International climate finance to accelerate the low-carbon transition in emerging countries? A global assessment of financial de-risking potential

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Overview

Variable renewable energy (VRE) investments are highly risky in many developing countries due to high upfront costs, poor local financing conditions, and lack of experience. Increased risks translate into higher financing costs and discourage investments in solar PV and wind power due to the capital-intensive nature of VRE installations. Therefore, de-risking VRE investments is key to accelerating VRE development and achieving regional decarbonization goals for the power sector. De-risking measures aim to reduce and spread the risks associated with VRE investments and reduce their overall weighted average cost of capital (WACC). These measures are related to the discussion on climate finance, as they include financing options for VRE projects through loans, equity, or guarantee mechanisms from bilateral and multilateral organizations such as the Multilateral Development Banks (MDBs). It has become clear that financial support to developing countries will be critical to decarbonizing the power sector worldwide and achieving global climate goals. This study examines the impact of de-risking policies on the power sector and the rest of the economy, and the role of international climate finance in decarbonization pathways. We go beyond existing assessments of heterogeneous WACC effects and de-risking by providing a global picture of the impact of real de-risking, calibrating flows of low-cost capital to international climate finance commitments.

Methods

This study investigates the impact of de-risking policies that aim to spread the risks on VRE investments and the role of international climate finance in decarbonization pathways. We fit a recursive, dynamic, multi-regional, and multi-sector Integrated Assessment Model IMACLIM-R with a technology-specific and regional Weighted Average Cost of Capital (the sum of the cost of debt and cost of equity weighted by the share of debt and equity in the total financing) estimate for each power generation technology. Aggregated financial market data on country risks are used to compute regional WACC. The regional installed capacity of VRE serves as a proxy for technology risk premiums that increase the financing cost of solar and wind power. The WACC model sheds light on the differences in financing costs for renewables projects between developed countries (below 7%) and emerging countries (higher than 8%). For Africa (12%), the financing costs of wind power are three times higher than for Europe (4,3%). These WACC gaps are far from negligible, knowing the impact of WACC variation on the Levelized Cost of Electricity (LCOE).

The standard WACC formula is modified to include concessional finance. The de-risking policy takes the form of low-cost public loans from developed to developing regions in a simplistic North-South framework. Developed countries endow a single "Renewable Energy Fund" (REF) with an annual portfolio. This portfolio is allocated to VRE projects in developing countries (solar PV, wind, and concentrated solar power). Thus, the financing costs for VRE projects in developing countries reflect a blend of private debt, public loans, and private equity.

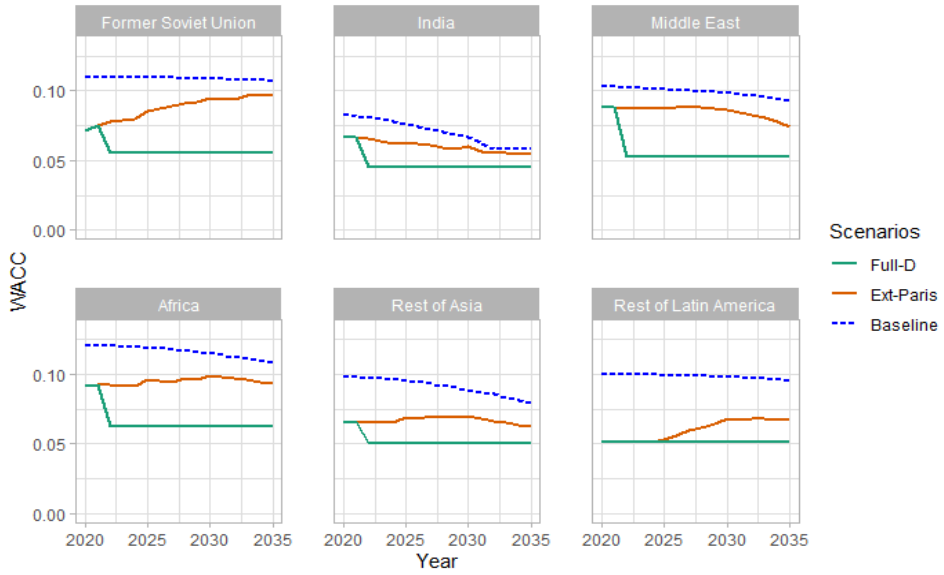
Several de-risking scenarios are tested. In the Baseline Scenario, no de-risking policy is undertaken. In the Paris Agreement (Paris) Scenario, climate finance flows to the electricity sector correspond to observed flows from 2015 to 2019 and COP15 commitments from 2020 to 2025. In the Extended Paris Agreement (Ext-Paris) Scenario, the 100 bn USD global climate finance target is extended to 2035. Note that among the 100 bn USD commitment, only a fraction (23% on average between 2016 and 2019) corresponds to public financing for mitigation projects in the electricity sector. In the Full Derisked (Full-D) Scenario, de-risking potential is maximized. From 2015 to 2021, climate finance flows are identical in Paris, Ext-Paris, and Full-D scenarios. Then, from 2022 on, every renewable project in emerging countries can benefit from low-cost loans, i.e., the Renewable Energy Fund has unlimited funds available to tap the full de-risking potential. This scenario explores the potential for renewable investment de-risking in six emerging regions or countries: Former Soviet Union, India, Middle East, Africa, Rest of Asia, and Rest of Latin America[1].

