



# INFORMATION PAPER

## Climate Vulnerability Assessment

3 SEPTEMBER 2021

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# Glossary

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<b>ABA</b>	Australian Banking Association
<b>ADI</b>	Authorised Deposit-taking Institution
<b>APRA</b>	Australian Prudential Regulation Authority
<b>CFR</b>	Council of Financial Regulators (comprising APRA, the Reserve Bank of Australia, the Australian Securities & Investments Commission and The Treasury)
<b>Climate risk</b>	Financial risks arising from climate change, including physical (both acute risks associated with extreme weather events; and chronic risks associated with gradual shifts in climate), transition and liability risks
<b>CPS 229</b>	Prudential Practice Guide CPS 229 Climate Change Financial Risks
<b>CVA</b>	Climate Vulnerability Assessment
<b>GDP</b>	Gross Domestic Product
<b>GVA</b>	Gross Value Added
<b>NGFS</b>	Network for Greening the Financial System
<b>Paris Agreement</b>	Legally binding international agreement within the United Nations Framework Convention on Climate Change adopted by approximately 195 other countries representing a global political consensus to limit global warming to well below 2°C above pre-industrial temperatures
<b>Stress test</b>	Stress tests provide forward looking analysis and insight on the resilience of entities, industries and the financial system to current and emerging risks

# Executive summary

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Climate change poses challenges to the stability and resilience of the financial system, including physical climate risks arising from changing climate conditions and extreme weather events, transition climate risks associated with economic and technology change and social adaptation, and for climate-related liability risks. Globally, central banks and supervisors are responding to these challenges, taking steps to understand and assess the financial risks of climate change, and integrating climate risk consideration into their existing financial stability and prudential supervisory activities.

The Australian Prudential Regulation Authority (APRA) is tasked to ensure the financial safety of individual financial institutions and promote the stability of the Australian financial system. In particular, APRA is responsible for ensuring that, under all reasonable circumstances, the financial promises made by APRA-supervised institutions are met within a stable, efficient and competitive financial system. Given the potentially material and systemic nature of climate-related financial risk, APRA has been giving greater attention to the financial risks of climate change as part of its broader supervisory activities.

In April 2021 APRA released draft guidance for banks, insurers and superannuation trustees on managing the financial risks of climate change.<sup>1</sup> An aspect of this guidance was the value of using scenario analysis to underpin the quantitative analysis of the potential impacts of different future climate scenarios on the performance of financial entities in Australia. The Climate Vulnerability Assessment (CVA), a Council of Financial Regulators (CFR) initiative led by APRA, has adopted this scenario analysis approach to assess the nature and extent of the financial risks that large banks in Australia may face due to climate change.

This information paper provides an overview of the CVA, as well as international activities relating to climate scenario analysis and stress testing, including:

1. **Objectives of the CVA:** the three key objectives of the CVA are to assess potential financial exposure to climate risk; to understand how banks may adjust business models and implement management actions in response to different scenarios; and to foster improvement in climate risk management capabilities.
2. **Key design features:** the key design features of the CVA are outlined in this report, including the types of climate risks considered, scope (geographic and financial exposures) of the assessment, climate scenarios, and the timeframe for the assessment.

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<sup>1</sup> CPG 229 was open for consultation from 22 April 2021 to 31 July 2021. The draft guidance will be reviewed in light of stakeholder feedback, and issued as final guidance before the end of 2021.

3. **International comparisons:** recent examples of similar activities undertaken by international supervisors are summarised in this information paper.
4. **Next steps:** outline of the priorities for completing the CVA, as well as communication of the results and engagement with international peers.

Climate risks have the potential to cause immediate financial risks to both financial and non-financial entities: as a result, a system-wide approach is best placed to address the potential impacts associated with this risk. Achieving the objectives of the CVA will strengthen the understanding and management of climate risk in the banking sector: however, the design approach taken for the CVA is also more widely applicable, including for the superannuation and insurance sectors, and may be of use to other non-financial enterprises in Australia.

