Box 3.2: Artificial Intelligence's interaction with Climate Change and Supervisory Objectives

Background:

Digital transformation and climate change[25] are the two most powerful trends that appear to re-shape global economy over the coming years. These forces are not only posing serious challenges to the globe independently, their increasing interaction also involves both positive and negative implications for economic and financial stability. Artificial Intelligence (AI)—the science of making computers perform complex tasks typically associated with human intelligence—is a powerful tool for advancing and scaling up transformative climate action. It can improve the effectiveness of decision making and can also help in mitigating risks arising from climate change, by efficiently handling the complex and large size datasets and scenarios involved.[26] However, energy intensive aspect of AI technology involves environmental concerns and its ineffective use in the financial sector may pose supervisory challenges relating to operational failures, cyber-attacks, conduct, and increased volatility in financial markets, among others.

AI is helping to address climate challenges and improve efficiency:

AI is already contributing in climate-resilient and low-emissions development in several ways. For instance, it is helping to measure changes in icebergs with incredible pace (10,000 times faster than humans could do).[27] Besides providing more advanced warnings for extreme weathers, AI is supporting to map the impact of deforestation on the climate crisis. Further, AI technology is being utilized to make waste management more efficient. In addition, AI is being utilized to reduce plastic pollution from ocean.[28] Particularly, AI has impressive capacity to gather, complete, and interpret large datasets thus supporting data driven decisions for climate action.

AI and environmental concerns:

Nonetheless, AI could be a double edged sword. The concerns arise from the fact that the infrastructure required to run AI is energy and resource intensive.[29] For example, training a large language model (LLM) such as OpenAI's Generative Pre-trained Transformer (GPT)-3 consumes thousands of megawatts of electricity and emits 300,000 KG of carbon dioxide equivalent.[30] Besides consuming substantial quantum of electricity, the data centers then need a significant amount of water to cool, leading to strain on local water resources. Moreover, these data centers—which run AI systems—often rely on non-renewable energy sources.[31] Worryingly, rapid growth in AI technology is leading to increased number and size of data centers and consequently amplifying their impact on the environment. The extent of growth is manifested by a recent international survey, which indicates that around 75 percent of organizations have adopted AI for one or more business operations.[32] According to International Energy Agency , the AI, cryptocurrencies, and data centers together accounted for two percent of world's power demand in 2022 which could double and match electricity consumption of Japan by 2026.[33] Nonetheless, Chinese AI DeepSeek R1 technology, introduced in January 2025, may offer significant help in addressing climate concerns if it proves to be energy efficient.

In addition to the energy intensive nature of AI, another serious environmental concern relates to electronic waste generation. Rapid technological advancement is resulting in high turnover rate leading to increased accumulation of

[25] According to World Health Organization (WHO), almost four billion people are living in areas highly vulnerable to climate change

[26] What opportunities and risks does AI present for climate action?

[27] 9 ways AI is helping tackle climate change

[28] Ibid

[29] AI is supposed to make us more efficient – but it could mean we waste more energy

[30] AI can help us fight climate change. But it has an energy problem, too

[31] Zhuk, A. (2023). Artificial Intelligence Impact on the Environment: Hidden Ecological Costs and Ethical-Legal Issues. Journal of Digital Technologies and Law, 1(4), 932-954.

[32] Artificial intelligence: a central bank's view

[33] The environmental cost of AI

electronic waste. As per Global E-Waste Monitor 2024, 62 million tons of *e*-waste was produced in 2022, showing a staggering increase of 82 percent from 2010. This is likely to increase by another 32 percent in 2030.[34]

AI and supervisory concerns with regard to conduct and financial soundness

A highly important aspect of AI is to assess the systemic risks on financial institutions and their customers. For instance, high technological penetration[35] and supplier concentration[36] could expose financial institutions to losses arising from operational failures, cyber-attacks and supply chain disruptions affecting key vendors.[37] Further, increased use of AI models with similar characteristics could augment asset price vulnerabilities due to increased correlations in financial markets.[38] Furthermore, AI models may have implications for the integrity of financial institutions resulting from discriminatory customer treatment due to algorithmic biases.[39]

In this regard, financial sector regulators and supervisors need to ensure responsible use of AI by adequately managing the risks of AI applications without compromising innovative efforts. It is important to note that European Artificial Intelligence Act—the first comprehensive Act worldwide—has entered into force from August 01, 2024.[32] It prohibits AI systems that pose "unacceptable risks" such as social scoring[33] that threaten fundamental rights of citizens. The Act, however, authorizes a wide range of AI systems that entails "high risks" to public health and safety, subject to a set of requirements and regulations.

