Policy Brief

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Greening Macroprudential Policies in the Arab Region
A Framework in Early-Stage Development

Moez Labidi*

Key Points

- **Without integrating climate-related risks into central banks' macroprudential framework we cannot expect to win the battle for a rapid green transition.**
- **The process of Greening the macroprudential framework in the Arab region is still in its early stages of development, particularly given the narrowness of the currently used toolbox.**
- **Macroprudential policy should be sufficiently flexible to address climate-related risks, given their high level of uncertainty and high degree of non-linearity.**
- **Central banks may be forced to shift to an increasingly sophisticated climate stress testing to ensure better assessment of the soundness of the financial system.**

1. Introduction

The Global Financial Crisis (GFC) of 2007-2008 has increased the focus of policymakers' attention to collateral damages induced by financial instability. To contain system-wide risks and meet their financial stability objectives, central banks were led to tighten their supervisory role to publish a financial stability report every year and to strengthen the soundness of micro-prudential supervision to enable the emergence of a new banking regulatory framework called a macroprudential policy (Belkhir et al., 2020).

Central banks and supervisors deploy macroprudential tools for two main reasons: "first is increasing the financial system's resilience to aggregate shocks by strengthening bank's loss absorption capacity,

*Adviser - *Arab Planning Institute* (API) moezlabidi@api.org.kw

and second is containing the accumulation of systemic risks" (Coelho and Restoy, 2023).

The current banking industry faces a plethora of new risks and challenges caused by fast-paced digitalization of financial services, the risk of being exposed to cyberattacks, and the need to build climate change resilience.

Climate risks could generate systemic risks to the banking sector. To address potential climate risks policymakers cannot limit their actions to a combination of policy instruments such as carbon taxes, subsidies, and public investments in renewable energy, but they should develop an interest in creating a monetary and micro/macroprudential framework of incentives (and disincentives) to boost investment that could accelerate environment transition projects and to make the financial sector more resilient to environment risks.

Central bank laws typically provide for several functions: strengthening their role as lenders of last resort, collecting information and data, publishing financial stability reports, strengthening the soundness of micro-prudential supervision and policies, and enabling the emergence of a new banking regulatory framework called a macroprudential policy (IMF, 2024).

The increased physical (extreme weather events and chronic risks), transition risks that may impact prices and financial stability, central banks will be forced to integrate climate risks into their monetary and macroprudential modeling and analysis exercises (Tamez et al., 2024). The Basel Committee on Banking Supervision (BCBS) has recently started introducing climate risks into its core principles, at a meeting attended by more than 200 central bankers and supervisors, in in Basel, Switzerland on 24-25 April 2024. "Supervisors are also expected to consider climate-related financial risks in their supervision of banks, to assess banks' risk management processes, and to require banks to submit the information that makes it possible to assess the materiality of climate-related financial risks", recalled the Basel Committee (BCBS, 2024).

How can we transform prudential regulation into an active instrument of green transition? Are Central banks in the right position when they are in the driving seat concerning policies designed to address climate change? How can macroprudential policy tackle climate emergency to enhance financial resilience to shocks made to contain system-wide risks and accelerate green transition? Won't the greening of monetary and prudential policies risk jeopardize the achievement of the central bank's traditional objectives (price stability and financial stability)? Is the current macroprudential toolbox, deployed by Arab central banks sufficiently dense and qualified to address climate systemic risk? What recommendations can be suggested to central bankers to accelerate incorporating environmental considerations into their macroprudential toolkits to increase the resilience of the financial system, and to contain the potential system-wide risks to financial stability posed by climate change?

This policy brief is structured as follows. The second section will explore the main challenges facing macroprudential regulation in the age of global climate change. A third section will highlight the key points of convergence and divergence between climate systemic risks and other systemic risks. A fourth section discusses the opportunities offered by macroprudential instruments used to address risks generated by climate change. A fifth section will focus on reviewing progress on the ground of macroprudential policies adopted by central banks in the Arab region. Finally, the paper will offer some conclusions and recommendations for policymakers.

2. Macroprudential policy in the age of climate change

Is the current macroprudential toolkit adequately adapted to fight climate-related systemic risks?

