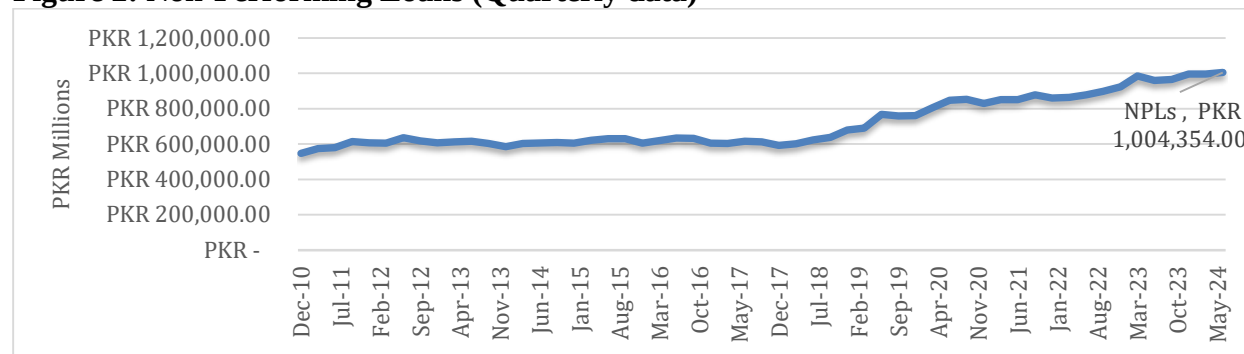
The economic repercussions of climate change extend beyond immediate disaster impacts, affecting broader fiscal stability and macroeconomic performance (Khan et al., 2021). The Fiscal Risk Statement (FSR) for FY 2024-25 projects severe economic consequences from climate-related events. The statement evaluates various scenarios to assess potential fiscal impacts, such as a significant reduction in GDP growth, increased inflation rates, and depreciation of the national currency. For instance, scenarios predicting a major natural disaster by 2030, with and without a Natural Disaster Fund, highlight stark contrasts in fiscal outcomes. Without adequate mitigation and preparedness, the fiscal deficit could rise significantly, and government debt could increase, putting additional pressure on public finances. The statement underscores that investing in green initiatives and establishing a dedicated Natural Disaster Fund could help cushion some of these adverse effects, suggesting that integrated climate change mitigation and disaster risk management strategies are crucial for maintaining fiscal stability and promoting sustainable economic growth (FSR, 2024).

Impact on Financial Stability and Non-Performing Loans

The financial sector in Pakistan is also vulnerable to the impacts of climate change, particularly in terms of financial stability and non-performing loans (NPLs). Research on the relationship between climate change and financial stability reveals that natural disasters, such as the 2022 floods, lead to a notable rise in NPLs (Brik, 2024). These loans, which are indicators of the financial health of banks, become problematic as borrowers in affected areas struggle to meet repayment obligations due to loss of income and property damage. The increase in NPLs can strain the banking sector, reduce credit availability, and exacerbate economic instability. Analyzing the data (Figure 2) from the aftermath of the 2022 floods, the financial sector's

exposure to climate-related risks requires robust risk management strategies (Kamran & Omran, 2023). Implementing comprehensive environmental risk assessments, enhancing resilience in financial operations, and integrating climate considerations into financial regulations are essential steps to safeguard the banking system against the future financial impacts of climate-induced disasters.

Figure 2: Non-Performing Loans (Quarterly data)



Source: State Bank of Pakistan (2024)

Research Questions

- Does the SBP's policy framework mitigate the environmental risks in Pakistan's financial sector?
- To what extent SBP's policy framework impact the sustainability of financial sector in Pakistan?
- To what level the SBP's policy framework aligned with the International Best Framework and Policies for the integration of sustainable finance in Pakistan?

Research Hypotheses

- H01:** The State Bank of Pakistan (SBP) has effectively established a policy framework for integrating environmental risks in Pakistan.
- H02:** The State Bank of Pakistan (SBP)'s policy framework has increased the sustainability of financial sector in Pakistan.
- H03:** The State Bank of Pakistan (SBP) has successfully aligned the International Best Framework and Policies for the integration of sustainable finance in Pakistan.

Objectives of the Study

This study aims to discuss the role of the State Bank of Pakistan in integrating environmental risk into its policy framework. The main objectives of the study include understanding the State Bank's framework on environmental risk management agenda while emphasizing on the sustainability of the financial sector in Pakistan. It also examines and identifies the major challenges faced by the central authorities in implementation of the environmental policies. The study also explores the international best frameworks and policies adopted by other international Central Financial institutions while managing climate risk. It also aims to provide practical policy recommendations to the State Bank of Pakistan and other responsible financial institutions to endorse the integration of environmental risk and promote sustainable finance.

Literature Review

Central Banks usually emphasize on maintaining financial and monetary stability in the economy. Recently, the role of central banks in fostering sustainable finance and promotion of green finance

