Responses to Comments on the Draft Benchmark Climate Risk Scenarios

May 2023

Background

The climate-related risk scenarios were developed by the Benchmark Scenario Working Group, as part of South Africa's Sustainable Finance Initiative, chaired by National Treasury. National Treasury published the Technical Paper on "Financing a Sustainable Economy" in May 2020, updated in August 2021, as a framework for financial institutions to better disclose public information on their green practices and investments, and to stimulate the allocation of capital to support a development-focused and climate-resilient economy. One of the recommendations of the paper is to "Develop a benchmark climate risk scenario for use in stress tests by the sector". A Steering Committee and Working Groups were established to support the implementation of the Technical Paper recommendations. These include a Benchmark Scenario Working Group chaired by the Prudential Authority and including representatives from National Treasury, the South African Reserve Bank, and the Financial Sector Conduct Authority (FSCA). The initial phase of work for the Working Group is supported by the International Food Policy and Research Institute (IFPRI). The draft report on the first set of these scenarios, which cover transition and physical risks, was presented and released for comments. Comments were received from 4 associations/institutions, and a summary of these comments and responses is provided below.

Climate-related risk scenarios are in early stages of development, and require considerable data, skills and expertise. The benchmark scenarios presented leveraged domestic work done, and a first attempt to align these SA models and scenarios with international developments. The objective is to publish these scenarios to enable information sharing and knowledge building in an open and transparent manner. The development of these benchmark scenarios is primarily for financial firms to improve their understanding of risks and capabilities, and not for policy or supervisory objectives. Scenarios, by their nature, can often provide more questions than answers, and thus require an iterative process. Within this context, these responses provide an overview of the work that has been done, the data that was used, and a plethora of future work to be considered.

Summary of Comments	Response
1. Link to Stress Tests undertaken by SARB financial stability unit - Clarity on the intended purpose of the scenarios and its application for stress testing	The climate change work of the SARB and the PA is coordinated through a SARB Climate Change Programme. The SARB financial stability unit undertakes stress tests on systemically important financial institutions to assess the solvency and liquidity profile of the SA banking sector. The results are used internally by the SARB and are sector-wide results are published in the SARB Financial Stability Review. The stress tests have no impact on the prudential regulatory capital requirements. A Common Scenario Stress Test is undertaken every 2 years. In 2021, an initial bottom-up (meaning the banks received the scenario to conduct stress test based on their internal models) climate change risk add-on was undertaken. A climate stress test is being planned for 2024. The 2024 stress test will likely not use these scenarios but leverage off them. The SARB stress test has a macro prudential focus and international comparability is a key consideration. The SARB stress testing is one of the macroprudential monitoring tools used to assess financial stability and resilience. These benchmark climate risk scenarios are intended as a tool for all banks, insurers and other firms to use as part of their internal climate risk analysis, disclosures and risk management. These scenarios reference local data and modelling, which provide best available data and models for South Africa. These are deemed applicable for firms to use in climate related risk scenarios to better understand their exposure to climate risks and to internalise these risks as appropriate to their situation. These scenarios are based on work done in South Africa to date, under the guidance of a working group. These scenarios are 'open access' products and are not a mandated tool of the SARB or Prudential Authority.
2. Requests for further details and data - Request for additional details on the data and technical parameters of the scenarios	The scenarios are run annually from 2019 to 2050. It is therefore not necessary to interpolate between years. Detailed annual information can be made available. The data for each scenario including the baseline can be made available. Selected data is provided in the appendices to the report.

