Mobilising private capital for grid-connected renewable power in developing countries – Lessons learnt

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Executive Summary

Background

In order to reach the Sustainable Development Goals (SDGs) and ensure the timely implementation of the Paris Climate Agreement attracting private capital – along with raising tax revenues and development finance – will be critical to fill the investment gap.[1]

Yet, in developing and emerging economies renewable energy developers often struggle to access financing at adequate conditions as private investors may find it difficult to accurately assess risk. This particularly affects renewable power projects, such as wind and solar photovoltaic (PV), as they require higher up-front capital expenditures than comparable fossil fuel alternatives making power prices more sensitive to financing cost.[2]

A wide array of public de-risking instruments has been developed over recent years to address these investor risks to attract – or crowd-in – private capital both from international and local private investors into the power sector (Huenteler, 2014).

As KfW Development Bank has gained experience in the design, implementation and evaluation of de-risking instruments in developing and emerging economies, the goal of this report is to synthesise findings from the academic literature and KfW Development Bank's experience in crowding-in private capital into grid-connected renewable energy projects (>5 MW) in developing and emerging economies.

KfW Development Bank deploys different financial instruments to mobilise private capital. At the same time, the main mandate of KfW Development Bank is to work with governmental institutions in developing and emerging economies, while Deutsche Investitions- und Entwicklungsgesellschaft (DEG Invest) of KfW Banking Group finances long-term private sector investments in these countries. Another study compares the portfolios of FC, DEG Invest and Austrian Development Bank for private sector mobilisation, assessing where FC can provide pre-requisites for DFIs to enter the market. This study focuses on KfW Development Bank, implementing agency for International Financial Cooperation (FC) of the German Federal Government.

Differences in readiness across countries

There are various approaches to gauge the readiness of countries for the mobilisation of private capital into the power sector, which can be condensed into risks (or constraints) related to the 1) power sector policy and regulatory risk, 2) power sector context risk, and 3) country context-risk (Probst et al., 2019).

Countries differ in the extent to which they address these risks to make them more attractive for private investors. In line with the World Bank's Regulatory Indicators for Sustainable Energy (RISE, 2019), countries can be divided into three main classes – low, medium, and high – regarding their regulatory readiness for private sector participation in renewable energy as shown in the map below. Depending on the readiness of the respective countries, different instruments are most appropriate.

In countries with high levels of readiness – with an established RE market and high liquidity for mature technologies – an appropriate approach is to enable technology diversification by financing pilot and model projects with promotional loans, development loans, investment grants for innovative components (e.g., storage) also in non-grant countries, and securitization through green bonds and regional funds for investments in green bonds.

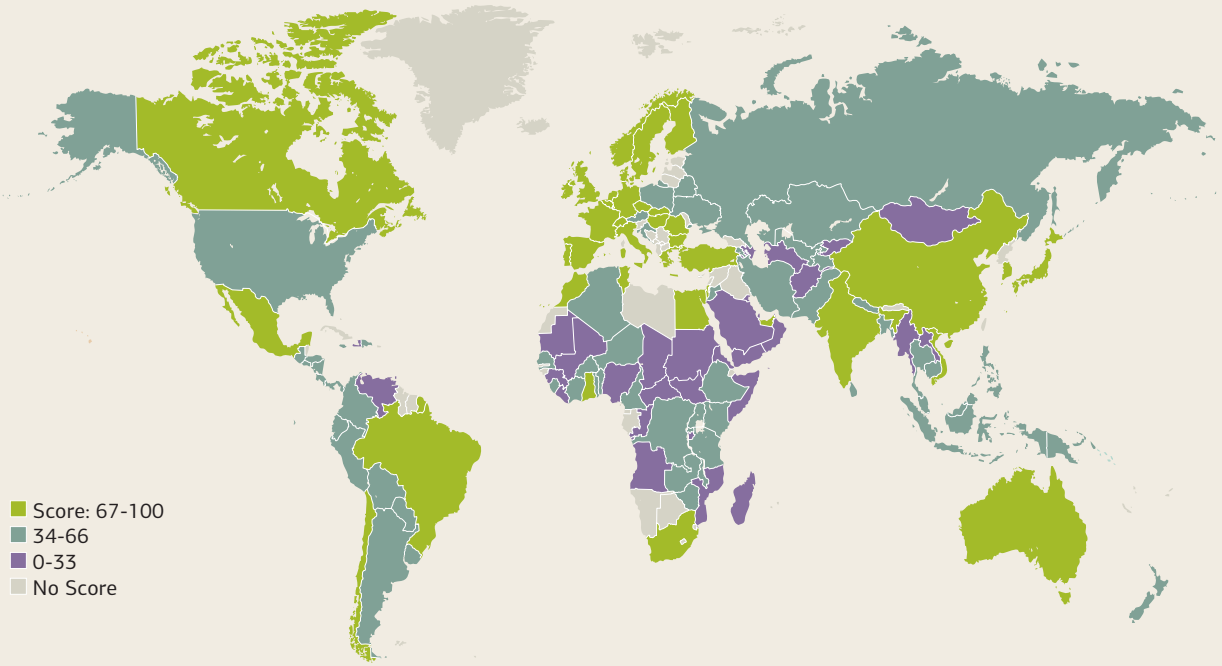
Countries with medium readiness – with first RE projects successfully implemented and increasing interest of the government and the private sector in promoting renewable energy projects – policy-based lending (PBL) to improve framework conditions, risk mitigation instruments to hedge country or off-taker risks (see Regional Liquidity Support Facility - RLSF in Africa) for private sector mobilisation, risk mitigation instruments for technology-specific risks, and financing of RE projects with development and promotional loans are most appropriate.

For countries with low readiness – with no/ or few renewable energy projects, low private sector participation, and limited liquidity – financing pilot and model projects with standard loans (possibly development loans); support schemes for the design of the private sector framework with grants (e.g., feed-in tariffs as in GET-FiT approaches) are suitable.

[1] As underscored in a recent IMF study (Gaspar et al., 2019)

[2] This increased cost of financing between industrialised and developing countries can lead to 40 % higher costs of wind compared to combined cycle-gas power projects, despite cost parity (or better) in industrialised countries (Waissbein et al., 2013).

Figure 1: Differences in readiness for renewable energy. Green=high, Dark Green=medium, Purple=low



Source: RISE (2019)

Instruments for mobilising private capital – FC portfolio

IRENA (2016) differentiates between 1) enabling policies and tools (e.g., PBL, direct investment in companies and credit lines), 2) financial risk mitigation instruments (e.g., guarantees) and 3) structured finance mechanism and standardisation (e.g., share in collective investment vehicles) that can be used to crowd-in private sector capital.

KfW Development Bank (FC) is active in all three of these segments. Credit lines and collective investment vehicles (structured finance) dominate in its portfolio, while financial risk mitigation instruments play a minor role in terms of financial volume. On-lending facilities, such as credit lines, and syndicated loans facilitate the build-up of dedicated resources and capacity at local financial institutions.

KfW Development Bank's portfolio contains approaches that are tailored to the needs of a specific partner country or technology but also features instruments that address broader liquidity and – to a very limited extent - currency risk that can be used across countries and technologies.

Policy-based loans – also called reform financing - are an FC instrument that falls into the category 1) enabling framework and are designed to create the conditions for private capital mobilisation. A disbursement of FC funds into the budget of the partner government takes place after achieving sector reforms previously agreed in a policy matrix. In the energy sector projects are being implemented in Georgia and Indonesia.

In contrast to KfW Development Bank, other development finance institutions (DFI) put a greater emphasis on financial risk mitigation instruments, such as guarantees. Almost half of the amounts mobilised from the private sector by OECD countries' development finance institutions in the energy sector from 2012-2015 was mobilised via guarantees (OECD, 2017, 2018a) (see Figure 2).

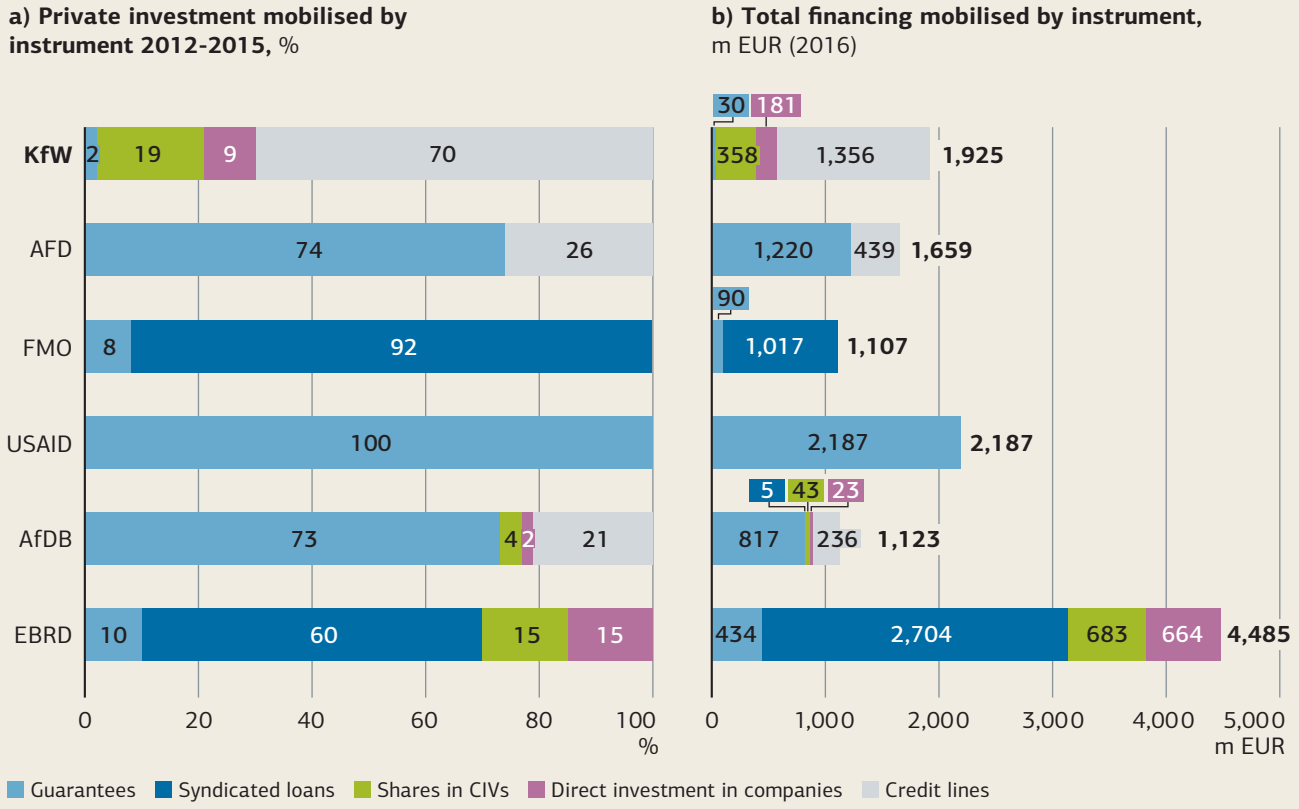
Existing guarantee instruments such as MIGA of World Bank have benefitted larges scale infrastructure projects. Yet, the central challenge is reducing the transactions cost for guarantees to be also amenable to smaller projects. One way might be to pool smaller projects and provide a political risk insurance for a bundle of projects rather than for each individual project.

Standardisation has enabled bundling together smaller renewable energy projects (particularly in industrialised countries), but securisation to date has only occurred on a limited scale. Yet, securisation – building upon greater standardisation – is likely necessary for a substantial up-scaling in private energy sector/ climate investments. For instance, pension funds commonly only make investments of at least several hundred million USD, which limits transactions costs. Attracting large investors for small-to-medium projects remains a challenge.

In KfW Development Bank's portfolio with relevance for mobilisation of private investment there is clear focus on credit lines, with a geographic emphasis on Africa and Latin America.