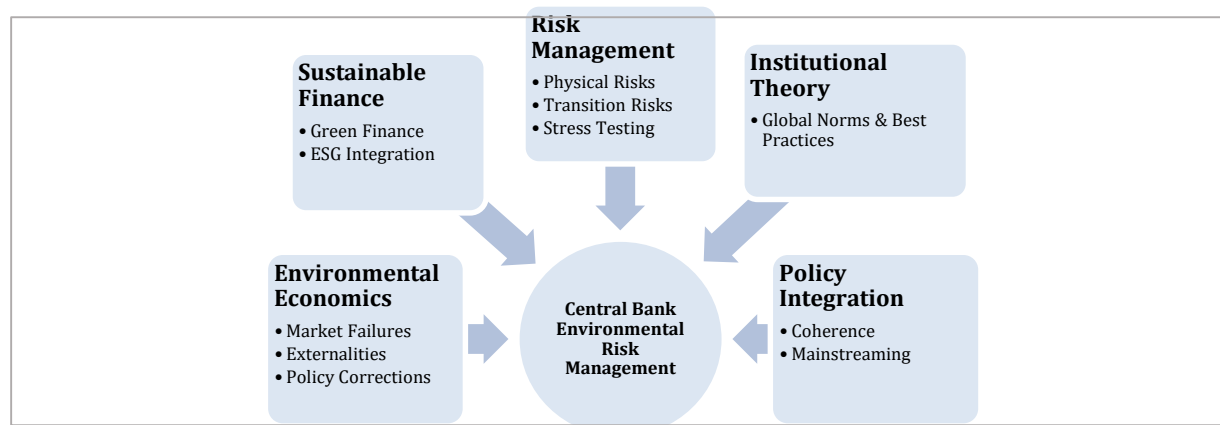
has been recognized (Bolton et al., 2020). Central banks are the gatekeepers of the financial system having a monopoly to direct capital flow, direct financial markets, and formulate an agenda for economic and financial policy. The participation of the central bank in achieving sustainable finance can make the mobility of financial resources towards developmental projects easy, and significantly contribute in achieving sustainable development goals. Central banks are continuously incorporating climate change analysis and assessment of risks related to environmental projects in their ongoing programs. The motivation behind this continuous effort is multi-dimensional, so they are trying to incorporate these eco-friendly tasks in their micro-prudential projects as they benefit the whole economy as well as the financial system (Thiemann et al., 2023). Additionally, Central Banks are focusing on ESG factors while managing their portfolios so that they can make sustainable and responsible investments. They are also disclosing the climate related risk factors of their ongoing projects in their portfolios. They are actively participating to promote green eco-friendly activities also known as green finance (Smoleńska, 2023). Various central banks have taken significant initiatives including formation of networks with other responsible entities to help green the financial system (Shirai, 2023). Another study finds that Microfinance banks with higher social and financial performance are more likely to adopt environmentally friendly policies (Mubashir et al., 2025). These institutions are contributing in refined analysis and integrating climatic and environment related challenges (Fischer et al., 2024). Recent years are considered as pathways in activities related to green finance and transition towards low-carbon economies but the road ahead is still long. In this context, the challenges faced by the authoritative institutions mainly the central bank and other financial institutions are not insignificant. Challenges include lack of information regarding climate related risks, minimum knowledge about green or carbon free environment, insufficient awareness about green methodologies and techniques, and limited financial resources. Moreover, lack of predictable policies makes the situation worse-off (Smoleńska, 2023). Globally, central banks are playing a vital role in controlling climate associated risks particularly related to climate change by introducing relevant precautionary measures in their policy frameworks (Cecot, 2019). The role of central banks in this regard are multifaceted including maintaining monetary policy, regulatory supervision, smooth market functioning and financial stability. Central Banks mostly play a monopolistic role in regulating monetary and fiscal policy. As an authoritative body it ensures the smooth functioning of all sectors and having potential to mitigate risk (Goodhart, 2011). The Bank of England (BoE) has been actively participating to incorporate climate associated risk into its supervisory framework. They are regularly conducting climate stress tests to acknowledge climate related risks. These tests also indicate how various climatic situations could impact the Bank's performance and its balance sheets (Gründl et al, 2017; NGFS, 2021). Similarly, the European Central Bank (ECB) has issued strategic guidelines for banks to deal with environment related risks. Banks must incorporate these guidelines into their agenda and risk management framework (Capasso et al., 2020). More than 80% of the world's energy comes from fossil fuels (Friedlingstein et al., 2022). This dependence not only drives up economic costs but also harms the environment and intensifies climate change risks. Around 40% of global carbon emissions are linked to energy production (Olivier et al., 2020), with fossil fuels accounting for roughly two-thirds of total Greenhouse Gas (GHG) emissions. To limit global temperature, rise to 1.5°C, as outlined in the Paris Agreement, CO₂ emissions must be reduced by 45% by 2030, compared to 2010 levels, and reach net zero by 2050 (Lee et al., 2023). Meeting these targets will be challenging, requiring a reduction of 30 giga-tons of emissions annually.

Methodological Consideration

Theoretical Framework: Central Banks and Environmental Risks

Central banks are mostly responsible for the smooth functioning of the financial sector of the country but their role in tackling environmental challenges is also significant. This study investigates the role of the SBP in managing the risks associated with climate change along with maintaining the stability of the financial sector. The theme of the study is grounded in multiple interrelated theoretical perspectives, including environmental economics, sustainable finance, risk management, and institutional theory. This framework provides a guideline on how SBP includes environmental risk into its regulatory framework (Figure 3). It will also aid in understanding the implication of these advisory policies to maintain financial sustainability, economic growth and overall sustainable development of the economy.

Figure 3: Central Bank Environmental Risk Management



Source: Author's own compilation

Environmental economics is directly linked with the study as it examines the economic effects of environmental policies and the economic causes of environmental problems and climatic degradation. This theoretical perspective helps to understand how environmental degradation, such as pollution and climate change, imposes costs on society and the economy. Environmental degradation mostly results in externalities, costs or benefits that affect third parties who choose not to incur those costs or benefits. For example, pollution from industrial activities can harm public health and the environment, imposing costs on society that are not reflected in market transactions (Ashwini & Aithal, 2023). Environmental issues often highlight a form of market failure, where the market alone does not allocate resources efficiently. This is because the full social costs of environmental damage are not borne by the polluters but by society at large. Theoretical approaches in environmental economics seek to assign economic value to environmental goods and services, which can inform policy decisions, such as setting appropriate prices for carbon emissions or designing subsidies for renewable energy. In this context, environmental economics provides the foundation for understanding that the central banks might need to incorporate environmental considerations into their policy framework. It explains the rationale behind policies aimed at correcting market failures and internalizing externalities associated with environmental risks (Ferrari & Landi, 2024).

