International Journal of Advance Research in Science and Engineering
Volume No. 13, Issue No. 05, May 2024
www.ijarse.com
IJARSE
ISSN 2319 - 8354

Striking a Balance in Climate Risk Assessment in the Banking sector: Evidence on India-Canada comparative analysis

Surjeet Singh[1], Dr. Rajinder Kumar[2]

[1]Research Scholar, School of Arts & Humanities, Arni University, Indora, Himachal Pradesh,

[2]School of Arts and Humanities, Arni University, Indora, Himachal Pradesh

Abstract

Climate change presents systemic risks to the stability of global financial systems by revealing physical risks to the banking industry through extreme weather occurrences, floods, heatwaves, and transition risks due to policy, technology, and market structure changes. Banking institutions are the major capital intermediaries, and they are under pressure to incorporate climate issues into governance, risk evaluation, and reporting. The research conducts a comparative analysis, which is carried out solely based on secondary data, which is composed of peer-reviewed literature, regulatory literature, bank disclosures, and the global frameworks, including the Network of Greening the Financial System (NGFS) and the Task Force Climate-related Financial Disclosures (TCFD).

Keywords: *Climate risk, Banking regulation, Stress testing, Secondary data analysis, India, Canada, NGFS, TCFD, Comparative study, Regulatory maturity, Physical risks, Transition risks, Climate finance, financial stability, green lending, Data infrastructure, Climate risk governance, Harmonized framework*

1. Introduction

The growing recognition of systemic financial dangers of climate change has altogether revolutionized the priorities of banking regulation globally. Climate-related risks are multi-dimensional, interdependent, and long-term in nature, and they usually operate over decades as opposed to conducting the usual examples of financial risk like credit, market, or operational risks. It is difficult to describe them and model them into established risk management systems because they interact with the economic systems in such a complex fashion. The international regulatory community widely differentiates climate-related risks into two interconnected categories:

1. Physical Risks- These are a result of both sudden occurrences that include floods, cyclones, hurricanes, and wildfires, as well as long-term changes like long-term temperature changes, sea-level rise, and changes in precipitation patterns. These risks may lead to direct losses, damages to assets, production, and distribution supply chains, deterioration of margins on the collateral, and may affect major loan defaults.

2. Transition Risks- The risks of this nature are driven by the policy, technological, and market transition associated with the shift of the world to a low-carbon economy. They have the capability of creating stranded assets, changing capital flows, valuation losses in carbon-intensive sectors, and re-pricing of risks in various financial markets. These include the effect of carbon pricing, renewable energy, and variation in the demand patterns. As the risks associated with climate change are now widely recognized to require action, international organizations developed broad directions, scenarios, and approaches to incorporate climate risks into the

prudential supervision and stress testing practices: The Network for Greening the Financial System (NGFS), the Task Force on Climate-related Financial Disclosures (TCFD), and the Basel Committee on Banking Supervision (BCBS) have issued a thorough guideline, scenario, and a technical framework to integrate climate risks into prudential supervision and stress-testing. All these frameworks focus on integrating governance, future-oriented scenario analysis, and the creation of standardized climate-related metrics and disclosures. The article presents a secondary-data comparative analysis of climate risk assessment in the banking industries of two countries, India and Canada, that vary largely in economic setup, climate exposure, and regulatory developments, yet adhere to global climate-financing endeavours.

2. Literature Review

2.1 Finance Stability and Climate Risk

The increasingly mounting literature has repeatedly mentioned that climate change is a systemic risk to the global order of financial systems, and the effects are communicated mainly along two channels, viz., physical risks and transition risks. Supply chain resiliency Physical risks can be described as the true impacts of climate-related events (both acute, such as cyclones, floods, wildfires, and chronic, such as gradual sea-level rise and temperature change, and changes in precipitation patterns). Such tendencies may affect the value of assets, derail supply chains, and augment loan defaults, especially in economies in which climate-intensive economic activities have a significant share in agriculture, fisheries, and tourism (Battiston et al., 2017; Bolton et al., 2020) The transition risks, in their turn, are related to structural change in the pace of the economy towards decarbonization. The effects of climate-related policy changes, technological innovation, and a possible shift in consumer habits, which can cause asset stranding, reallocation of capital, or drastic repricing in the carbon-intensive sector (Carney, 2015; Somonauk et al., 2022). Empirical studies call for a differentiated geographic distribution of the prevalence of such risks: in emerging economies, physical risks have a larger weight, and in advanced economies with a rapid pace of decarbonization, it is transition risks (Volz, 2021). Besides, the non-linear relationships of climate change-related damage indicate that in response to minor changes in the environment, the financial effects may be disproportionately high and even irreversible (an increase in global mean temperature, Dietz et al., 2016).