- Request to set the forward-looking periods, to 5, 10 and/or 15 years etc. to have common time periods amongst banks. There may be small to negligible differences in a 5-year period, but more notable differences between the three scenarios in a 15-year scenario. - Request for baseline values for granular forecasts - Extent to which sub-provincial impacts can be determined from a damage perspective (in flooding)	Data on flooding depth at a 30 meter resolution combined with Open Street Map Data, Newly generated global 0.1 degree population and GDP data with Provincial level Capital stock data is being produced. Such data can be aggregated to any spatial level desired. These scenarios use daily rainfall extremes. South Africa has some of the longest records in Africa and the world. SA Weather Service has daily rainfall values since 1836 and daily surface observations for all stations, but for selected stations since 1884. This will provide accurate estimates of 100 to 200 year daily extreme rainfall. GCMs projections of changes in extreme daily precipitation is accepted to 100-year level and below. This combination of solid historical data and Climate Change projection to 100 year storm is good solid level of data for estimating changes in Flood damages.
3. Link to Network for Greening the Financial Sector (NGFS) Scenarios - Request for further information on why these scenarios are being used and not the NGFS scenarios - The NGFS includes a disorderly transition scenario, will this be developed	These scenarios are based on existing work that has been done for SA which is deemed more appropriate than the NGFS outputs as the models are specifically run for SA as opposed to the globe or SA as part of Africa. That said, the aim is to closely align with the NGFS, and thus the mapping of these scenarios with the NGFS was provided in the report. A national set of models which consider global conditions provide for a better analysis of domestic impacts than the models currently used for the NGFS scenarios as these models include country specific information and considerations whereas the NGFS model are run at the global scale and therefore do not accurately capture country level impacts. While the scenarios currently available using the SACReD framework do not match 1-to-1 with the NGFS scenarios the tool is available to further develop better aligned scenarios in future work. Additional transition risk scenarios can be conducted to better align with the NGFS. The current set of scenarios highlight the work that has been done. Further research/scenarios can be developed to consider what would be considered a disorderly scenario for SA and to implement these in the modelling framework. The range of climate futures modelled represents the uncertainty related to climate changes. We are using the same global emission scenarios from NGFS but are looking at the uncertainty in extreme precipitation among the many climate models available Further detail on climate change modelling in South Africa, can be found here: https://www.resbank.co.za/en/home/publications/publication-detail-pages/working-papers/2022/AclimatechangemodellingframeworkforfinancialstresstestinginSouthernAfrica Reference: SARB Working paper, A climate change modelling framework for financial stress testing in Southern Africa
4. Assumptions - Economic growth rate of 2.8% seems very optimistic - Additional factors should be considered for South Africa, specifically political risks, global contagion risk (global inflation and recession risks), the Russian Ukraine war and the impact of potential Financial Action Task Force (FAFT) grey listing the country. - The economic structure of the economy would change as a result of the transition. - The cost impact of increased demand globally for renewable energy technologies and infrastructure and the elevated cost pressures from increased demand on this production, along with availability needs to be examined more deeply as an effect. - It's not clear why the Total Primary Energy Supplied declines so dramatically (figure 4).	The assumptions included in the model are based on research and data. The assumptions where applicable are aligned to those used by government in their energy planning. The economic growth rate reflects the reference growth projection used in the NDC update. The growth rate is based on the National Treasury 3 year outlook from the 2020 MTBPS and the IMF's long term forecast available at that time. The average growth rate is to 2050. The model includes other growth scenarios as well and we are currently in the process of updating the outlook with the most recent historical and forecasted data. More detail on the economic growth rate can be found online at: https://zivahub.uct.ac.za/articles/report/Technical_Analysis_to_support_the_update_of_South_Africa_s_First_NDC_s_mitigation_target_ranges_UCT_2021_/16691950 The forecast in these scenarios was prior to covid and other recent events. The forecast used in the reference projection is in the process of being updated and can be used for future scenarios. The economic model does not project growth in the reference case but rather the model is calibrated to an expected growth projection which is based on the forecasts of other institutions such as the National Treasury. So as to not impose a bias in the reference case we assume a business as usual outlook for the composition of growth. The impact