Sustainable financial activities in the context of the present research indicates financial services that incorporate social, environmental, and governance (ESG) specific criteria into major investment decisions for the sustainable benefit of society and for the stability of the environment. Key concepts under the umbrella of sustainable finance include green finance, ESG integration, and impact investing. Green finance encompasses financial activities aimed at supporting projects or initiatives that are eco-friendly and having sustainable long-term outcomes. This may include

heavy investments in renewable energy resources, energy efficiency technologies, and pollution prevention methods. Moreover, integration of environmental, social, and governance factors into investment perspective and financial decision-making processes can aid to integrate climate risk with policy decisions. This approach recognizes that ESG factors can materially impact the performance and risk profile of investments in the country. The investments made only with the intention to accelerate positive, measurable social and environmental impact along with a having financial return are included in impact investing.

The theory of sustainable finance helps to analyze how the Central Banks especially SBP can promote green eco-friendly finance through its regulatory and policy frameworks. It also provides a lens to evaluate the effectiveness of SBP's initiatives in fostering an environmentally sustainable financial sector. The theory of risk management deals with the assessment, identification, and prioritization of risks followed by collective efforts to reduce, monitor, and control the impact of unfortunate climatic events (Clifford & Smith, 1995). Major concepts in the theory of risk management include financial risk management, climate related financial risk, and stress testing. The management of financial risk includes managing the risks to a financial institution's capital and earnings that arise from changes in market conditions, client's creditworthiness, and operational efficiencies checked by the services provided by the financial institutions. Climate-related financial risk includes physical risks (having direct impacts from climate change, such as natural disasters and global warming) and transition risks (risks associated with the transition to a low-carbon economy, such as policy changes, technological shifts, and market dynamics). Climate related risks impose heavy pressure on the financial sector as well as on the society as a whole. It creates inflation and unemployment which are the significant obstacles in the way of development of the society. Stress testing techniques are very popular nowadays as they are used to assess the resilience of financial institutions and systems to adverse environmental and climate-related events.

Institutional theories get a deeper knowledge into more resilient aspects of social structure in this context. It incorporates the processes through which structures, including, rules, schemes, major norms, and effective routines, become established as guidelines for social behavior. For central banks, institutional theory can explain how global norms and best practices in environmental risk management influence their policy frameworks. It also helps to understand the role of international organizations and networks, such as the Network for Greening the Financial System (NGFS), in shaping the approach to environmental risk integration.

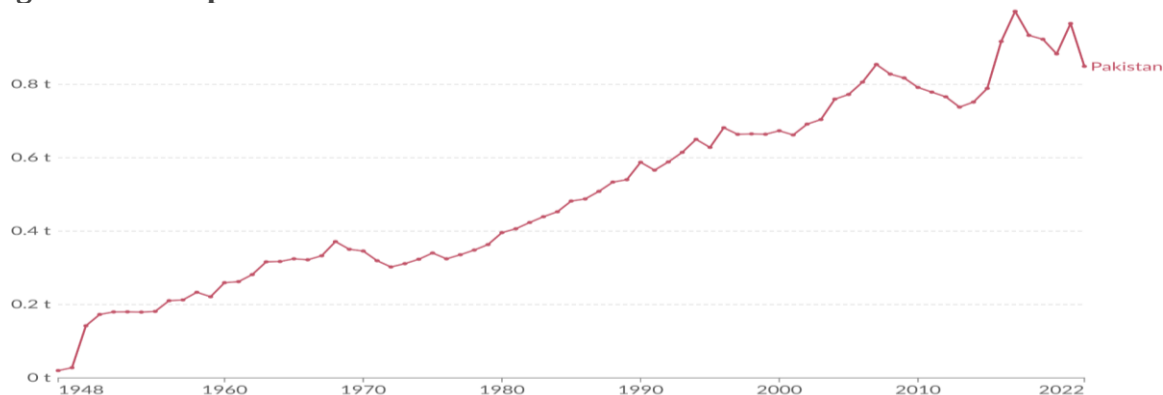
The theory of policy integration refers to the process of incorporating environmental considerations into all stages of policymaking in non-environmental policy sectors. The key concept in policy integration theory includes policy coherence and mainstreaming. Policy coherence ensures that policies across different sectors are aligned and do not undermine each other. For instance, financial policies should support, rather than contradict, environmental objectives and mainstreaming indicates the systematic integration of environmental considerations into all sectors and levels of policy and practice. This theoretical lens is useful for examining how environmental risk considerations are integrated across various policy areas within the SBP's mandate, including monetary policy, financial regulation, and market supervision.

Role of Central Banks

There is a consistent increase in carbon emissions in Pakistan (Figure 4). These emissions also led to environmental risk for the country. Like other developing countries Pakistan is also facing serious consequences of climate change since last decade. The fluctuation in weather conditions including extreme hot seasons followed by severe floods in monsoon season results in resource depletion and economic loss. So, the need for sustainable finance to tackle environmental

externalities is urgently needed. Along with other Asian developing countries, Pakistan is highly vulnerable to the extreme effects of climate change, which are endorsing significant pressure on the economy and the society (Masud et al., 2023). Extreme weather conditions are becoming worse every year including floods, droughts and heat strokes. These events are frequently increasing with a rise in the percentage of severity. As Pakistan is an agriculturally based economy where significant output came from the agricultural sector, their extreme climatic effects are a serious threat for the economic health of the economy. Climatic conditions also cause damage to the irrigation system, water resources and infrastructure of the country (Otto et al., 2023). These environmental challenges intensify already existing socio-economic challenges to the nation. Moreover, these vulnerabilities directly hit the poor segment of the economy by inflating food prices and other basic necessities of life (Flori et al., 2021). On the services side, due to damaged infrastructure, electric breakdowns and limited resources the demand for labor declines in the market and ultimately, level of unemployment increases in the economy. On the other hand, a large segment of the society is living below the poverty line due to unequal distribution of resources. These economic challenges along with climatic shocks make the situation more difficult for developing nations like Pakistan (Shehzad, 2023). Addressing these issues requires a comprehensive approach that integrates environmental sustainability with economic resilience. The SBP as the central authority for regulating the financial system is responsible to make such effective strategies to integrate environmental risks and maintain financial sustainability in the country (SBP, 2023).