2.2 Climate Risk Governance Frameworks in the World

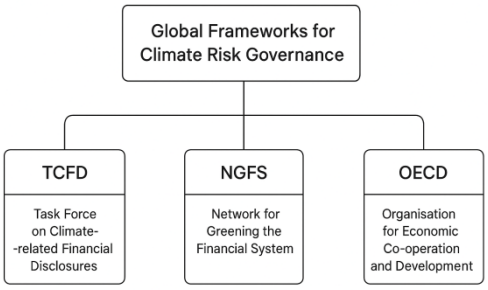
Several international systems have been formulated to meet the challenge of integrating climate-related risks into financial supervision:

• Task Force on Climate-related Financial Disclosures (TCFD) - The TCFD was formed by the Financial Stability Board in 2015, and its 2017 recommendations are based upon four pillars, or requirements: governance, strategy, risk management, and metrics/ targets. The framework promotes proactive scenario examining, which allows the financial institutions to identify risks that are not likely to be proven in closed-ended models. The fact that it is voluntary has not acted as a barrier to adoption; instead, the TCFD has gained remarkable uptake in G20 economies and has helped change national regulatory regimes (Krueger et al., 2020; Ameli et al., 2021).

• **Network for Greening the Financial System (NGFS) –** The NGFS constitutes more than 120 central banks and supervisors and has formulated a set of climate scenario pathways, i.e., Orderly, Disorderly, and Hot House World, to be used in climate stress testing. The scenarios consider macroeconomic, sectoral, and emissions, which allows assessing the situation at more than merely a short-term level (NGFS, 2020; 2022; Allen et al., 2020;

Pieterse et al., 2021).

• **OECD (Organisation for Economic Co-operation and Development) data:** organisations emphasise that usable and meaningful climate risk integration needs high-quality, granular data, state-of-the-art macro-financial modelling, and cross-sector co-operation between regulators, data providers, and financial markets.



2.3 Climate Risk in the Emerging Market: India

Physical climate risks to India are very significant, including severe exposures in agriculture, energy infrastructure, and coastal urban areas (Sharma & Gupta, 2021). As a case in point, crop yield decline linked to increased frequency of cyclones within the Bay of Bengal and extended heatwaves in northern states has been cited as one of the factors surrounding loan repayment in rural spheres within the banking industries.

Regulatory Developments:

Lastly, the Reserve Bank of India (RBI) has released Discussion Papers on Climate Risk and Sustainable Finance (2022, 2023) that set out the expected standards of governance arrangements, voluntary disclosure practices, and initial guidance on the risk identification procedure.

• The PSL norms in India offer a subsidy on financing projects under renewable energy, indirectly coupling credit given to climate-related missions.

Problems in Conventional Literature:

• **Information Vacuums:** Climate-finance data are breakable and can be used to develop advanced stress trials (RBI, 2023).

• **Capacity Limitations:** Smaller and regional cooperating banks do not usually have the technical skills to engage in NGFS-compatible scenario analysis (World Bank, 2022).

• **Regulatory Maturity:** The current practice of the RBI has been principles-based and non-binding; thus, not created uniformity with regard to climate disclosures at the bank level.

2.4 Climate Risk in Developed Economies: The example of Canada

Being a high-income and resource-intensive economy, Canada has sharp transition risks associated with the decarbonization of carbon-dense industries that include oil, gas, and mining (Carney, 2019).

Regulatory Developments: The Office of the Superintendent of Financial Institutions (OSFI) released Guideline B-15: Climate Risk Management (2023), requiring the integration of climate risk into governance and risk assessment and into TFD-aligned disclosure processes.

• The Bank of Canada has undertaken numerous NGFS-oriented pilot exercises in climate scenarios targeting the incorporation of the long-term implications of new carbon prices and the transition policies on the high-emission sectors.

