TECHNICAL ASSISTANCE REPORT

BANGLADESH

Climate Risk Analysis

September 2023

Prepared By

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Authoring Department:

Monetary and Capital Markets Department

DISCLAIMER

CONTENTS

GLOSSARY

BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistics
CEGIS	Center for Environmental and Geographic Information Services
CIB	Credit Information Bureau
EPSG	European Petroleum Survey Group
FID	Financial Institutions Division
FFWC	Flood Forecasting Warning Center
FSD	Financial Stability Department
GCM	Global Circulation Model
GDP	Gross Domestic Product
IMF	International Monetary Fund
LTV	Loan to Value
MCM	Monetary and Capital Markets Department
MoA	Ministry of Agriculture
MoEFCC	Ministry of Environment, Forest and Climate Change
MoDMR	Ministry of Disaster Management and Relief
MoWR	Ministry of Water Resources
MoF	Ministry of Finance
NAP	National Adaptation Plan
NPL	Non-Performing Loans
RCM	Regional Climate Model
RSF	Resilience and Sustainability Facility
SD	Statistics Department
SFD	Sustainable Finance Department
SSP	Shared Socioeconomic Pathway
TA	Technical Assistance

PREFACE

Bangladesh Bank (BB, the central bank of Bangladesh) requested Technical Assistance (TA) to develop a suitable framework for assessing climate-related risks in the financial sector of Bangladesh.

The IMF's Monetary and Capital Markets (MCM) Department conducted an in-person mission between March 5 and March 9, 2023, to help the authorities set up a physical climate risk assessment framework. The team for the scoping mission included Agnese Carella (MCMFR) and Javier Uruñuela López (MCMFS).

The mission met with Mr. Abdur Rouf Talukder (Governor, BB), Mr. Md. Ala Uddin (Director of Financial Stability Department - FSD, BB),Mr. Kamrul Hoque Maruf (Joint Secretary, Financial Institutions Division - FID, Ministry of Finance - MoF), Mr. Md. Rafiqul Islam (Joint Director, Bangladesh Bureau of Statistics - BBS), Dr. Farhina Ahmed (Secretary, Ministry of Environment, Forest and Climate Change - MoEFCC), Mr. Iqbal Abdullah Harun (Additional Secretary, MoEFCC), Mr. Mohammad Eamin Khan (Deputy Secretary, Ministry of Agriculture - MoA), Dr. Kisinger Chakma (Deputy Secretary, Ministry of Disaster Management and Relief - MoDMR), Mr. Malik Fida A. Khan (Executive Director, Center for Environmental and Geographic Information Services – CEGIS), Mr. Bhuiya Md. Tamim Al Hossain (Associate Specialist, CEGIS), Mr. Sardar Udoy Raihan (Sub-Divisional Engineer, Flood Forecasting Warning Center – FFWC, Ministry of Water Resources - MoWR)and other staff across departments from the Ministries and BB. The mission wishes to thank Mr. Abdur Rouf Talukder, Mr. Md. Ala Uddin, officials from FSD, Statistics Department (SD), Sustainable Finance Department (SFD) and Credit Information Bureau (CIB) of BB, Dr. Farhina Ahmed, Mr. Malid Fida A. Khan, and their staff for their cooperation, productive discussions, and hospitality.

EXECUTIVE SUMMARY

BB requested a TA to develop a suitable framework for assessing climate-related risks in the financial sector of Bangladesh. Natural disasters from climate change are one of the authorities' main long-term concerns. The country is highly vulnerable to physical risk from river and coastal floods that already have substantial impact on population[1] (particularly the poorest and most vulnerable groups), the economy and social development, and could also have consequences for financial stability.

Bangladesh was granted access to the new Resilience and Sustainability Facility (RSF) to meet financing needs posed by climate risk. Under the RSF arrangement, BB is expected to conduct and publish climate stress testing for the overall financial system[2] and update the Guidelines on Stress Testing for banks and financial institutions to include climate change considerations by end-December 2024.

This mission is a first step in helping the authorities to set up a framework to assess physical climate risk. This included: (i) proposing a risk assessment framework tailored to available data, with a focus on the impact of floods on the banking sector ; (ii) taking stock of financial and climate data availability and identifying data gaps; and (iii) setting up collaboration and data sharing mechanisms, taking into account legal obligations and confidentiality constraints, between climate experts in the MoEFCC, MoWR, MoDMR, MoA and financial sector experts in BB (FSD, SD, SFD, and CIB), MoF and BBS.

