

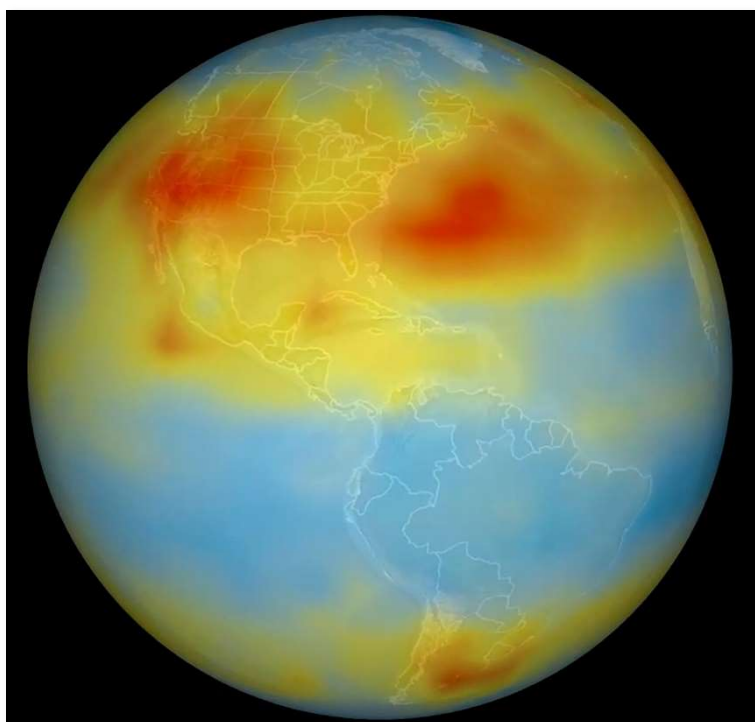
Quant Foundry Climate Change Risk Offering: Insights for Banks

With the wide adoption of the Paris Agreement on climate change in 2015 and strong commitments to limit greenhouse gas emissions by many states, the world has started to overhaul its use of natural resources. The impacts of climate change are in some cases enormous from acute weather events to the chronic long-term impacts on agriculture and demands on businesses to adapt their business to enable the transition.

Many financial organisations on both the buy side and the sell side have signed up to voluntary disclosures such as TCFD, however there is an increasing push to implement regulatory measures such as scenario stress tests such as those from the Bank of England¹, the ECB² and recently guidelines from CFTC³ in the United States. The regulatory landscape will require financial organisations to implement robust stress testing and risk assessment exercise to meet the current standards of the quantification of risks across their balance sheets.

The challenge of addressing the huge medium to long term horizon risks is considerable and few organisations have only just started the process of setting up governance and businesses strategies to address these risk fewer have the inhouse knowledge to begin to quantify the risks.

The Climate Risk team in Quant Foundry is actively involved in the latest research to address climate transition and physical risks and have developed an offering, guidance and coherent quantitative solutions that enable banks / asset managers / insurers to quantify the physical and transition risks associated with climate change.



The impact to climate will bring about enormous upheaval for every country in world. Even the most optimistic scenarios will create pressures on companies and nations to adapt.

In this note we highlight how an organisation can put itself on the path of building and embedding climate risk calculations across their whole business. This is to enable organisations to only meet the needs of the regulator but also provide a means to deliver and assessment for new business products, improved investment advice and economic planning.

¹ Bank of England, [Climate Change](#)

² ECB [Guide on Climate Related and Environmental Risks](#)

³ CFTC [Managing Climate Risks in the US Financial System](#)

How Can My Organisation Deal with Climate Risks?

Each organisation will start with a different set of capabilities and knowledge, the solutions proposed by Quant Foundry aim to provide each organisation to take the steps from their current capabilities to providing a pathway for an integrated assessment of the risks to meet not only the regulatory requirements but also to help shape a strategy for future business opportunities.



Energy Intensive industries will be significantly impacted by transition pathways planned to mitigate climate risks.

Steps to Assessing Climate Risks

Each organisation will need to define what it wishes to achieve in assessing climate risks within the organisation.

Governance

Already there are requirements to have board level responsibilities to identify and report on climate risks as part of an organisation's current governance process (the 3 lines of defence model). Management teams are expected to consider climate related risks when developing the institutions overall business strategy, objectives, and risk management framework.