While Africa and Latin America feature a high number of countries with 'low and medium readiness' that may be nudged towards greater mobilisation of private capital, countries in Asia, South-eastern Europe, and the Middle East can

Figure 2: Amounts mobilised from the private sector by official development finance interventions in terms of a) portfolio composition and b) total financing volume.[3]



[3] Note as the OECD (2017) does not report numbers on the different sectoral activities, the figures include both energy and non-energy related investment. Energy-related investments constitute ~25% of the portfolio of all surveyed actors. The sectors analysed by the OECD (2017) include banking and financial services, energy, industry, natural resources and mining, transport and storage, agriculture, health, water and sanitation, communications, multisector aid, and "other sectors" (i.e., minor fraction of projects unrelated to any of the former categories). Source: OECD (2017)

also be interesting environments for derisking instruments – untapped potential can be found here.

The substantial decline in the cost of RE technologies may shift the focus of the German Financial Cooperation (FC) in renewable energy capacity installation and potentially electricity distribution from large-volume development and promotional loans to private capital mobilisation approaches in the medium term. At the same time, development and promotional loans for adequate transmission infrastructure may still be prominent for longer, given that investment in public transmission infrastructure may present even more barriers to private investors.

Since there are no or only small amounts of budget funds ('Haushaltsmittel') available for emerging economies from the Federal Government, approaches to mobilise private capital are being implemented especially in Africa, or through the limited resources of the BMZ budget line „FC Regional". Opportunities to scale up private investment for SDG agenda and Paris Agreement achievement in other regions have thus remained partly untapped. A flexibilization of the use of Federal Government budget funds and respective financial instruments may thus help.

In addition, from KfW Development Bank's portfolio some important lessons have emerged for future de-risking approaches:

– Power sector planning is critical to ensure that power generation capacity financed through additional private sector capital can be integrated into the grid and absorbed by the economy. This can otherwise worsen the domestic utility's balance sheet substantially and drive up sovereign debt (Meyer, Eberhard and Gratwick, 2018).

– Windows of opportunities (due to power shortage or high-power cost) may make renewable power solutions more enticing and increase high-level political support for derisking instruments.

– Planning a sequence (e.g., grant, development loan) of financial support for technologies with limited track record – such as geothermal – is critical and should be communicated from the outset.

– Local champions (as in the case of the Electricity Regulatory Authority in Uganda or the Moroccan Agency for Solar Energy) are important for the timely implementation of projects in increasingly liberalised markets.

– As many off-takers in developing and emerging countries are considered not creditworthy, there will likely be a necessity for liquidity support to the offtaker and guarantees to investors in most countries.

1. Background

Attracting private capital – along with raising tax revenues and development finance – will be critical to fill the investment gap in order to reach the Sustainable Development Goals (SDGs) and to ensure the timely implementation of the Paris Climate Agreement. A recent study by the IMF indicates that the additional spending required to make meaningful progress on all SDGs by 2030 stands half a trillion USD (real, 2016) (Gaspar et al., 2019)[4]. While raising additional funds through improved tax collection and development finance can contribute towards filling the gap, they are unlikely to be sufficient. Concerns about debt distress limit the possibility for concerned countries to take on sovereign debt to this extent. Substantial research has shown that private solutions – defined here as private sector participation in financing or energy generation or transmission service delivery – can make a meaningful contribution towards filling the gap if designed to minimise sovereign obligations and contingent liabilities to private investors (Eberhard et al., 2016).

Yet, in developing and emerging economies renewable energy developers often struggle to access financing at adequate conditions as investors find it difficult to accurately assess risk, which particularly affects renewable power projects. Global capital markets, totalling USD 177 USD trillion in 2018[5] (SIFMA, 2019), are of sufficient size and depth to fill the investment gap. Yet, renewable power project developers often struggle to access the large quantities of financing needed to develop grid-connected renewable projects. When financing is available, costs are commonly substantially higher than in industrialised countries translating into higher power prices (Waissbein et al., 2013). Investors may find it difficult to assess the technical, regulatory, financial and administrative barriers leading them to skip even profitable investment opportunities. This increased cost of financing particularly affects renewable power developers, as renewable power projects, such as wind and solar PV, require higher upfront capital expenditures than comparable fossil fuel alternatives making power prices more sensitive to financing cost.[6]

A wide array of public de-risking instruments has been developed over recent years to address these investor risks to attract – or crowd-in – private capital into the power sector (Huenteler, 2014). Two main de-risking instruments can be distinguished. First, policy de-risking instruments attempt to remove the root cause of risk, which include support for renewable energy policy design, institutional capacity building and grid connection and management. Second, financial de-risking instruments do not tackle the underlying root cause, but transfer part of investors' risk to public actors, such as development banks. These instruments include loan guarantees, political risk insurance (PRI) and public equity co-investments. A complement to de-risking strategies is to provide direct financial incentives, such as price premiums, tax breaks and carbon offsets (IRENA, 2016).

KfW Development Bank has gathered experience in the design, implementation and evaluation of de-risking instruments in developing and emerging economies. Against this background, the goal of this report is to synthesise findings from the academic literature and KfW Development Bank's experience in crowding-in private capital into grid-connected renewable energy projects (>5 MW) in developing and emerging economies. The methodology employed in this report to measure the mobilisation effect of official development finance interventions relies on the approach developed by the OECD-DAC (OECD, 2018b). While this methodology is the most comprehensive effort to date to collect, analyse and visualise mobilisation financing, it does not capture all instruments employed by KfW Development Bank (e.g. grants, conventional loans and policy-based lending are not captured).

[4] This corresponds to at 15 % of GDP for low-income countries

[5] This refers to equity and bond markets; Source: https://www.sifma.org/resources/research/fact-book/

[6] This increased cost of financing between industrialised and developing countries can lead to 40 % higher costs of wind compared to combined cycle-gas power projects, despite cost parity (or better) in industrialised countries (Waissbein et al., 2013).

2. Minimum Requirements and Regional Differences

2.1 What are the minimum regulatory requirements for crowding-in instruments?

There are various approaches to gauge the readiness of countries for the mobilisation of private capital into the power sector, which can be condensed into risks (or constraints) related to the 1) power sector policy and regulatory risk, 2) power sector context risk, and 3) country context-risk (Table 1). A recent World Bank report (Probst et al., 2019) proposes a framework that contains three broad risk category scores distinguished into ten risk factors. The extent to which countries address these constraints improves the readiness for private solutions.

Policy and regulatory risk related to the regulatory arrangements and policies in the power sector describe the ease of market entry, the governments' clarity of investment priorities, and the certainty of cash flows. Important questions in this category are: Are independent power producers (IPPs) – private firms that finance, build, own and operate power generation assets – authorised by law? Does the government have an updated generation plan that details the future expansion of power sector generation? And lastly, are there clear policies for tariff-setting to ascertain predictable recovery of costs and returns? This may also include a mechanism to enforce payment from the offtaker (entity purchasing the electricity, commonly a utility) and/or a reliable government support mechanism to cover tariff-shortfalls or backstopping underpayment by utilities.

Power sector context risk are those risks that capture wider power-sector risks related to the sectoral track record, sectoral growth, and the firm's personal track record and access to relevant decision makers. Countries that already have a higher share of IPPs in its power sector may find it easier to attract further IPP investment. Similarly, a power market size and prospective growth rate makes it more attractive for investors for several reasons, including economies of scale and a more substantial project pipeline. Lastly, if firms already have experience in the country and a network with decisions makers, this reduces entry barriers and may increase the willingness of private actors to further invest in the country.

Country context risk captures country-specific risk factors, such as governance and political risk, business environment, macro-economic framework, and domestic banking and capital markets. Governments with higher political stability, rule of law and reliable institutions may instil higher confidence in investors that contractual obligations will be honoured. Similarly, the business environment indicates the degree to which businesses are able to access international sources of financing. Greater macro-economic stability, which includes greater fiscal discipline and better sovereign debt rating, is another factor considered by investors. Lastly, the depth and track record of the domestic banking sector may also play a role.

Renewable potential also plays a role but is not explicitly listed in the risk framework as this is not a risk that governments can commonly directly address. Countries differ in the extent to which it is both technically feasible to introduce projects by independent power producers (IPPs) near load centres, as well as economically sensible, since it is part of a least-cost generation expansion plan. Similarly, countries that face power constraints need to add new generation capacity quickly and may therefore be more inclined to opt for grid-connected renewable power, such as solar PV. This technology has short construction periods and due to substantially declined cost over the past years, may be able to provide cheaper and less carbon emission intensive electricity than existing emergency fossil-fuel generators. Countries that have large domestic fossil-fuel resources may be less willing to move into renewable energy, although some countries such as South Africa are an exception to that rule (Eberhard and Naude, 2017).

Table 1: Main risk factors to assess the readiness of countries for private solutions in the power sector

	Risk factor	Explanation
Policy and regulatory risk factors	**1. Ease of market entry**	Risks related to licensing, procurement / tendering, and general legal framework affecting investors' ability to enter the market
	2. Clarity of investment priorities	Risks related to government plans for electrification, generation, and transmission expansion and required technical standards
	3. Certainty of cash flow	Risks related to recovery of costs and investment returns, ability to enforce payment discipline, and government support
Power sector context risk	**4. Sectoral track record**	Risks related to past experiences / lack of track record in the power sector, such as no/few IPPs and low investment volumes
	5. Sectoral growth	Risks related to market size and prospective demand growth in the power sector, such as low electrification rates and population growth
	6. Firm's personal track record and access	Risks related to the firm's (IPP's) lack of experience in the power sector of a given country, such as no/limited access to relevant decisionmakers
Country context risk factors	**7. Governance and political risk**	Risks related to high political instability, poor governance, poor rule of law, and poor institutions
	8. Business environment	Risks related to the country's integration into the international economy, as indicated by access to international financing
	9. Macro-economic framework	Risks related to economic growth, currency convertibility and transferability risk, fiscal discipline, and sovereign debt rating
	10. Banking and capital markets	Risks related to the efficiency, depth, and track record of local banking and capital markets, such access to local debt and equity finance

Source: Probst et al. (2019)

2.2 Regional differences in the readiness for private solutions in the power sector

While there is not one indicator that can be used to assess readiness, the World Bank Regulator Indicators for Sustainable Energy (RISE) approach aggregates several indicators on countries' regulatory and policy support for sustainable energy. The RISE indicator has three main categories: access to modern energy, energy efficiency, and renewable energy. As this study focuses on for grid-connected renewable power, the factors enabling renewable energy are discussed in this section. Those factors are comprised of several sub-categories, aligning well with the previously described framework in Section 2.1. The RISE indicator also correlates well with the subjective experience of investors in Sub-Saharan Africa (Probst et al., 2019) and are therefore likely extendable to other developing and emerging economies.

In line with RISE, countries can be divided into three main classes – low, medium and high – regarding their regulatory readiness for private sector solutions for renewable energy (Figure 1). Those with high level of readiness (67-100 points, with 100 being the highest) include several Western European countries, Canada, Australia, but also emerging economies such as Brazil, India, China, Chile, and Mexico and a few low and medium income countries such as Egypt, Turkey, and Ghana. These countries feature good country risk, favourable framework conditions for RE support, and good and efficient project partners for financial cooperation. Countries with medium readiness (34-66) include the United States, Russia, several low-and medium income countries in South and Central America as well as North and Sub-Saharan Africa and South East Asia. Countries with low readiness (0-33) are mainly concentrated in Africa and the Middle East.

