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MONGOLBANK
CENTRAL BANK OF MONGOLIA

Climate Scenario Analysis 2024-25: Methodology Document

NDC PARTNERSHIP

ESCAP
Economic and Social Commission for Asia and the Pacific

About this document

The document provides detailed guidance on the scenarios to be used, the parameters to be applied, and the procedures for estimating climate-related credit risks and financed emissions. It also outlines the expected reporting format and supporting qualitative information on climate risk management practices to ensure consistency and comparability across institutions.

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Acronymns

BNP	Banque Nationale de Paris
CO2	Carbon dioxide
CSA	Climate Scenario Analysis
ECB	European Central Bank
GCAM	Global Change Assessment Model
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GLOBIOM	Global Biosphere Management Model
IEA	International Energy Agency
IFRS	International Financial Reporting Standards
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ISIC	International Standard Industrial Classification
IT	Information Technology
JPY	Japanese Yen
LGD	Loss Given Default
LTV	Loan To Value
MECC	Ministry of Environment and Climate Change
MNT	Mongolian tögrög
MSFA	Mongolian Sustainable Finance Association
NAMEM	National Agency for Meteorology and Environmental Monitoring
NGFS	Network for Greening the Financial System
NPL	Non-Performing Loans
PCAF	Partnership for Carbon Accounting Financials
PD	Probability of Default
RCP	Representative Concentration Pathways
RE	Renewable Energy
REMIND	Regional Model of Investment and Development
SME	Small and Medium Enterprise
TCFD	Task Force on Climate-related Financial Disclosures
US	United States
USA	United States of America
USD	United States Dollar
WI	Winter Intensity Index

1. Introduction

Increasing greenhouse gas emissions from human activities are causing climate change, which in turn affects the economies and financial systems of countries. The specific ways these effects will unfold are uncertain due to the complex and interconnected nature of the factors involved. However, what is known is that climate change is driving structural changes which can threaten financial sector stability. Mongolia is especially vulnerable to climate change due to its geography and climate.

Climate change-related risks to financial stability have several distinct characteristics. Climate change will affect all agents in the economy, across all sectors and geographies. The risks will be non-linearly correlated and potentially aggravated by tipping points, making their impact systemic and more widespread than that of other structural changes. Feedback loops between the macroeconomy and the financial system could further exacerbate these impacts and risks. Moreover, the exact outcomes, time horizons, and pathways of these risks are marked by a high level of uncertainty. The magnitude and nature of the future impacts will depend on the actions taken today.

The Bank of Mongolia as part of its primary objectives contributes to the balanced development of the national economy by the way of ensuring the stability of financial markets and the banking system.[1] Greening the financial sector has been established as a critical goal of the government's 2022 Monetary Policy Guidelines. Within this context, BoM aims to introduce commonly accepted concepts and principles of green and sustainable financing to the banking sector, identify and assess various climate change risks that may affect the financial system, and strengthen the financial system's resilience to these risks.

Within its mandate to assess and manage climate-related risks to the financial sector the Bank of Mongolia is conducting a Climate Scenario Analysis (CSA) exercise. A scenario describes a consistent future state of the world over time, resulting from a plausible and possibly adverse set of events or sequences of events. Scenario analysis offers a flexible 'what-if' methodological framework that is better suited than conventional stress tests to explore the risks that could crystallize in different possible futures. A Climate-Scenario Analysis (CSA) is a useful tool to assess the magnitude of these climate-related risks to the financial sector over a long-term horizon. Scenario analysis facilitates productive engagement with the uncertainties surrounding climate-related socioeconomic and technological developments, as well as the physical impacts of climate change, by calculating possible future outcomes in different scenarios.[2]

This document describes the main characteristics and the rationale behind the Climate Scenario Analysis. It provides common scenario narratives and necessary inputs for the participating institutions to assess climate-related risks. The risk estimations and the scenarios can further serve as inputs for banks to align their reporting and disclosures to international best practices and recommendations provided by the Task Force for Climate-Related Disclosures (TCFD). The document outlines the necessary steps that must be followed while specifying the information and data that is needed to assess the climate-related risks.

[1] Law Of Mongolia On Central Bank (Bank Of Mongolia), September 3, 1996. Article 4 Primary Objective of the Bank of Mongolia.

[2] Purposeful scenario analysis: A framework to guide central banks and financial supervisors in the selection and design of climate scenarios Matthias Täger and Simon Dikau Policy insight May 2023

2. Climate Scenario Analysis Overview

Objective

The CSA aims to raise awareness about the climate-related risks to the financial sector, the development of capacities of the regulator and the participating financial institutions as well as assessing the gaps in data and methodologies to estimate the climate-related risks. The main objectives of this pilot Climate Scenario Analysis are as follows:

- Build capacities to understand and analyze climate-related risks to the financial system.
- Increase the understanding of the financial sectors' potential exposures arising from physical risks particular to the region and transition risks coming from internal and external policy actions to move towards a low carbon emissions state.
- Understand the data gaps (both climate and financial data) and methodologies (such as estimation of GHG emissions, losses, and counterparty exposures) to estimate the risks.

The results of the pilot exercise will provide a strong foundation for the development and improvement of subsequent climate risk assessments and the overall strategy of greening the financial system. Given the investigative nature of the exercise and its objectives, the results of this exercise will not include changes in capital regulatory requirements for financial institutions.

Scenario Narrative:

Unlike traditional risk management, where the underlying models are based on historical data, climate scenarios must deal with uncertainty, as they cannot rely on past sources, as climate change-related risks have rarely been observed[3]. Climate scenarios are not predictions of most likely pathways but rather represent plausible future "what if" states under certain conditions and assumptions. Several organizations have published these possible "what if" scenarios like the IEA scenarios used for the World Energy Outlook 2021[4], the IPCC scenarios from the Sixth Assessment Reports[5], and the NGFS scenarios[6] used by several central banks. While IPCC scenarios focus on examining physical risks and include sectors such as real estate, which are especially vulnerable to these risks, NGFS scenarios cover transition risks and sectors most affected by this risk type, such as energy. NGFS scenarios have been used as a starting point for this CSA as they provide a common reference point for central banks and users, have an annual release cycle, integrate both transition and physical risk, and have high sectoral granularity.

Three NGFS scenarios have been selected as a starting point for this exercise and have been modified to incorporate Mongolia-specific details to produce the following three scenarios:

- Current Policies: This scenario assumes that Mongolia continues with its existing climate policies without any significant new interventions or changes.

[3] Hugues Chenet, Josh Ryan-Collins, Frank van Lerven, Finance, climate-change and radical uncertainty: Towards a precautionary approach to financial policy, Ecological Economics, 2021

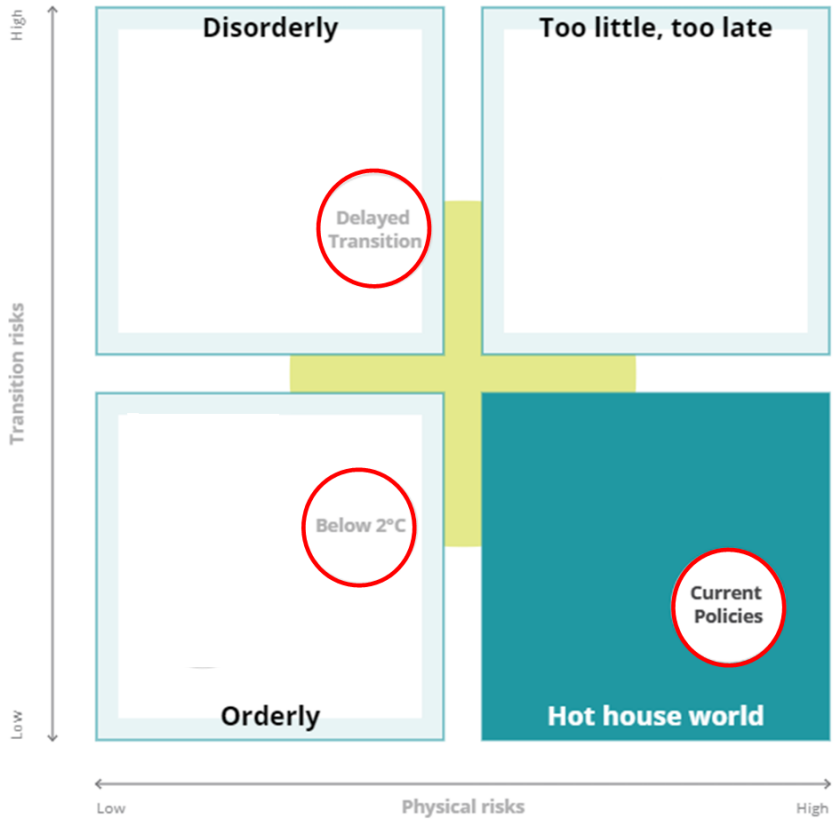
[4] See Scenario trajectories and temperature outcomes – World Energy Outlook 2021 – Analysis - IEA for more details.