Figure 4: Per capita Carbon Emissions in Pakistan



Source: Ritchie & Roser (2023)

Environmental Risk and Financial Stability

Environmental risk refers to the potential negative consequences for the environment arising from factors such as climate change, pollution, and resource depletion (Slevin et al., 2020). These risks have increasingly significant implications for financial stability. The link between environmental risk and financial stability has come to the forefront in recent years due to the growing realization that environmental factors can cause systemic disruptions to the financial system. Climate-related events, regulatory transitions to green economies, and environmental degradation are among the primary drivers of these risks, which can lead to financial crises if not properly managed (Farbis, 2020). This section explores the types of environmental risks, their transmission channels into the financial system, and their implications for financial stability.

Types of Environmental Risks

Physical Risks

Physical risks arise from the direct effects of climate change and environmental degradation. These risks include extreme weather events e.g., hurricanes, floods, droughts, rising sea levels, and long-term environmental shifts, for instance desertification, loss of biodiversity (NGFS,

2020). Physical risks can have devastating effects on economic activity, reducing productivity, damaging infrastructure, and disrupting supply chains. For example, severe floods can destroy homes, businesses, and infrastructure, leading to significant insurance losses and impairing the value of financial assets tied to real estate or businesses in the affected areas (Battiston et al., 2017).

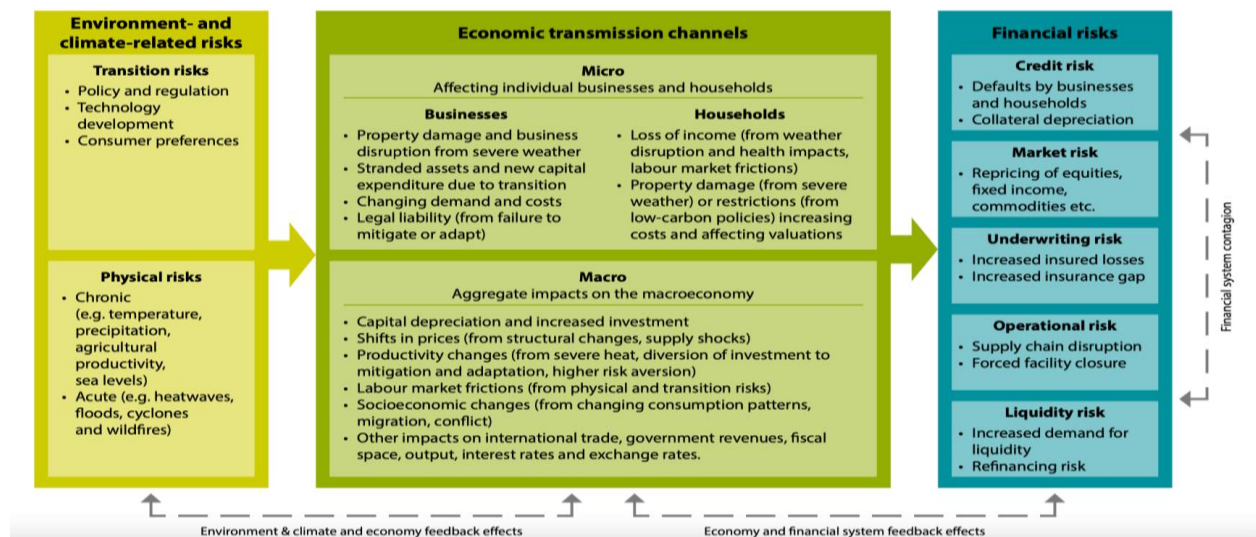
Transition Risks

Transition risks emerge from the process of moving toward a low-carbon economy. This includes risks related to changes in regulations e.g., carbon pricing, emissions limits, technological shifts including renewable energy innovations, and changing consumer preferences e.g., demand for sustainable products (NGFS, 2020). Transition risks can affect the financial sector by rendering certain assets, such as fossil fuel investments, obsolete or unprofitable. For instance, as governments impose stricter regulations on carbon emissions, companies in carbon-intensive industries may face declining profits or even bankruptcy, leading to potential losses for banks and investors exposed to these sectors (Semieniuk et al., 2021).

Transmission Channels to Financial Stability

Environmental risks can affect financial stability through various channels, impacting banks, insurers, and the broader financial system (Figure 5). The risks associated to financial stability includes:

Figure 5: Transmission of Environment and Climate risks to financial risks



Source: NGFS (2020)

Credit Risk

Environmental risks can increase credit risk for banks and financial institutions. For instance, natural disasters can lead to defaults on loans in affected areas as businesses lose revenue and households struggle to rebuild. Similarly, companies in industries exposed to transition risks, such as fossil fuels, may become less creditworthy as their business models are disrupted by climate policies and changing market conditions (Capasso et al., 2020). In 2011, Thai floods caused severe damage to the country's manufacturing sector, leading to significant loan defaults and credit losses for banks exposed to the affected regions (Forslid & Sanctuary, 2023).

Market Risk

Market risk arises from adverse movements in market prices, and banks are particularly

vulnerable to it due to their exposure to the risks associated with the securities they hold. For instance, climate change could heighten sovereign risk, potentially leading to a downgrade in a country's credit rating. This, in turn, could reduce the value of government securities owned by banks (Bolton et al., 2020).

Underwriting Risk

Underwriting institutions (Insurers and reinsurers) are particularly vulnerable to physical risks. Extreme weather events and natural disasters can lead to significant claims, potentially resulting in losses for insurers and increasing the cost of reinsurance (NGFS, 2020). This can destabilize the insurance sector, leading to potential spillover effects into the broader financial system. In 2017, Hurricane Harvey, Hurricane Irma, and Hurricane Maria led to substantial insurance losses, with estimates exceeding \$200 billion. This created strain on the reinsurance market and affected the financial stability of insurance firms (Ouazad & Kahn, 2022).

Operational Risk

Physical risks from climate change can disrupt the operations of financial institutions. For example, extreme weather events can damage physical infrastructure, such as bank branches or data centers, leading to operational disruptions (NGFS, 2020). Additionally, environmental degradation can disrupt supply chains, affecting companies that financial institutions lend to or invest in. Hurricane Katrina, in 2005, caused significant operational disruptions for financial institutions in the Gulf Coast region, resulting in losses from destroyed infrastructure and reduced business activity (Ouazad & Kahn, 2022).