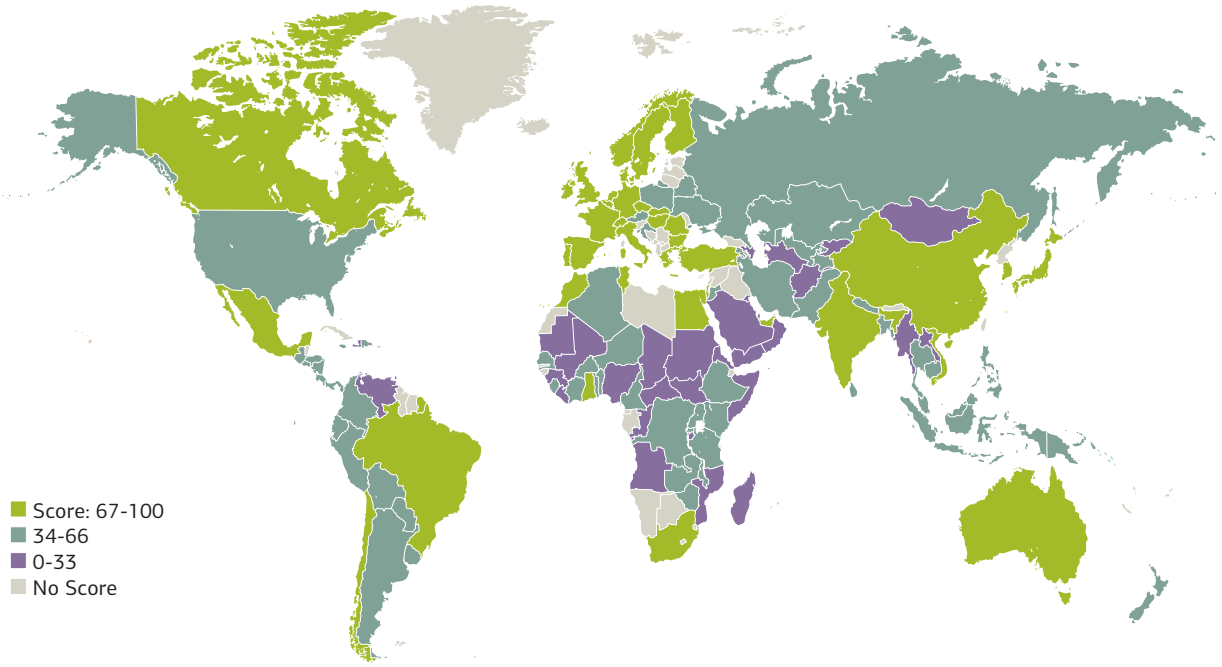
Depending on the readiness of the respective countries, different instruments are most appropriate. In countries with high levels of readiness – with an established RE market and high liquidity for mature technologies – appropriate approaches are enabling technology diversification by financing pilot projects with promotional loans ('Förderkredite'), development loans ('Entwicklungskredite'), investment grants for innovative components (e.g., storage, also in non-grant countries), and securitization through green bonds, and regional funds for investments in green bonds. Countries with medium readiness – with first renewable energy projects successfully implemented and increasing interest in promoting these projects – PBLs to improve framework conditions, risk mitigation instruments to hedge country or off-taker risks (see Regional Liquidity Support Facility - RLSF in Africa) for private sector mobilisation, risk mitigation instruments for technology-specific risks and financing of RE projects with development and promotional loans ('Förderkredite') are most appropriate. For countries with low readiness – with no/few RE projects, low private sector participation and limited liquitiy – financing pilot projects with standard loans (possibly development loans); and support schemes for the design of the private sector framework are the first lines of actions (e.g. feed-in tariffs as in GET-FiT approaches (discussed below).

Targeted instruments that crowd-in private sector capital are particularly needed in countries with low and medium readiness where market incentives alone are insufficient to crowd-in appropriate levels of private capital and governments are constrained to take on more public debt. Offering additional support – e.g., liquidity – to IPPs in mature markets, such as Germany, would likely not crowd-in substantially more 'additional' capital (i.e., capital that would not have been invested even without the additional incentives). Hence, it is important to focus on countries where the potential additionality – i.e., mobilising capital that would not have been invested without the support – is particularly high.

Interviews conducted for this report and several existing studies indicate that additionality is likely greatest in countries with low to medium readiness. Countries with high readiness likely already hold sufficient incentives in place to mobilise private capital for well-established renewable technologies, even in the absence of additional government programmes. The role of a development bank may be in the case of established technologies rather fomenting environmental and social standards of infrastructure development. Yet, it should also be underscored that there are markets that may be too risky even in the face of substantial policy-support, such as Somalia (which ranks at the bottom of the RISE indicator with 2 out of 100 points). In addition, these instruments are best placed to support existing government programmes. Strong domestic political and institutional commitments and policy alignment across ministries and public agencies, de-risking programmes to mobilise private capital are more likely to work (Eberhard et al., 2016).

A country's readiness is not fixed and changes over time. Several factors can change the readiness of countries for private sector solutions. These include, for instance, power supply shortages that may increase the readiness for renewable power that can be quickly built, such as solar.

Figure 1: Differences in readiness for renewable energy. Green=high, Dark Green=medium, Purple=low



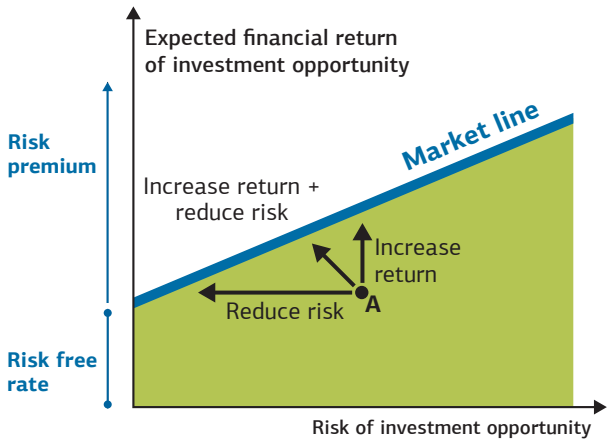
Source: RISE (2019)

3. Which instruments exist and which are used by German Financial Cooperation (FC) to crowd-in private sector capital?

The German Financial Cooperation (FC) focuses on improving the risk-return profile of investors to crowd-in private sector capital (Figure 2). For many investors in developing and emerging economies the potential return on an investment is not commensurate to the risk. Three approaches can be taken in practice. First, the return of an investor can be improved byh e.g., 'topping' up existing power prices. Second, risk mitigation measures, such as risk insurance, training for the regulator, and other measures, can be implemented. Third, approaches that jointly improve risk and revenue, such as the GET FiT programme (discussed in section 4.2.1), increase the return of investors through a subsidy on the existing feed-in tariff, while reducing the risk of investors through streamlined bureaucratic processes. A recent literature review on the factors that are critical to mobilise private sector investments underscore that particularly those approaches that jointly target risk and return are the most effective (Polzin et al., 2019).

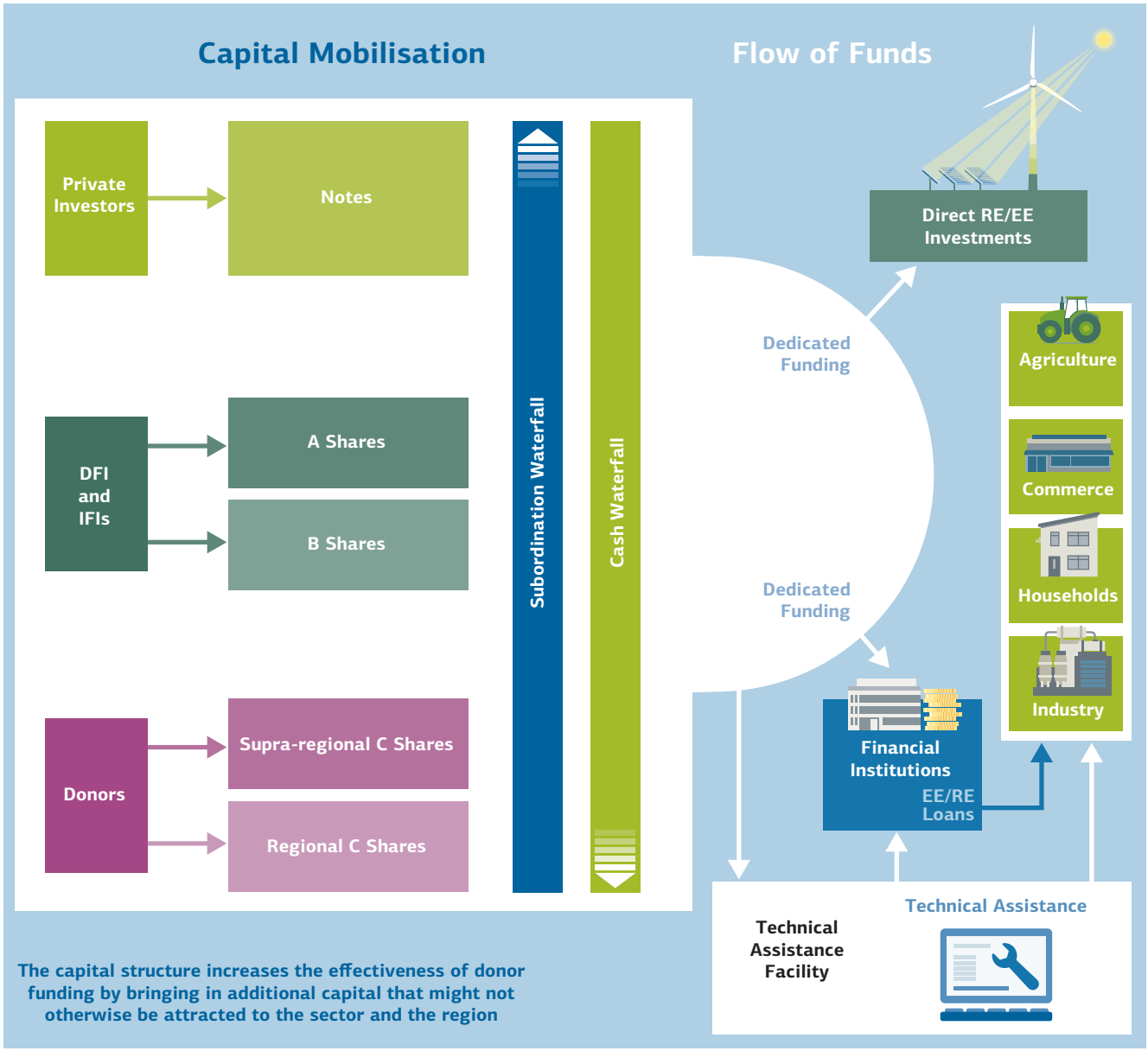
IRENA (2016) differentiates between 1) enabling policies and tools, 2) financial risk mitigation instruments and 3) structured finance vehicles and standardisation that can be used to crowd-in private sector capital, with different levels of scalability. First, enabling policies and tools create stable and predictable investment environments, remove barriers and improve the certainty of cashflow. These include financial policies and regulation, project preparation facilities, project facilitation tools, on-lending structures and hybrid structures. Second, financial risk mitigation instruments transfer some of those project risks that an investor is not well placed to assess or address to public finance institutions. These include guarantees, currency hedging instruments, liquidity facilities and resource risk mitigation tools (e.g., for geothermal resources). Third, structured finance mechanisms and tools attempt to standardise, aggregate and securitise obligations. These include green bonds and shares in collective investment vehicles (CIV).

Figure 2: Risk-return framework and different policy options to mobilise private investment.



Source: Polzin et al., 2019
Note: A= risk and return without intervention
Market line=feasibility of private financing

Figure 3: How does a Collective Investment Vehicle work? An example.



Collective Investment Vehicles (CIV)

Shares in collective investment vehicles (CIVs) are those invested in entities that allow investors to pool their money and jointly invest in a portfolio of companies. A CIV can either have a flat structure – in which investment by all participants has the same profile with respect to risks, profits and losses – or have its capital divided in tranches with different risk and return profiles, e.g. by different order of repayment entitlements (seniority), different maturities (locked-up capital versus redeemable shares) or other structuring criteria. Moreover, CIVs can be close- or open-ended. Close-ended CIVs have a limited period of time during which new investments in the CIV may be made (fund-raising period), while open-ended CIVs can issue and redeem shares at any time (OECD 2018b).

