



# Guidance for participants of the 2021 Biennial Exploratory Scenario: Financial risks from climate change

June 2021



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# 1: Introduction

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## 1.1: Background

The Bank of England ('the Bank') complements its annual solvency stress tests by using exploratory scenarios to investigate a range of risks that may not directly link to prevailing economic or financial conditions. The Bank aims to run these exercises every other year. These Biennial Exploratory Scenario (BES) exercises help the Bank and financial institutions prepare for possible future shocks.

The 2021 BES will test the resilience of the UK financial system to the physical and transition risks associated with different climate pathways. The Bank decided to undertake this exploratory exercise following the publication of the Van Steenis [Future of Finance report](#).

The desired outcomes of this 2021 Climate BES (CBES) are to:

- **size the financial exposures of participants and the financial system more broadly to climate-related risks;**
- **understand the challenges to participants' business models from these risks**, and gauge their likely responses and the implications this carries for the provision of financial services. This includes investigating the interdependency between insurers and banks, namely the impact of potential changes in insurance provision on banks' credit risk exposures; and
- **assist participants in enhancing their management of climate-related financial risks.** This includes embedding these risks in business-as-usual risk management, engaging counterparties to understand their vulnerability to climate change, and encouraging boards to take a strategic, long-term approach to managing these risks.<sup>(1)</sup>

**The Bank intends for the CBES to be a learning exercise. Expertise in modelling climate-related risks is in its infancy, so this exercise will develop the capabilities of both the Bank and CBES participants.**

The CBES will explore the vulnerability of current business models to future climate pathways. In doing so, it will help to identify the potential risks posed to those business models over time. To do this, participants will measure the impact of the scenarios on their end-2020 balance sheets, which represents a proxy for their current business models. For banks, the CBES focuses on the credit risk associated with the banking book, with an emphasis on detailed analysis of risks to large corporate counterparties. For insurers, the CBES will focus on changes in Invested Assets (and Reinsurance Recoverables) and Insurance Liabilities (including accepted Reinsurance).

The CBES will also explore how firms intend to adapt their business models over time, in light of climate changes. The exercise also covers the management actions participants would anticipate taking in the published scenarios; as well as participants' present and future planned approaches to managing climate risk.

The exercise will not be used by the Bank to set capital requirements, and individual participants' projected losses will not be tied directly to actions participants are required to take. Instead, participants' submissions may inform the Financial Policy Committee's approach to system wide policy issues; the Prudential

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(1) Counterparty refers to a firm whose liabilities are held by participants (these include loans, bonds, equity).

Regulation Authority's (PRA's) approach to supervisory policy; and guide further work between participants and supervisors to address any issues highlighted.

## 1.2: Purpose of this document

This document accompanies the final [data templates](#) and the final [qualitative questionnaire](#). In April 2021, the Bank published an early version of this guidance document to support participants by improving their readiness for the exercise. The purpose of this document is to help participants understand the data requirements, including any changes to requirements as compared to those published in April. Relative to the April publication, this document includes additional sections with more detail on the approach to analysis participants should adopt for different asset types, explicitly linking that approach to scenario narratives and published [variable paths](#). The Bank has also published '[Key elements of the 2021 Biennial Exploratory Scenario: Financial risks from climate change](#)' (henceforth 'Key elements'), which explains the scenarios in further detail.

The information provided in this document and any other CBES materials is specific to the CBES and does not set precedents relating to any regulatory guidance or policy.

## 1.3: CBES scenarios

The exercise considers two routes to net zero greenhouse gas emissions: Early Action scenario and Late Action scenario. These scenarios primarily explore transition risks from climate change:

- **Early Action:** The transition to a net zero emissions economy starts in 2021 so carbon taxes and other policies intensify relatively gradually over the scenario horizon. Global carbon dioxide emissions are reduced to net zero by around 2050. Global warming is limited to 1.8°C by the end of the scenario (relative to pre-industrial levels).<sup>(2)</sup> Some sectors are more adversely affected by the transition than others, but the overall impact on GDP growth is muted, particularly in the latter half of the scenario once a significant portion of the required transition has occurred and the productivity benefits of green technology begin to be realised.
- **Late Action:** The implementation of policy to drive transition is delayed until 2031 and is then more sudden and substantial. Global warming is limited to 1.8°C by the end of the scenario (relative to pre-industrial levels). The more compressed nature of the transition results in material short-term macroeconomic disruption, which is particularly concentrated in carbon-intensive sectors. Output contracts sharply in the UK and international economies. The rapid sectoral adjustment associated with the sharp fall in GDP, reduces employment and leads to some assets being stranded, with knock-on consequences for demand and spending. Risk premia rise across multiple assets.

The **No Additional Action** scenario primarily explores physical risks from climate change. Here, there are no new climate policies introduced beyond those already implemented. The absence of transition policies leads to a growing concentration of greenhouse gas emissions in the atmosphere and, as a result, global temperature levels continue to increase, reaching 3.3°C relative to pre-industrial levels by the end of the scenario.<sup>(3)</sup> This leads to chronic changes in precipitation, ecosystems and sea level. There is also a rise in the frequency and severity of severe weather events such as heatwaves, droughts, wildfires, tropical cyclones and flooding. There are permanent impacts on living and working conditions, buildings, infrastructure. UK and global GDP growth is permanently lower and macroeconomic uncertainty increases. Changes in physical hazards are unevenly distributed with tropical and subtropical regions affected more severely. Many of the impacts from physical risks are expected to become more severe later in the

(2) Reference period: 1850–1900.

(3) Climate scientists' projections suggest that absent a rapid transition, some physical risks will crystallise in the period to 2050, but the most material shocks would occur later in the century. To ensure the No Additional Action scenario captures these more severe risks, it has been calibrated based on the level of physical risk that could be prevalent between 2050 and 2080 in the absence of further policy action. The end-of-century warming in this scenario is 4.1°C.

21st century and some will become irreversible. So the headwinds facing the economy would be expected to increase further into the future.

It is likely that participants will need to expand the set of published variable paths provided by the Bank. For example, participants may need to derive paths for some additional variables or to expand the scenario paths across a broader range of geographies, or at a regional level within geographies. Such scenario expansion should be consistent with the narratives set out in the Key elements document and with the variable paths published by the Bank.

The CBES scenarios build on scenarios by the Network for Greening the Financial System (NGFS). The CBES scenarios are not identical to those produced by the NGFS, but they are broadly consistent. Participants may therefore draw on the NGFS scenario database for additional variables, but should carefully consider whether those variables are consistent with the CBES narratives set out in the Key elements document, as the CBES scenarios may differ from the NGFS scenarios in some aspects. A mapping between the CBES scenarios and the corresponding NGFS scenarios is provided in Annex 1. Participants are asked to describe the methodology used for scenario expansion and the paths for key variables they produced in the qualitative questionnaire.

## 1.4: Timeline

The timeline for CBES and the early engagement with participants is set out below:

- December 2019: publication of the Discussion Paper.
- November 2020: announcement about the Bank participation in the CBES, timelines for the exercise, and how the Bank intends to engage with participants ahead of launch.
- December 2020: publication of the Update on the Bank's approach to the CBES in selected areas, including a provisional set of scenario variables to be included in the exercise.
- End-December 2020: Balance sheet cut-off date for the exercise.
- Mid-February 2021: release of a set of draft data templates, a draft qualitative questionnaire as well as the accompanying notes, for feedback from participants. Followed by calls with participants to discuss the drafts. The Bank invited feedback from participants on these documents by 12 March 2021.
- 23 April 2021: publication of a finalised set of data templates and the qualitative questionnaire and the accompanying notes. Followed by calls with participants.
- 8 June 2021: official launch of CBES. Publication of the final Guidance, scenario variable paths and Key elements document. Launch event.
- 13 October 2021: participants' initial submissions due.
- End-January 2022: the Bank expects to launch a second round of the exercise, and will release any materials associated with that second round.
- May 2022: publication of CBES Results (in the event that the Bank makes the decision not to go ahead with a second round, the Bank will publish results sooner).

## 1.5: Participation

Table 1.A lists CBES participants. They are to report on a group consolidated basis unless otherwise stated.

**Table 1.A: CBES participation and coverage**

Large UK banking groups and building societies	Large UK life insurers	Large UK general insurers	
Participation:			
<ul style="list-style-type: none"> <li>• Barclays</li> <li>• HSBC</li> <li>• Lloyds Banking Group</li> <li>• Nationwide Building Society</li> <li>• NatWest Group</li> <li>• Santander UK</li> <li>• Standard Chartered</li> </ul>	<ul style="list-style-type: none"> <li>• Aviva (Group)</li> <li>• Legal &amp; General (Group)</li> <li>• M&amp;G (Group)</li> <li>• Phoenix (Group)</li> <li>• Scottish Widows (Group)</li> </ul>	<ul style="list-style-type: none"> <li>• AIG (UK entities only)</li> <li>• Allianz Holdings plc (UK entities only)</li> <li>• Aviva (Group)</li> <li>• AXA (UK entities only)</li> <li>• Direct Line (Group)</li> <li>• RSA (UK entities only)</li> </ul>	Society of Lloyd's (10 selected Managing Agents)
Coverage:			
Around 70% of UK bank lending to UK households and businesses.	Around 65% of the UK life insurance market by asset size. A range of business models (annuities, with-profits, unit-linked).	Around 60% of the UK general insurance market by Gross Written Premium.	Ten selected Managing Agents account for around 40% of the Society of Lloyd's property and liability insurance market by premium. Society of Lloyd's will estimate the results for the entire market based on their results.

## 1.6: Governance of submissions

Participants' internal governance processes around their CBES submissions should involve effective challenge from senior management, including by relevant committees and the board of directors. Participants should provide details of these governance and quality assurance processes in their responses to the [qualitative questionnaire](#). Participants should include a record of which committees considered and approved their responses to the exercise, and should also provide board papers relating to their submissions.

Participants should summarise the key issues that were challenged by senior management or relevant committees, and what changes to responses were made following this challenge.

Participants should also provide a statement as to how they have satisfied themselves that the [data templates](#) and the responses to the [qualitative questionnaire](#) have been completed as accurately as possible and that the appropriate level of quality assurance has been applied.

## 2: Participants' submissions: scope and key metrics

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Participants are asked to submit the [data templates](#) as well as the [qualitative questionnaire](#).

### 2.1: Data templates

The CBES will explore the vulnerability of participants' current business models to future climate pathways. In doing so, it will help to identify the potential risks posed to those business models over time. To do this, participants will measure the impact of the scenarios on their end-2020 balance sheets, which represents a proxy for their current business models. To understand the vulnerability of current business models to climate change, banks will project the stock of their cumulative provisions, and insurers will project the change in the value of their assets and liabilities, at different points in each scenario. In general, the nominal size and composition of balance sheets are assumed to be fixed, and should be updated to account for mitigation and adaptation plans of counterparties only if those plans are already under way, and are highly likely to be completed (see Section 3.5).

For banks, the CBES focuses on the credit risk associated with the banking book, with an emphasis on detailed analysis of risks to large corporate counterparties. A key metric of that risk will be the cumulative total of provisions at various points in the scenarios. Traded risk and non-traded market risk will be out of scope.<sup>(1)(2)</sup> Banks are also asked to submit projections for risk-weighted assets in the scenario, but at a far less granular level than projections for provisions. For more details on the scope of each template see Sections 5 and 6.

Although CBES results are expected to be reported on an IFRS 9 basis, IFRS 9 Expected Credit Loss and stage calculation is not a focus of the CBES exercise. Over the long time horizons of the CBES scenarios, the Bank would expect a relatively narrow gap between cumulative IFRS 9 provisions and the total observed losses. Banks are therefore encouraged to concentrate primarily on projecting actual losses that may materialise in the scenarios provided. If necessary, banks then may wish to make adjustments to the timing of loss recognition so that their submissions are consistent with IFRS 9 reporting.

For insurers, the 2021 CBES focuses on changes in Invested Assets (and Reinsurance Recoverables), and Insurance Liabilities (including accepted Reinsurance) assuming an instantaneous shock. This means that the stress brings forward the future climatic environment to today's balance sheet, with no allowance for changes in future premiums, asset allocation, expenses, reinsurance programmes and other future changes in participants' business models. For general insurers, there are also additional templates to help the Bank investigate other implications of climate change, including on insurance coverage and the risk from litigation.

In addition to sizing the financial risks from climate change, the exercise covers the management actions participants would anticipate taking in the published scenarios. This will enable analysis of how current business models could change, and the broader financial stability impact that could have. The CBES is also

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(1) On 16 December 2020, the Bank [announced](#) its decision to exclude traded risk from the scope of the CBES. Because of the dynamic nature of the trading book, point in time balance sheet exposures have limited relevance in long duration climate scenarios, like those used in the CBES. Thus, a meaningful analysis of climate-related risks to the trading book would need to adopt a different approach to that used in the rest of the exercise. Leaving the trading book out of scope should also allow participants to focus their efforts on assessing credit risk in the banking book, including through detailed counterparty-level analysis. This decision does not, however, rule out the inclusion of traded risk in any future climate change focused stress tests.

(2) Also excluded from the scope of the 2021 CBES are: assets and liabilities of banks' pension schemes; and structured finance (trading book and non-trading book assets, eg exposures to third-party cash or synthetic securitisations; exposures to own-originated securitisations which have achieved significant risk transfer; and exposures to third-party covered bonds that are risk weighted as per CRR Articles 120, 121 or 129).

designed to enable the Bank to assess participants' present and future planned approaches to managing climate risk. Some of this information will be captured via a questionnaire to be completed by participants (see next section).

## 2.2: Qualitative questionnaire

The qualitative questionnaire will be used primarily to understand challenges to participants' business models from climate-related risks; size participants' proposed management actions; and to understand how participants will improve risk management of climate-related risks (including as a result of lessons learnt from the exercise).

The qualitative questionnaire therefore covers:

- A. **The overarching narrative around participants' results and methodology.**
- B. **Management actions** participants would look to take in the scenarios. Participants will give details on each proposed management action in the data templates. This will be supported by a number of qualitative questions, where participants will provide more detail on their overall approach to management actions and the judgements taken in determining them.
- C. Participants' **qualitative views of climate-related risks**. This includes questions on risks and opportunities from climate change, operational risks, climate litigation risks, and progress towards estimating portfolio alignment metrics.
- D. Participants' **current risk management practices** with respect to climate change. Participants will describe their current risk management practices, and business model sustainability now and through the scenarios.
- E. **Plans for the development of climate risk management**, including how participants are working to improve their risk management. Participants will describe how they plan on improving risk management, including through lessons learnt from the exercise. Participants will also provide details on data gaps identified and how they plan to fill them.
- F. **Participants' approach to estimating results for specific products in the scenarios**. This section will cover questions on overarching methodology for completing the data templates, including judgements, overlays and scenario expansion. This will also include questions specific to each template.

Where participants are asked to break down their answers by 'asset type' in the qualitative questionnaire, the asset types expected to be considered are set out in **Table 2.A**. Participants are welcome to give further detail in their responses on sub-sections of the asset types outlined where this will add value.

Participants are free to provide relevant documentation to support their answers to the qualitative questionnaire, where they judge this will add value.

**Table 2.A: List of asset types**

Insurers	Banks
• Government bonds	• Mortgages
• Other bonds	• Commercial real estate
• Equities	• Car finance
• Derivatives	• Other consumer credit
• Property	• Large corporates
• Reinsurance assets	• Mid-sized corporates
• Other assets	• Retail small and medium-sized enterprises (SMEs) <sup>(a)</sup>

(a) Participants can refer to 'Tier 1' (ie counterparty level) and 'Tier 2' (thematic) analysis instead of Large Corporates, Mid Corporates and SMEs, if preferable (see Section 4.2 for more detail).



## **2.3: Second round of submissions**

The Bank intends to run a second round of the exercise, which would launch in late January 2022. A decision on the form and content of this second round will be based on analysis of participants' initial submissions. Any second round would not entail a full resubmission of data by participants but may, for example, focus on exploring particular potential interactions between participants' responses.

# 3: Approach to time and treatment of balance sheet

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## 3.1: Modelling horizon

Climate change, and the policies to mitigate it, will occur over many decades. The resulting financial risks therefore crystallise over a timeframe much longer than the normal horizon for stress testing. To ensure the CBES captures these risks to a meaningful degree, this exercise will use a 30-year modelling horizon.

Absent a rapid transition, some physical risks are likely to crystallise in the period to 2050 but the most material physical shocks are likely to occur later in the century. To ensure that the No Additional Action scenario captures these severe risks, but to avoid lengthening the modelling period, the Bank has calibrated that scenario based on the physical risks that might be expected to materialise in the period from 2050 to 2080 if no further policy action were taken. This scenario will also run from 2020 to 2050. Thus, when projecting losses, participants should apply the scenario to their starting balance sheet (as at end-2020).

## 3.2: Reporting frequency

Multiple reporting points are required to test the financial system's sensitivity to varying levels of stress over a scenario. Participants are asked to report projections every five years, ie Years 5, 10, 15, 20, 25 and 30. In addition, every projections template will include Year 0 data for actual exposures.

However, to reduce the reporting burden:

- Banks and life insurers participants are asked to only report projections for Years 10 and 30 in the Counterparty projections templates in the No Additional Action scenario;
- General insurance participants are asked to only report projections in Years 10 and 30 across the GI liabilities templates in all scenarios.

Where participants report projections with a five-yearly frequency, they might choose to conduct detailed analysis of **physical** risks in fewer reporting periods, and interpolate the results in between them. Further guidance on this is provided in Section 4.1 Modelling of physical risks.

## 3.3: Approach to modelling the evolution of balance sheets

To size current financial exposures to climate-related risks and help understand challenges to participants' business models, CBES participants should adopt a 'fixed' balance sheet assumption for the bulk of their quantitative projections.<sup>(1)</sup> This will also avoid the difficulty of projecting changes in balance sheets over a multi-decade horizon.

The CBES will test the resilience of end-2020 balance sheets to climate-related financial risks at different points in each scenario. At the end of each reporting period, the aim is to capture the impact of the scenarios from 2020 to that date.

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(1) Participants can deviate from the fixed balance sheet assumption in their management actions. See Section 3.6 for more detail.

## Banks

### Treatment of credit impaired exposures

Banks will report the cumulative stock of provisions at the end of each reporting period. When exposures move to IFRS 9 stage three, rather than being subsequently written off and replaced, these credit-impaired exposures should remain locked in stage three for the remainder of the scenario. This will reduce the stock of non-impaired exposures. Total exposures should remain at a constant level.<sup>(2)</sup>

In addition to not assuming write-off from stage three, for the purposes of estimating exposure amounts, cures from stage three back to non-credit impaired should also not be assumed. However, this assumption should not influence provision calculation, where implicit cures can still be assumed in Loss Given Default estimates. Banks should not release accumulated provisions for any given IFRS 9 stage three credit-impaired exposure.

### Maturity and amortisation

Banks should assume that the residual maturity of their assets remains constant. For example, a 10-year loan with residual maturity of five years at the start of the exercise should be treated as if the residual maturity stays at five years throughout the exercise. Similarly, the outstanding balance of the loan should not be reduced due to amortisation.

### Modelling the impact of the scenarios

Consistent with the fixed balance sheet assumption, market value fluctuations have no impact on the exposure and, in particular, cannot decrease the exposure. In addition, fair value effects shall have no impact on the exposure.