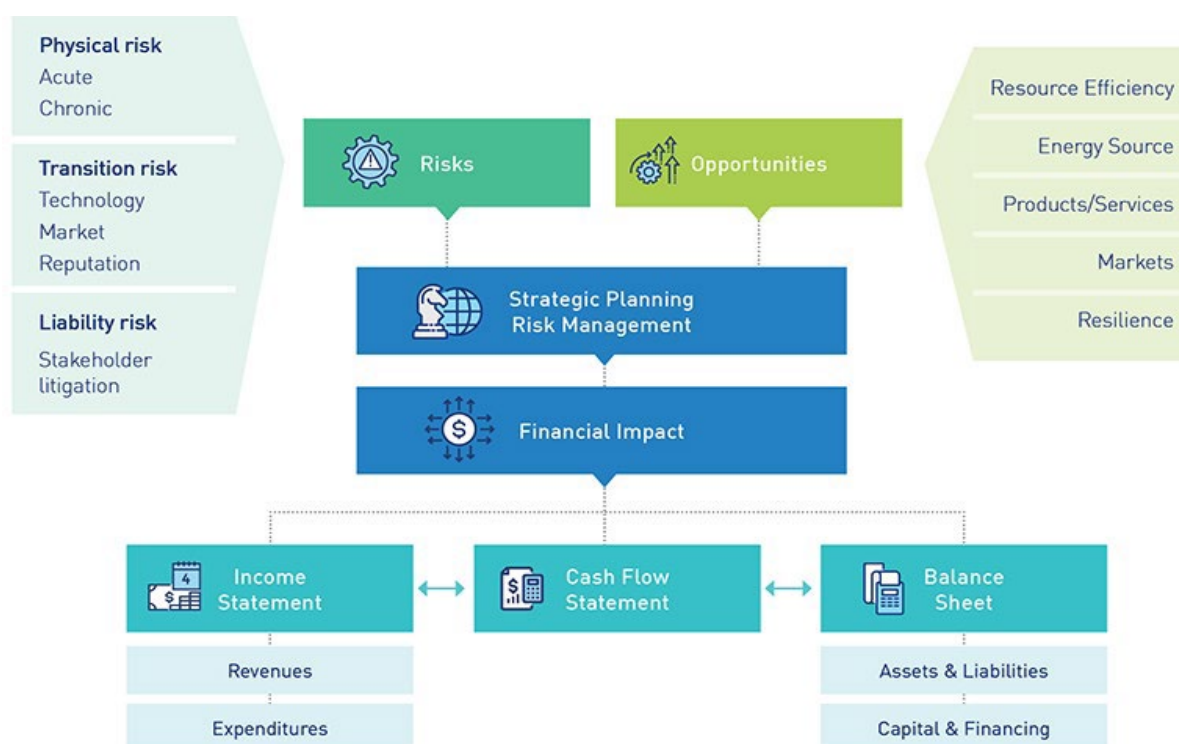
# Chapter 1 - Assessing climate risk

## Climate change as a financial risk

Climate change poses significant challenges for the global and Australian economy, and hence for the financial sector. The impact of climate change has the potential to drive material and widespread changes to industries, markets and communities. These changes inevitably lead to increasing risks, as well as opening up new opportunities, for the economy, for financial and non-financial institutions, and for society more broadly.

Organisations within the financial system need to consider where, how and to what extent the financial risks associated with climate change will impact their business. They will also need to consider how they will respond to the impacts of physical climate events, an economic transition to a lower emissions economy, and the potential liability risks that may arise from climate risk (Figure 1).

**Figure 1. Climate risks, opportunities and financial impact**



<sup>2</sup> Adapted from Financial Stability Board Task Force on Climate-related Financial Disclosures, Final Report: Recommendations of the task force on climate-related financial disclosures (June 2017)

The risks associated with a changing climate also extend across many, if not all, sectors of the economy. Each sector will face its own challenges in understanding, assessing and managing the most material climate-related risks. For firms in the finance sector, it will become necessary to understand not only their own businesses exposure to climate-related risks, but also to assess the potential financial risks of climate change of their customers and counterparties across a wide range of sectors, to build a comprehensive understanding of their climate risk exposure.

Internationally, regulators and supervisors are increasingly focused on ensuring that climate-related risks and opportunities associated are recognised within the finance system, and that decisions are made with the benefit of this knowledge. While the scope of APRA's draft climate change financial risk guidance relates to all APRA-regulated sectors, the CVA is specifically focused on the banking sector. More broadly, initiatives undertaken by other CFR agencies relating to climate risk may be relevant for, or transferable to, other sectors in the economy.

## **Climate risk and APRA's supervisory activities**

Ensuring sound risk management and well-informed decisions is the driver of APRA's actions to increase industry understanding of, and resilience to, climate-related risks. Mitigation of these risks aligns to APRA's objective of ensuring the financial safety of institutions and the stability of the Australian financial system. Delivering this outcome requires a considered and timely approach to climate-related risks, both from industry and from the CFR agencies.

Alongside APRA's work to support industry understanding of climate risk, there are a number of global actions and initiatives that have focused attention on the financial risks of climate change. These include:

- the Paris Agreement, an international treaty with the goal of limiting global warming to well below 2 degrees Celsius compared to pre-industrial levels, driving significant government policy changes around the globe;
- the recommendations of the Taskforce on Climate-related Financial Disclosures (TCFD), which were developed to promote more informed investment, lending and underwriting decisions in response to climate change; and
- senior legal opinion on the potential liability of company directors in Australia where risks associated with climate change are not adequately managed.

In addition to increasing international recognition of the material nature of climate-related risks, there is increasing co-ordination of new standards and supervisory guidance to overcome challenges relating to methods, processes, tools and data availability to effectively measure, monitor and manage climate risks. International groups active in this area include the Network for Greening the Financial System, the IFRS Foundation, International Association of Insurance Supervisors, the Basel Committee on Banking Supervision and the Financial Stability Board. Through membership and engagement with these and other forums, APRA learns from and contributes its expertise to improving global understanding, and where relevant consistency, on climate-related risks.



Against this backdrop, APRA has sought to ensure regulated entities are taking appropriate steps to understand and manage the financial risks associated with a changing climate. Together with publishing its draft climate change financial risk guidance in April 2020, APRA has taken the lead for CFR agencies in developing and undertaking the Climate Vulnerability Assessment.

## Climate Vulnerability Assessment

As the first of its kind in Australia, but consistent with similar exercises being undertaken in a number of other jurisdictions, the CVA was initiated to better understand and quantify the potential financial impact of climate change on banks under different but plausible climate scenarios, and to improve understanding of the potential financial impact of the economic and climate transitions under these scenarios.

This CVA is not a prudential capital stress test, as it does not include capital adequacy components and its results do not lead to direct prudential requirements. However, the CVA has adapted existing stress testing methods to test the resilience of entities to the emerging financial risks associated with climate risk. By following this approach, the CVA is expected to improve the understanding of the financial risks associated with climate change by industry and CFR agencies, as well as support strategic decision-making in relation to climate-related risks.