Where Quant Foundry Can Help

Quant Foundry has extensive senior risk expertise with a team of senior consultants that have held senior risk roles that can help assess your current capabilities, identify the areas required for improvement in risk infrastructure and help shape and frame future proficiency in climate risk.

Strategy

With the assessment of current capabilities and knowledge of the services that can be provided by external specialists an organisation can start the process of investing in solutions to help create new solutions and advise for their clients as well as ensuring they have the ability to meet the regulatory needs and capital requirements.

Where Quant Foundry Can Help

Quant Foundry's senior climate consulting team can help you navigate the path of opportunities that can be opened with our best of class solutions. Taking an organisation that may be struggling with measuring and meeting the needs for regulatory reporting and compliance to an organisation that can not only meet those needs but leverage the insights from a coherent quantitative platform.

Identification of the next steps and the potential returns on business opportunities will be an important driver for investment in solutions, some organisations will looking to provide enhanced advisory to corporate clients on new ways of raising funding for climate change, having a the risk infrastructure to back up this advice will be crucial and provide the credibility needed above the qualitative solutions offered by others.

Other organisations will be looking to build an understanding of their risks through the organisation to address their regulatory needs and improve their risk management capability in the short term, then seize upon the opportunities across their business. The knowledge and skills of the Quant

Foundry team can help build and categorise the taxonomy of risks to help prioritise resources to enable your organisation to take the first step on the journey of implementing a best in class risk solution.

Measurement & Metrics

At the core of the risk solution are the metrics and the means to measure the risks related to climate change. The need for robust categorisations of risk, processes to assess credit worthiness, identify the duration of the risk from short term market shifts, prolonged credit risks or operational risks (both for the portfolio and your organisation) and how to integrate into current risk calculation processes.

Where Quant Foundry Can Help



Capturing the impacts from physical risk from direct damage and understanding the wider implications for each part of the world will be critical for everyone.

This is where the solutions we have developed can provide the greatest value for your organisation. Quant Foundry has already invested in building a system that allows organisations to integrate their current portfolios of companies across all sectors (with an emphasis on utilities, Oil & Gas, cement etc) and obtain a view on the likely credit risks (PD, LGD) associated with each position / loan. With our partners on the physical risk side we can provide asset (or property level) risk information integrated with our transition model that can be used to assess the impacts to mortgage defaults and loss given default, allowing reports on the impact of transition and physical risks over time to meet the needs for stressed capital calculations.

More details on the model offering are provided in the sections below.

Reporting & Disclosure

Each organisation will be judged on the quality and usefulness of its disclosures, the reassurance that a framework of risk classification that can be blended over time with a quantitative solution, will provide your organisation with a scalable solution to meet the business and regulatory demands as your strategy evolves.

Where Quant Foundry Can Help

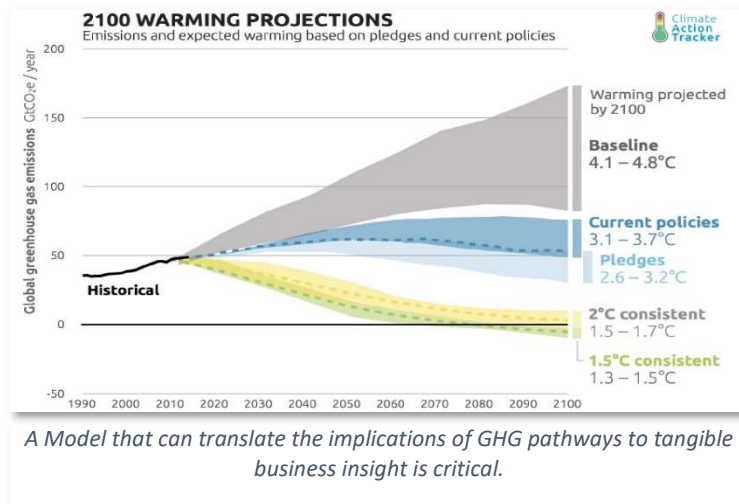
We have developed a number of end use applications to allow users to build reporting dashboards covering the risks and impacts to the portfolio of for individual companies. Our data layer can also be accessed via standard open source analytics layers such as Python or can be integrated into your inhouse data stores.