These instruments differ in terms of scalability, ranging from low (enabling policies and tools), to medium (financial risk mitigation instruments) to high (structured finance mechanism and tools) scalability. Enabling policies and tools are commonly country-specific and need to be tailored to the political, regulatory and socio-economic environment. Financial risk mitigation instruments, such as liquidity guarantees or currency-hedging facilities, can be used across different projects and countries, yet may still display a certain heterogeneity in use-cases across countries, increasing due-diligence and transactions cost; therefore, displaying medium scalability. Structured finance mechanisms and tools, such as green bonds, can substantially reduce due-diligence needed for high scalability.

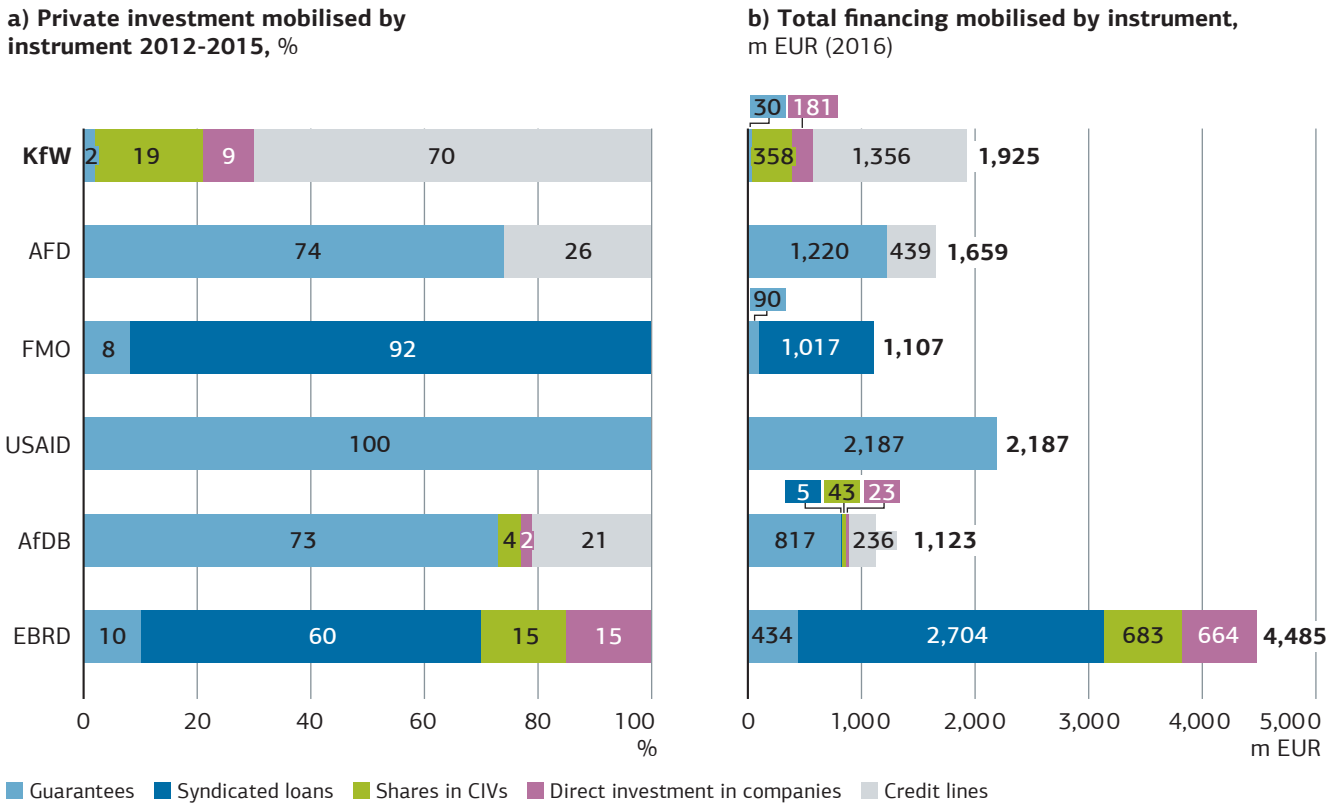
While the FC is active in all three of these segments, enabling tools and structured finance mechanisms dominate

Table 2: Policies, tools and instruments that reduce barriers and mitigate risk

	Enabling policies and tools	Financial risk mitigation instruments	Structured Finance Mechanisms and Tools
Specific approaches	**– Financial policies and regulations** **– Project preparation facilities** **– On-lending structures (e.g., credit lines)** – Loan syndication **– Direct investment in companies**	– Guarantees* **– Currency hedging instruments** **– Liquidity facilities** **– Resource risk mitigation tools**	– Standardisation – Aggregation – Securitisation **– Green bonds** **– Share in Collective Investment Vehicles (CIVs)**
Scalability	Low	Medium	High

Note: In bold those that KfW Development Bank uses to mobilise private sector investment both specifically targeted at energy projects and multi-purpose approaches.)* very few individual cases; Source: Adapted based on IRENA (2016)

Figure 4: Amounts mobilised from the private sector by official development finance interventions in terms of a) portfolio composition and b) total financing volume.



Notes: As the OECD (2017) does not report numbers on the different sectoral activities, the figures include both energy and non-energy related investment. Energy-related investments constitute ~25% of the portfolio of all surveyed actors. The sectors analysed by the OECD (2017) include banking and financial services, energy, industry, natural resources and mining, transport and storage, agriculture, health, water and sanitation, communications, multisector aid, and "other sectors" (i.e., minor fraction of projects unrelated to any of the former categories). Source: OECD (2017)

in KfW Development Bank's portfolio, while financial risk mitigation instruments play a minor role for mobilisation of private capital in renewable energy. In KfW Development Bank's portfolio the most important instruments (in order) are 1) credit lines, 2) shares in CIVs, 3) direct investment in companies, and 4) guarantees. In the latest OECD review of private sector mobilisation more than 70 % of the KfW Development Bank portfolio that is mobilising private capital according to OECD methodology was comprised of credit lines, whereas shares in CIVs accounted for 19 %, direct investment for 9%, and guarantees for a negligible 2 %. One of the reasons that guarantees play such a minor role in the FC portfolio may be that they are not directly eligible as Official Development Assistance (ODA). In addition, guarantee instruments require different procedures for government budgeting given that disbursements only occur in case a guarantee is activated. Other governments and bilateral and multilateral agencies, however, seem to care less about these aspects.

In contrast to FC, other DFIs put a greater emphasis on financial risk mitigation instruments, such as guarantees. Almost half of the amounts mobilised by OECD development finance institutions/ bilateral development banks in the energy sector from 2012-2015 was mobilised via guarantees (OECD, 2017). Several funders, such as USAID and its Development Credit Authority, exclusively worked with guarantees to crowd-in private investment. For other donors, guarantees accounted for more than half of their private finance mobilisation efforts, such as the Agence Française de Développement (AFD) and the African Development Bank Group (AfDB). The European Bank for Reconstruction and Development (EBRD) shows a diversified instruments portfolio, using almost all instruments. The Netherlands Development Finance Company (FMO), in contrast, mainly uses syndicated loans (and some guarantees).

3.1 Academic and non-peer-reviewed literature on effectiveness of different schemes

Due to the recency of many public instruments in developing and emerging countries to crowd in private sector finance, the academic and non-peer-reviewed literature is limited but growing. In a comprehensive review, Lindenberg (2014; p.33) concludes that "[a] quantitative assessment of the effectiveness and efficiency of public spending that is aimed at mobilising private funds for green investments in developing countries has not yet been carried out for the simple reason that data is not available." Existing studies largely focus on reviewing different options for supporting developing and emerging economies in their own energy transition and complement those reviews with hypothetical modelling studies (Huenteler, 2014). A recent exception is Probst et al. (forthcoming), which investigates the financial additionality and productivity gains related to the GET FiT scheme introduced in Uganda (discussed in Section 4.2.1).

The design elements of public policies to crowd in investors into developing countries will likely have to be more comprehensive than in industrialised countries, due to multiple and substantial barriers in the investment environment, and therefore likely involve a combination of different instruments. These policies include the previously introduced enabling policies and tools, financial risk mitigation instruments, and structured finance mechanisms. It also requires an investigation about which stakeholders are best placed to identify risks in a transparent way, to evaluate them and to take on specific risks (Eberhard et al., 2017).

Different tools will be needed to support the specific requirements of each step in the project development pipeline. For instance, grants and technical assistance are most important at the beginning of the project development phase. Debt and equity are critical to get the projects off the ground, and credit lines and guarantees can help to further scale up an existing project pipeline. Yet, only later in the process – once a sufficient volume of projects is reached – can greater standardisation and aggregation be used, such as shares in investment vehicles or green bonds. Lindenberg (2014; p. 12) notes that "The well-designed use of the variety of public instruments – in most cases a combination of, e.g. concessional lending or grants plus guarantees – can create attractive investment conditions for private investors even for green projects in developing or emerging countries."

3.1.1 Enabling Policies and Tools

There is a 'rug of case studies' on developing and emerging economies, which have been primarily conducted on technologies such as wind and solar PV, and energy efficiency but only a few studies focus on South America and Central Africa. Case studies are scattered across developing countries, with an apparent lack for Central Africa and South America (Lindenberg, 2014). Lindenberg (2014) identifies one exception, namely OECD (2013), which uses a dataset on 87 countries and six renewable energy sectors (wind, solar, biomass, small hydropower, marine and geothermal) from 2000-2011.They find that "in contrast to quota-based schemes, price-based support schemes [e.g. FIT] are positively correlated with investors' ability to raise private finance." Yet, they also note – in line with Polzin et al. (2019) – that it is not per se the instrument itself, but rather the specific design elements that allow projects to attract investment.

The peer-reviewed literature on the impact of public policies aimed at mobilising private finance for renewable energy in industrialised countries has highlighted that effective policy instruments commonly address both the risk and return of investors at the same time. In a recent study, Polzin et al. (2019) review 96 empirical studies and show that the most effective instruments simultaneously increase the return of investors while decreasing risk. The authors also find that generic policy design elements, such as credibility and predictability (instead of constant policy revisions) are also an important driver for reducing investment risk. They conclude that "[..] Feed-in-tariffs (also in the early stages of the technology life-cycle), quota mechanisms and auctions (especially for mature technologies) tend to be the most effective instruments when used alongside a credible RE planning framework." To illustrate this point, a FIT with fixed tariffs (instead of a variable premium) reduces the risk of investors by transferring price risk from the power generator to the grid operator while providing predictable and stable returns.

On-lending facilities, such as credit lines, and syndicated loans facilitate the build-up of dedicated resources and capacity at local financial institutions. The domestic banking sector in many developing and emerging economies often has limited experience with the structure, duration and stakeholders in renewable energy projects. Credit lines and syndicated loans can help to facilitate learning-by-doing at local institutions and engage a greater number of domestic banks that would otherwise not be interested in lending to renewable projects. For instance, the World Bank and the GEF-funded Tanzania Energy Development and Access Project (TEDAP) set up a credit line for commercial banks in Tanzania to up-scale small rural energy projects via on-lending. Through on-lending the interest rate was reduced from 6.2 % to 5.6 % p.a., while engaging local banks (IRENA, 2016).

Project preparation facilities are particularly important for projects that face substantial resource risk, such as geothermal projects. Exploratory drills to determine the potential for geothermal electricity generation cost between USD 3 and 7 Mio. and overall exploratory expenditures constitute ~15 % of overall investment cost of a geothermal power plant. Thus, an expected rate of failure in the range of 20 % to 30 % of all drillings poses a serious financial risk for develop-

ers and hence a serious impediment to the development of the technology in general. KfW Development Bank is implementing project preparation facilities with grant financing for exploratory drills with the support of BMZ and EU grant funding in Eastern Africa (GRMF – Geothermal Risk Mitigation Facility) and Latin America (GDF – Geothermal Development Facility).