Macroprudential regulation is a generator of a range of challenges that are not easy to overcome: the capacity to detect financial fragility at an early stage, the overlap with other policy objectives (monetary policy/micro-prudential policy), the cost of unpopular measures, risk of amplifying the impact of measures taken, … "The objective of macroprudential policy is to limit such downside risks to financial and economic activity by implementing countercyclical policies aimed at mitigating negative externalities" (Chavleishvili et al. 2021). Greening macroprudential regulation provides adequate protection against climate-related financial risks but also creates new challenges. Macroprudential authorities can find themselves in embarrassing situations. Will we be led to conduct proper targeting of the firm? Project? or sectorial activities? Do the macroprudential authorities have the capacity to impose additional capital requirements on banks? At what level should the macroprudential authorities define the adequate buffer which would limit the bank's exposure to climate-related systemic risks? Could this additional capital undermine financial stability, particularly through strong exposure to concentration risk in the banking sector?

All these challenges and their potential side effects will have to be considered in the implementation of macroprudential policies for a successful green transition because poorly designed macroprudential policies could unintentionally amplify systemic risks.

Why is it so important to enhance the coordination between micro- and macroprudential policies?

There are strong complementarities between micro- and macroprudential policies to achieve the required high quality of policy formulation. Micro- and macroprudential policies could play a crucial role in mitigating the consequences of climate change on financial stability. Several reasons plead for greater coordination between micro- and macroprudential policies. First, policy action divergence could undermine the credibility of the authorities. Without deep coordination, micro-prudential regulation could generate undesirable macro-level results, largely due to procyclical effects. Second, even though many instruments are an integral part of both micro- and macroprudential toolboxes (*Capital Risk Weights, Pillar 2 Capital Requirements, Dynamic Provisioning, Leverage Ratio, Large Exposure Limits, Loan-to-Value Limits, Debt-to-Income Limits, Foreign Exchange Limits, Liquidity Requirements, …*), we should know that these policies cannot use their common instruments with the same degree of granularity. Considering the climate-related financial risks, supervisors may be forced to rethink their framework and to undertake several priority actions such as transition plans, concentration risk measures, climate stress testing, and disclosure requirements, …. Finally, coordination between micro- and macroprudential policies is crucial for the appropriate specifications of the stress testing framework.

3. Climate risks versus other systemic risks

Climate systemic risks and other systemic risks share several common features (*Figure 1*):

Climate systemic risk shares several points of convergence with other systemic risks. First, economic fundamentals and businesses could be adversely affected by climate and other systemic risks, which in turn have an impact on the safety and soundness of financial institutions. Second, like many other systemic

risks, all aspects of financial risks are likely to be affected by climate risk: credit, liquidity, market, and operational risks. Third, like many other systemic risks, climate risks may trigger a collapse in bank's asset prices causing a sharp depreciation of their loan portfolios. Finally, climate risks and other systemic risks can be amplified by the depth of the financial markets and the interlinkages between financial institutions via many second-round effects and spillover effects (Monnin, 2022; Viral et al., 2024).

However, climate systemic risk stands out from other systemic risks for its specificities (*Figure 1*):

Climate systemic risk presents a high degree of uncertainty and is likely to grow over time. The path and the impact of physical risks remain a determining factor. It is not the case for other systemic risks which are characterized by a low degree of uncertainty and largely explained by the wealth of information about the history of systemic crises.

Unlike current systemic risks, climate systemic risk is characterized by a high level of complexity which is mainly due to the high degree of non-linearity of climate-related risks. "The high degree of uncertainty around the timing of these risks suggests that banks should take a prudent and dynamic approach to developing their risk management capabilities" (Basel Committee on Banking Supervision, 2022). However, current systemic risks are often linear rather than non-linear.