The CVA has been designed to support the following three key objectives of:

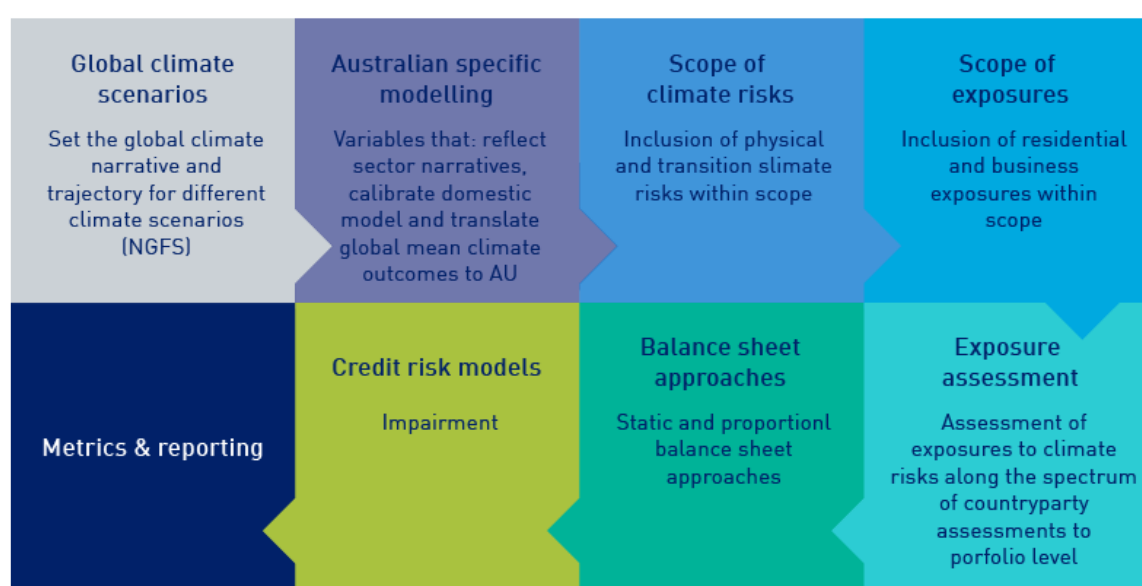
- **measuring** the potential financial risks to banks, the financial system and economy posed by both physical and transition climate risks;
- **understanding** how banks may adjust their business models and implement management actions in response to the different scenarios; and
- **improving** banks' climate risk management capabilities.

The CVA is aligned to APRA's wider efforts to improve scenario analysis capabilities within the financial sector and strengthen the understanding and management of climate-related risks. The banking sector was selected for the inaugural CVA due to its centrality and systemic importance to the Australian financial system, and to best meet the objective of considering the overall macroeconomic impact of climate risk. The experience gained from this CVA may be applied to similar future activities in the insurance and superannuation sectors, as well as inform future banking-sector activities.

## Chapter 2 - Key design features

The Climate Vulnerability Assessment is being completed by Australia's five largest banks<sup>3</sup>, with the design process involving consultation with the participating banks facilitated by the Australian Banking Association. This collaborative approach was taken to develop a sufficiently practical design to ensure that the objectives of the CVA could be achieved, and that the results will provide a meaningful snapshot of the potential financial exposure to climate-related risks between today and 2050. The key components of the CVA are outlined in this Chapter and in Figure 2.

**Figure 2. Overview of key components of the CVA**



### The CVA and APRA's stress testing program

Stress tests are a core, forward-looking tool used by prudential regulators to test the resilience of financial institutions to adverse economic conditions and emerging risks. The CVA offers an opportunity to incorporate climate-related factors into APRA's existing stress testing program. This will help to further inform planning for the range of potential future financial impacts that may be triggered by climate change.

<sup>3</sup> The five largest banks in Australia: ANZ, CBA, Macquarie Bank Limited, NAB and Westpac.

Climate stress tests, much like traditional prudential stress tests, seek to determine the size of, and assist in the preparation for, potential financial system risks. Traditional prudential stress tests typically use scenarios to test the resilience of the financial system where economic output and employment experience a sharp downturn, measured over a relatively short (i.e. 3-5 year) timeframe. Translating climate change risks (some of which may occur over decades) into economic output and employment impacts that can be incorporated into existing risk models is a key challenge, and the approach taken in the CVA is set out below.

## Climate scenarios

The CVA uses two climate scenarios as the foundation for assessing potential climate risk impacts on the banks. These climate scenarios set out different potential pathways for the evolution of the policy and physical climate environments between 2020 and 2050, and are aligned to the internationally accepted scenarios developed by the Network for Greening the Financial System (NGFS).<sup>4</sup>

The CVA is based on the climate-related risks associated with two of the NGFS Phase II scenarios, published in June 2021<sup>5</sup>. Scenario 1 involves a delayed but then rapid reduction in emissions by 2050, while Scenario 2 is largely based on a continuation of current global policies and forecasts (Table 1 and Figure 3).

The NGFS scenarios are not forecasts of future climate trajectories: rather, they are explorations of potential future climate conditions, with different assumptions embedded in each scenario spanning temperature targets, policy responses and technology development. They are only two of many possible scenarios, but their different respective outcomes are useful for testing the resilience of the entities under markedly different climate futures.