The TA mission provided recommendations and deadlines for authorities responsible for their implementation (Table 1). The mission proposed a preferred micro approach for climate risk assessment based on high-granularity data, and two alternative options that would rely on more aggregate data. The micro approach is a borrower-level assessment based on geo-located bank exposures data. The other alternatives rely on lower granularity or country-level exposures, possibly resulting in estimates that might be of lower precision and output of lower quality: (i) a micro approach with bank exposure data at Thana administrative level,[3] and (ii) macro approach with exposure based on gridded GDP.[4]

A follow-up mission will be organized by March 2024 subject to sufficient progress made on the recommendations of this mission. The follow-up mission will focus on mapping (with either a micro or a macro approach) the impact of the hazards on the banking sector.

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[1] See 2021 WB Climate Risk Country Profile: Bangladesh and National Adaptation Plan of Bangladesh (2023-2025)

[2] The data is only available for banks which was the scope of the TA.

[3] Third-order administrative level (495), named thana or upazila, first-order are divisions (8) and second-order districts (64)

[4] A geographical grid corresponds to a square representation of the earth's surface in a specific EPSG (European Petroleum Survey Group), and a gridded GDP dataset corresponds to a distribution of GDP into these grids.

Table 1. Key Recommendations		
Recommendations and Authority Responsible for Implementation	**Priority**	**Timeframe[5]**
General		
BB and Ministries: Lay out a climate risk assessment plan. The plan should carefully define the time and scope of the analysis, objectives and expected outcomes, main contributors and beneficiaries, and a division of tasks (Para 21).	High	Short term
Risk Framework		
BB and Ministries: Select the risk framework to be implemented among the options proposed by the TA after carefully evaluating pros and cons of each option (Para 22).	High	Short term
BB and CEGIS: Design a stylized climate scenario tailored to available data with a focus on floods. The climate scenario should be gradually refined to better capture tail risks, and country-specific damage factors and changes in data availability (Para 24, 25).	High	Medium term
BB: Link the climate scenario to assessment of financial sector resilience following the NPL inflow rate approach or other credit risk modeling as defined in the context of macroprudential solvency stress test (Para 26).	High	Medium term
BB and CEGIS: Test the proposed framework for climate risk assessment; start with implementation of a basic assessment and then use the above recommendations to expand it and improve it (Para 25).	Medium	Medium term
Data Assessment		
BB: Close the identified data gaps: (i) start data collection and validation for the value of exposed assets (corporate and household physical assets at market value, LTVs at current prices, collateral value, firms' balance sheets, and financial statements); (ii) produce longer and more granular time series for credit risk modeling as recommended by the recent macroprudential stress testing TA (NPL inflow rate, stock, write-offs, and other NPL outflows) (Para 26).	High	Medium term
BB and Ministries: Promote engagement across participating agencies to establish, when applicable, a regular cross-validation framework for data quality and consistency (Para 27).	High	Medium term
BB: Increase granularity of the information for assets' location (location of firms' assets and location of houses bought using a mortgage loan at the individual household level, in addition to locations at the Thana level) (Para 27).	High	Long term
CEGIS, BBS, MoA, MoDMR: Start data collection and collaboration to develop a Bangladesh or regional-specific damage function, possibly differentiating between different assets and regions (Para 27).	Medium	Long term
Cooperation between stakeholders		
BB and Ministries: Establish the proper framework to best coordinate and manage the collaboration and data-sharing mechanisms between financial sector experts (in the different departments of BB and MoF) and climate experts (in the different Ministries) (Para 28).	High	Medium term

[5] Short term: up to 6 months; Medium term: 6 to 12months; Long term: more than 12 months.

I. INTRODUCTION

1. Bangladesh authorities requested a TA on climate risk analysis. IMF MCM is planning a series of TA missions, until the end of 2024, to meet this request. The current, first mission is a "scoping" mission that took place in person during March 5-9, 2023. The mission's agenda is included in Annex I. The follow up mission will help the authorities on specific elements of climate risk analysis via hands-on training once sufficient progress on the scoping mission's recommendations is achieved.