To fight climate systemic risks, central banks need to bridge data gaps where data remains unavailable, less precise, and less complete. This is far from being the case with other systemic risks where the availability of data allows central banks to adopt a backward-looking data approach. A better understanding of the climate risks' impact on economic activities and the effectiveness of climate policies depends on the availability of data in the concerned country. With the rise of climate-related risks, the availability of data relating to sectoral developments and geographical position has become crucial for containing risks for the broader financial system. Without overcoming the data deficit, it will be difficult to integrate climate risks in the macroprudential framework. However, using models that are based only on historical data won't be of great value to the supervisor, because climate risks and biodiversity loss remain unprecedented development. Historical data is not sufficient to be able to understand the environmental, economic and social implications of climate risks. Thus, only a forward-looking approach would be the most appropriate way.

Climate risk requires increasingly sophisticated climate stress testing. Given the potential systemic implications of climate-related financial risks, central banks will be forced to assess the soundness of the financial system using sophisticated climate stress testing (Labidi, 2024). How can central banks achieve modernization of their macroprudential policies by establishing the growing and sophisticated climate stress testing (Battiston and Monasterolo, 2024), given the complexity of the interaction between climate risks and socio-economic context and the lack of historical data? The sophisticated macroprudential approach is based on the endogeneity of climate risks and the contagion and spillover effects between financial institutions and a real economy (Battiston et al., 2021; Dafermos, 2022 Labidi; 2024). Neglecting such endogeneity could amplify the risks of financial instability (Battiston and Monasterolo, 2024).

Figure 1: Climate Risks versus Other Systemic Risks

		Climate Risks	Others Sytemic Risks
Similar		*Climate risks and others systemic risks:*	
	1	could heavily impact the economy and the safety and soundness of financial institutions	
	2	have major negative effects on credit, market, liquidity and operational risk levels	
	3	often cause a significant depreciation of the bank's asset thus restricting its lending capacity	
	4	can be amplified by the depth of the financial market through interlinkages between financial institutions	
Different	Uncertainty	High degree of uncertainty *Path and impact are still uncertain*	Low degree of uncertainty *Largely explained by the history of crises*
	Complexity	Complex *Climate-related risks may be highly non-linear*	Not complex *Systemics risks are often linear rather than non-linear*
	Observation	Not yet observed *Dramatic climate risks are ahead over a longer-timescale*	Historically observed *The history is rich in information on financial systemic crisis*
	Data	Non available - Less precise - Less complete ↓ *Central banks and supervisors need most of all a Forward looking data*	Available - Precise - Complete ↓ *Central banks and supervisors need most of all a Backward-looking data*
	Stress test	Less developed *the endogeneity of climate risks is not clearly adequately taken into account*	Sufficiently well-developed *help supervisors to identify vulnerabilities and address them early*
	Materialisation	Climate risks are unescapable ↓ Do inevitably materialise	Other systemic risks have a probability of happening ↓ But do not inevitably materialise
	Macroprudential tools	Some adjustments on the current toolkit have become unavoidable	Current toolkit is sufficiently adapted to the common financial shocks

Source: *The author.*

Climate risks are unescapable and thus do not necessarily materialize, while other systemic risks have a probability of happening but do not inevitably materialize. Considering the high frequency of physical risks (acute and chronic events) and the negative implications of transition risks (change in the regulatory environment and the rapid shift to green technology) climate systemic risks have become inevitable. Climate risk and its systemic features call for an adjustment and a renewal of the current macroprudential toolkit providing favorable conditions for a rapid green transition. Contrary to other systemic risks where the current toolbox remains sufficiently adapted to the common financial shocks, climate risks force central banks and financial supervisors to modernize the major traditional macroprudential instruments.

4. Greening Macroprudential Framework

The macroprudential framework offers central banks and financial supervisors several instruments (*Capital-based measures*, *Liquidity-based measures*, *Borrower-based Measures*, …) that could be used to address risks generated by climate change.

Greening Capital-Based Measures

These buffers were introduced to mitigate cyclical shocks or to address structural inadequacies such as current exposures or the structure of the banking sector:

- **Counter-cyclical capital buffer (CCB)**

Among Basle III innovations we find the introduction of the distinction between (i) *cyclical buffers* which vary according to the evolution of financial conditions, that will be used to build up capital buffers during good times and to increase resilience to shocks in bad times (*Counter-cyclical capital buffers - CCyCBs*), and (ii) *structural buffers* which remain constant throughout the cycle and cover structural risks threatening the banking system (*Systemic risk buffers - SyRBs, Other Systemic important institutions capital buffer - O-SII Buffer*). The main idea behind establishing these instruments is to enhance the management of cyclical and structural risks and to improve financial institutions' resilience through additional capital requirements.