Literary strengths:

Data Infrastructure: The presence of large and long-term data sets of climate services, like the Canadian Centre for Climate Services (Doda et al., 2021).

• High-performance Modelling: Incorporation of macroeconomic feedback mechanisms, assigning of policies to sectors, and pricing transition risks into scenario analysis (Pieterse et al., 2021).

• Regulatory Maturity: Prescriptive requirements will provide consistency among large financial institutions, and put Canada on the world map in terms of climate risk management (Gingras et al., 2023).

In the pie chart, the climate risk profile of India against the emerging developments in regulation and major challenges can be compared with the profile of Canada, which is characterized by robust actions and stable institutions.

2.5 Research Gap and Comparative Literature

Although there has been a very fast growth of a body of literature in the area of climate finance, there is still a dearth of direct bilateral comparison between emerging economies and the advanced economies of the world. The works (e.g., Volz, 2021; Allen et al., 2020) are most commonly devoted to regional clusters (e.g., European Union, ASEAN) or single case studies and not to systematic, cross-country analysis.

The major gaps found in the literature are:

1. The absence of Integrated Comparative Frameworks- Few studies involve the methodology-like rigor of the advanced economies, with the detail-related flexibility necessary for the emerging markets.

2. Lack of Cross-Learning Mechanisms – Inadequate consideration of how the separation of advanced modelling skills could be conveyed to the new markets, with less risk of placing an excess demand on the institutional capabilities of the new markets.

3. Lack of Harmonization Models – Nonetheless, there is no commonly applied model (or proposed framework) that strikes a suitable balance between global comparability and national relevance, even though a majority of actors have recognized the necessity of both in effective climate risk governance.

3. Methodology

3.1 Philosophy and approach to research

The design of this study is a qualitative, comparative case study with the interpretivist research philosophy applied

due to the use of secondary sources of data. The interpretivist approach is especially informative due to the reason that incorporation of climate risks is not so much a technical or quantitative undertaking but a regulatory and institutional practice to be influenced by the political priorities of a country, economic frameworks, and governing traditions.

3.2 Rationale of case selection

To perform this analysis, India and Canada were intentionally chosen in that the two countries have opposite and contrasting profiles of climate risks, dealing with significant differences in regulatory maturity, although they share similarities in relation to their engagement in international initiatives surrounding climate finance.

• **Diverging Risk landscapes:** India is very susceptible to physical climate risks (flood, drought, cyclone), whereas Canada is more exposed to transition risks (because of its aggressive use of its carbon-related industries).

• **Regulatory Maturity:** where Canada has a prescriptive and mandatory disclosure regime (e.g., OSFI Guideline B-15), a very different state of climate risk regulation exists in India, which is at an early point by principles rather than form.

• **Economic Structures:** The Indian system of banking is heterogeneous, i.e., catering to both large corporates and the rural agricultural borrower; the Canadian system of banking is highly concentrated under a few organizations that are larger and globally integrated.

3.3 Study Design

To keep the research designed in a structured and systematic manner, it comes in three stages of sequential research design:

1. Exploratory Phase: The international frames of climate finance (NGFS, TCFD, and BCBS) were reviewed desk-based to select a range of global principles to work towards in climate risk incorporation in the banking industry. This move set a standard for comparing the Indian and Canadian systems of the country.

2. Comparative Phase: Indian as well as Canadian regulatory, central bank publications, and financial sector policy papers were retrieved and examined. ESG and sustainability disclosures published by the largest banks of the countries were also publicly reviewed to identify the established structures of governance, approaches adopted to identify risks, and practices of disclosure.

3. Analytical Phase- The results obtained in the earlier stages were assembled as a Convergence Divergence Innovation Matrix to classify elements that are:

- Similarities present in the two countries (convergences)
- Country specific (divergences)
- novel and perhaps movable innovations

3.4 Source of Data

To retain methodological rigor, the research uses only secondary data collection, which can be categorized into four key topics:

1. Regulatory Publications: These are publications on regulations or rules of play, licensing and registration; fair play and unfair play and/or unethical practices in sports; the structure of rules, rules governing the format of a game, etc.; suspension, deduction of points, and disqualification; fines on players, the team as a whole, coaches, etc.; disqualification on grounds of doping or other grounds or reasons; disqualification as well as dismissal of officials; etc.

