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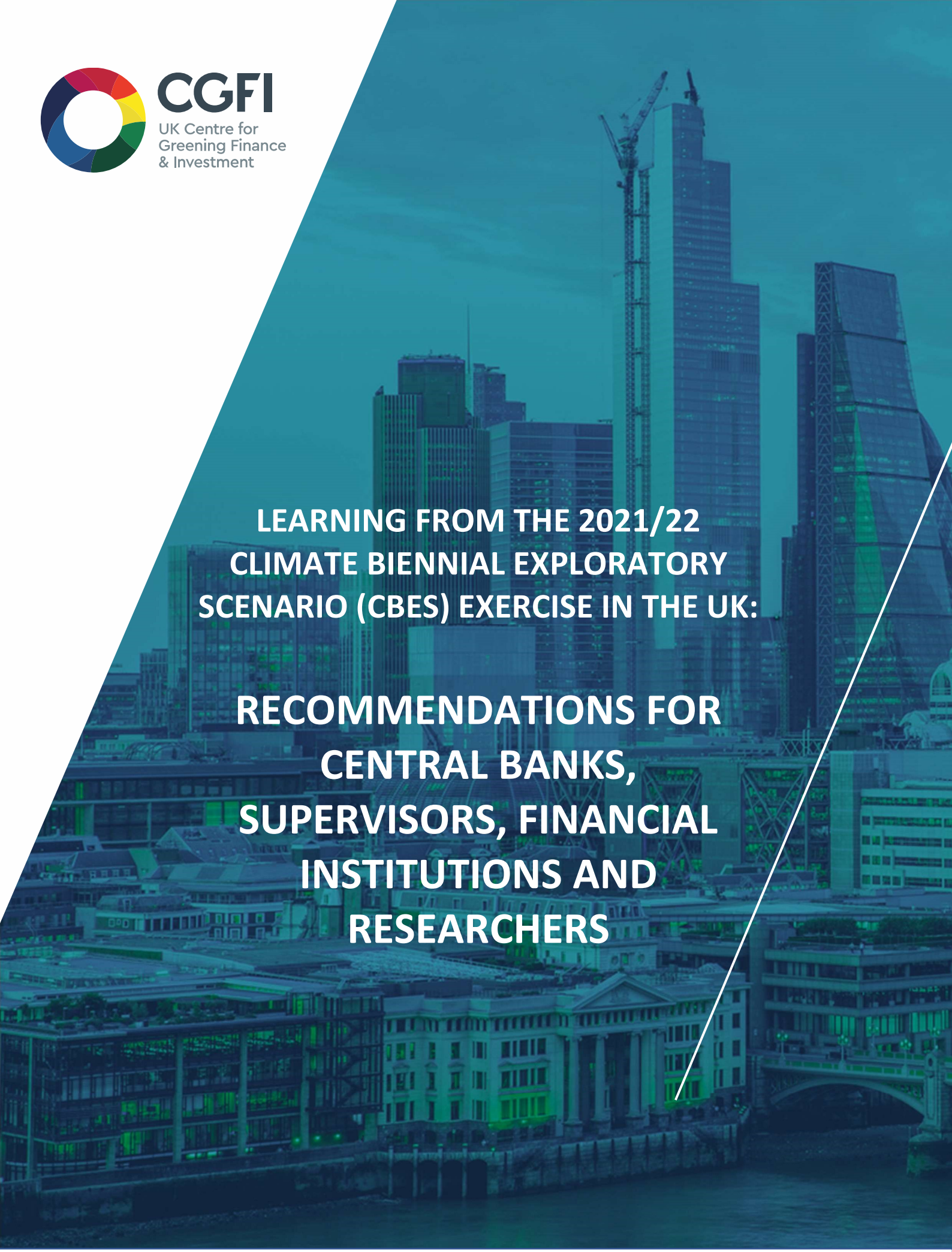

LEARNING FROM THE 2021/22 CLIMATE BIENNIAL EXPLORATORY SCENARIO (CBES) EXERCISE IN THE UK:

