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BANK FOR INTERNATIONAL SETTLEMENTS

# Climate Risks in Banking – Risk Drivers

## Introduction

The effects of climate change are becoming increasingly apparent. The global mean temperature of the earth was 1.1° Celsius higher in the past decade than it was between 1850 and 1900. Moreover, this global mean masks considerable variations across regions.

The resulting climate changes will have profound effects on our societies, economies and everyday lives. The financial sector is already feeling the force of these changes. For most banks, however, the impacts of these climate changes are not yet material, but they may become so faster than expected as estimates regarding these changes are regularly revised upwards.

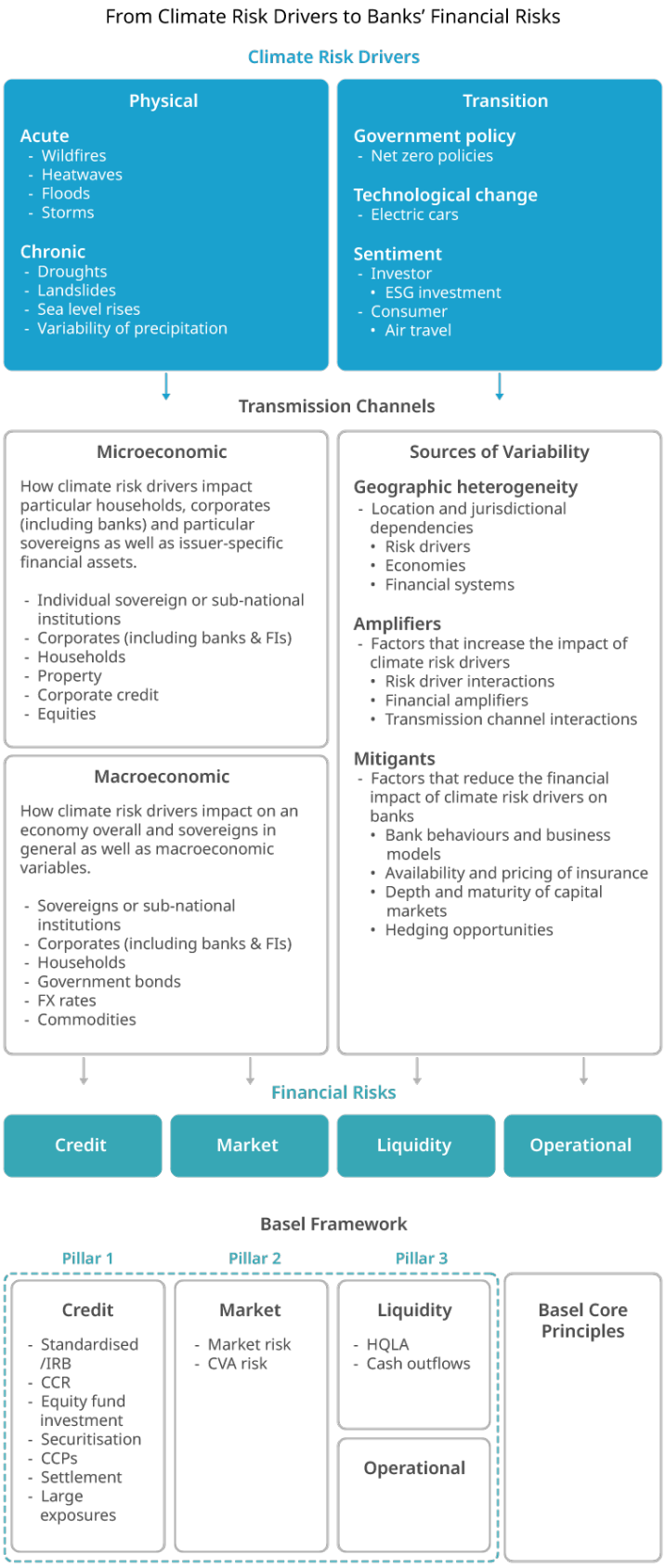
There are multiple climate-related risk drivers that are increasingly likely to translate into significant financial risks for banks. Identifying and understanding these risk drivers and assessing how they can affect bank exposures and their income are crucial if such drivers are to be managed.