About the Quant Foundry Climate Risk Solutions

Implementing climate risk measurement capabilities within an organisation is a monumental exercise and understanding where to start and what can be achieved realistically over what time frames given your starting point is not easy task either. Defining the goals of the business from the need to report on exposures to building an integrated risk solution to meet stress scenario construction and improved client advisory is only the start.

With the increasing desire for oversight from regulators for climate risk and increased demands from client's, organisations will need to justify investment and advisory choices and be able to defend the quantitative aspects of stress scenarios.

This will require an careful view of the long term investment into skills and capabilities in this space for a number of years, the urgency with which this needs to happen will transcend the normal time frames for regulatory change for most banks.



The Steps in the Right Direction

Faced with the likely need to provide climate related stress testing on an ongoing basis for the foreseeable future from 2021 organisation that plan for the long-term solution makes sense.

Step 1 - Classification and Exposure

With any new risk assessment defining how the risks may manifest themselves and hence your exposure is a starting point even if risks cannot be fully quantified or data and process are not fully formed. Our work on building a taxonomy of climate related risks will enable your organisation to identify items on your balance sheet that are exposed to climate linked risks. The taxonomy is coupled with our risk calculation capabilities providing coherence from the start of the process to whatever next steps you desire to take. Exposure in this case is linked to

The Exposure assessment exercise would be in the form of a consultation and assessments of exposures covering physical and transition risks to corporations, physical risks to mortgage portfolios, impacts to commercial real estate portfolios, exposures to climate linked sovereign risks.

This process of classification within the context of our robust quantitative capabilities provides a solid first step in the journey to building a best in class risk framework.

Step 2 – Defining the Path to Risk and Opportunity Quantification

With a view of climate risk exposures across the organisation the next step is naturally to address these risks and adapt business strategies to identify opportunities, data, and capability gaps across the organisation. At this stage, many organisations will look to understand the costs of what can be achieved and timelines. Discussions across the organisation should start:

- **For the front office** on how to develop new client solutions and advisory, client management plans, new funding / loan structures and start the detailed understanding of how clients are going to address climate risks. For asset managers the ability to build and justify portfolios to address client requests and provide a clear motivation for your investment choices.
- **For risk teams** an understanding of their data and systems requirements driven by both the pressures from regulators and demands from customers as well as current existing capabilities from climate risk experts. This will lead to a clear path on how climate stress testing can be implemented within the organisation. Some organisations may in the first phase look to adopt a top down approach to stress scenario construction based on their current capabilities built for other regulatory stress testing programs (eg. CCAR, ECB, BoE etc). The need to have a clear and explainable causal explanation for each stress scenario is critical where historical data is missing (as is the case with climate linked stress scenarios).

For many organisations, the directions taken in Step 2 are critical, organisations looking to coherently integrate climate risk assessment across all their business lines will need to centralise and fix methodology design choices at this point.

