

Drought Stress Testing

Making Financial Institutions More Resilient to Environmental Risks

Summary Report



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The institutions and individuals that have participated in and provided input to the tool and the report do not necessarily condone the use and interpretation of the data and information in the report or support the conclusions.

Caveats

It should be noted that these findings are specific to the scenarios and the portfolios of loans used in the analysis and therefore do not necessarily represent standard industry sector impacts or country-wide risk assessments. The loan portfolios used are only a portion of the total loan portfolio of financial institutions, represented by the industry sectors that are in the scope of the study. Some of the scenarios analysed within the tool are, by design, severe and represent catastrophic droughts in these countries. The Drought Stress Testing Tool is a prototype and the first step in the development of broader capabilities for financial institutions to quantify the environmental risks to their loan portfolios. As discussed in the Possible Project Extensions section of the accompanying report, a number of additional elements have been considered, which if included would enhance the accuracy of the drought risk assessment.

The Drought Stress Testing Tool rating model does not necessarily mirror financial institutions' own rating model. The default rating model incorporated in the tool is a financial metric-only based model and does not take into account certain important qualitative information. In addition, companies' balance sheet could be more or less fragile due to recent economic conditions. As such, the portfolio results detailed in this section should be viewed with this in mind and may not incorporate company, country or industry sector-specific mitigation measures which are outside of the scope of this tool and report.

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Environmental degradation and climate change are key global challenges of our times. The impact on economic activity and human lives – for instance caused by extreme weather events such as droughts – are significant and will become more severe as global warming continues. The negative consequences for the financial sector that provides companies and citizens with capital can be substantial, resulting in potentially material risks for financial stability and hence our economic system as a whole.

With the Paris Agreement on Climate Change, which Germany agreed upon jointly with 196 governments in 2015, a milestone was set in formulating a “global response to the threat of climate change”. Our commitments now require action. To reach the ambitious goal, enormous investments such as in green technologies, low-carbon infrastructure and resource-friendly production methods are required.

Financial markets can play a pivotal role in accelerating this transformation towards a sustainable, greener future as lending and investment decisions direct the allocation of capital in our economic system. For the markets to assume this role, a key prerequisite is to understand the underlying risks imposed by climate change and environmental degradation. In order to understand and consequentially adequately assess and price environmental risks to enable informed financial decision making, reliable data and methodologies are required.

The existing gaps in the environmental risk management capacity of financial institutions are increasingly recognized and addressed by international initiatives and fora such as the Financial Stability Board’s Task Force on Climate-related Financial Disclosures (TCFD) or the G20 Green Finance Study Group (GFSG).

To support such efforts in our ambition to make decision-making in the financial system more sustainable, the German Federal Ministry for Economic Cooperation and Development (BMZ) works with the financial sector to mainstream environmental considerations into lending and investment decisions. As part of this effort, the drought stress testing framework and tool presented in this summary of a larger report were developed to enable banks to assess the exposure of their corporate loan portfolio to environmental risks, specifically drought.

As drought risk has been assessed for the first time in this way, validation through several banks from Brazil, China, Mexico and the United States, which advised the model design and tested the purposefulness and compatibility of the tool with their existing stress testing procedures, was key to the successful development of the tool. I would like to thank the contributing financial institutions in line with Risk Management Solutions, the Natural Capital Finance Alliance and GIZ (Emerging Markets Sustainability Dialogues – Sustainable Finance Component (EMDF)) for the great partnership in developing this innovative framework and tool.

Highlights

Ground-breaking new stress testing tool launched

For the first time, financial institutions from across the globe and environmental experts have partnered to enhance an economic stress test for banks with environmental scenarios to produce an open and free tool for environmental stress testing.

- The tool uncovers a previously untreated risk in financial portfolios – drought.
- It reveals that extreme droughts could increase loan defaults 10-fold for institutions with specific portfolios that are most exposed to drought risks.
- Even when exposed to drought scenarios of medium severity, most companies see their credit ratings downgraded.
- The approach can highlight where companies in disparate sectors share a dependence on water availability, which can make portfolios less diverse than they at first appear.
- The most affected sectors are water supply, agriculture and power generation, particularly in countries that are heavily reliant upon hydroelectric power. Significant impacts are also found in water-dependent sectors such as food and beverages.

- Sectors that are less water-dependent but highly sensitive to general economic strength, such as petroleum refining, were also affected by the general economic impacts of drought.

The Drought Stress Testing Tool is now available for download, and includes drought scenarios for Brazil, China, Mexico and the USA.

The outputs of the project represent a significant step forward in incorporating environmental scenarios into traditional risk models. However readers should also note that the Drought Stress Testing Tool is a prototype and the first step in the development of broader capabilities for financial institutions to quantify the environmental risks to their loan portfolios. More information about the methodologies, assumptions and limitations that underlie the tool is available in the results section of this report and the full report.