[5] See Cross-Section Box.2: Scenarios, Global Warming Levels, and Risks from IPCC_AR6_SYR_LongerReport.pdf

[6] NGFS Climate Scenarios for Central Banks and Supervisors, 2021

- Below 2^0 C: This scenario envisions Mongolia taking strong, immediate actions to limit global warming to below 2°C, aligning with the Paris Agreement targets.
- Delayed Transition: This scenario considers a late but abrupt shift towards stringent climate policies and measures, causing significant economic and financial adjustments in a short time frame.

Figure 1 NGFS Scenario Framework



Under the NGFS scenario modeling framework, the outputs from three integrated assessment models are available, these models are MESSAGEix-GLOBIOM 1.1-M-R12, GCAM 6.0, and REMIND-MAgPIE 3.2-4.6. The three models are set up with key structural differences between them however, the conceptual underpinnings and goals of the models are broadly aligned.[7] For the CSA the outputs from REMIND-MAgPIE Model have been used due to the model's emphasis on the energy sector, a key sector in the Mongolian context, and based on the coherency of the starting point values with national sources data. Table 1 below summarizes the narratives for each scenario, to which a detailed explanation follows.

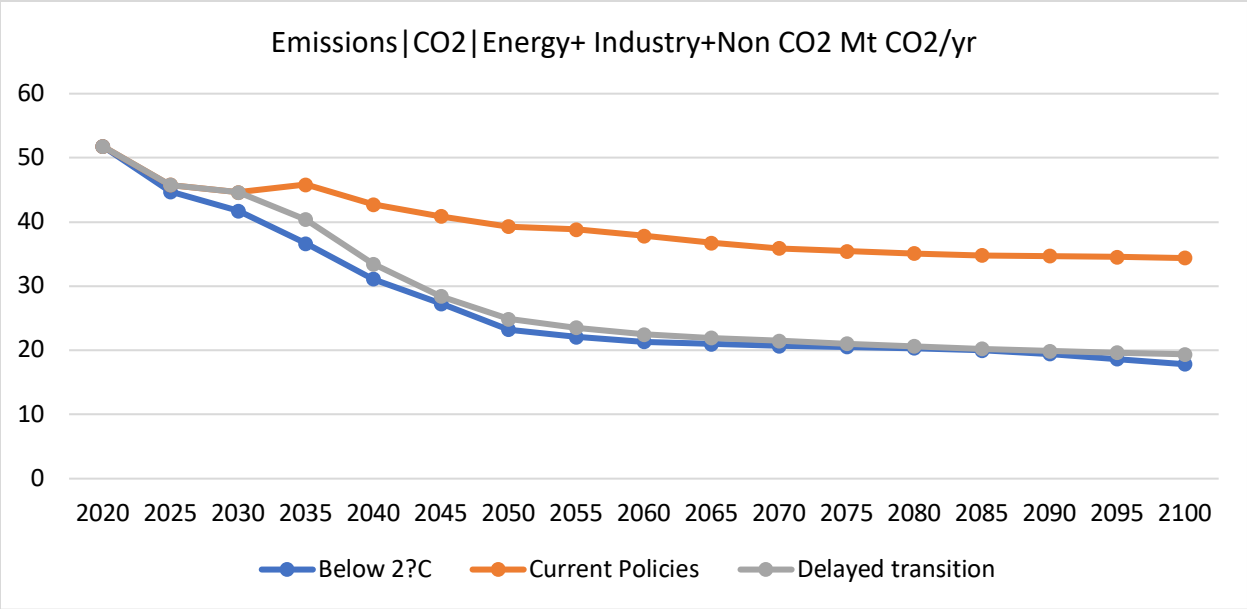
[7] See Table 4. Key Model Characteristics from the NGFS Climate Scenarios Technical Documentation V4.2, November 2023. Additional information on all models can also be found here.

Table 1 Scenario Narrative for Climate Scenario Analysis

Scenario	Current Policies	Below 2^0 C	Delayed Transition
Global Temperature Target	3^0+	67% chance of 1.6^0	1.7^0
Physical Risks	High	Medium	Medium
Transition Risks	Medium	High	High
Emission Reduction 2030	14%	19%	14%
Emission Reduction 2050	24%	55%	52%
Carbon Price Implementation	No Change	Immediate	After 2030
Carbon 2030 (US$/tCO2e)	5.63	35.2	5.63
Carbon 2050 (US$/tCO2e)	6.16	131.1	161.9
Final Energy Prices	Flat Final Energy prices	Immediate Price Liberalization	Price Liberalization after 2030
Energy Mix	• Coal phase down but remains a part of energy mix with small share of 8% after 2050 • Liquids phase down, small share of gases • RE capacity is slowly built till end of century, • Heating component increases to 50% by 2050.	• Immediate and gradual Coal Phase out by 2030 • Higher share of liquids as transition fuel • Renewable energy component is scaled to 30% share by 2050 • Heating component increases from 26% in 2020 to 50% in 2050	• Coal phase down till 2030, then drastic phase out by 2045 • Liquid used as bridge fuel • Renewable Energy capacity develops slowly • Heating share increases to 50% in 2050.
Technology Change	Slow Change	Moderate Change	Slow Change till 2030 then Fast Change
CO2 Removal	Low Use	Medium Use	Medium Use
Regional Policy Variation	Low Variation all countries are not increasing ambition	Low Variation, all countries implement immediate coordinated policy action	High Variation due to sudden needs of transition to meet temperature targets

The **Current Policies** scenario represents a pessimistic case where the global temperatures rise to more than 3^0C. Under this scenario, no additional policy is implemented other than those already in place. This leads to high physical risks and medium transition risks. There is no change in the carbon price[8] and emissions reduction is the least between all three scenarios. The energy prices have been modified to reflect starting point values for Mongolia, flat energy pricing is applied (as under current national policies) with a 15% increase every 5 years to reflect increasing costs (without the impact of climate change). Parameters like inflation, interest rates, and exchange rates reflect these additional assumptions to incorporate the Mongolian context. The scenario still simulates a phase-down of coal by 2050, however, coal remains a part of the energy mix beyond 2050. Renewable energy capacity is assumed to develop gradually till the end of the century. Due to this policy environment, technological change is slow and there is low use of carbon dioxide removal technologies. All countries are assumed to not implement additional needed policies and hence the variation in policy across countries is low.

Figure 2 Emissions Pathways under scenarios

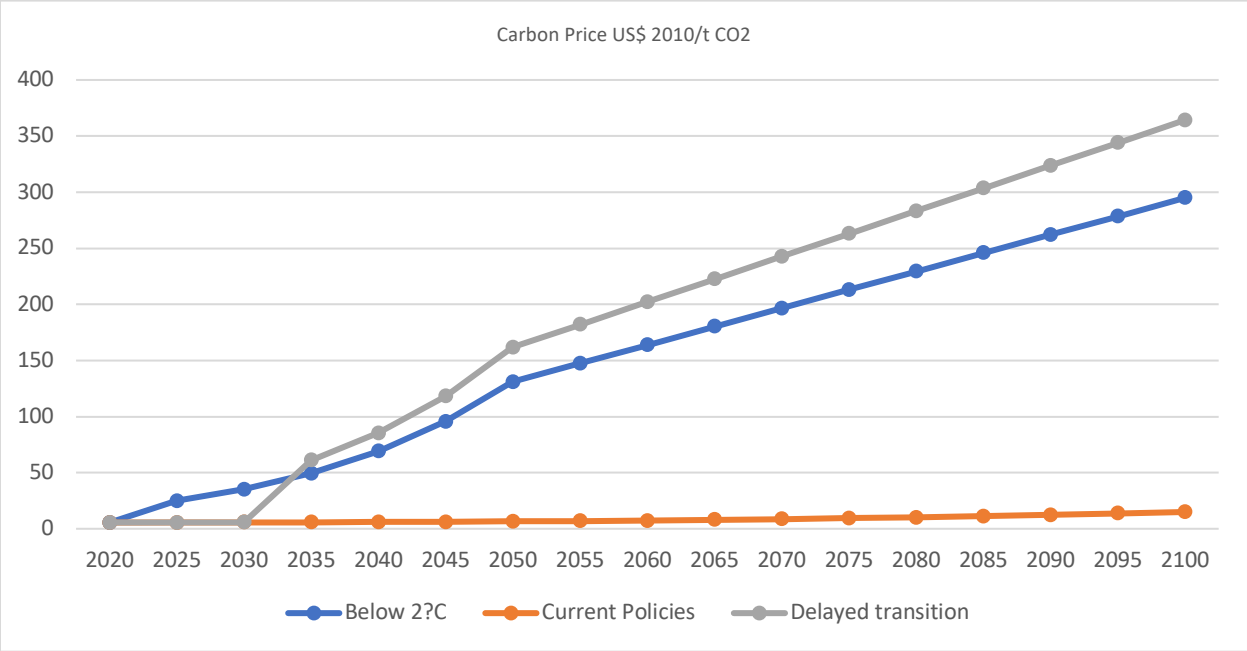


The **Below 2^0 C** Scenario is an optimistic case where there is a 67% chance to restrict global to 1.6^0 C. Under this scenario there is immediate policy action required to reduce emissions, hence this scenario entails low physical risks but medium transition risks. Carbon Price increases immediately to reflect policy action to reduce emissions and gradually increase to achieve emissions reduction by 55% (as compared to 2020) in 2050. It is additionally assumed that energy prices in Mongolia are liberalized and there is a price increase due to the combined effects of carbon prices and liberalization. The energy prices have been modified to reflect starting point values for Mongolia. However, after an initial shock from liberalization, the energy prices converge to the trend modeled by NGFS. These policies together lead to immediate and gradual phase-out of coal and faster scaling of renewable energy (+30% by 2050) owing

[8] The NGFS REMIND-MAgPIE Model downscaled for Mongolia assumes a constant carbon price of 5.54 US$ in Mongolia, this has not been changed despite the non-existence of a carbon price in the country for simplicity. Trends have been applied to starting point values from national sources (for example: prices for energy and fuel) to make the data more coherent with the national context.

to moderate level technical change and carbon dioxide removal. The variation in policies across countries is low as all countries are assumed to take similar immediate action to reduce emissions.

