

REVIEW ON MANAGING CLIMATE CHANGE AND ESG RISKS IN FINANCIAL MARKET

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Abstract

Climate change and environmental issues have an impact on the overall stability of the financial system. Intermediaries that operate on a long-term horizon are exposed to the consequences of extreme environmental events. Banking sectors and insurance companies could be the most vulnerable and sensitive to these issues. Consequently, the aims of this paper is to review recent development on the risk frameworks developed by regulators and to classify the climate-related risks, and to explore whether these risks affecting the costs and benefits that is related to organizations.

Research paper

Keywords: Climate change; environmental risks; governance; risk frameworks; systemic risk, finance

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Introduction

A blueprint of the United Nations (UN) Sustainable Development Goals (SDG) is a global call to end poverty, protect the planet, and ensure the peace and prosperity of all people from different walks of life. The 17 SDGs initiatives, developed in 2015, are integrated whereby it balances social, economic, and environmental sustainability. Advanced countries in Europe, America, the United Kingdom, and Japan for instance are committed to supporting the SDG agenda by developing their own risk framework. In the same year, the Paris agreement is launched and it recognized the agenda to reduce carbon emissions and protect the environment.

In supporting the above agenda, a research group from the University of Notre Dame through the Notre Dame Global Adaptation Initiative (ND-GAIN¹) developed an index where it ranked countries based on their climate vulnerability and readiness. The latest data in 2019, which is released in July 2021, shows that Norway score the highest index of 76.2, followed by Finland (73.3) and Switzerland (72.4). Singapore is the only Asian country in the top ten that score 71.2. The United Arab Emirates ranked 30th (61.2); the highest score among the MENA region, followed by Qatar in 44th ranked (57.4). Malaysia ranked 49th (57.1), while Saudi Arabia ranked 56 (55.9). When the index is adjusted for their gross domestic product (GDP), America, India, Saudi Arabia, UAE, and Luxembourg are among the most sensitive nations to climate change (ND-GAIN, 2022).

From the perspective of the financial market, sustainable finance which incorporates environmental, social, and governance (ESG), plays a

¹ Thirty-six indicators contribute to ND-GAIN's measure of vulnerability and nine indicators contribute to the measure of readiness.

greater role in decision-making of a financial operator. Many ESG-related investments are being offered in the market and it shows an increasing trend. For example, in Europe, ESG investment funds have increased the total assets managed by over 170%, where in the first ten months of 2020, this category of funds in Europe recorded net inflows of more than €150 billion, which is approximately 80% more than the same period in the previous year (ECB, 2022).

As reported by Bank Negara Malaysia, a central bank of Malaysia, at November 2019, a total of 11.7% of the assets held by financial players in Malaysia are in sectors potentially exposed to climate change. Malaysian financial institutions need to manage climate risk to ensure that their ability to provide financial intermediation services is not significantly affected by the threat of climate change. If not dealt with effectively, climate change could affect the general economy, leading to potentially large economic losses. (Bank Negara Malaysia, 2022).

The capital market have so far focused on climate change in terms of the predominant environmental risk and its effect on equities. However, focus on debt market especially sukuk is scarce, regardless of the sovereign or corporate issuance. To date, the most comprehensive framework with regards to climate change is focusing on the banking and insurance sectors. This is probably because these sectors functioned as the intermediary of the financial resources, and thus drive the market, especially in ESG-related investment. Furthermore, the banking sector needs to have a cushion and protection, otherwise, if the banking system is vulnerable, it might be creating a severe shock to the entire economy.

Nonetheless, with approximately eight years remaining to achieve the UN SDG initiative, many agendas are not being addressed properly, yet. Not all institutions are capable to recognize risks related to climate change and the environment in their organizational practice. What is the role of the financial market in minimizing the impact of climate change and environmental risks? Does taking ESG into account benefits the organizations?

In view of this matter, there is an urgent need to redefine and understand risks in the financial market, particularly systemic risks caused by climate change and the environment. In fact, Bank Negara Malaysia has highlighted and put its concentration on placing the appropriate regulation and supervision to ensure that financial institutions are adequately measuring, mitigating and buffered against climate risks. Furthermore, Bank Negara Malaysia aims to increase the capacity of financial institutions to be the catalyst in the transition to a low-carbon economy. This includes increasing their offering of green financial solutions that can help their customers to transition to greener practices and to better cope with climate-related events.