[1] Brazil was excluded from the analysis since accelerating VRE development is less crucial there than in other emerging regions (the Brazilian power system is already quite decarbonized due to a high share of hydropower).

Results

Our WACC model allows us to represent the evolution of the cost of capital for renewable projects under Baseline and de-risking scenarios (Figure 1, for solar PV)[2].

Figure 1: Weighted Average Cost of Capital (WACC) in emerging regions, Solar PV



In the six emerging regions, climate finance significantly reduces the cost of capital for renewable power. Including climate finance flows from 2015 to 2021 reduces the WACC by 28% on average. The WACC start diverging between the Full-D and Ext-Paris scenarios in 2022. In the Full-D scenario, every renewable investment can benefit from a full share of de-risked debt. Then, the de-risked WACC is constant, equal to its value with 100% of low-interest loans. In the Ext-Paris scenario, the share of de-risked loans in total debt for RE projects varies between 29% (Middle East) to 100% (Rest of Latin America, depending on the regional renewable energy investment demand. Thus, after 2022 WACC values in the Ext-Paris scenario lie between Baseline and Full-D.

In the Ext-Paris scenario, the annual portfolio reaches a maximum in 2025 and remains constant in absolute terms after that until 2035. Since VRE investment demand rises over this period, the share of de-risked loans decreases in the emerging regions, leading to a gradual increase in the de-risked WACC in this scenario. The lower the share of de-risked loans in the Ext-Paris scenario, the more significant the gap between Ext-Paris and Full-D renewable energy deployment. Indeed, a low percentage of de-risked loans indicates that the WACC of RE projects could further be reduced by increasing the annual Renewable Energy Fund portfolio size.

We choose to focus on two regions - in this preliminary analysis -, India and Africa, due to their polar situation in the "emerging countries" group: they face a pre-de-risking policy WACC of 8,3% and 12%, respectively. In the Ext-Paris scenario, renewable electricity production rises significantly compared to Baseline. In 2035, RE production is 8% and 22% higher in India and Africa, respectively. Paris Agreement climate finance commitments stimulate renewable energy investments through WACC reductions. However, Paris-compatible climate finance flows do not take advantage of the full potential of RE investment de-risking. In the Full-D scenario, RE production surges by an additional 16% pts for India (+ 24 % regarding Baseline in Full-D) and 22% pts for Africa (+ 44% regarding Baseline).

Conclusions

This article combines regional and technology-specific WACC values to explore global, real-world de-risking impact on VRE deployment in key emerging regions with a global energy model. By matching WACC reductions with real-world policy instruments such as low-cost loans, we show the current and potential impact of climate finance flows for renewable projects in emerging countries and provide quantitative insights into the amounts at stake. We conclude that upscaling low-cost climate finance flows towards VRE projects is key to accelerating the low-carbon transition of the power sector in emerging countries.

[2] Note that WACC reduction is endogenous to our model regardless of any de-risking policy feature. Indeed, the WACC of each renewable technology depends on its regional installed capacity through the Renewable Project Premium. RE installation leads to a decrease in the WACC, leading to higher RE penetration. That explains the observed WACC reduction trend in the Baseline scenario.