

2021

# JANUARY WEBCAST: Q&A

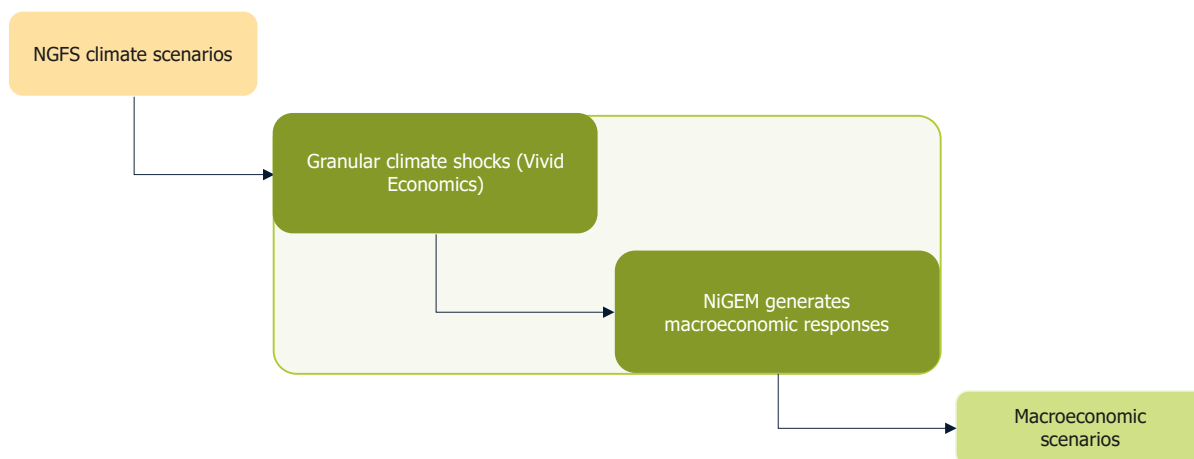
How to Make Climate  
Scenarios Usable for  
Financial Firms



# Bridging the Gap Between Climate Scenarios and Risk Measurement: How to Make Climate Scenarios Usable for Financial Firms

## A Q&A with Experts from NatWest, Vivid Economics, and NIESR

With regulators increasingly requiring financial firms to undertake climate scenario analysis, how to bridge the gap between climate scenarios, such as those released by the Network for Greening the Financial System (NGFS), and the macroeconomic information needed for risk modeling is becoming an active challenge for many. In our first Climate Risk Webcast for 2021, an expert panel shared their experience in how to bridge this gap. The webcast covered three main themes – illustrated in the diagram below:



### SPEAKERS:

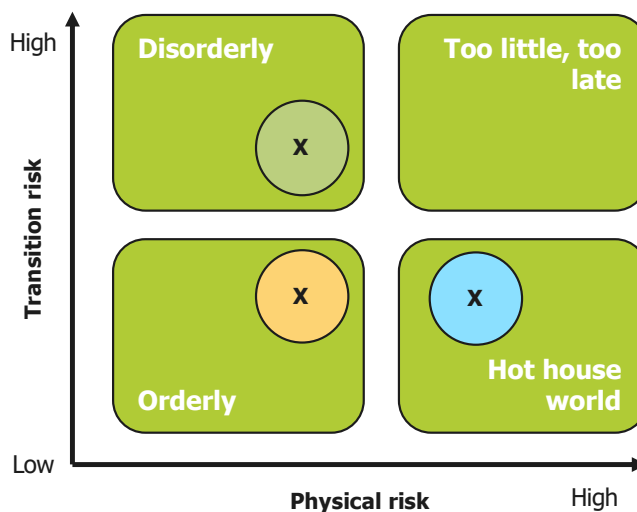
- **Katerina Lisenkova** (NatWest) who set the scene, explaining the challenge of using the NGFS climate scenarios for internal modeling;
- **Jason Eis** (Vivid Economics) who described how the NGFS dataset could be expanded to create country-level physical risk GDP shocks and transition risk energy shocks; and
- **Amit Kara** who described how his former employer, the National Institute of Economic and Social Research (NIESR), had taken those shocks and fed them into the structural macroeconomic model, NiGEM, to generate profiles of macroeconomic variables that could be used in firms' risk modeling.