In Pakistan's case, '*Guidelines on the Responsible use of Artificial Intelligence* (***AI***) *in Financial Services*' are at an advance stage of finalization at SBP, with the objective to foster trust, transparency and accountability in AI-driven financial services, while safeguarding the rights and interests of the consumers.

AI and the banking industry:

With AI adoption surging across different sectors, the global banking industry is also increasingly embracing these technologies.[40] The most commonly adopted AI technologies by banks include robotics, process automation (for structured operational tasks), virtual assistant (for customer service), and machine learning techniques (for fraud detection and risk management).[41] In case of Pakistan, financial institutions are also embracing AI technology. The results of the SBP's first survey on use of AI in banks reveal that about half of the regulated entities have either deployed AI in financial services, or are in the process of development. Moreover, survey indicates that the AI is being used for a variety of financial services, including fraud detection, customer services, marketing, credit risk assessment, process automation etc. In this context, banks need to take care of associated risks of AIs and incorporate carbon footprint of AI into their risk management frameworks, introducing it as a specific risk category. This requires relevant risk identification, assessment, development and implementation of adequate risk mitigation strategies.

The foremost step is to recognize the potential environmental risks associated with the adoption of AI systems. It is imperative to note that the most commonly used AI technologies in the banking sector are among the most energy intensive owing to real time processing and high accuracy requirement. After risks identification, banks need to measure the emissions associated with AI models throughout their life cycle.[42] Carbon accounting tools such as GHG

[34] The global E-waste Monitor 2024
[35] When AI is widely adopted across different financial entities for an increasing number of processes and applications
[36] When a majority of financial institutions use the same or very similar foundation models provided by a few suppliers
[37] Leitner, G., Singh, J., van der Kraaij, A., & Zsámboki, B. (2024). *The rise of artificial intelligence: benefits and risks for financial stability. Financial Stability Review,1*.
[38] Board, F. S. (2024). *The financial stability implications of artificial intelligence*.
[39] Algorithmic bias *results in unfair outcomes due to skewed or limited input data, unfair algorithms, or* exclusionary practices during AI development
[40] According to McKinsey Global AI Survey in 2021, almost 60 percent of the financial sector's respondents revealed that their firms were using at least one AI capability.
[41] McKinsey (2021). Building the AI Bank of the Future
[42] Tkachenko, N. (2024). Integrating AI's Carbon Footprint into Risk Management Frameworks: Strategies and Tools for Sustainable Compliance in Banking Sector. arXiv preprint arXiv:2410.01818.

Protocol Toolkit[43] and OpenLCA[44] could help assess the concrete environmental impact. Finally, banks must implement risk mitigation strategies to contain the environmental impact of their AI systems. The energy efficient AI models and algorithms could help address climate concerns. Another way is green cloud computing practices — data centers that are powered by renewable energy sources. Incorporating AI carbon concerns into existing risk management frameworks and treating emission risks with same level of importance along other traditional risks is critical. It is noteworthy that International Financing Reporting Standards (IFRS) S1 and S2 also require companies to disclose information about all sustainability-related risks and opportunities specifically about climate related exposures.[45] In Pakistan, the adoption of these standards have been proposed in a phased manner, initially starting with listed companies on the basis of certain criteria, such as total assets, turnover and number of employees.[46] It deserves emphasis that banks must define risk appetite and tolerance level for AI's carbon footprint. By setting thresholds, banks would ably deploy AI system balancing operational efficiency with environmental concerns.

[43] GHG Protocol tools enable companies and cities to develop comprehensive and reliable inventories of their GHG emissions, and help countries and cities track progress toward their climate goals.
[44] OpenLCA is a free and open-source software tool for conducting Life Cycle Assessments (LCAs) and other sustainability assessments.
[45] Introduction to the ISSB and IFRS Sustainability Disclosure Standards, available at: https://www.ifrs.org/sustainability/knowledge-hub/introduction-to-issb-and-ifrs-sustainability-disclosure-standards/
[46] SECP Press Release: adoption of IFRS Sustainability Disclosure Standards, available at: https://www.secp.gov.pk/wp-content/uploads/2025/01/Press-release-on-Jan-1.pdf