RECOMMENDATIONS FOR CENTRAL BANKS, SUPERVISORS, FINANCIAL INSTITUTIONS AND RESEARCHERS

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LEARNING FROM THE 2021/22 CLIMATE BIENNIAL EXPLORATORY SCENARIO (CBES) EXERCISE

RECOMMENDATIONS FOR CENTRAL BANKS, SUPERVISORS, FINANCIAL INSTITUTIONS AND RESEARCHERS

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RECOMMENDATIONS FOR CONSULTATION

This document outlines proposed recommendations for Central Banks and Supervisors, Financial Institutions, Government, Professional Bodies and Research and Technical Institutions that emerge from the CFRF and CGFI study "Learning from the 2021/22 Climate Biennial Exploratory Scenario (CBES) Exercise".

The recommendations were prepared by the UK Centre for Greening Finance and Investment (CGFI) and subsequently refined following feedback workshops with CBES participants in January 2023. This draft is for consultation with wider CFRF members.

Recommendations for different stakeholders are denoted as follows:
[CB&S] Central Banks and Supervisors
[FIs] Financial Institutions
[G] Government
[PBs] Professional Bodies
[RTIs] Research and Technical Institutions (including professional service providers)

The recommendations are divided into four (interconnected) areas:

I. Addressing Data Gaps

II. Recommendations for enhancing scenario analysis and stress testing capabilities, usability and application

III. A research agenda to support future scenario analysis and stress testing

IV. Recommendations for the UK Green Finance Strategy

I. ADDRESSING DATA GAPS

1. **Resolving the key data gaps revealed by CBES should be an ongoing priority but requires urgent action now by CB&Ss, Government and Financial Institutions** [CB&Ss, PBs, FIs, G]**.** Improved data would enhance risk management but also the effectiveness of FIs in supporting their clients to transition

    a. **Disclosure requirements could play a role in addressing gaps in counterparty data that were revealed by CBES** [CB&Ss, G]. Key data gaps raised by participants related to transition risks included company emissions, supply chain information and transition plans. For physical risk, this included historical losses, adaptation, and the geographical locations of assets.

Regulators should consider how to fill data gaps, particularly beyond listed assets, and collaborate with international regulators to close international gaps.

b. **Future climate transition plans stand out as a priority data gap to improve transition risk assessment and management** [CB&Ss, G]**.** FIs need guidance on how to assess the credibility of plans and use them. Guidance on credible transition plans being developed by the UK Transition Plan Taskforce, GFANZ and standards bodies will play an important role alongside enhanced disclosure requirements by regulators. Adaptation plans are also identified by some as needing more consistent data to enhance physical risk assessment.

c. **The adoption of consistent standards for counterparty disclosures will increase the effectiveness and efficiency of climate risk management across the sector** [CB&Ss, G]**.** Inconsistencies lead to uncertainties and increase the time required by FIs to process and use data in decision making.

d. **Investment in data aggregation platforms can improve climate financial risk assessment and increase efficiency** [CB&Ss, G, FIs]**.** For example, some FIs (and CB&Ss) are unaware of the breadth of data available so facilities to make data more accessible and 'findable' would be beneficial. Some CBES participants also spent significant time asking (often the same) counterparties for the same data in slightly different formats and this added to inefficiencies both for the counterparties and the FIs. The industry should continue to explore opportunities for pre-competitive data collection platforms.

e. **Supporting enhancements in open Geoasset data as a public good** [CB&Ss, RTIs, G]**.** Geolocated asset-level data was one of the biggest constraints reported by respondents both for physical and transition risk assessment. Recent advancements in satellite data and AI provide opportunities to make such information available at scale. There is a strong rationale for public support to do so as a public good or to co-fund with industry to create a utility which would benefit the public and private sectors, and would also ensure transparency and consistency across FIs.