Other instruments *like* ***Sectoral capital requirements*** introduce sectoral buffers to avoid sectoral vulnerability which could turn into a systemic crisis. In this specific case, banks build up buffers to reduce risks generated by the large exposure to the sectors concerned. Also, *Sectoral capital requirements* could play a crucial role in accelerating the green transition and in mitigating climate risks in banks that have a large sectoral exposure (real estate, Tourism, industries based on fossil fuel energies, …). This instrument could increase the resilience of the banking system by building up buffers to losses in the real estate sector exposed to acute climate events, in the tourism sector exposed to sea level rise, in the agricultural sector exposed to water scarcity, and in all industries depending on fossil energies.

For example, **Systemic risk buffers** (SyRBs), which are designed to minimize or neutralize long-term and non-cyclical systemic risks seem to be appropriate for climate-related risks (ECB, 2022). What option is most suitable for the context: an institution-specific buffer or a system-wide buffer similar for each bank? An institution-specific buffer will impose a certain discipline in the banking system and thus introduce strong incentives for each bank to reduce its exposure to climate risks to limit capital costs. However, in the system-wide buffer, similar for each bank,

the effectiveness will be adversely affected by a climate risk management failure which potentially increases the costs associated with higher capital in the banking sector (Monnin, 2021).

However, to preserve the effectiveness of these instruments, supervisors should, first, be more transparent and above all set a clear rule, and second, allocate the buffers according to the degree of exposure of bank assets to climate risks (physical and transition). Monnin (2021) found that "a proportional scheme introduces incentives for financial institutions to reduce their exposure to climate-related risks to limit capital costs".

Greening Liquidity-Based Measures

Macroprudential liquidity instruments aim to strengthen banks' resilience, allowing them to have a comfortable liquidity buffer in the short run (*Liquidity coverage rate* (LCR)) and the longer run (*Net stable funding ratio* (NSFR)). The lack of liquidity may drive financial institutions to fire sales and credit crunches that might threaten the financial system as a whole.

To speed up the green transition, NSFR is not in the supervisor spotlight. More attention is given to two liquidity base measures, the LCR and the LTD (Loan-to-deposit).

The liquidity coverage ratio could contribute to the green transition If supervisors decide to promote the holding of green bonds by banks and discourage them from holding the brown ones via the greening of the "high-quality liquid assets" (HQLA). However, the greening *Liquidity coverage ratio* depends on the deepening of the green bond market and the emergence of a '*green yield curve*' also for sovereign and corporate green bonds. In brief, without a liquid and deep green bond market, there will be no interest in greening LCR.

Loan-to-deposit ratio (LTD) assesses a bank's ability to cope with deposit withdrawals without causing any solvency problems. This ratio is calculated by comparing a bank's loan book to its deposits for the same period. It should be remembered that the *loan-to-deposit ratio* ideally should be between 80% to 90%. LTD is also an opportunity for regulators to boost lending to low-carbon companies which accelerates the green transition. Central banks could lessen regulation over the distinction made between green and brown loans. For example, in a banking system where the LTD ratio is set at 80 %, regulators could push toward a green economy by modulating this ratio by the rise of the share of loans allocated to green projects (*Figure 2*).

Figure 2: Example of greening Loan-to-deposit ratio

The share of loans to green projects	< 20 %	20% - 40 %	40% - 60 %	60% - 80 %	80% - 100 %
Loan - to - Deposit	80%	82%	84%	86%	90%

Source: *The author.*

The higher the share of loans allocated to green projects, the higher the LTD ratio. We can also follow the same constructive approach about the weight of the sustainable deposits (saving accounts that can be used to finance sustainable projects) in total deposits, to modulate the LTD ratio.

Greening Borrower-Based Measures (BBMs)

Borrower-based Measures (BBMs) aim to improve borrowers' debt service capacity and limit lenders' loss given default, which is designed to strengthen the financial system's resilience.