As a simplification, for their quantitative submissions, participants **should not assume** that the nominal size of banks' balance sheets increases over time with trend inflation and GDP growth. So, hypothetically, if there were zero impairments, the nominal value of assets should be assumed to be the same at the end of the 30-year scenario as in 2020.

Relatedly, baseline trend growth in variables such as property prices or corporate profits should not be modelled as reducing loan to value ratios or corporate income coverage ratios, for example. The Bank has set out summary statistics for counterfactual paths of key variables in the published [variable paths](#). To estimate the baseline trend growth for variables for which this has not been provided, participants should assume the trend paths from Years 6 to 10 of the Late Action scenario continue beyond Year 10.<sup>(3)(4)</sup> For example, if corporate profits in a particular sector grow by an average of X% between Years 6 and 10, and by Y% between Years 11 and 15, then only (Y-X)% profitability growth should have an impact on interest coverage ratios between Years 11 and 15. A similar approach should apply to other variables.

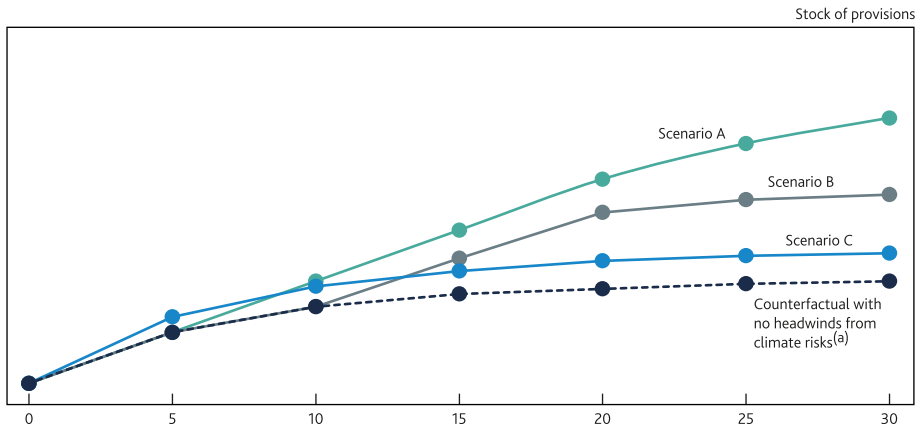
Under this approach, in the absence of shocks, the cumulative stock of provisions is expected to build up more quickly in the early part of the scenario (dashed line in **Figure 1**). This is because the overall stock of non-credit impaired assets shrinks over time; and because the proportion of lower-quality assets in the non-impaired stock is likely to fall. Hence, this approach is expected to be less useful for comparing the extent of credit risk in different reporting periods in the same scenario. This approach will, however, allow the Bank to focus on comparing the risks to existing balance sheets under different scenarios, without the complication of analysing assumptions around balance sheet dynamics over time.

(2) For banks, the implementation of the fixed balance sheet assumption is similar to that applied in the European Banking Authority's EU-Wide Stress Tests.

(3) Throughout this document, benchmark pathways for variables that might be expected in the absence of physical or transition risks are referred to as 'the counterfactual' or 'counterfactual pathways'. To get counterfactual Gross Value Added (GVA) paths, participants can use starting GVA levels for Year 0, and assume each sector grows at the same rate as the counterfactual GDP.

(4) The initial 10-year period of the Late Action scenario has limited transition risks because the bulk of the net zero transition policies are introduced later on in the scenario. In addition, this period has little physical risks compared to the later periods. And looking through the first five years of the scenario helps reduce the most significant impacts of the Covid-19 crisis on the counterfactual.

**Figure 1: Illustrative example of how the cumulative stock of provisions builds up over time under the fixed balance sheet guidance**



(a) Even though the exact size and nature of risks from climate change is uncertain, some combination of physical and transition risks will materialise in the future with a high degree of certainty. The counterfactual pathways that might be expected in the absence of climate risks are therefore purely hypothetical.

## Insurers

Where a balance sheet measure is being stressed, participants should treat the stress as an 'instantaneous shock'. This means re-evaluating asset prices based on the prevailing conditions at each point in the scenario – for example, incorporating information on the new carbon price, or new physical risk conditions, as well as macroeconomic conditions. This effectively assumes that climate risk is not 'priced in', at least not fully, in current asset prices.

Trend growth in variables such as equity prices or corporate profits would need to be 'stripped out' to isolate the impact of climate risk in the scenario. For example, baseline (or counterfactual) trend growth in variables such as property prices or corporate profits should not be modelled as reducing loan to value ratios or corporate income coverage ratios. The Bank has set out summary statistics for counterfactual paths of key variables in the published [variable paths](#). As per the advice for banking participants, to estimate the baseline trend growth for variables for which this has not been provided, participants should assume the trend paths from Years 6 to 10 of the Late Action scenario continue beyond Year 10.<sup>(5)</sup> For example, if corporate profits in a particular sector grow by an average of X% between Years 6 and 10, and by Y% between Years 11 and 15, then only (Y-X)% profitability growth should have an impact on interest coverage ratios between Years 11 and 15. Bond-like assets can be re-evaluated by assuming the contractual position is unchanged (issuer, coupon, duration etc) and reworking the rating and spread as a result of the new conditions for each projection point.

Liabilities can similarly be re-evaluated, assuming the same contractual obligations to policyholders, allowing for changes in the risk-free term structure, as well as any changes in the probability or level of cash flows arising from the crystallising physical risks. Where liabilities depend on the value of assets, they should also be adjusted for changes to the asset values.

This simplification means the exercise will ignore the complications of run-off of insurance books, and will reflect the position that insurers play in risk transfer, retirement provision and other forms of saving in the financial system as it is today.

(5) Throughout this document, benchmark pathways for variables that might be expected in the absence of physical or transition risks are referred to as 'the counterfactual' or 'counterfactual pathways'. To get counterfactual GVA paths for other variables, participants can use starting GVA paths for Year 0, and assume each sector grows at the same rate as the counterfactual GDP. This early period of the Late Action scenario has limited transition risks because the bulk of the net zero transition policies are introduced later on in the scenario. In addition, this period has little physical risks compared to the later periods. And looking through the first five years of the scenario helps reduce the most significant impacts of the Covid-19 crisis on the counterfactual.

## All participants

### Foresight

In general, for the purposes of producing their quantitative loss projections, all participants can assume foresight of the variables provided for the later years in the scenario to the extent that it is relevant to the residual maturity of exposures.<sup>(6)</sup> However, one exception is that participants should not assume foresight of the shock that occurs in 2030 in the Late Action scenario, consistent with the narrative.

Similarly, participants should not assume perfect foresight of future scenario variables when producing their management actions. Participants should instead formulate their management actions as if they were observing the scenarios unfold in real time, and updating their expectations about the future accordingly.

### Exceptions to the fixed balance sheet rule

Section 4 provides guidance around balance sheet items where the fixed balance sheet assumption might impede the understanding of the underlying vulnerability to climate-related risks. The key exceptions to the fixed balance sheet assumption are in modelling energy efficiency risks to the housing and CRE stock (Section 4.3) and car finance residual value risk (Section 4.4).

Participants will also be able to account for the mitigation and adaptation plans of individual large counterparties, if these plans are highly likely to be completed (as set out in Section 3.5).

## 3.4: Treatment of coronavirus government guarantee schemes

The fixed balance sheet assumption applies as follows to any coronavirus government loan schemes on participants' balance sheets:

Extent of government guarantee in Covid-19 schemes	Treatment in CBES
Fully guaranteed loans (eg BBLS in the UK)	Excluded from the scope of CBES (both from Actual and from Projection submissions).
Partially guaranteed loans (eg CBILS and CLBILS in the UK)	Included in the scope of CBES. Participants should assume that after the guarantee expires, the loan is refinanced with the same terms but without the guarantee.

The same rules apply whether the coronavirus government loans schemes are in the UK or in other countries.

## 3.5: Accounting for counterparty climate mitigation and adaptation plans

In the [data templates](#), participants should not account for individual counterparty climate adaptation plans unless there is evidence these adaptation plans are already being implemented and CBES participants judge their completion is highly likely.

Section 4.2 outlines detailed guidance for treatment of adaptation plans of corporate counterparties, to help participants assess counterparties' adaptation strategies in terms of their credibility and effectiveness. Section 4.2.7 of the [Key elements document](#) includes more detail on the assumptions on flood defences.

## 3.6: Management actions of participants

Participants are asked to consider the management actions they would take in response to the scenarios. These will be recorded in two structured templates, separate from participants' fixed balance sheet projections.

(6) For banks' modelling of credit provisions, this is similar to the perfect foresight approach in the annual cyclical scenario under IFRS 9.

In the first of these structured templates, participants are asked to set out each action they would take to mitigate risks and respond to new business opportunities in each scenario. Participants will choose from a menu of possible actions, including, for example, adjusting the size and pricing of different exposures, instead of reporting actions separately split by, for instance, each country or counterparty. Participants will report the estimated impact of their proposed management actions on losses and exposures. Participants should also indicate at which reporting point in the scenario they would take the action, and provide a high-level description.

For participants' most material actions, they are asked in a second structured template for additional detail, for instance any disclosures they would make as a result of the action, and any dependencies. Participants are free to define their most material management actions as they choose. For example, this could take into account of the impact on cumulative provisions (for banks), asset and liability values (for insurers), overall business models as well as any other relevant factors.

The qualitative questionnaire supplements these structured templates. It gives participants the opportunity to provide more detail on their overall approach to management actions and the judgements made in determining them.

Participants' management actions should be provided using the same assumptions around counterparty adaptation as used elsewhere (that to be included in their pre-management action projections, adaptation plans must be under way and highly likely to be completed). Participants will though, have an opportunity to describe those counterparty adaptation plans which, on the balance of probability would be expected to mitigate losses, even if these plans do not meet the 'under way and highly likely' standard .

Participants' pre-existent management actions might also be included in the management actions worksheets if they are relevant to the results. However, where these ongoing management actions are expected to affect the size or the composition of future balance sheets, they should not be reflected in the projections reported in any other data templates (which are reported under a fixed balance sheet assumption, using end-2020 balance sheets).

Participants are asked to record the impact of specific management actions on drawn balances in the structured templates. Participants should calculate the drawn balance impact as the change in the sum of defaulted and non-defaulted balances as a result of taking the specific action.

Participants are asked to record the impact of specific management actions on cumulative provisions in the structured templates. This should be reported relative to the pre-management action results provided in the other structured templates. In these pre-management action templates, participants are not required to model new lending and existing loans are assumed not to mature. For the purposes of reporting management actions, however, participants should consider new lending. Any plans to rebuild non-defaulted books via increased new lending, or plans to reduce new lending to reduce the size of books over time should be reported as management actions.

# 4: Modelling approaches

This section sets out the way in which participating banks and insurers should assess the impact of the CBES scenarios on their balance sheets. In particular, it provides further detail on the data the Bank intends to provide, how participants should use that, and describes some key transmission channels from climate risks to losses across different asset types. These transmission mechanisms are summarised in Box A.

The Bank intends for the CBES to be a learning exercise. Expertise in modelling climate-related risks is in its infancy. Consistent with this, while participants should be confident in the outputs of models used for the CBES and should have applied appropriate model governance, the Bank's expectations for model validation by participants are lower for the CBES exercise than for the Solvency Stress Test.

## 4.1: Modelling of physical risks

### Physical risks scenario expansion

The following principles should apply to the scenario expansion for physical risks variables.

- The Bank has specified end-of-century warming levels in each of the scenarios, as well as warming levels in different scenario periods (**Table 4.A** and the published [variable paths](#)). The Bank has also specified high-level summary statistics for a set of hazard indicators ('benchmark data'). The list of these benchmark variable names is provided in **Table 4.B**; their values are specified in the direct physical risk template.
- The Bank has also provided links to open source climate data ('optional climate data') that are consistent with these warming levels to support participants' analysis in Annex 2. A list of variable names is included in Annex 2. This set of climatic data is aligned with the warming levels in each CBES scenario. Participants are required to undertake scenario expansion to cover all material perils and territories (see **Table 4.C**).
- In recognition of the heterogeneity of tools likely to be used by participants, participants are allowed to use their own climate data, **so long as these are consistent with the warming levels (Table 4.A) and benchmark data (Table 4.B) specified by the Bank.**

**Table 4.A: Global mean warming outcomes in key scenario periods (refer to published variable paths for full trajectory)**

Reporting period	Year 0 (2020)	Year 10	Year 30	2100
Early/Late Action <sup>(a)</sup>	1.1°C*	1.4°C*	1.8°C*	1.6°C
No Additional Action <sup>(b)(c)</sup>	1.1°C	2.5°C*	3.3°C*	4.1°C

Note: the asterisks indicate those scenario periods and global warming temperatures that participants are expected to use for model calibration. Differences relative to the benchmark data supplied should also be reported for these periods.

(a) Source: Global warming level projection based on 50th percentile NGFS climate scenarios.

(b) Source: Global warming level projection based on 90th percentile NGFS climate scenarios.

(c) The No Additional Action scenario is calibrated based on the physical risks that might be expected to materialise in the period from 2050 to 2080 if no further policy action were taken. Participants should assume that the shift to 2.3°C occurs on Day 1 of the No Additional Action scenario.

The Bank sets out summary statistics for the benchmark data presented in **Table 4.B** for several material geographies (Canada, China, France, Germany, HK, Japan, UK and US) in Section 4 of the [Key elements document](#). Recognising the complexity and multiple stages involved in physical risk modelling, the benchmark variables are split into 'primary variables' that are more central to the scenario narratives and typically an input to hazard models; and 'secondary variables' that typically are the outputs of hazard

models. Participants that choose to use different climate data to that provided by the Bank are asked to calibrate their tools to match at least three of the primary benchmark variables and report all other primary and secondary benchmark variables relevant to their balance sheets. Where applicable, the selection of primary benchmark calibration variables should be coming from the same data source. Where the calibration process includes the selection of Representative Concentration Pathways (RCP) within models, participants can choose the RCP whose impact is most closely aligned to the benchmark variables that the Bank has issued in **Table 4.B**.

Participants will be required to specify the variables they used for each scenario (Early/Late Action and No Additional Action), reporting period (Year 0, 10 and 30, where Year 0 is the same across the three scenarios), and material countries of exposure. Participants can choose to provide different variables for their projections of different asset types that the template is applicable to – Tier 1 counterparties (for Banks and life insurers) or GI Liabilities (for general insurers) and 'Other asset type' (eg mortgages). Participants that wish to draw on the NGFS scenario database for additional variables should consider that the CBES scenarios have been based on building blocks from the NGFS as specified in Annex 1.

**Table 4.B: Benchmark data for physical risks variables<sup>(a)</sup>**

Risk category	Variable	Unit	Benchmark category	Data provider for UK	Data provider for other material countries (eg US, China etc)
Temperature	Near-Surface Air Temperature: change in annual average	degrees Celsius	Primary	Met Office	NGFS
Temperature	Near-Surface Air Temperature: change in daily max	degrees Celsius	Primary	NGFS	NGFS
Rainfall	Precipitation rate: change in average summer and winter	% change	Primary	Met Office	NGFS
Rainfall	Precipitation rate: change in annual average	% change	Primary	Met Office (UKCP regional projections)	NGFS
Rainfall	Precipitation rate for London: annual average	% change	Primary	Met Office	NGFS
Sea-level rise	Sea-level rise at the Southend gauge (51.5167N, 0.7333E): change in average annual	metres against baseline	Primary	Met Office	N/A
Sea-level rise	Sea-level rise: change in average annual	metres against baseline	Primary	Met Office	Oasis Hub
Windstorm	Near-Surface Wind Speed: change in daily max	% change	Secondary	Oasis Hub	Oasis Hub
Windstorm	Near-Surface Wind Speed: change in annual average	% change	Secondary	Oasis Hub	Oasis Hub
Windstorm	Tropical cyclone: change in frequency of Category 4–5 tropical cyclones, change in intensity, and change in precipitation rates	% change	Secondary	Knutson <i>et al</i> (2000) <sup>(b)</sup>	Knutson <i>et al</i> (2000)
Agricultural yield	Land area exposed to crop failure: change in annual average	% change	Secondary	NGFS	NGFS
Wildfire	Land area exposed to wildfire: change in annual average	% change	Secondary	NGFS	NGFS
Heatwave	Land area exposed to heatwave: change in annual average	% change	Secondary	NGFS	NGFS
Soil moisture	Soil moisture: change in annual average	% change	Secondary	NGFS	NGFS

(a) Met Office and Oasis Hub use baseline period 1981–2000. NGFS uses baseline period 1986–2005. The impact of this baseline difference is expected to be small. Knutson *et al* (2000) paper uses varied baselines for different windstorm variables which can be found in the paper.

(b) Knutson *et al* (2000), 'Tropical cyclones and climate change assessment: Part II: Projected response to anthropogenic warming', *Bulletin of the American Meteorological Society*.



In recognition of the fact that exact matching of participants' modelled output to benchmark values may not be possible, even with a reasonable degree of effort, participants are asked to report in the direct physical risk variable reporting template the values they applied for all benchmark variables relevant to their balance sheets.

In the qualitative questionnaire, participants will also provide high-level information on what models and inputs they have used when performing scenario expansion (ie a series of models to expand emissions pathways to physical damages). They will also describe any material divergences between the optional climate data provided and any climate projections or hazard indicators used in their modelling of losses, along with the likely impact of these divergences on their results.

### Description and caveats to the physical climate data

The Bank has provided physical climate data (both optional climate data and benchmark data) using three different open sources and made a series of assumptions to ensure that they align with the CBES scenarios. Annex 4 contains a description of the data and related caveats.

Users should appraise the limitations of the data prior to expanding and using the projections.

### Estimating the impact of physical risks

Participants should use physical risk variables (in addition to macroeconomic and financial scenario variables) when estimating the impact of chronic and acute physical risks on:

- residential and commercial properties (whether in the UK or in other countries where participants have material exposures); and
- counterparties assessed at counterparty-level.

Participants may choose to perform detailed assessment of physical risks at the beginning of the scenario, in Year 10, and at the end of the scenario only, and linearly interpolate between those points.<sup>(1)</sup> If they choose to do so, they should describe their methodology in the qualitative questionnaire.

The selection of climate-related perils to be included in the analysis should be based on the impact of climate change on the peril in question (ie climate signal) and on the geographic location of participants' exposures. Perils that might be considered as having a weak climate signal in a given territory under current climate conditions may become more material under future conditions. Participants are invited to comment on the appropriateness of the tools they are using to assess current and future climate in the qualitative questionnaire.<sup>(2)</sup>

**Table 4.C** presents a selection of perils/territories with material climate signal by year 2080 under a 3.3°C global warming level, based on a review of academic literature and industry consultation (this projection point is equivalent to 2050 in the calibration of the No Additional Action scenario, as explained in Section 4.3.1 the Key elements document). The materiality of the signal is a function of current understanding of the peril at a national level and hence the table should be used indicatively to drive materiality analysis. Participants should formulate their own view of materiality based on the asset distribution and – where necessary – extend the list to other perils/territories where their own assessment indicates a material climate signal. Justification of the materiality assessment is captured as part of the qualitative questionnaire. For detailed modelling (eg for Tier 1 corporate counterparties) participants will also need to provide information on the perils and regions they considered as part of their assessment.

(1) The periods where the analysis is performed at a detailed level should be consistent with the reporting requirements. All participants should perform detailed analysis in Year 10 and Year 30. Insurers should also perform detailed analysis in Year 0. For banks, the first reporting period for projections is either Year 5 or Year 10 (depending on the template).

