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How do global decarbonization trends create external risks for emerging and developing economies?

The low-carbon transition, despite its imperative nature, is likely to present both economic and social opportunities as well as downside risks, depending on the companies, sectors, or regions. The assessment of these risks through the conduct of in-depth microeconomic studies is a mean of contributing to the emergence of financially and socially sustainable transition processes and limiting the risk of macro-financial imbalances and social disturbances at the national level.

What are climate transition risks (CTR) and why do they matter for emerging and developing economies (EMDEs)?

CTR were originally conceived as a systemic financial risk, but more attention is nowadays brought-up to macro-financial and social stability. In contrast, relatively less focus has been placed on the potential consequences of CTR for fiscal sustainability, local or national economic growth, and workers' livelihoods. However, CTR, along with the planning, and financing of the transition are now gaining strong momentum over the last few years among policymakers and public institutions, particularly in the context of a new era marked by rising green protectionism, industrial policies, carbon pricing policies, and other environmentally friendly trade policies.

Managing and navigating CTR is particularly relevant for EMDEs, some of which have significant concentrated exposure to high emitting sectors and related revenues (fiscal resources, FX reserves, dividends…) and jobs at risk[1]**.** Many EMDE countries already face structural macro-financial vulnerabilities such as liquidity shortages, FX crises, and external shocks to the energy sector or sudden

[1] Tailoring Transition Plans: Considerations for EMDEs (ngfs.net)

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technological breakthroughs. Consequently, they have a restricted financial space to invest in mitigating CTR, and may even aggravate the situation if they **lock some investments in high-emitting solutions**[2], which could make their supply curve uncompetitive in globalized trade. Furthermore, physical risks and the insurance protection gap[3] are adding pressure on economic resilience. **Prioritizing investments**[4] in the right growth opportunities is therefore critical.

The vicious cycle[5]**: The government's role as the ultimate risk bearer threatens national public finances and the cost of capital.** Governments often face additional contingent liabilities beyond those obligations that have been formally budgeted. For example, one would expect the national government to step in to support local governments facing declining revenues (see Box 1). The impact of CTR on the economic performance of key sectors, national government revenues and costs, and the value of state-owned enterprises could pose risks to the sustainability of national public finances. This, in turn, could have knock-on effects on the future cost of raising sovereign debt and, ultimately, on the sovereign credit rating.

Most importantly, the factors driving CTR and their **timing are mostly beyond the control of EMDE countries, as they are driven by decarbonization pathways (technology, policy) occurring predominantly in developed countries and China.**

The complexities of transition risk modeling at a system level: beyond emissions-based approaches

Climate risk modeling has become an important task in the public policy dialogue over climate issues. It aims at identifying, measuring, and designing the adequate strategy to manage those risks and navigate the inherent **uncertainties**. The most common methodologies in CTR modeling use macro, top-down models and use carbon pricing (as a proxy for climate policy) or carbon intensities as a key drivers of CTR. However, this approach is at best a proxy and comes with significant shortcomings. Other factors and configurations can influence risks, and **there may even be a reverse correlation between emissions and risk, potentially leading to misaligned capital allocation:**

- **Timing and cross-border dynamics:** A timing mismatch between the development of new, clean energy and economic systems and the decline of existing fossil-based ones can lead to price and macroeconomic volatility. For instance, there could be an incorrect anticipation of a policy or a flawed bet on emerging technology, such as batteries. A business might enter the market prematurely with green solutions or enter when there is over-supply or greenflation, rendering them uncompetitive.
- **Oversimplified CTR metrics such us the emission-based ones can provide flawed analysis:** First, they will likely underestimate risks in places with limited carbon pricing. Second, consider the case of a low-emissions entity, such as a software or service provider, that supplies a company with high CTR, like a coal mining operation. These are not adequately captured even by Scope 3 emissions accounting[6].
- **Indirect exposures:** A banking sector with limited exposure to high-emitting lending but significant concentration in sovereign risk could face destabilization in a country that is failing to effectively manage its transition risks.
- **The dynamic nature of exposure:** An entity can be exposed to CTR but present low vulnerability to that risk due to its capacity to shift quickly or transfer the risk.

The **mismatch between anticipated and actual supply and demand curves is the key driver of CTR**, showing that broad, quantitative macro models solely based on carbon pricing attached to carbon emissions metrics will fail to capture this.

Box 1- Why detailed country-specific analysis is critical: the case of Colombia vs. Ghana

AFD has supported detailed CTR analyses in Colombia[7] and Ghana. The countries have significant fiscal and trade dependence on fossil fuels (coal and oil contributed 48% of Colombia's exports in 2022; oil contributed 26% of Ghana's exports). But the differences between the countries' economic structures and starting levels of fiscal resilience mean that CTR impacts them in different ways and the countries have different options for dealing with the risk.