To encourage banks to expand their risk management efforts, the Basel Committee on Banking Supervision has published a report analysing these climate-related risk drivers and their transmission channels. It explores how climate changes pose financial risks to banks and why the related risk drivers make it difficult to quantify potential losses.

This Basel Committee report forms the basis of this suite of tutorials.

# Climate Risk Drivers and Banks' Financial Risks

Climates are changing due to global warming. Weather conditions are becoming more extreme and less predictable, and such changes may generate losses for banks. Conversely, efforts to curb climate change may also expose banks to losses as investments in carbon-intensive sectors may lose value. Look at the diagram on the next page to see how climate change transmits to financial risks for banks.




Source: Figure 1 – Financial risks from climate risk drivers in Climate-related risk drivers and their transmission channels (BCBS, 2021)

**Climate Risk Drivers**

Climate risk drivers are climate-related changes that could give rise to financial risks. Such drivers are covered in this tutorial.

**Transmission Channels**

Transmission channels are the causal chains that explain how climate risk drivers impact banks.

**Sources of Variability**

Sources of variability are factors that may amplify, reduce or offset the likelihood and/or the size of impacts and losses.

**Financial Risks**

Financial risks are traditional risk categories through which climate risk drivers ultimately manifest.

**Basel Framework**

The Basel Framework encompasses international banking standards and guidance for managing financial risks, including those that originate from climate change.

# Evolution of Climate Risks

According to climate scientists, the global mean temperature of the earth has become 1.1° Celsius (C) higher over the last 10 years (2011-2020) than it was between 1850 and 1900. In fact, many land regions experienced warming that exceeded this global average. Climate science suggests that the unprecedented increase in greenhouse gas (GHG) emissions from human activities is the main cause of global warming.

Risks arising from changes in weather and climate are termed physical risks. Their impacts on the economy and on living conditions will increase in the near future. Because of these impacts, there is a growing need to reduce annual emissions over the next few decades. This can only be achieved by transitioning to lower-carbon economies.

While this transition reduces GHG emissions, it also exposes economies to disruptions, especially if the shifts take place abruptly. It is these shifts and their associated risks that are covered under the term transition risks.

In the following pages, we will review the key drivers of physical and transition risks.

# Physical Risks – Acute and Chronic

Physical risks arise from the economic costs and financial losses caused by climate changes. These risks can be categorised as either acute or chronic, both of which are increasing in severity and frequency. Indirect drivers of physical risks, such as desertification, are also on the rise.

Let's take a closer look at acute and chronic physical risks, along with some interacting and additional factors.

## Acute Physical Risks

Acute physical risks (also known as physical risk hazards) are associated with natural disasters and extreme weather events, with the latter including:

- meteorological events, such as tropical storms, hurricanes and typhoons
- hydrological events, such as extreme precipitation and floods
- climatological events, such as extreme temperatures (for instance, heatwaves*), droughts and wildfires

* According to the World Meteorological Organisation, heatwaves are periods of five days or more where temperatures exceed 35°C. When accompanied by humidity that surpasses 95% (wet bulb conditions), such heatwaves can become lethal for human beings.

## Chronic Physical Risks

A distinguishing feature of chronic physical risks is their extended periods. They refer to recurrent climate events that are becoming harder to predict as weather patterns change gradually. They include rising sea levels, ocean acidification and rising average temperatures. The latter may lead to soil degradation, reduced water availability, reduced crop yields or chronic crop failures and desertification.

## Interacting and Additional Factors

Acute and chronic risk drivers can reinforce each other. Their effects can also be aggravated by human actions. For instance, gradual increases in temperatures may lead to prolonged heatwaves. These are more lethal in countries where a higher proportion of the population is elderly.

Heatwaves increasingly cause wildfires, reduce crop yields and water availability and can force more migration, both within national borders and internationally. Seasonal, temporary or permanent migrations are already taking place in Africa, Asia and Latin America as a result of rainfall variability and food insecurity.