3.1.2 Financial Risk Mitigation Instruments

Guarantees can make projects more financially attractive to investors by mitigating risks that investors are not well placed to address, or even to evaluate in the first place. As political risk insurance is the most prominent form of support, it is dicussed here (in contrast to export credit insurance, partial credit guarantee, and partial risk guarantee). The most prominent example of political risk insurance is granted by the Multilateral Investment Guarantee Agency (MIGA). MIGA offers investment guarantees to cover five non-commercial risks, including: 1) war, terrorism, and civil disturbance, 2) expropriation, 3) breach of contract, 4) currency inconvertibility and 5) non-honouring of financial obligations. Political risk insurance plays a role in the context of the GET FiT programme. In Uganda, MIGA insurance was offered to project developers. Yet, due to the lengthy process, it was only taken up to a limited extent.

Generally, guarantees are seen by the policy literature as an important vehicle to crowd in additional financing, but are constrained by high transactions cost. For instance, the Ugandan 250 MW Bujagali hydropower project mitigated government-related risks by covering 90 % of the invested equity through a MIGA insurance. This allowed the project to attract a higher share of private investments than comparable projects in Sub-Saharan Africa (Frisari and Micale, 2015). On a more general level, a study by Bielenberg et al. (2016) indicates that the use of more guarantees could lead to additional USD 100-165 billion in private sector investments in sustainable infrastructure until 2030. Yet, the central challenge is reducing the transactions cost for guarantees to be also amenable to smaller projects. One way might be to pool smaller projects and provide a political risk insurance for all rather than for each individual project.

IRENA (2016) survey results suggest that guarantees provided by public finance institutions remain limited in renewable energy investments, and – if they are used – are largely constrained to large-scale hydropower investment. Analysing the guarantees from 16 major guarantors, they find that the guarantors dedicated only 4 % of their total risk insurance portfolio to renewable energy projects (with a range from 0-13 %). Some of these institutions indicated that they had no experience at all for renewable energy projects. Over half of the guarantees were issued for large-scale hydropower projects and around one third flowed to geothermal projects. Both wind and solar accounted for less than 10 % of the portfolio, respectively. Yet, these low numbers are not only due to a lack of supply, but also due to limited demand from project developers. IRENA (2016; p.60) notes that "lack of product awareness, long processing times, high due diligence requirements and high transaction costs" are contributing to the low uptake.

The most pressing concern for investors in many developing countries is the certainty of cash flow, which underscores the relevance of enhancing the financial stability of the offtaker through liquidity support (Probst et al., 2019). Liquidity constraints of the off-taker are to be expected as many utilities in the developing world are de-facto insolvent and dependent on support through the public purse. These disruptions in payment are particularly troubling for renewable power projects at the beginning, where projects face the greatest financial pressure.

3.2.3 Structured Finance Mechanisms and Tools

Standardisation has enabled bundling together smaller renewable energy projects (particularly in industrialised countries), but securisation to date has only occurred on a limited scale. Studies indicate that standardisation can reduce due diligence cost, better conform to investor requirements, deepen the investor pool and diversify individual asset risks (Lowder and Mendelsohn, 2013). Yet, securisation – building upon greater standardisation – is likely necessary for a substantial up-scaling in private energy sector/ climate investments. For instance, pension funds commonly only make investments of at least several hundred million USD, which limits transactions costs. Attracting large investors for small-to-medium projects remains a challenge, but one positive experience should be highlighted. The US National Renewable Energy Laboratory standardised residential lease and commercial power purchase agreements via the Solar Access to Public Capital working group. This group contains 440 organisations, including residential and commercial solar developers, law firms, investment banks and capital managers, rating agencies and engineers. The standardised documents have been made publicly available. and served as a basis to enable solar project securitization (IRENA, 2016).

Renewable energy projects in developing and emerging economies – particularly of small and medium size – also find it challenging to attract direct private investment, which can be mitigated through aggregation facilitated by DFIs. As transactions cost and due diligence tend to be similar regardless of project size, small projects are at a disadvantage, as the transactions costs relative to total cost are higher for smaller than for bigger projects. In many developing and emerging economies institutional investors may lack the in-house ability or mandate to perform due diligence necessary for direct investment in companies. Aggregating smaller renewable energy projects into one collective investment vehicle – such as in the case of the Green for Growth Fund – can help projects to secure funding.

4. KfW Development Bank's experience with approaches to mobilise private capital for grid-connected renewable power generation

4.1 KfW Development Bank's renewable energy portfolio

KfW Development Bank's portfolio contains both approaches that are tailored to the needs of a specific partner country or technology but also features instruments that address broader liquidity and – only to a very limited extent - currency risk that can be used across countries and technologies. On the one hand, these are approaches that are specifically structured for the investment barriers in the energy sector of the respective partner country (e.g. GET FiT) or the respective technology (geothermal facility) and, above all, address the dimensions 1) enabling framework, including policies 2) risk mitigation. In addition, there are FC approaches that are designed to mitigate currency risks or liquidity risks and that were not structured specifically for the energy sector, but can be applied there. Not all of the projects listed below are merely for on-grid, but may address energy efficiency and decentralised infrastructure as well, such as the Green for Growth Fund or the Global Climate Partnership Fund, which pertain to 3) Structured Finance Mechanisms and Tools. The specific risks each project addresses are described in detail in Table 3.

Table 3: Specific elements of KfW Development Bank projects to tackle specific investor risk

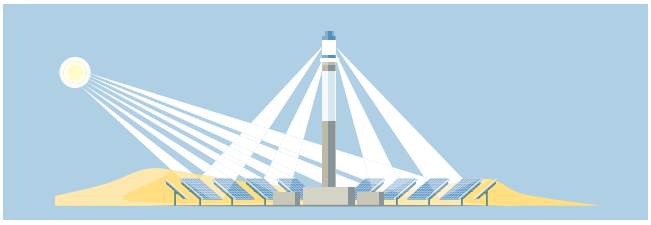
	Policy and regulatory risks			Power-sector context risks			Country-context risks			
	Ease of market entry	**Clarity of investment priorities**	**Certainty of cash flow**	**Sectoral track record**	**Sectoral growth**	**Firm's personal track record**	**Governance & political risk**	**Business Environment**	**Macro-economic framework**	**Banking and capital markets**
GET FiT Uganda	Standardised project documents (power purchase agreements)	Technical assistance for power generation expansion planning, FiT adjustment	Sovereign guarantee, front-loaded FiT premium		Building a pipeline of independent power producer projects		Sovereign guarantee, World Bank Political Risk Insurance (MIGA)	Access to cheap finance through concessional finance		
Geothermal Development Facility	Standardisation of contracts		Grants for surface studies / Contingency Grants for Exploratory Drilling							Credit lines support local banking
Regional Liquidity Support Facility			Support for short-term liquidity constraints				Support of African Trade Insurance Agency, the local implementing partner, which also carries some of the risk			
Ouarzazate			Concessional financing for four solar projects							
Olkaria		"Cost-plus approach" to power prices enabling cost recovery and a margin	Feed-in tariff Co-financing through KfW Development Bank				Sovereign guarantees			
Green for Growth Fund			FC Investment i.a. in C-tranche – riskiest part of fund to attract private investors							
Global Climate Partnership Fund										

Sources: Probst et al (2019), KfW Development Bank internal documents, interviews with relevant project managers

The Global Energy Transfer Feed-in Tariff (GET FiT) is a model programme designed and financed via KfW Development Bank and seeks to assist developing countries in pursuing a climate resilient low-carbon development path. For example, GET FiT Uganda is a comprehensive programme to fast-track a portfolio of currently 17 small-scale renewable energy generation projects promoted by private developers. The programme enhances the overall enabling environment for private investment in renewable energy through improvements in the Renewable Energy Feed-In Tariff system and its application. It also stabilizes Ugandan power sector finances by adding least-cost generation capacity. Furthermore, it improves the availability of long-term commercial finance for small-scale renewable energy generation projects in Uganda. With small RE projects it seeks to decentralize and diversify Uganda's energy mix, thus enhancing security of supply. The GET FiT Programme is being replicated by Financial Cooperation, e.g. in Zambia and Mozambique. Lessons Learnt from Uganda have shaped the programme design there. For instance, GET FiT Zambia has established a grid connection support facility from the start, included the construction of the grid connection in the Independent Power Producer's bid and later contract and defined a maximum distance of renewable power plants from the grid. That way, incentives for least-cost and timely feed-in of electricity into the grid are in place.

The Geothermal Development Facility (GDF) intends to drive forward the expansion of geothermal power plants in Latin America by offering a combination of grants for exploratory studies, risk mitigation funds and concessionary loans. The GDF was established in 2016 and started specific project work in the beginning of 2017. Contingency grant funds from a risk management fund are available to qualified public and private project developers. This grant covers up to 40 % of the costs accruing in the early exploration phase, which constitutes a substantial share of the exploration risk. If successful, the project developers are expected to repay 80 % of this grant, with the possibility to finance the repayment using the concessionary loans supplied (35m EUR in grants, 250m in EUR in credit lines). It still remains to be seen to which extent actual investments in geothermal power plants will follow the exploration phase.

The Regional Liquidity Support Facility (RLSF) hedges short-term payment risks for private renewable energy projects (RE-IPPs) in Africa. Since its start in 2017 it has become evident that it has particularly been requested in less developed markets – Zambia, Malawi, Burundi and Madagascar – but less in more developed markets, such as Kenya and South Africa. While MIGA is seen to be too complex by many project developers, RLSF can bridge the gap between large-scale projects (e.g., large hydropower projects) that are of sufficient size to go through the lengthy MIGA process and smaller projects that do not have this capacity. Short-term liquidity support is also a good complement to long-term guarantees that do not address short-term risks. RLSF addresses a key problem in financing these RE IPPs: The RE IPPs conclude power purchase agreements with the - usually government-owned - electricity suppliers, usually for a period of 20 years. For this period, this contract will secure the purchase of electricity at fixed rates, thus providing the project with predictable revenues, which are the prerequisites for financing the project by investors. However, public electricity companies pose a high political and economic risk to many investors. The investors in the RE IPPs therefore demand long-term guarantees combined with short-term liquidity support (liquidity support), which safeguard the payment obligations of electricity suppliers. Many RE IPPs on the African continent are currently not reaching financial close because neither the utilities nor the RE IPPs have the cash and cash equivalents needed to provide short-term cash collateral. The German financial contribution to the RLSF amounts to 31.6 million EUR, with the African Trade Insurance Agency as project partner.



KfW Development Bank supported the world's largest solar complex through concessional finance in the desert north of Ouarzazate, Morocco, with 580 MW across three solar technologies: parabolic mirrors, solar tower, and one conventional solar PV plant. The Federal Ministry for Economic Cooperation and Development (BMZ) as well as the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety put forward roughly 830 million EURto the total investment of 2.3 billion EUR, in the form of loans via KfW Development Bank. The rest was covered mainly by public-sector donors and development banks like the French Agence Française de Développement (AFD). The European Union subsidised the complex with around 120 million EUR. Through a clear regulatory framework and transparent auction design – including state-of-the-art power purchase agreements and a capable local partner – a wide range of private actors invested in the project.

The project Olkaria II entailed the co-financing of a geothermal power plant in Kenya. The project included a substation at the power plant site, a high-voltage power line to Nairobi and its integration into the grid at the Nairobi Norrth and Dandora substations. Its location is the geothermal field Olkaria on Lake Naivasha, about 90 km northwest of Nairobi in the East African Divide. Most of the construction work was carried out as planned, but as part of the project implementation process, the power plant capacity was successfully increased from the originally planned 64 MW (gross) to 70 MW (2x35 MW). In addition, due to the high volume of steam in the Olkaria geothermal field beyond the FC project, a third turbine with an additional capacity of 35 MW was installed in the Olkaria II power plant. It is important to note that DEG – the arm of KfW focusing on private sector development abroad – financed part of the project once it was clear that abundant geothermal resource at the envisaged plant location.