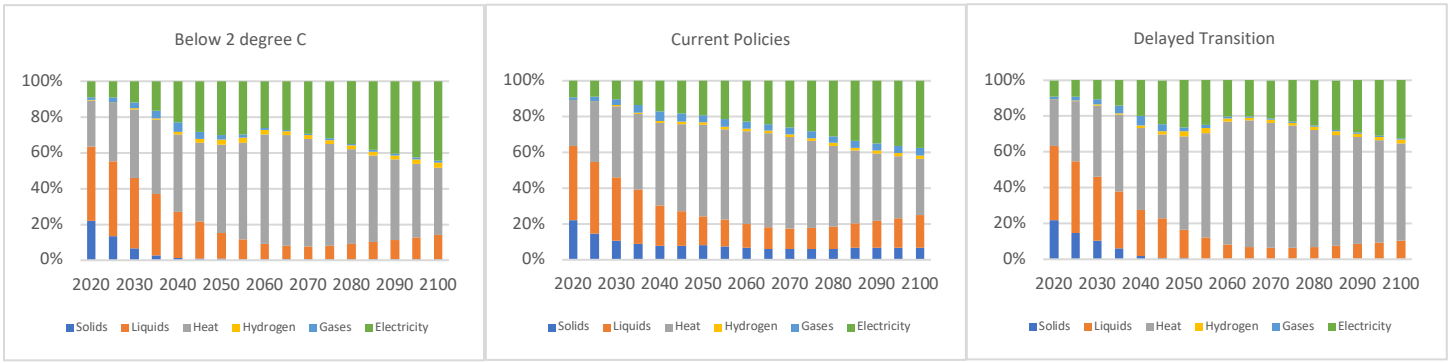
Figure 3 Carbon Price evolution under scenarios



The **Delayed Transition** scenario presents a path between the above two scenarios. Where the policies needed to reduce emissions and limit global warming to below 2^0C (1.7^0 C as per the model estimates) are not implemented until 2030. This means that the scenario follows the current policies path until 2030. However, owing to delayed action more stringent policies will be deployed at a faster rate from 2030 leading to medium physical risks and high transition risks[9]. Carbon price does not increase till 2030 and energy pricing is flat with a 15% increase every 5 years owing to higher costs. The carbon price in this scenario is the highest by 2050. The energy prices are liberalized from 2030 and hence increase steeply from 2030 and gradually converge to NGFS model trends. These policies lead to a slow phase-down of coal till 2030 and then a phase-out by 2050, renewable energy deployment is also scaled up after 2030. Technological change is slow till 2030 and then rapid afterward. There is high variation in policies across countries due to the urgency for a transition from 2030 to meet the temperature targets.

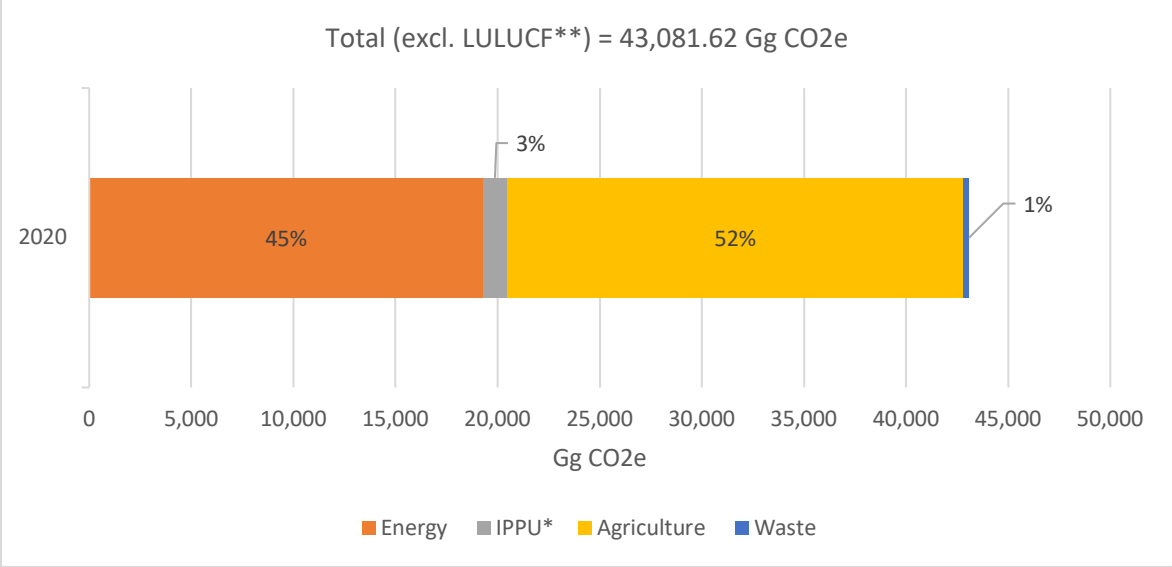
[9] Transition risks in Delayed Transition scenario are highest amongst the three chosen scenarios.

Figure 4 Final Energy Share by Source



The national emissions inventory for Mongolia from the Ministry of Environment and Climate Change (MECC) categorizes sectoral emissions under Energy, Industrial Processes and Product Use (IPPU), Agriculture, and Waste with data through 2020 (See Figure 2).[10] The inventory also provides Tier 1 key category analysis[11] which has been used to disaggregate emissions by sector at ISIC level 1[12] following the methodology developed by Sparkassenstiftung. The sectors at ISIC Level 1 along with corresponding IPCC sector codes and emissions are shown in Table 2 below. The CSA will use ISIC level 1 classification.

Figure 5 Aggregated GHG emissions and removals by sectors



[10] Mongolia's National Inventory Report-2023 Annex to Second Biennial Update Report To UNFCCC
[11] Mongolia's National Inventory Report-2023, Page 188
[12] The International Standard Industrial Classification of All Economic Activities (ISIC) consists of a coherent and consistent classification structure of economic activities based on a set of internationally agreed concepts, definitions, principles and classification rules. ISIC Revision 5 Introduction (un.org)

Table 2 ISIC Sector Level 1 to Emissions Sector Mapping

Code (level 1)	Sector (Level 1)	Corresponding IPCC Sector Code	Emissions (Gg CO2e)
ISIC-A	Agriculture, forestry, and fishing	4A, 4B, 4C, 4D, 4E (Agriculture), 5A (Land-Use Change and Forestry)	22721.07854
ISIC-B	Mining and quarrying	1B1 (Fugitive Emissions from Solid Fuels), 1B2 (Oil and Natural Gas)	1743.872921
ISIC-C	Manufacturing	1A2 (Fuel Combustion in Manufacturing Industries), 2 (Industrial Processes)	1370.6776
ISIC-D	Electricity, gas, steam and air conditioning supply	1A1 (Energy Industries)	11095.4
ISIC-E	Water supply; sewerage, waste management and remediation activities	6A (Wastewater Handling), 6B (Solid Waste Disposal)	266.1065843
ISIC-F	Construction	1A2f (Fuel Combustion in Manufacturing Industries and Construction)	74.3125
ISIC-G	Wholesale and retail trade; repair of motor vehicles and motorcycles	1A4a (Commercial/Institutional), 1A3 (Transport)	242.3567793
ISIC-H	Transportation and storage	1A3 (Transport)	4896.87
ISIC-I	Accommodation and food service activities	1A4a (Commercial/Institutional)	21.30068442
ISIC-J	Information and communication	1A4a (Commercial/Institutional)	48.20436747
ISIC-K	Financial and insurance activities	1A4a (Commercial/Institutional)	121.2006439
ISIC-L	Real estate activities	1A4a (Commercial/Institutional)	127.9902422
ISIC-M	Professional, scientific and technical activities	1A4a (Commercial/Institutional)	34.42379925

ISIC-N	Administrative and support service activities	1A4a (Commercial/Institutional)	14.34259204
ISIC-O	Public administration and defence; compulsory social security	1A4a (Commercial/Institutional)	125.9476771
ISIC-P	Education	1A4a (Commercial/Institutional)	101.1592743
ISIC-Q	Human health and social work activities	1A4a (Commercial/Institutional)	56.08478044
ISIC-R	Arts, entertainment and recreation	1A4a (Commercial/Institutional)	9.504054839
ISIC-S	Other service activities	1A4a (Commercial/Institutional)	10.77706228
ISIC-T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	1A4b (Residential)	0
ISIC-U	Activities of extraterritorial organizations and bodies	1A4a (Commercial/Institutional)	0
		Total	**43,081.62**

2. Risks Covered

The CSA will cover the following financial risks:

- Credit Risk on business and corporate loan portfolios under selected scenarios that incorporate transition risks and chronic physical risks.
- Credit Risk on business and corporate loan portfolios under the dzud and drought scenario.
- Credit Risk on mortgage loans and loans collateralized by real estate under flood scenario.
- Transition Risks for the current portfolio based on Financed Emissions.