BBMs are complementary to other macroprudential instruments related to bank capital requirements and intended to address cyclical and structural systemic risks to bank capital requirements (*Counter Cyclical Capital Buffer* (CCyB) and the sectoral Systemic Risk Buffer (SRB).

BBMs are adapted to address risks related to the real estate sector by imposing restrictions on (i) the amount borrowed relative to the underlying collateral (a loan to value (LTV) cap) or (ii) the income of the borrower (an income loan (LTI) cap) or (iii) the debt service to monthly net income (DSTI cap). It is difficult to imagine that modulation of caps (limits/rules) on DSTI and LTI ratios could accelerate the green transition. However, the LTV ratio could certainly play a crucial role in speeding up the move to a green economy.

The loan-to-value ratio is calculated by comparing the amount of debt used to buy a home to the amount of the value of the home being purchased.

The higher the LTV, the higher the risk for the bank**.** LTV more than 80%, generates risks for the lenders if the borrower defaults. The lender is less likely to be able to recoup the total amount of the loan by selling the house.

The situation is further complicated if the authorities encourage with appropriate incentives or through direct budget support green buildings. Thus, these measures could adversely affect real estate prices and make banks more vulnerable to loans allocated to the traditional real estate sector and non-green constructions.

Three approaches characterize the value of denominator "value" that differs from national legislation (EGOV, 2020):

- the current "Loan-to-value": for the denominator "value" the regulator takes only the value of the property bought (the dominant approach in an important part of the world),
- The second approach where the LTV should be called the "Loan-to-collateral" approach: for the denominator "value" the regulator takes the value of all assets presented as collateral for the loan (as in the Swedish case).
- The third approach where the LTV should be called the "Loan-to-assets" approach: for the denominator "value" the regulator takes the value of all assets owned by the borrower.

In the first approach, regulators could push toward a green economy by modulating the LTV ratio according to the green concept of housing construction.

In the second and third approaches the borrower could cumulate two advantages: a rise in LTV ratio resulting from investment in green housing projects and a rise in LTV ratio according to the green collateral provided. Hence, borrowers will be able to green their assets used as collateral to increase their capacity to borrow.

Other Tools

- **Large Exposure restrictions**

Exposure limits aim to reduce the risk of concentration, interconnectedness, and their systemic ramifications, by putting an upper limit on losses from counterparty default and from network effects.

Basel Committee on Banking Supervision (BCBS) is well aware of the risks generated by concentrated exposure to single counterparts of a group of connected counterparts. BCBS adds that other types of concentrated exposures could undermine bank resilience such as the case of sectoral and regional exposures, (Basel Committee on Banking Supervision, 2013). Instruments proposed by the Basle committee to limit concentration exposures seem to be appropriate for addressing climate-related risks (Hiebert and Monnin, 2023).

Supervisors could become highly demanding in terms of concentration limits to speed up green transition. Certain sectors are more exposed than others. Regulators reinforce restrictions on brown activities and ease them for green sectors. Also, regulators could strengthen restrictions for regions exposed to sea level rise or water scarcity and maintain them unchanged for the others.

- **Disclosures**

It is now evident that central banks have come to assume a pivotal role in speeding up the green transition. The Network for Greening the Financial System (NGFS) publishes recently a second edition of the guide about the first steps in climate-related disclosure (NGFS, 2024), which are crucial to offer practical support to central banks that are ready to introduce climate-related risks in their risk mapping and are sufficiently aware of the urgent necessity of greening financial system.

Great efforts are needed to enhance disclosures about the assessment and the management of climate-related risks. Central banks should disclose:

- the governance model for managing climate-related risks and for capturing opportunities generated by financial stability and supervision framework;
- which bodies are under an obligation to manage climate-related risks to micro- and macroprudential supervision;
- the transition plan
- what is required to identify and assess their exposure to climate-related risks;
- the estimated impact on financial markets resulting from changes in financial regulation and supervision;
- the forward-looking metrics implemented to assess transition risk in their portfolios;
- the variety of transition scenarios, which include a worst-case scenario; ..