2. The TA mission provided recommendations for authorities to set up and operationalize the climate risk assessment framework. The mission team proposed three frameworks for assessing physical climate risk from river and coastal floods on the financial sector of Bangladesh. Each framework is based on data availability (current and future data once data gaps are closed), and defines its own timeframe, and inter-agency collaboration. The mission recommended closing data gaps on exposure data and emphasized necessity of making progress on credit risk modeling as recommended by the recent macroprudential solvency stress testing TA. The mission identified the main data gaps and the main stakeholders in the climate risk assessment with CEGIS as the main proposed agency for work on climate data (specifically for flood projections). The mission also proposed the mechanisms (ideally involving both the BB and the MoEFCC) to coordinate the collaboration and capacity development between climate and financial sector experts.

II. BACKGROUND

3. The Bangladesh economy is facing several macroeconomic challenges amid multiple external shocks. The war in Ukraine intensified external pressures and interrupted the recovery from the COVID-19 pandemic. Rising commodity prices, supply chain disruptions, and the slowdown in external demand have led to a widening current account deficit and the depletion of foreign exchange reserves, while global headwinds and tighter financial conditions will likely keep the balance of payments under pressure in the coming years. The near-term economic outlook remains surrounded by many uncertainties, making long-standing structural issues (growth and productivity, social and development spending, tax revenue mobilization, export scale and diversification, foreign direct investment inflows, climate investment)[6] all the more challenging.

4. Bangladesh is highly vulnerable to climate change and natural disasters, including from river and coastal floods. Average temperatures in the country have been increasing over the past decades and are expected to accelerate in the coming years, especially if no global mitigation polices to curb greenhouse gas emissions are implemented. Extreme rainfall and tropical cyclones are likely to intensify, driven by rising temperatures, and sea levels are expected to increase, exposing the country's economy and the people living in affected areas to the risk of more frequent and severe floods. All this may have disproportionate effects on the poor and most vulnerable groups, which are often exposed to overlapping shocks in the face of low adaptive capacity.

5. Climate change and natural disasters can raise macroeconomic and financial stability concerns. According to recent estimates, damages from extreme flood events could account for up to 6 percent of the country's annual GDP in a "hot house world" scenario. Losses could transmit to banks with

[6] See 2022 Article IV Staff Report and 2021 Bangladesh: Selected Issues paper Bangladesh in Transition

exposures to affected assets, with potential consequences for financial stability. For an extreme flood event, financial losses could be as high as 5 percent of total outstanding loans (see the 2022 Article IV Staff Report).

6. To help address its large climate financing needs, Bangladesh was granted SDR 1 billion (about US$1.4 billion) under the new RSF. The arrangements under the RSF are expected to strengthen the country's institutional setup, mobilize private climate financing, and enhance financial sector resilience to climate risks. Some of the proposed reforms include the adoption of guidelines for banks and financial institutions on reporting and disclosing climate-related risks, the inclusion of climate change considerations in risk assessment and financial sector surveillance, and the publication of regular climate stress testing exercises.

7. A macroprudential solvency stress testing TA mission took place earlier in September 2022. The current sensitivity analysis used by the BB to assess financial resilience under volatile global conditions and uncertain economic outlook has several limitations. The macroprudential TA mission recommended practical solutions to introduce a scenario-based stress test framework, including an assessment of available internal and external data and of the satellite models for various risk categories, in line with international best practices. The recommendations of the current climate risk TA leverages tools designed during the macroprudential solvency stress testing mission.[7]

III. OBJECTIVES

8. The TA scoping mission aimed to build authorities' capacity to set up a climate risk assessment framework tailored to available data. The focus was on the impact of physical climate risk from river and coastal floods on the banking sector, which could be extended to additional hazards. The TA work was divided into three pillars:(i) proposal of risk assessment options and suitable analytical tools based on data availability, timeframe, and inter-agency collaboration; (ii) assessment of financial and climate data availability, including legal and confidentiality issues regarding data access and data sharing options between agencies, and data gaps to be filled; and (iii) establishment of coordination mechanisms between climate experts from the ministries and financial sector experts from the BB.

9. The TA will help authorities meet the RSF conditions on climate risk stress testing required for program disbursement by end-2024. Under the RSF arrangement, BB is expected to conduct and publish climate stress testing for the overall financial system and update the Guidelines on stress testing for banks and financial institutions to include climate change considerations by end-December 2024.