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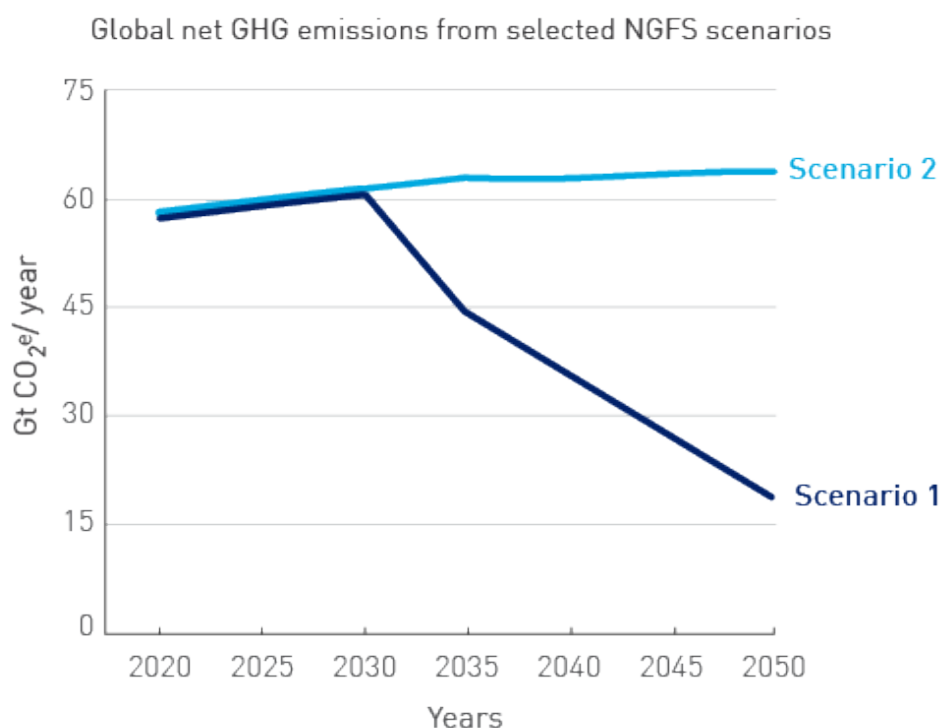
<sup>4</sup> The NGFS is an international group comprised of nearly 100 global central banks and supervisors, including APRA and the RBA. It was established in 2017 to enhance the ability of the financial system to manage the systemic risks posed by climate change, and to mobilise the capital for green and low carbon investments. The NGFS has published publicly available climate scenarios to help identify, quantify and mitigate climate risks to the global economy. The scenarios can be found here: [https://www.ngfs.net/sites/default/files/medias/documents/ngfs\\_climate\\_scenarios\\_phase2\\_june2021.pdf](https://www.ngfs.net/sites/default/files/medias/documents/ngfs_climate_scenarios_phase2_june2021.pdf)

<sup>5</sup> 'Current policies' reflect policies existing when the NGFS commenced work on the Phase II scenario modelling, which was published in June 2021.

**Table 1. Overview of climate scenario narratives**

	Scenario 1	Scenario 2
Overview	<ul style="list-style-type: none"> <li>This Scenario is aligned to the NGFS Disorderly Transition: Delayed Transition Scenario.</li> <li>This Scenario explores a future with higher transition risks, arising from a delayed transition to a lower emissions global economy. The NGFS model assumes: <ul style="list-style-type: none"> <li>Current climate policies until 2030.</li> <li>A rapid reduction in global GHG emissions after 2030, consistent with limiting global warming to less than 2°C.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>This Scenario is aligned to the NGFS Hot House World: Current Policies Scenario.</li> <li>This Scenario explores a future with higher physical risks, arising from a continued increase in global GHG emissions. The NGFS model assumes that only currently implemented policies are preserved.</li> <li>Global GHG emissions continue at an elevated level beyond 2050, reaching a peak in 2080.</li> </ul>
Key features	<ul style="list-style-type: none"> <li>Global annual greenhouse gas (GHG) emissions follow the same trajectory to 2030 as Scenario 2. Beyond 2030, reductions in net annual GHG emissions in the order of a 6 per cent compound annual reduction to 2050, with limited GHG emissions removal, result in a rapid decarbonisation of the global economy. <ul style="list-style-type: none"> <li>Around 40 per cent of year-on-year GHG reductions from 2030 to 2050 occur in the period 2030 to 2035.</li> <li>Emissions in 2050 are around 70 per cent lower than in the Scenario 2.</li> </ul> </li> <li>Australia maintains its current climate initiatives to 2030, with national annual GHG emissions tracking towards its 2030 Paris agreement target. From 2030, Australia's emissions fall consistent with a global trajectory to net zero CO<sub>2</sub> emissions by 2060.</li> </ul>	<ul style="list-style-type: none"> <li>Global annual GHG emissions experience a modest increase of around 0.7 per cent compound annual growth rate to 2030. Emissions continue this growth rate to around 2035, and then stabilise over the following 15 years to 2050. <ul style="list-style-type: none"> <li>Global emissions from energy increase around 27 per cent by 2050 (versus 2020).</li> <li>Total GHG emissions over the period 2030-2050 are around 40 per cent above those in Scenario 1.</li> </ul> </li> <li>Australia maintains its current climate initiatives to 2050, with national emissions tracking towards its 2030 Paris agreement target principally through decarbonisation of the electricity system<sup>7</sup>.</li> </ul>

**Figure 3. Emissions trajectories to 2050 for the two NGFS scenarios<sup>6</sup>**



### Tailoring the NGFS scenarios to the Australian context

Basing the CVA analysis on specific NGFS scenarios improves comparability between the CVA for Australian banks and the outcomes of similar activities being undertaken by international peer supervisors, as well as between the CVA results from different banks. Nevertheless, there will be some differences that arise in the implementation of the NGFS scenarios, due to the limited sector and regional resolution of the scenarios as well as the selection of models within the NGFS scenarios. The NGFS has indicated it will continue making improvements to its models. In the meantime, central banks and supervisors are often choosing to undertake additional modelling to support domestic climate risk analysis.

This approach has been taken by APRA, with additional Australia-focused modelling carried out to provide improved sector and sub-national model outputs that remain aligned to the overarching NGFS scenarios (Table 2).