(2) For more details, see Figure 5 in A framework for assessing financial impacts of physical climate change.

**Table 4.C:** List of peril/territories with material climate signal by 2080 under a 3.3°C global warming level<sup>(a)</sup>

Country	Inland flooding	Drought/ heatwave	Severe weather (eg convective storm)	Sea-level rise	Storm (tropical, extra-tropical cyclone, including coastal flooding)	Wildfire
UK	Yes	Yes		Yes	Yes	
China	Yes	Yes	Yes	Yes	Yes	
Japan	Yes			Yes	Yes	
Canada	Yes			Yes	Yes	Yes
EU	Yes	Yes	Yes	Yes	Yes	Yes
US	Yes	Yes	Yes	Yes	Yes	Yes
Taiwan	Yes			Yes	Yes	
Singapore				Yes	Yes	
Indonesia	Yes			Yes	Yes	
South Korea	Yes	Yes		Yes	Yes	
South Africa	Yes			Yes		
Mexico	Yes	Yes		Yes	Yes	
Russia	Yes					
Brazil	Yes			Yes	Yes	
Australia	Yes	Yes	Yes	Yes	Yes	Yes
Argentina	Yes			Yes	Yes	
India	Yes	Yes		Yes	Yes	

(a) 2080 translates to 2050 in the calibration of the No Additional Action scenario.

### Assumptions on flood defences

As outlined in Section 4.2.7 of the [Key elements document](#), the assumptions on flood defences will result in the standard of protection offered deteriorating in the scenarios as the risk of flooding increases. **Table 4.D** provides a benchmark indication of the potential change in standard of protection under the different climatic conditions explored in CBES. Participants are expected to calibrate their models against this benchmark or use third-party data where that is more representative of the different flood defences across UK floodplains.<sup>(3)</sup> Participants are required to report their approach in the [qualitative questionnaire](#).

**Table 4.D:** Benchmark indication of the change in UK flood defences' standard of protection under different climatic conditions explored in CBES

Scenario – year	Proposed	
	Global warming level	Change in Standard of Protection from current (2020)
Early/Late Action – Y30	1.8°C	-33%
No Additional Action – Y10	2.5°C	-50%
No Additional Action – Y30	3.3°C	-66%

(3) 'Impact of climate change on asset deterioration'.

## Box A: Summary of key transmission mechanisms

When producing their loss or provisions estimates, participants **should consider the main climate-specific transmission mechanisms as discussed in the sections that follow and outlined in Table 1**. This is not an exhaustive list and participants are encouraged to expand their modelling to include further mechanisms they deem to be material. Participants are invited to provide details of their methodology for projecting losses by asset type in the [qualitative questionnaire](#).

**Table 1: Summary of key transmission mechanisms participants should consider**

Asset type	Transmission mechanisms participants should consider
Property exposures (eg domestic and international mortgages, CRE)	<ul style="list-style-type: none"> <li>• Changes in energy prices, affecting gas and electricity bills.</li> <li>• Low energy efficiency, leading to property price discounts and costs to retro-fit properties to required standards.</li> <li>• Increased physical risks (flooding and subsidence for the UK), leading to property price discounts, costs to repair physical damage and increased insurance premiums.</li> <li>• Participants should also consider indirect impacts from wider economic developments (eg due to unemployment, shocks to inflation, lower productivity, depleting capital stock, supply shock, labour supply impacts, lower consumption/investment, etc).</li> </ul>
Corporate exposures (Tier 1 counterparty-level analysis)	<ul style="list-style-type: none"> <li>• Direct costs to counterparties from physical damage.</li> <li>• Disruption to supply chains and employees, forced facility closure and/or increased insurance premiums.</li> <li>• Cost and price shifts.</li> <li>• Stranding of assets due to physical or transition risks materialising.</li> <li>• Legal liabilities from failure to mitigate or adapt.</li> <li>• Participants should also consider indirect impacts from wider economic developments (eg due to unemployment, shocks to inflation, lower productivity, depleting capital stock, supply shock, labour supply impacts, lower consumption/investment, etc).</li> </ul>
Corporate exposures (Tier 2 analysis)	<ul style="list-style-type: none"> <li>• The transmission pathways under 'Tier 1' have been taken into account when developing sectoral GVA pathways. These pathways should be used when modelling Tier 2 exposures.</li> <li>• For some (groups of) counterparties, participants may have access to additional individual or sector-level information to inform their assessment of relevant transmission mechanisms. In these cases, participants could use this information to complement the sectoral GVA approach.</li> </ul>
Consumer credit	<ul style="list-style-type: none"> <li>• Residual value losses for car finance portfolios.</li> <li>• Contagion from non-consumer credit risks affecting borrowers (eg from flood risk or higher energy bills).</li> </ul>
Insurance Liabilities	<ul style="list-style-type: none"> <li>• Pass-through of asset-side transmission channels which affect liability valuation (including unit-linked, with-profits and matching adjustment).</li> <li>• Change in frequency and severity of claims through physical risks (General insurance liabilities)</li> <li>• Solvency II risk-free rate.</li> </ul>
Sovereigns	<ul style="list-style-type: none"> <li>• Macroeconomic impacts of climate risks on corporates and households reducing tax revenue and increasing government spending.</li> <li>• Depletion of natural resources impacting the long-term sustainability of government finances.</li> <li>• Increased government spending to adapt and mitigate climate-related risks, including government to intervention to support financial systems affected by climate change.</li> <li>• Impact of disrupted global trade flows on international capital flows.</li> <li>• Government-owned businesses and assets may be less profitable or lose value, either due to transition or physical risks crystallising.</li> </ul>

## 4.2: Corporate exposures (eg bank corporate loans and life insurer investment assets)

Participants' aggregate corporate projections should reflect a weighted average of results modelled at counterparty level (Tier 1) and at portfolio level (Tier 2).<sup>(4)</sup>

Participants have been provided with sectoral Gross Value Added (GVA) pathways. These GVA paths reflect the value of goods and services produced by companies in each sector. Participants should use these paths to inform their modelling of turnover, profits and impairments for their corporate counterparties in different sectors.<sup>(5)</sup> As outlined below, participants should use these paths in their Tier 2 analysis, and could also use them for Tier 1 counterparties as appropriate.

### Counterparty-level analysis (Tier 1)

The Bank considers high-quality counterparty-level analysis essential for assessing the financial impacts from climate change. Thus, the Bank has set out its minimum expectations of the coverage for counterparty-level analysis for participants in the CBES. For banks and life insurers, this should include **at least 100 largest and most material corporate counterparties**, where those exposures are greater than £10 million.<sup>(6)</sup> **However, participants are strongly encouraged to extend the detailed analysis to more corporate counterparties than their top 100**, consistent with expectations set out in Supervisory Statement 3/19 and the Dear CEO letter dated 1 July 2020 which should be embedded by end-2021.

In the qualitative questionnaire, participants are asked about **the proportion of their corporate exposures that they were able to analyse in sufficient depth at counterparty-level**. Participants should include all such counterparties analysed in the Counterparty projections template.

For their counterparty-level analysis, information and approaches participants are encouraged to use include, for example:

- cash-flow analysis;
- publicly reported firm-level data;
- data counterparties publish to meet the recommendations by the Task Force on Climate-related Financial Disclosures; and
- detailed climate scenario variables for transition and physical risks.

Participants are also particularly encouraged to engage with their counterparties directly as far as possible to support this analysis. However, there may be some counterparties that participants are unable to have direct conversations with, instead basing their analysis solely on third-party analysis and public data. In the description of their methodology provided as part of the qualitative questionnaire, participants should indicate the proportion of their counterparties with which they were able to engage directly.

For Tier 1 counterparties, participants should consider how their counterparties' income, costs and operations will be affected by the scenarios. Participants should consider the following climate-specific transmission mechanisms as, appropriate:

- increased likelihood of physical damage to property and assets, including where these assets act as collateral;
- disruption to supply chains and employees, and/or forced facility closure;

(4) For example, as captured in the worksheets Wholesale projections (for banks) and Asset sector summary (for insurers).

(5) For financial and insurance services (NACE code K), the paths for GVA over the past reflect the value of services produced by companies in those sectors, as measured by the Office for National Statistics. Over the projection period, however, the published GVA paths for these sectors include in addition an estimated effect from changes the prices of investments those companies hold in non-financial firms. The intention is to provide participants with a better sense of how financial firms' turnover and profitability might be affected in each of the scenarios.

(6) These requirements are set out in detail in Data Guidance accompanying the relevant templates.

- increased insurance premiums for assets or business lines with high exposures to physical risk events;
- cost and price shifts for certain products or services;
- assets that become stranded as a result of policy change; and
- potential legal liabilities from failure to mitigate or adapt.

Participants have the opportunity to give details of their methodology for projecting losses by asset type in the [qualitative questionnaire](#).

This guidance applies to corporates in all sectors, although the Bank recognises complexities involved in the modelling of risks to counterparties in different sectors will vary. For example, for counterparties in the Financial Institutions (FI) sector, participants might consider the following:

- Concentration of the exposures of the FI's portfolio, eg to sectors or geographies most at risk in different climate scenarios.
- The quality of the FI's disclosures.
- Physical risks to the FI's headquarters and other key assets.

In order to quantify the impacts from physical risk on their corporate exposures using spatially granular climate data, participants could use climate impact models (eg natural catastrophe models) or similar. Participants should strive to undertake a materiality assessment and quantify the impact on the counterparty for all relevant hazards and regions. This should involve a detailed assessment of the impact of the scenario on counterparties' physical assets, supply chains and/or employees (on a best efforts basis). The Bank recognises that this may be challenging for participants given their current capabilities. Participants should record key data and modelling gaps they find in conducting this analysis in the appropriate section of the [qualitative questionnaire](#).

Participants should primarily use individual counterparty-level information when analysing their Tier 1 exposures. This analysis should take place in the context of the economy-wide macroeconomic and physical risk variables set out for each scenario. Participants could choose to complement this information with the sectoral GVA paths provided to help inform their judgements, but should consider that sectoral GVA paths may not be representative for individual counterparties. For example, the GVA path for the Electricity Supply sector reflects that initially, this sector mostly comprises fossil-fuel based electricity supply but gradually includes more renewable electricity supply. As a result, the GVA path for this sector does not provide a good basis for an analysis of fossil-fuel based power plants.

The Bank will assess the capability of individual participants to analyse their large counterparty exposures. The Bank will consider the extent to which it is appropriate to publish this assessment with the CBES Results.

### Treatment of Tier 1 corporate adaptation plans

**For the purposes of their individual counterparty projections, participants should not factor in a corporate's climate adaptation plans unless the corporate in question is already implementing its plan and it is highly likely it will be completed.** The criteria participants should use to judge whether these conditions are met are as follows:

- Adaptation plans should be public commitments from the counterparties (although stated intent is not sufficient).
- For plans to be 'currently being implemented', the key technologies should already be in use and key products or resources should already be sourced. This should be judged as at the balance sheet cut-off date of end-2020. If a plan requires implementing new functions or significant changes in business strategy, the plan is not 'already being implemented'. Plans for meeting targets cannot rely on, for

instance, outcomes of Research & Development that have not been realised yet, even if this Research & Development is funded or under way.

- Participants are expected to make judgements about whether the plans are 'highly likely to be completed'. Participants should consider as a minimum: performance against interim targets, the credibility of future plans and targets including an appropriate level of granularity in strategies for how targets will be met, the credibility of strategies for achieving future targets, and whether a counterparty has considered any adverse effects of putting the plan into practice. Only plans that the participant judges are 'highly likely to be completed' should be factored into projections.
- The impact of future regulatory changes should not be factored into Tier 1 counterparty projections 'by default', even if counterparties have a history of complying with regulation; and regulation changes affect future climate adaptation. The same high bar for accounting for adaptation plans applies to counterparties in regulated sectors.
- Participants might break down proposed adaptation plans into key targets across business lines, climate strategies or timeframes. Judgements on whether completion is 'highly likely' and the plan to achieve the target is 'currently being implemented' can differ across different climate-related targets from the same counterparty.
- Longer-term plans are less likely to meet the requirements set out in this guidance and thus less likely to be factored into participants' projections.
- If participants decide to factor in the adaptation plans, the costs of continuing to implement the plan should also be factored into projections, as well as the benefits.

**The Bank recognises that these criteria are only likely to be fully met in a small number of cases, and so there may be many corporate adaptation plans which are not factored in to participants' projections. It is particularly unlikely that participants will be able to judge longer-term adaptation plans as a) already being implemented, and b) highly likely to be successfully implemented.**

Annex 3 sets out worked examples of how this guidance might work in practice.

In the Counterparty\_projections template, there is a free-text field (up to 2,000 characters), which participants should use to provide further details on each of the largest counterparties' vulnerability to climate risks. This should also include which of the counterparties' adaptation plans were accounted for in the participants' estimates (as advanced and highly likely to be completed) and which adaptation plans were considered more uncertain. Participants may also choose to describe in this field any management actions related to the counterparty which they anticipate they would take in the absence of the 'fixed balance sheet' assumption (this is optional).

In the [qualitative questionnaire](#), participants will also have an opportunity to describe how they accounted for counterparties' adaptation plans more generally.

### Thematic analysis (Tier 2)

For their thematic modelling, participants should draw on the published macroeconomic variables, including the sectoral GVA paths when modelling the CBES impact on their balance sheets. Participants might also undertake further scenario expansion where required. For instance, the Bank has only published GVA paths for the UK given underlying data availability. The relative impacts on different sectors in non-UK geographies might differ.

For Tier 2 corporates participants are not required to consider adaptation plans of individual counterparties, as this would be infeasible. Instead, participants might infer an amount of adaptation based on the relevant sectoral GVA paths to be provided with the scenarios.

For some Tier 2 counterparties, participants may have access to additional individual or sectoral-level information to inform their analysis or view on adaptation plans. In these cases, participants could use this information to complement the sectoral GVA approach.

When reporting aggregate results, participants will take into account the results from their counterparty-level analysis (Tier 1) and thematic analysis (Tier 2). Participants will describe their approach to counterparty and thematic analysis of corporate counterparties in the [qualitative questionnaire](#).

### 4.3: Residential and commercial mortgages

Participants will assess the impact on their commercial and residential mortgage exposures based on their vulnerability to transition risks and physical risks.

- The key transition risk participants will consider is costs related to the transition of properties to higher energy efficiency standards. Specified macroeconomic variables such as changes in real household income and unemployment will also have an impact.
- The key physical risk participants will consider for UK properties are from flooding (both coastal and inland). Properties in other countries may also be exposed to other physical risks.

This section gives guidance for banks on assessment and reporting of residential and commercial mortgages. Life insurers may also have material holdings of commercial mortgages and equity release mortgages. Although insurers do not have to complete the detailed mortgage templates which apply to banks, they may find this section useful to their assessment, since there will be considerable overlap in the transmission channels, and how climate risks will be felt in the probability of default, underlying property value or any no-negative-equity-guarantee (NNEG). Detailed modelling may be required because the average movement in the property index will not capture the distribution across individual properties. Losses will be concentrated in vulnerable parts of the portfolio, and the impact on (for example) NNEG could be very non-linear.

#### Energy efficiency risks

Participating banks are asked to report their starting balances of UK residential and commercial properties split by Energy Performance Certificate (EPC) Rating. Banks should estimate the EPC rating for the part of the portfolio where that is unavailable. This could be based, for example, on build year, EPC ratings of nearby properties, and other property characteristics. Banks will describe their methodology for estimating Year 0 EPC ratings in the [qualitative questionnaire](#). They should also describe reasons for any instances where it was not possible to estimate EPC ratings.

In the Early and Late Action scenarios, participating banks are also asked to report projections of provisions on their UK residential mortgage exposures split by EPC Rating. Banks will describe their methodology and assumptions in the [qualitative questionnaire](#) (eg consideration of how different properties face different level and type of transition risks).

To support participants with the modelling of the energy efficiency policies set out in Box B of the [Key elements document](#), Annex 4 sets out paths for the evolution of EPC ratings of the UK housing and CRE stock through the scenarios, and associated policy assumptions. Participants should identify any material sensitivities in their projections to the assumptions set out in this section and Annex 4 in the [qualitative questionnaire](#).

Participants should consider how the following transmission mechanisms may impact losses, particularly in the Early and Late Action scenarios.

- The impact on increased energy prices on debt serviceability. This may be offset by reduced energy usage as a result of improved EPC ratings.
- The impact on debt serviceability as a result of the costs of retro-fitting properties (given the policy assumptions set out in Box B of the [Key elements document](#)).
- The impact on property prices for lower EPC properties relative to high EPC properties, including properties that become unmarketable due to being unable to upgrade from the lowest EPC ratings.

## Flood risk

In the No Additional Action scenario for participating banks, and all scenarios for participating insurers, participants will report projections on their UK residential mortgage exposures at a regional granularity of the postcode district (also known as 'outward code', which is typically four characters in length for the list of postcode districts).

The CBES scenarios will specify the level of residential property insurance coverage at national level; but will not include a regional or demographic breakdown of coverage. For their quantitative projections, banks and life insurers with material mortgage portfolios should use the level of residential property insurance coverage<sup>(7)</sup> specified in **Table 4.E**.

**Table 4.E: Proportion of residential properties with property insurance coverage in the scenarios**

	Year 0	Year 10	Year 20	Year 30
Early Action	95%	95%	95%	95%
Late Action	95%	95%	95%	95%
No Additional Action	95%	95%	92%	90%

They will need to assume that the UK-wide insurance coverage as specified in the scenario applies to their overall mortgage portfolio on average; but participants will need to form a view on how insurance coverage might differ for different postcodes or different sections of the portfolio (eg mortgages in arrears may have lower insurance coverage). The participating banks are asked to explain how the insurance coverage applied for their projections varied for different parts of their portfolio.

Participants are required to report the proportion of their mortgage and CRE portfolios be affected in the event of a 1 in 100 physical risk event as part of the [data templates](#). Participants should fill this out for Year 0 as well as the projection periods. Where participants do not have actual data for these Year 0 variables, they should provide modelled estimates, as for the other projection periods.

Participants have been provided with variables for precipitation and sea-level rise that can be used to understand the flood risk faced by different areas of the UK (both coastal and inland). Participants are expected to model flood risk at four-digit postcode level for reporting purposes, but may choose to model risks at an even more granular level. Modelling should account for the following factors:

- direct costs to property owners as a result of repairs required due to flooding damages;
- reduction in property value as a result of flood events, or as a result of an increased risk of flood events for properties exposed to flood risk relative to those with low exposure to physical risks (including the risk that some properties become unliveable/stranded); and
- increased insurance premiums as a result of an increased risk of flood events, including the risk of some properties becoming 'uninsurable' (only for mortgages, not CRE).

(7) Insurance coverage is defined as (count of properties insured to 100% of buildings and contents)/(number of properties).



Participants could also consider relevant indirect impacts, such as impacts on productivity, labour supply, and inflation (particularly in energy and food costs).

The Bank acknowledges that participants' data on their CRE exposures may not be as geographically granular as it is for household mortgages. Participants may therefore need to base their analysis of the risks to CRE exposures on high-level assumptions, which they should outline in the [qualitative questionnaire](#).

Participants should identify any material sensitivities in their projections to the assumptions set out in this section in the [qualitative questionnaire](#).

