Low-carbon investment risks and de-risking

Tobias S. SCHMIDT

Swiss Federal Institute of Technology Zurich (ETH Zurich), Department of Management, Technology, and Economics, Chair of Sustainability and Technology, Weinbergstrasse 56, Zurich CH-8092, Switzerland

And: Precourt Energy Efficiency Center, Stanford University, 473 Via Ortega, Stanford, CA 94305, USA

Corresponding author contact details: tobiasschmidt@ethz.ch

Published in *Nature Climate Change.* (doi: 10.1038/nclimate2112)

Please cite this article as: Schmidt, T. S. (2014). Low-carbon investment risks and de-risking. *Nature Climate Change*, 4(4), 237-239.

Abstract

Effective mitigation of climate change requires investment flows to be re-directed from high- to low-carbon technologies. However, especially in non-OECD countries low-carbon investments often suffer from high investment risks. More research is needed to address these risks and allow sound policy decisions to be made.

Climate policy has to address a global investment challenge. The IEA estimates that in the energy sector alone, infrastructure investments of US$37 trillion will be needed by 2035[1] to meet rising global energy demand. In order to achieve the 450ppm scenario, these investment flows have to be re-directed from high-carbon to low-carbon technologies and topped up by an additional US$17tn[1]. This can realistically only be achieved by successfully mobilising private capital[2]. Consequently, climate policy needs to create attractive conditions for private low-carbon investments, especially in non-OECD countries where the lion's share of investments is needed[1]. As the private sector takes investment decisions based on the risk-return profile of investment opportunities[3], there are two levers for climate policy: first, increase the returns of low-carbon investments (or decrease those of high-carbon investments); second, decrease the downside risk of low-carbon investments, also called 'de-risking'.

Although existing literature shows the importance of risk in determining private investments[3] – especially in developing countries where investment risks are typically higher than in developed countries[4,5] – hitherto most climate policy instruments, such as the Kyoto Protocol's Clean Development Mechanism, have focused on the return lever. In contrast, future climate policy might incorporate both levers through Nationally Appropriate Mitigation Actions (NAMAs)[6] and activities of the Green Climate Fund (GCF)[7]. However, it remains debated, how the underlying public instruments should be designed and to which extent resources should be devoted to one or the other lever[6,8]. Further research on low-carbon investment risks and de-risking is needed. Here I focus on the role of risk in low-carbon investments, explain the concept of de-risking and propose five steps for future research.

The role of risk in low-carbon investments

Downside risk is the combination of the likelihood of the occurrence of a negative event and its associated financial impact[9]. Examples of the many potential negative events that may affect fixed asset investments and thereby drive risks include construction delays due to complicated permitting processes, loss of assets due to expropriation, or default in payment by the customer. Investors' decisions are influenced by the likelihood and impact of such events. The perception of risk is then reflected in the financing costs or 'cost of capital'[3]: with higher investment risks, a bank raises the interest rate (cost of debt) and an equity investor raises the return expectation (cost of equity). This is true for both high- and low-carbon investments. However, low-carbon technologies are much more capital-intensive than their high-carbon alternatives, whose costs are mainly dictated by the cost of fuels. Therefore, investment risks, and the related financing costs, are more significant for low-carbon projects. Figure 1a depicts the typical power generation cost of five renewable and three fossil fuel-based technologies. For each technology, the left bar shows the life-cycle cost assuming low financing costs (in an industrialised country) whereas the right bar assumes higher financing costs (typical in developing countries). A clear pattern emerges: the life-cycle costs of capital-intensive renewable energy technologies are much more sensitive to the increase in financing costs (+31% to +46%) than those of fuel-cost dominated technologies (-3% to +17%), as shown in Figure 1a. Higher investment risks thereby decrease the competitiveness of renewables vis-à-vis fossil fuel-based technologies. This is also reflected in the marginal abatement costs depicted in Figure 1b, which strongly increase with higher risks. In particular, competitive low-carbon technologies whose abatement costs are low (e.g., wind, small hydro, and biogas), are strongly affected by higher risks when compared to a fossil-fuel baseline (experiencing abatement cost increases of up to 330%).