“The quantification of financial impacts arising from environmental risks, particularly those related to climate change, is an important step in the evolution of environmental and social risk management. The focus on drought, a physical risk arising from climate change, is an important addition to the body of work related to stress testing, carbon emissions and climate change.”

The development of the tool is timely, as it will inform how institutions can conduct scenario analysis on climate change risks in alignment with the expected guidance from the Taskforce on Climate-Related Financial Disclosures.”

– Courtney Lowrance, Global Head of Citi Environmental and Social Risk Management

“Calibrating scenario modelling to reflect how external environmental shocks could affect the credit quality of certain industries will be useful for Stress Testing.”

–Jorge Sobehart, Managing Director at Citi Risk Architecture

Why is this project needed?

There is a growing body of evidence – from the five-year drought that hit California from 2011 to the record heatwaves that have swept Australia in recent years – that natural hazards and their resulting impacts have the potential to pose systemic risks to the financial system. Regulators and policy makers have started paying attention to these risks, through initiatives such as the Financial Stability Board's Task Force on Climate-Related Disclosures and the G20's Green Finance Study Group, and many of the most advanced financial institutions are already starting to do the same in their risk management assessments.

The Natural Capital Financial Alliance (NCFA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH have developed the Drought Stress Testing project, an initiative to find the best way to integrate drought into standard financial decision-making processes. Financed by the Federal Ministry for Economic Cooperation and Development (BMZ), the project sought to develop a tool and framework that allows banks to quantify the risks posed by droughts to their corporate loan portfolios. A consortium led by global modelling experts Risk Management Solutions (RMS) designed, developed and implemented a framework to assess the impact of drought scenarios on financial institutions' corporate lending portfolios.

The Drought Stress Testing project follows on from a previous project, the Corporate Bonds Water Credit Risk Tool, which focused on individual debt instruments issued by power utility, beverage and mining companies and the risks posed to buyers of their bonds by water scarcity. While that project highlighted the risks in individual company assets, feedback from users highlighted the need for and relevance of a tool that can be used at a broader sector or portfolio level.

The tool looks at the impact of drought on at least eight industries in each of China, Brazil, Mexico and the US. This report showcases the tool in action by stress testing selected corporate lending portfolios of nine international banks, representing more than USD 10 trillion in assets. They are: Caixa Econômica Federal, Itaú, Santander, Banorte, Banamex, Trust Funds for Rural Development (FIRA), Citigroup, Industrial and Commercial Bank of China (ICBC), and UBS.

The new analytical tool allows financial institutions to see how incorporating drought scenarios changes the perception of risk in their own loan portfolios. Based on the catastrophe modelling framework that the insurance industry has used for 25 years, it uses five drought scenarios for four countries – Brazil, China, Mexico and the US – to model the impact of drought on 19 different industry sectors, the companies in those sectors and the likelihood they will default on their loans.

“We consider environmental risk management as an irreversible trend in the financial industry. Santander has a long-standing history of considering ESG in its risk assessments and of promoting sustainable business among its clients. Participating in this pilot project was an excellent opportunity to further foster this agenda and to evolve our understanding of the possible impacts of droughts to our business. This tool will have immediate impact in terms of awareness raising, bringing the issue of environmental stress testing closer to mainstream risk management.”

– Linda Murasawa, Sustainability Head, Santander Brazil

The business case for assessing drought risk

A large proportion of the global population lives in areas that suffer from severe water stress. In some areas, according to the World Resources Institute, society and business withdraw more than 80% of local water supplies every year, which in certain circumstances can put huge numbers of people and companies at risk of severe social and economic impacts if the amount of rainfall declines even slightly.

For example, in 2012, around half of India's population lost power in part because of the effect of low rainfall on the country's hydroelectric capacity, while in Venezuela, which gets 70% of its electricity from hydro, the government cut the working week to two days and restricted manufacturers' power use as a result of drought-induced power shortages.

According to a study by the World Bank, water shortages will deliver a "severe hit" to the economies of the Middle East, Central Asia, and Africa by the middle of the century, taking double digits off their GDP in the worst-case scenarios. East Asia alone could lose close to about 7% of GDP under business-as-usual water management policies.¹

There has been little examination of how large-scale droughts might affect local businesses. However, they can lead to companies cutting their output, and this could expose lenders to drought-induced defaults. In 2014, Solvay's Rhodia chemical subsidiary shut four of 22 output units at its Paulinia plant in Sao Paulo, Brazil, due to water shortages. According to CDP's 2016 Annual Report of Corporate Water Disclosure, disclosing companies reported USD 14 billion in water-related impacts, a five-fold increase from the previous year.² With droughts affecting wide swathes of the economy, banks could see concentrations of company defaults in particular geographic areas. Yet there is limited quantitative assessment of the risks.

