

A climate-risk measuring tool



Why MS²?

Management Sustainability Solutions

MS² - Management Sustainability Solutions Solutions is a tool aimed at financial institutions and insurance companies that uses various methodologies for measuring the physical and transition risks associated with climate change, as well as estimating financed emissions. For this, climate scenario analysis methodologies are implemented based on internationally accepted models. The tool covers different portfolios and products, providing short and long term estimates based on scenarios developed by research institutes and made available by international organizations.

MS² – Management Sustainability Solutions is a technological solution for the measurement of risks associated with climate change, adapted to the particularities of the financial and insurance sector.

MS² responds to industry needs, such as:

- ▶ Modeling the potential impact of climate change risks on the value of financial or physical assets, over different time horizons and under different scenarios, for different geographies.
- ▶ MS² also serves as a basis for ICAAP and regulatory or internal stress testing exercises, and supports compliance with specific regulatory requirements.
- ▶ Estimating financed emissions based on available information on the real and economic activity of counterparties, and setting the decarbonization targets for the different portfolios.
- ▶ Developing mechanisms for data and scenario processing. MS² autonomously handles requests for physical risk scenario data, incorporating the physical and transition scenarios generated from IPCC and NGFS data.
- ▶ Obtaining aggregated information and indicators for strategic and management decision making.

In addition, MS² has been developed in a modular format, with opensource technology, and with an architecture that allows an agile integration in different technological environments, either on-premises or in the cloud. This approach also allows the tool to be adapted to integrate other methodological alternatives, in cases where the client has already developed its own models.

This makes MS² a flexible tool that adapts to the needs of each client, and allows you to obtain results for their subsequent analysis, use and integration into the management process.

MS² functionality

The tool has four specific features:

1. Obtaining climate scenarios

Selection of physical risk and transition scenarios and their associated variables for scenario analysis. MS² has a set of transition scenarios (NGFS) and physical scenario variables (IPCC), which are updated according to the data published by these organizations.

2. Physical risk analysis

Analysis of the different physical event scenarios (floods, fires, storms, etc.) on the risk parameters (PD / LGD) of corporate portfolios or portfolios secured by real estate. This analysis uses the geolocation of physical assets.

3. Transition risk analysis

Analysis of the impact of transition scenarios (NetZero2050, Delayed transition, etc.) on the risk parameters (PD / LGD) of company portfolios. This analysis is carried out at the sector level and the geographical level.

4. Financed emissions

Estimate of current emissions financed through loan or investment portfolios. This estimate is made using the PCAF methodology.

Setting of financed emission targets by sector and geography.



The MS² tool enables scenario-based impact analysis of climate risks on credit portfolios, and allows you to estimate financed emissions and to set targets

Benefits

The use of the tool allows for a quick, efficient and traceable calculation of the impact of climate risks on business strategy and risk parameters. The key benefits of the tool are:

The MS² tool makes the estimation process more efficient



Automation

Ability to efficiently scale to multiple portfolios in different geographical areas
Reduced implementation time



Efficient use of methodologies

Methodologies are already developed and standardized
Use of portfolio-based methodologies and adaptability to new scenarios



Scalability

It can be used with other portfolios and can be adapted to other subsidiaries of interest.



Traceability and audits

Increases the traceability and historicity of results
Results can be audited more efficiently



Flexibility

The tool can be customized according to the organization's requirements.



Regulatory requirements

The use of international climate scenarios allows regulatory aspects to be covered

Technical architecture

The architecture comprises the following elements



Database for information storage, with the following functionality:

- ▶ Loading and storage of internal data according to a set of input files.
- ▶ Loading of scenario data (external data)