Balance Sheet Method

The CSA follows a static balance sheet methodology where the size and composition of a bank's balance sheet will remain largely unchanged over the scenario horizon. The loans that mature within the analysis period will be replaced with similar loans in the same sector with the same maturity. The static balance

sheet will help the Bank of Mongolia and participating banks to understand the impact of climate change scenarios on the current business model and balance sheets.

3. Climate Scenario Analysis Methodology

The climate scenario analysis will follow a combination of Top-down and Bottom-up methodologies. The Bank of Mongolia will define the common set of scenarios (as outlined in the previous section) and provide necessary inputs for the estimation of risks, while the banks using these inputs will be responsible for calculating respective credit risk parameters for their portfolios.

The banks are also required to share a methodological note on the process of estimation of credit risks to ensure the quality of the process and data. This hybrid approach would support the development of capacities and foster learning within banks as well as the regulator supporting the exploratory objectives of the exercise. This will also allow the Bank of Mongolia to assess the various methodologies present and evaluate best practices.

Estimation of Credit Risks

Overview

The climate scenario analysis exercise focuses primarily on credit risks, specifically within the context of climate change. The goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters.[13] As climate impacts or the transition to a low-carbon economy intensify, borrowers in vulnerable sectors or regions may increasingly struggle to meet their financial obligations. This can lead to higher loan defaults and credit losses, thereby raising credit exposure for banks and potentially undermining their stability and resilience. Key parameters to consider include the Probability of Defaults (PD), Loss Given Default (LGD), Cure Rate, Non-Performing Loans Percentage (NPL%), and Loan-to-Value (LTV) of collaterals.

Steps to estimate Credit Risks based on NGFS scenarios.

1. Banks are required to classify all outstanding business and corporate loans as per the Level 1 ISIC sectoral classification outlined in section 2.3 Table 2 and an additional category for herder loans.
2. Banks then estimate for each Level 1 ISIC sector and herder loans, the following parameters as of December 2023:
    - Outstanding amount
    - Total earnings in Interest, fees, and commissions
    - Percentage of loan amount classified as Performing
    - Percentage of loan amount classified as Special Mention
    - Percentage of loan amount classified as non-performing
    - Probability of Default

[13] Principles for the Management of Credit Risk Basel Committee on Banking Supervision Basel September 2000 Basel Committee Publications - Principles for the Management of Credit Risk - Oct 2000 (bis.org)

- Loss Given Default
- Expected Credit Loss

3. Under static balance sheet assumptions[14] banks will calculate the credit risk parameters for each of the three selected scenarios: Current Policies, Below 2^0C, and Delayed Transition for the years 2030 and 2050. The calculations for the credit risk parameters must be based on the changes in the input parameters provided by the Bank of Mongolia for each scenario and respective year. The list of the input parameters can be found in Table 3. The following credit risk parameters must be calculated:
    - Outstanding amount
    - Percentage of loan amount classified as Performing
    - Percentage of loan amount classified as Special Mention
    - Percentage of loan amount classified as non-performing
    - Probability of Default
    - Loss Given Default
    - Expected Credit Loss

All inputs should be provided in the input format shared by the Bank of Mongolia with the participating institutions.

Table 3 List of Input Parameters for Credit Risk calculation for selected scenarios

Input Parameter	Disaggregation Level	Unit
Carbon Price	Aggregate	US$
GDP	Aggregate	Million MNT
Inflation	-	%
Unemployment Rate	Aggregate	%
Labor Productivity	Aggregate	%
Exchange Rates	-	MNT/USD
Short-term Interest Rate	-	%
Final Energy Prices	By Fuel Type and Usage	MNT/Fuel Unit
Energy Mix	By Fuel Type	%
Emissions Pathways	For key Sectors	tCO2e

Credit Risk Estimations for Physical Risk Scenarios

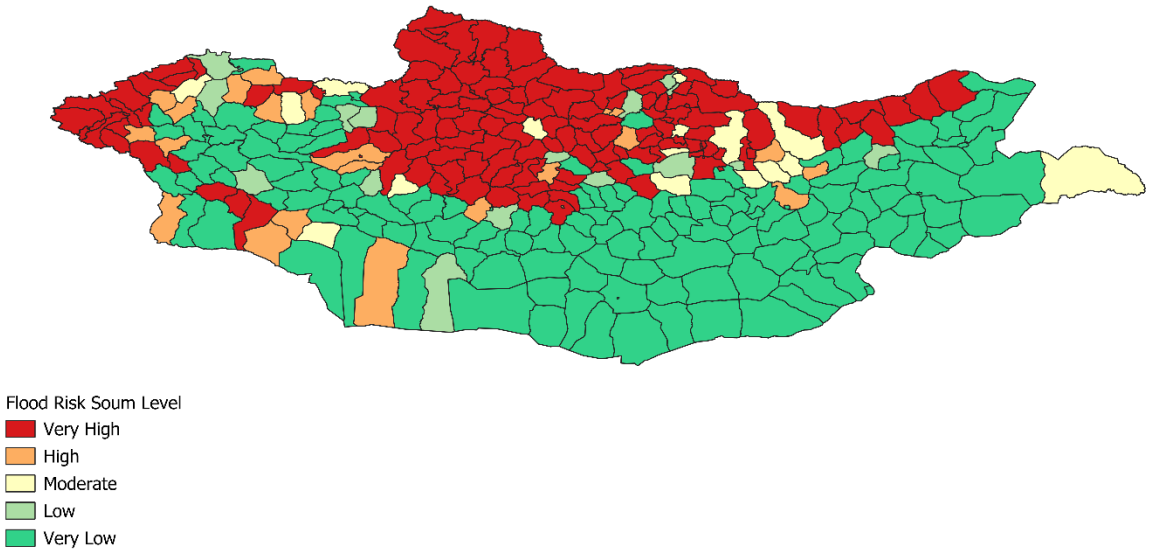
1. Credit risk Flood Scenario

The impacts of floods will increase risks to the financial sector through disruption of businesses, loss of livelihoods, and majorly due to their impact on collateral and their repricing due to increased risks.

[14] As outlined in Section 2.4, following the static balance sheet assumption banks must replace maturing loans with loans from the same sector with similar outstanding amounts and maturity.

Based on the historical data from the National Agency of Metrology and Environmental Monitoring (NAMEM) and forward-looking data from the Climate Analytics Climate Impact Explorer, soum level flood risk map classifies soums into Very High, High, Moderate, and Low-risk zones. (See Figure 3).

Figure 6 Flood Risk Map at soum level[15]



A price shock to residential and commercial properties, as outlined in Table 3, has been defined for each type of risk zone that will be used by banks. House price effects are less explored in the literature and lesser so for Mongolia. Due to unavailability of data, the starting point values were taken from the ECB[16] stress test and adapted using studies available in the literature for other countries like Malaysia, Thailand, China and USA[17]. Hence, these values are at best informed assumptions rather than actual price shocks scenarios for the analysis. The objective is to understand the mortgage exposure to flood risk and pilot the methodology of estimating credit risks.

Table 4 Real Estate Price Shock for Flood Scenario

Flood Risk of the area	Commercial Real Estate Price Shock	Residential Real Estate Price Shock
Low	0%	0%
Moderate	0%	0%
High	-3%	-5%
Very High	-9%	-12%

[15] The flood risk map is a compound risk indicator reflecting risks to populations, households, house area, dwellings, Education and Health Facilities, Gas Stations, Warehouses and Mining sites based on the study ADB, NEMA | TA-9880 MON: Strengthening Capacity on Disaster Risk Assessment, Reduction, and Transfer Instruments in Mongolia National Disaster Risk Assessment of Mongolia |September 2023.

[16] Table A, Pg. 18, 2022 climate risk stress test – Methodology, scenarios and quality assurance, ECB July 2022.

[17] Ismail et. Al 2014, Wei F, Zhao L. 2022, Sawada et al. 2018, Holtermans et al. 2024, Miller et al. 2021,

For the CSA the impact of the flood will be evaluated on the **current portfolio of mortgages and loans collateralized by real estate as of December 2023.** Based on the flood risk map, soums are classified based on the risk of flooding as very high, high, medium, and low.