India: Reserve Bank of India (RBI) Discussion Papers on Climate Risk and Sustainable Finance (2022, 2023), RBI Annual Reports, and Department of Banking Regulation circulars.

Canada: 1. Guideline B-15- Climate Risk Management (2023), published on the Office of the Superintendent of Financial Institutions (OSFI) website; the Bank of Canada climate scenario analysis reports (2021-2023), published on the Bank of Canada website; and the Government of Canada sustainable finance strategy documents.

2. Public Bank Disclosures - ESG and sustainability integrated annual reports of the top-10 banks in each country by the amount of assets and market capitalization. The documents can shed some light on governance at an institutional level, scenario analysis activity, and the risks of climate-related disclosures.

3. Academic Literature-Peer-reviewed research covering the 2015-2024 period that relates to the studies on climate risk governance, stress testing approaches, and comparative financial regulation. Authorities were taken from credible journals in banking, finance, and environmental economics.

4. International Frameworks – To provide a global standard and framework to manage climate risks, official reports and data by the NGFS (2020, 2022), TCFD (2017), and BCBS (2021) were relied on.

Category India Sources Canada Sources Scope / Purpose

1. Regulatory Publications Bank of Canada climate scenario analysis reports (20212023)

• RBI Discussion Papers on Climate Risk & Sustainable Finance (2022, 2023)

• Department of Banking Regulation circulars, RBI Annual Reports

• RBI Annual Reports

2. Public Bank disclosures: Disclosed ESG, sustainability, and integrated annual reports of the top 10 banks by the size of total assets and market capitalization. Disclosed institutional level of governance, scenario analysis practice, and climate-related risk disclosures.

4. Findings

4.1 Convergences

The argument analysis of secondary literature reveals that the two countries of India and Canada have several areas of convergence:

• **Regulatory Acknowledgment:** Both the Reserve Bank of India (RBI) and the Office of the Superintendent of Financial Institutions (OSFI) acknowledge explicitly climate change as a material financial risk.

• **Scenario Analysis Adoption:** Both have begun to use the use of NGFS- aligned scenarios to test climate stresses, albeit in different stages of maturity.

• **Stakeholder Participation via** Publication. Stakeholder participation in both countries is demonstrated by written collaboration with banking organizations, international financial systems, and consultations with the population to optimize procedures.

4.2 Divergences

Comparison of the secondary data makes it clear that there exist some differences in the manner in which India and Canada carry out the integration of climate risk in the banking sector. Such differences can be traced to varying exposure to risk, regulatory development, availability of data, and capacity of the institutions.

India Canada

Data Availability Data systems in India are disunified, and climate-finance data sets can be found widely dispersed

in ministries, research organizations, and international organizations.

Domestically, German banks have a thirst for the best quality global databases (e.g., NGFS scenarios, IPCC datasets) or third-party consultancy reports to fill domestic gaps. Canada has access to large, nationally maintained datasets handled by specialized agencies like the Canadian Centre for Climate Services (CCCS) and has access to detailed, long-term historical and projected climatic data at the regional and sectoral levels.

Regulatory Maturity: The climate risk regulation model in India is based on principles rather than a prescribed regulation and emphasizes making climate disclosures voluntary. There is no mandatory requirement that all banks issue TCFD Climate risk reports, even though the Reserve Bank of India (RBI) has already issued discussion papers and policy guidelines that banks can use as a guideline to issue TCFD-aligned reports. Canada has a prescriptive and enforceable framework. The Office of the Superintendent of Financial Institutions (OSFI) requires integration of climate risk into risk governance, ICAAP, and public communication, and places supervisory requirements in a stricter context.

Risk Focus: The physical risks are at the centre of policy and institutional attention in the country since it is highly exposed to floods, droughts, cyclones, and heatwaves, which affect agricultural lending, infrastructure financing, and the market rural credit directly. The transition risks prevail, fuelled by carbon pricing programs, energy transition requirements, and allocation changes in resource-intensive industries, egg, oil and gas and mining.

Speed of integration: The pace of climate risk integration in India is slow and is directly connected to the capacity-building initiatives, as regulators give banks time to adjust to the pace at different speeds according to their size and resources. The process of integration is time-limited and fast, as deadlines and implementation stages are outlined by OSFI.