¹ <http://www.worldbank.org/en/news/press-release/2016/05/03/climate-driven-water-scarcity-could-hit-economic-growth-by-up-to-6-percent-in-some-regions-says-world-bank>

² <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/001/306/original/CDP-Global-Water-Report-2016.pdf?1484156313>

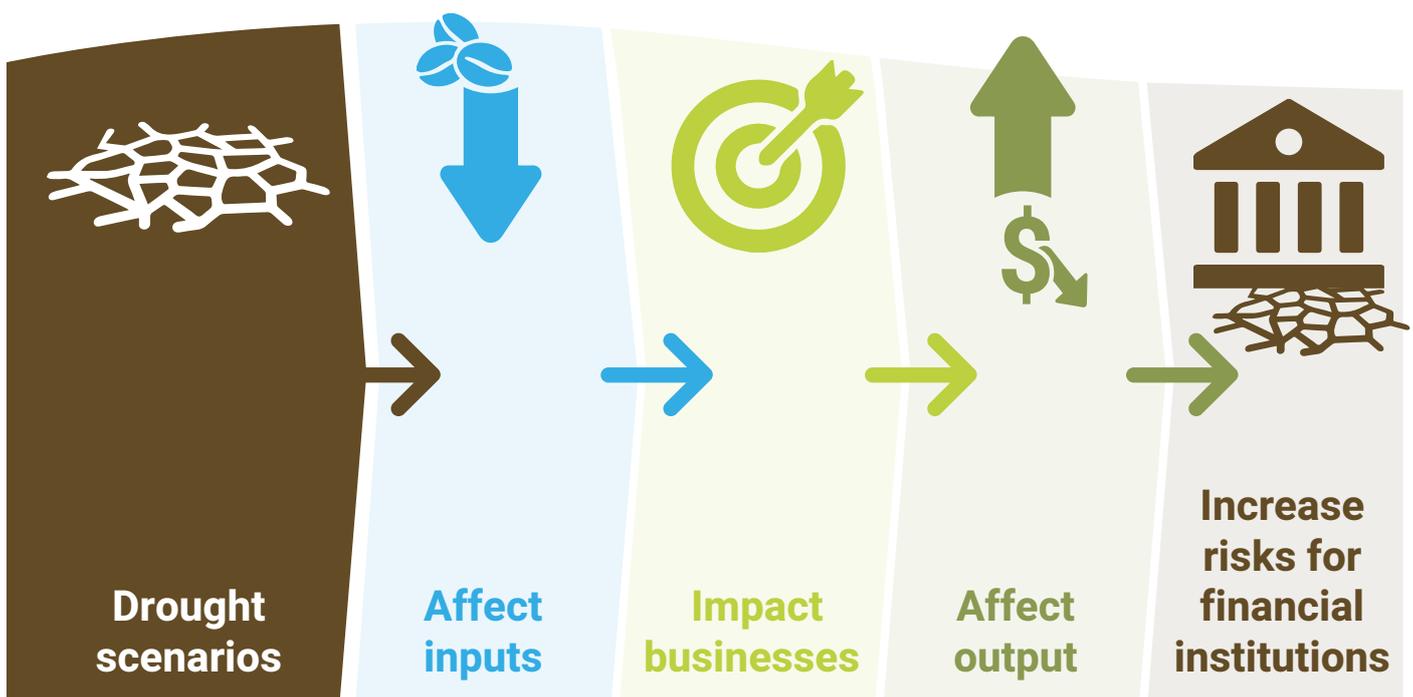


Fig. 1: The drought risk on businesses and financial institutions

Currently, very few banks use environmental stress testing and those that do use a range of different techniques, data sources and analytical processes, leading to inconsistencies of reporting between and even within institutions. A consistent framework for environmental stress testing that all banks accept would support and enable modelling of these risks.

The Drought Stress Testing Tool is a significant innovation for the financial sector because it enables lenders to incorporate drought risks into their stress testing for the first time. It benefits from and builds upon the traditional catastrophe risk modelling framework used by the insurance industry, although it is designed to measure the impact on a company's credit rating, expected losses and probability of default rather than insured losses.

A set of five drought scenarios for each country was developed, showing the impact of drought geographically and over time. Partnering with financial institutions, the tool was then utilised to assess the impact of these scenarios on real-world loan portfolios.

To assess how the drought would affect an individual company's likelihood of default, the model looks at how drought could directly and indirectly affect a company. By applying a series of impact factors across a company's operations, the tool calculates how drought conditions could affect the business both through reducing output and thus decreasing revenue and also by increasing operating costs through increasing the costs of raw materials (including water) and power.