Finally, there is an FC instrument that falls into the category a) enabling framework, i.e. policy-based loans – also called reform financing – designed to create the conditions for private capital mobilisation. A disbursement of FC funds into the budget of the partner government takes place after achieving sector reforms previously agreed in a policy matrix. In the energy sector projects are being implemented in

Table 4: Examples of KfW Development Bank projects to mobilise private financing for grid-connected renewable power

Project	Volume (m. EUR) by FC	FC instrument	Region	Technology
Ouarzazate	830	Concessional finance	Africa	Solar
GET FiT Uganda	94 (with Norway, UK, and other donors)	Grants	Africa	Solar, Biomass, Hydro
Olkaria	12	Grants	Africa	Geothermal
Geothermal Development Facility	35 in grants, 250 in credit lines	Grants, credit lines	Latin America	Geothermal
Regional Liquidity Support Facility	32	Grants	Africa	Generic
Green for Growth Fund	61.5	CIV	Western Balkan, Africa	All renewable energy and energy efficiency
Global Climate Partnership Fund	80.7m USD (C-Shares on behalf of BMU) + 75m USD (A + B Shares)	CIV	Global	All renewable energy and energy efficiency

Source: Internal KfW Development Bank documents; Note: not a complete list

Georgia and Indonesia. Not all of these approaches have so far been covered by the OECD methodologies for collecting mobilised private capital. KfW Development Bank's use of policy-based loans in general has increased by a factor of four between 2014 and 2018 (336m to 1.246m EUR).

There is clear focus on credit lines and grants, with a geographic emphasis on Africa. Projects implemented in Northern Africa (Ouarzazate) and Sub-Saharan Africa (Olkaria, Liquidity Support Facility, GET FiT) constitute the lion's share of KfW Development Bank's portfolio focused on mobilising private capital for grid-connected RE. A prominent exception is the geothermal development facility, which focuses on Latin America. Projects in Asia and the Middle East are notably much less pronounced KfW Development Bank's portfolio with relevance for private finance mobilisation in the energy sector. While Africa does not have a number of countries with 'low and medium readiness' that may be nudged towards greater mobilisation of private capital, countries in Asia, Latin America and the Middle East can also be interesting environments for employing more de-risking instruments.

Yet, for investment incentives to mobilise private capital, grants remain an important source. Since there are no or only small amounts of budget funds (especially grants) available for emerging economies ('Haushaltsmittel') from the Federal Government, approaches to mobilise private capital are being implemented especially in Africa, or through the limited resources of the BMZ budget heading „FC Regional". Opportunities to scale up private investment for SDG agenda and Paris Agreement achievement in other regions have thus remained partly untapped.

4.2 Mobilisation and climate change mitigation impact of KfW Development Bank projects

The OECD-DAC established an international standard for measuring the volume of private finance mobilised by official development finance interventions. The need to mobilise private resources is central to discussions around how to finance the Sustainable Development Goals (SDGs), including to combat climate change. The methodological development is carried out in consultation with multilateral and bilateral development finance institutions, as well as in close collaboration with the OECD-led Research Collaborative on tracking private climate finance (Julia, Hos and Sangaré, 2017).

To date, the OECD-DAC methodology tracks five different instruments – guarantees, syndicated loans, shares in collective investment vehicles, credit lines and direct investment in companies – and is working on two additional instruments, namely standard grants or loans in simple co-financing arrangements and project finance schemes. OECD-DAC statistics show that standard grants and loans are still the most frequently used financial instruments in official development finance (concessional and non-concessional). From 2012-2016, they represented 67 % and 22 % of bilateral commitments and 24 % and 73 % of multilateral commitments, respectively. In addition, the existing methodology captures merely a part of instruments aimed at mobilising funds from the private sector. There are cases where a private investment in a fi-

Table 5: KfW Development Bank projects that seek to mobilise private financing for grid-connected renewable power: Volume, private finance mobilised, CO2 emission reduction, and electricity generation potential

Project	Volume (m. EUR) by FC	Private financing mobilised (m EUR)	CO2-emission reduction (tonnes p.a.)	Electricity generation potential (MW)
Ouarzazate	830	NA	800,000	580
GET FiT Uganda	94 (with Norway, UK, and other donors)	453	500,000	158
Olkaria	12	NA	450,000	70
Geothermal Development Facility	35 in grants, 250 in credit lines	1000	2,500,000 (ex-ante estimation)	350 MW (planned)
Regional Liquidity Support Facility	32	NA	NA	NA
Green for Growth Fund	62	13	600,000	NA
Global Climate Partnership Fund	80.7m USD (C-Shares on behalf of BMU) + 75m USD (A + B Shares)	8.5	755,000	475 installed (2010-2019)

Source: Internal KfW Development Bank documents

nancing scheme is not directly connected to an official intervention already covered by the existing methodologies, such as "stand-alone" equity or debt financing.

The OECD-DAC approach is the most comprehensive methodology to date in terms of instrument and actor coverage, but likely overestimates the mobilisation effect from the private sector. The methodology makes the strong assumption that the private sector would not have invested without the official interventions (additionality assumption). The causal link between a standard grant or loan and a private co-investment is conclusively shown if and only if the provision of official funds (or at least a portion) is formally conditioned (i.e. through a contractual or another type of formal agreement) to either private sector co-financing or achievement of previously-agreed results. Hence, it remains important for detailed impact assessment studies to ascertain the additionality of certain funding programmes. Similarly, crowding-out private funds through DFI interventions remains a relevant concern that is not addressed by the OECD-DAC methodology. The leverage ratio – public funds divided by total public and private investment raised – should not be the only criterion, as high leverage ratios may be less likely to have been additional.

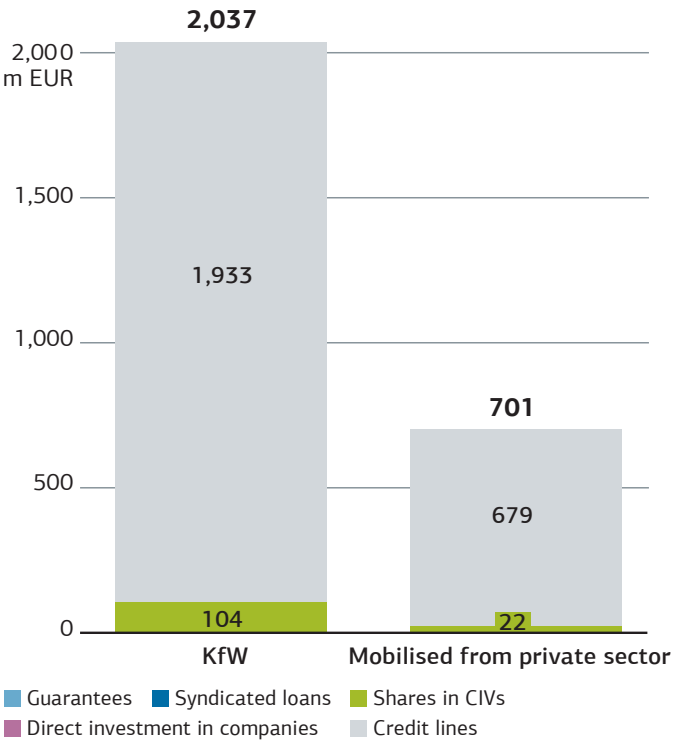
Figures 5a and b show the composition of KfW Development Bank's portfolio that is captured by the OECD methodology and Figure 6 the geographical distribution. A clear dominance of credit lines is visible over the only other instrument – share in CIVs –in the portfolio for grid-connected RE. The mobilisation of private funds is slightly higher, likely due to challenges in attracting private funds in the CIVs (see box: impact of the green growth fund). Mitigation features much more prominently than adaptation, which is not surprising as the analysed portfolio seeks to deploy climate change mitigation technologies. Geographically, there is a clear dominance of Africa and Latin America, although the multi-region funds do invest in Southeastern Europe, the Middle East, but to a more limited extent. As shown in Table 5, if one added the projects not captured by the OECD, the dominance of Africa and Latin America would further grow. Lastly, the leverage ratio observed for the projects in Figure 5a is lower than for other projects in KfW Development Bank's portfolio, such as GET FiT, and therefore likely underestimates the leveraging effect that KfW Development Bank projects have.

[7] Around 10 million tonnes in total over 20y asset life, yielding 0.5 million tonnes p.a. Source: GET FiT (2018)

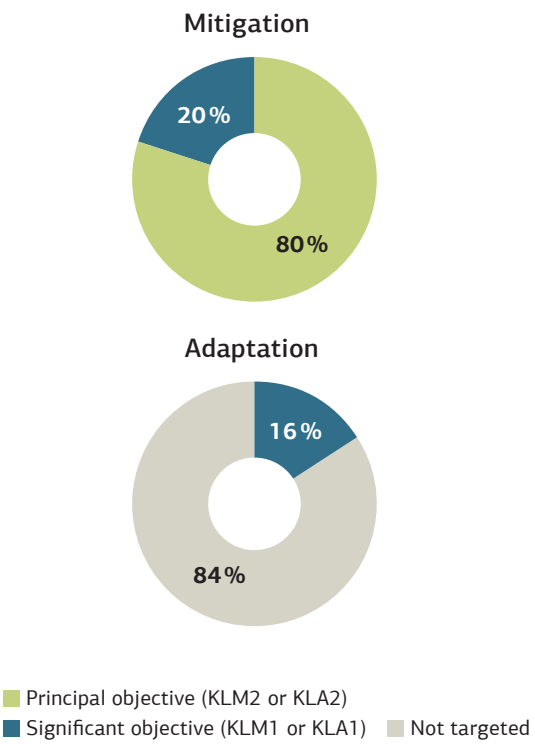
[8] According to the project document· an investment volume totaling more than one billion euros is planned· Over the entire term of the facility, geothermal power plants with an installed capacity of at least 350 MW will be built, which should save a total of 50 million tons worth of CO2 and supply two million people with environmentally and climate-friendly energy. Source: KfW Development Bank project appraisal). Assume asset life of 20 years, yielding 2.5 tonnes p.a. Source: Internal KfW Development Bank documents

Figure 5: a) Composition of FC RE (grid-connected) portfolio to mobilise private capital and relevance for Climate Change Mitigation and Adapation as measured by OECD-DAC official classification.[9]

a) Composition RE portfolio mobilisation of private capital, m EUR (relevant for OECD DAC) 2012-2018