The event was one of GARP's most well-attended webcasts, with a range of thought-provoking questions from the audience, some of which we were unable to address at the time. Given the increasing focus on using scenario analysis to understand and manage the risks that arise from climate change the panelists kindly agreed to respond to the questions in writing. Thanks to Katerina, Jason, and Amit for their input.

## QUESTIONS ABOUT THE NGFS CLIMATE SCENARIOS

### Q: How was the carbon price pathway in the NGFS scenarios determined?

A: Carbon prices were taken from NGFS scenarios. For this analysis representative marker scenarios from the NGFS database were used. NGFS classifies scenarios into Orderly, Disorderly and Hot house world categories, illustrated by the three circles in the diagram below.



Source: NGFS (2020) NGFS Climate Scenarios for central banks and supervisors

The profiles for carbon prices were produced using integrated assessment models (IAMs). In IAMs, the carbon price is solved for in order to achieve a target temperature level.

### Q: What types of technologies, and advances in technology, were considered in the model?

A: Carbon capture and storage (CCS) (and other technological assumptions) are part of the NGFS scenarios. Vivid Economics used their outputs (primary energy demand), which depends on technological assumptions.

Assumptions about technology development, like the production of electric vehicles, fuel cells use, efficiency and life of solar cells are taken into account through the energy consumption and composition figures from the NGFS scenarios. This includes changes in the energy mix (between fossil fuels and renewables) over time. (Note, the renewables/non-carbon category includes nuclear power). All NGFS scenarios assume that technology progresses in line with the historical patterns of Shared Socioeconomic Pathway 2 (SSP2).

### Q: Have you taken into consideration the impact of climate on demographics? Is population size expected to stay constant or grow at a steady rate?

A: These calculations maintain coherence with the NGFS scenarios and their population projections. As noted above, the NGFS scenarios are based on SSP2 which incorporates a set of middle of the road assumptions for key variables such as population. Alternative population projections can be used as an additional shock within NiGEM on top of current climate options (e.g. migration).

## QUESTIONS ABOUT CREATING THE GRANULAR CLIMATE-RELATED SHOCKS

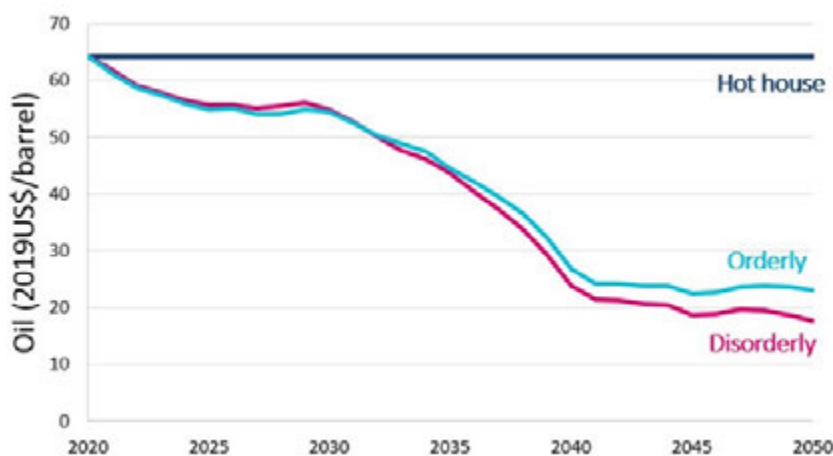
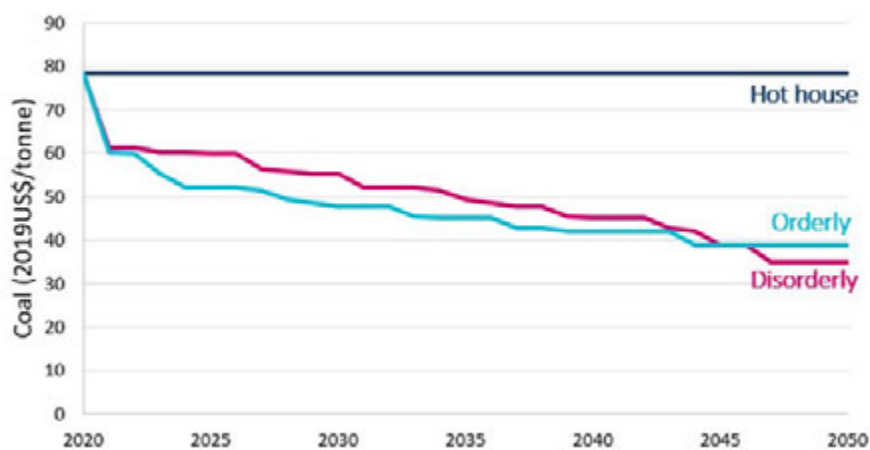
There were a range of questions on how Vivid Economics had used the NGFS scenario data to generate granular GDP shocks reflecting the impact of physical risk and transition risk energy shocks.