This information gives financial institutions insight into how exposed to these drought scenarios the companies in their loan portfolio are and whether the impacts are likely to cause downgrades or defaults on loans. Lenders are able to gain insight into the potential correlations to drought of their entire portfolio, which can inform decisions about how to lend to companies in specific industry segments or regions. It could also allow lenders to charge lower rates of interest to companies that are more resilient to drought.

The tool provides the most complete view of drought impact when information on the financial statements, and location of operating sites is available for the companies to which financial institutions are lending money. Many credit-modelling teams do not have this information, but that does not mean they cannot benefit from the tool. By using "archetype" data (included within the tool) to supplement their own data, they can still get an idea of the impact of drought on the companies in their portfolios. As the amount and quality of data available to them improves, so the insight derived from the tool will increase.

The tool also considers the macroeconomic impact of the drought scenarios and this feeds into the probability of default for each company. Expected losses are aggregated across all companies to determine the total expected loss for a loan portfolio in each scenario.

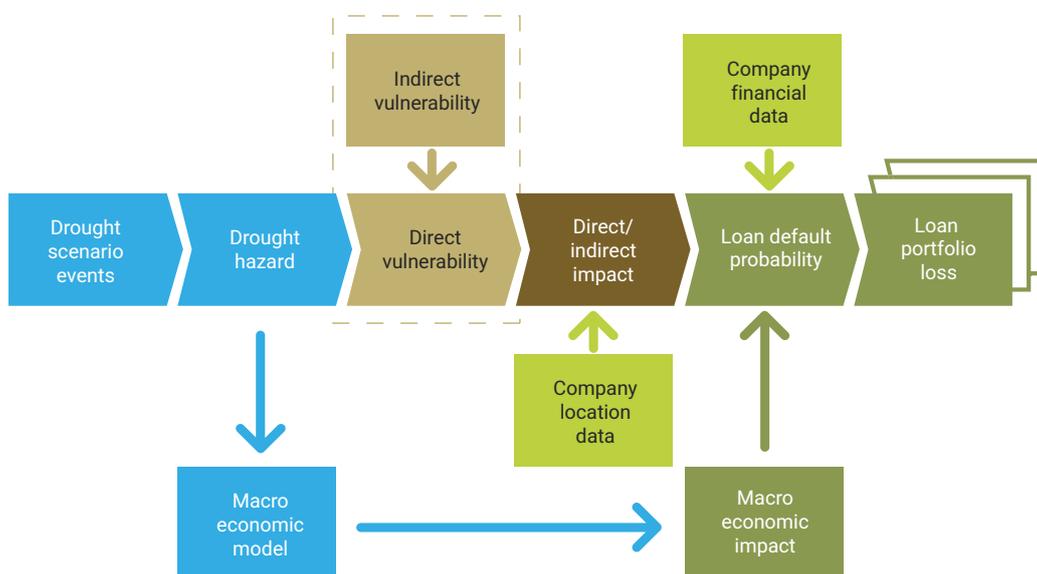


Fig. 2: The drought tool model

Drought scenario selection

The tool includes five scenarios for each of the four modelled countries. The scenarios vary in their duration, intensity and geographical extent. The least intense scenarios have the severity of a once in 50-year drought event, about the same probability as some of the financial

stress tests that banks currently use. The more severe drought scenarios have a much higher intensity, and so represent events that are less probable than the pure financial stresses that banks currently assess.

Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
The most severe, this drought might be expected once every 200 years, lasting for five years.	This also lasts five years, but is less severe and classed as a once-in-100-years event.	A five-year drought that might be expected once every 50 years.	This is also a once-in-200-years event, but lasting for two years.	A once-in-100-years event, with a duration of two years.

Table 1: Drought scenarios used in drought tool model

Macroeconomic modelling methodology

Severe droughts can significantly impact the broader economy, so the tool also analyses how drought shocks are transmitted through the global economy and how this can affect the likelihood of default.

It considers factors such as:



The prices of metals, agricultural inputs and oil



Interest and exchange rates



GDP



Inflation



Share prices

The model is weighted to reflect the fact that regions with a higher GDP will see a higher macroeconomic impact from a drought event than poorer regions – because more economic activity is at risk. It applies the changes in revenue and costs that different drought scenarios cause, along with the macroeconomic impacts and a company's credit rating, to determine how likely each business is to default. Banks can replace the tool's standard credit model with their own credit models if they wish.

Vulnerability module methodology

The real strength of the tool is the vulnerability module, which allows users to incorporate drought risks into their stress testing models for the first time. It provides a link between drought hazard and company impact by industry sector and by region for each of the drought scenarios. This gives users the ability to develop an intuitive understanding of how sensitive different industries and regions are to drought.