### Non-UK exposures

As described in Section 4 of the [Key elements document](#), other jurisdictions are likely to face a different set of climate-related risks to the UK. For the most part, analysis of non-UK exposures is not expected to be as granular as for UK exposures. But the granularity of the analysis is expected to be proportionate to both the materiality of the exposures and the risks facing that jurisdiction.

## 4.4: Consumer Credit

### Car finance

For participants with direct car finance lending exposures, the key climate-related risk to consumer credit portfolios will be residual value risk as a result of the transition from Internal Combustion Engine Vehicles (ICEVs) to Electric Vehicles (EVs).

The UK government currently intends to ban the sale of new ICEVs from 2030.<sup>(8)</sup> This means that car finance lending will be required to transition from ICEVs to EVs. To capture risks from this transition, participants are permitted to assume that their portfolios transition from ICEVs to EVs, in line with the published [variable paths](#). Participants should assume that the composition of lending by engine type on new vehicles will transition in line with the paths for new vehicle sales provided. The composition of lending by vehicle type on used vehicles should reflect the paths provided on the composition of vehicles on the road.

Participants should assume that other characteristics of their car finance portfolios remain unchanged through the scenarios, prior to management actions. For example, the split of lending extended that is secured on new versus used vehicles should remain fixed. Used car price paths have been provided for ICEVs, EVs and Hybrids for each scenario. These paths should be used to estimate residual value risk to participants' exposures. In pre-management action projections, the buffer between estimated residual values and guaranteed future values should remain fixed – it should not widen or narrow in response to the outlook for used car prices. In other words, the changes in used car prices specified in the scenarios should be treated as unforeseen by participants. Reasonable deviations from these assumptions could be considered as part of participants' management responses. Participants should identify any material sensitivities in their pre-management action projections to the assumptions set out in this section in the [qualitative questionnaire](#).

### Other consumer credit

Participants should also consider whether their consumer credit portfolios are exposed to other climate-related risks. For example, the consumer credit debt held by mortgagors may be affected by climate risks affecting the mortgage market. Relatedly, some individuals with consumer credit debt may face repayment pressures as energy bills increase in the scenarios.

(8) On 18 November 2020, the UK government announced the end of the sale of new petrol and diesel cars in the UK by 2030, and hybrid vehicles by 2035.

## 4.5: Insurance Liabilities

Participants need to re-evaluate the liability side of the balance sheet, with a focus on the Solvency II Best Estimate Liabilities (and 'Technical Provisions as a Whole' where this is used). Best Estimate Liabilities are calculated using a probability-weighted discounted present value of future claims.

- General insurance participants will have modelled increased claims through the AAL (in the selected lines of business), and so this can be used to calculate a consistent change in Best Estimate Liabilities under the assumption.
- For life insurers, there are no explicit longevity or mortality shocks included within the CBES scenarios. Life insurers should make their own assumptions on lapse or policyholder behaviour consistent with the market movements in the scenario.
- Both types of participant will be affected by any change in the risk-free rate.

### Solvency II Risk-Free Rates

The scenarios include a Risk-Free Rate (RFR) to 20 years for each projection period and scenario. This should be assumed to be the Solvency II RFR for this exercise.

- For maturities beyond 20 year, participants are expected to expand the scenario from the 20-year maturity to the Ultimate Forward Rate (UFR).
- Participants should assume the 31 December 2020 UFR for all projection periods and scenarios.
- Extrapolation from the 20-year point to the UFR could be done using Smith-Wilson functions in the way that the Solvency II Technical Information is done, although simpler approximations are acceptable.
- For Year 0 (ie year end 2020) participants are expected to use the regular YE2020 Solvency II Technical Information yield curve provided by the Bank. This avoids the need to restate the starting balance sheet.

### Matching Adjustment Funds

In a Matching Adjustment Fund the value of liabilities depends on characteristics of the matching assets, including the **Spread**, **Credit Quality Step (CQS)** and **Fundamental Spread (FS)**. The scenarios provide the broad market credit spreads in each projection period and scenario.

- Participants are asked to determine the credit spreads of their in scope assets for each projection period and scenario, consistent with the circumstances in which the broad market has followed the credit spread provided in the scenarios.
- For individual counterparties in the Matching Adjustment Portfolio, participants are asked to provide CQS in addition to spread. The scenarios do not provide a market-wide change in CQS on which participants can condition, but the Bank does expect a market wide degradation in CQS where the average probability of default (PD) across the market over a three-year horizon has increased. This is consistent with definition of CQS as a measure of PD over a three-year horizon.
- Participants are expected to make a realistic assessment of how the PD over a three-year horizon has changed and update the CQS accordingly, rather than assume that credit spread movements are a short-term fluctuation that will not affect CQS. This is because the degradation in credit quality portrayed in the scenarios is a long-term and in most cases permanent degradation.
- For individual counterparties in the Matching Adjustment Portfolio participants are asked to provide FS in addition to CQS. Calculating the exact FS can be a complex calculation, so reasonable approximations to the FS calculation are acceptable.

## 4.6: Banks' Risk-Weighted Assets projections

The Bank's expectation of the sophistication of participants' approaches in modelling Risk-Weighted Assets (RWA) is lower than that for cumulative provisions estimates. As the CBES is not an exercise informing capital requirements, the RWA worksheet is only intended to capture approximate impacts. There is no 'RWA impact' variable in the Management actions worksheet – ie participants are only asked to estimate RWA projections prior to management actions.

## 4.7: Sovereign risk

Climate change can have a material impact on sovereign risk,<sup>(9)</sup> participants should consider this when forming their projections.

Several factors may reduce government creditworthiness and hence push up on government bond yields in the scenarios, with some more exposed sovereigns likely to be more affected than others:<sup>(10)</sup>

- the direct and indirect macroeconomic impacts of climate risks on corporates and households could reduce tax revenue and increase government spending (eg on welfare payments);
- the depletion of natural resources could impact the long-term sustainability of government finances;
- governments may be forced to increase spending to adapt and mitigate climate-related risks (eg increased spending on healthcare and infrastructure);
- risks to the financial system from climate (including via increased borrowing costs) may force some governments to step in to support their financial systems;
- disruption to trade flows could have impacts on international capital flows with some sovereigns affected by capital flight; and
- government-owned businesses and assets may be less profitable or lose value, either due to transition or physical risks crystallising.

**In addition, sovereigns could face exogenous shocks to borrowing costs, either as risk-free long-term interest rates rise, or investor risk aversion increases, which could lead to a further leg down in credit-worthiness.**<sup>(11)</sup> Relative climate vulnerability was taken into consideration by the Bank when providing indicative information on emerging market sovereign bond yields in Section 4.3.2 of the [Key elements document](#).

(9) SOAS (2020), *Climate Change and Sovereign Risk*. SOAS Centre for Sustainable Finance; Asian Development Bank Institute; World Wide Fund for Nature Singapore, Four Twenty Seven.

(10) Chen et al (2015), *University of Notre Dame Global Adaptation Index Country Index Technical Report*.

(11) BIS (2021), *Climate-related risk drivers and their transmission channels*, Basel Committee on Banking Supervision, Bank for International Settlements.

# 5: Banking data templates

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This part of the CBES data guidance document provides participants with all reporting guidance and coverage of the Banking and Insurance templates.

## Banking templates

This section provides detailed guidance on all templates and worksheets to be reported by banking participants, including coverage and any specific reporting instructions for these templates. Banking templates cover loans and advances and debt securities exposures that are held under accounting designations 'Financial assets at amortised cost' and 'Financial assets at fair value through other comprehensive income', excluding reverse repos and loans that are fully guaranteed by coronavirus government loans schemes (whether in the UK or elsewhere), eg Bounce Back Loans (BBLs). All covered bonds and securitisation positions are also excluded. For 'Financial assets at fair value through other comprehensive income', the exercise will only capture cumulative provisions on these assets; Other fair value movements (which would ordinarily be recognised in Other comprehensive income) should not be reported. More specific guidance on coverage for specific templates is listed below in **Table 5.A**. This is similar to the coverage for all Credit risk templates within the Stress Test Data Framework (STDF); the one difference is that loans that are fully guaranteed by coronavirus government loans schemes (whether in the UK or elsewhere) are out of scope in the CBES. No other assets than those listed above are in scope of these templates. Stocks should be reported as at the end of each projection period, eg Year 5 stocks as at 31 December 2025. Projection periods are defined in the CBES data dictionary. All metrics should be reported for all projection periods unless specified otherwise.

**Table 5.A: Balance sheet map of CBES banking templates**

Asset	Book	Accounting category	Actuals worksheet coverage	Projections worksheet coverage
	Trading book	Financial assets held for trading	Not in scope	Not in scope
	Banking book held at fair value	Non-trading financial assets mandatorily at fair value through profit or loss	Not in scope	Not in scope
		Financial assets designated at fair value through profit or loss	Not in scope	
		Financial assets at fair value through other comprehensive income		
		Equity instruments	Not in scope	Not in scope
		Debt securities	CRE_actuals	RWA Management_actions Top_5_management_actions Wholesale_projections Counterparty_projections Counterparty_risk_drivers CRE_projections
		Loans and advances	Loans and advances	RWA Management_actions Top_5_management_actions UK_mortgage_postcode_projections UK_mortgage_EPC_projections Mortgage_projections Consumer_credit_projections Wholesale_projections Counterparty_projections Counterparty_risk_drivers CRE_projections
	Banking book held at amortised cost	Financial assets at amortised cost		
		Debt securities	CRE_actuals	RWA Management_actions Top_5_management_actions Wholesale_projections Counterparty_projections Counterparty_risk_drivers CRE_projections
		Loans and advances	UK_mortgage_actuals UK_Car_finance_actuals CRE_actuals	RWA Management_actions Top_5_management_actions UK_mortgage_postcode_projections UK_mortgage_EPC_projections Mortgage_projections Consumer_credit_projections Wholesale_projections Counterparty_projections Counterparty_risk_drivers CRE_projections

## Template CBES banking actuals

The CBES banking actuals template captures actuals data across UK mortgage, UK car finance and global CRE exposures. Actuals data are collected to support analysis of CBES projections data. All data in these worksheets are to be reported as at 31 December 2020.

### Worksheet: UK mortgage actuals

This worksheet captures drawn balance from Retail mortgage asset types: Owner occupied and Buy to let, covering UK exposures only, split by EPC rating and Indexed LTV band. These data are collected in addition to what is requested in STDF, to obtain participants' stocks of exposures by EPC rating by LTV band. EPC ratings included in this template should include imputed ratings (ie where the data on actual rating was missing and participants estimated it using other proxies). Where participants are unable to produce a reasonable EPC estimate, this should be reported as 'N/A'.

### Worksheet: UK car finance actuals

This worksheet captures data on: UK car finance drawn balances; expected residual values of vehicles; and guaranteed future values of vehicles. These balances are split by: contract type (eg Hire Purchase or Personal Contract Purchase); engine type; and whether the vehicles are new, nearly new or used. All data should be reported where the asset type is car finance. This worksheet aims to capture the risk from the transition away from Internal Combustion Engine Vehicles by measuring the composition of lenders' books by vehicle type, and the vulnerability of different vehicle types to residual value risk.

### Worksheet: CRE actuals

This worksheet captures data on participants' CRE exposures globally, with a focus on capturing risks related to the transition to more energy-efficient properties (ie EPC rating risk). The two metrics collected are drawn balance and number of mortgages. These metrics are requested by country, LTV band and EPC rating (for UK properties only). EPC ratings reported in this template should include imputed ratings (ie where data on actual rating were missing and participants estimated the rating using other proxies). Where participants are unable to produce a reasonable EPC estimate, this should be reported as 'N/A'.

**Specific reporting instructions:** EPC rating should only be reported where Country of exposure = UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND. Individual countries should be identified in this template if they constitute 2% or more of a participant's CRE exposures as defined by Exposure for RWA. Wholesale and retail exposures should be considered separately when determining this threshold. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions. International organisations should be reported separately at all times. Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions.

## Template CBES banking wholesale projections

The CBES\_banking\_wholesale\_projections template captures data across a range of different asset types, geographies and industrial sectors. Projections data are collected to allow comparison between participants and to analyse sector-wide vulnerabilities. Projections for the cumulative stock of provisions will be collected for each projection period for all three scenarios, as well as a collection of other metrics relevant to climate change related risk.

In each worksheet, individual countries should be identified in this template if they constitute 2% or more of a participant's wholesale exposures as defined by Exposure for RWA. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions. International organisations should be reported separately at all times. Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions. Similarly, there should be no double counting in the reporting of data by industrial classification.

Data should be reported by Standard Industrial Classification (SIC) codes. The list is split by all SIC level 1 sectors and some SIC level 2 sectors where these are particularly relevant for climate-related risks. Please see the individual enumeration descriptions for the exhaustive list of sectors.

### Worksheet: Wholesale projections

This worksheet captures data on a participant's wholesale exposures and the stock of cumulative provisions that participants project throughout each scenario and projection period. These metrics are split by asset type, industrial classification and country. Results reported in this template should be a weighted average of Tier 1 exposures reported in the Counterparty projections worksheet and Tier 2 exposures analysed at portfolio level.

For Tier 2 results, participants may adapt one or a combination of the following approaches:

- i. Extrapolate Tier 1 results to Tier 2. This will require assessing and accounting for the differences in distribution between Tier 1 and Tier 2 counterparties, eg by applying a statistical technique to mitigate differences in sample vs. population characteristics.
- ii. Base Tier 2 results solely on macro variables, with judgement overlays but without a specific reference to Tier 1 counterparties.

Participants should describe their approach to modelling Tier 1 and Tier 2 counterparties in the [qualitative questionnaire](#).

**Specific reporting instructions:** Please break down all metrics by industrial classifications and default status for every country where there are exposures. Metrics 'Drawn balance' and 'Exposure for RWA' should be reported for Year 0 only. The stock of cumulative provisions should be reported for all projection periods and scenarios.

### Worksheet: Counterparty projections

This worksheet captures data on, at least, participants' largest corporate exposures (based on 'Exposure for RWA') and participants' views on how the probability of default for those counterparties might change throughout each scenario and projection period. Further information on the counterparty, such as industrial classification, asset types and country of exposure, will also be collected. This should include any further explanations of the main risks that a given corporate counterparty faces from climate change, how the corporate counterparty may adapt to or mitigate these risks, and how these risks may vary by UK/non-UK operations. The Bank also asks participants to report material physical hazards for each counterparty and the locations these apply to. The physical hazards are expected to be from the following list: Flooding (inland and coastal), Storm (tropical, extra-tropical, convective), Wildfires, Drought, Heatwaves, Other (please specify).

Metrics 'Drawn Balance' and 'Exposure for RWA' (which is split by facility type) should be reported for Year 0 only. The stock of cumulative provisions and Probability of Default (based on Internal Ratings Based approach) should be reported for all projection periods and scenarios.

Specific reporting instructions: On this worksheet, participants should report at the minimum their top 100 non-financial non-sovereign corporate counterparties as ranked by Year 0 Exposure For RWA, where those exposures are greater than £10 million. Commercial Real Estate and Housing Association counterparties are not included in the top 100 (for more detail on the treatment of these assets see below). However, participants are strongly encouraged to extend the detailed analysis and reporting to a larger number of corporate counterparties, consistent with expectations set out in Supervisory Statement 3/19 and the Dear CEO letter dated 1 July 2020 setting out that these expectations should be embedded by end-2021. Participants are not expected to engage with Tier 1 counterparties that are already in default at the start of the scenario.

Projections data should be reported for the No Additional Action scenario for Years 10 and 30 only.

The list of counterparties must include those described below, even if they are not in the top 100 counterparties but only if these exposures are greater than £10 million. Therefore it is possible that a participant reports more than 100 counterparties.

1. At least the top 3 counterparties from the specified industrial classifications, (see **Table 5.B** below) if not already included in the overall top 100. (For example, if the top 3 counterparties classified under 'A 01 – Crop and animal production, hunting and related service activities' are not already part of the participant's top 100 non-financial corporates and if each of these top 3 exposures are greater than £10 million, then these additional counterparties should also be included.)
2. At least the top 5 counterparties for banks (top 5 banks ie K64.19).
3. At least the top 5 non-bank financial institutions (NBFIs) (ie sector K other than banks).
4. At least the top 10 Commercial Real Estate asset class names.
5. At least the top 10 Housing associations asset type names (see the data dictionary for an extended definition of housing associations).

**Table 5.B: List of all industrial classifications participants should report at least three counterparties for**

Sector level 1	Sector level 2 (short name)	Full name
A 01 Agriculture	Crop/animal production	Crop and animal production, hunting and related service activities
B 06 Mining	Extraction	Extraction of crude petroleum and natural gas
C 10 Manufacturing	Food manufacturing	Manufacture of food products
C 19 Manufacturing	Coke and petrol manufacturing	Manufacture of coke and refined petroleum products
C 20 Manufacturing	Chemical manufacturing	Manufacture of chemicals and chemical products
C29 Manufacturing	Car manufacturing	Manufacture of motor vehicles, trailers and semi-trailers
D Electricity, Gas, Steam and Air Conditioning Supply	–	Electricity, Gas, Steam and Air Conditioning Supply
F Construction	–	Construction
G Wholesale/Retail Trade	–	Wholesale/Retail Trade
H49 Transport	Land transport	Land transport and transport via pipelines
H51 Transport	Air transport	Air transport



Year 0 exposures to the same counterparties held in the trading book or at fair value through profit or loss should be excluded when ranking largest counterparties, though any information relevant to offsetting exposures that may explain movements in the projections for probability of default should be considered within the primary risk drivers (for example hedging). The country of exposure and industrial classification should indicate where the majority of the exposure is. Metrics are on a Guarantor basis. Counterparty name is requested on an obligor basis, in line with previous submissions of the STDF Large\_exposures worksheet (in template 18), in addition to parent name where applicable (>50% ownership). Exposures to central banks should be excluded from this worksheet.

### Worksheet: Counterparty risk drivers

This worksheet captures counterparty primary risk drivers based on participants' analysis and judgement for each counterparty across each scenario. Participants should report the same list of counterparties within this template as they do within the Counterparty projections template. This should include any further explanations of the main risks that a given corporate counterparty faces from climate change, how the corporate counterparty may adapt to or mitigate these risks, and how these risks may vary by UK/non-UK operations.

### Worksheet: CRE projections

This worksheet captures data on participants' projected stock of cumulative CRE provisions at a high level. The stock of cumulative provisions should cover all losses booked through the participants' profit or loss account, regardless of whether these are due to climate-induced physical hazards or other risk factors. The Bank asks participants to report the proportion of drawn balance and the proportion of properties affected by severe events from climate-induced physical hazards. For this purpose, a severe event is defined as a 1 in 100 year flood (inland and coastal) at the end of each projection period.

**Specific reporting instructions:** Drawn balance should be reported for Year 0 only. Please report all other metrics for these assets by country, for each scenario and projection period.

## Template CBES banking retail projections

The CBES banking retail projections template captures data across a range of different asset types and geographies. Projections data are collected to allow comparison between participants and to analyse sector wide-vulnerabilities. The stock of cumulative provisions will be collected for each projection period for all three scenarios, as well as a collection of other metrics relevant to climate change related risk.

Individual countries should be identified in this template if they constitute 2% or more of a participant's wholesale or retail exposures as defined by Exposure for RWA. Wholesale and retail exposures should be considered separately when determining this threshold. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions. International organisations should be reported separately at all times. Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions.