5. Greening Macroprudential Framework in Arab region: still in an embryonic state

Is the current macroprudential toolbox, deployed by Arab central banks, sufficiently dense and qualified to address climate systemic risk?

Considering the positive impact of a resilient banking sector on economic growth, many central banks in the Arab region have increasingly introduced macroprudential instruments (Obeid, 2024).
However, despite some initiatives introduced in several countries of the region (Atef, 2022; Beyer and Bayoumi, 2022), since 2010, the current state of the green transition in Arab banking reveals a significant shortfall in meeting the Paris Goals.

Macroprudential policy failed to receive the prominence it deserves on the central banks' agenda in the Arab region. On the one hand, most central banks in the region do not publish a report on financial stability. Only nine central banks in the region (Bank Al-Maghrib, Central Bank of Bahrain, Central Bank of Egypt, Central Bank of Jordan, Central Bank of Kuwait, Central Bank of Oman, Central Bank of UAE, Qatar Central Bank, Saudi Monetary Authority) publish reports, not necessarily on regular basis and on time. On the other hand, some macro-prudential instruments are missing from their toolboxes. Policymakers in the Arab region began to become aware that climate risks have proved very harmful and threatening to their financial systems. Recognizing the growing exposure to climate risks (IMF, 2024), central banks and financial supervisors seem to have become conscious of the urgency to integrate climate-related risks into their micro- and macroprudential frameworks.

Awareness of climate risks in the Financial Stability Reports can be seen with the number of citations in relation to "climate risks" and "green transition". Based on the latest published annual reports (from 2021 to 2023) by the central banks of the region, only three have several citations exceeding 100 (Central Bank of Jordan: 161, Central Bank of Iraq: 199, four reports between 50 and 100 citations (Bank Al-Maghrib: 50, Central Bank of UAE: 59, Central Bank of Bahrain: 59, Central Bank of Egypt: 81), and five reports less than 50 citations (Palestinian Monetary Authority: 5, Central Bank of Qatar: 14, Central Bank of Oman: 43, Central Bank of Kuwait: 47) (*Figure 3*).

Certain Arab countries have simply joined the Network for Greening the Financial System (NGFS). Founded in 1917, NGFS includes, until November 14th, 2024, 144 members and 21 observers. It should be remembered that the NGFS is a network composed of central banks and financial supervisors. Its main purpose is to "define, promote and contribute to the development of best practices to be implemented within and outside of the Membership of the NGFS and to conduct or commission analytical work on green finance" (NGFS, 2017). To date, only eleven Arab central banks have joined the NGFS (*Figure 3*): Bank Al-Maghrib (2018), Central Bank of Tunisia (2019), Central Bank of the U.A.E (2019), Central Bank of Egypt (2020), Bank of Jordan (2021), Bank of Lebanon (2022), Central Bank of Bahrain (2022), Central Bank of Libya (2022), Central Bank of Mauritania (2022), Saudi Arabia Monetary Authority (2022), Palestine Monetary Authority (2023). Two Arab institutions have also joined NGFS, such as the Abu Dhabi Financial Services Regulatory Authority (2019) and the Financial Regulatory Authority of Egypt (2020).

In the Arab region, climate risk analyses, climate stress-testing exercises, and E-DSGE models remain still in the initial phases of development. Only four central banks (Bank Al-Maghrib, Central Bank of Egypt, Central Bank of Jordan, and Central Bank of the UAE) have incorporated climate risks in their stress-testing exercises. In 2023, the CBUAE introduced climate risk stress testing, primarily focused on transition risk (CBUAE, Financial Stability Report, 2024). A supervisory circular (Circular No. 23/2/2954 dated 8/2/2023) of the Central Bank of Jordan (CBJ) required introducing the impact of geopolitical tensions in the World, and the risks associated with climate change in their stress testing exercises (CBJ, 2022).