Liquidity Risk

Climate risk can exacerbate liquidity risk by causing asset devaluation, market disruptions, and increased volatility. Extreme weather events or regulatory shifts may lead to sudden declines in asset prices, making them harder to sell without significant losses. This strain on liquidity can force institutions to sell assets at unfavorable prices or face funding shortages (Lang et al., 2023).

Research Findings

The financial sector of Pakistan is regulated by the SBP and the Security and Exchange Commission of Pakistan (SECP). The central bank regulates commercial banks, microfinance banks, exchange companies, credit bureaus, electronic money institutions, payment system providers and digital banks. Whereas, the non-banking finance companies (NBFCs), Insurance companies, Asset management companies, and non-bank leasing companies, are regulated by SECP. According to the empirical study by Lal et al. (2009), Pakistan has a bank-based financial system. A bank-based financial system is a one in which the banks are the main players in mobilization and allocation of financial resources and provide other financial services such as risk management and investment decision making (Levine, 2002).

State Bank of Pakistan Act, 1956 authorizes the bank to function as the central bank of Pakistan. According to the SBP Act, the bank has two primary objectives, i.e. to maintain the domestic price stability and stability of the financial system of Pakistan (Javed, 2021). The act also mandates the bank to provide support to the government's economic policies to foster growth and fuller utilization of the productive resources. The act also states the core functions for the banks to achieve the primary objectives (Javed, 2021). The act does not provide an explicit sustainability mandate to the bank to develop climate related policies. However, given the current climate crisis in Pakistan, SBP identified climate change as a strategic theme for its SBP vision 2028. The adoption of climate change would be pivotal to reshape the banking sector in Pakistan (SBP, 2023).

SBP Policies for Environmental and Social Risk Management

Prior to 2010, environmental risks and climate change were not widely recognized in Pakistan. However, the devastating floods of 2010 brought these issues to the forefront, prompting a policy response from various government bodies. In response, the SBP began introducing several policy initiatives to address these concerns. Notably, in 2017, the SBP issued the Green Banking Guidelines, designed to protect financial institutions from risks associated with environmental and climate change. These guidelines encourage financial institutions to invest in energy-efficient projects and revamp their internal controls to minimize negative environmental and social impacts. The guidelines focus on three key areas: risk management, business facilitation, and reducing environmental and societal impacts. In 2018, under the Financial Inclusion and Infrastructure Project, SBP issued Environmental and Social Risk Management (ESRM) Guidelines for Microfinance Institutions (SBP, 2018). Later in 2022, SBP issued an ESRM Implementation Manual for financial institutions. The objectives of these policies include setting applicable E&S requirements for all business activities, strengthening Environmental and Social Management Systems (ESMS), complying with national E&S risk management requirements, and promoting greater transparency and accountability on E&S issues. The ESRM Implementation Manual provides a comprehensive framework for integrating these climate-related risk assessments into the operations of banks and financial institutions. The manual outlines the responsibilities of the Board of Directors and senior management in developing and overseeing ESRM policies and procedures. It includes high-level indicators to assess and manage environmental, social, and climate-related risks, ensuring that these risks are incorporated into credit approval procedures and overall decision-making processes. Additionally, the manual highlights the need for green product development and the establishment of data collection systems to generate meaningful statistics on green banking activities. These efforts contribute to transparency and accountability through annual disclosures, enabling financial institutions to manage environmental and social risks effectively, promote sustainable finance, and support the transition towards a low-carbon and climate-resilient economy. A significant element of these initiatives is the incorporation of climate risk scenario analysis into the regulatory framework (SBP, 2024). Under the latest Financial Stability Review (2023), the SBP incorporated the climate risk scenario analysis. It assesses both physical and transition risks posed by climate change to the financial sector. Physical risks refer to economic losses from climate-related extreme weather events and long-term climatic changes, while transition risks stem from the economic adjustments needed to shift towards a low-carbon economy. The SBP's climate risk scenario analysis, particularly in the context of physical risks, involved stress testing the banking sector's lending portfolios in flood-affected areas. Using district-wise loan data, the analysis estimated incremental credit losses under hypothetical flooding scenarios. This analysis revealed that while only 6.8% of banks' gross loan portfolio was in vulnerable sectors, a significant 58% of Microfinance Banks' (MFBs) loan portfolio was at risk, indicating higher vulnerability within the microfinance sector (SBP, 2024). In terms of transition risks, the scenario analysis, conducted by SBP, explored the potential impact of a carbon tax on the financial health of firms listed on the Pakistan Stock Exchange (PSX). This analysis showed that sectors such as Fuel & Energy and Chemicals would face increased probabilities of default and reduced interest coverage ratios under higher carbon taxes. Despite these challenges, the overall resilience of the corporate sector was noted, with most firms maintaining financial stability (SBP, 2024).

SBP Initiatives for Promoting Renewable Energy and Sustainable Finance

The State Bank of Pakistan (SBP) has implemented several initiatives to promote sustainable finance in the country by introducing various green refinancing schemes that target key areas such

as renewable energy, brick kiln modernization, and efficient water management. The Renewable Energy Scheme, which includes both conventional and Islamic financing options, is designed to support projects that utilize renewable energy sources, thereby addressing Pakistan's energy shortages and contributing to climate change mitigation efforts by promoting cleaner energy alternatives. In 2019, SBP launched a refinance facility aimed at modernizing brick kilns to reduce harmful emissions from traditional kilns by encouraging the adoption of more efficient zigzag technology. This facility provides refinancing for the purchase of advanced plant and machinery needed to upgrade existing kilns or establish new ones using environmentally friendly technology, thus contributing to improved air quality and energy efficiency. Additionally, recognizing the critical issue of water scarcity, SBP introduced the Efficient Water Management Financing initiative in 2011, issuing guidelines to help farmers implement modern water management systems. This initiative seeks to optimize water use, reduce wastage, and address the rapid depletion of underground water resources by promoting the adoption of advanced irrigation techniques and water conservation practices. Collectively, these efforts by SBP demonstrate a strategic approach to fostering sustainable economic development by addressing key environmental challenges through targeted financial support (SBP, 2021).