4.3 Promising Practices

Although there are discrepancies, there are innovations in both countries on how to harmonize the approach:

• Canada:

Introduction of sophisticated sectoral profiles of transition risk built into the Internal Capital Adequacy Assessment Process (ICAAP).

Mandatory TCFD-compatible disclosures, which would entail banks quantifying and reporting on the exposure to climate risk through various scenarios promulgated by NGFS.

• India:

Priority Sector Lending (PSL) is the requirements that encourage banks to deliver funds to renewable energy projects as well as other environmentally based projects.

Agricultural lending mechanisms that are climate-friendly, as postulated in RBI policy papers, whereby credit risk evaluations are made specific to regional climate risks.

India against Canada in terms of the Comparative Climate Risk Profile

Indicator India (Physical Risk-Focused) Canada (Transition Risk-Focused) Source. **Main Types of Risk:** Physical risks, e.g., floods, droughts, cyclones. Transition risks, e.g., the carbon policy changes, energy transitions, RBI (2023); OSFI (2023).

Regulatory Framework Level Principles-based; TCFD implementation voluntarily in initial phases, Prescriptive; TCFD-based obligatory reporting. **Data Infrastructure:** Highly segmented; relies on international data,

Nationwide long-term data through Canadian Climate Centre NGFS (2022)

5. Discussion

As analysed below in the comparative review of secondary sources, regulatory reports, and publicly available bank disclosures, harmonizing climate risk assessment in the banking sector does not mean any uniformity of practice is being requested. More appropriately, it should mean a process of defining the fundamental, comparatively similar principles with flexibility that can enable adjustments at the jurisdiction-level to suit local contexts, priorities, and capabilities of institutions.

• **Standardization:** There is a uniformity in the scenario models to be followed by banks, disclosure templates, and governance requirements, and therefore, the metrics on climate risk may thus be directly compared across banks.

• **Regulatory Clarity:** Clear prescriptive regulations exclude ambiguity, so banks have a clear understanding of what the supervisors are looking forward to.

• **Investor Confidence:** Clear and frequent disclosures enhance transparency in the market, which facilitates making informed decisions by the investors, credit rating agencies, and other market stakeholders.

• **Consistency with Developmental Priorities:** The model includes climate risk within the context of broader development, which could include financial inclusion, rural expansion of credit, and sustainable funding of infrastructure.

• **Capacity-Sensitive Implementation:** Regulations promulgated include how they are presented, and it is observed that regulatory expectations are presented without the usual demand requirements, but in the perspective of being presented as guides to enable respective institutions to adjust accordingly based on their technical preparedness and operational capacity.

Innovation in Niche Areas: It was India that introduced the Priority Sector Lending (PSL) used in financing renewable energy projects, with renewable sectors experiencing a green credit stimulus.

Policy Implication:

A hybrid framework seems to be the most feasible way of harmonizing global climate risk within the banking sector. It would include:

1. Global Baseline Standards: Core requirements Appliance of NGFS scenarios with the application of TCFD reporting pillars requirements would achieve a floor of methodological rigor and cross-border comparability.

2. Jurisdictional Flexibility: Nations would be at liberty to flex regulation, data, and capacity building works to both their economies and institutions.

3. Cross-Border Learning Platforms: It might also help to have a regular exchange program among the regulators, policymakers, and industry stakeholders that might allow information and data tool transfers about technical expertise between advanced and developing economies.

4. Phased Enforcement: Emerging economies may be allowed to implement a tier-based approach to compliance, initially with qualitative disclosures and then work up to fully quantitative, scenario-based reports, as the capacity matures.

6. Policy Recommendations

With the help of the comparative analysis of secondary sources of data-regulatory guidelines, central bank reports,

academic literature, and sustainability reports published by banks publicly, this research paper has suggested the following policy proposals in developing a harmonized but contextually sensitive approach to climate risk assessment in banking:

1. Provide a Global Local-Global Trade Promoting Framework

Implement at least the climate risk integration standards that are congruent with NGFS climate scenarios, as well as TCFD disclosure pillars. This ought to specify:

• Key governance provisions of the board-level oversight of climate risk.

• The penalizing requirement of classifying the climate-related risks on a physical and transition basis.

• Template minimum disclosures to make them inter-jurisdictional.