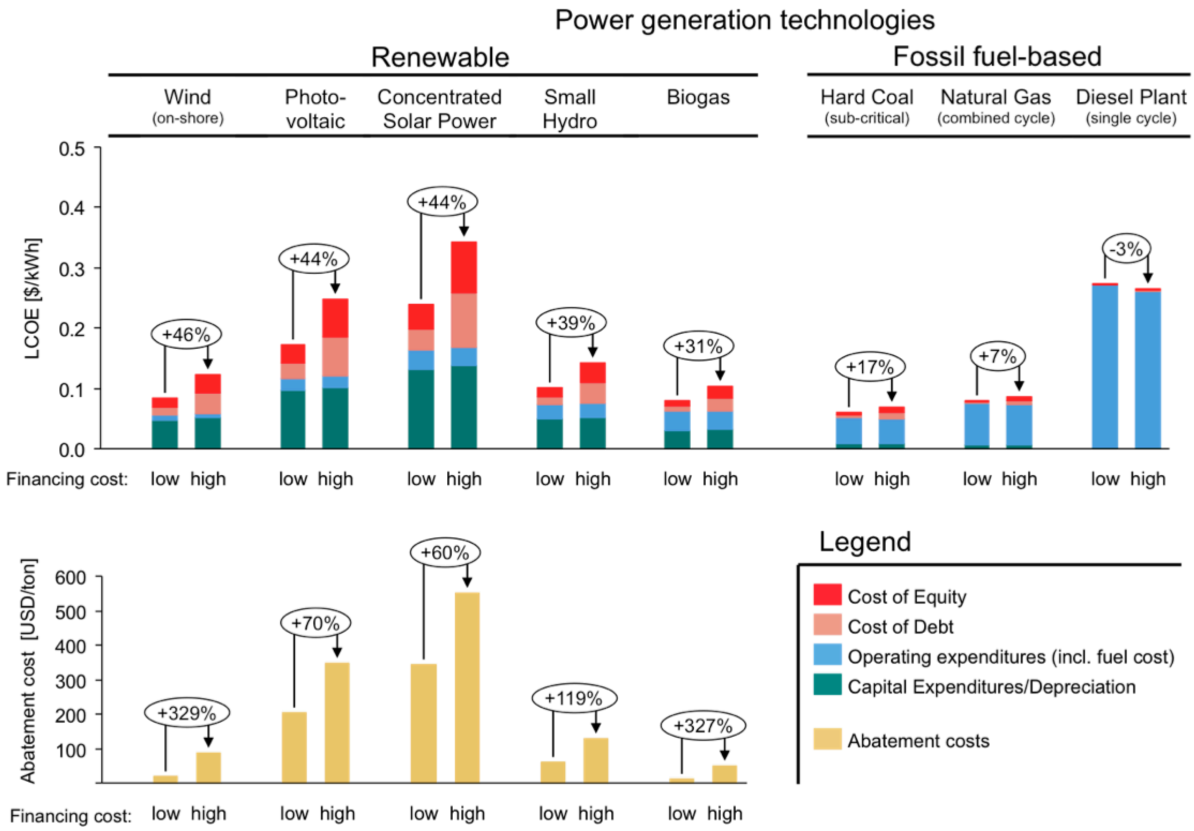

Figure 1 The impact of risk on the cost of power generation. a,b, The left bar for each technology assumes a low cost of capital: 5% cost of debt, 10% cost of equity (typical current values in an industrialised country) while the right bar assumes a high cost of capital: 10% cost of debt, 18% cost of equity (typical current values for a low-income country[11]). While Figure 1 only assumes differences in the capital costs, higher risks typically also affect other financial parameters, such as the capital structure (i.e., the relationship between equity and capital) or the loan tenor (i.e., the maturity of the bank loan). Changes in these parameters additionally increase the role of risk[11] a, The pre-tax levelised cost of electricity (LCOE) in USD_{2012} per kWh. The different stacks depict the different cost components (see legend). The fact that the LCOE Diesel decreases with higher capital costs is related to discounting effects on fuel costs. b, The cost of emission abatement in $US\$_{2012}$ per tCO_2. A marginal baseline consisting of 50% Hard Coal and 50% Natural Gas is assumed.

Addressing investment risks via de-risking

Given the importance of investment risks, de-risking is a potentially powerful policy option to re-direct financial flows from high- to low-carbon investments. De-risking lowers the financing costs and consequently the greenhouse gas abatement costs of low-carbon technologies. It works in two ways –financial and policy de-risking. As to the first, the financial impact of a negative event is reduced by transferring large portions of the impact to other parties. Examples are risk insurance or guarantees offered by public sector actors (e.g., development banks) who cover damages, e.g. in the form of reduced or no payment of the customer. As to the second, the likelihood of a negative event is reduced by removing barriers in the investment environment and improving local institutions. An example is a streamlined permitting process that reduces the likelihood of construction delays.

A report published in 2011 by Deutsche Bank provides the conceptual basis for the idea of low-carbon de-risking and its economic effects[10]. In April 2013, the United Nations Development Programme (UNDP) published

Derisking Renewable Energy Investment (DREI)[11] – a report that further develops the concepts of measuring the effects of de-risking in quantitative terms, and applies them to on-shore wind power in four selected developing countries. The results indicate that de-risking can increase the effectiveness and efficiency of policies aiming to attract low-carbon investments. However, these reports can only be seen as first steps.

Towards a research agenda

Despite the importance of risk and associated financing costs as well as the potential of de-risking, related research and data are scarce. To address this gap, I propose five specific topics essential to improving our knowledge of risk and de-risking.

A global database on financing costs

Despite large differences in risk profiles, currently most energy models and reports assume the same financing costs across countries (e.g., 10%)[12]. One important reason is the lack of good country-level data. The UNFCCC has released estimates on the cost of equity in many developing countries[13]; however, their numbers are limited to the costs of equity, aggregated at the sector level, and do not match with others' observations. In order to better inform energy analysts and policy makers, a global database that collects financing costs and other important investment parameters (such as capital structures and loan maturities) is needed. As the data are often sensitive, an international institution should be in place to aggregate and anonymise the data. IRENA's renewable cost database[12] has started to collect such data but is limited to renewable energy projects.