II. RECOMMENDATIONS FOR ENHANCING SCENARIO ANALYSIS AND STRESS TESTING CAPABILITIES, USABILITY AND APPLICATION

Strengthening capability of FIs to enhance financial resilience to climate change

2. **Gaps in capability for climate financial risk assessment and scenario analysis need to be filled in order to ensure a resilient financial sector and to support the transition to a green real-economy.** Financial Institutions (FIs) should continue to prioritise enhancing internal capabilities for climate financial risk assessment, risk pricing and risk management. FIs should also advance the integration these into business strategies to deliver real-economy impacts [FIs, PBs].

    a. **Enhancing internal capability will require continued investment for all FIs, as well as accountability for delivering enhanced capabilities.** Major FIs have made significant progress in assessing climate-related risks but there is much more to be done, particularly in terms of operationalising this into core risk management, risk pricing, and business strategy. Advancements in capability in the past years need to be maintained and continued. In addition, smaller FIs that were not involved in CBES should also take the opportunity learn from CBES and continue to enhance their internal capabilities.

    b. **The ability to model climate-related risks is at an early stage and there are major data, knowledge and capability gaps that require attention.** All FIs should learn from the CBES experience and develop plans for their own enhancements in data, knowledge and capability to reflect their priorities.

    c. **All FIs should invest in strengthening their ability to scrutinise and build-upon third-party analyses and scenarios where this can add-to and complement internal capabilities** [FIs, PBs, RTIs]. Many CBES participants relied upon third-parties and further they used the same small number of firms. Outsourcing e.g. to consultancies and third-party model vendors is necessary and efficient in some cases to plug gaps, but should be adopted strategically to ensure sufficient internal capability is built. In addition, issues were raised concerning the lack of transparency and adaptability of the third-party models that were used extensively in the CBES process. Building internal capability to scrutinise third-party models and scenarios is therefore essential to ensure the appropriateness of models and data for the scenarios being examined. RTIs – particularly academics and neutral advisors - can help here and support FIs to access the latest knowledge to scrutinise models. CB&Ss should also explore if there could be a role for them in requiring minimum standards of transparency in model assumptions for supervisory exercises and also undertaking collaborations with RTIs to develop frameworks to assist interpretation and use of models as a public good, and well as to help raise the

quality and transparency of third-party models. For insurance purposes, respondents also proposed that CB&Ss engage directly with third-party modellers to ensure the appropriateness of models for regulator needs.

d. **Professional bodies** [PBs] **can play an important role through offering professional training and supporting knowledge transfer and sharing across the financial sector.** Most UK and international PBs now offer tailored training on climate financial risk assessment and scenario analysis, as well as lecture series and workshops. These should also reflect the learnings from CBES and work with RTIs to fill draw upon the latest knowledge.

3. **Supervisory requirements including scenario exercises are an effective tool in encouraging FIs to make strategic enhancements in capacity** [CB&Ss]**.** The central finding of the study is the strong evidence of the enhanced capacity and positive impact of the CBES exercise on participating FIs, including greater awareness of climate risks and opportunities, and greater integration into risk management.

   a. **For CB&Ss a clear recommendation emerges to undertake such 'bottom-up' scenario analysis exercises to enhance capability across the sector**. The frequency of such exercises must, however, be appropriate to balance three drivers: (a) the minimum number of exercises to encourage FIs to maintain and strengthen capability over time; (b) the need to update exercises to reflect changing knowledge or policy/outcomes over time; and (c) taking account of the high resource costs of such exercises on FIs. Regulatory requirements create a 'stick' but can also enable a 'carrot' for improved risk management where exercises are designed to encourage client engagement. CB&S should consider how exercises can be designed to increase client benefit.

   b. **CB&Ss should provide a clear roadmap for supervisory exercises to allow FIs to build capability over time accordingly and have longer-lead times for data collection and client dialogue** [CB&Ss]. Positive impacts may be enhanced through allowing more time for the exercise and/or sufficient warning, to allow client dialogue to happen and to ensure full engagement across the financial institution at all levels.