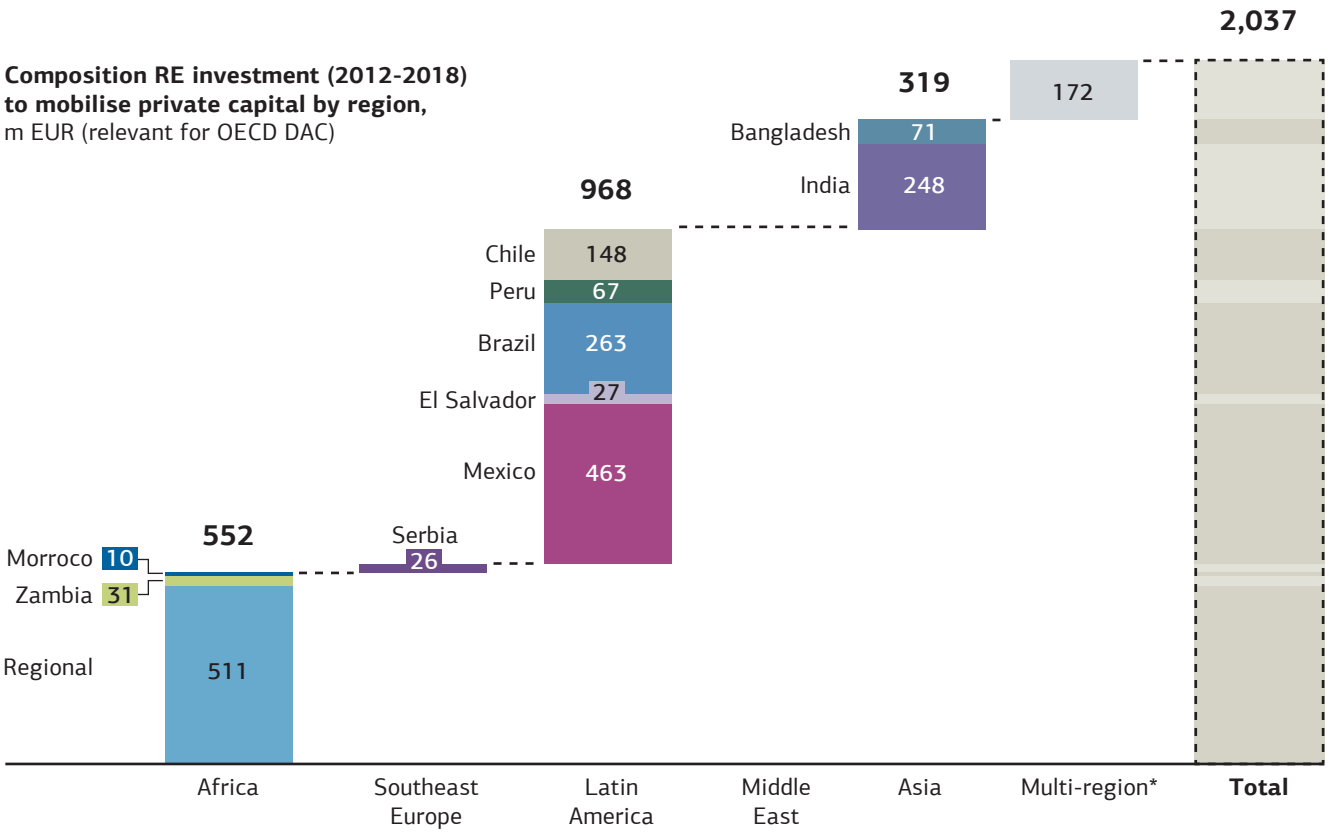
b) Relevance for Climate Change Mitigation and Adaptation, %



[9] "Rio markers": Climate Mitigation (KLM) and Climate Adaptation (KLA)

Notes: Only includes those five instruments that are captured by the OECD methodology, including guarantees, direct investment in companies, syndicated loans, credit lines and share in collective investment vehicles. The OECD methodology does not yet include loans and grants. For share in CIVs the OECD attributes 50 % to organisations holding the riskiest tranche, and the rest on a pro-rata basis. For credit lines, both the lifetime of the credit line is is considered (which may be longer than the maturity of the loan) and the amount of equity that the firm taking out the loan spends on the final project. Source: Internal KfW Development Bank documents

Figure 6: Composition of KfW Development Bank's RE (grid-connected) portfolio that mobilises private capital disaggregated by regional investment volumes.



Note: Only includes five instruments that are captured by the OECD methodology, which include guarantees, direct investment in companies, syndicated loans, credit lines, and share in collective investment vehicles. The OECD methodology does not yet include loans and grants Source: Internal KfW Development Bank documents
Multi-region comprises three funds, namely Green for Growth Fund, Global Climate Partnership, and Renewable Energy and Energy Efficiency Programme III investing mainly in South-Eastern Europe, Central America, and the Middle East.

The impacts of the Green for Growth Fund (GGF)

GGF provides loans to qualified local financial institutions (FIs) to promote RE / RE investments by micro, small and medium-sized enterprises (MSMEs) and households at close to market conditions as well as up to 30 % of the funds in the form of direct investment in energy production from renewable sources.

The risk waterfall structure of the Fund allows investors to invest in the following tranches, depending on their risk-bearing ability and willingness: (1) the junior tranche serves as a risk buffer, which initially mitigates losses of the fund; and at the same time has the lowest dividend distribution within all share classes. These are capital contributions of public donors (C-Shares), which are available indefinitely or for a very long tenor (20 years); (2) The „mezzanine" tranche, which absorbs potential losses after the C Shares, comprises participations of international FIs (IFIs) with a term of ten years (B Shares); (3) The „senior" tranche (A shares), also issued with a term of ten years and purchased by IFIs, bears the lowest risk in the group of shares. Finally, the GGF issues notes to private, social and/or commercial investors, with fixed or floating coupons, for maturities ranging from 3-7 years.

The fund is currently refinancing - with a volume of EUR 554.8 million - 61 partner institutions (PI) in 17 different countries. Turkey and the Western Balkans account for 43 % of the investment volume, the eastern neighbourhood region of the EU 29 % and 28 % for the countries of the MENA region.

Across the entire fund, CO2 reduction compared to business as usual of 60 % (equivalent to 870,674 t CO2 / year) and energy savings of 58 % (equivalent to 3,423,404 MWh / year) has been achieved so far. CO2 emission reductions of the Fund (traditional energy savings) are attributable to 51 % (52 %) to energy efficiency measures and 49 % (48 %) to the use of RE. Since its inception, more than 36,000 loans have been issued to final borrowers with a total volume of more than EUR 1,013.6 million (as of 31.12.2019). These were largely split between the services sector (34 %), households (33 %) and manufacturing (20 %).

Over time, the focus of the portfolio has significantly shifted towards investment in RE, both directly and via its financial institution partners.

By year-end 2019, private capital invested via notes accounted for nearly 30 % of the overall capital structure, rising from EUR 7 million a few years ago to EUR 154 million at year-end 2019. With additional observed demand translating into new investments in 2020 already in the pipeline, the share of private capital is nearing the limits set forth at inception in the fund's Issue Document.

4.2.1 GET FiT Case Study – Additionality of private capital

While the GET FiT approach is currently not captured by the OECD methodology, the following section shows its substantial effect on mobilising private capital, which was corroborated in a research collaboration between the University of Cambridge and KfW Development Bank's evaluation department.

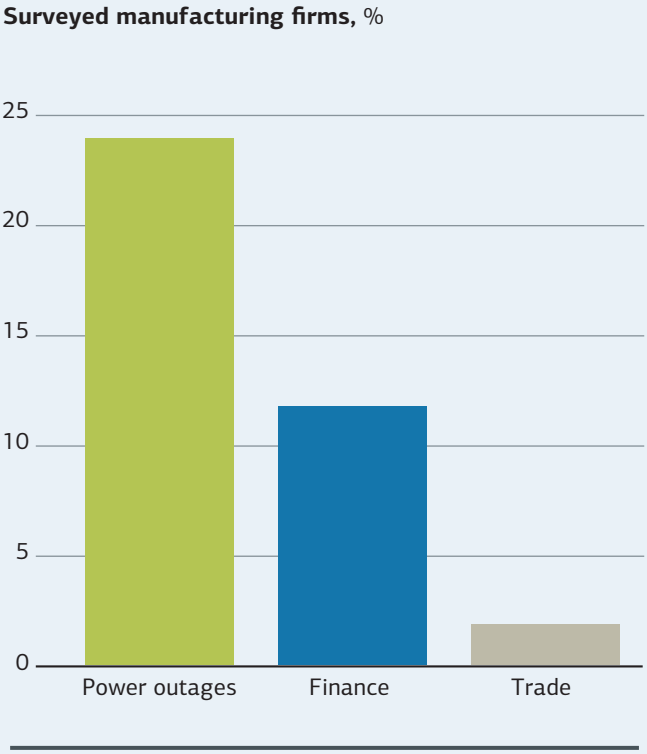
The Global Energy Transfer Feed-in Tariff (GET FiT) seeks to assist East African nations in pursuing a climate resilient low-carbon development path. GET FiT is a comprehensive programme to fast-track a portfolio of currently 17 small-scale renewable energy generation projects promoted by private developers. The programme enhances the overall enabling environment for private investment in renewable energy through improvements in the Renewable Energy Feed-In Tariff system and its application. It also stabilizes Ugandan power sector finances by adding least-cost generation capacity. It also improves the availability of long-term commercial finance for small-scale renewable energy generation projects in Uganda. With the small RE projects it seeks to decentralize and diversify Uganda's energy mix, thus enhancing security of supply and potentially power outages, which has been identified as a key obstacle to firm productivity in Uganda, as measured by a representative sample of Ugandan manufacturing firms (Figure 7).

Hence, the question is to what extent the GET FiT Programme incentivised private investments that would not have happened otherwise. Given that Randomised Controlled Trials (RCTs) are normally not possible for infrastructure projects such as GET FiT, a threshold approach was used to evaluate the additionality of the GET FiT Programme.

The profitability of projects was modelled, namely the Internal Rate of Return (IRR) and a threshold approach applied to compare projects that were accepted by the programme and those that were rejected. Firms that applied to build GET FiT plants needed to provide extensive financial documentation, which was checked by the Programme Management. The quality of this documentation is above that of most other comparable programmes. In addition, the threshold approach did not apply the same metric of financial viability across different rounds (e.g. 11 % IRR), but instead the lowest IRR in each round of projects that were rejected, but then went ahead with construction despite not receiving funding by the GET FiT Programme, was used as a threshold value. This IRR is referred to as the counterfactual IRR, and provides an indicative level for the actual (non-subsidised) market IRR. Out of the 17 projects, 14 were small hydropower plants, so the focus is only on this subset of plants.

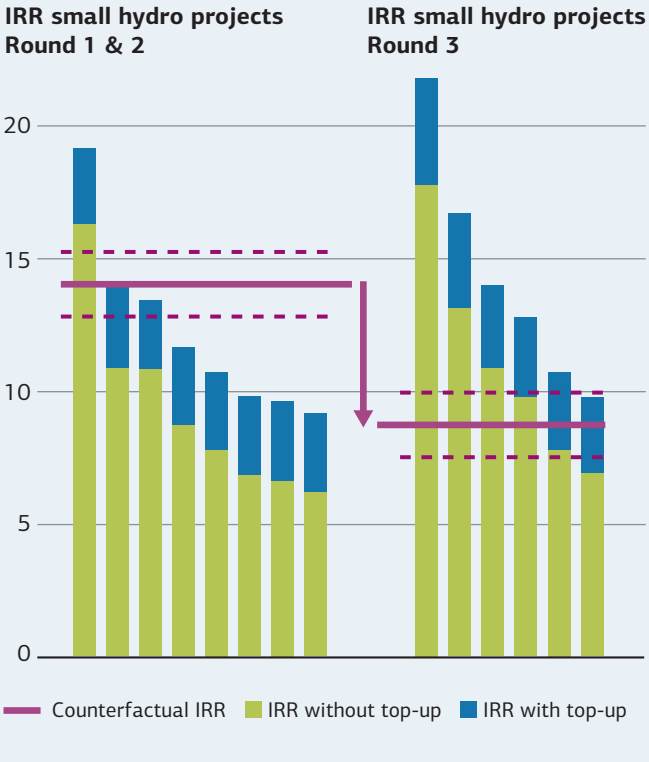
The findings, as illustrated in Figure 8, suggest that most small hydropower plant projects were additional i.e., would not have been built without the GET FiT project support, particularly in funding rounds 1 and 2. It is evident from the data, that the profitability of projects required to go ahead with construction (counterfactual IRR)

Figure 7: Firms' Main Obstacles in Uganda 2013



Source: World Bank Enterprise Survey (2013)

Figure 8: The required profitability of the projects dropped across the three rounds, due to lower investment risk



Source: GET FiT (2018)

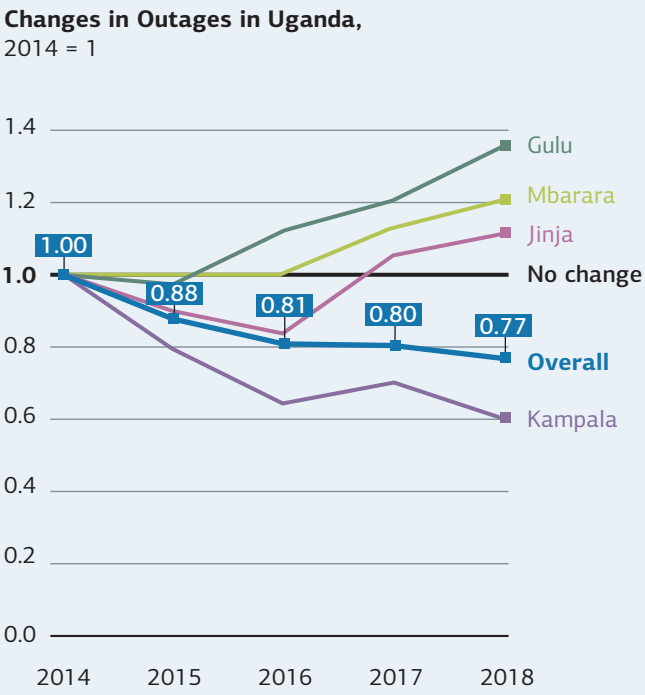
declined substantially in round 3, indicating lower investment risks. This suggests that the cost of capital – particularly equity – went down over time and across the different rounds. The GET FiT Programme rightfully decreased the top-up over the rounds to account for lower investment risks in Uganda. Nonetheless, our research indicates that, in retrospect, the phase-out could have been even faster.