### Q: What physical risks are included in the scenarios?

A: Physical risk impacts of coastal and river flooding, and agricultural and labor productivity were included in the model, along with flood risk adaptations. The damages were considered for countries/regions expressed as a share of GDP. The NGFS scenarios provide a probability distribution of future global temperature increases, for each scenario, relative to pre-industrial period. For this exercise median pathways were used. In the 'Hot House World' scenario by the end of the century global temperature increases to 3.6C.

### Q: Why are oil and coal prices declining in the profiles create by Vivid Economics? Don't you think supply will decrease faster than demand? I see more pressure on producers to cut back than users. I would think part of the driver will be oil and coal prices increasing to make renewables more attractive.

A: Vivid's energy model was used to provide projections for world fuel prices. Country level energy prices increase due to the imposition of a carbon tax; however, world fuel prices (pre-carbon tax) do fall, due to a drop in demand. The depletion of current reserves is also taken into consideration, as is future production coming from sources with higher marginal costs.





## MACROECONOMIC RESPONSES

The audience asked about how the granular shocks generated by Vivid were input into NiGEM, which then created future pathways for macroeconomic variables that could be used for risk modeling.

**Q: What is the scope of the macroeconomic model?**

**A:** A macro model can be built to assess the impact of climate change on any, or all, countries, and the outputs for all countries currently modeled in National Institute's Global Economic Model (NiGEM) is available. It imposes the country-level shock to calculate country-level macroeconomic scenarios. To get results for specific locations more disaggregated models would be needed. You can find results for selected countries here <https://www.niesr.ac.uk/events/climate-change-analysis-ngfs-macroeconomic-scenarios>.

**Q: How reliable are the model projections when generally economic models generate shorter term projections?**

**A:** Different models generate different projections. NiGEM is a structural macroeconomic model and is suitable to look at future shocks over longer-term horizons. For example, we know how the economy reacts to higher taxes.

Climate risk analysis is very complex. These models are designed to assess long-term risks, however different banks will be using different types of data and different scenarios. Each bank will make its choice of tools and methods to use. For example, to assess the impact of individual severe climate events firms could use CAT modeling.

**Q: What assumptions do you make about the impact of the carbon tax revenues within the macro model?**

**A:** The implementation of carbon tax revenue is a model choice. Choices include making assumptions about how the carbon tax revenues are used. For example, it might reduce government debt directly, or be re-distributed to households or companies, or it may lead to higher government spending. In the scenarios displayed in this webcast, it was assumed that the revenues were redistributed to households, reducing the tax burden. We had different versions of the same scenarios with different fiscal assumptions.

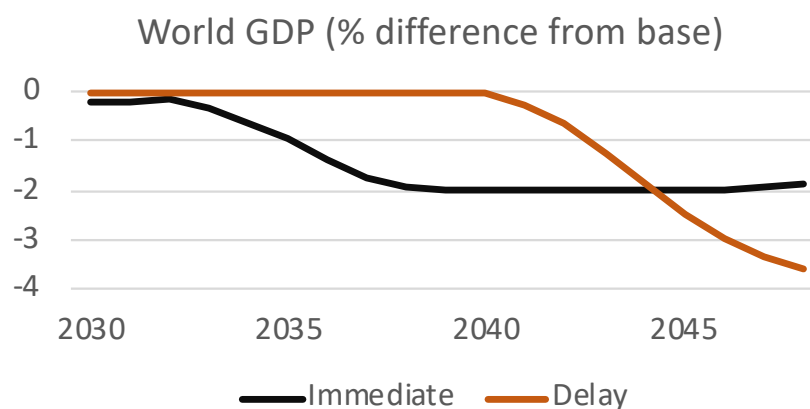
**Q: What is the energy intensity reduction and how does it help to reduce inflation and increase GDP?**