The tool overlays the vulnerability of the industry sectors to understand how the drought affects the revenue and costs of a company with locations in drought-hit areas. This impact then flows through the income statement, showing how the drought scenario affects the financial health (and hence the likelihood of default) of the company.

Having determined the drought characteristics for each scenario, the model assesses what impact each scenario will have on different industries in the affected regions. The vulnerability module converts the drought hazard footprint into an implied change in revenue and Cost of Goods Sold (COGS) for each company location by assessing three key factors:

- The direct impact on a sector due to water deficit.
- The indirect impact due to electric power shortages.
- The indirect impact due to reduced material or labour supply.

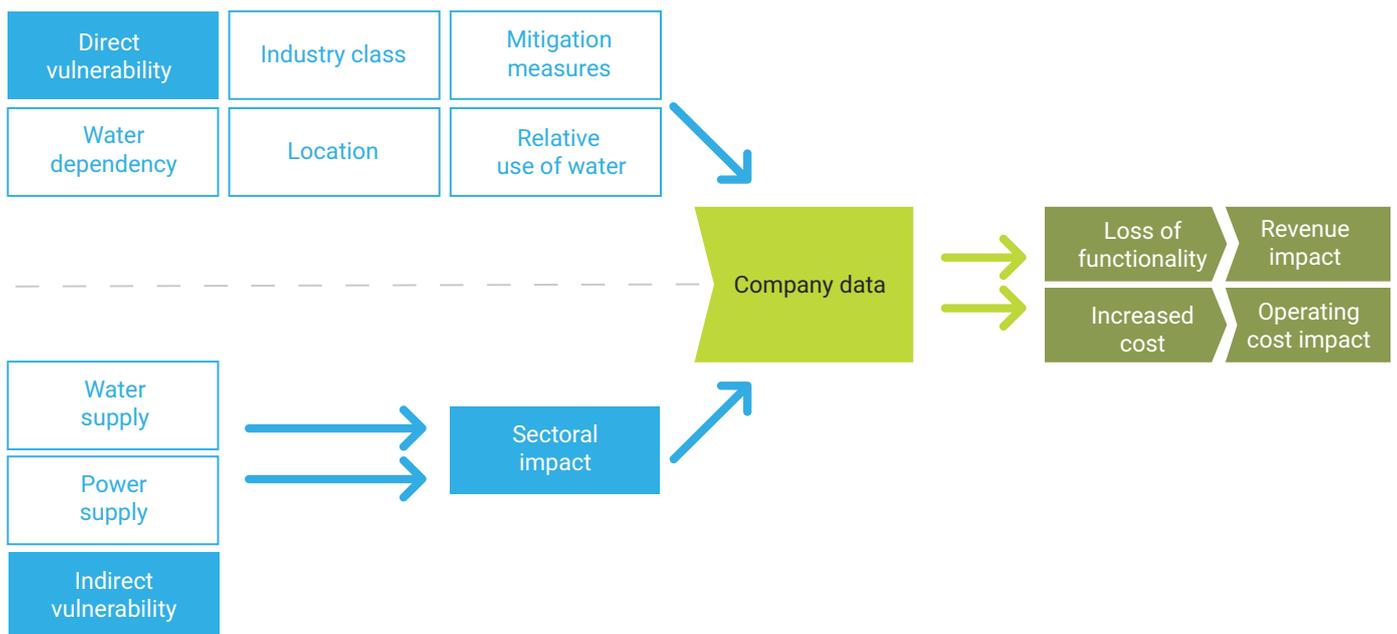


Fig 3: The vulnerability module of the drought tool model

Results

What risks did the financial institutions uncover?

Applying a quantitative framework to assess the potential risks to portfolios of banks through using the Drought Stress Testing tool, highlights drought as a previously unquantified risk which in certain cases could have a dramatic effect on portfolio loan default rates.

For each country five drought scenarios were created, each lasting either two years or five years and with varying levels of severity. Information was gathered about the companies in each of the relevant portfolios and the sites that contribute to their revenue. The analysis looks at which regions are most affected by each scenario and the relative impact on companies of different sizes and in different sectors.

The results in this section provide insights into how the tool can model the effect of drought on a lending portfolio. However, readers should also exercise due caution in drawing conclusions about the vulnerability of a particular country, sector or portfolio. The tool is a prototype and the first step in the development of broader capabilities for financial institutions to quantify the environmental risks to their loan portfolios. More details on the methodology and its limitations are available in the full report but below is a brief overview of the limitations of the tool that exemplify the challenges in developing such capabilities.