1. Banks classify their loans based on the geographical location of the real estate into the risk categories and report the following parameters for each risk category as the baseline:
    - Number of collateralized loans
    - Outstanding Amount
    - Loan to Value (LTV)
    - Loan Provision Amount
    - Loss Given Default (LGD)
    - Expected Credit Loss
2. Banks are then required to apply a real estate price shock as outlined in Table 4 and recalculate the credit risk parameters.
    - Outstanding Amount
    - Loan to Value (LTV)
    - Loan Provision Amount
    - Loss Given Default (LGD)
    - Expected Credit Loss

For simplicity, banks will assume that other economic variables, such as GDP growth, the unemployment rate, and interest rates, etc. will be unaffected by the flood. Banks must provide data in the input format as shared by the Bank of Mongolia.

All inputs should be provided in the input format shared by the Bank of Mongolia with the participating institutions.

2. Credit risk Drought and Dzud Scenarios

The impacts of slow-onset disasters like drought are transmitted to various elements interconnected in the economic system. From the livelihoods of the population dependent on agriculture to the businesses that depend on agricultural products to the export performance of the economy, are all impacted by severe droughts.

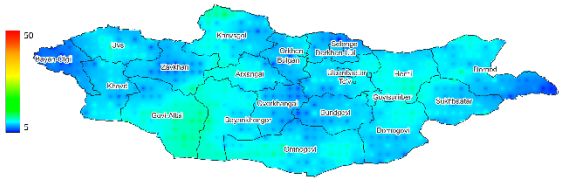
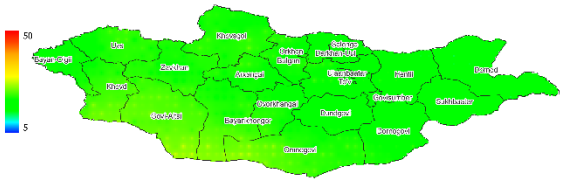
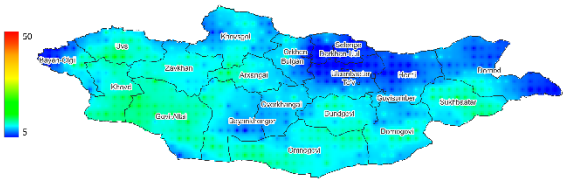
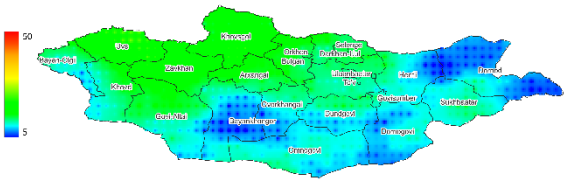
The severity of dzuds and the socio-economic impacts of dzuds cannot be understated. Dzuds have economy-wide impacts, and these are transmitted to the financial system through various channels.

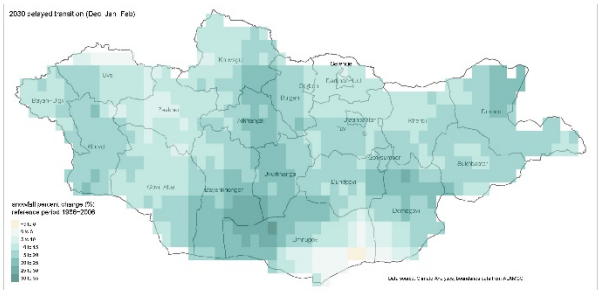
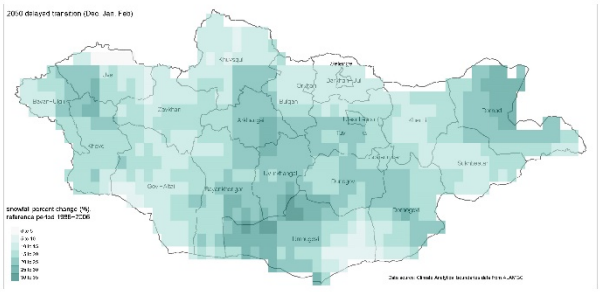
The severe scenario represents a combination effect of droughts and dzud. It is assumed that a drought occurs in the summer and is succeeded by a dzud in the winters. This scenario has been designed to subject the loan portfolios to sever stress. For instance, in the Gobi region, the average annual livestock mortality for years with a combination of drought and dzuds (18%) was 4.8% greater than in the years with dzuds alone, and 7% greater than in years with only drought.

To quantify the credit risks coming from Dzuds and drought in 2030 and 2050, the adverse case scenarios are defined for years where a combination of drought and dzud occurs. This is reasonable given the fact that frequency for both droughts and dzud increases under the adverse and even moderate climate scenarios. Using the forward-looking data from NAMEM studies that use the RCP8.5 scenarios and assumptions based on literature and historical data the scenario descriptor as outlined in Table 5 for an

adverse case of Dzud+Drought is created. (Baseline 1986-2005 until specified otherwise). The input parameters that will be shared for the “Dzud and Drought Scenario” are outlined in Table 6.

Table 5 Dzud + Drought Scenario Descriptor

Variable	2030	2050
Frequency Increase of Drought	5-15%	15-35%
Geographical Distribution of Frequency increase of Drought		
Winter-Harsh Winter Intensity Index (WI)	0.27	0.98
Dzud Intensity Index	0.84	1.81
Frequency Increase for Dzud	5-15%	5-35%
Geographical Distribution of Frequency increase of Dzud		
Increase in Winter Period Snowfall (Dec-Feb)	5-35%	10-45%

Geographical distribution of Increase in Winter Period Snowfall (Dec-Feb)		
Livestock Mortality increase from current average	50%	115%
Projected Livestock Mortality[18]	11.5 million heads	15.5 million heads

For the scenario analysis exercise the credit risks for drought and Dzuds scenarios will be evaluated on the banks' business and corporate loan portfolios plus herder loans.

1. Banks are required to classify all outstanding business and corporate loans based on the Level 1 ISIC sectoral classification and an additional category for herder loans as outlined in section 2.3 Table 2. An additional category of consumer loans classified as herder loans must also be added. Baseline values: for each Level 1 ISIC sector and herder loan category, banks are required to provide the following parameters as of December 2023:
    - Outstanding amount
    - Total earnings in Interest, fees, and commissions
    - Percentage of loan amount classified as Performing
    - Percentage of loan amount classified as Special Mention
    - Percentage of loan amount classified as non-performing
    - Probability of Default
    - Loss Given Default
    - Expected Credit Loss
2. Under the static balance sheet assumptions[19] banks then calculate the credit risk parameters for the drought and dzud scenarios for the years 2030 and 2050. The calculations for the credit risk parameters must be based on the changes in the input parameters provided by the Bank of Mongolia for the drought and dzud scenario. The list of the input parameters can be found in Table 6. The following credit risk parameters must be calculated:

[18] Estimates based on liner projections of historical mortality data proportional to increase in frequency and severity for 2030 and 2050.

[19] As outlined in Section 2.4, following the static balance sheet assumption banks must replace maturing loans with loans from the same sector with similar outstanding amounts and maturity.

- Outstanding amount
- Percentage of loan amount classified as Performing
- Percentage of loan amount classified as Special Mention
- Percentage of loan amount classified as non-performing
- Probability of Default
- Loss Given Default
- Expected Credit Loss

All inputs should be provided in the input format shared by the Bank of Mongolia with the participating institutions.

Table 6 Input Parameter list for credit risk calculation for Drought Scenario

Input Parameter	Disaggregation level	Units
GDP Loss	Aggregate	MNT Billion
GDP Loss	Sectoral	MNT Billion
GDP Loss	By Province	MNT Billion
Unemployment	Sectoral	1000 persons
Inflation Change In Exports	Aggregate Aggregate	% Million USD
Change In Imports	Aggregate	Million USD

Transition Risks as Financed Emissions

The GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard (referred to as the Scope 3 Standard)[20] defines 15 distinct reporting categories in Scope 3. For a financial institution, scope 3 category 15 emissions i.e., financed emissions are often the most significant part of its GHG emissions inventory, and special consideration must be made regarding how these are measured.

Financed emissions are defined by the following formula.

$$Financed\ Emissions = \sum_i (Attribution\ factor)_i \times Emissions_i$$

$$where\ i = counterparty$$

[Emissions represent total emissions of the counterparty (Scope 1 + 2 + 3)]

$$Attribution\ Factor = \frac{\text{Outstanding Amount}_i}{Total\ Equity + Debt_i}$$

[20] Corporate Value Chain (Scope 3) Standard | GHG Protocol

The first part of the metric (Attribution factor) shows the extent to which the bank accounts for a portion of the corporate counterparty's annual emissions. Scope 1[21], Scope 2[22] and Scope 3[23] GHG emissions provide important information for the mapping of direct and indirect emissions.

Financed emissions are a necessary input for climate scenario analysis. As such, financed emissions are a key metric for financial institutions that want to understand and manage climate-related transition risks and opportunities. As countries strive to reduce emissions and efforts increase to develop policies that support decarbonization, the price of carbon-intensive activities through carbon pricing will increase. These policies could have material impacts on the viability of certain loans and investments in carbon-intensive industries. Measuring financed emissions can help financial institutions uncover carbon-intensive hotspots in their portfolios and enable them to take the necessary actions to minimize their exposure to riskier assets and encourage them to develop climate-friendly products such as low carbon funds, green bonds, sustainability-linked bonds, green mortgages, and more.[24] Understanding a bank's financed emissions can also support its disclosure and reporting frameworks as recommended by TCFD.