### Worksheet: UK mortgage NAA projections

This worksheet captures data from Retail mortgage asset types: Owner occupied and Buy to let. This worksheet collects data for UK exposures across the No Additional Action scenario only, for all projection periods. Metrics are collected at a postcode district level, which is typically four characters in length. Participants should not provide data at a more detailed postcode level than this. The stock of cumulative

provisions should cover all losses booked through the participant's profit or loss account, regardless of whether these are due to flooding or other risk factors. In addition to the stock of cumulative provisions, participants are asked to report the proportion of drawn balance and the proportion of properties that face flooding in a severe flood outcome for the given postcode. For this purpose, a severe flood outcome is defined as 1 in 100 year flood (inland and coastal) at the end of the projection period. A property is flooded in the event that the maximum envelope of flood water from the flood event impacts the centroid of the property.

**Specific reporting instructions:** Metrics 'Drawn balance' and 'Number of mortgages' should be reported for Year 0 only.

### Worksheet: UK mortgage EALA projections

This worksheet captures data from Retail mortgage asset types: Owner occupied and Buy to let. This worksheet collects data for UK exposures across the Early and Late Action scenarios, for all projection periods. Metrics are collected by EPC rating. Where EPC rating is not known, participants should provide an estimated EPC rating (see Section 4.3 for more detail). The stock of cumulative provisions should cover all losses booked through the participant's profit or loss account, regardless of whether these are due to EPC transition risks or other risk factors.

**Specific reporting instructions:** Metrics 'Drawn balance' and 'Number of mortgages' should be reported for Year 0 only.

### Worksheet: Mortgage projections

This worksheet collects data for mortgage exposures only, at country level by default status, with a focus on physical risks. The stock of cumulative provisions should cover all losses booked through the participant's profit or loss account, regardless of whether these are due to physical climate risks or other risk factors. In addition to impairments, participants are asked to report both the number of, and drawn balances of, properties damaged due to flooding or other physical hazards events – at least once – for each scenario and projection period.

**Specific reporting instructions:** Metric 'Drawn balance' should be reported for Year 0 only.

### Worksheet: Consumer credit projections

This worksheet captures a participant's projected cumulative provisions on Retail excluding mortgage asset types: Credit card, Overdraft, Personal or term loan, Car finance and Other. It collects the stock of cumulative provisions, split by asset types, default status and by country.

**Specific reporting instructions:** Metric 'Drawn balance' should be reported for Year 0 only.

## Template CBES banking RWA and management actions projections

The CBES banking RWA and management actions projections template captures RWAs and management actions across a range of different asset types, geographies and industrial sectors.

Individual countries should be identified in this template if they constitute 2% or more of a participant's wholesale or retail exposures as defined by Exposure for RWA. Wholesale and retail exposures should be considered separately when determining this threshold. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions. International organisations

should be reported separately at all times. Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions. Similarly, there should be no double counting in the reporting of data by sector.

### Worksheet: Management actions

This worksheet captures management actions that can be taken to mitigate losses under any of the three scenarios. These actions should not be embedded in the central projections.

**Specific reporting instructions:** Management action numbers should be reported as an integer for every individual management action. Participants should also report the total of all management actions, which is the sum of the individual management actions that they would invoke should this stress occur. This should exclude any second-order impacts. When reporting the Total management actions, please report 'Total' in Management action description and report 0 in Management action number. Participants should identify whether the management action is either a pre-existing action or one made in response to this scenario.

Participants are asked to record the impact of specific management actions on drawn balances in the structured templates. Participants should calculate the drawn balance impact as the change in the sum of defaulted and non-defaulted balances as a result of taking the specific action.

Participants are asked to record the impact of specific management actions on cumulative provisions in the structured templates. This should be reported relative to the pre-management action results provided in the other structured templates. In these pre-management action templates, participants are not required to model new lending and existing loans are assumed not to mature. For the purposes of reporting management actions, however, participants should consider new lending. Any plans to rebuild non-defaulted books via increased new lending, or plans to reduce new lending to reduce the size of books over time should be reported as management actions.

### Worksheet: Top 5 management actions

This worksheet captures additional information on the top 5 management actions that are reported for each scenario in the Management\_actions worksheet. Participants are free to define their most material management actions as they choose. For example, this could take into account of the impact on cumulative provisions, overall business models and any other relevant factors. For these management actions the Bank is seeking to understand the profit or loss impact, whether it has any impact on regulatory or public disclosure and any key dependencies. Participants should identify whether the management action is either a pre-existing action or one made in response to this scenario.

**Specific reporting instructions:** Management action numbers should be reported as an integer for every individual management action. Any management actions that are reported here must also be reported in the Management\_actions worksheet.

### Worksheet: RWA

This worksheet provides a comprehensive view of participants' RWAs across the credit risk framework for Retail and Wholesale exposures. Data should be provided for all asset types, broken down by country.

For the purposes of RWA calculations, future regulatory changes should not be incorporated into the projections.

## Template CBES direct physical risk variable reporting

This template captures any differences in variables used by participants for their physical risk modelling in case they are different from Bank of England defined benchmarks. These variables are consistent with the scenario data. This should be completed by all participants.

### Worksheet: Physical risk variables

Physical risk variables are collected by Scenario, projection period and across eight different countries consistent with how data are provided in the scenario.

**Specific reporting instructions:** There are 13 physical risk variables in total, please see the individual definitions for which units these variables should be reported in.

### Comments worksheet

The comments worksheet in all CBES structured templates allows participants to provide either general comments or validation rule comments. Any validation rule breaks should be explained by providing the rule ID and the worksheet they relate to, along with an explanation of why the validation rule has broken. General comments can also be provided in the comments worksheet; the Bank expects these to either relate to anything the Bank should be aware of in regards to the qualitative questionnaire of the data, providing detail on changes made since the previous submission, the reason for resubmission, data quality issues addressed (eg in response to Stress Test Question & Answer log queries).

# 6: Insurance data templates

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This section provides detailed guidance on all templates and worksheets to be reported by Insurance participants, including their coverage and any specific reporting instructions. The main insurance templates are designed to be consistent with the fixed balance sheet, with measures that will change under an ‘instantaneous shock’ in line with the conditions of the projection point in the scenario.

These measures are designed to correspond with measures already defined in Solvency II reporting where possible. The fixed balance sheet assumption is then relaxed for later templates which explore management actions and the availability and coverage of some insurance products. The Climate Litigation template is separate from the main exercise and is more exploratory in nature.

The insurance templates are structured into three main sections:

- **All insurers:** Actuals balance sheet, Summary balance sheet for projections, Summary asset breakdown by sector.
- **Life insurers:** Detailed asset-by-asset template (‘Top 100+ Corporate Counterparties’).
- **General insurers:** Detailed breakdown of expected changes in insurance liabilities by peril for property insurance products and potential exposures to climate litigation.

In addition, there are templates for management actions, for both life and general insurers, which capture actions across a range of different asset types, geographies and industrial sectors. More specific guidance on coverage for specific templates is listed below in **Table 6.A**.

**Table 6.A: Balance sheet map of CBES Insurance templates**

	Balance sheet section	Worksheet coverage
Life insurance	Assets	Balance_sheet_actuals Balance_sheet_projections  Asset_sector_summary Counterparty_projections Counterparty_risk_drivers  Management_actions Top_5_management_actions
	Liabilities	Balance_sheet_actuals Balance_sheet_projections  Management_actions Top_5_management_actions
General insurance	Assets	Balance_sheet_actuals Balance_sheet_projections  Asset_sector_summary Management_actions Top_5_management_actions
	Liabilities	Balance_sheet_actuals Balance_sheet_projections  Non_UK_GI_liabilities_actuals UK_GI_liabilities_actuals Non_UK_GI_liabilities_by_peril UK_GI_liabilities_by_peril  Climate_litigation_metrics  Bank_ins_interactions  Management_actions Top_5_management_actions

## Template CBES insurance balance sheet

The CBES insurance balance sheet template captures both actuals and projections data. 'Actuals' is the term used in the Bank of England Stress Testing programme to denote the starting position of the stress test or any historical values. Actuals data are generally collected to facilitate the Bank running internal models, to understand exposure to risks, or to reconcile against data already held by the Bank. This means that some data will be collected for Year 0 (ie 31 December 2020). 'Projections' refers to any values that are recalculated under stress for a specific scenario, and are reported back by participants at each time step, or 'projection period'. Projections data are collected to allow comparison between participants and to analyse sector-wide vulnerabilities. Results will be collected for each period of each of the three scenarios as well as a collection of other metrics relevant to climate change related risks.

### Worksheet: Balance sheet actuals

Life and general insurers are required to complete this template.

This worksheet captures a condensed Solvency II balance sheet that should reconcile with Solvency II year-end returns (at 31 December 2020), unless otherwise agreed, to ensure consistency between the starting position and the scope of the stress. This data point will be known as Year 0.

The worksheet provides a starting point for the application of stresses. For most participants the actuals data will cover the full Group entity, and the entries will correspond exactly with Solvency II returns. However, there may be exceptions:

- A participant might want to exclude a subsidiary or portfolio on the grounds that effort in modelling is disproportionate to the impact.
- A participant might need to report on the basis of combined UK-entities, where the ultimate parent is not in the UK.

### Worksheet: Balance sheet projections

Life and general insurers are required to complete this template.

This worksheet will capture impacts to the summary balance sheet under each scenario and projection period. The assets and liabilities are split into six high-level aggregated categories. The purpose of this template is to capture the main changes to the balance sheet, without requiring a detailed breakdown of each component. This allows participants to focus the exercise on changes in:

- Invested Assets.
- Reinsurance.
- Best Estimate Liabilities (or 'Technical Provisions as a Whole' where this is used).

This allows simplifications to be made to:

- Any other elements of the Technical Provisions, such as Risk Margin and TMTP, which participants may assume are unchanged under the scenario.
- Other assets and non-insurance liabilities. For each element from the 'actuals' balance sheet, participants can consider whether the item can be proxied using a modelled element (eg BEL or invested assets). If there is no such relevant proxy, they may assume the item is unchanged over the scenario.

Life insurers will need to identify assets and best estimate liabilities (including 'Technical Provisions as a Whole') held in ring-fenced funds, Matching Adjustment portfolios and unit-linked assets and liabilities. Life insurers should sum across all matching adjustment portfolios and sum across all with-profits ring-fenced funds. This means that each row for invested assets, reinsurance and Life Best Estimate Liabilities will show the value in with-profit ring-fenced funds, the value in matching adjustment ring-fenced funds, and a value in unit-linked funds. It will also show a total 'Solvency II value', but this is not necessarily the sum of preceding columns, because those categories are not exhaustive. Other assets, Other insurance liabilities, and Non-insurance liabilities do not need to be split. Zero entries do not need to be reported.

Simplifications are also expected for Matching Adjustment portfolios:

- The reported value of assets in the Matching Adjustment portfolio at a projection point should be before any 'top-up' or transfer from outside the matching adjustment portfolio.
- Participants can then assume such a top-up or transfer occurs to allow continuation of the Matching Adjustment.
- A high-level translation of the asset movement to the change in matching adjustment and hence liabilities is acceptable. This may be informed by internal model methodology, and matching adjustment assets in the counterparty analysis.

### Template CBES insurance assets

The CBES insurance assets template captures the change in value of assets on an insurer's balance sheet for each scenario and projection period. The projection periods are as defined in Section 3.2 under reporting frequency.

## Worksheet: Asset sector summary

Life and general insurers are required to complete this template.

This worksheet summarises the insurer's invested assets at each projection point in the scenario, breaking it down by geographical region and industrial sector. The geographic and industrial sector breakdown is consistent with the level of breakdown provided by the Bank in respect of GVAs.

Each combination of geographical region, asset types and sectoral exposure needs to be shown as a separate row, for each projection point in the scenario, the Solvency II value reported. For life insurers, this will again need separate values for matching adjustment, ring-fenced funds, and unit-linked business. Zero values do not need a row.

**The purpose of the template is to show which sectors and regions are projected to be most vulnerable, which drive the losses (since exposure might be high even if vulnerability is low) and whether these vulnerabilities or sources of loss differ across different portfolios, eg between shareholder and policyholder funds.**

This subtotals across all sectors and countries in this worksheet should reconcile to invested assets in the balance sheet projections worksheet.

## Worksheet: Counterparty projections

Only life insurers are required to complete this template.

This worksheet captures estimates of a participant's largest corporate exposures and their view on how those counterparties might default or be downgraded throughout each scenario and projection period. Projections for the No Additional Action scenario should be reported for Years 10 and 30 only.

Further information on the counterparty, such as industrial classification, asset types and country of exposure, will also be collected. The template is structured such that a number of fields can be taken directly from fields in form S.06.02 Solvency II reporting (or a simple mapping can be produced from those fields to the required category).

A row is required for each asset relating to a Tier 1 counterparty (there may be multiple assets relating to one counterparty, eg a share, a bond, a reinsurance contract) at Year 0. This row would then be repeated under each scenario and projection point combination, to show:

- the Solvency II value
- the CQS (matching adjustment assets only)
- the spread over risk-free (matching adjustment assets only, in basis points)
- the fundamental spread (matching adjustment assets only, in basis points)

The Bank also asks participants to report material physical hazards to each counterparty and the locations these apply to. The physical hazards are expected to be from the following list: Flooding (inland and coastal), Storm (tropical, extra-tropical, convective), Wildfires, Drought, Heatwaves, and Other (please specify).

There are also a number of other fields to help the Bank structure the data on a participant's assessment:

- The number of Geocodes relates to the assessment of the counterparty's vulnerability to physical risk – ie how many Geocodes did the participant use in their assessment.
- Transition risk/Physical risk/Risk Management and Other have drop-down menus to show how the risk is operating on the counterparty.



**Scope of the Template:** Life insurers should report their top 100 non-financial non-sovereign corporate counterparties based on Year 0 Exposure, where the starting asset values are greater than £10 million. In addition, the list of counterparties must include those described below, even if they are not in the top 100 counterparties, assuming the assets still meet the £10 million threshold. Therefore it is possible that a participant reports more than 100 counterparties. Participants are not expected to engage with Tier 1 counterparties that are already in default at the start of the scenario.

1. At least the top 3 counterparties from the specified industrial classifications, (see **Table 6.B** below) if not already included in the overall top 100, but as long as these exposures are greater than £10 million. (For example, if the top 3 counterparties classified under 'A 01 – Crop and animal production, hunting and related service activities' are not already part of the participant's top 100 non-financial corporates, then these additional counterparties should also be included.)
2. At least the top 5 financial counterparties including banks (K64.19) and reinsurers (K.65.20), but excluding trusts, funds and similar financial entities (K.64.30). Reinsurance contracts should be brought through at their Gross Solvency II value, and treated as 'Other' asset type.
3. At least the top 5 Commercial Real Estate asset type names.
4. At least the top 10 (non-sovereign) assets in the Matching Adjustment portfolio.

**Table 6.B: List of all industrial classifications participants should report at least three counterparties for**

Sector level 1	Sector level 2 (short name)	Full name
A 01 Agriculture	Crop/animal production	Crop and animal production, hunting and related service activities
B 06 Mining	Extraction	Extraction of crude petroleum and natural gas
C 10 Manufacturing	Food Manufacturing	Manufacture of food products
C 19 Manufacturing	Coke and petrol manufacturing	Manufacture of coke and refined petroleum products
C 20 Manufacturing	Chemical manufacturing	Manufacture of chemicals and chemical products
C29 Manufacturing	Car manufacturing	Manufacture of motor vehicles, trailers and semi-trailers
D Electricity, Gas, Steam and Air Conditioning Supply	–	Electricity, Gas, Steam and Air Conditioning Supply
F Construction	–	Construction
G Wholesale/Retail Trade	–	Wholesale/Retail Trade
H49 Transport	Land transport	Land transport and transport via pipelines
H51 Transport	Air transport	Air transport

### Worksheet: Counterparty risk drivers

This worksheet captures counterparty primary risk drivers based on participants' analysis and judgement for each counterparty across each scenario. Participants should report the same list of counterparties within this template as they do within the Counterparty projections template. This should include any further explanations of the main risks that a given corporate counterparty faces from climate change, how the corporate counterparty may adapt to or mitigate these risks, and how these risks may vary by UK/non-UK operations.

### Template CBES insurance GI liabilities

This template captures data on the liabilities of general insurers. The key metrics are change in 'Gross Average Annual Loss (AAL)' by peril and change in Gross 1 in 100 Annual Exceedance Probability (AEP) in aggregate by country. The Bank expects the movement in liabilities in the balance sheet template to be consistent with the change in Gross AAL. Gross written premium and net written premium refers to policies in-force on 31 December 2020.

This template does not capture any anticipated reinsurance recoveries, although any changes in aggregate should be captured in the Balance Sheet projections.

The projection periods are set out in Section 3.2 Reporting frequency.

### **Worksheet: GI liabilities actuals**

Only general insurers are required to complete this template.

The purpose of this worksheet is to understand the potential gross and net of reinsurance exposures at Year 0 for all property risks. Participants are required to provide premiums and policy counts, which are used as a proxy for exposure.

The template requires participants to provide gross and net written premiums as well as policy count for all property (residential, commercial and corporate) contracts in-force on 31 December 2020. This should include both direct and inwards reinsurance business (including facultative).

This information will need to be split by country.

Individual countries should be identified in this template if they constitute 2% or more of a participant's property exposures as defined by Gross Written Premium. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions.

Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions.

### **Worksheet: UK GI liabilities actuals**

Only general insurers are required to complete this template.

This template requires those general insurers that underwrite UK residential property risks to provide a further breakdown of their premiums and policy count, down to postcode district level (which is typically four characters in length). This information is required for all UK residential property contracts in-force on 31 December 2020, and covers only direct and facultative business.

### **Worksheet: GI liabilities by peril**

Only general insurers are required to complete this template.

The purpose of this worksheet is to understand the projected changes to property risks from changes in each of the different climate scenarios.

Participants are required to provide details of projected changes to both their Gross AAL and Gross 1-in-100 AEP, by country, peril and projection period.

Individual countries should be identified in this template if they constitute 2% or more of a participant's exposures as defined by Gross Written Premium. Countries which are below this 2% threshold can either be reported as individual countries or wrapped up to one of the following economic regions: Euro Area, Other Europe, Africa, Asia, Middle East, Americas, and Australasia and Oceania. Asia should exclude all Middle East countries and Other Europe should exclude all Euro Area countries. Please see the individual enumeration descriptions for which countries are included in these regions.

Data should be reported such that the sum of all countries of exposure equals the participant's total exposures, ie there should be no overlapping or double counting of any exposures against individual countries or economic regions.

Data should be reported for all scenarios for projections in Years 10 and 30 only.

**Table 4.C** in Section 4.1 presents a selection of perils/territories with material climate signal, based on the literature review and industry consultation. Participants should extend the list to other perils/territories if their own assessment indicates these are material. The AEP for each country is before diversification with other countries.

### Worksheet: UK\_GI\_liabilities\_by\_peril

Only general insurers are required to complete this template.

The purpose of this worksheet is to understand the projected changes to UK residential property risks at a postcode district level (typically four characters in length) and for the two main perils of inland and coastal flooding from changes in each of the different climate scenarios.

The key metrics required are the Gross Average Annual Loss (AAL) by peril and the Gross 1 in 100 Annual Exceedance Probability (AEP). The AEP for each postcode is before diversification with other postcodes. There is also an 'aggregate' postcode to complete which participants should use to show the diversified AEP across all postcodes.