Hence, it is imperative to understand the available framework and legislations, and how it mitigates uncertainties related to climate change and ESG risks. Section 2 of this paper will discuss sustainability finance and its relation to costs and benefits. Section 3 will review the management and supervision of climate-related risk at the banking sector across geographical areas. Section 4 is discussing risks related to climate change and the environment, and Section 5 concludes.

Sustainability Finance, Climate-Change and ESG: Costs and Benefits

Referring to the Paris Agreement that aims to limit the temperature increase to 2 Celsius requires USD3 trillion of investment yearly until the year 2030. To raise such a huge amount, financing and funding are required where it need to be sourced through the issuance of sustainable investment products such as green sukuk and bonds. Despite that, in order to implement sustainability finance, a set of financial regulations, standards, and norms related to ESG need to be developed to facilitate the market. When the market is well-regulated and well-facilitated, risk management capabilities could be improved. Yet, without strategy to mitigate the climate change risk, (Dietz et al., 2016; Radović-Marković et al., 2022; Soleimani et al., 2022) estimates that we might need to face losses of value in global financial assets amounting to USD2.5-24.2 trillion

As the risk management improves, it may result in greater opportunities for the companies such as higher profitability and lower cost of financing. This is evidenced by some empirical research which suggests that issuers adopting sustainable ESG-compliant strategies will be able to enjoy a mix of funding sources at lower costs. Furthermore, it shows that companies with high ESG scores reported lower average cost of capital and cost of debt compared to companies with low ESG scores (Avantage Reply).

This is further supported by a recent study by (Sun et al., 2022) who study how financial stability might be used to effectively finance the mitigation of climate change and climate risks. They reveal that financial institutions might adjust their lending strategies and capital costs to face their sensitivity to climate hazards.

The table below summarized some of the empirical research that demonstrates the cost and benefits of non-compliance and compliance to climate risk mitigation. It is also explains the contribution of ESG towards the sustainability in finance.

Table 1. Costs and Benefits for ESG Adoption

Author(s)	Costs/Benefits	Focus
Zhang, Zhao & He, (2022)	Both high- and low-level ESG portfolios can earn higher abnormal returns. Higher ESG performance is associated with worse future profitability, its impairs firm value.	China
Egorova, Sergei & Karminsky, (2022)	IT companies have the opportunity to develop their ESG practice, and will have a positive effect on its financial performance. Companies that developing and implementing ESG components are increasing their value and position in the market.	Russia
European Central Bank, (2021)	Lead to macro-financial changes, and lower corporate profitability or devaluation of assets.	-
Kim & Li, (2021)	The positive effect of ESG factors on credit rating and corporate profitability, and the effect is more pronounced for larger firms. Moreover the findings potentially help investors to understand the underpinning rationale for recent trends in ESG-linked or ESG-integrated investment strategies.	Canada
Mohamad W., Wasiuz-zaman S. (2021)	Increased ESG disclosure results in an increase in firm performance. Competitive advantage is found to have a negative relationship with ESG disclosure, implying that firms with competitive advantage disclose less ESG-related matters. However, when firms have competitive advantage, increased disclosure results in improved firm performance while in firms with no competitive advantage, increased ESG disclosure decreases firm performance.	Malaysia
Piechocka-Kaluzna et al., (2021)	ESG practices can improve a company's financial position because it implies the ability to raise capital with lower cost	United States

Bolton et.al., (2020)	Contagion and asset devaluations in financial system triggered by physical risk. There are also transition risks related to potentially disorderly mitigation strategies. Both physical and transition risks, in turn, can increase systemic financial risk. Thus their potential consequences have implications for central banks' financial stability mandate.	France
Cantino V., Devalle A., Fiandrino S. (2017)	The boundaries among ESG sustainability and equity financing are well delineated, results concerning the relationship between ESG sustainability and debt financing are ambiguous and no clear-cut defined.	Various countries
Friede, Busch & Bassen, (2015)	Non negative ESG and corporate financial performance	Various countries
Battiston, et.al., (2012)	Banks and non-banks can experience both positive and negative shocks, which decreases the accuracy of default.	-

Management and Supervision of Climate-related and Environmental Risks in Financial Market.

Financial Stability Board (FSB)² is one of the supervisory bodies that monitor and provide recommendations on the global financial system. They assist supervisory and regulatory authorities to monitor, manage and mitigate risks arising from climate change. For the regulatory and supervisory purposes, data related to climate change is collected where it consists of micro-prudential³, macroprudential⁴ and macroeconomic⁵ objectives (FSB, 2022).

² FSB is based in Basel, Switzerland and was established after the G20 London summit in April 2009 as a successor to the Financial Stability Forum (FSF). The Board includes all G20 major economies, FSF members, and the European Commission.