<sup>6</sup> Reference to NGFS scenarios and emissions trajectories in Table 1 are from the NGFS Phase II GCAM 5.3 model, Delayed Transition Scenario and Current Policies Scenario.

<sup>7</sup> Emissions reductions in the electricity generation sector are forecast to account for over 90 per cent of total emissions reductions in decarbonising sectors in 2030 versus 2020. (Australia's Emissions Projections 2020: Department of Industry, Science, Energy & Resources, 2020).

<sup>8</sup> Net GHG emissions trajectories from NGFS Phase II GCAM 5.3 model, Delayed Transition Scenario and Current Policies Scenario.

**Table 2. Modelling parameters for the two climate scenarios**

Parameter	Region	Scenario 1	Scenario 2
NGFS Model <sup>9</sup>		Global Change Analysis Model (GCAM 5.3)	
Timesteps	Australia and international	Five-yearly modelling timesteps	
Electricity Sector	Australia	Aligned to AEMO <i>Steady Progress</i> scenario to 2030, then modelled to 2050	Aligned to AEMO <i>Steady Progress</i> scenario
	International	As per NGFS global scenario	As per NGFS global scenario
Representative Concentration Pathway (RCP) <sup>10</sup>	Global	RCP2.6	Transition risk – RCP4.5 Physical risk – RCP8.5
Shared Socioeconomic Pathway (SSP) <sup>11</sup>	Global	SSP2	SSP2

## Scope of the CVA

With the exposure of participating banks dominated by Australian-based lending, the CVA focuses on transition and physical climate risks arising in Australia, or internationally with direct impact on Australian lending. Banks will be required to assess residential mortgages, corporate and business lending exposures, which account for approximately three quarters of their Australian lending exposure.

Assessment of New Zealand exposures, and in some instances (such as transition risk for business exposures) broader international-based exposures, are optional (Figure 4).

<sup>9</sup> The NGFS uses three different Integrated Assessments Models (IAM) for each scenario. APRA has sought alignment with the NGFS through one of these models, the Global Change Analysis Model (GCAM), as it models the highest number of discrete regions and does not incorporate perfect foresight.

<sup>10</sup> Representative Concentration Pathways (RCP) describe different trajectories for future greenhouse gas concentrations as a result of human activities.

<sup>11</sup> Shared Socioeconomic Pathways (SSPs) describe potential future socioeconomic changes. The SSPs were developed by a joint international community of climate scientists, economists and energy modellers, and originally published in 2016. The Intergovernmental Panel on Climate Change relied on SSP's as part of its Sixth Assessment Report (published 9 August 2021).

**Figure 4. Scope of climate risks assessed against exposure in the CVA (overview)**

		AU	NZ	REST OF WORLD			AU	NZ	REST OF WORLD
<b>Physical Risk</b>	Residential	Yes	Optional*	Out of scope	<b>Transition Risk</b>	Residential	Yes	Optional*	Out of scope
	Business	Yes^	Optional*	Out of scope		Business	Yes^	Optional*	Optional*
	FI, sovereign & other	Out of scope	Out of scope	Out of scope		FI, sovereign & other	Out of scope	Out of scope	Out of scope

^ For selected exposures

\* Options for the banks to provide further information on a voluntary basis

## Prudential risk scope

Credit risk has been selected as the primary lens through which the quantitative outputs of the CVA are viewed. Credit risk is also the most readily measured and observed transmission channel of climate risk to the financial risk of banks.

While climate risk may result in, or amplify, market, liquidity and operational risks, these risks are more difficult to co-ordinate and assess in a common scenario exercise. As a result, the CVA asks for a qualitative assessment of market, liquidity and operational risk, with a questionnaire to provide supplemental insights for these risks (Table 3).

**Table 3. Qualitative questions included in the CVA**

Risk type	Question
<b>Operational risk</b>	Have there been any climate-related events in the last 5-10 years that have led to prolonged (more than three days) outages or loss of access to your firm's sites? If yes, provide the three most material events in Australia, and two most material events internationally, and briefly describe their nature.
<b>Operational risk</b>	What actions would your firm consider taking to mitigate physical climate risks in its operations?
<b>Market risk</b>	Assuming that your firm does not take any mitigating actions, indicate how your firm's exposure to market risk evolves in each scenario as a result of physical and transitional risks from climate change. Provide a brief justification for this answer, referencing the relevant sources of market risk (equity and commodity prices, interest rates, foreign exchange). In your answer, clarify which assets you considered.
<b>Funding/liquidity risk</b>	Under each scenario, which risks (e.g. credit, reputational etc) would your firm expect to have a consequential impact on liquidity and funding risk? Outline the nature of the consequential impact, its likely severity, and potential mitigating actions that could be available.

## Portfolio exposure scope for climate risks

### Mortgage exposures

With mortgages representing a significant proportion of bank lending exposure in Australia, the assessment of mortgage exposures against both transition and physical risks is an important component of the CVA. The approach to mortgage exposures assessment is:

- **transition risk:** impact on Australian-based residential mortgage exposures from changes in economic activity; and
- **physical risk:** impact on Australian-based residential mortgage exposures from physical risks<sup>12</sup>, with the option to provide further information relating to New Zealand-based residential mortgage exposures.

Insurance coverage has been included within the mortgage exposure analysis, as changes to the physical climate have the potential to impact insurance affordability and availability, which may in turn result in changes to patterns of underinsurance and non-insurance.<sup>13</sup> Combined with more frequent and severe climate events, this could impact credit losses by region.