Interpretation of CBES exploratory scenario analyses

4. **Climate scenario analysis is still in its infancy. The Bank of England itself has noted the substantial uncertainty around the true magnitude of financial risks from climate change. As such we recommend that the quantitative CBES results – in**

terms of sizing financial risk - are interpreted with caution [FIs, G, CB&Ss]. It is clear that there are missing risks and trade-offs with the methodologies adopted – some of which will increase estimated risks and others decrease. Further work is required for climate change risk to be appropriated sized, particularly mid to long term.

a. **Physical climate risks are likely closer to a lower bound.** On balance, the scientific evidence and respondents feedback point toward much larger downside risks than were captured in the CBES scenarios. For example, the exercise included only a subset of risks from the UK Climate Change Risk Assessment, missing important indirect risks such as supply chain risks. CB&Ss and FIs should not overinterpret the results and make the false assumption that risks are not systemic relative to other forms of financial risk based on the scenario analysis that has been undertaken. Respondents noted that the NGFS scenarios currently are not an adequate standard for analyses of physical climate risks now for several reasons and we recommend that NGFS look to evolve to better represent such risks, including acute risks. The interplay of insurance and financial risk also requires further exploration, including risks to insurability, and insurance conduct risks.

b. **Transition risks, particularly at a counterparty level, should be interpreted with caution and with awareness of the limitations of the exercise design.** While most respondents agreed that the range of transition risks looked about right based on current knowledge, there was significant uncertainty e.g. on sectoral level impacts and the static balance sheet assumption may have inflated some risks. Further, FIs struggled to assess risk variation across counterparties. In addition, the scenarios adopted assumed that the transition would be relatively smooth and (effectively) that the transition to net zero would be successful. Some respondents argued that this was unrealistic and did not appear to reflect current UK government policy, the reality of the state of global mitigation action or the potential for rapid changes in policy and sentiments and compounding events, such as the 2022-23 crises, as well as risks such as greenwashing. The scenarios did not allow participants to explore potential shocks, including 'Minsky moments'.

c. **The CBES scenarios were not stress scenarios** *(arguably they were not intended to be given this was a scenario exercise).* Future exercises should look to stress portfolios via fuller exploration of extreme but plausible scenarios.

d. **The absolute numbers on financial risks provided by the CBES should not be overinterpreted. In terms of the CBES objective on sizing financial risks, the value of CBES was the process, the advancement in capability and dialogue within firms, and to provide initial broad data points on potential transition**

vs physical risk, not the absolute numbers. This was the message conveyed by respondents. In addition to risks not captured in the scenarios, the static balance sheet assumptions (which makes analysis more tractable) and counterfactual adjustments were raised by many respondents as limitations in the design of the exercise that limit the direct usability of the absolute results for sizing financial risks and consequently, internal risk management. *(However, it was noted that for any regulatory stress test there is never direct usability for internal risk management).*

e. **More work is needed on the interpretation of results and how to communicate them both to Boards, clients and through disclosures.** For example, more work is needed on how to compare physical and transition risks, given that transition risks are a temporary adjustment to a greener and productive future, whereas physical risks are a long term and irreversible drag on revenues. The nature of these two areas of risk are therefore fundamentally different and so the numbers should not be compared directly. This created challenges for firms participating in CBES in interpretating results and communicating them.

Improving scenario design and methods to enhance usability of scenario-analysis for risk management and business planning

5. **FIs, CB&Ss and RTIs should work together to develop good practice and enhanced methodologies, guidance, knowledge, models, and scenarios for climate risk management and business planning** [CB&Ss, G, FIs, RTIs]. All FIs expressed a desire for more knowledge sharing and collaboration. An upfront investment in methodological development now, in advance of the next regulatory exercise, would reduce the load on FIs, benefit smaller FIs, and enhance outcomes in terms in sizing of financial risks, and usability for risk management and business planning.

    a. **Priorities areas of investment should include**:

        i. Methodologies for dynamic balance sheet assessment and refined approaches to defining counterfactuals for scenario exercises. It is recommended that CB&Ss work with FIs to test approaches to modelling dynamic balance sheets.

        ii. The development of short-term scenarios (up to 5 years), including capturing the likely volatility and delay of transition paths and potential compounding effects with non-climate factors, learning lessons from recent crises. Also to capture 'missing risks' (opportunities) associated with the transition e.g. greenwashing and the potential for near-term rapid shifts in government policy and market sentiments, litigation risks and second-order macroeconomic feedbacks.