Drivers of financing costs

The probabilities of negative events, and the financial impacts of such events, determine the risks, the financing costs and the investment decisions and therefore should be documented.
However, in developing countries and especially for infrastructure investments such information is scarce. Recent studies analysed the relative importance of different risks in selected countries[14,15] but there has been almost no analysis on how these factors translate into higher financing costs. The DREI report has proposed a linear survey-based method. Although this is a first step in the right direction, experts should develop more sophisticated methodologies that for example better incorporate the correlation among risk drivers. To this end, collecting global data on risk drivers is highly relevant and would complement the database proposed above.

Effectiveness of de-risking

It is fairly simple to track the effectiveness of financial de-risking measures in terms of lowering financing costs. As soon as these measures are implemented, the cost of capital is reduced (e.g., a bank reduces the interest rate if a World Bank loan guarantee is provided). For policy de-risking measures this is not the case: their effects only build up over time, as investors gain trust. This makes the evaluation of effectiveness more complex. Currently there are no studies analysing these effects over time, which calls for future research.

Efficiency of de-risking

In order to evaluate the efficiency of de-risking measures, one needs to compare their financial effects with their costs. Financial de-risking measures are effective immediately (see above) and produce costs for each new project, making their efficiency evaluation quite easy. In contrast, policy de-risking measures are often long-term in nature (e.g., building up a new streamlined permitting process). They produce most costs before the projects take place but only little (or no) additional costs with each project that follows. Therefore, they hold the potential to reduce the long-term dependence of developing countries on international assistance. Although the literature on development issues provides methods to track the efficiency of assistance measures, these measures currently do not refer to financing costs and studies fail to relate this efficiency to climate change mitigation.

Political feasibility of de-risking

Once new methods and data are available, future research will need to develop workable policy recommendations for national and international institutions. At national level, research on the design of low-emission development strategies and NAMAs that makes use of the de-risking leaver is needed. At international level, recommendations should be developed on how the GCF can assure its funds are efficiently distributed between the return and the risk leaver (and between financial and policy de-risking). Also, experts should discuss how de-risking can be embedded in a global post-Kyoto policy regime. To this end, there is need of standards that allow measuring, reporting, and verifying the effectiveness and efficiency of climate policies and climate finance in a comparable way.

De-risking can be a powerful leaver to address the investment challenge underlying climate change mitigation. Therefore I strongly encourage researchers from multiple disciplines to help improve our understanding of risk and derisking, and thereby allow tapping into the full potential of this leaver.

Acknowledgements:

I thank Volker Hoffmann, Joern Huenteler, Christian Niebuhr, Catharina Bening and further members of SusTec, as well as Oliver Waissbein and David Goldblatt for their constructive comments.

References

1 IEA. World Energy Outlook 2012. (International Energy Agency, 2012).

2 Buchner, B., Falconer, A., Hervé-Mignucci, M. & Trabacchi, C. The Landscape of Climate Finance 2012. (Climate Policy Initiative, 2012).

3 Brealey, R. A. & Myers, S. C. *Principles of corporate finance*. 6th edn, (McGraw-Hill, 2000).

4 MIGA. World Investment and Political Risk 2012. (World Bank Group, 2012).

5 Schneider, F. & Frey, B. S. Economic and political determinants of foreign direct investment. *World Development* **13**, 161-175 (1985).

6 Hoehne, N. Policy: Changing the rules. *Nature Clim. Change* **1**, 31-33 (2011).

7 Farrukh, I. K. & Dustin, S. S. Triple transformation. *Nature Climate Change* **3**, 692-694, (2013).

8 Chatham House. Private Sector Consultation to Support the Work of the Transitional Committee for the design of the Green Climate Fund (Chatham House, 2011).

9 International Standardisation Organisation. ISO Guide 73, Risk Management - Vocabulary. (2009).

10 Deutsche Bank Climate Change Advisors. Get FiT Plus - De-Risking Clean Energy Business Models in a Developing Country Context. (2011).

11 Waissbein, O., Glemarec, Y., Bayraktar, H. & Schmidt, T. S. Derisking Renewable Energy Investment. (United Nations Development Programme, 2013).

12 IRENA. Renewable Power Generation Costs in 2012: An Overview. (International Renewable Energy Agency, 2013).

13 UNFCCC. Draft Revision to the Guidelines on the Assessment of Investment Analysis. (United Nations Framework Convention on Climate Change, 2010).

14 Komendantova, N., Patt, A., Barras, L. & Battaglini, A. Perception of risks in renewable energy projects: The case of concentrated solar power in North Africa. *Energy Policy* **40**, 103-109, (2012).

15 Shrimali, G., Nelson, D., Goel, S., Konda, C. & Kumar, R. Renewable deployment in India: Financing costs and implications for policy. *Energy Policy* **62**, 28-43, (2013).