Banks are required to calculate financed emissions on their corporate and business loan portfolios. Based on the methodological guidance from the Partnership for Carbon Accounting Financials (PCAF) financed emissions are calculated as per the formula mentioned above.

1. Banks classify all outstanding business and corporate loans based on the Level 1 ISIC sectoral classification outlined in section 2.3 Table 2.
2. For each sector banks calculate the following parameters:
    - Total Outstanding
    - Attribution Factor
    - Financed Emissions

In cases where counterparty-level information on financials and/or emissions is not available to the bank, banks should refer to the guidance provided in PCAF's Global GHG Accounting and Reporting Standard for the Financial Industry document Section 5.1. Table 7 summarizes the guidance.

[21] Scope 1: Direct GHG emissions that occur from sources owned or controlled by the reporting company – i.e., emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
[22] Scope 2: Indirect GHG emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company. Scope 2 emissions physically occur at the facility where the electricity, steam, heating, or cooling is generated.
[23] Scope 3: All other indirect GHG emissions (not included in Scope 2) that occur in the value chain of the reporting company. Scope 3 can be broken down into upstream emissions that occur in the supply chain (for example, from production or extraction of purchased materials) and downstream emissions that occur as a consequence of using the organization's products or services.
[24] The Global GHG Accounting & Reporting Standard for the Financial Industry, PCAF, Nov 2020

Table 7 General description of the data quality score table for business loans and unlisted equity[25]

(score 1 = highest data quality; score 5 = lowest data quality)

Data Quality	Options to estimate the financed emissions		When to use each option
Score 1	Option 1: Reported emissions	1a	Outstanding amount in the company and total company equity plus debt are known. **Verified emissions** of the company are available.
Score 2		1b	Outstanding amount in the company and total company equity plus debt are known. **Unverified emissions** calculated by the company are available.
	Option 2: Physical activity based emissions	2a	Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data for the company's energy **consumption** and emission factors specific to that primary data. Relevant process emissions are added.
Score 3		2b	Outstanding amount in the company and total company equity plus debt are known. Reported company emissions are not known. Emissions are calculated using primary physical activity data for the company's **production** and emission factors specific to that primary data.
Score 4	Option 3: Economic activity based emissions	3a	Outstanding amount in the company, total company equity plus debt, and the **company's revenue** are known. Emission factors for the sector per unit of revenue are known (e.g., tCO2e per euro of revenue earned in a sector).
Score 5		3b	Outstanding amount in the company is known. Emission factors for the sector per unit of asset (e.g., tCO2e per euro of asset in a sector) are known.

[25] PCAF Global GHG Accounting and Reporting Standard for the Financial Industry

		3c	Outstanding amount in the company is known. Emission factors for the sector per unit of revenue (e.g., tCO2e per euro of revenue earned in a sector) and asset turnover ratios for the sector are known.

Banks must report financed emissions by sector in the input format provided by the Bank of Mongolia.

4. Qualitative Assessment

The qualitative assessment has been designed to understand the current climate risk management practices in the banking sector and qualitatively assess some aspects of other risk types such as Liquidity, Operational and Legal risks. The banks must respond to the qualitative questionnaire in adequate detail providing necessary explanatory notes where requested. Relevant personnel from relevant departments must fill out the respective sections of the questionnaire.

As detailed out in Annex 1, the questionnaire consists of 7 sections. The first section covers a general overview of Banks approach to climate risk assessment and aims to understand banks current processes and systems specifically around climate risk assessment. The next two sections aim to capture information on the challenges that the bank faced while conducting this climate scenario analysis exercise. Details are requested on gaps in capacity and availability of data and methodologies, key challenges in following the process outlined in this document will be noted. This will allow Bank of Mongolia to assess the design of the exercise against the current practices and capacities and will also support the planning for needed capacity building initiatives. Section 4 aims to capture the current usage of insurance as a hedging tool.

Section 5 questions the banks on their understanding and qualitative assessment of other climate related risks like Legal, Operational and Liquidity risks. The section also aims to capture some information on Market risks which are not quantitatively covered in this first iteration of the Climate Scenario Analysis. Banks should refer to the following explanations and examples to better understand the risks and respond to the qualitative questions. The questionnaire must be filled out in the online form.

Link to the questionnaire.

Legal Risks:

Legal risks resulting from climate change encompass various types of potential legal liabilities and challenges that financial institutions might face as a consequence of climate-related impacts and actions. Legal risks especially include the non-compliance with climate related laws and regulations and cases alleging misinformation or inadequate disclosure of climate-related risks by businesses[26].

Transition risk drivers include legal challenges related but not limited to change in policies, technologies, market dynamics that could lead to regulatory changes, litigation on account of failure to meet GHG reduction targets, greenwashing, non-compliance, and impacts of shifting investor and consumer sentiments.

[26] https://www.clientearth.org/latest/news/how-can-the-law-fight-climate-change/

Physical risk drivers on the other hand involve direct consequences of climate change such as damage from dzuds, droughts, floods and long term shifts in weather patterns leading to economic and social losses. Lack of disclosures, high financed emissions, lack of mitigation efforts could lead to increased likelihoods of facing legal action.

Example:

Milieudefensie, the Dutch arm of Friends of the Earth, has actively pursued legal challenges against major corporations to enforce climate action. After their landmark victory against Shell, where a Dutch court mandated a 45% reduction in CO2 emissions by 2030 compared to 2019 levels, Milieudefensie turned its focus towards the financial sector, specifically targeting banks like ING and BNP Paribas. These lawsuits argue that the banks' financing of fossil fuel projects contributes to climate change, thereby violating environmental and human rights norms. In the case of ING, Milieudefensie is demanding that the bank aligns its policies with the Paris Agreement's target of limiting global warming to 1.5°C, which includes cutting its financed emissions by about 50% by 2030[27][28]. These legal actions are part of a broader trend of using courts to hold financial institutions accountable for their environmental impact, reflecting a growing recognition of the crucial role banks play in funding carbon-intensive industries[29].

Operational Risks:

Operational risk is defined in the Basel capital Framework as the risk of loss resulting from inadequate or failed internal processes, people, and systems or from external events[30].

Physical risk drivers include damage to property, branches, data centers and infrastructure that prevent the banks from carrying out their normal functions. Disruption to infrastructure leading to electricity outages, IT or server failures, suppliers could also lead to operational failures. In addition, there are second-order impacts coming from increased conflicting tensions imposing external and internal frauds[31].

Operational risks can also arise due to lack of needed novelle capacities for instance lack of skills around planning for climate scenarios, climate related disclosures, quantification of climate related risks, trading errors, etc. could also impact banks operations.

Example:

The impact of Typhoon Mangkhut in Hong Kong in September 2018, often referred to as the world's most expensive tropical cyclone for that year, Mangkhut caused widespread destruction across Hong Kong, including significant damage to buildings, infrastructure, and the suspension of business operations and with physical damage to bank branches and ATMs leading to temporary closures and disruptions in customer services. This event highlighted the operational risks banks face from extreme

[27] https://en.milieudefensie.nl/climate-case-ing
[28] https://www.ft.com/content/669b3d0a-11fd-41e3-b813-fb6cf4425089
[29] https://www.justiceinfo.net/en/125924-banks-new-targets-climate-action.html
[30] https://www.bis.org/bcbs/publ/d515.pd
[31] https://elseware.fr/public/blog/blog_ClimateRisk_20210909_61dc12b2b3169f5351c441e2.html

weather events, underscoring the need for enhanced risk management and investment in resilient infrastructure to withstand the impacts of climate change[32].

Liquidity Risks:

Liquidity risk is defined as the risk that the financial institution will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm.[33]

Physical risk divers can directly affect a bank's ability to raise cash or cash-equivalent assets and liquidate assets or indirectly through increased demand for liquidity after a disaster event. Disaster events such as dzuds, floods, or droughts can lead to larger than expected withdrawals leading to increased demand for liquid assets in the form of cash. Moreover, people may require additional expenses for relief, reconstruction and repair from the damage caused by the disasters. This in turn can increase liquidity pressures on the banks which could lead to the liquidation of assets on banks' balance sheet to meet the increased cash withdrawal[34].

Transition risk drivers will also affect the bankability and environmental viability of business models in certain economic sectors, such as energy and mining. Especially mining sector can be affected by climate-related regulations and policies leading to abrupt repricing if certain adaptation and mitigation measures are not implemented. In absence of an orderly transition, this leads to stranded assets which reduce the value of banks' assets and affect the banks' liquidity buffers[35]. Furthermore, increasing regulatory focus in Mongolia and more stringent regulations on portfolio assessment and disclosure of climate-related risks can increase banks' costs including the cost of obtaining necessary information and implementing risk management strategies, which can further impact their liquidity[36]

Example:

Following the Great East Japan Earthquake in March 2011, the Bank of Japan (BoJ) had to provide daily liquidity of JPY 21.8 trillion (~ USD 274 billion) to cover the increased demand from households and businesses channeled through banks. This was three times the liquidity that was offered by BoJ during the financial crisis in 2007/2008. Without the extensive support of BoJ the risk would have been burdened on the local banks[37].