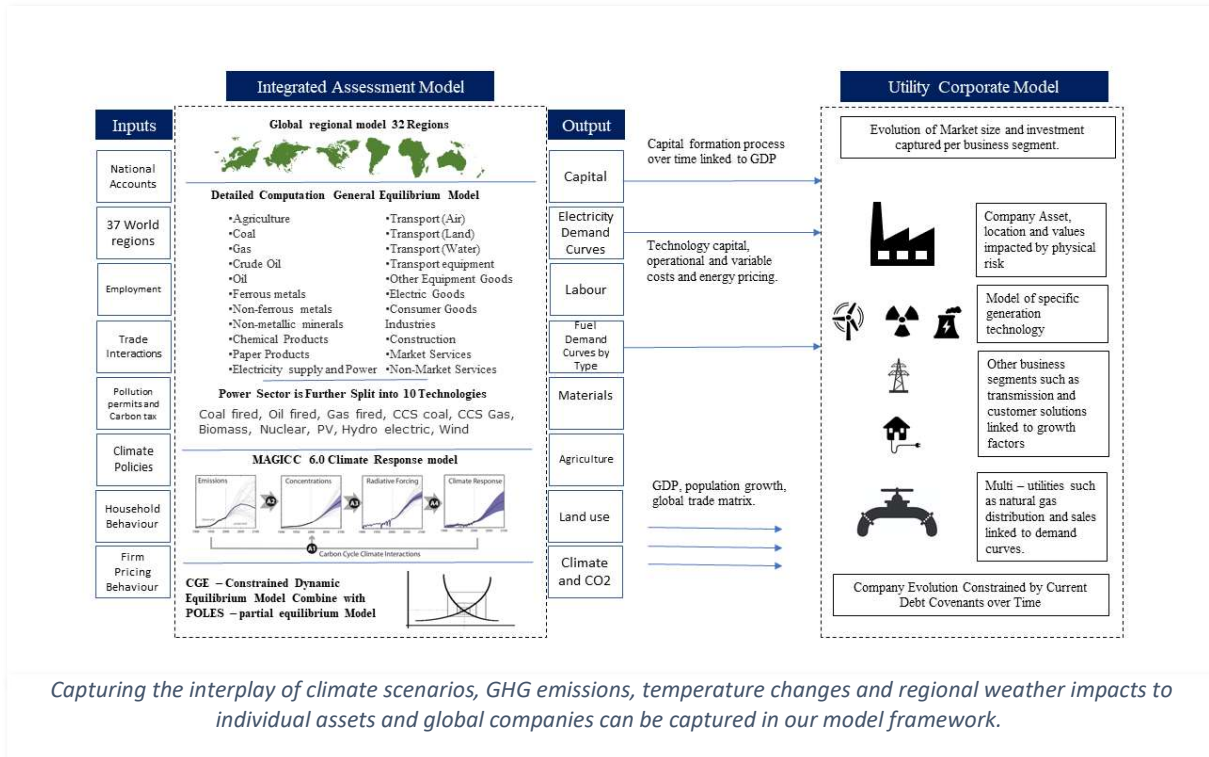
The methodologies developed by Quant Foundry allow organisations to build coherent scenarios for global impacts of **transition** and **physical** direct risks around the world that include a direct link to GHG emissions embedded within the framework. These cover energy extractors (Coal, Oil & Gas), Utilities, Cement companies, heavy industry, transportation. It also covers the use of energy sources for commercial and residential properties a full description of the underlying model capabilities is included here⁴. This information is combined with a model to evolve impacts at individual company levels.

To address the challenged posed by physical risks we have partnered with XDI Systems who provide detailed property level risk analysis driven by detailed downscaled weather models combined with engineering structural models that allow a loss assessment for properties. This can provide direct forward-looking scenario impact analysis addressing mortgage portfolios but also corporate assets and provide a risk assessment and impact for critical infrastructure such as ports, road and rail links.

Step 3 – Consolidation and Coherent Quantification of Climate Risks

Organisations that are looking to fully integrate climate risk assessments into their business models will need to engage the expertise across a wide range of disciplines utilising modelling techniques and methods that are not currently commonly used by financial organisations. For example models that incorporate the potential change in technologies, capital costs, expected revenues that can account for future business strategies that are coherently aligned with climate scenarios and can

⁴ What to look for in a Climate Risk Offering (Quant Foundry 2020)



produce estimates of GHG emissions that are then coupled with models for physical risk do not currently exist within most organisations.

Quant Foundry’s suite of modelling capabilities can provide your organisation with this capability along with world class expertise and understanding of climate risks and continuous involvement in research and development in this space. The model has been designed to permit a detailed description of the revenue generation capabilities and has been specifically designed to capture the impact of capital-intensive plant and machinery that companies may invest in to meet their climate targets.



The ability to determine those regions of the world likely to be impacted by drought, flooding, crop failure will be important in understanding the wider scale national risks to each economy.

The model uses a variety of economic factors across countries including GDP and population as well as sectoral output shares to predict demand for energy across a variety of sectors including residential, transport, industry, commercial, agriculture etc. It also utilises energy system data inputs.

This model drawn from research and development with the Quant Foundry team leverages models that have been developed for policy design (including the IPCC) provides a means to input

government policy via levers such as carbon taxation and limits combined with detailed models for how companies would fair under competition going forward in time.