        iii. Ensuring the consistency and transparency of scenario assumptions.

iv. New approaches to long-term scenario development to better assess physical climate risks, particularly at the extremes and enabling better differentiation between potential impacts at low and high temperatures. This includes better capturing potential trends of extreme weather events, and capturing key plausible but 'missing' risks including supply side shocks, indirect physical climate risks, compounding geopolitical risks, and interlinkages with nature risk.

v. Enhancing data and models to assess variation in risks within a sector. Some respondents noted that while transition risk looked roughly right overall, they struggled to assess the risk variation across counterparties. The BoE itself reports variations of up to ten times between risk estimates. So while the overall risk on average appears reasonable, it does not provide the kind of risk information that FIs really need for decision making and risk management. FIs also requested that the BoE provide more feedback on the issues in modelling counterparty risks and work with FIs to develop more standardised methods.

b. **Substantial enhancements are possible in the near-term through collaboration with RTIs that would improve the representation of the main material risks (the '80%') to a level of rigor appropriate for standard scenario analysis by financial institutions** [G, RTIs, CB&Ss, FIs]. The CBES exercise did not fully draw upon the latest research and evidence; for example, the key knowledge captured in reports of the Climate Change Committee – ensuring that key evidence is captured would give us the '80%' for example. In addition, for many CBES participants, there was limited engagement with research institutions during the CBES process and for both CB&Ss and FIs there are unexplored opportunities to draw upon a much wider range of evidence and disciplines to support scenario analysis. Exploring a wider set of narrative scenarios to capture key missing factors, could help close the gaps in terms of material financial risks. Organisations such as the CGFI can support such convening and connections. FIs noted that NGFS has provided this important bridging role between FIs and RTIs, however there were concerns over the lack of transparency and inclusiveness of that process given that many of the world's largest FIs are now using their scenarios.

c. **Fully closing the gap in knowledge and producing quantified scenarios (the 'last 20%') will require a longer-term investment in new science and modelling** [G, CB&Ss]. We recommend engagement with research funders, such as UK Research and Innovation, to co-develop targeted new research programmes that can deliver the enhancements in core knowledge required over the medium-term. This includes, for example, tackling issues such as narrowing uncertainties in long-term projections of changes in extreme weather or sea level rise in the UK.

6. **The CFRF can play an important role in convening FIs and RTIs to co-develop new methodologies, standardised guidance, good practice, industry benchmarks and scenarios for the UK** [CB&Ss, FIs, G]. Respondents were supportive of collaboration across the sector to develop good practice standards in scenario analysis. This will be particularly important to support medium and small FIs to share in the learning from CBES and build their capability. The NGFS will continue to play an important role in the development of baseline scenarios applicable globally, but to complement this and address the learnings from CBES, a public-private forum like the Climate Financial Risk Forum (CFRF) is needed to bring together the required experts and users across FIs and RTIs, including via the CGFI, to address the gaps in methods and the CBES (and NGFS) scenarios most relevant to UK FIs given the structure of their portfolios and the consequent nature of exposures of the UK financial sector.

   a. **CFRF should work toward co-producing standardised methodologies to address the technical lessons learnt in the CBES exercise as a public good**, including balance sheet assumptions and counterfactual adjustments, as well as how to capture near-term risks, shocks, and address gaps in material risks in scenarios. CFRF could also support FIs to enhance methodologies for assessing individual counterparty risks – a challenge highlighted by many respondents - and identify and collect appropriate data. While some FIs are already doing this work internally, many participants valued a collective 'public good' approach to set minimum standards consistent with supervisory requirements and this will be particularly important as exercises are broadened to smaller FIs.

   b. **We further recommend that the CFRF continue its important work in developing guidance and tools for UK FIs and making these available openly** [CB&S, G]. Additionally, this could include new workstreams on:

      - **Development of a scenario and model taxonomy** to assist FIs in scrutinising and using models and scenarios effectively. Such a taxonomy will help raise awareness of FIs about how to use and interpret the existing scenarios and models for business and risk management applications. A taxonomy would make transparent the assumptions behind the models and scenarios, so aid their interpretation, and provide guidance on where the existing scenarios are likely to sit within the range of plausible future outcomes based on current knowledge.
      - **Exploring approaches to climate scenario design to inform regulatory capital requirements**. From the interviews, it emerged that there are no industry standard methods for how to select or use climate scenarios within a

regulatory capital setting; the development of baseline methods in collaboration with regulators was seen by some participants as a potential value-add.