If there is exposure remaining within participants' book that is not attributable to the postcodes listed, disaggregate them across all the postcodes by weighting against the portfolios' UK residential spatial distribution. Data should be reported for all scenarios for projections in Years 10 and 30 only.

## Template CBES insurance climate litigation

This template provides a quantitative approach covering potential exposures to climate-related litigation risk for general insurers. General insurers are required to provide details of their exposure (policy limits and probable maximum loss) from specific products, in-force on 31 December 2020, covering a number of sectors of the economy that have been identified as having an elevated or direct exposure to climate risk. In addition, the scenario provides a number of hypothetical legal case rulings against insureds to assess the potential risks arising from climate litigation. General insurers are requested to provide their view on the likelihood that their insurance products would respond assuming these case rulings are successful. This view should reflect the insurer's intent as set out in the underlying policy wording.

Consideration of the case rulings will depend on the sectors that insurers are most exposed to. In setting out these model rulings the Bank is not opining on the likelihood of such a ruling, instead, the Bank is seeking to understand the extent to which general insurance products could respond if such a ruling were to be successful. The examples have been inspired by actual cases, and for the purpose of this exercise, it is assumed they all arise from civil cases. In addition, the Bank acknowledges that its case descriptions are intentionally high-level, in that they do not specify every aspect that is needed to assess whether an insurance claim is likely. Doing so would require the need to define a very specific and detailed case, which is not in the spirit of this exercise. The outcome of this exercise should provide insight as to whether the risk would remain with corporates (potentially increasing transition risks) or whether this risk would be transferred to the insurance sector.

The Bank expects insurers to consider how such cases could, if successful, impact their products (allowing for insurance policy scope and exclusion), and to provide details of the key assumptions underlying the

conclusions. The template requires participants to set out their assumptions in assessing whether the policy responds – for example setting out who is making the claim. In doing so the Bank expects participants to consider this broadly and not simply consider areas that are commonly excluded or unlikely to give rise to a financial loss – for example by assuming criminal activity or no impact on the share price of the underlying insured. Further, insurers are expected to consider the intent of their policy-wording, not the additional risks that courts may overturn this.

**For all sectors other than Financial Services, insurers should consider the following legal cases:**

- i. **Case 1, direct causal contribution:** this case is representative of the 'causal contribution' argument, where a corporate has been found liable for their representative contribution to manmade climate change. The corporate is being sued for their direct contribution to climate change, which results in physical damages linked to an extreme weather event.
- ii. **Case 2, violation of fundamental rights resulting in cessation or significant reduction of operations:** this involves a corporate that has been prevented from practising carbon-intensive activities on the grounds that these activities violate the fundamental rights to human life and dignity as stated in the UN Convention on Human Rights. The corporate has been forced to cease or significantly reduce these activities, which has had a significant impact on its financial revenues (reflecting the stranding of assets).
- iii. **Case 3, greenwashing:** a corporate has been found liable for misleading its customers and investors with either false advertising and mislabelling products as 'environmentally friendly' or understated disclosures (either via TCFD or similar frameworks). The manufacturer is ordered to pay out large sums in compensation to customers who made purchases based on this advertising or the firm's investors. Greenwashing is defined as the process of conveying a false impression or misleading information about the environmental soundness of a product or corporate activity.
- iv. **Case 4, misreading the transition:** this case involves the misreading of the transition. A corporate that has been successfully sued on the basis that it continued to sell a carbon-intensive product while in the knowledge it would become redundant following the introduction of government net zero policy. The corporate is ordered to issue refunds and compensate customers who purchased the particular product.
- v. **Case 5 (additional for those with exposure to the Utilities sector only), indirect causal contribution (negligently preparing for climate change):** this case is when utilities are sued for their indirect contribution to climate change that amplifies climate physical risks, which could be due to inadequately or negligently preparing for climate change (eg utility companies in preparing for an increasing prevalence of natural catastrophes wildfires, or infrastructure companies).

**For those with exposure to the Financial Services Sector, insurers need to consider the following legal cases:**

- vi. **Case 6, directors' breach of fiduciary duties:** (this case is only relevant for those insurers providing cover against asset managers). This case has been brought by the investors of an asset manager, who allege that the entity's directors have understated in their disclosure (either via a TCFD or similar framework) how much risk physical and/or transition impacts pose to their assets. Investors seek payments for damages from corporate directors for a breach of their fiduciary duties. This case could also apply to employees with investments in a pension fund who bring charges against fund directors for inadequate disclosures on climate risk (physical or transition elements), which have resulted in loss.
- vii. **Case 7, indirect casual contribution (financing):** (this case is only relevant for those insurers providing cover against financial institutions). It assumes that a case is brought against financiers of carbon-intensive activities. The financiers have contributed to manmade climate change indirectly, by funding the activities of carbon majors, rendering them a target of legal action. This may specifically be applied to a bank or some other lending entity who may become indirectly involved in climate change via their role as a provider of capital.

These cases are believed to cover the currently perceived most common bases for attempted climate litigation against corporates – recognising that some of these are perceived as highly speculative and very remote.

### Insurance product scope and materiality

Participants should consider the following insurance products and the extent to which they could be triggered in the event of the model case rulings described above:

1. General liability.
2. Directors and Officers.
3. Errors and Omission.
4. Professional Indemnity.

Participants are required to complete the template for their largest **three** insured sectors (according to Gross Written Premium (GWP)). The sectors refer to those sectors of the economy defined by the United Nations Environment Programme Finance Initiative (UNEP FI) that have been identified as having an elevated or direct exposure to climate transition risk.

Within each of these identified sectors, participants are required to segment their underwriting lines of business (stated in this heading) into policies that have a common contract coverage (creating portfolio groupings with unified scope of cover, exclusions, write-backs etc). This may require an assessment at the individual insured where a contract wording is unique to that policyholder. Within each of these sectors, participants should ensure a minimum coverage of 50% of GWP.

### Assessing Exposures

For each of the policy coverage groupings identified (as explained above), participants will need to provide their GWP, Policy Limits (PL) and an assessment of Probable Maximum Loss (PML), both gross and net of reinsurance. The calculation of policy limits should reflect the lower sub-limited amounts that may apply in the policy coverage that is relevant for each of the seven legal cases. The estimate of the PML (under each grouping) should be calculated taking into account the number of likely claims for the relevant case(s), past claims experience and the level of premiums applied across the product/sector. Note: the template requires participants to state the **aggregate** PML and Policy Limits (not per contract).

### Geographical scope

Participants are required to consider the need to specify geographical scope. For multi-location policies, or those insureds exposed to litigation from various jurisdictions, use the jurisdictions with the largest exposure in the calculation of PMLs.

### Defence costs in addition

Participants are required to state whether, within their policy wording, defence costs are included in addition to the policy limits provided, in which case respond 'Yes', otherwise respond 'No'. In either case, participants should report an estimate of potential defence costs per claim in the next column, whether or not the claim is successful.

### Allowance for historical exposures

To reflect the complexity inherent in this, 'first-of-a-kind', exercise participants are not required to consider back-book historic exposures.

### Other Assumptions

As set out above, general insurers are asked to assume that each of these cases is successful at court and estimate the likelihood of a corporate (or professional services firm) being able to claim against their

relevant commercial liability insurance policy, in each of the sectors required per the instructions above. To note, general insurers are not asked to opine on the likelihood that their insured will suffer a loss; this is intrinsic in the scenario description. Instead, general insurers are asked to opine on whether all or part of the loss could be recoverable under an insurance policy.

This template is to be completed by general insurers only.

### Worksheet: Climate litigation metrics

Only general insurers are required to complete this template.

This worksheet captures data to assess the potential risks arising from climate litigation. Insurers are required to consider and assess a number of model case rulings that will depend on the sectors that they are most exposed to.

This sheet requires participants to summarise their view on whether policies are or are not likely to respond and to set out the financial exposures. The definition of each of the fields is as follows:

1. **Sector:** this should be aligned to the UN sectors (Agriculture/Fishing, Agriculture/Livestock, Agriculture/Paper and Forestry, Chemicals, Construction/Coal, Construction/Hydro Dams, Construction/Nuclear, Electronics/Technology, Energy: Onshore, Energy: Offshore, Financial services, Garment Manufacturing (Textiles), Mining, Oil and Gas, Real Estate, Transport/Shipping/Logistics, Utilities (Waste and Water)).
2. **Contract\_ID:** This is unique to the firm and should be used as an identifier to reflect the level at which the analysis has been performed. This should be aligned to the policy coverage groupings (see Section 1.5 above).
3. **Individual name or contract wording group:** This field is free format, allowing the firm to provide colour to the grouping defined by the Contract\_ID.
4. **Product coverage:** This field is a drop down and requires participants to specify the insurance coverage considered. Choices are: General Liability, Professional Indemnity, Directors and Officers and Errors and Omission.
5. **Number of insureds:** This field requires participants to provide details of how many insureds are covered within one Contract\_ID.
6. **Case 1–7:** These fields require participants to provide a view on the likelihood of recoverability based on the different legal cases. This field should only contain either 'Likely', 'Unlikely' or 'N/A'.
7. **Gross written premiums, Policy limit, Probable maximum loss (gross and net of reinsurance), and an Estimate of defence costs:** These fields are all numerical values, should be input in millions and are required regardless of the assessment of cases 1–7. **Defence costs** is a yes/no field.

### Worksheet: Comments

Only general insurers are required to complete this template. This guidance reflects specific reporting guidance to the Comments worksheet in the Climate litigation template over and above the standard guidance for Comments worksheets.

This worksheet captures data to assess the potential risks arising from climate litigation. Insurers are required to consider and assess a number of model case rulings that will depend on the sectors that they are most exposed to.

**Specific reporting instructions:** This sheet requires participants to provide details in relation to:

1. PML assumptions: detail the main assumptions used to calculate PML (this will assist in ensuring comparability across participants).

2. Policy responding assumptions: detail the main assumptions and/or policy exclusions used to support participants' views on the extent to which the policies would or would not respond given the legal cases set out in this scenario.
3. General comments: provide any additional comments that are not adequately reflected (this field is optional).

These comments should map across to each of the groupings set out in tab 3 above, and are connected via a common 'Contract\_ID' field.

## Template CBES insurance banking interactions and management actions

This template analyses both the potential change in insurance coverage for bank-insurer interaction on mortgages and captures the management actions across a range of different asset types, geographies and industrial sectors. Additional information on the top 5 management actions that insurers may consider to protect their business model is captured in the second management actions template.

### Worksheet: Bank ins interactions

Only general insurers are required to complete this template.

This worksheet captures the change in insurance coverage level and insurance coverage level ceded to Flood Re for UK residential property, in order to consider insurer-bank interactions on UK residential mortgages.

Insurance coverage is defined as the percentage of current portfolios within current underwriting appetite (as at 31 December 2020). At Year 0 this will be 100%. Participants should assume that policy terms and conditions cannot be altered ie if a property would require alterations to terms and conditions to remain within underwriting appetite, for the purpose of the exercise the property would be outside of underwriting appetite. Changes in premiums are permitted.

The following assumptions regarding Flood Re must be incorporated:

- **Early Action:** Flood Re ends as planned at 2039 and flood risk reflective pricing is achieved before its end. The market gradually transitions, starting well before 2039 (Year 19). Risks that are currently ceded to Flood Re will not be ceded in the future because the insurance market has found its equilibrium without Flood Re's subsidy. Insurers need to assess how the changes in the insurance market coupled with changes in flood risk will impact their underwriting strategy, including the insurability of those risks currently ceded to Flood Re.
- **Late Action:** Flood Re ends as planned in 2039 (Year 19); due to disruption created by the late transition to a net zero emissions economy, the market has not yet transitioned to risk reflective pricing (ie the objective of Flood Re has not been met). Insurers refuse risks previously ceded to Flood Re at renewal.
- **No Additional Action:** Flood Re ends as planned in 2039 (Year 19); the market has not transitioned to risk reflective pricing (ie the objective of Flood Re has not been met). Insurers refuse risks previously ceded to Flood Re as well as any additional risks identified to fall outside current underwriting appetite following the increased flood risks under this scenario at renewal.

### Worksheet: Management actions

Life and general insurers are required to complete this template.

This worksheet captures the management actions that might be taken under any of the three scenarios to mitigate losses. These actions should not be embedded in the central projections, ie these are actions that participants could take under stress.

Management action number should be reported as an integer for every individual management action. Participants should also report the total of all management actions which would be the sum of the individual management actions that they would invoke should this stress occur. This should exclude any second order impacts.

When reporting the Total management actions please report 'Total' in Management action description and report 0 in Management action number.

Please identify whether the management action is a pre-existing management action (which is still being undertaken during the scenario) or one made in response to this scenario. Select the type of management action from the suggested categories. For each scenario, and for those categories which result in a change in impact of the scenario, participants should complete the 'mitigation' field. This allows participants to relax the fixed balance sheet assumption, and provide the quantification. It is expressed as the proportion of the stress (the change in Assets over Liabilities), at Year 30, which is mitigated by the management action.

### Worksheet: Top 5 Management actions

Life and general insurers are required to complete this template.

This worksheet captures additional information on the top 5 management actions that are reported in the Management actions worksheet. Participants are free to define their most material management actions as they choose. For example, this could take into account of the impact on asset and liability values, overall business models and any other relevant factors. The Bank is seeking to understand the business model impact for insurers, whether it has any impact on regulatory, or public disclosure, and any key dependencies.

Management action numbers should be reported as an integer for every individual management action. Any management actions that are reported here must also be reported in the Management actions worksheet. Please identify whether the management action is either a pre-existing BAU or strategic management action or one made in response to this stress.

## Template CBES direct physical risk variable reporting

This template captures any differences in variables used by participants for their physical risk modelling in case they are different from Bank of England defined benchmarks. These variables are consistent with the scenario data. This should be completed by all participants.

### Worksheet: Physical risk variables

Physical risk variables are collected by Scenario, Projection period and across eight different countries consistent with how data are provided in the scenario.

**Specific reporting instructions:** There are 13 physical risk variables in total, please see the individual definitions for which units these variables should be reported in.

### Worksheet: Comments

The comments worksheet in all CBES structured templates allows participants to provide either general comments or validation rule comments. Any validation rule breaks should be explained by providing the rule ID and the worksheet they relate to, along with an explanation of why the validation rule has broken. General comments can also be provided in the comments worksheet; the Bank expects these to either relate to anything the Bank should be aware of in regards to the [qualitative questionnaire](#) of the data, providing detail on changes made since the previous submission, the reason for resubmission, data quality issues addressed (eg in response to Stress Test Question & Answer log queries).



# 7: General data guidance

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## 7.1: Background and objective of this section

The main purpose of these [data templates](#) is to support the CBES exercise, as outlined in the other sections of this Guidance document. This section contains information about the structured data requests that participants<sup>(1)</sup> need to complete. It includes guidance for the templates requested by the Bank, as well as the data quality rules that participants' submissions are expected to adhere to.

### Using the CBES Banking and Insurance data dictionaries

The CBES Banking and Insurance data dictionaries set out the relevant [data templates](#) and enumerations permitted within these templates, together with definitions for both; they also describe the data quality rules, patterns and reconciliations required to complete the [data templates](#). Finally, they also contain an index of all CBES data items with information on reporting all of the tables found in Sections 5 and 6 of this document.

### Governance of submissions

In responding to the data request, participants' internal governance processes should include challenge by senior management and/or relevant committees. Further detail on ensuring effective data quality checks is contained within Section 7.3 of this document.

### Reporting the qualitative questionnaire

The [qualitative questionnaire](#) will be used primarily: to understand challenges to participants' business models from climate-related risks; to assess participants' proposed management actions; and to understand how participants will improve risk management of climate-related risks (including as a result of lessons learnt from the exercise).

Responses to the questions in the questionnaire should be submitted as separate documents, alongside the structured submissions. In addition, participants should submit a completed version of the questionnaire, containing the following details for each question: the zip folder name, filename, and page number references to relevant supporting documents that answer the respective questions, as well as any other comments participants may like to add.

Banks should respond to questions where the 'Group to respond' column is given as 'Banks only' and 'Banks and insurers'. Insurers should respond to questions where the 'Group to respond' column is given as either 'life insurers' or 'general insurers' and 'Banks and Insurers'. The 'Suggested word limit' is intended as guidance only and is not binding. Please see the section 'Unstructured data' within Section 7.2 covering the data submission process for more details on sending documents in response to qualitative questions.

## 7.2: The data submission process

### Submission procedure, standard and conventions

**Please follow the instructions in this section exactly and completely.**

Participants are expected to submit CBES stress testing files via the BEEDS portal. More detailed information – including the required set-up processes and example error handling – is also available via the

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(1) More information about stress testing in the Bank of England is available at [www.bankofengland.co.uk/stress-testing](http://www.bankofengland.co.uk/stress-testing).

BEEDS User Guide published on the Bank of England website. If participants have any specific technical issues preventing submission, they should contact the Bank as soon as possible to discuss suitable alternatives (see next sub-section for detailed information on the available support structures).

There may be occasions where BEEDS is unavailable due to maintenance, in which case a participant attempting to submit data at weekends may be unable to access the portal until the following Monday. Scheduled maintenance will not take place around key stress test submission dates and participants will also receive relevant communications as to when such maintenance will occur.

To complement this guidance, submission details will also be scheduled within the BEEDS system.

### Summary of Stress Testing key support structures

With regards to the BEEDS portal, there are two key support mechanisms for Stress Testing data submissions.

Firstly, for technical questions **specifically regarding the BEEDS portal**, please contact [BEEDSQueries@bankofengland.co.uk](mailto:BEEDSQueries@bankofengland.co.uk) or 020 3461 5360. Standard support hours for these questions are 9am–5pm, Monday–Friday with further details in the BEEDS User Guide.

Also, as part of the creation of participant profiles within the BEEDS portal, named individuals in each participant are either 'principal users' or 'additional users'. The creation of these users forms part of the BEEDS security profile with the differences between these roles related mainly to different available functionality. Once a submission is made by any of these users via BEEDS, all users will then receive relevant progress notifications.

Secondly, all other communication between the Bank and the participants involved in this exercise is via the Question & Answer (Q&A) process. Each participant will receive their own Q&A logs via their PRA Supervision teams to use within the Stress Test process. Participants should aim to:

- Log and distribute communications sent by the Bank to relevant parties in the participant.
- Ensure actions for the participant and queries from the Bank are responded to within good time and to a high-quality standard.

Finally, please also contact [PRA-SRS-RALC-RDA@bankofengland.co.uk](mailto:PRA-SRS-RALC-RDA@bankofengland.co.uk) with very urgent queries. For example, if any part of a participant's submission is likely to be delayed, the participant should contact the Bank as soon as possible to discuss alternative arrangements. In such a case, the participant may be asked to submit a partially completed template and then resubmit the template including the missing data as relevant (NB: the Submission ID should then be increased).

### File conventions and identifiers

All data should be provided in base units and all percentages should be expressed in decimals (maximum of four decimal places).