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[32] https://www.sciencedirect.com/science/article/pii/S2225603220300564
[33] https://www.bis.org/publ/bcbs144.pdf
[34] https://www.sciencedirect.com/science/article/abs/pii/S0040162523001658#:~:text=The%20study%20shows%20that%20climate,definitions%20after%20adjusting%20other%20factors.
[35] https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.202011finalguideonclimate-relatedandenvironmentalrisks~58213f6564.en.pdf
[36] https://www.sciencedirect.com/science/article/abs/pii/S0040162523001658
[37] https://www.bis.org/bcbs/publ/d517.htm

By gaining a nuanced comprehension of these risks, banks can better anticipate and manage the multifaceted challenges posed by climate change. This qualitative insight will enable both banks and regulators to not only mitigate potential financial losses but also to capitalize on emerging opportunities in sustainable finance, designing holistic risk metrics and algorithms, thereby aligning their operations with long-term resilience and strategic growth in a rapidly evolving economic landscape.

The questionnaire will be shared with the participating institutions by the Bank of Mongolia in excel form.

5. Conclusion

Climate Scenario Analysis (CSA) is an evolving topic across jurisdictions. The methodology explained in this document has been designed as the first iteration of climate risk assessment in the Mongolian financial sector. The objectives of this exercise are to build the necessary capacities for integrating climate risks into risk management frameworks for banks, increase the understanding of banks' exposures arising from physical risks particular to the region, and transition risks coming from internal and external policy changes. The exercise also aims to identify gaps in required data, methodologies, and processes essential for effective climate risk assessment. While only credit risks are assessed in this first stage, market risk quantification will be added to future scenario analysis exercises. The elements scenario analysis exercise will also help banks better prepare to comply with international disclosure standards like the IFRS S2 standards which recommend use of clime scenarios and require banks to measure their financed emissions. The banks are encouraged to leverage this process to understand the impacts of climate-related risks and develop innovative approaches to improve climate risk assessment in their risk management frameworks.

The qualitative questionnaire will help banks, and the Bank of Mongolia evaluate the current state of readiness and integration of climate-related risks in banks' business and sustainability strategies. The qualitative insight will enable both banks and regulators to not only mitigate potential financial losses but also to capitalize on emerging opportunities in sustainable finance, designing holistic risk metrics and algorithms, thereby aligning their operations with long-term resilience and strategic growth in a rapidly evolving economic landscape.

The findings will help the Bank of Mongolia develop necessary interventions and capacity-building initiatives. The Bank of Mongolia aims to build upon the findings of this first climate scenario analysis to further develop and improve its risk management framework in the banking sector within the context of climate change.

Annex 1: Qualitative questionnaire

General climate Assessment Overview

1. Does your organization assess climate related risks?
    a. Yes
    b. No
2. If yes, what is the nature of the climate risk assessment framework?
    a. Qualitative (Elaborate)
    b. Climate Stress Testing
    c. Other (Elaborate)
3. Does the institution take into account climate-related factors in other processes? [multiple answers possible]
    a. Yes, for pricing
    b. Yes, for credit approval
    c. Yes, others, please specify […]
    d. No
4. What is the time horizon over which your organization plans to assess and manage climate risks?
    a. Short-Medium Term (2-5 years)
    b. Medium to Long Term (more than 5 years horizon)
    c. Neither
5. What are major long term climate risk management measures/mitigation plans that are in-place or being discussed in your organization? [Long Answer]
6. Which risk types are material for your organization? [multiple answers possible]
    a. Credit and counterparty risks
    b. Securitizations
    c. Market risk
    d. Operational risk
    e. Legal risk and associated litigation costs
    f. Liquidity risk
    g. Interest rate risk from non-trading activities
    h. Concentration risk
    i. Foreign exchange risk

j. Strategic/business model risk
k. Reputational risk
l. Other, please specify […]

7. Which portfolios do you think are most exposed to climate related risk for your organization? [multiple answers possible]
    a. Corporate loans
    b. Retail household loans
    c. Retail SME loans
    d. Government exposures
    e. Derivatives
    f. Structured Products
    g. Bonds
    h. Equity
    i. Commodities
    j. Securitizations
    k. Other, please specify […]
8. What is the main reason why the institution does not include climate risk in its stress test framework?
    a. Staffing
    b. Insufficient knowledge
    c. Data availability
    d. Bank focused in previous years on the development of the climate risk management framework; a climate risk stress test framework is the next step
    e. Lack of IT tools (financial, stress test-related)
    f. Other reason, please specify […]
9. What are the key data (climate risk related/counterparty related/portfolio related) related areas where your organization needs more information?
    a. Designing scenarios
    b. Mapping the institution's assets
    c. Other, please specify […]
10. What steps will the institution take to respond to the data availability challenges? [multiple answers possible]
    a. Staff recruitment
    b. Internal training and data enhancement activities
    c. Improve data collection from counterparties
    d. Engage with data providers
    e. Other, please specify […]
11. Which business unit within the institution will run the climate risk stress test?
    a. Risk department
    b. Dedicated stress test business unit
    c. Other, please specify […]

12. Which business unit will validate the climate risk stress test framework?
    a. Onsite compliance unit
    b. Risk department
    c. External assurance provider
    d. Other, please specify […]
13. Which other business units, in addition to the business units identified earlier will contribute to the climate risk stress test? [multiple answers possible]
    a. Research department
    b. Business centers
    c. Finance department
    d. Trading desk
    e. Another business area within the risk department
    f. Other, please specify […]
    g. No interaction with other business units

Challenges: Climate Related Data Availability

1. In terms of the availability of climate data, what information about the bank's counterparties that was pertinent to climate risk was internally available to the relevant business sectors of the organization? [multiple answers possible]
    a. Emissions data for corporate counterparties
    b. Climate strategies and targets for corporate counterparties
    c. Energy label classification for real estate
    d. Granular location data (not only location of headquarters but also of main manufacturing facilities)
    e. None
    f. Other, please specify […]
2. What data was observed directly from your counterparties (e.g. via dedicated Questionnaires or reports)? [multiple answers possible]
    a. Emissions data for corporate counterparties
    b. Climate strategies and targets for corporate counterparties
    c. Energy label classification for retail real estate
    d. None
3. Did the institution make use of any specific external data providers for the climate scenario analysis exercise?
    a. Yes, please specify names of external data providers and type of data purchased[…]
    b. No, but it is planning to do so
    c. No

Challenges Methodology:

1. What proportion of current corporate exposures is the institution able to classify based on the ISIC Level 1[38] classification?
    a. Less than 75%
    b. 75% to 80%
    c. 80% to 90%
    d. 90% to 99%
    e. More than 99%
2. What was your biggest challenge when projecting the effects of climate transition scenarios on your banks' credit risk parameters for the period 2022-2024?
    a. Correct and complete classification of existing exposures by industry/energy efficiency rating
    b. The ability of the internal stress test model to produce credit risk parameters at the required granularity (i.e. disaggregated by industrial sector/energy efficiency rating)
    c. Connecting scenario assumptions to credit risk parameters (e.g. PD, LGD)
    d. Identification of geographical location of collateral
    e. Other, please specify […]
3. What was your biggest challenge when projecting the credit risk parameters for 2030 and 2050 in the three long-term transition scenarios?
    a. Producing long-term projections under a static balance sheet assumption
    b. Connecting scenario assumptions to credit risk parameters (e.g. PD, LGD)
    c. Need to additional variables or assumptions to calculate risks
    d. Other, please specify […]
4. What was your biggest challenge when projecting the credit risk parameters for Drought and dzud scenarios?
    a. The ability of the internal stress test model to produce credit risk parameters at the required granularity (i.e. disaggregated by industrial sector/energy efficiency rating)
    b. Connecting scenario assumptions to credit risk parameters (e.g. PD, LGD)
    c. Need to additional variables or assumptions to calculate risks
    d. Other, please specify […]

5. What was your biggest challenge when projecting the credit risk parameters for flood scenarios?
    a. The ability of the internal stress test model to produce credit risk parameters at the required granularity (i.e. disaggregated by industrial sector/energy efficiency rating)
    b. Connecting scenario assumptions to credit risk parameters (e.g. PD, LGD)
    c. Need to additional variables or assumptions to calculate risks
    d. Identification of geographical location of collateral.
    e. Application of the price shock to collateral

[38] The International Standard Industrial Classification of All Economic Activities (ISIC) consists of a coherent and consistent classification structure of economic activities based on a set of internationally agreed concepts, definitions, principles and classification rules. ISIC Revision 5 Introduction (un.org)

    f. Other, please specify […]
6. For what proportion of the exposures in scope did the institution need to use the address of the lender instead of the address of the collateral to match the location?
    a. 0%
    b. 0% to 5%
    c. 5% to 10%
    d. More than 10%
7. Please explain how the scenario data provided for the different scenarios used for the estimation of credit risk parameters, which variables were used with your model, which variables were not used, and were there any additional assumptions made? [Long answer]

