



JUPITER INTELLIGENCE TECHNOLOGY BRIEF

The Value—and Many Limitations—of CORDEX-Based Climate Risk Data

Data from this global downscaling initiative can help compare local and regional climate trends, but it is not suitable for robust physical risk analysis

Downscaling, and the role of CORDEX

Climate change is a global phenomenon that affects every continent. Downscaling—the practice of taking coarse environmental information that comes from Global Climate Models (**GCM**) to finer spatial and temporal scales—is a critical tool in assessing potential physical risk from extreme weather events to resources, infrastructure, and individuals.

The worldwide scientific community has identified an urgent need for regional and national climate model downscaling, in both developed and developing countries. The **CO**ordinated **R**egional **D**ownscaling **E**xperiment—**CORDEX**—is an effort by the World Climate Research Programme (**WCRP**) to catalyze the widespread research and development of regional climate downscaling techniques.

The WCRP, according to ClimatEurope, “views regional downscaling as both an important research topic and an opportunity to engage a broader community of climate scientists in its activities...Regional Climate Models (**RCMs**) and Empirical Statistical Downscaling (**ESDs**), applied over a limited area and driven by global models, can provide information on much smaller scales supporting more detailed impact and adaptation assessment and planning, which is vital in many vulnerable regions.”¹

But CORDEX was never meant to provide a consistent view that can inform global financial or policy decision-making. Jupiter Intelligence uses the CORDEX project’s contributions indirectly in the comparison of local climate trends, but it has concluded that CORDEX data—as it currently exists—does not add value for the robust analysis needed to assess portfolio-wide physical climate risk.

What are the strengths of CORDEX?

CORDEX is a proven enabler for the scientific community vitally interested in exploring the regional effects of climate change. The WCRP supports national-level organizations in their quests for funding for regional downscaling experimentation. The science born from the project's distributed, yet coordinated, efforts has in turn advanced knowledge of both the strengths and weaknesses of dynamical downscaling approaches. As a result, CORDEX has contributed to the improved quality of dynamical downscaling since it effectively launched in 2012.

CORDEX also enables more organizations to engage in climate impact studies by developing regional data that can be produced with far less computational power than needed for GCM production runs.

What are its weaknesses?

"In practice, CORDEX is a global, bottom-up-driven, collaborative initiative aiming to develop and provide detailed, regional climate information necessary for studies on vulnerability, impact, and adaptation at local and regional levels," the WCRP has noted. "CORDEX has contributed to advancing the scientific understanding of regional climates, as well as the production of and access to regional climate data and information. However, knowledge gaps persist, and further development of models, infrastructure, tools and knowledge is necessary."²

Its bottom-up structure, national/regional focus, and lack of a globally consistent downscaling methodology are among the root causes that render CORDEX data unsuitable for robust physical climate risk analysis. Its key weaknesses include:

- **CORDEX is not designed as a basis for global portfolio risk analysis and applications.** It is a scientific and capacity building effort.
- **Models and methodologies are not normalized across jurisdictions.** CORDEX makes no attempt to unify the overall methodology, regional models or GCMs used; activities are primarily funded at the national level to increase participation in science associated with regional climate modeling.
- **Model resolutions, though improved, still aren't fine enough.** The CORDEX model grid spacing of 20-50 km (with a few with resolutions as fine as approximately 12 km) is insufficient to simulate the dynamics that capture extreme hydrometeorological and wind events, and other weather-related hazards.
- **Simulations can show conflicting trends, making interpretation difficult.** Even when embedded within the same GCM, CORDEX simulations can show contradictory climate trends (e.g., drying conditions versus more rainfall) because of inconsistencies between the GCMs and the regional model.
- **CORDEX does not support best-in-science GCMs.** All contributions are currently based on CMIP5, which dates to the early 2010s. It may take years for CORDEX to reflect CMIP6/AR6.

- **Most CORDEX projects don't support the full range of greenhouse-gas-emission pathways.** With few exceptions, they reflect only RCP 4.5 and 8.5, which limits analysis of the possible range of global outcomes. Addressing this is an explicit goal for future CORDEX work.
- **They have limited ability to model rare weather events.** A lack of ensembles inhibits robust extreme value calculations. Addressing this also is an explicit goal for future CORDEX work.
- **They cannot adequately assess tropical cyclone risks.** CORDEX lacks the information necessary to model these perils.

CORDEX research has been extremely useful for learning and comparison. Its mobilization of the global scientific community is exemplary, and its growing body of research benefits the development of novel downscaling approaches. But, at present and for the foreseeable future, CORDEX-based data can't compare to more advanced, scalable, and globally consistent approaches to downscaled climate risk data. These more credible approaches effectively inform impacts, risk management and disclosure, adaptability, and resilience planning.

About Jupiter Intelligence

Jupiter Intelligence is the global leader in climate analytics for resilience and risk management. For further information, please visit jupiterintel.com.

¹ ClimatEurope, 2020, [CORDEX: Coordinated Regional Downscaling Experiment](#).

² The World Climate Research Programme (6 July 2018), [WCRP Spotlight: The Coordinated Regional Downscaling Experiment \(CORDEX\)](#).