# Transition Risks – Changes in Policies

Transition risks refer to the risks related to the process of adjustment towards a low-carbon economy. According to Our World in Data, 84% of global energy came from fossil fuels in 2019. To meet the Paris Agreement targets (see resource), this should be reduced to around 50% by 2050, with renewable energies making up most of the rest.

Meeting these targets requires changes in public sector policies covering legal or regulatory measures to curb GHG emissions. The purpose is to reach net-zero emissions by a target date (generally 2050) with little or no disruption to the economy. Such measures can take the form of providing incentives or disincentives or instituting prohibitions.

**Incentives**

Measures providing incentives include energy transition policies (for example, tax rebates on solar panels) or subsidies encouraging improved insulation of housing or favouring the expansion of renewable energies, such as wind and solar.

**Disincentives**

Measures providing disincentives include carbon taxes, which set a direct price on carbon by defining either a tax rate on GHG emissions or on the carbon content of fuels, or emissions trading systems (ETSs) that enable industries with low emissions to sell their extra allowances to large emitters. By creating supply and demand for these allowances, an ETS provides a market price for GHG emissions.

**Prohibitions**

Prohibition measures include the United Kingdom's decision in 2020 to ban sales of new diesel or petrol cars and vans after 2030 and a proposal made in July 2021 by the European Commission to do the same across the European Union by 2035.

### Renewable Energies

Renewable energies – as opposed to fossil and mineral fuels – come from natural sources or processes that are constantly renewed. They include hydropower, geothermal power, solar power, wind power and biomass sources, such as organic waste from plants or animals.

### Net-zero Emissions

The net-zero emission target or 'net zero' refers to the goal of not releasing additional carbon dioxide into the atmosphere by a specified date. It is reached when GHG emissions from human activities have been reduced or offset as close as possible to zero.

**Do You Know? - Paris Agreement Targets**

The Paris Agreement is a legally binding international treaty on climate change that was reached in December 2015 and addresses the threat of climate change by pledging to limit the global temperature rise this century to well below 2°C above pre-industrial levels and to pursue efforts to limit the global temperature increase to 1.5°C. The agreement requires all parties to put forward their best efforts through 'nationally determined contributions'.

**Do You Know? - Our World in Data**

Our World in Data is a project of the Global Change Data Lab, a non-profit organisation and charity whose purpose is to advance education through the production and maintenance of online resources on how living conditions and the Earth's environment are changing.

# Transition Risks – Technological Changes

Technological changes play a major role in helping achieve orderly transitions. They need to take place on a large scale if the desired GHG reductions are to be achieved without disrupting economies.

New technologies can support transition strategies by:

- reducing the demand for energy and making its usage more efficient so that less fossil fuel is required. Examples include better insulation for buildings or the increasing use of electrical cars
- replacing high carbon fossil fuels (coal and oil) with zero- or lower-carbon alternatives, such as renewable energy sources but also nuclear energy and natural gas
- removing carbon through carbon removal technologies that either directly remove carbon from the atmosphere or increase the carbon captured through forests, soils and oceans

Many technologies that enable transitions do not yet exist or are not yet financially viable. One example is that of hydrogen fuel, which may replace kerosene. Hydrogen fuel has been known for over a century but still needs to be adapted to aircrafts and to become more cost effective.

Moreover, technological changes may be slower than anticipated, and may compromise transition plans that rely too much on them.

### Carbon Removal Technologies

Carbon removal technologies include natural strategies, like tree restoration and agricultural soil management; high-tech strategies, such as direct air capture and enhanced mineralisation; and hybrid strategies, such as enhanced root crops, ocean-based carbon removal and bioenergy with carbon capture, usage and storage. Many of these technologies are still under development or are experimental.

# Transition Risks – Changes in Market Sentiment

Investors' awareness of climate change is increasing as they integrate climate risk assessments in their investment decisions. While this shift is partly taking place under the growing pressure of environmental groups, it is also the result of policy actions. One of the main transition risks is that certain assets, especially those producing fossil fuels, become stranded assets as they lose their value and fail to generate sufficient income.

A related risk is that renewable assets become overvalued as strong demand for them outpaces supply, leading to asset price bubbles. The effects can combine and amplify through large-scale divestment from carbon-related assets and massive reinvestment in renewable assets.