As a result, companies are encouraged to focus on capital expenditure that is designed to reduce GHG emissions. This may result in companies closing or making high carbon plant idle and to invest in new low carbon plant and technology to ensure targets are hit. Not to do so will result in significant negative financial consequences as well as investor and customer flight. Companies focused intelligently on the transitory journey will develop healthy revenue mixes and outperform those without an effective strategy.

Banks faced with making the decisions of which loans to grant, bonds to issue, equity financing deals to run etc., will need to be able to justify to their current and future customers why loan facilities may be limited or refused and develop a means to track the reasons for financing some companies to the stakeholders. The Quant Foundry model provides a clear impact view on both the financial risks and the GHG emissions for each company as it evolves over time.

The Quant Foundry Climate Change Modelling Capability

The provider landscape is continually evolving as it stands there are only a few models in the commercial realm that provide the ability to make statements at a company level many of them do not factor in the rational management of companies going forward in time, this gives rise to unrealistic company exposures in time that nowhere near

QF has linked and customised a best in class Integrated Assessment model (that has been academically validated in hind casting studies and used as part of IPCC studies), this is then combined with a detailed model of the revenue generation capability for company's optimal transition path and thus measure the impact to their market capitalisation and credit rating. It also provides non-financial insight, such as technology mix.

The amalgamated model provides estimates of macro and micro-economic measures annually (macro and micro-economic pathways) between 2020 to 2050 (and beyond to 2100 if required) to meet CO2 emittance targets. Inputs include macro-economic information such as level of the carbon tax, energy demand, generation mix as well as micro-economic corporate financial information including revenue, EBIT, credit spread/rating, market cap, outstanding debt.

- The macroeconomic pathways project what the future economy is likely to look like and can be configured to provide views on GDP (or have updated views on GDP)
- whilst the microeconomic pathways provide insight into the performance of companies based on their ability to complete the necessary transition path a critical requirement on sell side.

Essentially, the model comprises of two principle components. The first being an overall CO2 emission allowance, set at a country / nation state level. Secondly, each company can then be allocated a specific allocation of that emission allowance. To survive and prosper, a company will need to meet or fall short of its allocation.

For Asset Managers

With our detailed risk model and revenue forecasting model QF4CM has the ability to provide insights into the construction of a portfolio and can be used as part of an optimisation process across equities

and bonds. As an understanding of the choices made by regional governments becomes clearer the impacts of those scenarios and how companies may be able to adapt will become clearer.

The QF4CM model has the power and insight to highlight those companies that can adapt efficiently versus those that may struggle. This will provide a powerful means to build and explain offering to clients, ranging from pure renewables to fast adapters. A solution such as this provides a way to accelerate an organisation in terms of expertise and capability to be competitive in an evolving marketplace.

Future and Development Plans

In choosing a supplier of solutions one must look at the strength of their capability in proving genuine innovation in this space, do they have commitment to research and innovation, do they have the experience and knowledge quantitative skills to address the challenges of climate risks. Do they have the knowledge of the financial sector regulation and processes to address the complexity of implementation in your organisation?

At Quant Foundry we have a commitment to building cutting edge solutions built upon leading research. This is blended with years of experience in implementing solutions in banks and other financial institutions.

About Quant Foundry and its Commitment to Building a Best In Class Climate Solution

Quant Foundry is a start-up company that provides quantitative modelling solutions and consulting services and has won awards for its innovative AI solutions to help mitigate climate impacts in agriculture.

Quant Foundry is committed to delivering and building a best in class climate solutions, led by its founder Chris Cormack(*) we are actively involved in research with a number of Universities around the world looking into new methods of addressing the risks of climate change and we have a commitment to publishing this research to allow people to gain an insight into the challenges of modelling these risks so that ideas can develop.

We have a team of quantitative modellers, analysts and consultants that can provide advice, implementation and customisation for your climate and other risk needs.

** Dr Chris Cormack, co-founder of QF is a fellow of Imperial College's Centre for Climate Finance and Investment in the Business School. He is involved as part of work with the NGFS to build and design scenarios for central banks around the world. Quant Foundry is also a founder partner in CERAF the UK's new centre for climate risk modelling.*

Authors

Dr Chris Cormack is Co-Founder and Managing Director of Quant Foundry Ltd (and owner of the Quant Foundry Climate Model)

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