### Business exposure

Business exposures will be assessed in the CVA using the following approaches:

- **transition risk:** impact on Australian-based business exposures from changes in economic activity; and
- **physical risk:** physical risk will be separated into two classifications, agriculture-focused lending, and non-agriculture focused lending. Banks will apply different physical risk assessment approaches for these two classifications of business lending, reflecting the differing risk profiles and impacts.

*Agriculture lending:* impact on Australian-based lending exposures from physical risk to primary agriculture activities for three commodities: beef cattle, dairy and grain. These three commodities have been chosen as they are material in relation to agriculture lending exposure for Australian banks, and may be impacted by physical climate risk.

*Non-agriculture lending:* impact on Australian-based non-agriculture business lending

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<sup>12</sup> Data made available to banks under the CVA included postcode-level risk index projections for tropical cyclone, precipitation stress, river flood, fire weather stress, drought stress and heat stress provided by Munich Re Australia.

<sup>13</sup> The CVA will utilise analysis undertaken by the Australian Competition and Consumer Commission on the rates of non-insurance in Australia, combined with the risk index projections, and consider changes in these rates into the future based on physical climate drivers.



from physical risk will be addressed at a counterparty (individual company) level only across sectors classified as high-risk for physical climate risk events. International exposures will be assessed using NGFS Phase II data and assumptions.

## Balance sheet approach

Regulatory stress tests are typically conducted on either a static or limited-dynamic balance sheet, where the size and composition of a bank's balance sheet remaining largely unchanged over the scenario horizon. This enables an analysis of the impact on the stress scenario on a bank, if it were to continue lending as it had been, over the next three-to-five-year period. Any increase or decrease to the size of a bank's total lending, or changes to its exposure to different industries or asset classes, can then be incorporated into additional after-mitigation actions results by the bank.

The extended time horizon of the CVA, and the resulting changes to segments and industries in the economy over this period from both of the CVA scenarios, presents unique challenges to the traditional balance sheet aspect of stress test design.

A static balance sheet provides insight into the impact of the stress scenario on current lending practices and exposures. However, over the extended 30-year modelling period for the CVA, a static balance sheet approach is likely to lead to inconsistencies between the composition of the banks' lending exposures, which remains static, and the structure and financing needs of the broader economy, which change over time.

In contrast, a fully dynamic balance sheet approach with no constraints allows for significant restructuring of the banks' balance sheets to accommodate the changes in the economy. However, this approach could lead to inconsistencies between bank lending exposures and the economy's financing needs over the 30-year time horizon of the CVA, as the banks model different shifts away from materially impacted sectors and/or towards high opportunity sectors. This would make comparison of the results more difficult compared to a typical three-to-five-year stress test.

To address these challenges, the CVA uses two balance sheet approaches: the "static" approach described above, and a "proportional" balance sheet approach (Table 4). Similar to the "dynamic" balance sheet approach, the "proportional" approach allows banks to adjust their exposure to different parts of the economy. However, the "proportional" approach is more tightly constrained than under the "dynamic" approach, with changes in banks' exposures to different parts of the economy remaining broadly proportional to changes in the structure of the broader economy to 2050. This approach allows banks to adjust the composition of their exposures to different industries or asset classes in line with changes in the broader economy, whilst still enabling comparability of results across multiple banks.

Together, these two approaches allow the CVA to explore credit risk resulting from climate change in the current balance sheet ("static"), and the credit risk resulting from climate change in a balance sheet that broadly follows the evolution of the economy and is influenced (within set limits) by the banks' management actions ("proportional").

**Table 4. Overview of balance sheet approaches**

Balance sheet	Definition	Objective
<b>Static</b>	Measures the potential financial exposure to physical and transition climate risks of banks current lending exposures.	<p>Uses a fixed total exposure balance, with portfolio/sectoral allocation only varying when replacing defaulted exposures. (For example, defaulted exposures to sectors with contracting Gross Value Added (GVA) post-2030, or mortgages in a postcode with an elevated physical risk score, would be reallocated to a different sector or postcode).</p> <p>This avoids banks having to assume constant financing for industries where their value relative to the economy changes significantly. It also reduces the implied re-origination of mortgages in postcodes where there may be changes to patterns of underinsurance and non-insurance.</p>
<b>Proportional</b>	Measures the impact of allowing banks to implement management actions in response to different scenarios, within defined constraints.	<p>Banks can vary both total exposure and portfolio/sectoral allocation such that it remains broadly consistent with sector growth in the economy, within defined constraints. Announced and unannounced management actions are applied subject to the constraint of changes in sector economic value over time.</p>

## Counterparty assessments

Assessments of counterparties to which the banks have a material exposure will be used to supplement the portfolio-level analysis of climate risk. This will provide insights into current bank approaches to understanding the financial risks of climate change in their counterparties, the data available (or otherwise) to support this understanding, the viability of carrying out multi-sector counterparty analysis, as well as providing a more specific assessment of a select number of counterparties' exposure to climate risks.

The CVA design includes counterparty assessments for 25<sup>14</sup> current, material, non-finance sector corporate exposures for each bank, on the basis of both transition and physical risk. The banks selected counterparties that reflected their balance sheet, with guidance that the

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<sup>14</sup> By comparison, similar climate risk stress test activities by the Bank of England required 100 counterparties to be assessed per participant.

selection include counterparties from both emissions intensive (e.g. electricity generation) and physical climate risk-exposed (e.g. agriculture) sectors<sup>15</sup>.

The counterparty assessment is expected to cover a wide range of information, including:

- cash flow analysis;
- publicly disclosed firm-level data;
- third party industry analysis;
- direct engagement with the counterparty;
- climate metrics (e.g. counterparty's scope 1 and 2 emissions, and/or emissions intensity of its business activities);
- mitigating and management actions that would likely be considered by the counterparty under the scenario; and
- consideration of the interplay between different climate risks and how this may impact the overall level of losses (either qualitatively or quantitatively).