³ To assess firm-specific strategy and risks (such as the viability of firms' business models, exposure quantification, the impact of scenario analysis and stress testing, capital adequacy assessments)

⁴ To assess sector level or financial system level risks (such as monitoring of vulnerabilities and their implications to financial stability, sector or jurisdiction level scenario analysis and stress testing)

⁵ To assess the impact on economic growth, productivity, inflation, structural implications or other macroeconomic aspects

Many countries have developed climate-related regulations (Rahman et al., 2022; Ramadani et al., 2022). For instance, Brazil has developed regulatory reporting for Social, Environmental and Climate (DRSAC) risks effective 2023. Financial Institutions in Brazil are required to submit their information related to the exposure of their loan book and securities to social, environmental, and climate risks (BCB,2021). Whereby in France, the authority requires the financial institutions to submit information on metrics on the assets that are held by firms connected to fossil fuel extraction and production, their effort in reducing carbon footprint, and climate-related risks requirement that is imposed on firms that they invest in.

In addition, the Swiss Financial Market Supervisory Authority (FINMA) impose regular reporting requirement in the area of climate-related financial risks, including specific and sector-wide risk assessment. Meanwhile, in the United Kingdom, Prudential Regulation Authority (PRA) is committed to monitoring Pillar 3⁶ disclosures for climate-related financial risks and ESG disclosure. Besides the development of the regulations, some countries also take initiative to develop their own analytical tools in assessing and regulate climate-related and environmental risks (Salamzadeh et al., 2021 a, b; Yakubu et al., 2022).

As for ASEAN countries, they have played active and leadership role in addressing climate change in the global community. The ASEAN Leaders at the regional level have issued Declarations/Statements related to climate change at their 2007, 2009, 2010 and 2011 Summits. In that event, they stated a common understanding/position and aspirations towards a global solution

⁶ Pillar 3 requires firms to publicly disclose information relating to their risks, capital adequacy, and policies for managing risk with the aim of promoting market discipline.

to the challenge of climate change and their resolve to achieve an ASEAN community resilient to climate change. Extension to that, ASEAN countries have been responding to climate change by focusing on the implementation of relevant actions in the ASEAN Socio-Cultural Community (ASCC) Blueprint 2009-2015. Through the blueprint, few agendas have been highlighted like encouraging the ASEAN countries to understand, participate, enhance knowledge, capacity for adaptation, do collaboration and strategize the way in engaging and facing the climate change. Table 2 explains in details the said blueprint.

Table 2. ASEAN Socio-Cultural Community (ASCC) Blueprint 2009-2015

Strategic Objective:

Enhance regional and international cooperation to address the issue of climate change and its impacts on socio-economic development, health and the environment, in ASEAN Member States through implementation of mitigation and adaptation measures, based on the principles of equity, flexibility, effectiveness, common but differentiated responsibilities, respective capabilities, as well as reflecting on different social and economic conditions.

Actions:

1. Encourage ASEAN common understanding on climate change issues and where possible, engage in joint efforts and common positions in addressing these issues;
2. Encourage the efforts to develop an ASEAN Climate Change Initiative (ACCI);
3. Promote and facilitate exchange of information/knowledge on scientific research and development (R&D), deployment and transfer of technology and best practices on adaptation and mitigation measures, and enhance human resource development;
4. Encourage the international community to participate in and contribute to ASEAN's efforts in afforestation and reforestation, as well as to reduce deforestation and forest degradation;
5. Develop regional strategies to enhance capacity for adaptation, low carbon economy, and promote public awareness to address effects of climate change;
6. Enhance collaboration among ASEAN Member States and relevant partners to address climate related hazards, and scenarios for climate change;
7. Develop regional systematic observation system to monitor impact of climate change on vulnerable ecosystems in ASEAN;
8. Conduct regional policy, scientific and related studies, to facilitate the implementation of climate change convention and related conventions;
9. Promote public awareness and advocacy to raise community participation on protecting human health from the potential impact of climate change;
10. Encourage the participation of local government, private sector, non-governmental organisations, and community to address the impacts of climate change; and
11. Promote strategies to ensure that climate change initiatives lead to economically vibrant and environment friendly ASEAN Community taking into account win-win synergy between climate change and the economic development.