This base would serve as a basis that would form the base of all the countries without leaving aside the differences that a country may have methodologically.

2. Encourage cross-border Learning

Developing India-Canada regulatory dialogue programmes. Share scenario modelling lesson plans and field-related vulnerability indices.

• Train regulators and risk officers in the emerging markets on modern stress testing.

• Create common policy briefings and technical tool kits to be modified according to varying regulatory levels of maturity.

5. Put in place Phased and Tiered Time Limits on Compliance

Realizing the existence of a varying degree of institutional preparedness, a two-tiered compliance structure might be used in the countries:

• **Phase 1:** Qualitative disclosures with governance, strategy, and risk identification.

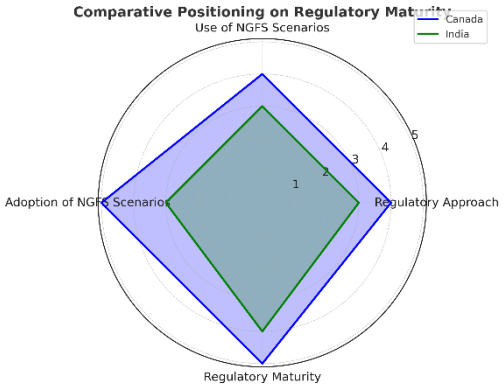
• **Phase 2:** Limit analysis of scenarios of important sectors in part.

• **Phase 3:** Portfolio-level, NGFS-compatible stress tests and reporting and disclosures consistent with TCFD.

Maturity Spectrum of Regulation

According to the synthesis of literature as revealed by NGFS, TCFD, RBI, and OSFI)

Comparative positioning on Regulatory Maturity



First, at the pilot stage, run by a few large banks, mentored by RBI discussion papers, and then hopefully ingrained within national climate scenario exercises. Not orderly. There is little observable evidence of adoption. It is used in transition risk analysis, OSFI stress tests. Hot House World. About RBI papers, but not yet incorporated into

supervision, apply to state the worst-case projections of climate.

Risk Focus: Adoption of NGFS scenarios, Physical risk focus vs. transition risk focus, Canada Risk focus on carbon-pricing stress tests. Data Application of international climate data, Data quality/granularity variance, India - Sector-wise agricultural lending

Future Scope

1. Climate Risk Supervisory Stress Tests at More Banks

The Canadian strategy can be transferred slowly to the Indian multi-faceted banking industry.

2. Design of Climate Risk Indices Sector-Specific: Literature recommends the sector to be targeted with agriculture, energy, and infrastructure indicators to be measured in India, whereas in Canada, the indicators to be used are the sectoral carbon intensity.

3. Improved Data Sharing: Secondary literature augments the importance of having open-access repositories of climate science and financial information.

4. Fortifying International Harmonization Activities: By taking NGFS and TCFD as a starting point, countries can co-develop cross-border comparability of risk metrics through interoperability.

Conclusion

Comparing the secondary data sources such as regulatory frameworks, reports of the central banks, international guidelines on climate governance, and peer-reviewed publications regarding the issue of climate change as the material financial risk, it can be stated that although, both India and Canada are facing the issue of climate change as the financial material risk, their approaches to climate risk assessment in the banking system are considerably different because of the structure of economy, profile of vulnerability to the climate changes, and legislative maturity.

The prescriptive approach in Canada is also described by solid information infrastructure, a requirement of disclosure according to TCFD standards, and scenario analysis according to NGFS principles in supervisory practice. This method makes standardization, comparability, and transparency quite valid, yet needs a great institutional and technological capacity, and thus, is more applicable in mature economies with a concentrated banking system and effective governance abilities.

fragmentation, capacity limitations, and the need to make the disclosure of climate-related information mandatory to all banks.

The results indicate that harmonization is not a necessity done in conformity. Rather, a good global strategy would be to have a methodological rigor achieved by Canada and the contextual context arrived at by India. It would exploit this hybrid and maintain global comparability in terms of climate risk measurements, whilst also guaranteeing local applicability and tractability, especially in emerging markets.