- The tool was built without historical data linking prior drought events to defaults. Such data is not currently collected but may become of interest following the release of this tool.
- The current version of the tool only models up to ten industry sectors for each country. Several industries that make up large components of typical lending portfolios are not modelled, meaning that related potential losses are not assessed.
- The default rating model incorporated in the tool is a financial metric-only based model and does not take into account certain important qualitative information used in banks' proprietary stress testing tools.
- The unavailability of complete financial and/or location information for some of the companies included in the analysis necessitated the use of company archetypes functionality in the tool. Therefore, some results are closer to what is expected of a typical industry portfolio rather than representative of the institutions' own underwriting practices.

China

The analysis included around 2,500 companies in 11 different industries including manufacturing, construction, power generation, retail, transport and water distribution. Results show:

- Depending on the respective scenario, droughts has a moderate impact on the credit portfolio assets of most affected regions.
- The largest financial impact in magnitude was seen in Scenario 2. The drought in this scenario hit the loan portfolio hardest because of its effect on the highly-industrialised regions surrounding Beijing, Tianjin and Shanghai, even though the overall extent of the drought was lower than in other scenarios.
- Small- and medium-sized firms were more affected than large firms, partly because they are less robust as a result of having smaller balance sheets and partly because large companies tend to have sites across the country, shielding them somewhat from the effects of drought in particular regions.

United States

The first stress test focused on a representative industry portfolio made up of companies from the power generation and petroleum sectors:

- Four of the five scenarios had little impact on expected losses and suggest that US power generation and petroleum companies are reasonably resilient to direct drought effects.
- Depending on the scenario 60%-100% of the companies analysed see their ratings fall, the majority however by not more than two notches. This indicates potential systemic risks droughts can bring to highly correlated portfolios.
- Drought increases portfolio losses by ten-fold in the scenario with the highest loss impact as compared with the reference scenario. This is in part due to a low baseline default rate.

The second portfolio focused on water utilities and refining:

- In some scenarios, California water utilities could expect a 75% fall in revenue and a 20% increase in prices, but the risk of default remained low, indicating strong resilience to direct drought. This sector demonstrates greater credit-worthiness than others, in part because of the expectation of government support for utilities.
- Refiners' probability of default over five years increased only nominally.
- There was minimal impact on the portfolio under the two-year drought scenarios, while the five-year drought scenarios have a moderate to severe impact on total losses, suggesting the companies and the portfolio are relatively resilient to short term drought.

Mexico

The first portfolio is weighted towards construction and agriculture, with some manufacturing, power generation and oil extraction:

- Between 90% and 100% of the companies are downgraded due to drought, depending on the scenario, illustrating the vulnerability of these sectors in Mexico to drought events.
- Because the biggest loans in the portfolio are to companies with relatively good credit ratings, the portfolio itself is more resilient, with only a small increase in the likelihood of default.
- The biggest impact in the first year comes from a Scenario 5 drought that affects the important industrial regions of Ciudad de México and México state, as well as the important agricultural region of Jalisco, highlighting the importance that regional concentration can play in the impact upon a portfolio.
- Oil and gas, and food manufacturing contribute the biggest losses because of their direct reliance on water. A less severe but longer-lasting drought, Scenario 2, has the biggest impact over the full five-year period.

The second portfolio is heavily weighted towards the energy sector:

- Between 65% and 90% of the companies in the portfolio were downgraded, depending on the drought scenario, with portfolio losses increasing by up to 150%, but against a low baseline default rate.
- The biggest impacts (85%-95%), in all five scenarios, came during the first two years of the drought event, with the biggest impact coming from a highly severe, two-year drought. The Mexican Gulf, where much of the country's oil and gas industry is located is one of the most affected regions.

Brazil

A large impact from severe drought events is expected in Brazil due to the country's heavy reliance on hydroelectric power. Approximately 75% of Brazil's electricity supply comes from hydropower, with power output dependent on reservoir water levels.

One portfolio with companies from eight different sectors, ranging from beverage and tobacco manufacturing to oil and gas extraction to water supply and irrigation, that are considered to be drought-sensitive showed that:

- In certain scenarios 65%-70% of companies were downgraded, and the drought increased defaults by 1.5-2 times.
- There was a significant fall in company revenues and consequent rise in operating costs in all scenarios, with the biggest impact coming from Scenario 5, because the drought hit the country's main production areas of Sao Paulo, Rio de Janeiro and Minas Gerais. However, losses were significantly higher in all scenarios.
- No significant difference in impact between small, medium and large companies was noted, likely as a result of affected industries being highly geographically concentrated.

A second portfolio covering a broad range of sectors, including crop production, power generation, food manufacturing, and oil and gas showed that:

- In the most severe drought event, Scenario 2, almost 90% of companies were downgraded, suggesting that drought impact is severe whether a company's reliance on water is direct or indirect, as outlined above in the Vulnerability Module Methodology.
- Crop production was the major contributor to losses because of its direct reliance on rainfall or irrigation.
- Losses in drought situations were 4-9 times higher than in times of normal rainfall because of the portfolio's high level of exposure to agriculture.