- **Developing new physical and transition scenarios - consistent with the NGFS (or other globally accepted scenarios inc. IPCC) - but tailored to the UK,** taking e.g. the UK Climate Change Risk Assessment (CCRA, for physical risk) and UK Net Zero Strategy (for transition risk) and Progress Reports of the Committee on Climate Change as a basis. For example, the current physical risk scenarios are inconsistent with the material risks identified in the UK CCRA.

7. **We recommend that the CFRF (and similar groups globally) establish a multidisciplinary scientific and technical advisory group – including experts from FIs and RTIs – to inform these new workstreams and openly peer review the existing scenarios and methodologies in terms of appropriateness for FIs**. Such a group could also provide advice on when scenarios and methods should be updated based on changes in policy, context or scientific advancements [CB&Ss, G, FIs, RTIs].

8. **Similarly, we recommend that the NGFS establish a multidisciplinary scientific and technical advisory group to ensure appropriate transparency, accountability, rigor and inclusiveness in its processes for scenario development.** Given the level of influence of NGFS scenarios (i.e. they are being used by all major FIs) there is an urgent and essential need for enhanced transparency, inclusiveness, accountability and openness around design decisions for NGFS scenarios. A multidisciplinary scientific and technical advisory group could play a helpful role here. Open selection of members will be critical. Peer-review is currently missing and urgently needed. Such a process could resemble a lighter-touch version of the Intergovernmental Panel on Climate Change, with strong principles of transparency, openness, and evidence-based approaches.

9. **An appropriate UK research institution, such as the UKCGFI or similar institution, can support CFRF's efforts in multiple ways and ensure long-term sustainability, objectivity, transparency, rigor, and robustness** [CB&Ss, G, RTIs]. This includes for example, hosting open data services for FIs, identifying and convening research institution partners and experts, supporting the development of robust methodologies, standards, taxonomies, and providing a facility of objective peer-review.

Further recommendations for future scenario and stress testing exercises

10. **CB&Ss should work collaboratively with FIs and RTIs to design future exercises, building upon the lessons from CBES** [CB&Ss, FIs]. It was emphasised that climate should be a mainstream part of normal regulatory stress testing and scenario analysis. Respondents emphasised that the objective of any future

dedicated exercise should be clear and should inform the design of the exercise. It was noted that there was little value in repeating what had already been done; future exercises should build upon and advance on CBES.

11. **It is important to ensure that the level of complexity of the exercises is justified by the availability of granular data and inherent uncertainty in the models underpinning the scenarios and analysis** [CB&Ss, FIs]. For example, it has been argued by some that detailed counterparty modelling may not give informative and useful results at this stage given the paucity of counterparty data and the uncertainty in sectoral and macroeconomic financial and economic outcomes under different scenarios. However, this must be balanced against the benefits of undertaking such analysis in terms of encouraging counterparty data collection and the refinement of models, as well as the potential positive spill-over effects for organizational capacity building, and client dialogue on climate risks.

III. A RESEARCH AGENDA FOR FUNDERS AND RESEARCH INSTITUTIONS TO SUPPORT ENHANCED SCENARIO ANALYSIS AND STRESS TESTING [G, RTIs]

1. **Improved representation of physical climate-related financial risks**, including ability to differentiate between risks at different temperature levels, and attribute the contribution to the build-up of systemic risk to specific counterparts/activities:

   - Continued cutting-edge scientific research to enhance understanding of expected changes in weather patterns in the UK and globally and their impacts.
   - Enhancing modelling of extreme physical climate risks, including subsidence, flooding, extratropical cyclone and coastal risks, including making available open data and models that are flexible for use in scenario exercises.
   - Improving representation of (indirect) economic and financial implications of extreme weather events domestically and internationally, including on the re-pricing of assets, supply chains and macroeconomic effects.
   - Developing physical climate risks scenarios consistent with the UK CCRA and accounting for differing assumptions about adaptation and insurance access.