IV. OUTCOMES

A. Risk Framework

10. The ultimate goal of any physical risk analysis is to estimate losses for the banking sector due to damages caused by more frequent/intense hazards in the future. The estimation of damages requires data on hazards projections, exposure, and vulnerability. A hazard is defined as the potential

[7] Additional TAs have been delivered to Bangladesh over the past years on banking supervision, interest rate operational target, foreign exchange intervention, domestic market development and international market access.

occurrence of a natural or human-induced physical event that may cause damage and losses to properties, infrastructures, livelihoods, services provision, ecosystems, and environmental resources. Hazards are characterized by their frequency of occurrence, usually presented in terms of return periods, and the geographically explicit distribution of their intensity. The exposure measures the presence of population, livelihoods, ecosystems, services, resources, infrastructures, and economic, social, or cultural assets that could be adversely affected. It also includes banks' exposure to affected assets. The vulnerability is the propensity or predisposition to be adversely affected, depending on sensitivity to damage and adaptive capacity. The risk assessment framework for physical risk analysis maps damages to assets that banks are exposed to and their impact on income statements and balance sheets.

11. The TA scoping mission proposed three alternatives for climate risk assessment based on current and future data availability (once data gaps are closed). The first two alternatives feature a borrower level assessment (micro approach) with either exposures at the highest granularity level (first best) or aggregated by Thana, which would still ensure geographical differentiation of banks. The third alternative is a country-level assessment (macro approach), which would instead focus on aggregate economy-wide effects of climate scenarios.

12. The preferred option is the micro approach based on exposure data by borrowers' geo-location. Under this approach flood events by grids[8] would be mapped into exposures' location, by longitude and latitude.[9] Damages would be estimated by applying the damage rate from the flood depth-damage global function (Huizinga et al., 2017) to the value of the exposed asset at each location. The impact on banks' balance sheets would be quantified using the NPL inflow rate approach, or other credit risk modeling tools that will be developed in the context of the macroprudential solvency stress test. The second best is a similar micro approach, but the mapping is done between flood events and banks' exposures by Thanas. The mapping will consider up scaling the damage rate grids within a Thana-to-Thana level by taking the mean, median or a percentile value of the grids. A land cover dataset (such as the built-up grids) could also be used to split the grids within a Thana. The third best is the macro approach, where flood events grids are mapped to gridded GDP by up scaling the higher-resolution grids to the lower-resolution grids with similar considerations as in the previous approach. Country-level damages from the global damage function would be used to calibrate a macro model and evaluate the impact of physical risk shocks on macro and financial variables and the effects of the macro scenarios on banks' credit and market risks (similar to the approach implemented for assessing physical risks from typhoons in the Philippines).[10]

13. The choice of the framework should aim at striking the right balance between timeliness and quality of the analysis. Access to high-granularity exposure data for the first-best micro approach might delay the framework implementation due to legal issues and validation requirements. While the lower resolution exposures by Thana (the second-best micro option) would allow for a timelier assessment, it will reduce precision of the analysis and potentially lead to upward-biased estimates of damages and bank losses. Moreover, the data collection on the value of corporates and households' physical assets – a prerequisite under both micro options – could further delay implementation of the framework. The macro assessment is subject to less information constraints, with data mostly retrievable from public sources. In fact, the macro financial scenario features shocks to physical capital from country-

[8] A geographical grid corresponds to a square representation of the earth's surface in a specific EPSG (European Petroleum Survey Group).

[9] Exposures' longitudes and latitudes can be retrieved using addresses (from the CIB) as input into geospatial software or packages; the outcome will depend on data quality and software precision.

[10] See Hallegatte et al. (2022).Bank Stress Testing of Physical Risks under Climate Change Macro Scenarios: Typhoon Risks to the Philippines. IMF WP No. 2022/163

level estimates of river and coastal flood damages based on the gridded GDP dataset and the global vulnerability curve from Huizinga et al. (2017). Yet, estimating the impact of the shock to physical capital on the economy requires macro modeling skills that are not currently available, with the results still not accounting for the highly locational and sectoral nature of climate risk. Moreover, quantifying the effect on individual banks' credit and market risk involves methodologies from the bank solvency stress test that are yet to be streamlined.

B. Data Assessment

14. The TA mission identified the main climate and financial data sources and existing data gaps that are necessary to be addressed to implement any of the proposed options for physical risk assessment framework (Appendix II). The analysis requires data on hazards, exposure, and vulnerability. Hazard data will come from CEGIS under all suggested framework alternatives. Exposure will be based on BB data from CIB or SD under the preferred micro approach, and gridded GDP under the macro alternative. The vulnerability assessment and damage estimation will be initially based on the flood damage function from Huizinga et al. 2017, and later on the Bangladesh-specific one (to be developed).