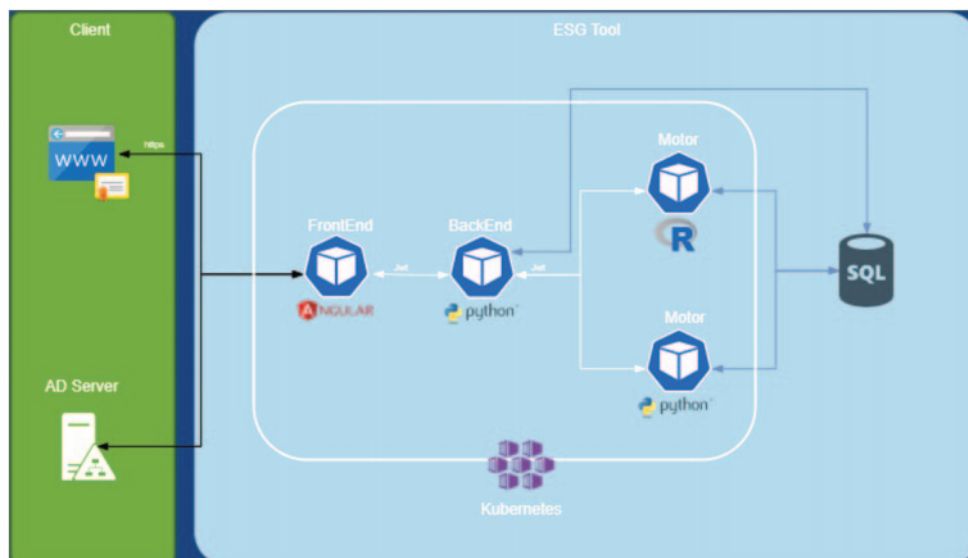
Back-end. Includes:

- ▶ Calculation engines, developed in Python, with models that run on the stored data:
- ▶ Estimation of impacts on parameters.
- ▶ Damage functions, heatmaps, etc.
- ▶ Variable projection models.
- ▶ Program flow management, receipt of requests from the backend, and execution management processes.



Front-end. Includes:

- ▶ User interaction screens.
- ▶ Reporting templates and screens output.
- ▶ Administration / user management screen.



The architecture also includes security and modularization elements:

- ▶ Best security practices, encryption algorithms, active directory integration.
- ▶ Kubernetes framework (for modularization of functionality).

This architecture can be installed both on-premises and in the Cloud.

Tool structure

Data Processing

The purpose of this section is to make available in the tool the data required to run the methodologies, both internal (credit and investment portfolios) and external (physical and transition scenarios).

This section allows you to implement the following functionality:

Internal Data

- ▶ Load internal portfolio data from a defined information structure
- ▶ Perform simple DQ Checks to validate the information
- ▶ Display uploaded data for review

External data

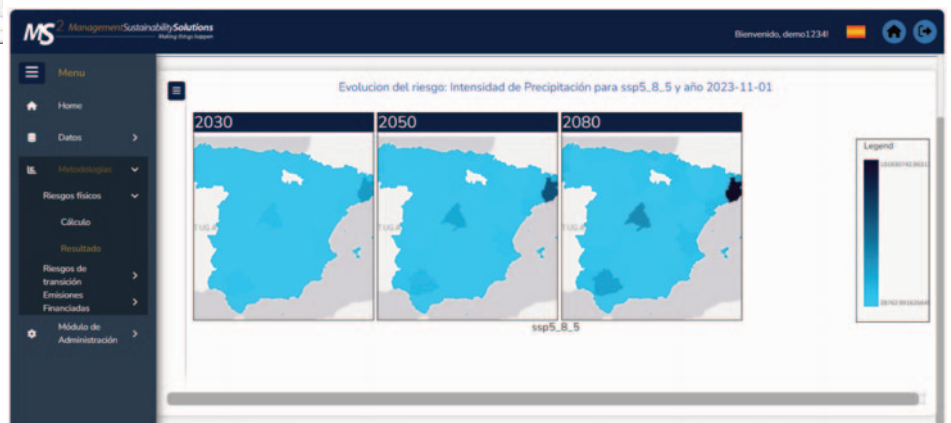
- ▶ Request physical scenario data via the Copernicus API connection
- ▶ Visualize NGFS scenario data

Methodologies

This section is used to run methodologies and visualize results. The built-in methodologies and dashboards can be adapted to the requirements of the organization during the installation process.

Results at a granular level are kept in the database, ensuring their historization. These granular data are available for download by the organization, thus facilitating their use in other management processes (materiality, stress testing, reporting, etc.).

Methodologies have been structured into three modules with the following functionality:



Physical risks

- › Estimate the impacts of physical scenarios on credit parameters (PD / LGD)
- › Obtain performance maps and scorecards

Transition risks

- › Customize and calibrate transition heatmaps
- › Run transition scenario impacts on the credit parameters of credit portfolios, or on the value of financial instruments in investment portfolios
- › Obtain performance maps and scorecards

Estimation of financed emissions and target setting

- › Obtain an estimate of emissions financed via the loan portfolio
- › Apply the SBT methodology to obtain decarbonization targets



The screenshot displays the MS2 Management Sustainability Solutions software interface. The main content area shows a table with the following columns: País, Escenario, Sector ESG, Subsector, Año, Coste directo, Coste indirecto, Gasto capital, and Ingreso. The table contains data for Brazil across various scenarios and sectors, with risk levels indicated by color-coded cells (e.g., Mod Alto, Moderado, Mod Bajo, Bajo).