Sources: ASEAN Cooperation on Environment (<http://env.asean.org/>)

Analytical Tools

Climate and scenario analysis is one of the analytical tools use to supervise and develop regulatory policies on climate risks. This analytical tool facilitated the initial identification and assessment of risk exposures and potential impacts of physical and transition risks to financial institutions and the

financial system⁷. Many jurisdictions⁸ have developed or are developing new climate scenario and stress test frameworks or are improving existing methodologies. Table 3 synthesizing the analytical tools used by selected countries.

Table 3. Analytical Tools Used by Selected Countries

Country	Purpose of the Analytical Tools	Sector
EU	to identify vulnerabilities, best practices & challenges banks face when managing climate-related risks	nonfinancial corporates & Euro area banks
Canada	To understand risks that arise from a low-carbon economy	Two banks, two life insurers, two property and casualty insurers
France	To identify insurance protection gap on the cost of risk for banks	Bank and insurance
Hong Kong	To understand the resilience of the banking sector to climate-related and develop means to measure the risks	Banks
Japan	To inform magnitude of risks and identify challenges to quantify the risks	Banks and non-life insurance
Netherlands	To assess the impacts of abrupt in energy sector.	Different financial sectors that rely on changes of technology and government policies
Singapore	To estimate the exposure to climate transition risk	Banks and insurance
United Kingdom	To assess system-wide impacts of climate-related risks	Banks and insurance
Malaysia	To strengthen the management of financial risks stemming from climate change and to facilitate development of low-carbon economy.	Banks, investment banks Insurance, takaful Development financial institutions Financial holding companies

Source: Author's compilation from FSB and BNM

⁷ Stress tests and scenario analysis have been applied mainly for the banking and insurance sectors and only a few jurisdictions have put in place climate scenario analysis and stress tests frameworks for asset managers and pension funds.

⁸ Canada (OSFI and Bank of Canada), EU (ECB), France (ACPR), Hong Kong (HKMA), Japan (FSA), Netherlands (DNB), Singapore (MAS) and United Kingdom (Bank of England).

Yet, climate scenario analysis and stress tests have been used to address only certain climate-related risks. The level of risks in the jurisdiction and scenario analysis is divided into several sectors as implied in Table 4.

Table 4. The Distribution of Transition, Physical, and Liability Risk Coverage Across the Financial Sectors

Sector	Physical Risk	Transition Risk	Liability/Legal Risk
Examples	Acute (flood, storm, landslide). Chronic (sea level, temperature rise)	Policy & regulation (net zero policy, energy transition). Technology development (electric cars) Consumer sentiment & preference (ESG investment, green products)	Stakeholders/penalty litigations (legal suit on lack of climate disclosure). Insurance claims (increase environmental liability claims)
Insurance sector	Average	Average	Lower
Banking sector	Average	Higher	Lower
Asset management	Average	Slightly higher	Lower
Pension funds	Average	Slightly higher	Lower

Source: Author’s compilation from FSB and BNM

Climate Change and Environmental Risks

Identifying and categorizing risks related to climate change and the environment is challenging because the related risk evolves over time, depending on how nature reacts to human activities, and hence historical data on climate change may be irrelevant. Regardless of that, the fact is that climate change worsens existing risks in the financial market, and also creates new disruptions such as natural and human system risks. Climate change is a systemic risk and has a domino effect that begins from an effect on the financial assets itself, then affects the industry, and later could trigger severe instability or breakdown of an entire industry or economy. There is no exact name

for climate risk, yet somehow, the terminology of ‘climate-related risk’ is adopted in the market.

In the financial market, climate-related risk is also transmitted to traditional risks in finance. BNM in their Exposure Draft (Bank Negara Malaysia, 2021) for climate risk management and scenario analysis, has listed the climate-related risks namely credit risk, market risk, liquidity risk, operational risk, and insurance/takaful underwriting and reserving risks. (Oguntuase O. J., 2020; Dana et al., 2022 a, b, c), suggests that climate-related risk can be divided into physical and transition risk, whereby physical risk is frequent and severe meteorological and hydrological events, while transition risk is a process of decarbonization to mitigate global warming.

Another critical issue is the identification of sectors or firms exposed to transition risk when focusing on financial risks. In many situations, sensitive sectors are identified by their direct greenhouse gas (GHG) emissions (e.g. Scope 1 GHG emission). For instance Petroliam Nasional Berhad, or Petronas, the world’s fourth-largest exporter of liquefied natural gas. It said it will intensify its efforts toward reducing the Scope 1 and Scope 2 greenhouse gas emissions, referring to direct emissions from operations and the electricity used by the company. It aims to become a net zero emitter of greenhouse gases by 2050 and also plans to increase its investments in renewable energy (Reuters, 2020).