15. Data on floods' hazards for the climate scenario design would be provided by CEGIS irrespective of the risk assessment option. Historical flood maps (with 100 m resolution) and flood events (depth and extent) for the country are already available, while projections under SSP1-2.6 and SSP5-8.5[11]can be generated over the medium term (depending on the number of tail events included) by relying on existing hydrological models for river and coastal floods[12] at specific resolution. The projections will include river and coastal floods, considering 4 to 5 different events and then more, in actual conditions and future climate scenarios.

16. Data on exposures would come from the BB or public sources, depending on the approach and granularity of the assessment.

- ***1st best micro approach***. Data on the value and location of physical assets of firms and households to which banks have exposures is currently not available and could be collected by BB. Confidential data on individual banks' loans to firms and households, including borrowers' addresses, are available at the CIB, within the BB. The high-granularity level of the information would allow for geographical differentiation of banks' exposure, but its use is subject to legal obligations and confidentiality constraints.
- ***2nd best micro approach.*** The bank exposure data, aggregated at the Thana level is not confidential and is accessible with no restrictions from BB's SD. Since floods are a highly localized phenomenon, the lower Thana resolution might result in substantial damage under- or overestimation.
- ***Macro approach***. As for country-level exposures, gridded GDP is publicly available from LitPop, Murakami or other sources.[13] Focusing on aggregate economy effect, however, would fail to account for the highly geospatial and sectoral nature of banks' exposure to floods.

[11] A Shared Socioeconomic Pathway (SSP) is a scenario describing a possible socioeconomic development, including sustainable progress, regional rivalry, inequality, fossil-fueled and middle-of-the-road developments. The SSP1-2.6 is the "sustainable development" scenario, where emissions reach net zero after 2050 and temperatures stabilize at around 1.8°C by the end of the century. The SSP5-8.5 is the "worst-case" scenario, where emissions double by 2050 and global temperature rise exceeding 4°C. These scenarios were considered in the National Adaptation Plan from the MoEFCC to capture the variation between low and very high emissions scenarios.

[12] For hazards projections, climate data on rainfall and temperatures are available for CORDEX (6 GCM-RCM) and CHELSA (5 GCM).CORDEX data available for RCP 4.5 & 8.5 up to 2100 and CHELSA for SSP1-2.6 & 5-8.5

[13] LitPop, Eberenz et al. (2020); Gridded GDP compatible with SSPs, Murakami et al. (2021).

17. The vulnerability assessment and estimation of damages relies on global damage functions from the literature, which, ideally, should be adjusted for country specificities. The global flood depth-damage function developed by Huizinga et al. 2017 for the Joint Research Centre links floods' depth to damage rates for different types of exposed asset, and it has been commonly used to estimate floods' damages.[14] As damage information becomes available (from BBS, MoA, MoDMR and other agencies), a Bangladesh or regional vulnerability function, accounting for country-specific damage factors can be developed by CEGIS. These damages would then be mapped into the effects on bank exposure to assess the impact on banks' health.

C. Inter-Agency Collaboration

18. An effective and successful climate risk analysis relies on smooth collaboration between climate and financial sector experts in the country. Joint work and sharing of knowledge across experts are crucial to map climate scenarios into risks for the economy and the financial sector, while preserving a clear division of tasks and responsibilities across agencies, according to their area of expertise (financial versus climate).

19. The TA scoping mission initiated collaboration among relevant stakeholders and proposed their involvement in terms of data provision and capacity development. A subsample of stakeholders has been identified as the main data owners/providers –CEGIS for climate data, BBS for hazards damages and survey data validation, and BB for financial data. Authorities should promote regular engagement of all agencies to meet the data validation requirements for official use; this also applies to data on granular exposures, country-specific damages, further events and hazards, still to be produced. It is up to the authorities to decide on how to set up mechanisms of collaboration and data sharing with other agencies. Other stakeholders, including the MoEFCC, MoWR, MoA, and MoDMR, could be involved at all stages to ensure a clear understanding of the data and their applicability within the framework, and to build capacity of staff resources to engage with climate risk analysis.

V. RECOMMENDATIONS

20. The TA scoping mission provided recommendations and deadlines for authorities responsible to implement them. Table 1summarizes the recommendations and classifies them by topic (general, data assessment and risk framework), priority and timeframe.