### Stranded Assets

According to the BCBS's definition, these are assets that, at some time prior to the end of their economic life, are no longer able to earn an economic return as a result of changes associated with the transition to a low-carbon economy.

### Asset Price Bubbles

An asset price bubble occurs when a limited amount of assets becomes increasingly sought after by investors, resulting in soaring valuations that are no longer justified by fundamentals. Asset price bubbles are characterised by cheap and abundant liquidity, real assets and actual innovations.

# Transition Risks – Changes in Customer and Public Sentiment

Shifts in customer and public sentiment can increase reputational risk, financial costs and litigation risks against corporates, sovereigns and financial firms. Banks that fund fossil-fuel-dependent corporates or insurance firms that insure them are exposed to liability risks.

These arise through lawsuits filed by people or businesses seeking compensation for losses suffered because of actions such as continued investment in carbon-intensive sectors or failures to act, for example, the failure to push for a reduction in the carbon footprints in funded or insured entities. The number of climate change lawsuits filed around the world tripled between 2017 and 2020.

These play an increasing role in compelling governments, corporates and financial institutions to commit to more ambitious emission reduction goals.

# Climate Risks and Uncertainty

The climate risk drivers explained so far have features that make their evolution highly uncertain and their impacts difficult to quantify. While transition risks are unprecedented on such a scale, physical risk events are not new. However, they are becoming more frequent and more severe at unprecedented speed of change. As a consequence, historical data becomes less useful to predict future climate changes.

Moreover, in its fifth assessment report on climate change, the Intergovernmental Panel on Climate Change (IPCC) defined an abrupt climate change as "a large-scale change in the climate system that takes place over a few decades, persists (or is anticipated to persist) for at least a few decades, and causes substantial disruptions in human and natural systems."

According to Carbon Brief, a UK-based website covering the latest developments in climate science and policies, there are nine components of Earth's climate system related to ice sheet melting, wind and ocean current circulation changes or changes in vegetation (biome shifts) that have tipping points (or critical thresholds) beyond which abrupt, nonlinear and mostly irreversible climate changes could happen. In other words, we could reach a point whereby a small change will cause irreversible changes in climate systems.

**Reference - Tipping Points, Implications and Uncertainty**
To learn more about the tipping points, their implications and climate risk uncertainty, select here to access Carbon Brief's explainer on these issues.

# Concentrated Exposures

Geographical and sectoral concentrations play an important role when assessing the impacts of climate changes on bank exposures.

**Geographical Concentrations**

While climate change is taking place around the world, the impacts of physical and transition risks may be 'localised' and specific to certain areas. An example of physical risk concentration is that of housing located in flood-prone areas, whether along riverbanks or in a coastal region. Another example of such concentrations are areas where economic agents share the same energy supplier or are supplied by the same power generation plant.

**Sectoral Concentrations**

The impacts of climate risk drivers vary significantly across regions and jurisdictions because of differences in the sectoral composition of their respective economies. For instance, some economies rely more heavily on labour-intensive industries and/or outdoor activities, such as tourism, agriculture or construction. These countries or regions are likely to face larger adverse effects when confronted with recurrent heatwaves, rising temperatures and periods of drought.

Transition risk drivers will also have outsized impacts on carbon-intensive sectors in countries or regions that are heavily reliant on the production and use of fossil fuels (coal, oil and natural gas). In addition, iron and steel making technologies currently depend heavily on coke, which is derived from coal. Accordingly, and unless alternative technologies are put in place, the transition away from coal production could have significant impacts on iron and steel production.

## Review Question

**Which of the following sectors are particularly vulnerable to an increase in average global temperature?**

- Construction (Yes/No)
- Aircraft manufacturing (Yes/No)
- Agriculture (Yes/No)
- Outdoor entertainment (Yes/No)
- Car manufacturing (Yes/No)

Activities such as agriculture, construction or outdoor entertainment are likely to face larger adverse effects when confronted with rising average temperatures. However, car and aircraft manufacturing would be more vulnerable to transition risks because of their reliance on fossil fuels.