Nevertheless, transition risk may also affect downstream users (e.g. Scope 3 GHG emissions), and in other words, it indirectly increases the financial stress on the emitting sectors. According to the most widely used accounting standard for greenhouse gas, the Greenhouse Gas Protocol; there are three scopes of emissions. Scope 1 and 2 are those emissions that are owned

or controlled by a company, whereas scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by it (GHG Protocol, 2022).

Authorities, standard-setting bodies, and The Network for Greening the Financial System (NGFS) have published definitions related to climate-related risks. Table 5 summarizes the types of climate-related risks.

Table 5. Various Categories of Climate-Related Risks

Definition by Authorities, standard-setting bodies, and the NGFS		
Types of Risks	Specific Risks	Definition
Physical risk Example: disruptions in global supply chains	Acute risk	Acute risks are noted as more severe weather events, such as floods, hurricanes, and droughts.
	Chronic risk	Chronic risks are often described by examples of sea-level rise, reduced farmland productivity, and changes in precipitation patterns.
Transition risk	Technological developments	One driver is technological developments that would make less environmentally friendly technology obsolete.
	Behaviour or social change	Another driver is behaviour or social change, where consumers and investors demand more environmentally sustainable products and services.
	Policy changes	Legislation or government policy changes intended to shift to a lower-carbon economy, such as carbon taxes or pricing mechanisms, are another source of risk.
Liability risk		Liability risk can result from manifestations of physical and transition risks. Some national authorities have accounted for liability risk within their definitions of either physical or transition risks, while others have established separate definitions for liability risk as an additional risk. Others have accounted for liability risk more broadly as ESG factors.

EBA's ESG Pillar 3		
Qualitative requirements	Governance, business strategy and risk management practices.	
Quantitative requirements	Physical risk	Loans, debt and securities instruments of nonfinancial corporates and real estate collateral for example exposed to chronic and acute physical risks.
	Transition risk	Credit quality of exposures by sector, GHG emissions and residual maturity in the banking book
	Top carbon-intensive	Exposures to top carbon-intensive companies in the world and/or country by average maturity.
	Real estate loans and collateral	Characteristics of the underlying property such as by energy efficiency and resilience or vulnerability of the property to physical risks.
	Assets	Assets with mitigation actions supporting transition activities of counterparties

Source: Author's compilation from EBA and NGFS

Conclusion and Recommendation

Climate-related risk management should be formulated where it should involve all stakeholders, and not just merely the responsibility of the government. Our first recommendation is to practice strict governance at all levels and to establish a governance index to monitor its compliance. The second is to set a standard of a business model that is taking into account the ESG requirements, and this business should be provided with a green ranking that can be used as an assessment for future capital financing by the financial institutions. The third one is to focus on the social development of talents in

the field of green economy, green technology, and most importantly to develop early childhood education on the importance of managing climate-related and environmental risks,

Combating against the climate change is a great responsibility to the global nations. Climate change and environmental issues is affecting all economy sectors. Going forward it is vital for the financial institutions, investors and the regulators to take action on this unprecedented challenge.

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Appendix

Appendix 1. Risks and Transmission Channels

	Transmission channels
Credit risk	Severe weather events can affect productivity, damage physical asset which lowers the asset/collateral value and disrupt corporates operation/supply chain. This will in turn increase probability of default (PD) for both corporates and individuals and loss given default given (LGD) due to depreciation of collateral value.
Market risk	Negative sentiment towards carbon-intensive assets/sectors or changes in regulation may result in volatile and downward market valuations and pricing, which lead to investment losses.
Liquidity risk	Sudden increase in deposits withdrawal, drawdown of committed facilities and insurance/takaful claims post disaster may result in significant and negative impact on liquidity buffers.
Operational risk	Financial institutions' operations are disrupted due to damage to their or outsourced service providers' physical property and data centres as a result of severe weather event; climate-related lawsuits could target financial institutions for poor management of climate risks or inadequate climate-related disclosures; and higher exposure to reputational damage due to change in consumer sentiments towards more climate friendly business practices.
Insurance/takaful underwriting risk	The impact can be two pronged, i.e. increase insured losses due to increased frequency and concentration of high impact natural catastrophes, resulting increases in weather-related insurance claims and increase insured gap due to ITOs constrained capacity to write insurance business due to increasing physical risks to insured property and assets, which increases the price beyond demand elasticity and customer's willingness to pay.

Source: Climate Risk Management and Scenario Analysis, Exposure Draft, BNM, 2021, as adapted from NGFS and BCBS