Conclusions

The tool shows that, there is significant variation in how the different scenarios affected different countries and sectors.

US companies were relatively resilient to the direct impacts of drought thanks to a limited reliance on hydropower and reasonably robust local and national government support. However, where droughts cause more general widespread disruption to economic activities, sectors such as petroleum refining and production are affected by the reduction in overall demand, rather than the drought itself.

Brazil, Mexico and China are much more vulnerable, with a number of scenarios implying default rates more than doubling. The losses were generally driven by the direct impacts of drought on water-dependent sectors such as power generation, water distribution, agriculture and food production.

In almost all scenarios, in all the countries examined, most companies saw their likelihood of default increase and their credit ratings reduced as a result of drought and while this may not always lead directly to more defaults, it will undoubtedly affect financial performance and the company's shareholders.

In severe drought situations, the tool shows that companies can suffer significantly, and in extreme cases, banks can have critical effects on their loan portfolios. And while it may be intuitive to focus just on water-intensive sectors, industries with only an indirect dependence on water, such as the petroleum industry, can also be significantly affected.

To completely understand the risks of drought to their loan books, banks need to take a more holistic approach that considers both secondary and macroeconomic impacts of drought events, as well as the direct impacts. It is clear drought and water scarcity are issues that they need to understand so they can identify which companies seeking loans are most at risk and where their loan portfolios are concentrated in regions or sectors that have the potential to drive significant defaults and losses.

The tool is useful even if, as is the case for many institutions, they do not yet have as much data as they would like. In that situation, as a first step they can use "archetype" data to get an idea of how companies like those in their portfolios will be affected by drought.

"This tool can provide information that helps us to measure the potential risks associated to climate change; it offers a powerful and objective way to measure the impact of drought scenarios. We are already promoting changes in our management of water-related risks, but this tool offers information to better evaluate the most risky areas and industries, with clear, objective information to establish priorities. We are probably going to adjust our long-term investment strategies due to the results of this kind of analysis. In the near future, all banks are going to introduce climate modelling in their risk management methodologies, considering potential changes due to global warming. For us, this tool is the first step to do so in a formal way."

–Trust Funds for Rural Development (FIRA)

The methodology and tool developed in this project gives banks insight into the level of loss they could experience in each of the drought scenarios, allowing them to decide if this figure threatens their resilience to such events. It also enables them to better manage the risks they face by identifying borrowers at risk, increasing dialogue with clients about the risks posed by drought; providing incentives to help borrowers become more drought-resilient; applying stricter loan criteria or a higher cost of capital in areas at risk; and by diversifying their loan portfolios.

Banks are encouraged to test the framework and tool on their own portfolios for the regions covered. For other regions, drought scenarios can be developed for use with the tool. It can also highlight gaps in banks' information about the companies they lend to and their exposure to water risks and other environmental factors, and provides an incentive for them to gather more data to cover these gaps.

The framework used in the drought tool is highly flexible and could be adapted to assess default risk for other environmental, social and governance issues, including other natural catastrophes such as hurricanes, earthquakes and flood, legislative risk and carbon risk. It could even be applied to more mainstream financial risks such as equity price volatility and infrastructure risk.

“*The world is facing a changing climate. Brazil's water crisis in 2015 made us more aware about the impacts and possible loss to companies, the economy and environment. We at Itaú Unibanco are proud to participate in the Drought Stress-testing project as we can now measure the effects of water-related crises to our business. Knowledge of the risks is the best way to mitigate them. The project is bringing us insights to become even better at socio-environmental risk management in our portfolio.*”

– Itaú Unibanco

“*Water-related risks have become increasingly serious all over the world. It increases the cost to companies, and compounds credit risk. As one of the biggest commercial banks in the world, ICBC has spent many years in protecting our portfolios against environmental risk; water risk is one of the most important. We actively participated in this project on water risk as it provides a useful tool to all financial institutions, and will encourage other commercial banks to focus on this risk.*”

– **ICBC**

“*While climate change is a global phenomenon, its impacts will vary across geographies. This project explored uncharted territory by modelling the impact of drought scenarios on lending portfolios. It has helped us better understand the data requirements in quantifying drought-related risk and the challenges that will need to be addressed to further develop climate-related risk quantification methodologies.*”

– **Liselotte Arni, Head Environmental and Social Risk, UBS**



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About the Emerging Markets Dialogue on Finance

Under the umbrella of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), the Emerging Market Sustainability Dialogues (EMSD) provide a network of stakeholders and decision-makers from think tanks, multinational corporations, and the financial sector. The Emerging Markets Dialogue on Finance (EMDF) represents one of the three EMSD networks and brings together financial experts and practitioners from G20 emerging economies. It strives to enhance the capacity of financial institutions and government bodies in order to advance the development of sustainable financial systems. Jointly with our partners, we develop solutions for some of the most pressing challenges in the financial sector.