The first key difference relates to the structure of the countries' fossil fuel sectors. Except for a limited amount of offshore gas reserves, Ghana uses effectively none of its fossil fuel reserves domestically. 100% of its crude oil production is exported, while a new oil refinery under construction is expected to run on imported crude. Colombia is not self-sufficient in oil products production but does utilize domestic crude in domestic refineries first before exporting the remainder. Similarly, while much of its coal production in the north of the country is dedicated to seaborne export, Colombia also supplies power plants and industry with coal produced inland that is not exposed to export markets. Colombia's fossil fuel sectors are therefore partially more insulated from global transition dynamics than Ghana's.

In a WB2C, both Colombia and Ghana would face lower tax revenues from fossil fuel extraction than in the "business as usual" scenario. However, the distribution of the impact within the countries varies. In Colombia, fossil fuel royalties are used as a primary distribution mechanism for government funds to local departments and municipalities that are tasked to deliver many public services. Royalties in Colombia have also on occasion been used as security for bank loans to fund infrastructure. In Ghana, fossil fuel royalties and the provision of public services are centralized at the national level. This means that the co-ordination challenge for dealing with transition impacts on the public finances are likely to be much more complex in Colombia, than Ghana.

[2] IPCC_AR6_WGIII_Chapter17.pdf

[3] https://www.cisl.cam.ac.uk/files/risk_sharing_for_loss_and_damage.pdf

[4] Strategic Prioritization of Action Plan Towards De-Carbonization and Sustainable Energy Transition for Developing Nations | IIETA

[5] Tackling the Vicious Circle – The Interim Report of the Expert Review on Debt, Nature and Climate (d1leqfwiwfltz5.cloudfront.net)

[6] FAQ.pdf (ghgprotocol.org): Scope 3 emissions are all indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions

[7] Understanding the impact of a low carbon transition on Colombia - WTW (wtwco.com)

Finally, both countries' financial systems face systemic challenges via financial sector exposure to sovereign debt from a global transition whose impacts are likely to materialize earlier than those from the domestic transition. But Colombia's financial sector has more direct exposure, meaning climate financial regulation may be more effective there, if effectively tailored for Colombia's circumstances.

Our methodology for bottom-up modeling in the context of concentrated and less diversified economies

Rather than analyzing an economic or financial system through a stylized representation of a few real economy sectors, the methodology developed by AFD and WTW[8] builds up from very granular microeconomic and financial models of sectors and firms (see Figure 1) facing concentrated CTR drivers to a broader understanding of risks to the real economy, public finances, and the financial system.

Furthermore, system-wide aspects of CTR, such as **indirect exposures, and risk spillovers**, are also assessed and aggregated from the bottom to the up. However, this model will not capture certain macro-financial feedback loops. From a public policy dialogue perspective, these models help **initiate dialogue based on real economy assets, state-owned enterprises, and sectors, providing concrete examples and helping policymakers better understand the mechanisms and narratives of CTR.** Macro models, which treat information at an aggregated level, are less suited for this.

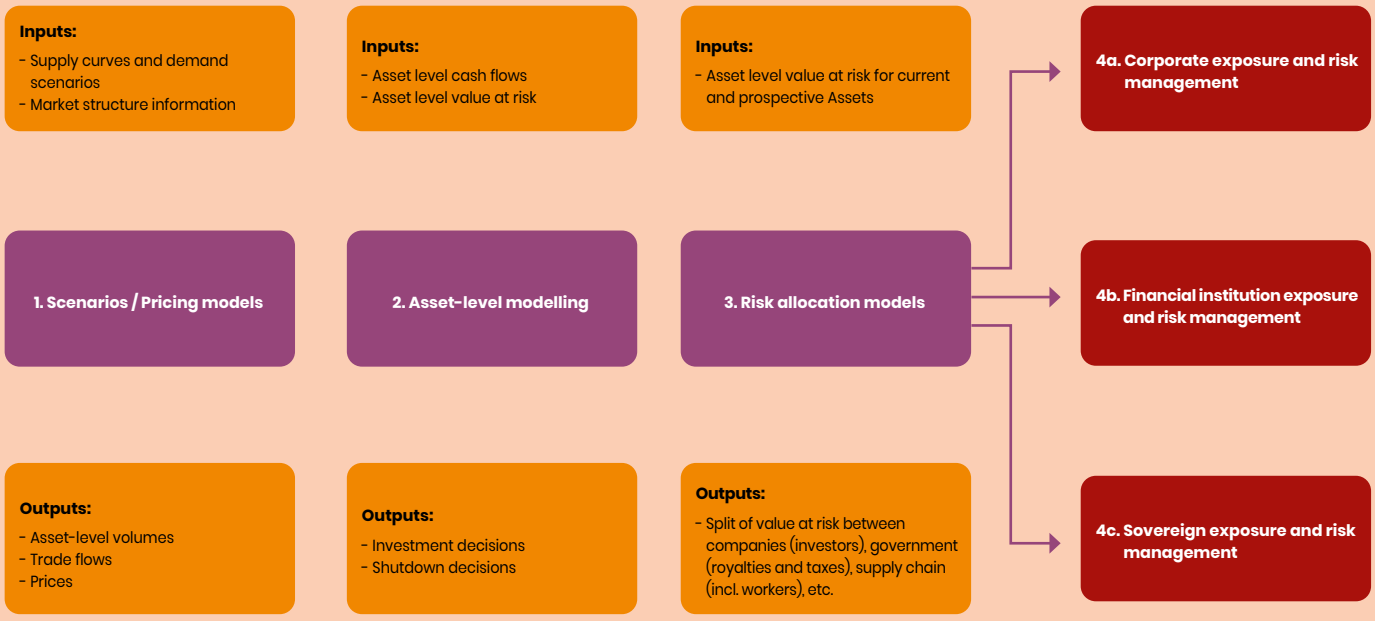
[8] https://www.wtwco.com/-/media/wtw/insights/campaigns/learn-more-about-quantifying-climate-transition-risk-us.pdf?modified=20211008173528