While these findings may provide a basis for further discussion on determination and adjustment of top- up levels in future GET FiT schemes, it should be noted that the counterfactual IRR only provides an indicative level of market IRR – different hydropower projects and different investors have different return requirements. Moreover, additionality is difficult to determine due to significant uncertainty with respect to exact level of returns required by individual investors. Interestingly, the GET FiT Zambia programme has made the top-up amount subject to competition by asking Independent Power Producers to quantify their required amount of 'viability gap financing' as part of their financial offer (within a pre-defined range of USDc 0.1 to 1.0 per kWh).

The GET FiT Programme in Uganda demonstrates that substantial declines in power cost are possible even for mature technologies, such as small hydropower technologies, through lowering the cost of capital and risk perception of investors. For that, a sound regulatory environment is critical, which includes a clear procedure for obtaining generation and environmental permits, interconnection and a solvent off-taker. This is particularly important for renewable energy technologies, where generally a greater proportion of the cost needs to be paid up-front compared to conventional technologies, such as gas plants. Hence, financing cost – cost of debt and equity – and risk perception are central cost drivers of these projects and maintaining a predictable investment environment is key to minimising project costs and ultimately electricity tariffs.

In the absence of reliable outage-data for the entire Ugandan territory, satellite data was used to measure nightlight variations to proxy changes in outages. We show that outages have declined by 23 % since the introduction of GET FiT programme. As the average firm faces roughly four hours of outages per day, this could amount to around one hour of fewer power outages per day, if these gains were distributed equally over all firms surveyed in the World Bank Enterprise Survey. If it is assumed that outages decrease sales by 0.3 % per hour of outage per month, decreasing outages by one hour per day (i.e., 30 per month), this could increase firm sales per month by 9 %. Yet, the geographic distribution of the reduction in outages is unequal, as it mainly occurred in the Ugandan capital Kampala (Figure 9). Yet, it should be underscored that there are several other factors that could have influenced the decline of outages, such as infrastructure measures outside of the programme, internal migration, and other factors.

Figure 9: Overall decline in median nightlight standard deviation (which we use as a proxy for outages) for the entire Ugandan territory and for the biggest city in each region



Source: VIIRS (2019) nightlight data

About the study

This section provided an overview of the ongoing research of KfW Development Bank, German Development Bank, and the Centre of the Environment, Energy and Natural Resource Governance (C-EENRG) of the University of Cambridge on the impacts of the GET FiT Programme. The study on GET FiT is a joint work between Benedict Probst, Prof. Laura Diaz Anadon, Prof. Andreas Kontoleon at the University of Cambridge and Lotte Westermann (KfW Development Bank). The study is envisaged to be published. The working title is "Leveraging private investment to expand renewable power generation: Evidence on financial additionality and productivity gains from Uganda".

4.3 Lessons Learnt from KfW Development Bank projects

4.3.1 Planning

Power sector planning is critical to ensure that power generation capacity financed through additional private sector capital can be integrated into the grid and absorbed by the economy. Eberhard and Gratwick (2011) analyse the success factor across 20 IPP deals across eight countries and conclude that planning is the single most important factor determining the long-term viability of IPPs. The experience of KfW Development Bank-backed projects corroborates this conclusion. For example, in parallel to the GET FiT Uganda programme (which increases power generation expands the existing power generation capacity of ~800 MW by 20%), two Chinese-backed hydropower plants are under construction and are to come online in 2020. These two projects will almost double the existing power generation capacity In Uganda. While some electricity may be exported to neighbouring countries, it is unlikely that the Ugandan economy can absorb this step-change in the power supply. Meyer, Eberhard and Gratwick (2018; p.86) conclude that "[...] a temporary excess supply of the expected scale has undoubtedly the potential to drive the offtaker, UETCL, to bankruptcy in a matter of months." In that case, the sovereign guarantees by the Ugandan government will kick in, potentially triggering a "race" for payments from sovereign guarantees, which will likely disadvantage small to medium projects compared to the large-scale hydro projects. Hence, ascertaining to what extent the additional power generation capacity is required or can be exported needs to be established early in the process to safeguard the positive track record of private sector solutions.

Windows of opportunities (due to power shortage or high-power cost) may make renewable power solutions more enticing and increase high-level political support for setting up programmes. Windows of opportunities for grid-connected renewable power projects change dynamically. For instance, before the start of the large-scale solar PV programme in Morocco, high energy prices, high water use of its energy system and a need to boost domestic power supply increased high-level political support to increase the share of domestically generated renewable power. Similarly, the government of Uganda was expecting substantial power shortages in 2015-2016, which could only be bridged by expensive heavy-fuel oil generators, costing roughly twice the average power price in Uganda. During these periods there is a strong economic justification for increasing the share of grid-connected renewable power generation, which in many countries can be above the average power price (particularly if power prices are not cost-reflective, which is commonly the case in many low- and middle-income countries). Renewable projects, such as solar PV, can often be constructed substantially quicker than comparable hydropower or conventional power projects making them particularly amenable to fill short-term power gaps.

Planning a sequence of financial support is critical for technologies with limited track record – specifically geothermal – and has to be communicated from the outset. For instance, geothermal power has various benefits: in contrast to solar PV and wind; it can provide base-load power, which means that it can generate electricity around the clock. In addition, in several countries it can be provided at low levelised cost (overall investment and operational cost divided by generated electricity) of $0.04 - 0.10 / kWh, substantially below the average LCOE of fossil-fuel alternatives. It is also substantially cleaner as it only produces a fraction of Greenhouse Gas Emissions of conventional fossil fuel plants. Yet, key to unlocking the power of geothermal projects is finding effective ways to finance exploratory cost, which account for around 15% of overall cost (USD 3-7 million) and have failure rates of 20-30%. In addition, as technologies with low track records find it difficult to attract commercial debt financing. This is critically needed to move beyond the exploration stage. Sequencing risk mitigation schemes[10] for exploration and attractive debt financing options[11] for the construction and operation phase is therefore important for geothermal projects to build a track-record. Similarly, grants were essential for smaller hydropower project developers in the GET FiT programme for exploratory engineering studies investigating the waterflows and potential construction types for specific sites. These grants were critical to make projects bankable and may also be relevant for other renewable energy technologies.

4.3.2 Implementation

Local champions are critical for the timely implementation of projects in increasingly liberalised markets. In Morocco, dedicated institutions for the promotion of renewable energy have been created to pursue the 2009 national energy strategy and subsequent solar and wind plans. For instance, the Moroccan Agency for Solar Energy (MASEN) played an integral role in the promotion of solar power in Morocco. MASEN not only manages the solar tenders, it also directly engages in project development, provides cheap debt financing (supported by international donors), commissioned site studies and negotiated grid connections with the grid-operator ONE. Similarly, in Uganda the Energy Regulation Authority (ERA) has played an integral role in the implementation of the GET FiT programme by accelerating licensing procedures. ERA also supported an investment composed of international experts, which enhanced transparency and credibility. Further supporting these project champions through technical assistance can strengthen their position. For example, ERA received project due diligence training enhancing internal capacities.

Given that almost every off-taker in Sub-Saharan Africa (and to a lesser extent other developing countries) is considered not creditworthy, there will likely be a necessity for liquidity support to the offtaker and guarantees to investors in most countries. Several countries might be hesitant to provide guarantees for smaller projects. Donors can facilitate the access of developers to partial risk guarantees or even support governments in drafting softer comfort letters (or a letter of acknowledgement) to address investor needs while minimising the risk exposure of domestic governments. In the GET FiT programme, the commitment of the Government of Uganda detailed in the Implementation Agreement is deliberately narrow and will only apply to specific circumstances. While there are markets, where deals have mate-

[10] KfW development bank is implementing these kinds of schemes with the support of BMZ and EU grant funding in Eastern Africa (GRMF – Geothermal Risk Mitigation Faciltiy) and Latin America (GDF – Geothermal Development Facility).
[11] Direct financing with public utilities (e.g. Kenya, Indonesia), KfW development bank: interest-subsidized or promotional and credit Lines Via (sub-)regional development banks (Latin America), KfW development bank: interest-subsidized or promotional loans

rialised without sovereign guarantees, some sort of minimum risk mitigation measure will likely continue to be important going forward. At the same time, liquidity issues are another key risk to investors, which can be mitigated through short-term liquidity support schemes, which are also part of the GET FiT programme.

Utilities continue to carry substantial currency risk, which can be mitigated through currency hedging options. Many feed-in tariffs in SSA and other developing regions are denominated in USD. While this substantially reduces the currency risk of the power generator, it increases the risk to the national utility and ultimately the domestic consumers, which earn their income in the domestic currency and pay for their electricity. As market exchange rates display substantially higher volatility in developing countries than in industrialised countries, this introduces uncertainty into the potential profits that can be made from a renewable energy project. If, for instance, a country sees a severe depreciation in its local currency relative to the dollar, the price of electricity can suddenly shoot up – despite the factors driving the currency changes being exogeneous to the project. In many developing countries, commercial currency hedging options only exist to a limited degree due to illiquid markets or have high cost due to substantial currency volatility. In the future, a co-operation with The Currency Exchange Fund (TCX) could provide an appropriate way to mitigate currency risk. In countries where FiTs are denominated in local currencies, such as in Namibia and Mozambique, hard currency-denominated gap financing is also an option.

Acronyms

AFD	Agence française de développement
AfDB	African Development Bank Group
BMZ	Federal Ministry for Economic Cooperation and Development
CIV	Collective Investment Vehicle
DAC	Development Assistance Committee
DFI	Development Finance Institution
EBRD	The European Bank for Reconstruction and Development
FC	Financial Cooperation
FMO	Netherlands Development Finance Company
GET FiT	Global Energy Transfer Feed-in Tariff
GDF	Geothermal Development Facility
GRMF	Geothermal Risk Mitigation Facility
IPP	Independent Power Producer
IRR	Internal Rate of Return
KfW	Kreditanstalt für Wiederaufbau
MIGA	Multilateral Investment Guarantee Agency
OECD	Organisation for Economic Co-operation and Development
PBL	Policy-based lending
PRI	Political Risk Insurance
RISE	Regulatory Indicators for Sustainable Energy
RLSF	Regional Liquidity Support Facility
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
TCX	The Currency Exchange Fund

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