## Data quality assessment

One of the difficulties in quantifying the financial risks of climate change is the limited availability of data to support the analysis: this is recognised as a challenge in Australia<sup>16</sup> and internationally<sup>17</sup>. To better understand this challenge and its impact on the finance sector in Australia, a data quality assessment process has been included in the CVA.

Data quality is a measure of key climate-related attributes for both internal (bank-owned/managed) and external (third party climate and economic) data utilised by the banks in the CVA (Figure 5). The data quality assessment is focused on Australian residential and business exposures to both transition and physical climate risk, across a number of attributes such as degree of physical risk data, climate hazard coverage and regional economic activity resolution.

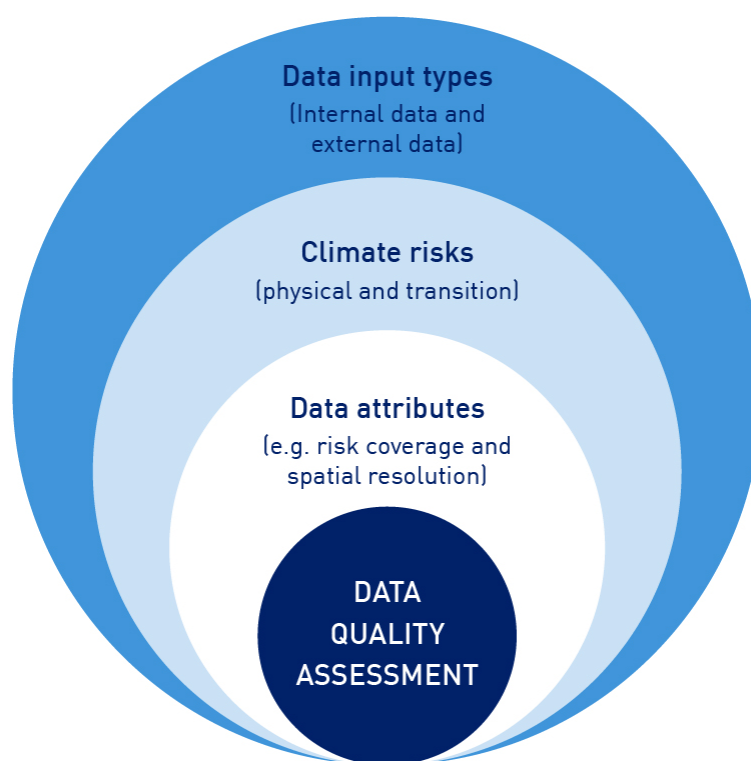
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<sup>15</sup> A similar approach to identifying sectors of interest was taken by the Banque de France (BdF) in its Climate Pilot Exercise: however, BdF's overall exercise was limited to the "sectors of interest", while the CVA used this approach only for the counterparty component of the analysis.

<sup>16</sup> See for example the Climate Measurement Standards Initiative.

<sup>17</sup> See for example the NGFS *Progress report on bridging data gaps*.

*Figure 5. Data quality assessment framework*



This semi-quantitative method will measure the quality of the data underpinning overall assessment results. The data quality assessment will identify where data quality is high and where the greatest quality challenges exist, where data quality improvements are needed, and where gains can be made into the future.

## Chapter 3 - International climate risk activities

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Central banks and regulators in a range of jurisdictions are seeking to understand the potential effects of climate change on their economies through both domestic activities and collaboration with peer agencies through international forums. In addition, prudential guidance on assessing and addressing climate risk, as well as training support, has been published by a number of supervisors and standards setters<sup>18</sup>. A number of supervisors are pursuing climate risk assessments and stress tests similar to the CVA in order to better understand the country- and region-specific impacts of climate change on their regulated entities.

The Bank of England announced an exploratory climate transition stress test in 2019, and central banks in a number of other countries are planning to run climate stress tests in 2021 and 2022. Climate stress tests are being conducted both in parallel to stress testing activities – APRA’s CVA is an example of this approach – as well as within existing annual stress testing regimes, an approach that has been adopted by regulators such as the Singapore Monetary Authority.

The NGFS scenarios are a common starting point for CVA-like assessments by a number of jurisdictions, supporting a range of analyses from banks, to insurers, and to the economy as a whole (Figure 6). While not an exhaustive list of all climate-related stress testing activities around the world,<sup>19</sup> Figure 6 illustrates the momentum of activities in the area, and the role central banks and supervisors hold in relation to climate risk.

The use of the NGFS scenarios increases the opportunity for comparability of results, even where the economic and policy conditions differ at a domestic level. However, while these scenarios support top-level alignment for scenario analysis activities, there is a range of subsequent considerations that could see approaches vary across jurisdictions. Additionally, approaches between jurisdictions may differ due to different objectives of each activity (Table 5).

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<sup>18</sup> See for example the *Climate Training Alliance* and the European Central Banks *Guide on climate-related and environmental risks*.

<sup>19</sup> The NGFS is planning to release a report in October 2021 which outlines the activities of international regulators in further detail.