Figure 3: Greening Macroprudential Framework in Arab region

Network for Greening the Financial System (NGFS)	
Central Banks Members	Bank Al-Maghrib (2018), Central Bank of Tunisia (2019), Central Bank of the UAE (2019), Central Bank of Egypt (2020), Central Bank of Jordan (2021), Central Bank of Bahrain (2022), Central Bank of Lebanon (2022), Central Bank of Libya (2022), Central Bank of Mauritania (2022), Saudi Arabia Monetary Authority (2022), Palestine Monetary Authority (2023)
Other Supervisory Authorities	Abu Dhabi Financial Services Regulatory Authority, Dubai Financial Services Authority, Financial Regulatory Authority of Egypt
Macroprudential Tools	
Greening Capital Based Mesures	
Greening Liquidity Based Mesures	
Greening Borrower Based Mesures	
Climate Stress Tests	
Highly Developed	
Developed	Bank Al-Maghrib
Weakly Developed	Central Bank of Egypt, Central Bank of Jordan, Central Bank of UAE
Green Disclosure Regulations	
High Quality	
Medium Quality	Bank Al-Maghrib, Central Bank of Egypt, Central Bank of Jordan, Central Bank of the UAE
Low Quality	The rest of the Arab countries
Financial Stability Report (*From 2021 to 2023*)	
With Climate Risks	Bank Al Maghrib (2021-2022-2023), Central Bank of Bahrain (2021-2022-2023), Central Bank of Egypt (2021-2022-2023), Central Bank of Jordan (2021-2022-2023), Central Bank of Iraq (2021), Central Bank of Kuwait (2021-2022-2023) Central Bank of Oman (2021-2022-2023), Qatar Central Bank (2021-2022-2023) , Saudi Arabia Monetary Authority (2023), Central Bank of UAE (2021-2022-2023), Palestine Monetary Authority (2021-2022)
Without Climate Risks	Central Bank of Koweit (2022-2023), Saudi Arab Monetary Authority (2021-2022), Palestine Monetary Authority (2021)
No Report Published	The rest of Arab countries

Source: *The author from NGFS and « Financial Stability Reports » published by some Arab central banks*

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Arab region, climate risk analyses, climate stress-testing exercises, and E-DSGE models remain still in the initial phases of development. Only four central banks (Bank Al-Maghrib, Central Bank of Egypt, Central Bank of Jordan, and Central Bank of the UAE) have incorporated climate risks in their stress-testing exercises. In 2023, the CBUAE introduced climate risk stress testing, primarily focused on transition risk (CBUAE, Financial Stability Report, 2024). A supervisory circular (Circular No. 23/2/2954 dated 8/2/2023) of the Central Bank of Jordan (CBJ) required introducing the impact of geopolitical tensions in the World, and the risks associated with climate change in their stress testing exercises (CBJ, 2022).

Although this process is still in the early stages of development within the region, there are some outstanding examples highlighting progress in this area (Green bonds and sustainability bonds issues, integrating climate-related risks into their analytical frameworks, growing visibility of climate-related risks in their *financial stability Reports*, …). Qatar Central Bank has established a specialized department to streamline the risk management framework concerning climate and environmental risk (QCB Financial Stability Report, 2021). The Central Bank of Oman plays a proactive role in advising financial institutions to strengthen their risk management frameworks by incorporating climate risks. However, other central banks in the region (Algeria, Kuwait, Libya, Mauritania, Tunisia…) have only started a discussion on the issue of climate-related risks and their impact on macroeconomic indicators and financial stability.

6. Conclusions and Recommendations

A few key lessons have emerged from this policy brief:

- The banking sector in the Arab region is increasingly vulnerable to climate-related risks. If nothing is done, such vulnerability could greatly lead to a systemic crisis.
- The transition to a green economy will not be possible and rapid without appropriate micro- and macroprudential policy responses.
- Current micro- and macroprudential policy tools will be unable to mitigate the threats hanging over the financial system caused by climate risks.
- Macroprudential policy could play a crucial role in transforming current toolkits into important catalysts for green transition.