The goal of the EMDF is to redirect capital flows away from assets that deplete natural capital towards climate and eco-friendly investments in order to enable the transformation towards low-carbon, resource-efficient, sustainable economies. To achieve this, we work with financial institutions, investment firms, stock exchanges, central banks, ministries of finance, and international organizations from G20 economies to integrate environmental indicators in lending and investment decisions, product development and risk management.



About NCFA

The Natural Capital Financial Alliance (NCFA) was launched at the UN Conference on Sustainable Development (Rio+ 20 Earth Summit) in 2012 by UNEP FI and the UK-based non-governmental organisation, Global Canopy Programme (GCP). It is a worldwide finance led initiative to integrate natural capital considerations into financial products and services, and to work towards their inclusion in financial accounting, disclosure and reporting. Signatory financial institutions are working towards implementing the commitments in the Declaration through NCFA projects. These are overseen by a steering committee of signatories and supporters and supported by a secretariat formed of the UNEP FI and GCP.



About UN Environment Programme Finance Initiative

United Nations Environment Programme – Finance Initiative (UNEP FI) is a partnership between United Nations Environment and the global financial sector created in the context of the 1992 Earth Summit with a mission to promote sustainable finance. Over 200 financial institutions, including banks, insurers and investors, work with UNEP FI to understand today's environmental challenges, why they matter to finance, and how to actively participate in addressing them.



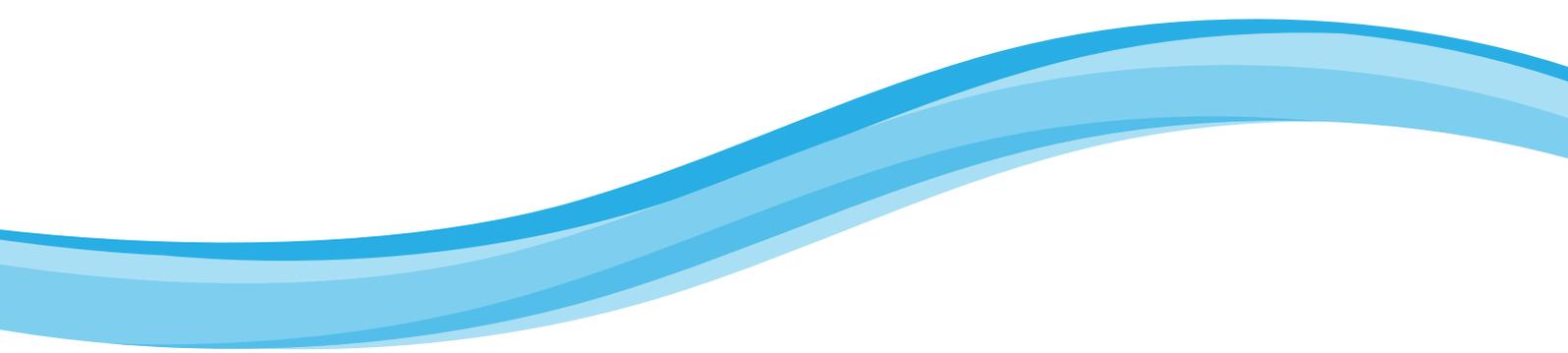
About Global Canopy Programme

The Global Canopy Programme is a tropical forest think tank working to demonstrate the scientific, political and business case for safeguarding forests as natural capital that underpins water, food, energy, health and climate security for all. Our vision is a world where rainforest destruction has ended. Our mission is to accelerate the transition to a deforestation free economy.



About RMS

RMS is a leading provider of data, models and software that help insurance companies, financial institutions, their corporate clients, and government agencies assess and manage their exposure to extreme events across the globe. As the world's largest catastrophe risk modelling company, our clients include 85% of the top 40 reinsurance companies and 9 of the top 10 ILS funds globally. We provide a wide range of probabilistic risk models to our client base, including accumulation and loss models for many global climate and seismic hazards.



This is a summary of a longer report for the Natural Capital Financial Alliance (NCFA) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, looking at how to develop an analytical tool that allows banks to quantify the risks posed by droughts to their corporate loan portfolios. It is part of a NCFA/GIZ project to develop Environmental Stress Testing Project. The framework was produced by a consortium led by Risk Management Solutions (RMS) and financed by Germany's Federal Ministry for Economic Co-operation and Development (BMZ).

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