2. **Strengthening transition risk scenarios:**

   - Developing scenarios more closely aligned with expected and potential UK and global policy (with regular updates), representing potential ranges of outcomes

and implications for the timing of key variables, e.g. carbon pricing. This includes more high physical risk and high transition risk scenarios.

- Development of short-term scenarios (up to 5 years), including representing potential volatility in transition pathways with rapid changes in policy or market sentiments and compounding factors e.g. learning from current shocks. Representing 'Minsky moments' that rapidly shift policy e.g. after physical events.
- Improved representation of uncertainties in global transition paths and disaggregation to country level, including emerging and developing economies. Reducing the dependence of scenarios on cost-optimisation models that are well known to provide a poor representation of the true state of the world, and consider using more narrative-based scenario approaches that combine expert judgement with quantitative models and transparent assumptions.

3. **Translation of climate pathways into multi-year economic scenarios:**

- Improved modelling of the macroeconomic impacts of climate change, particularly for more high-end transition and physical risk scenarios, and developing approaches to capture more complex and cascading risks. This includes utilising non-equilibrium macro-economic models. It is important to note that the current IAMs (integrated assessment models) that underpin the existing scenarios were not designed for financial risk analysis; there is a need for investment in new approaches tailored to the specific use cases of FIs.
- Understanding the potential (likelihoods/scenarios) for major and sudden economic disruption linked to supply-chain shocks, e.g. rising food prices or other inflationary pressures linked to physical or transition risks domestically or internationally.
- Capturing the potential for increased market volatility or market disruption in scenarios, e.g. related to changing investor expectations or market reactions to real or perceived risks from climate change.
- Enhancing sectoral scenarios for the direct and indirect impacts of rapid shifts in climate-related policies and their compounding impacts, and the potential likelihoods and dependencies for such scenarios.
- Better understanding the risks of unanticipated 'black swan' events, e.g. compounding climate shocks, tipping points, high-impact, low-likelihood (HILL)

events, interactions between nature and climate, or major impacts of geopolitical changes or climate-related conflict.

4. **Data and analytics**

   - Advancing innovations in the identification of the geolocation of assets and their characteristics, including utilising advancements in satellite data and AI.
   - Increasing availability of data on physical losses and adaptation at asset-level.

5. **Counterparty level modelling**

   - Developing methodological approaches for forward-looking, granular counterparty level risk assessment, including company disclosures and reflecting transition plans (and their credibility). This includes the ability to represent sectoral and macro-level transmission channels and translate them into balance sheet impacts at counterparty level, and accounting for the alignment/misalignment of transition pathways with scenarios.
   - Sensitivity testing of financial risk assessment to assumptions and scenarios.

IV. RECOMMENDATIONS FOR THE UK GREEN FINANCE STRATEGY

1. **Both CB&Ss and government can play a key role in closing the gap in knowledge through investing in better scenario development as a public good** [CB&Ss, G]**.** This would bring significant public benefits by strengthening the resilience of FIs to climate change, and enabling the improved risk pricing necessary to drive the net zero transition. Addressing the gaps will require substantial investment in the technical development of methodologies as well as close working with the climate research community to access the best available knowledge

2. **Support the generation of necessary data to underpin green finance, including enhancing disclosure standards to improve the accessibility, credibility, quality, and consistency of corporate/FI climate-related data**, including transition plans, adaptation plans, corporate emissions and supply chain information.

3. **Invest in appropriate facilities** to make data and knowledge more accessible as a public good as the foundation for a resilient and green financial sector.

4. **Invest in better underpinning science, research and knowledge translation** to enhance assessment of financial risks from climate change and improve the availability of open data including Geoasset data, satellite monitoring, and analytics.

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