- To address the systemic implications of climate-related financial risk, conventional macroprudential instruments may not be able to contribute effectively in achieving the desired objectives of financial stability.
- Macroprudential policy should be sufficiently flexible to address climate-related risks given the high level of uncertainty and the high degree of non-linearity that characterizes them.
- Central banks in the Arab region cannot expect to green their macroprudential policies if their current toolboxes have not yet taken on board all the main classical macroprudential instruments.
- Given the endogeneity and the potential systemic implications of climate risks and the nonlinear dynamical perspective on climate prediction, regulators are not in a good position to explore a range of different options in their climate scenarios for physical risks considering the sectoral and geographic distribution of hazard and exposures, and for transition risks considering the pace of the transition process to a low-carbon economy.

Considering the increased climate risks, it is urgent to start to act. Current and future climate challenges faced by the financial system can only be addressed if both of the following conditions are met: (i) the political will is there to implement reforms and innovate, and (ii) the close coordination between monetary and micro- and macroprudential policies. The following key recommendations are put forward to strengthen central banks' efforts to enhance the resilience of the financial system to address the systemic impacts of climate and to speed up the green transition.

- **Central banks should collect available and appropriate data on climate risks (physical and transition risks) and their specific transmission mechanisms (transmission channels, contagion, spillover effects, amplifiers, …) before elaborating guidelines for the preparation of a robust action plan.** Because the cost of acting too early and too strongly based on imperfect information can easily exceed the risk of acting too late and too gradually.

- **Central banks, financial supervisors, financial institutions, and climate experts need to collaborate to address climate data gaps through additional disclosure and reporting requirements for financial institutions and real sector firms.** Without relevant climate data, (i) the ability to measure climate risk exposures and run climate-related financial stress tests will be limited, and (ii) macroprudential policy will not provide much assistance for limiting systemic risk induced by climate change.

- **Central banks in the Arab region should develop an appropriate regulatory framework that makes a difference in strengthening the greening of macroprudential toolkit** to accelerate the transition towards sustainable finance and the adoption of international best practices.

- **Central banks and financial sector supervisors should adapt their stress-testing frameworks by incorporating climate risks under additional transmission channels.** Current stress testing frameworks have shown their limits as an effective instrument to detect climate-related financial risks, calling for an in-depth improvement of these frameworks to enrich their results for better detection of systemic risks.

- **Given the potential systemic implications of climate-related financial risks, central banks will be forced to shift to increasingly sophisticated climate stress testing to ensure a better assessment of the soundness of the financial system.** Central banks and

supervisors should incorporate the endogeneity of climate risks and the contagion and spillover effects between financial institutions and economic activities to enrich current transmission channels and to make climate stress testing statistical output more relevant.

- **Central banks should improve their modeling of financial imperfections and enrich the structure of their models by climate risks and climate policies, not only enhancing the efficiency of macroprudential tools but also improving the quality of the outcomes of scenarios.** An urgent need to push the modeling frontier to multi-sector and multi-region DSGE models (Dafermos et al., 2024) with financial frictions and spillovers considering a key transmission channel of climate change (acute and chronic physical risks) and climate policies (carbon pricing, micro- and macroprudential policies, green monetary and fiscal policies, …).

- **Central banks should develop and enhance the calibration of parameter values in E-DSGE models, which largely guided the formulation of macroprudential policy tools.** Without traceability of transmission channels of climate-related risks and identification of E-DSGE limitations, macroeconomic models could deliver misleading policy directives and the effectiveness of the green macroprudential.

- **Finance ministries should build a deep secondary market for government and corporate green bonds** (Labidi, 2022; Abdmoulah and Labidi, 2023; Labidi, 2024) (i) to enrich the central bank toolbox with unconventional instruments such as the '*Green quantitative easing'* and '*Green collateral framework' and (i) to green* certain macroprudential ratios such as the LCR (*Liquidity coverage ratio*) by valuing the holding of liquid 'green bonds'.

- **Central banks should be driven by the unflagging determination to contribute to speeding up the green transition while countering any threats of greenwashing.** The macroprudential framework should be as consistent as possible (clear, precise, and robust) and focus on the key issues to cancel out any green-washing risks.

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تليفون: 24844061 - 24843130 - 24848754

فاكس: 24842935

صندوق بريد: 5834 صفاة 13059 دولة الكويت

بريد الكتروني: api@api.org.kw

www.arab-api.org

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