Conclusion

In conclusion, while the SBP has laid a strong foundation for integrating environmental considerations into its regulatory framework, there is still a need for a more comprehensive, proactive approach to enhance its policies and strategies. By addressing the identified shortcomings such as expanding climate stress testing, improving data collection, integrating climate risks into monetary policy, and scaling up capacity-building efforts the SBP can strengthen its role in promoting environmental sustainability and financial stability. Moreover, complementing financial policies with broader climate mitigation efforts will be crucial for achieving a resilient financial system and a sustainable economy. The SBP's continued efforts in this direction will not only benefit Pakistan but also contribute to global efforts in achieving sustainable finance and combating climate change. The integration of environmental risks into central bank policy frameworks is increasingly recognized as vital for ensuring the resilience and sustainability of financial systems, particularly in countries like Pakistan that are highly vulnerable to the impacts of climate change. The SBP has demonstrated its commitment to incorporating environmental considerations into the financial sector by introducing comprehensive regulatory frameworks such as the Green Banking Guidelines, ESRM Guidelines, and the ESRM Implementation Manual. These initiatives are significant steps forward, reflecting an understanding of the urgent need to address climate-related challenges (Wijeweera & Rashid, 2023). However, a comparative analysis with best practices from central banks in developed economies reveals critical areas for improvement and opportunities for further alignment with global standards.

Policy Recommendations

To advance its efforts, the SBP should focus on expanding the scope of climate stress testing to include more comprehensive, scenario-based frameworks that consider a range of potential climate-related risks and their impacts on financial institutions. Enhancing these stress tests will provide policymakers with a better understanding of potential risks and the necessary buffers to maintain stability in adverse scenarios.

Additionally, accelerating the implementation of existing environmental policies is essential to bridge the gap between policy development and on-ground application. Although the SBP has established several guidelines, the pace at which these are put into practice remains a concern. Effective implementation would require clear timelines, measurable targets, and enhanced

coordination with financial institutions to ensure compliance and monitor progress. This step is crucial to ensure that policies do not remain mere directives but translate into tangible action that contributes to sustainable financial practices.

Another critical recommendation is to integrate climate risks into the SBP's monetary policy framework. Currently, the focus is predominantly on micro-prudential regulation; however, climate change poses significant macroeconomic risks that could impact inflation, growth, and overall economic stability. By incorporating climate-related risks into its monetary policy, the SBP could better manage the long-term implications of climate change on the economy, ensuring that monetary policy not only supports financial stability but also promotes sustainable economic development. This could involve adjusting interest rates, collateral frameworks, or asset purchase programs to favor green investments and penalize high-carbon activities.

Improving data collection and transparency is another crucial area where the SBP could make significant strides. A lack of accurate and comprehensive data on climate-related financial risks poses a significant barrier to effective risk management. Developing robust data collection frameworks that require financial institutions to report on their climate exposures, greenhouse gas emissions, and other relevant metrics will enable better risk assessment and decision-making. Enhanced transparency will also build trust among stakeholders and ensure that the financial system is better prepared to handle climate risks.

Broadening the scope of green financing initiatives is also vital. Currently, green financing in Pakistan is often limited to a few sectors, such as renewable energy. Expanding the focus to include other critical sectors like sustainable agriculture, water management, and climate-resilient infrastructure will not only diversify green investment opportunities but also address the broader spectrum of climate challenges facing the country. This would require developing targeted financial products, incentivizing private sector participation, and fostering public-private partnerships to scale up green investments. Scaling up capacity-building efforts is another key recommendation. For the SBP's policies to be effective, all financial institutions, especially smaller ones, must possess the necessary skills and resources to manage environmental risks. This would involve providing training, technical assistance, and resources to enhance the capacity of banks and other financial institutions to understand and incorporate environmental risks into their risk management frameworks. Building such capacity is crucial for ensuring that the entire financial sector is aligned with sustainable finance principles.

The study also highlights the need for implementing targeted policies such as Green Basel-type capital requirements, green public guarantees to credit, and carbon-risk adjustments in credit ratings. Green Basel-type requirements would adjust capital reserves for banks based on the carbon intensity of their loan portfolios, incentivizing them to reduce exposure to high-carbon activities. Similarly, green public guarantees for loans supporting sustainable projects could lower financing costs and encourage investment in low-carbon sectors. Finally, incorporating carbon risks into credit ratings would reflect the financial risks associated with high emissions, influencing firms' borrowing costs and driving them towards more sustainable practices.

However, the effects of these policies on financial stability and economic dynamics are complex and require careful calibration. While some combinations of these policies could foster a virtuous cycle of emission reductions, financial stability, and economic growth, they could also, if not managed carefully, lead to credit booms and increased financial instability. Therefore, a comprehensive policy approach is required that combines these financial policies with broader mitigation strategies targeting emissions from the real economy. This dual approach is necessary to ensure that while the financial sector adapts to climate risks, the root causes of climate change are also addressed.