For the .zip files submitted, a filename consists of a number of identifiers de-limited by an underscore '\_' and should not contain any of the following invalid characters: # % & \* : < > ? / { \ " |. **If this guidance is not followed, the participant could be asked to correct and re-submit its files.**

The following outlines how each .zip file name should be structured (in order of appearance in the filename):

- **Firm Codes:** for Banks, participants should use codes used for the Solvency Stress Test. For insurers, we will supply codes via Stress test Q&A.
- **Submission Frequency:** this should be CBES in all cases. Participants are reminded to use the BEEDS UAT environment (participant's will be informed when open) for testing purposes.
- **Structure:** data is either Structured (S) or Unstructured (U).
- **Content Code:** Worksheet 0 INDEX in the CBES data dictionary contains all content codes for the main submissions. The Basis of Preparation document lists additional content codes specifically relevant to unstructured questions.
- **Reporting Date:** the date for which the data are applicable, which is 31 December 2020 for most CBES templates. For unstructured files, this is the reporting date of the associated structured data.
- **Analysis Period:** if required in the filename, the Analysis Period denotes the Stress Test period to which the data relates.
- **Submission ID:** this should be '1' for the first submission of a file eg a first re-submission, this should be increased to '2' and so on.
- **Submission Part (optional):** this is for use with large unstructured data submissions where it is necessary to send more than one email each containing one .zip file. The first part of the submission is suffixed by 'A', the second part by 'B' and so on. Participants are reminded that this part of the filename should not be used to identify different versions of submissions.

### Number of files in a submission

Participants should send their CBES data within .zip files. Participants are reminded that:

- a. For unstructured data, BEEDS will currently accept zipped submissions up to a maximum zipped file size of 30MB per upload option and BEEDS offers up to 10 of these upload options/buttons per unstructured submission.
- b. For structured data, if participants wish to upload particularly large files, they are encouraged to consider any timing-out risks and/or possible system performance risks within their own IT environments before attempting submissions. Participants are also encouraged to contact the Bank for further guidance ahead of attempting submissions above 60MB in size.
- c. Structured and unstructured data must be submitted in separate .zip files.
- d. All structured or unstructured data within each individual .zip file must relate to one specific content/category code and must be the same one as noted within the .zip file name.
- e. All .zip file names must include a content/category code equating to the one scheduled to each participant via BEEDS or that the participant creates themselves (for other unstructured submission purposes).
- f. No folder structures should be embedded within .zip files – data submissions should be at the root of the .zip file.
- g. Participants are reminded not to put zipped files within other .zip files.

**Note that participants may be able to submit earlier than the deadline if they wish – BEEDS will have scheduled a deadline for each submission but will be available to accept early if needed.**

### Structured data

Structured data relating to a single CBES data template **must not be split across multiple files except to resolve any total file size related issues**. Each template should be submitted as a separate file within its own zip file – ie participants should submit one file per zip file for structured data. The structured file within a zip file **must follow the same naming convention as the zip file** and should enable the file to be distinguished from any other submission or re-submission.

## Unstructured data

Unstructured data refers to either the information that participants are requested to provide in response to the questions in the [qualitative questionnaire](#) document, or any other unstructured documents (ie participants can choose the format, structure and number of these documents themselves) that participants proactively choose to submit to aid understanding of their structured submissions.

For responses to [qualitative questionnaire](#) questions, participants will receive schedules for the relevant returns within BEEDS. For other unstructured CBES documents that participants may choose to submit, participants should follow relevant steps in the [BEEDS User Guide](#) on how to create their own 'unscheduled' unstructured returns within BEEDS. For these 'unscheduled' unstructured returns created by participants, participants must add an 'effective date' of 31 December 2020 in BEEDS when creating them.

If a participant wishes to submit more than one unstructured return, with different category codes but with the same effective date, they may receive an error message stating there is already a return with the same effective date. If this occurs, please see page 43 of the [BEEDS User Guide](#) on how this can be resolved.

Some unstructured data files will be related to a specific risk type and content code asking participants to provide supporting documents relevant to one or more structured templates. Other files will be more generic, for example outlining a participant's approach to the stress test. Acceptable formats **specifically for unstructured data files** are .XLSX, .DOCX, .PDF, .PPTX, .CSV and .TXT. If a participant needs to report in other formats, they should contact the Bank to discuss next steps.

All unstructured data files relating to a specified template/content code should be sent in one or more .zip files (NB: up to 10 unstructured files can be submitted within each submission).

The files within the .zip should **all relate to the same content code** and – while they do not need to follow specific naming conventions – they should have an understandable, distinguishable and descriptive name.

## Data encryption

The BEEDS portal is a secure interface through which participants will submit templates in a number of other exercises. Participants should refer to the information available via the [BEEDS User Guide](#) (and associated links) for further guidance on this connection and associated processes (for example, usage of security questions).

## Resubmissions

Participants must log on to BEEDS to request a resubmission of any information via the relevant functionality. As per the Submission ID noted above, the revision number in BEEDS should increase for every resubmission completed. Please see the [BEEDS User Guide](#) for further details on resubmissions.

When sending these resubmissions via BEEDS, the following guidance for participants remains:

- ensure that all templates still reconcile as expected after any changes made;
- submit only one final version of the template incorporating **all** changes; and
- ensure re-submitted CBES data templates are accompanied by a version of the CBES Reconciliations template updated as appropriate.

The deadline for final resubmissions will be confirmed to participants during this exercise. Also, the Bank will only process changes to data that it has requested – participants should therefore limit changes to those that have been requested by the Bank and clearly highlight them.

## Key Submission Header and other template guidance

All participants must include both the legal **Firm name** and relevant **Legal Entity Identifier (LEI)** in the appropriate cells in all Submission Headers. The **Firm name** should be exactly the same as the entry in the Firm Profile on BEEDS for the corresponding LEI.

**It is vital that participants fill in this name and LEI information correctly for every submission.** Also, if participants amend their LEIs for any reason, they should inform their PRA Supervision contacts through the standard Q&A process.

Please report the **Reporting date** in each template in line with the BEEDS return schedules.

Please report the **PRA analysis period** as CBES and so on in all templates.

Please ensure that the **Risk Type** in the submission header remains as per the template when it was published. Participants should not change this information.

Participants should also not amend the **Submission content type**, **Submission period type**, **Version** or any of the **worksheet headers** from what is provided in the templates when they were published.

For the **Submission ID**, for the first submission please report 1, each subsequent resubmission should increase the Submission ID by 1 so that the Submission ID for the second submission would be 2 and so on.

In relation to **Worksheet names**, **Column names** and **Enumerations**, please do not replace or delete any of the published Worksheet names from what was published. For example, please do not replace underscores '\_' in worksheet names with dashes '-' and do not amend the case of any letters in the Worksheet names (eg Submission\_header not Submission\_Header). Also, please do not change the spelling or order of any column names from the templates provided and do not add any columns or change the order of columns in the templates provided. Please also stick to using the enumerations as provided in CBES templates.

## 7.3: Data quality

### Data quality

CBES data uses validations, reconciliations and plausibility checks to ensure the quality of stress testing data. These three types of checks are key tools at various stages within the overall Stress Testing workflow, which together form the key data quality assurance process. The Bank applies judgements on materiality before raising any issue to ensure the Bank is proportionate in its queries. Participants will receive regular data quality assurance requests from Bank staff throughout the stress test and should confirm responses (and ask any quality assurance questions they may have) through the Q&A process.

### Validations

#### Overview and categories

Validation rules are checks on a submission's data structure and consistency that evaluate to a result that can be interpreted as either pass or fail. In addition, the BEEDS data ingestion system used for this exercise performs additional metadata focused checks. Further details are available via the [BEEDS User Guide](#).

Failing a data validation (or reconciliation) rule does not necessarily imply immediate rejection of a submission – this will be confirmed to participants on a case-by-case basis. Participants should also be aware that the Bank also conducts plausibility analysis of participant submissions and, as such, the passing of rules does not automatically imply the complete acceptance of a submission.

For data submissions, **Table 7.A** below summarises the main features of each of the rule categories used within these templates. All validation breaks should be accompanied by an explanation in the Comments worksheet in each template.

**Table 7.A: Categories of data validation rules**

Category	Description
Enumeration rule	<p>Enumeration checks compare (individual or patterns/combinations of) data entries to pre-defined lists within the CBES Data Dictionary. The check will fail if a data item differs from those in the list in any way. This is not a check to ensure that all combinations from the reference list are present only that the submitted value is a valid one.</p> <p>With the exception of a small number of enumerations that are (at least partially) participant-defined, checks do indicate if entries <b>within them</b> are mandatory or non-mandatory. However, other dimensions/enumerations <b>outside of the pattern but within the same worksheet and template</b> can still also be mandatory. All mandatory dimensions are described in the CBES Data Dictionary – patterns may only show the relevant subset of this wider 'mandatory' picture.</p>
Pattern rule	Patterns show a contingent relationship between different columns in the same template. Participants should only report relationships between columns that are in the Pattern rule provided.
Range rule	<p>For some numeric fields, an acceptable submission range has been pre-defined. A justification must be provided for values outside this range. On a case-by-case basis, these checks either include or exclude data exactly on the boundaries of the range as appropriate.</p> <p>In many cases, submission values outside the boundaries will result in the rejection of a submission. However, for some checks, unlikely but possible values have been explicitly excluded from the boundaries to elicit a participant justification. The Bank will discuss these with participants and apply, if necessary, pragmatic solutions.</p>
Type rule	Type checks ensure that data are in the correct format, eg no text items in numeric fields (or vice versa). These are fundamental constraints of the data request and failures result in the rejection of a submission.
Unique rule	Duplicate data are identified by the dimension fields in a sheet. If <b>all</b> the relevant dimensions are duplicated across more than one row when that is not permitted, an error will be flagged and cause a rejection.
Mandatory rule	<p>Mandatory rules flag if a data item that is expected to be filled in is left blank. They do not perform any mathematical checks – these are done by other checks.</p> <p>For non-enumeration based mandatory fields, please use 'NA' (text based) or 0 (numerical) as required. Non-mandatory cells can be left blank if relevant unless noted otherwise in the template section of this document.</p>

## Validation requirements

Validation rules are published in the CBES Data Dictionary (within the worksheet Validations) with each rule summarised on a separate row as follows:

- **Template:** The name of the template to which the rule applies.
- **Version:** Version of the template.
- **Tab name:** The worksheet for the relevant Published Rule ID.
- **Field name:** A one-line map of the required key fields for evaluation.
- **Rule type:** The rule category.
- **Published Rule Id:** A unique rule ID.
- **Description:** An articulation of rule-specific guidance.

## Reconciliations

### Overview and categories

Reconciliation rules compare two sets of data with the ability for participants to explain any material difference, via the structure:

**Source ± Reconciling Items – Target = Unreconciled difference.**

Where reconciliation rules indicate a difference, participants must provide a list of reconciling items with meaningful and justifiable descriptions such that the remaining unreconciled difference can be considered immaterial.

The origin of the source and target components determines the rule type.

**Rule type:** Internal      **Source:** A CBES data template      **Target:** A CBES data template

**Description:** These rules are designed to check the consistency of data within and across CBES submissions. Internal rules are either Intra worksheet, Intra template or Cross template reconciliations in the Reconciliations template.

**Rule type:** External      **Source:** A CBES data template      **Target:** An external target

**Description:** These rules are designed to support the accuracy and completeness of data within submission templates by reference against 'External target'. 'External targets' refer to any non-CBES data submissions such as statutory reports, regulatory returns, STDF or participants' internal risk reports. These are referred to as Reconciliations with External data in the Reconciliations template.

### Reconciliation requirements

All participants must perform the pre-defined set of reconciliation rules and present the results via the CBES Reconciliations template. All predefined items such as 'Unique ID', 'Qualified Name' etc must not be altered by participants. A completed Reconciliations template includes reconciliations for all templates and **must accompany each set of submissions** for which rules are defined, including resubmissions.

Within the Reconciliations template, each Qualified Name is prefixed by either an 'I' (internal data) or an 'E' (external data). Also, all reconciliation rule IDs must not be changed as they feed into the Bank's data quality checks.

Within the Reconciliations template, each rule is summarised as follows:

- **Unique ID:** A unique ID, assigned to each reconciliation rule.
- **Control type:**
  - **Source:** A data item from the CBES data item reference.
  - **Reconciling item:** Reasons for difference between Source(s) and Target(s). Participants must explain all reconciling differences with meaningful and justifiable descriptions. Across Banking templates there are several reconciliations to STDF templates. The Bank understands that for some of these there is a scope difference where exposures which are 100% government guaranteed are excluded from the CBES, the rest of the scope is the same. Please report these 100% government guaranteed exposures as reconciling items.
  - **Target:** A CBES data or External target data item reference.
  - **Unreconciled Difference:** The residual difference between Sources and Targets that is not explained by the Reconciling Item(s).
- **Qualified name:** The unique name, assigned to a CBES data item or External data item.
- **Sign:** The sign (positive or negative) that will be applied to the reported amount to determine the unreconciled difference.
- **Reported amount:** The amount reported via the qualified name in the CBES Data Item Reference or External Report Data Item Reference sheets.
- **Description:** A meaningful and justifiable description of the control type where relevant.

As well as the information listed above, the reconciliations template also includes additional metadata for every qualified name. These cover the Template, Worksheet, Dimensions, Dimension values, Field name and High-level reconciliation categories.

The High level reconciliation categories groups reconciliation IDs together logically so both the Bank and participants can see similar reconciliation IDs covering the same reconciliation, mainly across different scenarios and projection periods.

The Bank does accept that pulling all templates together to a deadline may result in a small number of differences in reconciliations which are due to the different times that data sets are signed off. The Bank accepts all immaterial differences that are due to these timing differences.

All reconciliations for CBES have been written at a high level of aggregation to avoid a high number of data quality rules for this exercise. The Bank has noted below general data quality expectations of participants for some of the high-level reconciliation categories beyond the reconciliations listed within the respective templates.

All details of these reconciliations are listed in the Banking and Insurance reconciliations templates respectively.

Participants	High-level reconciliation category	Additional data quality exceptions
Banks	RWA Yr 0 vs STDF	The Bank would also expect these reconciliations to match by country except loans that are fully guaranteed by coronavirus government loans schemes.
Banks	RWA intra Yr 0 projections	
Banks	Mortgages Yr 0 vs STDF	
Banks	Mortgages intra Yr 0 projections	
Banks	Consumer credit Yr 0 vs STDF	
Banks	Consumer credit intra Yr 0 projections	
Banks	Wholesale Yr 0 vs STDF	
Banks	CRE Yr 0 vs STDF	
Banks	Counterparty intra Yr 0 projections	
Banks	UK mortgages EALA intra Yr 0 projections	
Banks	Mortgages vs EALA projections Yr 0-30	The Bank would also expect these reconciliations to match by country and by sector except loans that are fully guaranteed by coronavirus government loans schemes.
Banks	Mortgages vs NAA projections Yr 0-30	
Banks	Wholesale intra Yr 0 projections	
Banks	CRE intra Yr 0 projections	
Banks	CRE actuals vs CRE projections Yr 0	
Banks	UK mortgage actuals vs UK mortgage EALA Yr 0	
Banks	UK car finance actuals vs Consumer credit projections Yr 0	
Banks	UK car finance actuals vs STDF template 17	
Insurers	Balance sheet actuals vs Solvency II	
Insurers	Balance sheet actuals vs Balance sheet projections Yr 0	
Insurers	Balance sheet projections Intra Yr 0	
Insurers	Asset sector summary vs Balance sheet projections Yr 0-30	
Insurers	Asset sector summary intra Yr 0	
Insurers	Counterparty projections intra Yr 0	
Insurers	GI liabilities actuals vs UK GI liabilities actuals	
Insurers	GI liabilities by peril vs UK GI liabilities by peril	
Insurers	GI liabilities by peril intra Yr 0	



## Plausibility checks

Once the data have been successfully validated and reconciled to within materiality thresholds, a subject matter expert at the Bank will also plausibility check the data. Plausibility checks may be in many forms and are intended to identify potential data errors using expert judgement.

## Annex 1: Mapping between the CBES scenarios and the corresponding NGFS scenarios

CBES scenario	NGFS scenario	NGFS Integrated Assessment Model driving physical risk assumptions	NGFS Integrated Assessment Model driving transition risk assumptions
Early Action	Net Zero 2050	GCAM 5.3 – 50th percentile (based on Disorderly transition)	REMIND-MAGPIE 2.1–4.2
Late Action	Disorderly transition		
No Additional Action	Current policies	GCAM 5.3 – 90th percentile	

## Annex 2: List of the optional climate data that the Bank has provided to participants

Risk category	Optional climate data variable	Link to data
Rainfall	Land-based gridded <sup>(a)</sup> precipitation	<a href="#">CEDA</a>
Temperature	Gridded near-surface air temperature	<a href="#">CEDA</a>
Windstorm	Gridded near-Surface Wind Speed	<a href="#">CEDA</a>
SLR	Sea-level rise on annual basis gridded across near-shore	UK: <a href="#">CEDA</a> Non-UK: <a href="#">ISIMIP</a>
Wildfire	Gridded land area exposed to wildfire	<a href="#">NGFS (zip file)</a>
Heatwave	Gridded land area exposed to heatwave	
Agricultural	Gridded land area exposed to crop failure	

(a) Gridded data: in the context of climatic model outputs, 'gridded' refers to a spatial index which is formed by a regular tessellation of the earth's surface dividing space into a series of contiguous cells which can be assigned unique identifiers.

Refer to the published [variable paths](#) for further instructions on downloading the optional climate data variables.

## Annex 3: Worked examples of corporate adaptation plans guidance

Tier 1 counterparty adaptation plans should not be accounted for in participants' projections, unless a counterparty was already implementing their plans as at end-2020, and it is highly likely the plans will be completed. If the participant decides to factor in adaptation plans, the costs of continuing to implement the plans should also be factored into projections, as well as the benefits.

Participants may break out subsets of overall plans from the same counterparty and make different judgements about whether to factor these into their projections, for instance across business lines, timeframes or climate strategies.

This annex sets out case studies according to the following three groups:<sup>(1)</sup>

1. examples where counterparty adaptation plans should not be factored into projections;
2. examples where counterparty adaptation plans might be factored into projections; and
3. examples where counterparty adaptation plans might be broken down into separate time frames or targets, and different judgements made about whether to factor into projections.

(1) Case studies are not intended to reflect real companies or counterparties and are for illustrative purposes only.

## Examples where counterparty adaptation plans should not be factored into projections:

- **Case study 1a: Counterparty has no adaptation plans, or has adaptation plans that are not currently being implemented.**

Counterparty 1a, a shipping company, has a target to be a net zero company by 2050. Part of this plan is to use carbon neutral vessels. They have invested in research into carbon efficient vessels, but their plan to reach net zero depends on the outcome of this research, which is uncertain at this stage.

This adaptation plan should not be regarded as already being implemented. Although funding has been allocated to research, this has not resulted in the key technology, carbon neutral vessels, being available at end-2020. **This adaptation plan should not be factored into CBES projections.** Publicly stated intent is necessary but not sufficient.

- **Case study 1b: counterparty has adaptation plans that are currently being implemented, but are not 'highly likely' to be completed.**

Counterparty 1b has a public commitment to reach net zero emissions by 2040. They have reduced their emissions steadily over the last 20 years. Through conversations with the counterparty, the lender has learnt that counterparty 1b has a series of interim targets and is implementing strategies to achieve these targets.

Current performance is not on track to meet interim targets, even though progress has been made in reducing emissions. Therefore, this adaptation plan is in train, but it is not highly likely that it will be completed and these targets met. **The targets should not be factored into projections** and only the progress made before the balance sheet cut-off date should be taken into account.