**A:** Energy intensity is the amount of energy used to produce a unit of GDP. The economy becomes more energy efficient when it uses less energy. This improvement could be driven by technology or by a shift in the output mix. Thus, if energy intensity is decreasing (as in our scenarios), GDP is increasing and energy prices are falling.

**Q:** It seems that the impact of an orderly transition has a more severe cumulative effect on GDP before 2050 than a delayed transition, but after 2050 the delayed outcome has a significant impact. Does the slightly lower GDP that is forecast in a scenario with immediate action take into account economic benefits from a transition to a green economy such as new workforce opportunities, potential innovation, and technology opportunities?

**A:** The impact that is seen is the basic principle behind carbon transition. With an orderly transition, transition costs are higher in the short-run, but with a delayed transition, physical costs are much higher in the long-run.

The transition to alternative energy is taken into account by imposing the IAM energy mix into the model. However, employment and technological improvements would be a judgment, so have not been imposed in the scenarios displayed.



**Q:** Isn't it a bit ironic to use GDP as the metrics for society's "health" in a world in which we need to significantly rethink our whole production processes and consumer habits? Shouldn't we rather use metrics like global percentage of healthy population, global percentage of well-fed population, number of conflicts (due to lack of resources or population displacement), amount of displaced people due to physical risks, etc.?

**A:** Climate change will have important consequences for almost all the UN Sustainable Development Goals (SDG). The NGFS scenarios have been developed for a specific purpose which is to assess the impact of climate change on the global economy and the financial sector. Once there is an agreed alternative standard, NIESR would be happy to adopt it in the NiGEM model. NIESR have already implemented poverty indices in the latest version of the model as part of our on-going research in this area.



## USING MACROECONOMIC SCENARIOS

And finally, the audience asked questions about the last stage of the process: namely, using the pathways of macroeconomic variables created by NiGEM for business decisioning.

**Q: What was the process to translate the findings from this climate scenario analysis exercise into business decisions?**

**A:** In the next step of the analysis each bank would develop its own method to analyze counterparty level impacts, assess portfolio returns, incorporate the climate risks into its business decisions and assess how much capital should be held for the risks that will materialize in the shorter term. For example, Vivid's Planetrics model does asset-level analysis that individual financial institutions can use in capital allocation and other business strategy decisions.

**Q: For regulatory scenario analysis, do you expect banks / insurers will have to define their own scenarios and estimate the impact on the economy and industries, or do you expect the shocks will be given for them by the regulator (for example, as you present it here)?**

**A:** Regulators will provide their own scenarios, but they would need to be expanded as necessary. The expansion methodology and requirements would be different for different banks, depending upon their portfolio composition and the variables that are most relevant for their risk models.

**Q: The proposed method to tackle climate-related risk is very quantitative, and many banks will not be able to implement a similar exercise: do you think that qualitative exercises with expert judgment are possible as a first step into risk management?**

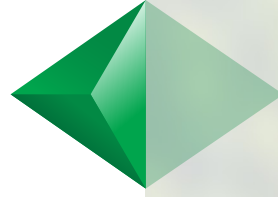
**A:** Absolutely. As methodology develops we will see various organizations providing climate macro scenarios and banks would be able to choose which methodology they trust and use those scenarios. However, irrespective of the approach that is being used, to be able to make an informed choice it is important to understand what is driving scenario outcomes.

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### WATCH THE WEBCAST TO:

- Learn more about the models and judgments needed to create usable macroeconomic scenarios that are consistent with climate scenarios.
- Further appreciate the scale of the challenges to make climate scenario analysis part of risk management.
- Accelerate learning and gain insights from others working collaboratively in this field.

Watch the webcast directly [here](#) or by visiting [climate.garp.org/insights-from-garp/](https://climate.garp.org/insights-from-garp/).



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