	of mitigation is then assessed by comparing mitigation scenarios to this reference case. In the mitigation scenarios we do see structural changes in the economy. Global energy and emission changes are not directly included although projections of key commodities such as the price of oil and coal as well as the demand for coal is included. These assumptions are in line with a moderate global emissions decline. The model includes costs for renewable energy over time which do adjust as learning increases over time. At present the impact of global demand on renewable energy costs are not included in the model. The increased demand for renewable energy, would likely be a short-term effect as global production ramps up to meet demand. Costs decrease for PV, wind and battery as per "moderate" projections found in international literature. The decline in Total Primary Energy Supplied is a result of the increased use of renewable energy. One unit of energy in the form of electricity produced by a coal power plant needs roughly 3 units of primary energy (coal). In the accounting framework adopted here (same as IEA), one unit of electricity produced from wind or solar consumes one unit of primary energy (solar energy/wind energy – measured in electricity equivalent energy).
5. Initial focus on a limited number of physical and transition risks - Clarity on whether climate risk refers to a full event (e.g., flood), or to the increase in the frequency/severity of the event relative to a baseline - Why recommendation is made to stress test agriculture exposures and no inclusion of other sectors based on potential economic impact. - There is not much detail on how physical risks translates into economic impacts. A suggestion that the interaction between physical risk and transition risk be quantified. - Guidance on modelling a just transition scenario - The scenarios allow for the potential of technology, such as hydrogen technologies, how would these be included in the scenarios - If a user wants to explore the potential for mitigation using hydrogen technologies, and the scenarios (both) allow for the “potential” for such technology, why are they then not included in the scenarios? - The impacts of physical risks should also be considered for other infrastructure, especially for flood risks along low-lying areas. - Request to include a fire scenario - Request the interaction between physical risk and transition risk be quantified	Different climate related risks are included in the report - these are defined as transition risks resulting from mitigation and physical risks related to climate change. Physical risks are defined as chronic (long term changes in temperature and precipitation) and acute (referring to extreme weather events). The physical scenarios with economic impacts is assessing the chronic physical impacts of climate change. For both of these a reference case is included, and impacts are measured as deviations from this reference case. Biophysical impacts and costs (where provided) are also provided for acute physical climate impacts. These consider both the severity and increase in frequency of these events. Further work will consider the economic impacts resulting from this as well as the economic impacts of updated biophysical impacts. The interaction between physical and transition risks is a difficult undertaking and is left to future work. Furthermore, the models used in these scenarios consider SA actions in relation to global objectives. Assumptions would need to be made on the actions of the rest of the world to account for this interaction. The NGFS has only recently started to account for this in one of the 3 models considered. The scenarios developed were from information available, and given that droughts and climate have the largest impact on agriculture, the focus has been on the agriculture sector. The model does assess the value chain impacts, which includes manufacturing. Climate impacts on water availability and the road network system is also modelled. These changes affect all sectors. Future work can consider other climate sector impacts. The just transition will be dependent on the policies put in place. Future work can consider just transition pathways once these have been defined. The objective of this project is to assess the risks related to mitigation. Hydrogen is included as a sector in the modelling framework, and is used by heavy freight transport, steel (green iron), chemicals (green ammonia) and other heavy industry in the 7Gton scenario. The supply chain for hydrogen is included with explicit representation of fuel cells, electrolysers and the electricity needed to make the green hydrogen. Results for the production and use of hydrogen for the scenarios can be provided. The current scenarios do not include a more ambitious hydrogen strategy for SA as this would include the export of the commodity or products using the commodity. This would need to be led by policy. As no such policy is currently in place this is not included in these scenarios. Other work by the ESRG has been done to assess the impact of developing a hydrogen economy in SA. Further information on this can be provided. The impact of flooding on infrastructure is important. The impact of flooding on capital stocks and annual impacts on crops and transport cost are being assessed. Further work is underway on linkages to economic variables in Macro-Models that will be used directly to estimate Economic impacts of increased flooding and benefits of flood control investments. A fire scenario could be considered in future work. The economic impact of physical risks is provided through the DFFE Long Term Adaptation Scenarios (LTAS) results. The interaction between physical and transition risks is a difficult undertaking and will be left for future work. Furthermore, the models used in these scenarios consider SA actions in relation to global objectives. Assumptions

	would need to be made on the actions of the rest of the world to account for this interaction. The NGFS has recently started to account for this in the third round of scenarios and only in one of the 3 models considered.
6. Financial outcomes - Clarity on how proposed scenario outputs are translated into financial metrics - The benefits and opportunities of the transition are not well covered	The current output from the scenarios focuses on the real impacts on the economy. Future work within the project will aim to relate these to outputs using the NiGEM model. This will provide additional impacts for financial related outcomes such as inflation. Further analysis will also be conducted to understand how these outcomes impact the current financial sector. Other macroeconomic variables from the model can be provided, noting these are limited to real economic variables. The scenarios described in the paper do not provide an analysis of the impact on the financial sector as it is deemed the responsibility of each financial institution to generate these impacts. The scenarios are intended to understand the risks, and therefore the benefits and opportunities are not highlighted to the same degree as the costs.