D. General

21. Authorities should lay out a climate risk assessment plan. The plan should specify the time and scope of the analysis. The initial focus should be on the impact of river and coastal floods on the banking sector. The assessment of other hazards is possible once the initial framework is fully operational. The plan should also clarify the objectives and expected outcomes of the analysis, identify its

[14] Damage survey data from the BBS on Household natural disaster can be used for comparison.

main contributors and beneficiaries, define a clear division or tasks and responsibilities, and monitor progress.

E. Risk Framework

22. Authorities should decide which of the three proposed risk assessment options is the most appropriate to implement. In doing so, they should carefully evaluate all the advantages and disadvantages of the proposed options and select alternatives for specific timeframe. For example, the authorities could decide to start with a stylized framework based on current data and modeling capacity over the short term, i.e., few events and low granularity, which could be refined with more granular information and techniques as they become available.

23. For practical purposes, the actual implementation of the framework should be left to the stakeholders responsible for providing the data. Other stakeholders could be engaged to strengthen their capacity development and ensure common accessibility and understanding of the final output.

24. Strong collaboration between CEGIS and the BB should be in place to design the climate scenario. The CEGIS should generate a set of events considering actual and future climate conditions. The BB should use those events to estimate the damages on banks' exposures (micro approach) or gridded GDP (macro approach) in discussion with CEGIS. A pilot climate scenario should begin with a few events and then gradually refined to properly account for tail risks (by increasing the set of events considered), Bangladesh-specific damage factors (by relying on a damage function adjusted for country characteristics) and other relevant hazards (depending on data availability).

25. The BB should define a mapping of the climate scenario into financial sector resilience and assess the impact of physical risk on banks. The mapping should be consistent with the approach to credit risk modeling developed in context of the macroprudential solvency stress testing TA, and consider how the damage to physical assets, the decline in household and corporate incomes, and rising costs would translate into losses within the banking system. To test the framework, the authorities should start with implementation of a basic assessment and use the above recommendations to improve it.

F. Data Assessment

26. BB should gradually close the identified data gaps for each option of the proposed physical climate risk assessment framework. The FSD and SD of the BB should: (i) start a data collection and validation of the value of exposed assets – options include the market value of physical assets held by corporates and households to which banks have exposures, the LTV at current prices, the value of collateral; and (ii) produce longer and more granular time series for credit risk modeling as recommended in the context of the macroprudential stress testing TA (NPL inflow rate, stock, write-offs, and other NPL outflows). Closing the data gaps would be a medium-term objective and should go hand-in-hand with refining the framework.

27. The authorities should define and produce data necessary to expand and refine the framework in the medium term. BB should increase granularity of the information available for assets' location such as location of firms' assets and location of houses bought using a mortgage loan at the longitude and latitude level, in addition to locations at the Thana level. BB, CEGIS, BBS, MoA, MoDMR should collaborate to the develop Bangladesh or regional-specific damage function, possibly differentiating between different assets and regions. The damage information collected by MoA and

MoDMR through surveys should be validated by BBS, which also has information on damages to households. BB should provide input on the most vulnerable sectors, based on banks' exposure and other relevant variables. A country specific damage function should be developed by the CEGIS using this information.

G. Coordination Mechanisms between Stakeholders

28. Authorities should decide on the most appropriate framework for coordination, collaboration and data sharing between the different stakeholders. This can be formally achieved through establishment of a high-level climate risk committee (possibly joint by the MoEFCC and the BB), or informally through the organization of a forum or workshops connecting relevant experts. Ministries, ideally represented by the MoEFCC, and the BB, should take the lead given the objectives or the physical risks analysis and data ownership.

VI. CONCLUSIONS

29. The mission outlined proposals for a climate risk assessment framework, based on different methodologies and data availability. In response to the authorities' request for a climate risk analysis TA, the IMF MCM Department had an in-person mission during March 5-9, 2023.The objective of the mission was to lay out proposals for a climate risk assessment framework tailored to available data, with a focus on the impact of physical risk from floods on the banking sector. While some data is available, and others can be produced by the authorities, the proposals also considered leveraging on global data sources.

30. The TA will serve as a valuable tool to support the authorities' efforts in meeting the RSF conditions. Climate risk analysis is a key reform under the new RSF arrangement. The proposed framework will eventually support the conditionality of the RSF on the publication of a climate risk stress-testing exercise required by end-December 2024.