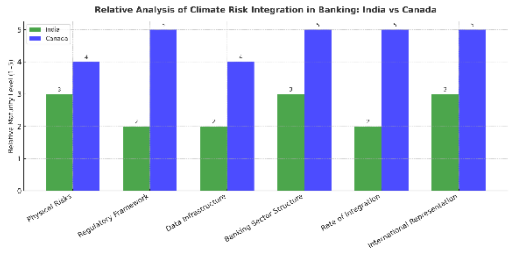
Moreover, the paper highlights that there is a necessity for:

1. A worldwide bottom-up system that is based on the idea of NGFS and TCFD.
2. Mechanisms of transnational knowledge flow to enable technology and skills transfer.
3. Enhanced data infrastructure to systematize climate-finance information, particularly in the emerging economies.

IJARSE
ISSN 2319 - 8354

4. Set staged implementation plans to strike a balance between ambition and capacity.
5. Regulation encouraging green lending and capital allocation with a climate orientation

Relative Analysis of Climate Risk Integration in Banking India vs. Canada



Physical Risks: A primary example is floods, droughts, and cyclones, which are mentioned in the RBI (2023) and the OSFI (2023) as well. Other examples include temperature shocks, wildfires, hail, rainfall, hurricanes, and droughts (HIFIS (2023)).

Regulation Framework: Regulation Framework Principles based on voluntary adoption of TCFD in early adoption stages. Prescriptive mandatory TCFD-aligned reporting becomes part of supervision TCFD (2022).

Data Infrastructure Distributed: dependency on international and third-party data. Developing a long-term national data set based on the Canadian Climate Centre NGFS (2022)

Banking Sector Structure Heterogeneous - rural cooperatives to large corporates Highly concentrated - top six banks occupy the stage Bank of Canada (2023).

Rate of Integration: Slow, associated with capacity building Swift, with set compliance schedules OSFI (2023); RBI (2023).

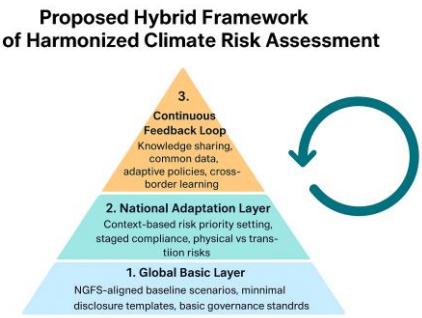
International Representation: International Platform on Sustainable Finance Representative in NGFS, G20 Sustainable Finance Representative in NGFS, G20, International Platform on Sustainable Finance NGFS (2023).

Proposed Hybrid framework of Harmonized climate risk assessment

1. Global Basic Layer - Global Baseline Layer, NGFS-aligned scenarios, minimal disclosure templates, basic governance standards.

2. National Adaptation Layer - Priority setting of risks (context-based, physical vs. transition), staged compliance.

3. Continuous Feedback Loop - Transcontinental knowledge sharing, common sets of data, and adaptation of policies.



References

[1] Network for Greening the Financial System (NGFS). (2020). *Guide for Supervisors: Integrating climate-related and environmental risks into prudential supervision*. Retrieved from https://www.ngfs.net

[2] Network for Greening the Financial System (NGFS). (2022). *NGFS Scenarios for central banks and supervisors*. Retrieved from https://www.ngfs.net

[3] Task Force on Climate-related Financial Disclosures (TCFD). (2017). *Final report: Recommendations of the Task Force on Climate-related Financial Disclosures*. Basel: Financial Stability Board. Retrieved from https://www.fsb-tcfd.org

[4] Reserve Bank of India (RBI). (2022). *Discussion Paper on Climate Risk and Sustainable Finance*. Mumbai: RBI.

[5] Reserve Bank of India (RBI). (2023). *Annual Report 2022–23*. Mumbai: RBI.

[6] Office of the Superintendent of Financial Institutions (OSFI). (2023). *Guideline B-15: Climate Risk Management*. Ottawa: Government of Canada.

[7] Bank of Canada. (2021). *Climate Change and the Economy: Staff Analytical Note*. Ottawa: Bank of Canada.

[8] Battiston, S., Mandel, A., Monasterio, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. *Nature Climate Change, 7*(4), 283–288. https://doi.org/10.1038/nclimate3255

[9] Campiglio, E., Monnin, P., & von Jagow, A. (2022). Climate risks in financial regulation: Challenges and opportunities. *Ecological Economics, 193*, 107318. https://doi.org/10.1016/j.ecolecon.2021.107318