References

- Alexander, K. (2016). Greening banking policy. *Support of the G20 Green Finance Study Group*.
- Ashwini, V., & Aithal, P. S. (2023). Development of a New Conceptual Model: Consumers' Purchase Intention towards Eco-friendly Bags. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 8(4), 154-195.
- Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. *Nature Climate Change*, 7(4), 283-288.
- Bihari, S. C. (2011). Green banking—socially responsible banking in India. *The India Banker*, 6(1), 32-37.
- Bolton, P., Despres, M., Da Silva, L. A. P., Samama, F., & Svartzman, R. (2020). The green swan. *BIS Books*.
- Braun, N. (2021). The Role of the European Central Bank in a Sustainable Financial System. *Junior Management Science (JUMS)*, 6(3), 468-488.
- Brik, H. (2024). Climate risk and financial stability: Assessing non-performing loans in Chinese banks. *Journal of Risk Management in Financial Institutions*, 17(3), 303-315.
- Capasso, G., Gianfrate, G., & Spinelli, M. (2020). Climate change and credit risk. *Journal of Cleaner Production*, 266, 121634.
- Cecot, M. (2019). Climate Emergency and Central Banks. Available at SSRN 3509012.
- Choudhary, S. A., & Salman, A. (2023). Role of Carbon Taxation in Mitigation of GHG Emissions in the Energy Sector of Pakistan.
- Clifford, W., & Smith, J. (1995). Corporate risk management: theory and practice. *The Journal of derivatives*, 30, 21-31.
- Craig, C. D. (2021). *Sustainable finance starts with data*. World Economic Forum.
- Dikau, S., & Volz, U. (2018). *Central banking, climate change and green finance* (No. 867). ADBI Working Paper.
- Diluiso, F., Annicchiarico, B., Kalkuhl, M., & Minx, J. C. (2021). Climate actions and macro-financial stability: The role of central banks. *Journal of Environmental Economics and Management*, 110, 102548.
- Dufays, L. (2012). Responsible Banking the 10 principles. *Aestimatio: The IEB International Journal of Finance*, (5), 238-269.
- Durrani, A. A., Khan, I. A., & Ahmad, M. I. (2021). Analysis of electric power generation growth in Pakistan: Falling into the vicious cycle of coal. *MDPI Eng*, 2(3), 296-311.
- Eckstein, D., Künzel, V., & Schäfer, L. (2021). *The global climate risk index 2021*. Bonn: Germanwatch.
- Economic Survey of Pakistan. (2024). *Economic Survey of Pakistan 2024*. Finance Division, Pakistan, Islamabad.
- ESPON Climate. (2011). *Climate change and territorial effects on regions and local economies*. ESPON Programme.
- Estella, A. (2018). *Legal foundations of EU economic governance*. Cambridge University Press.
- European Commission. (2021). *Overview of Sustainable Finance*. European Commission.
- Fabris, N. (2020). Financial stability and climate change. *Journal of Central Banking Theory and Practice*, 9(3), 27-43.
- Ferrari, A., & Landi, V. N. (2024). Whatever it takes to save the planet? Central banks and unconventional green policy. *Macroeconomic Dynamics*, 28(2), 299-324.
- Fiscal Risk Statement of Pakistan [FSR]. (2024). *Fiscal Risk Statement of Pakistan 2024*. Finance Division, Pakistan, Islamabad.
- Fischer, L., Rapp, M. S., & Zahner, J. (2024). *Central banks sowing the seeds for a green financial sector? NGFS membership and market reactions* (No. 198). IMFS Working Paper Series.
- Flori, A., Pammolli, F., & Spelta, A. (2021). Commodity prices co-movements and financial stability: A multidimensional visibility nexus with climate conditions. *Journal of Financial Stability*, 54,

- Forslid, R., & Sanctuary, M. (2023). Climate risks and global value chains: The impact of the 2011 thailand flood on swedish firms. *Available at SSRN 4348160*.
- Friedlingstein, P., O'sullivan, M., Jones, M. W., Andrew, R. M., Gregor, L., Hauck, J., & Zheng, B. (2022). Global carbon budget 2022. *Earth System Science Data*, 14(11), 4811-4900.
- Goodhart, C. A. (2011). The changing role of central banks. *Financial History Review*, 18(2), 135-154.
- Gründl, H., & Gal, J. (2017). The evolution of insurer portfolio investment strategies for long-term investing. *OECD Journal: Financial Market Trends*, 2016(2), 1-55.
- Hashmi, H. N., Siddiqui, Q. T. M., Ghumman, A. R., Kamal, M. A., & Mughal, H. U. R. (2012). A critical analysis of 2010 floods in Pakistan. *African Journal of Agricultural Research*, 7(7), 1054-1067.
- Hermans, K., & McLeman, R. (2021). Climate change, drought, land degradation and migration: exploring the linkages. *Current opinion in environmental sustainability*, 50, 236-244.
- Hina, S., Saleem, F., Arshad, A., Hina, A., & Ullah, I. (2021). Droughts over Pakistan: Possible cycles, precursors and associated mechanisms. *Geomatics, Natural Hazards and Risk*, 12(1), 1638-1668.
- Institute for Development and Research in Banking Technology [IDRBT]. (2013). *Greening banking for the Indian banking sector*.
- Intergovernmental Panel on Climate Change [IPCC]. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups 646 I. II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 151.
- Javed, S. A. (2021). First Response to the SBP Amendment Act 2021.
- Kaeufer, K. (2010). Banking as a vehicle for socio-economic development and change: case studies of socially responsible and Green banks. *Cambridge, MA: Presencing Institute*, 6.
- Kamran, H. W., & Omran, A. (2023). Role of Microfinance in Mitigating Disasters in Pakistan. *Journal of Environmental Management & Tourism*, 14(1), 150-159.
- Khan, A., Laeeque, S. H., & Munir, M. (2024). Green Banking in Pakistan: A Qualitative Study. *THE ASIAN BULLETIN OF GREEN MANAGEMENT AND CIRCULAR ECONOMY*, 4(1), 99-115.
- Khan, I., Lei, H., Shah, A. A., Khan, I., & Muhammad, I. (2021). Climate change impact assessment, flood management, and mitigation strategies in Pakistan for sustainable future. *Environmental Science and Pollution Research*, 28, 29720-29731.
- Kumar, S., Sharma, D., Rao, S., Lim, W. M., & Mangla, S. K. (2022). Past, present, and future of sustainable finance: insights from big data analytics through machine learning of scholarly research. *Annals of Operations Research*, 1-44.
- Lal, I., Muhammad, S. D., Hussain, A., & Jalil, M. A. (2009). Effects of financial structure and financial development on economic growth: A case study of Pakistan. *European Journal of Social Sciences*, 11(3).
- Lamperti, F., Bosetti, V., Roventini, A., Tavoni, M., & Treibich, T. (2021). Three green financial policies to address climate risks. *Journal of Financial Stability*, 54, 100875.
- Lang, Q., Ma, F., Mirza, N., & Umar, M. (2023). The interaction of climate risk and bank liquidity: An emerging market perspective for transitions to low carbon energy. *Technological Forecasting and Social Change*, 191, 122480.
- Lee, H., Calvin, K., Dasgupta, D., Krinmer, G., Mukherji, A., Thorne, P., ... & Zommers, Z. (2023). Synthesis report of the IPCC Sixth Assessment Report (AR6), Longer report. IPCC.
- Levine, R. (2002). Bank-based or market-based financial systems: which is better?. *Journal of financial intermediation*, 11(4), 398-428.
- Mahmood, S., Rahman, A. U., & Sajjad, A. (2019). Assessment of 2010 flood disaster causes and damages in district Muzaffargarh, Central Indus Basin, Pakistan. *Environmental Earth Sciences*, 78, 1-11.
- Masud, M. A. K., Sahara, J., & Kabir, M. H. (2023). A relationship between climate finance and climate

