The Coalition of Finance Ministers for Climate Action

Models for evaluating policies to mitigate greenhouse gas emissions and adapt to climate change in Morocco

Morocco—Ministry of Economy and Finance

A contribution to the 'Compendium of Practice from a Global Community of Ministries of Finance and Leading Organizations: Economic analysis and modeling tools to assist Ministries of Finance in driving green and resilient transitions'

Topic: Modeling tools relevant to Ministries of Finance

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Access the full Compendium at www.greenandresilienteconomics.org

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Background

Given the challenges that climate change raises in terms of adaptation and resilience for the sustainability of Morocco's economic and social development trajectory, the Department of Studies and Financial Forecasts (DEPF) has prioritized the development and use of forecasting and analyzing the impacts of economic policies and exogenous shocks in relation to climate issues of adaptation and mitigation.

From this perspective, the DEPF was interested in the development of tools allowing the understanding and appreciation of the transmission mechanisms of weather shocks and the impacts of climate change on agriculture to the Moroccan economy. The Department's interest was also focused on the green budgetary transition, environmental taxation, and the ex-ante evaluation of the macrofinancial issues of Morocco's long-term national low-carbon strategy.

The construction of these tools mobilized numerous skills, both national and international, and made it possible to develop significant expertise in the field of economic modeling within the DEPF.

The models developed by the DEPF concerning these questions focused on the following five main areas.

The impacts of droughts on the macroeconomic framework

The development of the short- and medium-term macroeconomic framework underlying the draft Finance Law is carried out by the DEPF in consultation with the relevant Directorates of the Ministry of Economy and Finance (MEF). This exercise is carried out using the MIMPAS[1] macroeconometric model (annual frequency).

Given that agricultural added value is very sensitive to climatic hazards and it exerts a significant influence on economic activity, the DEPF is often required to simulate the macroeconomic impacts of a scenario of a very good agricultural year and a bad agricultural year alongside the central scenario of an average agricultural season. More specifically, this involves the task of establishing scenarios on the basis of historical observational data concerning cereal production, as well as the production of other crops and of livestock.

These scenarios are simulated through the coupling of the MIMPAS model and a regionalized agricultural model that analyzes the agricultural production account, with a quantity/price distinction, for a very large number of products.

The coupling of these two tools makes it possible to obtain an idea of the effects of variations in agricultural added value on the different aggregates of the GDP balance, employment, prices, the trade balance, and public finances. On the other hand, the scenarios adopted in terms of agricultural production are not based on physical modeling, which takes climate scenarios into account upstream.

The GEMMES Morocco Project: impact of climate change on the national economy via the agricultural sector

In 2019, DEPF and the French Development Agency (AFD), in partnership with the Directorate General of Meteorology (DGM), the Directorate of Research and Water Planning (DRPE) of the Ministry of Equipment and Water, the AAA Initiative Foundation, and the Mediterranean Institute of Biodiversity and Marine and Continental Ecology (IMBE) undertook a modeling project, "GEMMES-Morocco", with the objective of analyzing the impacts of different climate scenarios on the Moroccan economy by 2050. GEMMES stands for General Monetary and Multisectoral Macrodynamics for the Ecological Shift.

1 Integrated macroeconomic model for projection and simulation analysis.

Deployed according to a partnership approach between peers, constructed with and mobilizing Moroccan, French, and international expertise, this partnership, which forms one of the objectives of informing public decision-making and action, aims to:

- Carry out a quantitative estimate of changes in surface water resources and in the production potential of the main Moroccan crops and their water needs over the decades up to 2050
- Identify the transmission mechanisms of water stress shocks and climate impacts on agriculture to the Moroccan economy via a national and territorial GEMMES macroeconomic model coupled with a hydro-agricultural model
- Explore scenarios and appropriate adaptation and resilience responses capable of coping with the harmful effects of climate change on the national economy.

The two modeling tools developed for this purpose are the following:

- The "GEMMES Maroc" model, which makes it possible to simulate the impacts of different climate scenarios on the Moroccan economy by 2050
- The "Lund-Potsdam-Jena managed Land (LPJmL)" model, which allows modeling of the physical impacts of climate change on hydrology and agricultural yields.

This modeling project concerning the impacts of climate change involved:

- The development of a study "The GEMMES Maroc Project: Climate, Hydrology, Agriculture and Macroeconomics"
- Putting together a policy brief titled "Morocco Facing Climate Change: Situation, Impacts and Response Policies in the Water and Agriculture Sectors"
- Writing a policy brief titled "The Moroccan Economy Facing the Challenges of Climate Change: Impact Scenarios by 2050 and Adaptation Policies."

The results of this project were the subject of a presentation at COP26 in 2021.

Assessment of the impacts of Morocco's long-term national low-carbon strategy (LEDS) by 2050

The DEPF is participating with the AFD in the adaptation of the GEMMES model, already used to study the impact of climate change on the Moroccan economy, to carry out an assessment of the impact of the national low-carbon strategy long-term plan of Morocco by 2050. This project is being carried out by the Department of Sustainable Development.

The macrofinancial impacts of the LEDS will be achieved through a coupling of the new GEMMES model, currently being adapted and improved by a joint AFD/DEPF team, with the Long-range Energy Alternatives Planning (LEAP) technical-economic sector model already developed by the office Stockholm Environment Institute (SEI) to explore the social costs of options capable of meeting future energy needs while mitigating the effects of climate change and moving toward low-carbon development pathway. The combined model tracks the consumption, production, and extraction of energy resources across all sectors of an economy and accounts for sources and sinks of greenhouse gas emissions from the energy and non-energy sectors.

Green Budget Transition Project

As part of the green budgetary transition project carried out in partnership with the AFD and the World Bank, two studies are planned, the terms of which are still to be defined with the AFD, on certain climate issues with the macroeconomy in Morocco by exploiting the GEMMES model, possibly with other models.

Study of the impacts of the introduction of a carbon tax in Morocco and the reform of butane gas compensation

In response to a request from the Ministry of the Environment, the World Bank produced a report in 2019 assessing the impacts of the introduction of a carbon tax and the removal of the butane gas subsidy.[2] The various simulations carried out in this report are based on the DEPF's computable general equilibrium (CGE) model, which was adapted to these questions with the technical support of World Bank expert Timilsina Govinda.

Finally, the DEPF considers that the mobilization of international skills and access to the latest tools developed in the field of economic modeling with a view to answering climate questions is always of great importance to strengthen its capacities and expertise in the field.

2 https://openknowledge.worldbank.org/server/api/core/bitstreams/6f135265-8812-5c80-98cb-18c628562272/content