The step-by-step methodology

Step 1 (see Figure 1) refers to the design and discussion of domestic and external transition scenarios, a foundational step in the process. This step leverages supply and demand curves along with market structure insights to estimate production volumes, trade flows, and prices under both BAU and WB2C scenarios. Since global scenarios often lack the right granularity to reflect the specific policies driving domestic transitions, the analysis is supplemented with detailed domestic scenarios. Developing these requires substantial in-house expertise, as climate transition scenario creation is a highly specialized exercise. The sectors selected for analysis, such as coal, oil and gas, and mining, are chosen based on their sensitivity to external decarbonization drivers and in consultation with local authorities. Building on these scenarios, **Step 2** involves asset-level modelling for the selected sectors (e.g., mines for mining or refineries for oil and gas) by analyzing cash flows and assessing the VaR. The outcomes inform critical decisions, such as whether to invest in new projects or shut down existing operations. In **Step 3**, risk allocation models are applied to evaluate and determine how risks are distributed among stakeholders. These include companies (investors), governments (via taxes and royalties), and the supply chain (e.g., workers and suppliers). Finally, **Step 4** focuses on helping stakeholders manage their exposure.

In conclusion, while the exercise provides a quantitative VaR and its allocation through stakeholders, the entire process—including scenario development— should be used as policy tools and dialogue, not deterministic outcomes. Assumptions must be discussed thoroughly with policy-makers from key ministries to foster a shared understanding and ensure adjustments reflect a common view.

Figure 1 - The step-by-step methodology



Conclusion

Beyond the final quantified outputs of modeling transition risks, the most valuable aspect of the exercise lies in its ability to initiate or strengthen a coordinated, multi-stakeholder process for assessing and planning transitions. This is achieved through public policy dialogues that critically explore assumptions, plausible futures, and their potential outcomes. However, these outcomes may sometimes be perceived as unfair and face opposition because diagnoses run counter to well established international processes that conceive of climate action as being co-ordinated within and not across national boundaries. Ultimately, mitigating climate transition risk is about managing the timing of mismatches between demand and supply curves. This requires a deep understanding of the drivers that shift these curves—drivers which are largely beyond the control of emerging and developing countries. Instead, these shifts are shaped by a global transition and external forces such as politics, trade dynamics, regulatory changes, and technological advancements. In addition, given limited financial resources and macro-financial structural challenges, it is essential to prioritize investments that are supported by domestic transition policies and to avoid lock-in effects from risky choices.

Definitions

Climate Transition Risk (CTR): Upside or downside risk related to the economy arising from different climate transition scenarios, driven by market, policy, technology, legal, or behavioral shifts.

Well Below Two Degrees Celcius (WB2C): The Paris Agreement goal to limit global warming to well below two degrees Celsius above pre-industrial levels, aiming for 1.5 degrees if possible.

Business as Usual (BAU): A baseline scenario representing current climate action trends and economic expectations.

Transition Scenarios: Models used to analyze future climate pathways, including BAU and lower-carbon scenarios aligned with the Paris Agreement goals (e.g. WB2C).

External Transition Risk: CTR influenced by global factors outside a country's policies, such as international policy and market changes.

Domestic Transition Risk: CTR driven by a country's own climate policies.

Value-at-Risk (VaR): A metric quantifying CTR as the difference in financial outcomes between BAU and a WB2C scenario.

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