- risk: Evidence from the South Asian Region. *Climate*, 11(6), 119.
- Monnet, E., & van't Klooster, J. (2023). Using green credit policy to bring down inflation: What central bankers can learn from history. *The Inspire Sustainable Central Banking Toolbox Policy Briefing Paper*, 13.
- Mubashir, M., Meraj, M., Ijaz, M., Shahnawaz, K., & Asif, M. (2025). Environmental Sustainability in the Microfinance Sector in Pakistan: Challenges and Opportunities. *Journal of Asian Development Studies*, 14(1), 887-899.
- National Determined Contributions [NDC]. (2021). *Unified National Determined Contributions of Pakistan*. Government of Pakistan, Islamabad.
- Naqvi, B., Rizvi, S. K. A., Mirza, N., & Umar, M. (2023). Financial market development: a potentiating policy choice for the green transition in G7 economies. *International Review of Financial Analysis*, 87, 102577.
- Network for Greening the Financial System [NGFS]. (2021). *NGFS climate scenarios for central banks and supervisors*. Network for Greening the Financial System, Paris.
- Network for Greening the Financial System [NGFS]. (2021). *Adapting central bank operations to a hotter world: reviewing some options*. Network for Greening the Financial System, Paris.
- Olivier, J. G., Schure, K. M., & Peters, J. A. H. W. (2020). Trends in global CO₂ and total greenhouse gas emissions. *PBL Netherlands Environmental Assessment Agency*, 5, 1-11.
- Otto, F. E., Zachariah, M., Saeed, F., Siddiqi, A., Kamil, S., Mushtaq, H., ... & Clarke, B. (2023). Climate change increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan. *Environmental Research: Climate*, 2(2), 025001.
- Ouazad, A., & Kahn, M. E. (2022). Mortgage finance and climate change: Securitization dynamics in the aftermath of natural disasters. *The Review of Financial Studies*, 35(8), 3617-3665.
- Pakistan. Economic Adviser's Wing. (2024). *Pakistan Economic Survey*. Government of Pakistan, Finance Division, Economic Adviser's Wing.
- Qazi, T. F., Niazi, A. A. K., Saleem, M., Basit, A., & Ahmed, M. U. (2023). Evaluation of Green Banking in Pakistan Using Framework of the Central Bank: Employing TOPSIS Approach. *Bulletin of Business and Economics (BBE)*, 12(4), 159-168.
- Rehmat, A., Ahmad, S. M., Danish, S., Umar, A., Khaver, A., & Khan, R. M. (2023). Claiming Reparation for Loss and Damage due to Floods 2022: The Case of Pakistan.
- Ritchie, H., & Roser, M. (2023). Global inequalities in CO₂ emissions. *Our World in Data*.
- Rizzello, A., & Kabli, A. (2020). Sustainable financial partnerships for the SDGs: The case of social impact bonds. *Sustainability*, 12(13), 5362.
- Semieniuk, G., Campiglio, E., Mercure, J. F., Volz, U., & Edwards, N. R. (2021). Low-carbon transition risks for finance. *Wiley Interdisciplinary Reviews: Climate Change*, 12(1), e678.
- Shehzad, K. (2023). Extreme flood in Pakistan: Is Pakistan paying the cost of climate change? A short communication. *Science of The Total Environment*, 880, 162973.
- Shirai, S. (2023). *Global climate challenges, innovative finance, and green central banking*. Asian Development Bank.
- Slevin, D., Hoerter, S., Humphreys, N., Viñes Fiestas, H., Lovisol, S., Wilmotte, J. Y., ... & Kramer, B. (2020). Taxonomy: final report of the Technical Expert Group on Sustainable Finance. *European Commission, Brussels*.
- Smoleńska, A. (2023). Central bank supervisory role: Micro-prudential supervision and regulation of ESG risks.
- State Bank of Pakistan. (2018). *Environmental & Social Risk Management (ESRM) Guidelines*. State Bank of Pakistan, Karachi.
- State Bank of Pakistan. (2022). *Environmental & Social Risk Management (ESRM) Implementation Manual for Financial Institutions*. State Bank of Pakistan, Karachi.
- State Bank of Pakistan. (2023). *SBP Vision 2028*. State Bank of Pakistan, Karachi.

- State Bank of Pakistan. (2024). *Financial Stability Review 2023*. State Bank of Pakistan, Karachi.
- Tarullo, D. K. (2014). Macroprudential regulation. *Yale J. on Reg.*, 31, 505.
- Thiemann, M., Büttner, T., & Kessler, O. (2023). Beyond market neutrality? Central banks and the problem of climate change. *Finance and Society*, 9(1), 14-34.
- Thwaites, J., Whitley, S., Wright, H., & Ott, C. (2018). Aligning Finance Is the Forgotten Goal of the Paris Agreement. But It Is Vital to Successful Climate Action. *World Resources Institute*.
- Weber, O., & Remer, S. (2011). Social banking: introduction. In *Social banks and the future of sustainable finance* (pp. 1-14). Routledge.
- Wijeweera, K. R., & Rashid, H. (2023). Greening the Financial System of Pakistan. *United Nations Development Program Pakistan*.