Participants should also not extrapolate current trends where progress is being made. Instead, if they do not judge that the target the counterparty has committed publicly to as 'highly likely', no further adaptation should be accounted for beyond the balance sheet cut-off date. To the extent that participants believe that some further progress will be made over the exercise horizon, they can record this at sector-level in the qualitative questionnaire and relevant management actions, but should not factor this into their quantitative projections.

- **Case study 1c: counterparty has adaptation plans that are currently being implemented, and current targets are being met. But they are not 'highly likely' to be completed.**

Illustrative counterparty 1c has committed to meeting certain renewable energy capacity goals at 2040. The participant learns that the plan to achieve this is already being implemented and 1c is meeting their targets for 2021. But, targets for 2021 are very low, and increase very rapidly at 2030.

The participant should consider whether the plans are highly likely to be completed, by analysing the counterparty's proposed strategy for meeting these targets and the credibility of the interim steps to get there. Participants may consider targets for different business units or products separately (see case studies 3b and 3c). Given the increase is very rapid at 2030, the targets may be unrealistic.

**This strategy should only be factored into projections if all steps to achieve the targets are already under way and judged highly likely to be completed.** If this high bar is not met, the strategy should not be accounted for and the counterparty balance sheet remain at end-2020. To the extent that participants believe that some further progress will be made over the exercise horizon, they can record this at sector-level in the qualitative questionnaire and relevant management actions, but should not factor this into their quantitative projections.

- **Case study 1d: counterparty is in a regulated industry with upcoming regulation changes to support the transition, but is not currently implementing adaptation plans.**

Future regulatory changes should not automatically be factored into Tier 1 counterparty projections, even if counterparties have a history of complying with regulation, and regulation changes affect climate adaptation. The same high standards of only accounting for plans already being implemented and highly likely to be completed applies even to counterparties in regulated sectors.

Counterparty 1d is a house-builder. Counterparty 1d has a history of complying with all regulation. Counterparty 1d does not currently build houses in the top EPC bands, but does build houses to current regulatory standards.

If energy efficiency standards increase, counterparty 1d cannot assume their houses meet new energy efficiency standards unless they are already building at these new higher standards, or implementing plans to build at these standards. **Counterparties that are not currently implementing adaptation plans that the participant judges as highly likely to be completed may fall behind industry standards as a result.**

**Examples where counterparty adaptation plans might be factored into projections:**

- **Case study 2a: counterparty has adaptation plans currently being implemented and that were started before end-2020. They are highly likely to be completed.**

Illustrative counterparty 2a has plans to reduce emissions by a certain percentage by 2030. They have identified concrete steps to achieve this as part of their adaptation plan. This includes clear targets in different areas of their business and credible plans for meeting each target. They have been taking these steps since 2010.

2a is on track to exceed all their interim targets and to meet their 2030 target. As part of this, all their production sites are certified according to the international environmental standard ISO 14001. They published their climate strategy and performance.

This adaptation plan could be factored into projections, if the participant judges it is highly likely to be completed on the basis of this evidence and counterparty engagement.

- **Case study 2b: counterparty has longer-term adaptation plans currently being implemented and that were started before end-2020.**

It is possible but less likely that participants will be able to judge longer-term adaptation plans as a) already being implemented, and b) highly likely to be successfully implemented.

Counterparty 2b has publicly committed to reaching net zero emissions by 2050. To do this, they have separate, concrete and achievable plans for each of their business activities. The counterparty is exceeding all interim targets and is ahead of schedule for their plan to 2050. On detailed analysis and engagement, the participant judges that their strategies for meeting their targets are credible and well progressed. The participant may choose to factor these adaptation plans into their analysis.

**Examples where counterparty adaptation plans might be broken down into separate time frames or targets, and different judgements made about whether to factor into projections:**

- **Case study 3a: counterparty has some adaptation plans currently being implemented and that were started before end-2020. Their completion is highly likely. Counterparty also has unrealistic longer-term goals.**

Counterparty 3a, a transport company, has a number of climate targets, including to reduce greenhouse gas emissions per passenger to a certain level by 2030. These measures have started to be implemented successfully. 3a has concrete and achievable plans for these targets and the participant judges that 3a is highly likely meet this goal by 2030. The participant may choose to factor meeting these targets into their counterparty projections.

3a also has plans to reach net zero greenhouse gas emissions by 2050. These plans rely on a number of initiatives that are not currently being implemented, including using more efficient future technologies and machinery from 2030, and carbon removal measures from 2035. As these initiatives are not currently being implemented, this part of 3a's adaptation plan should not be accounted for in CBES projections.

**Participants might break out different targets or plans from the same counterparty and reach different judgements about whether to factor them into projections.**

- **Case study 3b: counterparty has some adaptation plans currently being implemented and that were started before end-2020. Their completion is highly likely. But some parts of this adaptation plan should not be accepted.**

Counterparty 3b is an oil company that has started to transition to primarily natural gas. It plans for natural gas to overtake oil as their main activity by 2025. On analysis, the participant judges that this part of 3b's adaptation plan is being implemented already and it is highly likely to be completed. The increased production of natural gas can be factored into projections.

On the other hand, 3b has a long-term plan to transition to primarily renewables by 2050. They have started implementing this, but the transition is still in very early stages and highly uncertain. 3b does not have step-by-step achievable plans for increasing revenue from renewables beyond 2025, so the participant does not judge this part of the plan as highly likely to be completed.

**The participant may account for increases in revenue from natural gas in their projections, but not a transition to renewables.**

- **Case study 3c: counterparty has some adaptation plans currently being implemented and that were started before end-2020. Their completion is highly likely. But some parts of this adaptation plan should not be accepted.**

Counterparty 3c is a global car manufacturer that has publicly stated that all their products will be fully electric by 2040. But 3c's strategy for transitioning their sales towards fully electric products is in very early stages. 3c plans to announce new electric products for sale from 2025, but has not finished designing or started to manufacture them. Participants should not account for 3c's transition to fully electric products in their projections. The adaptation plan has not started to be implemented, as 3c does not already sell electric products to consumers.

But, 3c does produce and sell hybrid products. The planned increase in production and revenues from these products can be factored into projections.

3c can only be assumed to implement transition plans that are already in train and highly likely to be completed. 3c might fall behind industry average in the Early Action scenario, given GVA paths for the sector imply that transition is successful.

## Annex 4: Additional guidance on energy efficiency risks

Participants are required to consider the impact of policies aimed at increasing the energy efficiency of buildings. This annex provides guidance to assist participants in quantifying the impact of the energy efficiency policies set out in Box B of the [Key elements document](#).

For the purposes of the CBES, energy efficiency is measured using Energy Performance Certificates (EPCs). EPCs contain information on:

- a property's current energy efficiency, henceforth referred to as  $EPC_{t0}$ ;
- a property's maximum attainable energy efficiency, henceforth referred to as  $EPC^{MAX}$ ; and
- the average cost of transitioning from the current energy efficiency band to a higher band.

Participants are required to identify  $EPC_{t0}$  and  $EPC^{MAX}$  for the properties in their residential and commercial real estate portfolios. Where exact data is not available, proxies are to be used.

**Table A.1** shows the average costs of transitioning from current energy efficiency band to a higher band for residential properties, as estimated by the Bank on the basis of the EPC database. Participants are required to use these cost estimates in their analysis of residential real estate (RRE) portfolios. For commercial real estate (CRE) portfolios, participants should use their own projections of the cost of transitioning.

**Table A.1: Average costs of transitioning from current to higher energy efficiency bands for residential real estate**

		$EPC^{MAX}$						
		A	B	C	D	E	F	G
$EPC_{t0}$	A	7,052						
	B	10,843	4,212					
	C	20,202	12,234	4,941				
	D	32,712	18,490	12,661	6,234			
	E	40,129	23,377	17,028	11,258	5,120		
	F	44,514	28,865	22,715	18,721	12,995	6,341	
	G	47,012	31,597	26,652	23,744	20,058	19,658	15,401

When analysing the impact of these costs on counterparties, participants should make the following assumptions. A summary of these assumptions is given in **Table A.2**.

- Properties (RRE and CRE) transition to the highest EPC band feasible (ie  $EPC^{MAX}$ ). Note that  $EPC^{MAX}$  is different for each property. Properties that are in band A (ie  $EPC_{t0} = A$ ) do not transition and are not subject to the costs stipulated in **Table A.1**.
- Properties (RRE and CRE) that cannot be improved to an EPC band E or higher (ie  $EPC^{MAX} < E$ ) become unmarketable. For such properties, participants should not consider the cost of transitioning, but should instead consider that the value of the property is reduced to its land value (ie the building value falls to zero).
- Borrowers (RRE only) incur an additional cost to cover the installation of a heat pump. This assumption applies to 65% of all properties in participants' portfolios, and should be applied in equal proportion

across EPC bands (ie 65% of properties in each EPC band incurs an additional heat pump cost). The heat pump cost is to be added to the cost of transitioning given in **Table A.1**. The cost of installing a heat pump is assumed to be £5,000, regardless of a property's EPC band. Properties that are in band A (ie  $EPC_{t0} = A$ ) are exempt from this assumption and do not incur this cost.

- Borrowers (RRE only) receive a subsidy covering two-thirds of their retrofitting costs (the cost provided in **Table A.1** plus the heat pump cost), up to a maximum of £5,000. This subsidy can be subtracted from the combined transitioning and heat pump costs incurred by a property.

Properties for which the property value becomes equal to the land value of the property, the shock is assumed to have fully materialised by 2035 and there is no recovery afterwards. Participants can assume to apply this shock either suddenly in 2035, or with a gradual phase in.

For properties where the borrower incurs a cost, participants can choose to model this either as an impact on debt serviceability (akin to assuming that the borrower pays the expenses) or as an impact on property value (akin to assuming that prospective buyers incur the cost). These costs are assumed to materialise gradually over the scenario horizon, rather than all at once. Participants can model this in two ways:

- If modelled as a shock to property value, the shock should be phased in gradually, starting from 2021 in the Early Action scenario and from 2031 in the Late Action scenario.
- If modelled as a shock to debt serviceability, each borrower incurs the full shock once at a point in time during the scenario horizon. Specifically, at each timestep, it is assumed that a subset of borrowers incurs a shock such that by the end of the scenario all borrowers to which the shock applies have incurred it. In the Early Action scenario, shocks are to be applied from 2021 onwards, while in the Late Action scenario shocks are to be applied from 2031 onwards.

**Table A.2: Impact by borrower and property**

Type of property	Impact
RRE $A > EPC^{MAX} \geq E$	Total cost = transitioning cost + heat pump cost if applicable – subsidy Heat pump costs apply to 65% of RRE properties across EPC bands Impact materialises gradually over the scenario horizon
RRE $EPC^{MAX} < E$	Property value = land value of property Impact has fully materialised by 2035 ( $t = 15$ )
CRE $A > EPC^{MAX} \geq E$	Total cost = transitioning cost Impact materialises gradually over the scenario horizon
CRE $EPC^{MAX} < E$	Property value = land value of property Impact has fully materialised by 2035 ( $t = 15$ )

## Annex 5: Physical risk variable data description and caveats

This annex provides with descriptions and caveats relating to the optional climate and benchmark data provided by Met Office, Oasis Hub and NGFS. Although all open data providers have made every attempt to align model selection with the CBES scenario specifications, care needs to be taken when directly comparing the data provided given the differences in methodologies and assumptions relating to model selection that the data providers adopted.

### Met Office

Met Office's data is based on UK Climate Projections (UKCP as per Lowe *et al* (2018)).<sup>(2)</sup> The data dictionary contains benchmark temperature, precipitation, and sea-level rise data for the UK and the published [variable paths](#) contain UK and global data sets.

(2) See 'UKCP18 Science Overview Report'.

The variables relevant to the UK are sourced from the Met Office's Probabilistic Projections and UKCP Regional (12km). The selection of the UKCP data and percentiles chosen was based on comparing against the CBES climate scenarios produced using the NGFS's integrated assessment model runs as outlined in Section 4. The comparison of UKCP data with the CBES climate scenarios concluded that the Early and Late Action scenarios overlap with the global mean temperature range of the RCP 2.6 in UKCP and the No Additional Action scenario overlaps with UKCP's global mean temperature range of the RCP 6.0 emissions scenario. The benchmark data provided in **Table A.3** are expressed as changes compared to a 1981–2000 baseline and are based on:

1. UKCP Probabilistic Projections at RCP 2.6 50th percentile and RCP 6.0 90th percentile for the temperature and precipitation variables. The probabilistic projections better capture the range of uncertainty. For participants wanting to access the full gridded monthly time series, they can be extracted from the link to the [CEDA Archive](#) (Annex 2). For clarity, the seasonal precipitation rates (% change) for the UK are based on the UKCP Probabilistic Projections.
2. UKCP Regional (12km) expressed at global warming levels (GWLs) for the variables expressed at daily temporal scale and based on simulations driven by the RCP 8.5 emissions scenario. The UKCP GWLs correspond to the GWL from the NGFS IAM scenarios specified at particular years. This data set is useful when requiring high spatial and temporal granularity of analysis. For participants wanting to use the daily variables from the UKCP Regional (12km) model, these can be extracted from the [CEDA Archive](#). Instructions on how to extract the required 21-year time-slice corresponding to a GWL from UKCP Regional is outlined in the relevant template. For clarity, the annual average precipitation change (% change) for the UK and for London are based on the UKCP Regional data set at 50th percentile for the Early and Late Action scenarios and 90th percentile for the No Additional Action Scenario.
3. UKCP sea-level projections for RCP 2.6 50th percentile and RCP 4.5 95th percentile as the sea-level outcomes for RCP 4.5 and RCP 6.0 are very similar ([IPCC \(2014\)](#)). These can be extracted from the link to the [CEDA Archive](#).

Participants who decide to use the climate data provided by Bank via the Met Office need to take notice of the inherent differences that exists between Probabilistic and Regional data sets such as the year that GWLs are reached due to the way alignment to NGFS temperature projections was achieved. Participants should also be aware of the different percentiles the benchmark data is based on when comparing the climate data provided by the Bank and other data sets.

If participants are interested in using GWL data at international locations, they can extract daily gridded data using UKCP Global (60km). Participants can use the Jupyter notebook linked above but instead of loading 'UKCP Regional, RCP 8.5 simulation files', participants should load UKCP Global. Note that UKCP Global comprises a 28-member ensemble with 12 members corresponding to UKCP Regional and samples a wider range of outcomes.

## NGFS

Participants can access this data through the [NGFS Climate Impact Explorer \(CIE\)](#) and the [Variable Paths Spreadsheet](#) (gridded spatial climate data is also available via [ISIMIP portal](#) and links provided in Annex 1).

The Bank has provided benchmark data based on NGFS data for a selection of physical risk variables. Participants can access this data through the [NGFS Climate Impact Explorer \(CIE\)](#) and the [Variable Paths Spreadsheet](#) (gridded spatial climate model data is also available via the [ISIMIP portal](#) and links provided in Annex 1). This data provides country-level statistics for key chronic and acute climate change indicators aligned with the NGFS scenarios.

As mentioned in Section 3, the CBES scenarios are not identical to those produced by NGFS but they do largely overlap. For physical risk variables, the comparison of NGFS scenarios with CBES climate scenarios



concluded that Early and Late Action scenarios overlap with the NGFS Net Zero 2050 scenario and the No Additional Action scenario overlaps with the NGFS current policies scenario. The time periods in CBES scenarios correspond to different NGFS GWLs.

Participants who use the NGFS data provided by the Bank should be aware of the following caveats and limitations:

- The data is expressed as a change in comparison to a 1986–2005 baseline period (note baseline periods may vary for different data providers eg Met Office and Oasis Hub use a baseline period of 1981–2000).
- The Climate Impact Explorer provides projections for each climate impact indicator within confidence intervals. The Bank has chosen the median of these values but participants should be aware that data projections are subject to uncertainty (and this uncertainty increases at higher GWLs).
- Although the Climate Impact Explorer provides country-level information, impact models are not validated on the country-level. The climate input data is bias corrected to match local observations. But the same is not possible for all climate impact indicators.
- The land area exposed to wildfire, heatwave, and crop failures were derived based on the methodology used by Lange *et al* (2000).<sup>(3)</sup> Users are encouraged to understand the methodology when using these benchmark data.
- The numbers for land area exposed to wildfire and land area exposed to crop failures are relatively low and this might be because that these numbers are country level averages.
- Impact projections for very small islands have to be interpreted carefully because of the spatial resolution of approximately 50km.

The full [NGFS methodology](#) is available for participants to access

## Oasis Hub

Oasis Hub provided wind speed data, and sea-level rise data as indicated in **Table A.3**. The data aggregated for producing the benchmark data were sourced from the World Climate Research Programme's (WCRP) ESGF data portals for [CMIP5](#) (sea-level rise only) and [CMIP6 climate model](#) outputs. In many cases, the variables have been sourced from single model realisations and hence they have increased uncertainty.

The approach used to produce statistics was to extract data from global climate models (GCM) native to the specific country. A detailed breakdown of which GCM was used for each country per scenario (historical, Early/Late Action and No Additional Action), and climate variable is presented in **Table A.3** below. For wind speed data in No Additional Action scenario, no native GCMs was available for Germany, UK and US, therefore a number of substitute GCMs were used instead, detailed in **Table A.3**. Participants should take care when expanding the source data as the variables outlined in **Table A.3** is referencing models with different climate sensitivities over different regions.

**Table A.3: GCM breakdown of each variable per country**

Country	Wind speed	Sea-level rise
Canada	Can-ESM5	GFDL-ESM2M
China	FGOALS-G3	MIROC5
France	IPSL-CM6A-LR	IPSL-CM5A-LR
Germany	MPI-ESM1-2-LR (for No Additional Action: IPSL-CM6A-LR, Can-ESM5, FGOALS-G3 and MRI-ESM-0)	IPSL-CM5A-LR
Hong Kong	Not Available	MIROC5
Japan	MRI-ESM2-0	MIROC5
UK	UK-ESM1-0-LL (for No Additional Action: IPSL-CM6A-LR, Can-ESM5, FGOALS-G3 and MRI-ESM-0)	Not Applicable
US	GFDL-ESM4 (for No Additional Action: IPSL-CM6A-LR, Can-ESM5, FGOALS-G3 and MRI-ESM-0)	GFDL-ESM2M

(3) Lange *et al* (2000), 'Projecting exposure to extreme climate impact events across six event categories and three spatial scales', *Earth's Future*.

### Key assumptions and caveats:

- The wind speed and sea-level rise data were derived as relative to 1981–2000 baseline. The data retrieved was not bias-corrected. All the data does not have any alterations or remapping to the realisation, initialisation method, physics or forcing when running the models, creating an unbiased, unmodified data set. As the data was drawn from CMIP5 and CMIP6, the data is categorised by RCP emission pathways (CMIP5) and the more up-to-date Shared Socioeconomic Pathways (SSP) from CMIP6. Wind speed data were extracted from the SSP126 and SSP460 scenarios, which serve as updated versions of RCP2.6 and RCP6.0, with more consideration to the current global climate policy changes between 2013 and 2018. This improvement provides a significantly close match to the warming level ranges projected by the NGFS Early/Late Action and No Additional Action scenarios. Due to the lack of availability of sea-level rise data from CMIP6, data was retrieved under the RCP2.6 and RCP6.0 scenarios from bias corrected CMIP5 models.
- Country specific GCM model outputs were used for most variables/countries but not for all. For UK, Germany, and US wind speed data, mean of a number of substitute GCMs was used for No Additional Action scenario.