*Figure 6. International regulatory action on climate change*



While there is a widely held desire internationally for comparability in climate risk assessments, Table 5 demonstrates that achieving comparability will mean aligning a number of aspects of the assessments, including:

- Financial sectors included: The CVA and the European Central Bank (ECB) are focusing on the banking sector (the ECB is also including non-finance businesses), in comparison to Bank of England/Prudential Regulatory Authority (BoE/PRA) and Banque de France and Autorité de contrôle prudentiel et de résolution (BdF/ACPR) which consider the insurance and banking sectors together.
- Scope of exposures: even within a single finance sector, different approaches to the scope of exposures have been taken. The CVA and BoE/PRA include mortgages alongside business lending: by contrast the ECB includes business lending exposures only, and the BdF/ACPR include business lending exposures from selection of sectors only.
- Balance sheet: all four supervisors in Table 5 have taken different approaches to the balance sheet. The CVA and ECB adopted a dual balance sheet approach (though they differ on the type of approach for the second balance sheet), while the BoE/PRA and BdF/ACPR take a single balance sheet approach (and also differ on the type of single balance sheet).

The scope, approaches, design features and preliminary results from international regulators reinforces the importance of climate-related scenario analysis and stress testing as a form of assurance in respect to financial resilience for the short- and long-term future.

**Table 5. Comparison of key climate-related stress test design approaches**

	APRA/CFR CVA	ECB	BoE/PRA	BdF/ACPR
<b>Scope</b>	Banks	Banks and companies	Banks and insurers	Banks and insurers
<b>Approach</b>	Bottom up	Top down	Bottom up	Bottom up
<b>Exposures</b>	Mortgages and business	Business only	Mortgages and business	Business only, selected sectors only
<b>Time horizon</b>	2020-2050	2020-2050	2020-2050	2020-2050
<b>Climate scenarios</b>	Two NGFS scenarios	Three NGFS scenarios	Three NGFS scenarios	Four scenarios (one physical risk scenario, and three transition scenarios aligned to the NGFS)
<b>Downscaling<sup>20</sup> of transition and physical climate risk modelling</b>	Yes	Yes	Yes	Yes
<b>Balance sheet approach</b>	Two: Static and proportional	Two: Static and dynamic	One: Static	One: Combined static (2020-2050) and dynamic (2025-2050)
<b>Counterparty assessments</b>	Yes: qualitative counterparty assessments	No: however, granular (address level) data integrated into top down modelling.	Yes: counterparty-level modelling	Yes: counterparty-level modelling
<b>Timeline</b>	Results and publication in 2022	Assessment to be undertaken in 2022	Launched in mid-2021	Completed and results published (see below)

The BdF findings (Table 5 and Box 1) provide insight into the potential scale and impact of both transition and physical climate risk on national financial systems, and provide the opportunity for other jurisdictions to conduct a similar exercise. At the same time, differences in national circumstances (e.g. sectoral composition of the economy, or national exposure to climate risk) and the scope of the analysis (e.g. mortgages were not included in the BdF study, yet in Australia they represent around 45 per cent of total bank assets<sup>21</sup>) mean

that these results for France may not be reflective of results from climate vulnerability assessments in other countries.

The BdF results also point to areas for improvement, including assumptions relating to the design of climate scenarios and identifying sensitive sectors, the approach to considering physical risk, and addressing data gaps. Similar challenges were encountered in the design phase of the CVA, which suggests that international engagement and collaboration will be an important aspect of improving the quality of climate-related stress testing activities over time.

### ***Box 1 – Banque de France and Autorité de contrôle prudentiel et de resolution results<sup>2</sup>***

Banque de France and Autorité de contrôle prudentiel et de resolution (BdF/ACPR) has recently completed its climate risk exercise, and based on the results have stated that banking institutions and insurers now need to increase their efforts on climate change. Key insights from the exercise include that:

- the exposure of banking institutions to the most affected sectors by transition risk is considered ‘moderate’;
- subject to the limits of the assumptions and models used in the exercise, which will be progressively refined, banks and insurance undertakings appear ‘moderately’ exposed to the risks associated with climate change by 2050; and
- the expected increase in claims and premiums for certain insurance risks is particularly noticeable, including that ‘climate change would entail a two-fold to five-fold increase in the loss ratio for claims related to natural disasters in the most affected departments throughout France, and premiums would increase by 130 to 200% over 30 years to cover these losses’.

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<sup>20</sup> Downscaling of model results relates to utilising international scenarios, such as the NGFS, and localising this to the country and/or region under assessment. Downscaling of model results can improve understanding of localised transition and/or physical risk impacts.

<sup>21</sup> Source: APRA data, Q1 2021. Average contribution of residential mortgages to total bank assets for the five banks involved in the climate vulnerability assessment.

<sup>22</sup> BdF, A first assessment of financial risks stemming from climate change: The Main results of the 2020 climate pilot exercise, [https://acpr.banque-france.fr/sites/default/files/medias/documents/20210602\\_as\\_exercice\\_pilote\\_english.pdf](https://acpr.banque-france.fr/sites/default/files/medias/documents/20210602_as_exercice_pilote_english.pdf)



## Chapter 4 - Next steps

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The main CVA design phase commenced in early 2021, with a series of workshops conducted with the banks and the Australian Banking Association during Q1 and Q2 2021 to explore different aspects of the CVA design. With the conclusion of the design process, the banks commenced their analysis in June 2021.

The banks will submit the results of their CVA analyses to APRA, and APRA intends to publish aggregated results in 2022: individual banks results, including counterparty assessments, will not be published. APRA also intends to compare and contrast findings from the CVA with international peers that have similar timelines for climate-related stress testing and assessments.

While the CVA is banking sector focused, APRA will consider extending the CVA to include the insurance and superannuation sectors in the future. The insights and learnings from the inaugural CVA, as well as international peer experiences, would be used to support any extension of the CVA.

Looking further into the future, APRA will incorporate experience gained from the CVA process into the ongoing development of its wider climate risk supervisory activities. APRA will also continue collaborating with other central banks and regulators on key issues, including data availability and quality, and contribute to the continued development of global practices on the financial risks of climate change.



APRA