País	Escenario	Sector ESG	Subsector	Año	Coste directo	Coste indirecto	Gasto capital	Ingreso
Brazil	Below 2°C	Generacion de Energia	Quema de combustibles fósiles	2050	Mod Alto	Moderado	Mod Alto	Mod Alto
Brazil	Below 2°C	Generacion de Energia	Energia eólica	2050	Moderado	Mod Bajo	Moderado	Bajo
Brazil	Below 2°C	Generacion de Energia	Hidroeléctricas	2050	Moderado	Mod Bajo	Moderado	Mod Bajo
Brazil	Delayed transition	Generacion de Energia	Quema de combustibles fósiles	2050	Alto	Moderado	Moderado	Moderado
Brazil	Delayed transition	Generacion de Energia	Hidroeléctricas	2050	Moderado	Mod Bajo	Mod Bajo	Bajo
Brazil	Delayed transition	Generacion de Energia	Energia eólica	2050	Moderado	Mod Bajo	Moderado	Bajo
Brazil	Net Zero 2050	Generacion de Energia	Quema de combustibles fósiles	2050	Alto	Alto	Mod Alto	Mod Alto

The tool is divided into two sections:
(i) Data Processing, which allows climate scenarios to be incorporated, and (ii) Methodologies, which includes physical risk and transition scenario estimation as well as the emissions module.



Credentials

MS has extensive experience in climate risk across multiple sectors, particularly in financial institutions. We have developed numerous projects with the Sustainability and ESG Risk areas of many of the world's leading GSIBs and DSIBs. This allows us to benchmark and compare with other financial institutions.

Management Solutions provides differential value in the field of climate risk measurement:

- › We have broad experience in the development, validation and implementation of models and algorithms used to analyze climate risks in various industries and sectors.
- › We have an R&D team specialized in defining and implementing methodologies for climate and environmental risk measurement (impact of physical risk and transition scenarios on portfolio parameters, impact of physical risk on own buildings, calculation of financed emissions, portfolio alignment and targeting, etc.).
- › We have extensive experience in financial sector regulation and have a Regulatory Observatory that provides in-depth knowledge of regulatory requirements related to sustainability and climate change risks.
- › We have developed physical risk measurement and valuation projects, including definition and implementation of methodologies, obtaining results, conducting climate stress tests, analysis of indicators, ICAAP integration and integration into the management process.

As a result of this expertise, Management Solutions has implemented the MS² tool in all the countries where it operates.

Management Solutions

A leading business consulting firm in regulated industries

Management Solutions is an international consulting Firm focused on consulting for business, risks, organization and processes, in both their functional components and in the implementation of their related technologies.

Management Solutions Management Solutions currently has a multidisciplinary team (functional, mathematical, technical and systems integration) of more than 3.600 professionals, and operates through 45 offices (20 in Europe, 21 in Americas, 2 in Asia, 1 in África and 1 in Oceania) where we serve customers operating in more than 50 countries.

Management Solutions' differentiating factor lies in its in-depth knowledge of the businesses in which its clients operate and in its high degree of sector-specific and functional specialization.

To ensure full coverage of its clients' needs, Management Solutions structures its value proposition by industry (*Financial Institutions (Banking and Insurance), Energy, Telecommunications and Other Industries*), and line of activity, (*Strategy, Sales and Marketing Management, Management and Financial Information, Risk Management and Control, Transformation: Organization and Processes, New Technologies*), bringing together a wide range of skills.

We create value propositions and commit to their effective implementation, aiming to exceed our clients' expectations and become their trusted partners



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Asia: Beijing and Istanbul

Africa: Johannesburg

Oceania: Sydney

For further information you may contact:

Soledad Díaz-Noriega

Partner

Soledad.Diaz-Noriega@managementsolutions.com

Manuel Ángel Guzmán

Partner

manuel.guzman@managementsolutions.com

José Ángel Aragón

Partner

jose.angel.aragon@managementsolutions.com

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