31. The authorities should carefully evaluate the three risk assessment framework alternatives, taking into account data availability and timeline constraints. The mission highlighted that relying on more detailed data would allow to better identify climate-related vulnerabilities in the banking system.

32. The TA mission team provided recommendations on implementation of the proposed risk frameworks, improving data quality and closing the gaps and strengthening inter-agency collaboration. The recommendations were discussed with the authorities at the closing meeting and preliminary comments were taken on board. During the closing meeting, the team illustrated next steps after the scoping mission and before the publication of a climate stress testing exercise by end-2024, in accordance with the RSF requirements.

33. One or more follow-up missions could be scheduled by March 2024, once sufficient progress on the recommendations of the scoping mission is achieved. The team also proposed regular virtual check-ins to assess the status of the recommendations and the progress made, ideally once every 3 months and should consider the timing of the macroprudential stress testing TA.

ANNEX I. MEETINGS CALENDAR

Day 1: Sunday, March 5		
9:30 am – 10:30 am		**Opening session** *Ms. Agnese Carella* TA Scoping Mission: • Main objectives, motivation, plan, outcomes and team • Agenda • Risk assessment framework • Current understanding
10:30 am –11:30 am		**Climate Risk Analysis framework and the different agencies** *Mr. Javier Uruñuela* • Risk assessment framework, data for climate risk analysis, and roles of the different agencies • Confirm understanding and involvement of MoEFCC, MoDMR, and MoA • Discuss approach

Day 2: Monday, March 6		
9:30 am – 12:00 pm		**Climate scenarios and the CEGIS** *Mr. Javier Uruñuela* • Risk assessment framework and data for climate risk analysis, with emphasis on the climate scenario and CEGIS role • Confirm understanding and involvement of CEGIS • Discuss approach and short-term / long-term outputs
2:00 pm –4:00 pm		**Banks' exposure data** *Ms. Agnese Carella* • Discuss the approach considering CIB and SD exposure data • Review further data needs
Day 3: Tuesday, March 7		
9:30 am–11:00 pm		**Follow-up with BBS** Ms. Agnese Carella and Mr. Javier Uruñuela • Discuss validation process to generate damage official statistics • Review available hazards damage data
3:30 pm – 6:30 pm		**Follow-up with CEGIS** Ms. Agnese Carella and Mr. Javier Uruñuela • Discuss CEGIS capabilities, and approach to generate climate events under actual and future climate scenarios • Detail CEGIS involvement and possible timeline

Day 4: Wednesday, March8		
		Public holiday; no meeting.
Day 5: Thursday, March 9		
9:30 am – 11:00 am		**Closing session** *Ms. Agnese Carella* TA Scoping Mission: • Main objectives and outcomes • Preliminary Risk Framework • Data Assessment • Inter-agency collaboration • Preliminary recommendations • Next steps
11:00 am – 12:00 pm		**Main outcomes, and preliminary recommendations** *Ms. Agnese Carella*

ANNEX II. CLIMATE AND FINANCIAL DATA SOURCES

Timeline	Hazard projections	Exposure	Vulnerability
Short term (Up to 6 months)	**[D]** Set of events tail events *Source: CEGIS* ** Tail events, i.e., events that have a higher Return Period, such as 1-in-100-year event*	**[P]** Individual bank loans with address and geo-location *Source: BB – CIB* **[P]** Individual bank loans by Thana *Source: BB – SD* **[A]** Gridded GDP from LitPop, Murakami or others[1]	**[A]** Global damage functions *Source: Huizinga et al. (2017)* **[A]** For comparison: Household natural disaster damage information *Source: BBS*
Medium term (6-12 months)	**[P]** River and coastal floods, from 4 to 5 different events, one in actual conditions and others in future climate scenarios considering SSP1-2.6, and SSP5-8.5 *Source: CEGIS*	**[D, C]** Collateral value, LTV, Value of exposed assets (residential and corporates physical assets) at updated market prices *Source: BB*	**[D]** Vulnerable sectors, according to banks' exposure *BB* **[V]** Natural disaster damage information *Source: MoA and MoDMR*
Long term (More than 12 months)	**[D, P]** Further events and other hazards *Source: CEGIS*		**[D, P]** Bangladesh-specific damage function by sector *Source: CEGIS*

Data gaps: A - available, C – to be collected, D - to be defined, P - to be produced, V - to be validated

1. LitPop, Eberenz et al. (2020); Gridded GDP compatible with SSPs, Murakami et al. (2021)