Additional details on scenario analysis, the role of insurance:

1. Does the institution incorporate private or public insurance coverage for corporate loans?
    a. Yes
    b. No
2. If Yes, what fraction of the counterparties' exposures in the corporate loan portfolio is covered by private or public insurance? Please answer on a best effort basis.
    a. 0-5%
    b. 5-10%
    c. 10-15%
    d. 15-25%
    e. 25-50%
    f. 50-75%
    g. >75%
3. Does the institution incorporate private or public insurance coverage for herder loans?
    a. Yes
    b. No
4. If Yes, what fraction of the counterparties' exposures in the herders loan portfolio is covered by private or public insurance? Please answer on a best effort basis.
    a. <25%
    b. 25-50%
    c. 50-75%
    d. >75%
5. Does the institution incorporate private or public insurance coverage for mortgages and/or loans collateralized real estate?
    a. Yes
    b. No
6. If Yes, what fraction of the counterparties' exposures in the portfolio of mortgages and/or loans collateralized real estate is covered by private or public insurance? Please answer on a best effort basis.

a. <25%
b. 25-50%
c. 50-75%
d. >75%

Qualitative Assessment of other Climate Related Financial Risks

1. Has your institution evaluated the potential legal risks arising from financing fossil fuel intensive sectors?
    a. Yes
    b. No
2. If yes, please explain how.
3. Which of the following would you rate as the highest potential source of legal risk for your organization? [5 highest - 1 Lowest]
    a. Greenwashing
    b. Breach of Duties
    c. Financing
    d. Non-compliance with national regulations
    e. Non-compliance with international regulations
    f. Other [Please specify]
4. Does your institution have any risk mitigation plan in place to hedge against potential legal risks?
    a. Yes
    b. No
5. If yes, please explain how.
6. Based on the explanation and examples provided, are there any potential legal risks that could arise in the future for your institution, please explain why? [Long Answer]
7. Has your institution evaluated the potential operational risks arising from adverse effects of climate change?
    a. Yes
    b. No
8. If yes, please explain how.
9. Based on the explanation and examples provided, are there any potential operational risks that could arise in the future for your institution, please explain why? [Long Answer]
10. How does your bank assess the vulnerability of physical infrastructure (e.g., buildings, data centers, and external payment systems) to climate-related physical risks like natural disasters? [Long Answer]
11. What steps have been taken to strengthen operational resilience in the event of regional disasters or supply chain failures due to climate impacts? Are there contingency plans for relocation or redundancy? [Long Answer]

12. How do you evaluate the reliability of your suppliers in regions susceptible to climate-related physical and transition risks? What processes are in place to mitigate disruptions from supplier failure? [Long Answer]
13. How does your institution account for potential climate-related impacts on trading algorithms or other automated systems that might react to market volatility due to climate factors?
14. Has your institution evaluated the potential liquidity risks arising from adverse effects of climate change?
    a. Yes
    b. No
15. If yes, please explain how.
16. Based on the explanation and examples provided, are there any potential liquidity risks that could arise in the future for your institution, please explain why? [Long Answer]
17. What measures can you take to mitigate potential liquidity risks? [Long Answer]
18. What percentage of your organization's asset portfolio can be classified as within fossil fuel intensive sectors? (Agriculture, Mining, Energy)
    a. 0-10%
    b. 10-20%
    c. 20-30%
    d. 30-40%
    e. 40-50%
    f. More than 50%
19. Does your organization use a model to analyze possible asset revaluation due to climate change related risks?
    a. Yes
    b. No
20. If yes, please elaborate.
21. How does your organization plan to manage market risks arising from climate change related risks? [Long answer]

Future plans regarding climate risk stress testing and interaction with other priorities

1. What steps will the institution take to enhance its climate risk assessment framework? [multiple answers possible]
    a. Staff recruitment
    b. Improve data collection from counterparties
    c. Engage with data providers
    d. Other, please specify […]
2. Have climate-related regulatory developments outside Mongolia promoted or influenced the development of a climate risk assessment framework in the institution?
    a. Yes, please specify jurisdiction
    b. No

Using Results of Climate Stress Testing

2. Does the institution disclose or intend to disclose any results of the climate risk stress test under Pillar-III?
    a. Yes
    b. No
3. Apart from internal reporting, to whom are the results of climate risk stress tests would be reported/published ?
    a. Publicly, within any report
    b. Stakeholders
    c. Credit analysts
    d. Credit investors
    e. Rating agencies
    f. No public reporting
    g. Other, please specify […]
4. Do you plan to consider the results of climate risk stress test framework considered when implementing the institution's business strategy?
    a. Yes, included in the decision-making process on pricing, granting loans or investing in certain business areas
    b. Yes, included in the risk limits or metrics (e.g. value at risk (VaR), exposure at default and expected loss) specified for business areas
    c. Yes, other please specify […]
    d. No
5. Do you plan to include the results of the climate risk stress test framework included in the loan granting process of the institution?
    a. Yes, Applied to lending in certain sectors
    b. Yes, Applied to lending to certain clients
    c. Yes, Applied to holdings of bonds and/or equity
    d. Yes, Other, please specify […]
    e. No
6. Which mitigating actions does the institution include/could include based on the findings of the climate risk assessment? [multiple answers possible]
    a) Hedging of positions with financial derivatives
    b) Insurance policies covering immovable property
    c) Insurance policies covering losses stemming from physical risk
    d) Insurance policies covering losses stemming from transition risk
    e) National schemes
    f) Other, please specify […]
    g) None

Annex 2: Technical Note

Steps to estimate Credit Risks based on NGFS scenarios.

1. **Banks are required to classify all outstanding business and corporate loans as per the Level 1 ISIC sectoral classification outlined in section 2.3 Table 2 and an additional category for herder loans.**

- Banks must only classify all business and corporate loans (including SMEs). Consumer loans are out of scope for exercise. Only herder loans (a subcategory of consumer loans) should be included in classification.
- To further manage the scope of the exercise, the banks can limit their classification by merging sectors as "Others" for all the ISIC Level 1 sectors which represent less than 5% of their portfolio. However, key transition risk sectors must be classified, and credit risks must be calculated for them. Banks can refer to Table 8 below for reference.

Table 8 Amended classification of Business loans

Code (level 1)	Sector (Level 1)	Classification
ISIC-A	Agriculture, forestry, and fishing	Key Sector
ISIC-B	Mining and quarrying	Key Sector
ISIC-C	Manufacturing	Key Sector
ISIC-D	Electricity, gas, steam and air conditioning supply	Key Sector
ISIC-E	Water supply; sewerage, waste management and remediation activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-F	Construction	Key Sector
ISIC-G	Wholesale and retail trade; repair of motor vehicles and motorcycles	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-H	Transportation and storage	Key Sector
ISIC-I	Accommodation and food service activities	Use the average coefficient of the total loan portfolio outstanding if the

		sector represents less than 5% of the portfolio.
ISIC-J	Information and communication	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-K	Financial and insurance activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-L	Real estate activities	Key Sector
ISIC-M	Professional, scientific and technical activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-N	Administrative and support service activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-O	Public administration and defence; compulsory social security	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-P	Education	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-Q	Human health and social work activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-R	Arts, entertainment and recreation	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-S	Other service activities	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.
ISIC-T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.

ISIC-U	Activities of extraterritorial organizations and bodies	Use the average coefficient of the total loan portfolio outstanding if the sector represents less than 5% of the portfolio.

Using scenario data for estimation of credit risks.

- Due to limited historical data for credit risk estimations, banks might find that certain variables provided under the scenarios (Table 3) are statistically insignificant. For instance, Mongolian energy prices are flat, hence under current models are not significant for credit risk estimation. However, the energy prices under the price liberalization scenarios will increase and hence it is important that banks develop the scenario analysis processes and models to incorporate such variables. This would support future risk management processes in banks.

Estimation of Credit Risks for Flood Scenario

- Under the flood scenario banks must only classify all mortgage loans and loans that are collateralized by real estate.
- The flood scenario is front loaded, which implies that:
    a) It is assumed under the exercise that a flood will happen, and the current portfolio will be impacted.
    b) Impacts are calculated on the current portfolio only (no future projections)
    c) Price shock must be applied to the current prices of real estate for estimation of credit risk variables.

Estimation of Financed Emissions

- Bank must estimate their financed emissions by ISIC Level 1 sector on their current portfolio only. No future projections (2030 or 2050) are required for this part of the Climate Scenario Analysis Exercise.
- Banks are encouraged to use the financed emissions tool developed by the MSFA and the German Savings Bank Foundation.
- Banks using the template from MSFA and the German Savings Bank Foundation need not fill the same data in the Bank of Mongolia template.
- For banks that are not using the MSFA and the German Savings Bank Foundation template, column C has been removed and they only need to report the outstanding by ISIC Level 1 category and corresponding financed emissions.